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# Fog Monitor

## User's Guide AWIPS OB8.2 Release

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## 1 Introduction

The Fog Monitor is an AWIPS application which alerts forecasters to visibility hazards using station observations and satellite data. The station observations are automatically evaluated to find worst-case conditions, which are reported to the Guardian messaging tool. Station information is displayed in an interactive table and on the D-2D map. Adjustable algorithms are applied to visible and infrared satellite images in order to identify potential areas of fog. At night, the application primarily uses the standard infrared “Fog Product” (the difference of the 10.7 micron and 3.9 micron brightness temps) to highlight potential fog areas. During the daytime, there are several algorithms which attempt to discern fog areas by brightness, shape, and other characteristics. Also applied are filters which help to distinguish fog from possible false signal features such as snow cover and mid-level clouds. The results are displayed in a color field in the D-2D map and in the table mentioned above.

The application consists of a background processor on the px1 server, a D-2D display, and an extension table. The processor will continuously evaluate newly arrived station observations and satellite data, even when the display is not invoked. This allows the application to be a true “monitor”, as opposed to a passive interrogator of fog data upon user request. The Fog Monitor was originally designed to run as a part of SAFESEAS, to try to address the serious problem of marine fog (which can often go undetected due to the relative sparseness of maritime observations). The application has evolved into an independent process, versatile enough to run at inland forecast offices while retaining SAFESEAS tie-ins at coastal WFOs. The display table and configuration tools were based on the SAFESEAS design, so forecasters who use SAFESEAS or SNOW will find the “buttonology” of this application quite familiar.

MDL plans to include in-situ observations to complement the current satellite observations.

This users’ guide is limited in scope to the use of the Fog Monitor in AWIPS – how to run localization, start the processes, and interpret the displays. The science behind the Fog Monitor’s algorithms, while discussed somewhat in this document, deserves much more substantial mention, and these scientific aspects (theory, algorithms, limitations, etc.) will be described in further documentation available on the Fog Monitor web site (see section 5 for the web page link). Many of the algorithms used in Fog Monitor have been adapted from work performed by NWS colleagues and other experts in satellite meteorology. The scientific documentation described above will have references available for those who wish to read about the topic in greater detail.

## 2 What’s new in OB8.2?

OB8.2 features the first major upgrade of the Fog Monitor since it was first fielded in OB6. METARs, mesonets, and, for maritime WFOs, buoys, VOS ship reports and MAROBs, will be ingested and displayed in an expanded extension table. Worst-case conditions will be viewable in Guardian, and configuration interfaces will be available to allow users to adjust threshold settings.

### 3 *Fog Monitor Functional Overview*

The Fog Monitor consists of several processing and display components:

- a) The FMprocessor runs persistently on px1, along with an associated DataController process.
- b) The FMprocessor sends “worst case” visibility and algorithm updates to Guardian.
- c) The D-2D image display highlights areas of potential concern (derived from satellite data).
- d) D-2D also displays station observations for the area covered by the Fog Monitor.
- e) The Fog Monitor Table displays data from the station observations and the satellite-derived imagery.

The set-up/configuration components are the:

- a) localization script,
- b) Graphical User Interface (GUI) for editing the monitoring area,
- c) GUI for editing the algorithm setup thresholds

#### 3.1 *Fog Monitor Localization*

Fog Monitor localization uses the following files to produce your default monitoring area:

- a) US county “shape” files;
- b) marine zone “shape” files;
- c) the “maritimeStationInfo.txt” file; and
- d) the “metarStationInfo.txt” file.

It is the responsibility of each office to make sure that it has the current versions of these files *before* localization is run. In addition, for mesonet stations, SAFESEAS localization uses the following files in directory “/awips/fxa/ldad/data/”:

- a) “LDADinfo.txt”;
- b) one location information file for each external data source. These files have names of the form “xxxStation.txt, where “xxx” is a “data\_root” value from file “LDADinfo.txt”.
- c) one dataset information file for each external data source. These files have names of the form “yyy.desc”, where “yyy” is a “data\_type” value from file “LDADinfo.txt”.

It is the responsibility of each office to make sure these files are correct and up-to-date before localization is run. See documentation in file “/awips/fxa/data/localization/scripts/SS\_mesonetStationInfo.sh” for more information.

Fog Monitor localization is automatically run as a part of the full AWIPS localization that is done after an AWIPS build is installed. An office should not need to run Fog Monitor localization manually unless unusual, severe problems (such as the corruption of the files produced by localization) occur.

In the event that running Fog Monitor localization becomes necessary (outside of normal build installations, here is how to do it:

- 1) close all D-2D Fog Monitor displays on all lx workstations.
- 2) log on to the px1 system as user “fxa”.
- 3) change to directory “/awips/fxa/bin/”.
- 4) run the “stopFMprocessor” script.
- 5) change to directory “/awips/fxa/localization/scripts/”.
- 6) enter the command “mainScript.csh **-fogmon**”.
- 7) run the “startFMprocessor” script.

This localization step will create shared files visible to all machines under the `/${FXA_DATA}/workFiles/fog_monitor/` directories. It is therefore only necessary to run this command on a single machine (lx, px, or dx).

### *3.2 Fog Monitor background process startup*

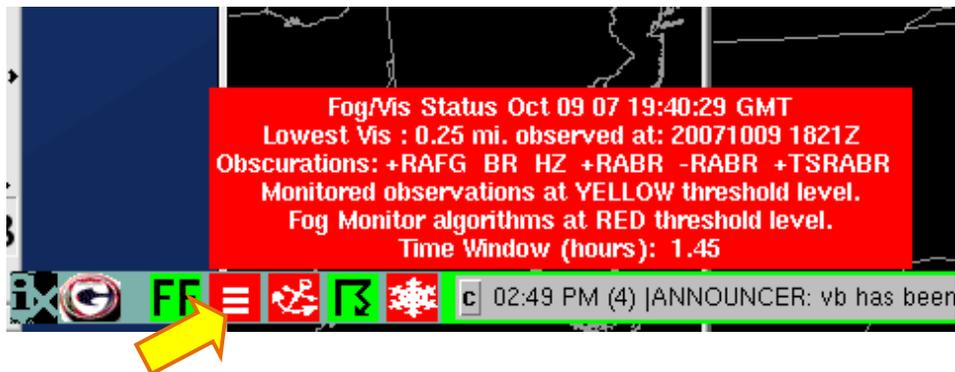
To start the Fog Monitor’s background processor user “fxa” should log into px1 and type the command: **startFMprocessor** (not to be confused with the similar “**startFFMPprocessor**”). The processor and a parent **DataController** will start up (as will a script called **runFogMonitor.bash**, which links the processes). Note that the normal px1 ingest routines should start these process, so the manual command described above will usually not be necessary. To stop the Fog Monitor application, run **stopFMprocessor**.

### *3.3 Monitoring Visibility, Fog, and other Obscurations through Guardian*

The Fog Monitor’s FMprocessor automatically evaluates observations and satellite data in the WFO-configured monitoring area for conditions for low visibility conditions. It regularly evaluates and updates a single, overall threat level for the monitoring area. This threat level is displayed in the Guardian panel as a colored-coded icon containing a fog symbol (Figure 3.3-1).

#### *3.3.1 Interpreting Guardian Icon Information*

The icon’s background color represents the overall threat level, determined by finding the worst-conditions for visibility, present weather obscurations, and satellite algorithm output. Scrolling the cursor over the icon reveals a popup with a summary of this worst-case information, including:



**Figure 3.3-1. Fog Monitor’s Guardian icon.** The popup indicates the lowest reported visibility in the Fog Monitor evaluation area, the algorithm threat level, and the types of obscurations detected. In the display above, the observations reach a user-configurable threshold of “YELLOW”, while the satellite-derived algorithm results indicate “RED” (i.e., probable fog). The icon takes on the color of the highest determined threat level (e.g., RED).

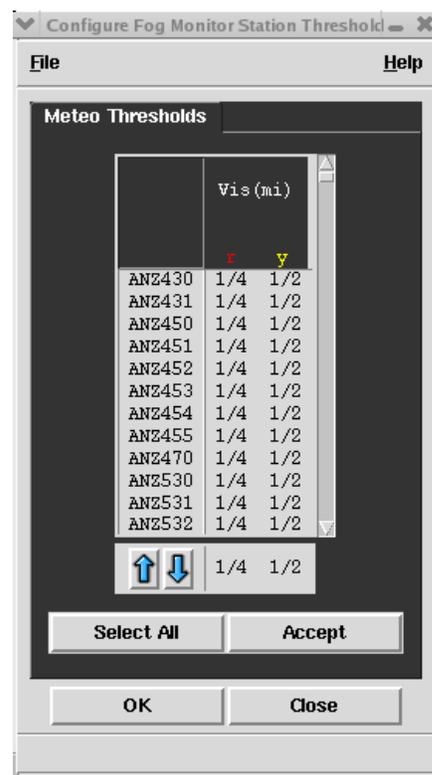
- **Fog/Vis Status:** Latest update time for the Fog Monitor.
- **Lowest Vis:** Lowest reported visibility among the Fog Monitor’s collection of stations, and the time at which it was observed.
- **Monitored observations at GREEN/YELLOW/RED threshold level:** This line gives the worst case threshold level reached by the visibility values, as determined by user configuration. Please note that the worst-case threshold may not always be generated from the lowest visibility, because users can set varying visibility thresholds on a county by county or zone by zone basis.
- **Obscurements:** Each unique present weather event that includes an obscuration will be listed in this row. Obscurements include:
  - **Fog (FG)**
  - **Mist (BR)**
  - **Smoke (FU)**
  - **Volcanic Ash (VA)**
  - **Widespread Dust (DU)**
  - **Sand (SA)**
  - **Haze (HZ)**
  - **Spray (PY)**
  - **Blowing Snow (BLSN)**
- **Monitored observations at GREEN/YELLOW/RED threshold level:** This line gives the worst case threshold level reached by the visibility values and present weather, as determined by users via the monitor thresholds interface. Please note that the worst-case threshold may not always be generated from the lowest visibility, because users can set varying visibility thresholds on a county by county or zone by zone basis. Also note that any reported

obscuration will trigger a threat level of **YELLOW** (which can be superseded by **RED** threshold levels from visibility or the fog algorithms).

- **Fog Monitor algorithms at GREEN/YELLOW/RED threshold level:** This is the worst-case threat level determined by the algorithms. The results can be adjusted with the algorithm thresholds interface, and, optionally, this feature can be disabled using the Monitoring Area Configuration Interface, this allowing the overall threat level to be determined solely by the visibility and present weather.
- **Time Window (hours):** Also adjustable in the Monitoring Area Configuration Window, the time window reflects how long the Fog Monitor will store its worst-case evaluations before they expire.

### 3.3.2 Modifying the Visibility Thresholds

- In the App Launcher’s Fog Monitor sub-menus, the “**Configure Visibility Thresholds for Guardian Monitoring**” selection will activate the Station Monitoring Thresholds interface (Fig. 3.3.2-1). By selecting individual zones and threshold levels, then selecting the red or yellow values to the right of the arrows, users can move the values up or down by clicking on the arrows. The “**Select All**” button will highlight all the zones. Selecting “**Accept**” and then “**OK**” will modify the yellow and red threshold levels as seen in Guardian. To de-select all selected zones, click the “**De-Select All**” button near the bottom of the window. This button appears only when the “**Select All**” button been pressed.



**Figure 3.3.2-1:** Station Monitoring Thresholds window

### 3.4 Optional SAFESEAS Monitor Tie-In

There is an optional tie-in as well to the SAFESEAS alert icon in Guardian (see Figure 3.4-1). The user can allow the Fog Monitor background processor to contribute data that determines the background color of this icon. The Fog Monitor looks for zones and counties which its monitoring area shares with that of SAFESEAS. The worst case fog conditions (and their attendant color values, described later) will be made available to be picked up by the SAFESEAS button, as an additional monitored parameter. Consult the SAFESEAS User’s Guide for information on the alert icon.



**Figure 3.4-1. Fog Monitor’s optional SAFESEAS tie-in :** The SAFESEAS Guardian icon can optionally, through the SAFESEAS Monitoring Area Configuration window, receive Fog Monitor satellite algorithm worst-case output.

### 3.5 Fog Monitor D-2D Display

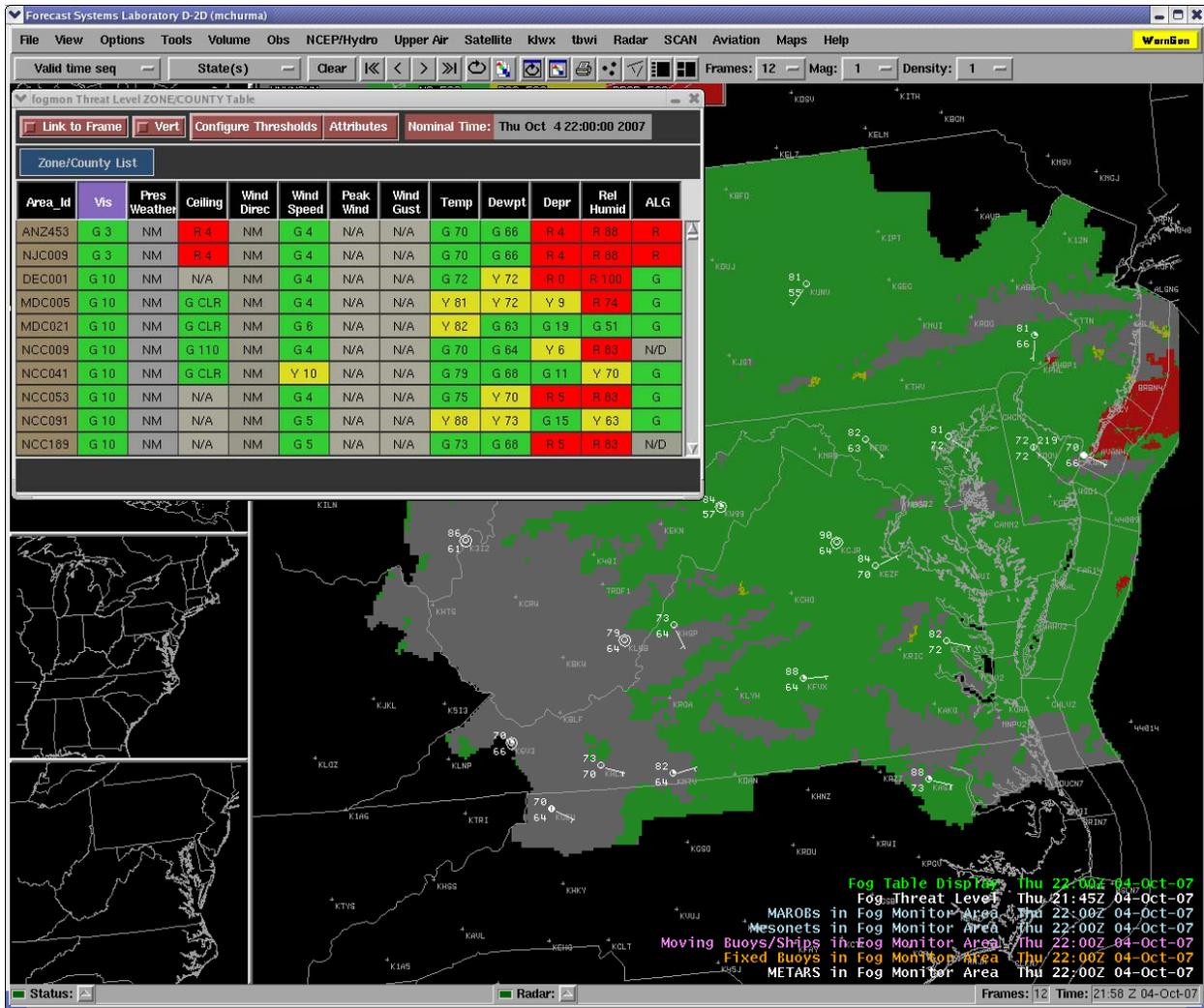
The selection for Fog Monitor is located near the bottom of D-2D’s **Obs** menu (Figure 3.5-1). When selected, the application’s output will appear on the screen, and data table will accompany it (Figure 3.5-2). By default, the monitoring area will consist of the local County Warning Area (CWA), each adjoining CWA, and the marine zones monitored by the local and adjoining CWAs.

Red areas indicate the probable presence of fog, as determined by the algorithm settings (discussed in detail in sections 4.1 and 4.2). Yellow areas indicate the possible presence of fog, and the green areas indicate no fog. Black areas are not monitored.

Gray areas denote regions of the monitoring area with an undetermined status. Usually, gray areas will be caused by mid-level or high clouds, which will obstruct the Fog Monitor’s view of the surface. Sometimes, though, a straight gray block can be seen cutting through the monitoring area. This indicates an area of twilight. The Fog Monitor is often ineffective near dawn and dusk, because those times provide “in-between” satellite data conditions: there is not enough reflected light for the visible-range algorithms to be effective, but there is too much scattering in the 3.9 micron channel to allow the use of the nighttime Fog Product channel differences (which assume black body emissions, not scattered returns). Figure 3.5-2 displays an example of Fog Monitor output in D-2D.



**Figure 3.5-1** Fog Monitor menu selection under the D-2D Obs menu.



**Figure 3.5-2.** Fog Monitor in D-2D includes algorithm imagery, station plots, and an interactive table.

### 3.6 The Zone Table

The zone/county table is automatically constructed and displayed when the Fog Monitor is launched. Each row provides information on the worst-case parameter value in the listed zone or county. The table is illustrated in Figure 3.6-1. Tables 3.6-1 and 3.6-2 summarize the features and actions available in the zone table display. The colors in the ALG column have the same meaning as those in the D-2D display field.

fogmon Threat Level ZONE/COUNTY Table

Link to Frame
  Vert
 

 Nominal Time: Thu Oct 4 22:00:00 2007

Zone/County List

Area_Id	Vis	Pres Weather	Ceiling	Wind Direc	Wind Speed	Peak Wind	Wind Gust	Temp	Dewpt	Depr	Rel Humid	ALG
NJC009	G 3	NM	R 4	NM	G 4	N/A	N/A	G 70	G 66	R 4	R 88	R
ANZ453	G 3	NM	R 4	NM	G 4	N/A	N/A	G 70	G 66	R 4	R 88	R
VAC840	G 10	NM	G 95	NM	G 4	N/A	N/A	Y 84	G 63	G 21	G 48	G
NCC009	G 10	NM	G 110	NM	G 4	N/A	N/A	G 70	G 64	Y 6	R 83	N/D
WVC053	G 10	NM	G CLR	NM	G 0	N/A	N/A	Y 86	G 61	G 25	G 43	N/D
WVC025	G 10	NM	G CLR	NM	G 0	N/A	N/A	G 79	G 64	G 15	Y 61	G
VAC800	G 10	NM	G CLR	NM	G 8	N/A	N/A	Y 81	G 68	G 13	Y 66	G
VAC550	G 10	NM	G CLR	NM	G 7	N/A	N/A	Y 82	Y 75	Y 7	R 79	G
VAC179	G 10	NM	G CLR	NM	G 5	N/A	N/A	Y 82	G 64	G 18	G 55	G
VAC177	G 10	NM	G CLR	NM	G 6	N/A	N/A	Y 84	Y 70	G 14	Y 62	G

**Figure 3.6-1:** The Zone Table displays the worst-case values in the listed zone or county. The highlighted “Ceiling” box indicates that the Ceiling column is being sorted. Note that pre-OB8.2 versions of the table included the “Area\_ID” and “ALG” columns (reabeled from the “Fog” title. All other columns in between were added in OB8.2.

**Table 3.6-1:** Contents of the zone and station table displays, by column.

COLUMN LABEL	DEFINITION	UNITS
Area_Id	Identifier for zone/county or station.	none (alphanumeric)
Vis	Horizontal Visibility	statute miles
Pres Weather	<b>At Zone Level:</b> No information at the zone level. “NM”, for “Not Monitored” will be displayed. <b>At Station Level:</b> Present Weather text will be displayed (no ranking by color or sorting)	none
Ceiling	Cloud Ceiling (METARS only).	statute miles, <b>in hundreds of feet</b> ; SKC or CLR when appropriate for manual or automatic reports of unlimited ceiling.
Wind Speed	Wind speed	knots
Peak Wind	Max hourly wind speed	knots
Wind Gust	Speed of wind gust	knots
Temp	Temperature	Degrees Fahrenheit
Dewpoint	Dewpoint Temperature	Degrees Fahrenheit
Depr	Dewpoint Depression ( <b>Please note:</b> If the difference between the Temp and Dewpoint columns <u>at the zone level</u> does not equal the Depr value, it is because you are seeing “worst-case” temperature, dewpoint, and depression results from more than one station in the zone/county.)	Degrees Fahrenheit
Rel Humid	Relative Humidity	Percent.

COLUMN LABEL	DEFINITION	UNITS
ALG	<p>Displays threat level status for the corresponding zone:</p> <p><b>G (Green -- No Fog).</b>  <b>Y (Yellow -- Possible Fog).</b>  <b>R (Red -- Probable Fog).</b>  <b>N/A (Gray -- Not Available</b> — usually indicates a county/zone within the monitoring area which has been intentionally removed by the user) <b>Note: <u>Station level of the table will always show N/A in the Fog column.</u></b>  <b>N/D (Gray -- Not Determined).</b></p>	None (letter indicating threat level)

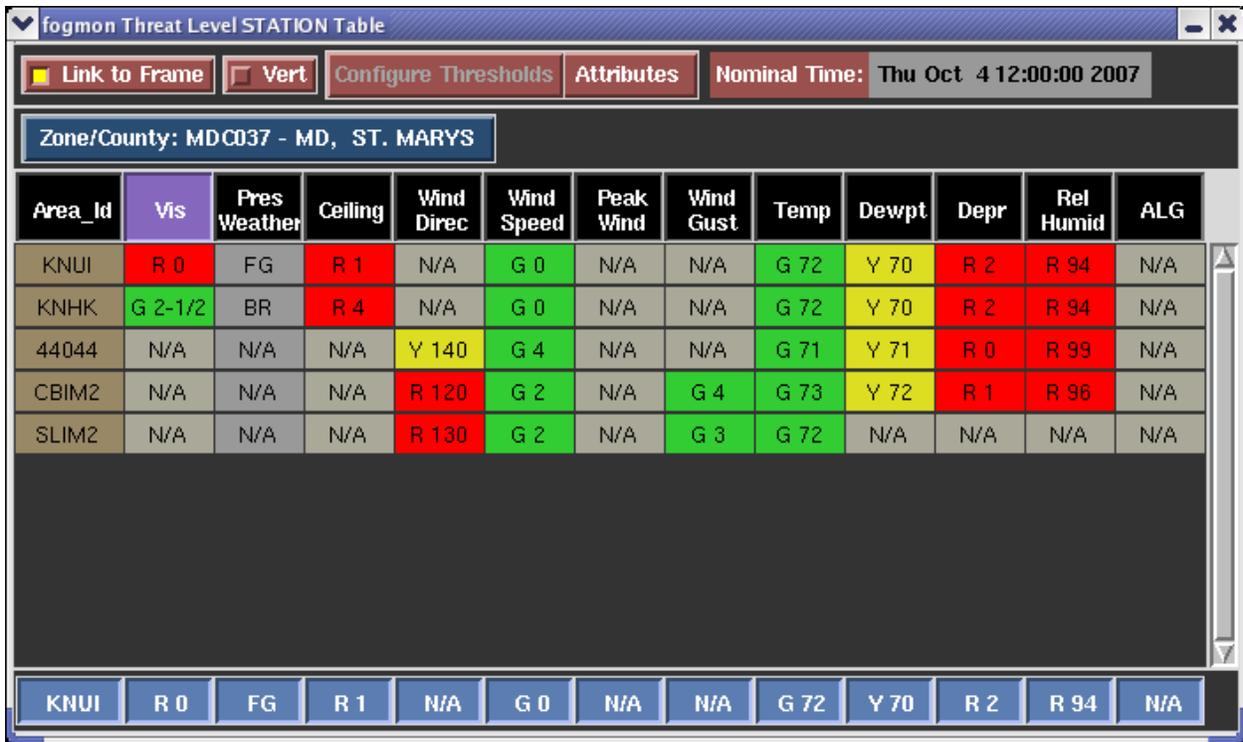
**Table 3.6-2:** Features and Action options for the zone table display.

Link to Frame	When link-to-frame is active, the nominal time in the zone and station tables always matches the valid time in the D-2D frame, and the data in the table animates with the D-2D looping. No matter what the “Link to Frame” mode is, the zone table will auto-update to display new data in the latest frame. Otherwise, the nominal time of the zone table remains unchanged at the last frame time in the D-2D display, until either you cause the table to be redrawn, or the D-2D frame advances to a new nominal hour valid time.
Configure Thresholds	Left-clicking the “Configure Thresholds” button near the top of the window brings up the editor for the display thresholds. Refer to Section 3.8.
Nominal Time	Represents the time of the data in the threat-level table display.
Zone Detail (Zoom/Recenter D-2D, and show station table)	Left-clicking on a zone ID (in the first (leftmost) column) causes the Fog Monitor D-2D plot to zoom in and re-center on the selected zone, and the zone table to be replaced by a station table (a table showing threat levels and variable values for the latest report for each station in the zone). Refer to Section 3.7 for information on the station table.

Vert	Selecting this button will cause the Zone Table to align itself vertically, with the highest-ranking values on the left hand side. De-selecting the button will cause the table to realign itself back to its horizontal configuration.
Attributes	This button will allow users to enable or disable the display of individual attributes in the Fog Monitor table. Note that all the attributes appear by default when the table is first loaded.
Resize Table	Users can grab the corners/sides of the table with the mouse to resize the table to alter the number of visible rows and columns. This feature, along with the Attributes button, will enable users to have greater control over the size of the Fog Monitor table pane.
Sort by Area-ID	Left-Clicking on “Area-ID” causes the table to be sorted alphabetically by zone-ID.
Sort by Threat-level	Left-clicking on the attribute titles (e.g., “ <b>Ceiling</b> ”, “ <b>Wind Speed</b> ”, etc.) causes the table to be sorted by threat level, with greatest threat-level appearing at the top of the table. The highest threat levels will usually correspond to the highest or lowest values of each parameter (i.e., highest wind speed or lowest ceiling). If users customize their zone-based threshold levels to vary from zone to zone, though, there may be circumstances where the highest threat levels do not correspond to the highest/lowest attribute values. If, for example, county X has a red threshold of 20 knots while the rest of the counties have uniform red thresholds of 40 knots, a “red” wind speed of 25 knots in county X will take precedence over 35 knot wind speeds in other counties.
Cursor-Sample Area Name	Scrolling the cursor over the Area ID’s will reveal popup text that provides the name of the encoded zone/county.

### 3.7 *The Station Table*

To launch the station table (Figure 3.7-1), left-click on the zone ID in the first (leftmost) column of the zone table. Only those stations associated in the monitoring area with the selected zone will be shown in the station table. Table 3.7-1 summarizes the features and actions available in the station table display.



**Figure 3.7-1:** Fog Monitor Station Table. As shown, the table is sorted by Area ID. Right-clicking on a cell in the table will launch a 24-hour trend plot (see figures 3.7-1-1, 3.7.1-2, and 4.5.1-3) for the station and the product or variable corresponding to the cell.

**Table 3.7-1:** Features and Action options for the station table display.

Link to Frame	<p>Clicking the “Link to Frame” button toggles link-to-frame behavior. When link-to-frame is active, the nominal time in the zone and station tables always matches the valid time in the D-2D frame, and the data in the tables animates with the D-2D looping.</p> <p>Otherwise, the nominal time of the station table remains unchanged at the last frame time in the D-2D display, until either you cause the table to be redrawn, or the D-2D frame advances to a new nominal hour valid time.</p>
Zoom/Recenter D-2D	Left-clicking on a station ID in the “Area ID” column causes the Fog Monitor plots to zoom in and re-center on the selected station.
Configure Thresholds	This feature is inactive at the station level, since the display thresholds are configured on a zone by zone or county by county basis.

Sort by Threat Level	Left-clicking on a product or variable name causes the table to be sorted by the threat levels in that column. Stations are first sorted into decreasing order based on the selected product's or variable's threat level values. Stations with the same threat level for the selected column are secondarily sorted alphabetically by station ID.
Display Trend	Right-clicking on a threat-level cell within the table produces a 24-hour trend for the station and variable corresponding to the cell. See Section 3.7.1.
Revert to Zone Table	The "Zone/County" button immediately above the column headings in the station table indicates which zone or county's stations are being displayed in the table. Left click on this button to return to the zone table mode.
Vert	Selecting this button will cause the Zone Table to align itself vertically, with the highest-ranking values on the left hand side. De-selecting the button will cause the table to realign itself back to its horizontal configuration.
Attributes	This button will allow users to enable or disable the display of individual attributes in the Fog Monitor table.
Resize Table	Users can grab the corners/sides of the table with the mouse to resize the table to alter the number of visible rows and columns. This feature, along with the Attributes button, will enable users to have greater control over the size of the Fog Monitor table pane.
Cursor-Sample Area Name	Scrolling the cursor over the Area ID's will reveal popup text that provides the name of the encoded zone/county.

***A Note about METAR Specials and Corrections:***

Users may occasionally notice discrepancies between D-2D METAR plot data and station information in the Fog Monitor station table. This can occur because the table will sometimes incorporate METAR special and correction reports more rapidly than will the D-2D plot.

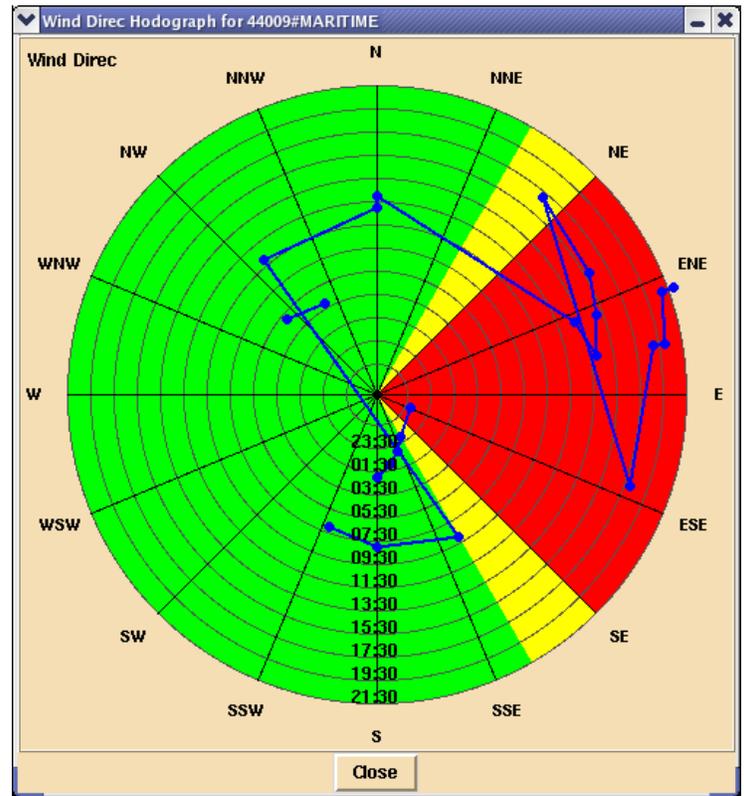
### 3.7.1 The Trend Plot

A trend can only be launched from the station table. Within the station table, right-click on the cell in the row/column corresponding to the station and variable of interest.

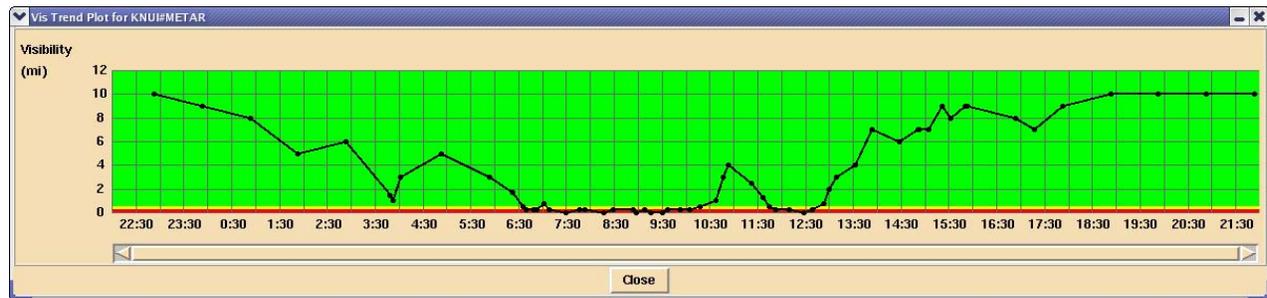
The trend plot for the selected data will be displayed. When you are finished viewing the plot, click the “Close” button below the graph.

A variable’s trend (Figure 3.7.1-1) is a plot (meteogram) of the selected variable’s values versus time for the past 24 hours. The background of the plot is colored to show where the plotted values lay within the display table’s threat levels. Dots representing individual observations are not connected when there are known to be other observations missing between the plotted points.

A right-click on wind direction will bring up a hodograph-type chart to represent directional trends (Figure 3.7.1-2). The direction of the wind is represented by a point’s bearing on a polar plot. Concentric circles represent the observation times. Azimuthal alert thresholds (discussed in the next section) are colored in red and yellow arcs.



**Figure 3.7.1-2:** Trend plot for a wind direction. The outermost circle represents the latest time. The points indicate that the winds have shifted from the S-SW to the E-NE direction. The red threat area is always contained within the yellow area.



**Figure 3.7.1-1:** Trend plot for a variable (visibility in the example shown).

### 3.7.2 Observation History Table.

In the station table, right-clicking on a station ID will produce a 24 hour observation history (OH) table (Fig 3.7.2-1). The appearance of the table will depend on the type of station being interrogated. Maritime stations, for example, will have wave information, while METARS stations will not. The user can choose the fields that will appear by clicking on the “Configure” button on the top right of the table. The OH Table configuration window will appear (Fig. 3.7.2-2)

Time (UTC)	Rel. Humid (%)	Visibility (mi)	Ceiling (fts:100)	Wind Dir (deg)	Wind Spd (kt)	Wind Gust (kt)	P (in)	T (deg F)	Dewpt (deg F)	Dewpt (deg F)	P Tendency (in)
21:53 Oct 04	48.1	10.0	N/A	N/A	0.0	N/A	30.14	82.0	61.0	21.0	N/A
20:53 Oct 04	39.9	N/A	70	N/A	0.0	N/A	30.14	84.0	57.0	27.0	-0.02
19:53 Oct 04	39.9	10.0	N/A	200	3.0	N/A	30.14	84.0	57.0	27.0	N/A
18:53 Oct 04	42.6	10.0	55	N/A	0.0	N/A	30.15	84.0	59.0	25.0	N/A
17:53 Oct 04	48.1	3.0	CLR	N/A	3.0	N/A	30.16	82.0	61.0	21.0	-0.04
17:34 Oct 04	47.8	10.0	CLR	N/A	0.0	N/A	N/A	81.0	59.0	22.0	N/A
17:26 Oct 04	47.8	2.500	CLR	N/A	3.0	N/A	N/A	81.0	59.0	22.0	N/A
16:53 Oct 04	47.8	10.0	CLR	210	4.0	N/A	30.18	81.0	59.0	22.0	N/A
15:53 Oct 04	47.6	10.0	CLR	180	7.0	N/A	30.19	79.0	57.0	22.0	N/A
14:53 Oct 04	56.9	10.0	CLR	150	5.0	N/A	30.20	73.0	57.0	16.0	+0.03
13:53 Oct 04	68.6	10.0	CLR	N/A	0.0	N/A	30.20	70.0	59.0	11.0	N/A
12:53 Oct 04	82.6	9.0	CLR	140	3.0	N/A	30.19	64.0	59.0	5.0	N/A
11:53 Oct 04	87.9	7.0	CLR	140	3.0	N/A	30.17	61.0	57.0	4.0	+0.04
10:53 Oct 04	93.7	8.0	N/A	140	4.0	N/A	30.16	59.0	57.0	2.0	N/A
09:53 Oct 04	87.9	8.0	CLR	30	3.0	N/A	30.14	61.0	57.0	4.0	N/A
08:53 Oct 04	82.5	10.0	CLR	N/A	0.0	N/A	30.12	63.0	57.0	6.0	+0.01
07:53 Oct 04	87.9	7.0	CLR	150	3.0	N/A	30.11	61.0	57.0	4.0	N/A
06:53 Oct 04	72.7	10.0	CLR	180	3.0	N/A	30.11	66.0	57.0	9.0	N/A
05:53 Oct 04	82.6	6.0	90	160	4.0	N/A	30.11	64.0	59.0	5.0	+0.01
04:53 Oct 04	72.7	6.0	CLR	120	3.0	N/A	30.11	66.0	57.0	9.0	N/A
03:53 Oct 04	60.2	10.0	CLR	120	3.0	N/A	30.10	70.0	55.0	15.0	N/A
02:53 Oct 04	60.2	10.0	CLR	N/A	0.0	N/A	30.10	70.0	55.0	15.0	+0.03
01:53 Oct 04	53.0	10.0	CLR	N/A	0.0	N/A	30.10	72.0	54.0	18.0	N/A
00:53 Oct 04	49.9	10.0	CLR	N/A	0.0	N/A	30.09	73.0	54.0	19.0	N/A

**Figure 3.7.2-1.** Observation History Table. The parameters in the table will change depending on whether the site is land or sea-based, and also by how the user configures it.

#### Observation History Table Cannot Sort....

Unlike the Fog Monitor zone/station table, the OH table’s columns cannot sort by value. The latest values are always at the top, the oldest at the bottom.

Inside the configuration window are two columns of parameters, one for METAR stations and one for maritime stations. Selecting or de-selecting each parameter will determine whether the parameter appears in the OH table for that type of station. Clicking on the “**Maritime**” or “**METAR**” buttons will automatically cause all parameters to be selected. Select the **Save** button to store the configuration, and select the OH Table’s “**Update**” button (which will have become enabled and turned white) to see the new configuration in the OH Table.

### 3.8 Configuring the Zone/Station Table Display Thresholds

To determine the threat level for a cell in the zone table, the Fog Monitor compares observation values for the most recent report for each station within the zone against thresholds for two alert levels. The most severe individual observation value threat level becomes the threat level for the zone. The thresholds for the two alert levels are both variable- and zone-specific. The editor for the display thresholds allows each site to customize the thresholds.

The display thresholds configuration window can be launched from the zone table only. Click the “**Configure Thresholds**” button near the top of the zone table to bring up the editor for the display thresholds (Figure 3.8-1). The display thresholds for each variable and product, for each zone in the monitoring area, are shown in the scrolling list in the center of the editor. To conserve space, the thresholds have been organized into multiple pages, with the selectable tabs for each page above the top left corner of the table:

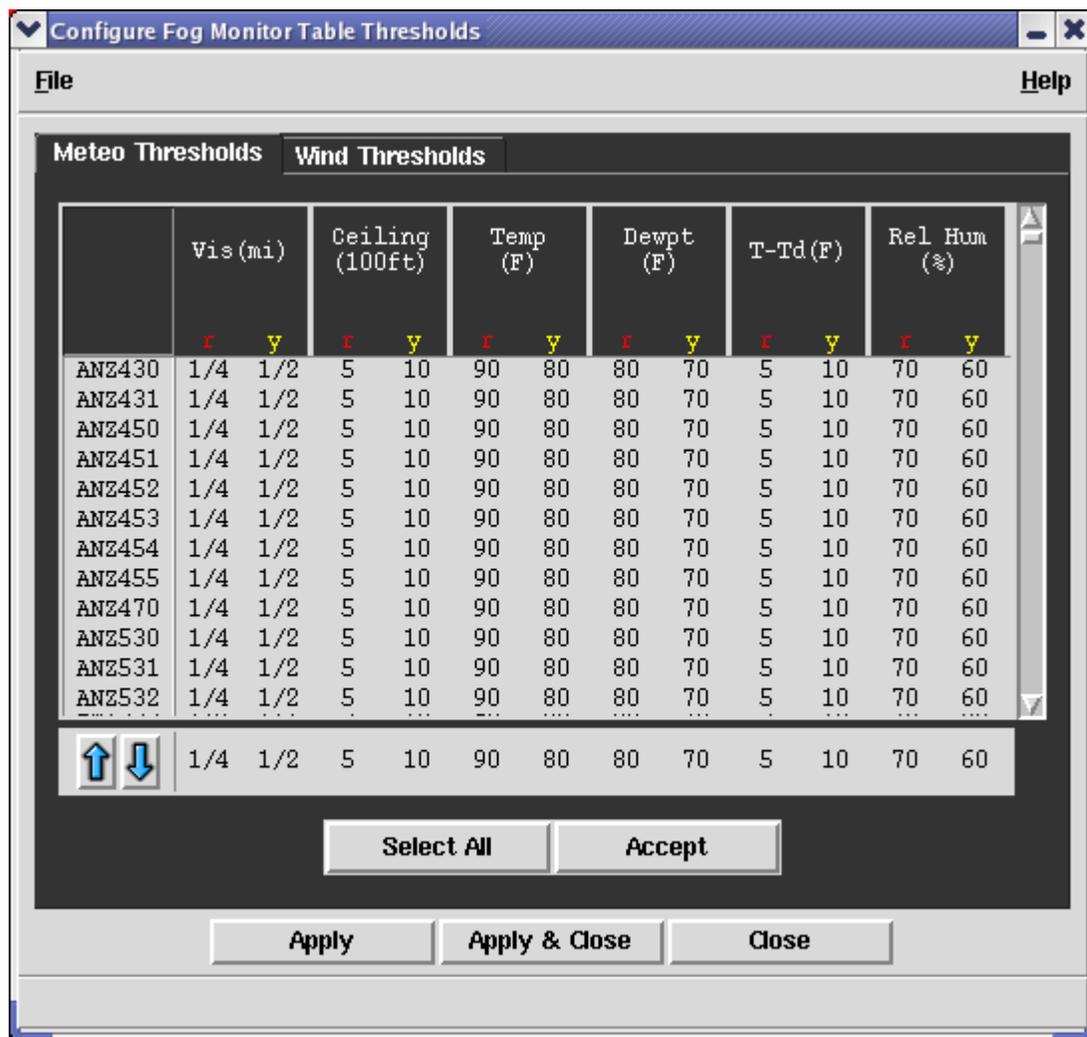
- The **Meteo** page includes Visibility, Ceiling, Temperature, Dewpoint, Dewpoint Depression, and Relative Humidity.
- The **Wind** page includes Wind Speed, Wind Gust, Peak Wind, and Wind Direction

To change display threshold values, first choose one of the pages above. Then select the zones/counties to which the new threshold values will apply.



**Figure 3.7.2-2.** The OH Table configuration window. With the Maritime button selected, all the maritime parameters in the left column will appear in the OH Table. On the right side, wind speed and wind gust have been de-selected, so they will not be seen in the OH Table.

- to select a zone, left-click on its ID. Multiple zones may be selected in this manner.
- to select a contiguous range of zones within the list, first left-click on the zone ID on one end of the desired range, and while holding down the mouse button, drag the cursor across the zone IDs in the desired range. Release the mouse button. The selected range of zones is added to any zones already selected.
- to select all zones when no zones are yet selected, click the “**Select All**” button near the bottom of the window. This button is enabled only when no zones are currently selected.
- to de-select a zone, left click on its ID. De-selection can only be done one zone at a time.
- to de-select all selected zones, click the “**De-Select All**” button near the bottom of the window. This button appears only when the “**Select All**” button has been pressed.



**Figure 3.8-1:** Display Threshold window for the Fog Monitor zone/station table. The window is shown with the **Meteo** page activated.

Once the desired zone(s) are selected, set their thresholds. In the row of threshold values below the zone thresholds scrolling list, click on the threshold value you wish to change. Then click the up or down arrows (on left edge of the thresholds) to change the threshold's value. Repeat this procedure for each threshold value you wish to change for the selected zones. The window will not allow you to set a red level threshold to a value less hazardous than the yellow level threshold's value. You also cannot set a yellow level threshold to a value more severe than the red level threshold's value.

Setting thresholds for primary and secondary swell directions must be handled in a special fashion. Those parameters each have “**From**” and “**To**” columns for red and yellow levels. The "From/To" selections are used to define an arc of azimuth values which will be colored in red or yellow on the trend hodograph. The swell direction cells in the station table will take on the red/yellow colors if the values lay inside those arcs. As was discussed in section 4.2.2, there are two rules to follow when choosing these azimuthal limits:

- The “From” and “To” bearings will be assumed by SAFESEAS to be in a clockwise order. For Example: A “From” value of 359 and a “To” value of 1 will produce an arc of 2 degrees, while a “From” value of 1 and a “To” value of 359 will produce a near-circle of 358 degrees.
- The red alerting area must always be contained within the yellow alerting area. The settings will otherwise not be accepted by SAFESEAS.

When all the thresholds for the variables' threat levels are as desired, click the “**Accept**” button to change the values for the selected zones in the scrolling zone thresholds list. Then click “**OK.**”

*Previewing Threshold Changes:*

To get a preview of how the new thresholds will affect the zone table, click the “**Apply**” button. The zone table will be redrawn with threat levels based on the new threshold values, but the editor will remain open for further editing. Clicking the “**Apply & Close**” button will cause the zone table to be redrawn with threat levels based on the new threshold values, and close the editor. Note that changes made to threshold values in this manner are not saved permanently. Pressing “**Close**” will close the editor without applying any changes that have not yet been applied.

*Permanently Saving Display Threshold Changes:*

Multiple sets of customized display thresholds may be saved, recalled, and deleted. For these capabilities, use the File menu options accessed on the menu bar of the editor. The “**File**” menu offers the following actions:

Open	Open a file holding an existing set of thresholds and load the set into the editor.
Save As	A list of display threshold file names is presented. Select an existing file name from the list, or enter a new file name manually. The threshold values displayed in the editor are saved in the user-specified file.

Select As Default	A list of display threshold file names is presented. Select a file name from the list, or enter a file name manually. The threshold values stored in the selected file will be the threshold values subsequently used each time the zone table is launched. The threshold values in the selected file are not loaded into editor.
Load Default	The threshold values in the display thresholds file currently specified to be the default are loaded into editor.
Delete	Permanently delete a display thresholds file. Select a file name from the list, or enter the file name manually.
Exit	Closes the editor without saving or applying any additional editing changes.

### 3.9 *Configuring the list of Monitored Zones, Counties, and Stations*

Users can configure the area which this application monitors. Users may, for example, want to remove counties for neighboring CWAs, add additional counties, drop all counties in favor of marine zones, etc.

The editor for the monitoring area is launched from the AWIPS App Launcher. Within the App Launcher menu, left-click “**Fog Monitor Apps**” to bring up the menu of Fog Monitor applications. Click the “**Configure Monitoring Area**” menu item to bring up the Monitoring Area configuration application..

#### 3.9.1 *Zone Mode*

To enter the zone mode of the Fog Monitor’s Monitor Area Set Up application (Figure 3.9.1-1), select the “**Zone**” pushbutton next to the “**Configure**” label at the top of the window. When editing in zone mode, the upper left list (the “**Monitor Area Zones**” list) includes the IDs for all the zones and counties currently comprising the monitoring area, and the lower left list (the “**Additional Zones**” list) includes the IDs for other nearby zones/counties. The text-entry box near the upper right corner, just above the “**Associated Stations**” label, indicates the name of the active zone whose associated stations list is being edited. The “**Associated Stations**” list shows the IDs for the fixed stations currently associated with the active zone.

*To Add Zones/Counties from the Additional Zones list:*

Zones may be added to the monitoring area by selecting them from the “**Additional Zones**” list, then clicking the “Add” button above the list to move the selected zones into the “**Monitor Area Zones**” list. Zone selection capabilities are as follows:

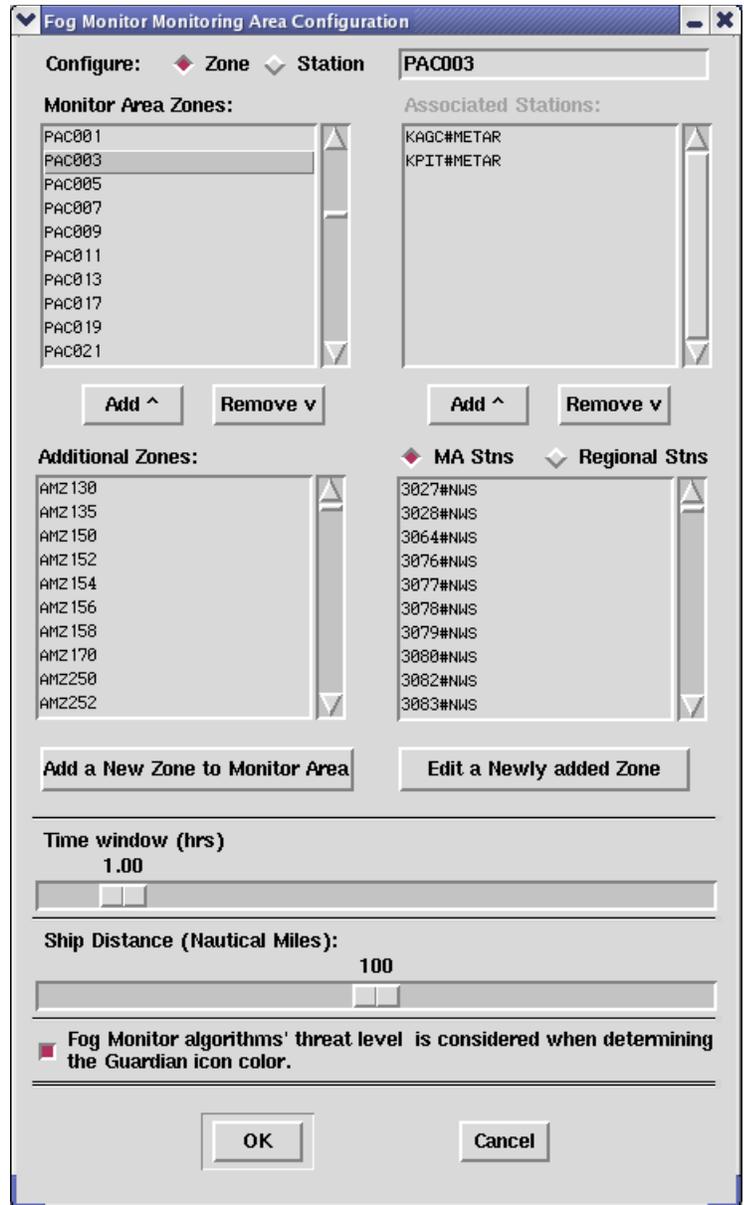
- to select a zone, left-click on its ID. Multiple zones may be selected in this manner.
- to select a contiguous range of zones within the list, first left-click on the zone ID on one end of the desired range, and while holding down the mouse button, drag the cursor across the zone IDs in the desired range. Release the mouse button. The selected range of zones is added to any zones already selected.
- to de-select a zone, left click on its ID. De-selection can only be done one zone at a time.

*To Remove a Zone/County from the Monitoring Area:*

To remove a zone from the monitoring area, click on the zone’s ID in the “**Monitor Area Zones**” list. Then click the “**Remove**” button located between the “**Monitor Area Zones**” list and the “**Additional Zones**” list. This can only be done one zone at a time.

*To associate Fixed Stations with a County in the Monitoring Area:*

To edit the list of stations associated with a zone, first double-left-click the zone’s ID in the “**Monitor Area Zones**” list. The stations currently associated with the zone will then be loaded into the “**Associated Stations**” list. The list may be empty, indicating no fixed stations are currently associated with the zone. Note that a given station may be associated with zero, one,



**Figure 3.9.1-1.** Fog Monitoring Area Configuration window, in Zone mode.

or several counties. To associate additional stations to the zone, first select their IDs from the “**MA Stns**” list or the “**Regional Stns**” list (whichever is selected). This is done the same way you selected zones from the “Additional Zones” list to add to the monitoring area. When you are done selecting stations, click the “Add” button located below the “**Associated Stations**” list.

*To remove Fixed Stations associations from a Zone or County in the Monitoring Area:*

To remove the association of a fixed station to a given zone, first double-left-click the zone’s ID in the “**Monitor Area Zones**” list to load the stations currently associated with the zone into the “Associated Stations” list. To remove a station association from the zone, click on the station’s ID in the “**Associated Stations**” list, then click the “**Remove**” button located below the “**Associated Stations**” list. This can only be done one station at a time.

*To Define and Add Zones/Counties not present in the Additional Zones list:*

Zones not present in the “**Additional Zones**” list may be defined and added to the monitoring area. For example, for WFOs bordering on Canada or Mexico, there are no zone/county definitions available to AWIPS from which to build those portions of the first-guess monitoring area and the additional zones/counties list outside the U.S. borders. To define and add a zone to the monitoring area that is not contained in the “**Monitoring Area**” or “**Additional Zones**” lists, click the “**Add a New Zone to Monitor Area**” button located just below the “Additional Zones” list. This will bring up an “**Add a New Zone**” window (Figure 3.9.1-2).

Near the top of the window, click either the “**Marine Zone**” button if the new zone is a marine zone, or the “**County**” button if the new zone is a county, parish, or other land political area. Now enter the zone’s ID, the latitude of the zone’s centroid, and the longitude of the zone’s centroid. Latitude is positive in the northern hemisphere, and negative in the southern hemisphere. East longitude values are positive; west longitude values are negative. When all the fields are filled in, click the “**Add**” button to add the new zone to the monitoring area. To abort the addition, click the “**Close**” button without pressing the “Add” button. After adding a zone, the window remains open so you can add additional zones. When you are done adding zones, click the “**Close**” button.

Please type in a new county/zone

Id (e.g. AMZ080): PAC003

Centroid Lat (e.g. 29.198): 40.48

Centroid Lon (e.g. -71.75): -80.00

Use Decimal Degrees, West Longitude negative

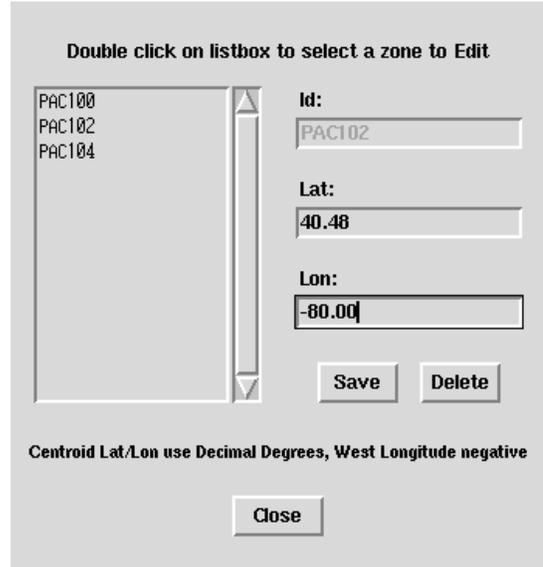
Add Close

**Figure 3.9.1-2:** window for manually defining and adding a new zone to the monitoring area.

*To Modify or Delete a User-Defined Zone/County:*

To edit zones added to the monitoring area via the “**Add a New Zone**” window, click the “**Edit a Newly Added Zone**” button located above the “**Cancel**” button in the Configure Monitor Area main window. This will bring up another smaller window (Fig. 3.9.1-3) for editing zone information. The left side of the window has a list of zones added to the monitoring area lists via the “Add a New Zone” window. Select the zone to be edited by double-left-clicking on its ID in the list. The window will fill in the “ID”, “Lat”, and “Lon” editing boxes with the zone’s current values. To correct these values, change them in the editing boxes, then click the “**Save**” button.

To delete the selected zone from both the “**Monitor Area Zones**” and the “**Additional Zones**” lists (in the parent window), click the “**Delete**” button. When finished deleting zones and/or editing zone information, click the “**Close**” button.



**Figure 3.9.1-3:** Window for editing manually-added zones.

### 3.9.2 Station Mode

When editing in station mode, the window’s “**Monitor Area Stns**” list contains the IDs for all the fixed stations currently located within the monitoring area, and the “**Additional Stations**” list includes the IDs for other stations located within the regional area. The text entry box near the window’s upper right corner, just above the “**Associated Zones**”, gives the ID of the “active” fixed station whose associated zones list is being edited. The window’s upper right list (the “**Associated Zones**” list) includes the IDs for the zones associated with the active fixed station. You have a choice as to what the window’s lower right list is. If “**MA Zones**” is selected, the list includes the IDs for all the zones in the monitoring area. If “**Regional Zones**” is selected, the list includes the IDs for all the zones within the broader region.

The contents of the window’s lower right list are configured by the “**MA Zones**” and “**Regional Zones**” pushbuttons. If “**MA Zones**” is selected, the IDs for all zones/counties currently configured to be contained in the monitoring area are listed. The list of fixed stations associated with a given zone/county contained in the monitoring area may be empty. When “**Regional Zones**” is selected, the IDs for all the zones/counties within the regional area not currently in the monitoring area are shown.

***Fixed stations and monitoring areas:***

A county may be configured to be contained in the monitoring area, whether or not a fixed station is associated with the zone or county.

A fixed station cannot be configured to be contained in the monitoring area unless it is associated to a zone or county in the area, since all monitoring thresholds are associated to counties, not stations.

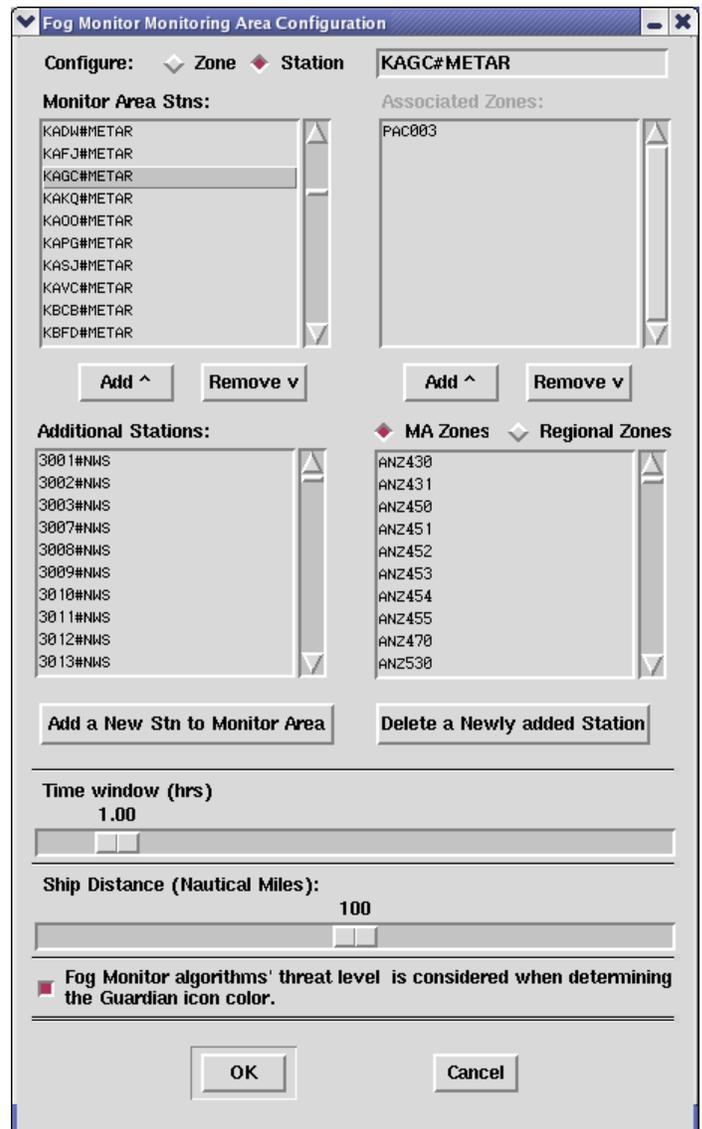
*To Add Stations to the Monitoring Area:*

In addition to generating a default monitoring area, the “fogmon” localization also builds additional lists of zones/counties and stations outside the monitoring area, but still within the regional area (defined by the D-2D regional scale). Stations may be added to the monitoring area by selecting them from the “**Additional Stations**” list, then clicking the “**Add**” button above the list to move the selected zones into the “**Monitor Area Stns**” list. Station selection capabilities are as follows:

- to select a station, left-click on its ID. Multiple stations may be selected in this manner.
- to select a contiguous range of stations within the list, first left-click on the station on one end of the desired range, and while holding down the mouse button, drag the cursor across the stations in the desired range. Release the mouse button. The selected range of stations is added to any stations already selected.
- to de-select a station, left click on its ID. De-selection can only be done one item at a time.

*To Remove a Station from the Monitoring Area:*

To remove a fixed station from the monitoring area, click on the station’s ID in the “**Monitor**



**Figure 3.9.2-1:** Monitoring Area Configuration Window, in Station mode.

**Area Stns**” list to select it. Then click the **“Remove”** button located between the **“Monitor Area Stns”** list and the **“Additional Stations”** list. This can only be done one station at a time. The removed station is disassociated from any zones in the monitoring area to which it was previously associated.

*To associate a Zone or County with a Fixed Station in the Monitoring Area:*

To edit the set of zones associated with a fixed station, first double-left-click the station’s ID in the **“Monitor Area Stns”** list to make the station **“active”**. The zones currently associated with the active station are then displayed in the **“Associated Zones”** list. Note the list may be empty, indicating no zones are currently associated with the station. To add zones to the set of zones associated with the station, first select from the **“MA Zones”** list or the **“Regional Zones”** list (whichever is selected) the IDs for the zones to be added. This is done the same way you selected stations from the **“Additional Stations”** list to add to the monitoring area. When you are done selecting zones, click the **“Add”** button located below the **“Associated Zones”** list.

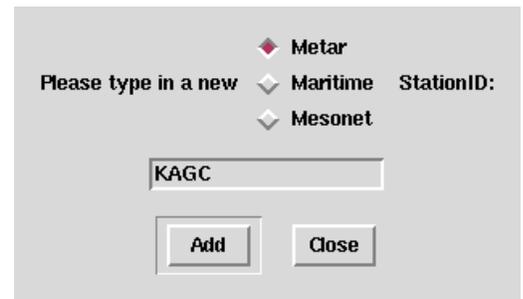
*To remove Zone or County associations from a Station in the Monitoring Area:*

To remove a zone from the set of zones associated with a fixed station, click on the zone’s ID in the **“Associated Zones”** list. Then click the **“Remove”** button located below the **“Associated Zones”** list. This can only be done one zone at a time.

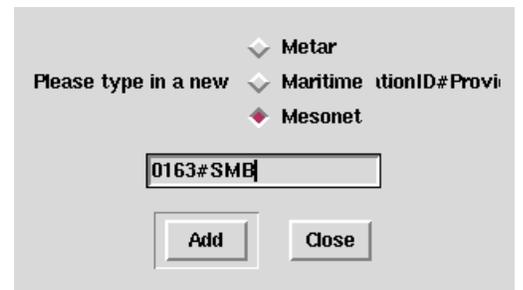
*To Define and Add Fixed Stations not present in the Additional Stations list:*

To add to the monitoring area a station that is not in the **“Additional Stations”** list, click the **“Add a New Stn to Monitor Area”** button located just below the **“Additional Stations”** list. This will bring up an **“Add a New Station”** window (see Figures 3.9.2-2 and 3.9.2-3). Near the top of the window, there are three buttons: a **“Metar”**, **“Maritime”** and **“Mesonet”**. Click one of these buttons.

- Click the **“Metar”** button if the new station is a METAR station;
- Click the **“Maritime”** button if the new station is a non-mesonet buoy, C-MAN, or other stationary marine observation platform;
- Click the **“Mesonet”** button if the new station is a mesonet (land or marine) platform. Then enter the station’s ID (the ID as contained in the body of the report, e.g., KSTL, 44001, etc.). Click the **“Add”** button to add the new station to the monitoring area. To abort the addition, click the **“Close”** button. After adding a station, the window remains open so you can add



**Figure 3.9.2-2:** window for adding a new fixed station for the monitoring area.

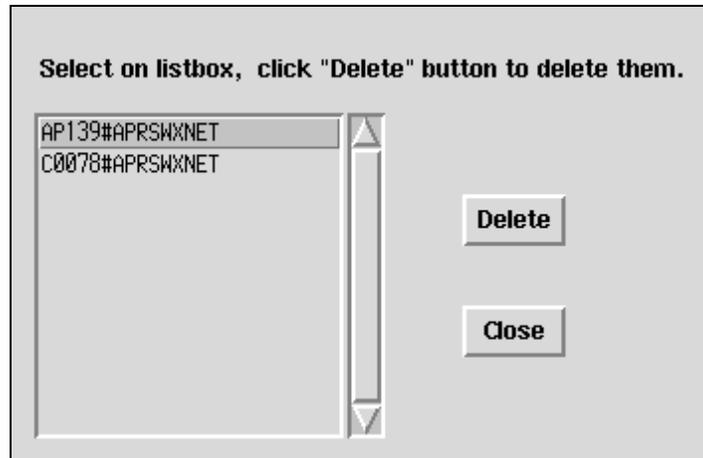


**Figure 3.9.2-3:** Window for adding a new fixed mesonet station for the Fog Monitor’s monitoring area.

additional stations. When you are done, click the “Close” button. Note that for METAR stations, you should enter only the station’s ID. But for a mesonet station, you must type the station’s ID, followed by the ‘#’ character and the station’s “provider”. This “provider” is the name or identifier of the mesonet to which the station belongs. The “provider” must match that found for the station in the following file:  
“\$FXA\_HOME/data/localizationDataSets/\$FXA\_LOCAL\_SITE/SSmesonetStationInfo.txt”.

#### *To Delete a User-entered Station:*

To delete any station you added to the monitoring area via the “Add a New Station” window, click the “Delete a Newly added Station” button located above the “Cancel” button in the monitoring area editor. This will bring up a “Delete a Newly Entered Station” window (Figure 3.9.2-4). The left part of this window contains a list of stations added to the monitoring area via the “Add a New Station” window. To select a station to delete, click its ID in the list. To add a station to the set of stations selected for deletion, click its ID in the list. To deselect a station, click its ID in the list. To delete all selected stations, click the “Delete” button. When you are done deleting stations, click the “Close” button. A deleted station is disassociated from any zones in the monitoring area to which it was previously associated.



**Figure 3.9.2-4:** Window for deleting a newly added station.

### *3.9.3 Modifying the Retrospective Time Window Value*

The “**Time window (hrs)**” slider bar (Figure 3.9.2-1) is used to set the time range for which the Fog Monitor will update old algorithm images when the user modifies the algorithm thresholds (see Chapter 4). It also determines how old a worst-case visibility condition (reported in Guardian) can be before the Fog Monitor allows the value to expire.

#### ***Time Window’s Dependency on the background Fog Monitor process:***

If the FMprocessor on px1 is restarted, the Fog Monitor will start its time window “bookkeeping” from scratch. This means that the FMprocessor, must be running for at least 8 hours, for example, to “remember” worst-case conditions over the previous 8 hours.

### 3.9.4 Modifying the Ship Distance Value

The “**Ship Distance (Nautical Miles)**” slider bar controls the distance from the nearest county/zone within which a ship report will included for monitoring. If 100 nmi is selected, for example, then ships within 100 nmi of a zone’s centerpoint will be included among that zone’s monitored observations.

### 3.9.5 Fog Monitor Algorithm Contribution to Alert Button

At the bottom of the setup window, a toggle button (under the “Ship Distance (Nautical Miles)” slider bar), when selected, allows satellite data from the Fog Monitor to influence the Fog Monitor’s Guardian alert icon. If the Fog Monitor algorithms indicate Probable Fog, for example, the icon will turn red. If the button is de-selected, the Guardian icon will rely solely on in-situ visibility observations.

### 3.9.6 Saving Editing Changes to the Monitoring Area

When you are done editing the monitoring area in zone mode, click the “**OK**” button at the bottom of the “Fog Monitoring Area Configuration” window to save the changes, or “**Cancel**” to abandon the changes and abort the editor. If you click “**OK**”, a confirmation window (Figure 3.9.6-1) will appear.



**Figure 3.9.6-1:** First monitor area setup change confirmation.



**Figure 3.9.6-2:** Selecting “Continue” will proceed to add new zones to the monitoring area.

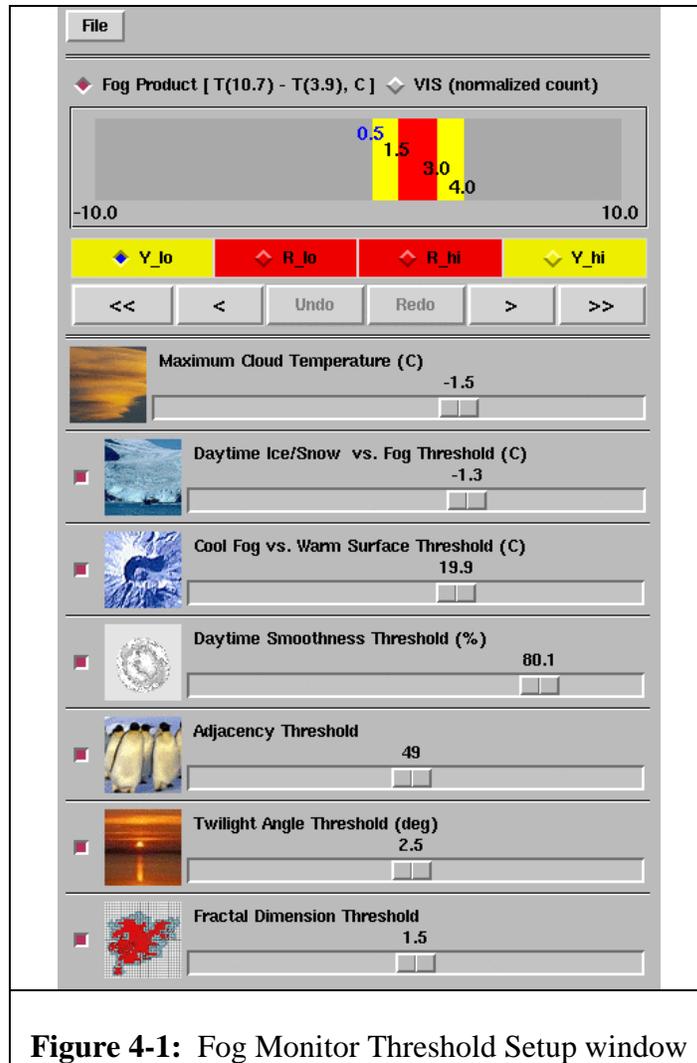
*If Zones were added or deleted to the Monitoring Area:*

When you click the “**Update**” button in the first confirmation box, a second confirmation box (Figure 3.9.6-2) will appear.

Once you are certain the Fog Monitor display is not running anywhere in the office, click the “**Continue**” button. When the Fog Monitor zone configuration is changed, the Fog Monitor image display will automatically add or take out the zones to and from the Fog Monitor image display.

#### *4      Configuring Fog Monitor Algorithm Thresholds*

The Fog Monitor Algorithm Thresholds window (Figure 4-1) allows users to adjust the behavior of the algorithms used to detect areas of fog. It can be reached via the App launcher menu (just like the Monitoring Area window), under the “Fog Monitor -- > Configure Monitoring Thresholds” selection. Users of Fog Monitor output data should be familiar with the operation of this window, since the optimum settings will vary based on several different factors (geography, season, and sky cover, to name a few). Note that none of the algorithms allows for exact fog detection; increasing the sensitivity to one type of fog scenario may hinder the Fog Monitor’s ability to detect a different scenario. The intention is for the user to experiment with settings under varying conditions, and develop customized settings that match the situation.



**Figure 4-1:** Fog Monitor Threshold Setup window

#### 4.1 *Configuring the Mandatory Thresholds.*

There are three mandatory thresholds which the Fog Monitor uses to discern areas of fog: Fog Product [T (10.7) – T (3.9)], VIS (Normalized Count), and Maximum Cloud Temperature (C). They are located at the top of the table.

##### Fog Product [T (10.7) – T (3.9)]

This nighttime threshold setting allows user to adjust the Fog Product’s temperature difference range. Highlight the button by the text to select this threshold, and use the left and right arrows to modify the range in which yellow and red areas will appear. Increasing the area of yellow and red will increase the area which can be flagged as potential fog areas. The use of the buttons to modify this selection is described in Table 4.1-1.

### VIS (Normalized Count)

This is a daytime range of normalized brightness values, perhaps less intuitive than the Fog Product, but the concept is similar. Increasing the range of red and yellow values will increase the likelihood that the application will highlight an area as fog.

### Maximum Cloud Temperature (C)

This threshold allows the user to determine the temperature value which the Fog Monitor uses to decide if it is detecting clouds instead of fog. The greater the temperature, the more likely the fog monitor will discount an area as having cloud cover (and thus an unknown status with regards to fog). Lowering the temperature will increase the potential areas the Fog Monitor will consider. As with all algorithm thresholds within this window, the user should use meteorological knowledge to determine the settings. A temperature setting of -25 C, for example, is unnecessarily low for fog detection, while a setting of +15 C will be too warm for most clouds.

**Table 4.1-1.** Fog Product and Vis brightness adjustment buttons.

<b>Button</b>	<b>Action</b>
<b>Y_lo</b>	Selects the low-end yellow range for modification
<b>R_lo</b>	Selects the low-end red range for modification (note that the low red range cannot be changed to a lesser value than that of the low yellow range.)
<b>R_hi</b>	Selects the high-end yellow range for modification
<b>Y_hi</b>	Selects the high-end red range for modification (note that the high red range cannot be modified to a greater than that of the high yellow range.)
<	Moves the values lower (0.1 degree for the Fog Product, 1 normalized count value for the VIS thresholds.)
<<	Moves the values lower (1 full degree for the Fog Product, 5 normalized count values for the VIS thresholds.)

>	Moves the values higher (0.1 degree for the Fog Product, 1 normalized count value for the VIS thresholds.)
>>	Moves the values lower (1 full degree for the Fog Product, 5 normalized count values for the VIS thresholds.)
<b>Undo</b>	Revert to the default threshold ranges.
<b>Redo</b>	Restores the user's changes.

## 4.2 *Configuring the Optional Thresholds*

The rest of the threshold settings on the Fog Monitor's Threshold Setup window are for optional algorithms. The user can choose to turn them on (using the buttons on the left) or adjust them (with the scroll bars) based on how well each performs under different fog scenarios.

### Daytime Ice/Snow vs. Fog Threshold (C)

This algorithm takes advantage of the strong scattering properties of fog at 3.9 microns when compared to snow or ice. This scattering leads to a higher brightness temperature for fog at 3.9 microns. If the Fog Monitor encounters a bright area that falls within the visible normalized count thresholds (set in this window, as described above), then this brightness temperature threshold will help the application distinguish fog from ice or snow cover. Raising the threshold will increase the brightness temperature range which the Fog Monitor will identify with snow or ice.

### Cool Fog vs. Warm Surface Threshold (C)

This scroll bar will set a 10.7 micron brightness temperature threshold between a cold fog area and a warmer surface. Because of the assumption of a warmer surface, this threshold will likely work best with radiation fog or evaporation fog, especially when the fog layer is thick (since the satellite data will reveal the brightness temperature of the cool top of the fog layer). This threshold will likely not work as well during an advection fog scenario, when warm air travels over a cool surface.

### Daytime Smoothness Threshold (%)

One distinguishing feature between fog and mid-level clouds in visible satellite data is the relative brightness uniformity of fog – it will tend to have a more uniform, “smoother” brightness profile than will clouds. Increasing this threshold will help to filter out bright areas which are not fog. This algorithm is not applicable to the nighttime regime, because both fog areas and mid-level cloud have relatively uniform IR signatures – it would be difficult to distinguish them using the smoothness algorithm.

### Adjacency Threshold

Adjusting this threshold higher will increase the minimum size at which an area of fog will be flagged. This will filter out the noise of errant, bright data pixels, though care must be taken to not set the thresholds so high as to eliminate legitimate small-scale, patchy fog.

### Twilight Angle Threshold (deg)

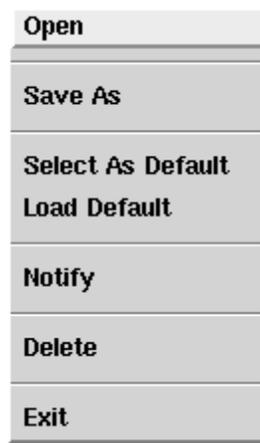
As mentioned previously, dawn and dusk pose challenges for the Fog Monitor – enough so that the application will apply an “unknown” determination to areas illuminated by low-angle sunlight. This threshold determines the maximum sun elevation (no lower than 0.1 degrees) at which to apply the twilight “unknown” default. The higher the angle, the more area will be covered by the twilight default.

### Fractal Dimension Threshold

This is a measure of the “jaggedness” of the edges of the detected area. Decreasing the threshold will only allow the Fog Monitor to consider brightness areas with relatively straight edges, while increasing the ratio allows for shapes with more jagged edges. This algorithm will allow the user to filter out the rough edges of low-lying clouds, favoring the more linear edges of fog banks. Cases of valley fog can have jagged edges, though, so the user must be careful not to eliminate those features by setting this threshold too low.

## *4.3 Working with Threshold Changes*

Multiple sets of customized display thresholds may be saved, recalled, and deleted. For these capabilities, use the File menu options accessed on the menu bar of the editor (Fig. 4.3-1.) “File” menu selections are described in Table 4.3-1



**Figure 4.3-1** Fog monitor thresholds File menu

**Table 4.3-1** Fog Thresholds File Menu selection descriptions.

Open	Open a file holding an existing set of thresholds and load the set into the editor.
Save As	A list of display threshold file names is presented. Select an existing file name from the list, or enter a new file name manually. The threshold values displayed in the editor are saved in the user-specified file.
Select As Default	A list of display threshold file names is presented. Select a file name from the list, or enter a file name manually. The threshold values stored in the selected file will be the threshold values subsequently used each time the zone table is launched. The threshold values in the selected file are not loaded into editor.
Load Default	The default threshold values are loaded into editor.
Notify	Signal the Fog Monitor that the configurations have been changed. This prompts the Fog Monitor to change the displays based on the new configurations.
Delete	Permanently delete a display thresholds file. Select a file name from the list, or enter the file name manually.
Exit	Closes the editor without saving or applying any additional editing changes.

Note that a “**Notify**” selection must be made if the Fog Monitor is to incorporate the threshold configuration changes. After the notification is received, the Fog Monitor will reach back to past output (as far as is selected in the Time Window of the Fog Monitor Area Configuration window). Subsequent output, though, will revert to the default threshold configurations. If the new changes are to apply to future output, then the user must “**Save**” the changes to a file, choose that file via the “**Select As Default**” button, and then choose “**Notify**”. The intended use case scenario is for the user to repeatedly select “**Notify**” to calibrate the thresholds (based on the

quality of the output when compared to the in-situ observations available) then **“Save”**, **“Select As Default”**, and **“Notify”** when satisfied with the results.

As can quickly be gleaned from the above paragraph, the Fog Monitor application is highly interactive and configurable, and requires some user input for best results. The default thresholds are reasonable as delivered, but it is hoped that the user will improve upon them, as the Fog Monitor is used during various types of fog events.

## 5 *Getting Help*

Questions about the Fog Monitor are handled through SAFESEAS list server. To join the SAFESEAS list server:

1. Go to `“http://infolist.nws.noaa.gov/read/login/”`
2. Select "all forums".
3. Scroll down to the SAFESEAS list, and click "subscribe" on the right column.
4. Enter your email address, name, and password.

Your membership will be approved by the list administrator, and then once approved, you can send, view, and receive messages.

Please also visit the Fog Monitor homepage at:

**“[http://www.nws.noaa.gov/mdl/fog\\_monitor/index.htm](http://www.nws.noaa.gov/mdl/fog_monitor/index.htm)”**

...for more information, including discussions regarding the algorithms (theory, citations, weaknesses, etc), as well as build updates and troubleshooting tips.