



Oklahoma Mesonet Dispersion Advisor Description

The Oklahoma Dispersion Advisor is a tool developed to aid in decision-making with respect to the near-surface release of gases and small particulates (airborne particles with diameters less than 20 microns). Examples include pesticides released by surface or aerial spraying, odors associated with land application of animal waste, and smoke generated by fire. In such practices, it is important to know both (1) the ability of the atmosphere to disperse the material and (2) the direction the material will be transported.

The Oklahoma Dispersion Advisor features both graphical and textual output that depict current and future conditions for atmospheric dispersion. The focus of the advisor is the evaluation of dispersion conditions with respect to downwind concentrations at distances of one-quarter mile to several miles. Thus, the advisor is a useful tool for assessing appropriate times to minimize downwind pollutant concentrations resulting from the near-surface release of gases and particulates.

In addition to dispersion conditions, it is also important to know the transport direction of such material. Interpretation of the Dispersion Advisor is discussed below, with dispersion conditions and transport direction described separately.

With respect to dispersion conditions, the Oklahoma Dispersion Advisor is used in conjunction with weather conditions reported by the Oklahoma Mesonet to produce a map of current dispersion conditions across Oklahoma. The Dispersion Advisor is also used in conjunction with the latest National Weather Service 84-hour North American Model (NAM) forecast to produce tables of forecast dispersion conditions at 1-hour or 3-hour intervals into the future. With respect to transport direction, the Mesonet wind maps can be used to view current wind conditions, while the forecast and past dispersion tables list wind direction for 1- or 3-hour intervals. These tables show a multitude of variables including future dispersion conditions and wind directions, and are available for specific Mesonet locations across Oklahoma.

Dispersion Conditions

Based on the current or forecasted weather conditions, the Oklahoma Dispersion Advisor assigns a "Dispersion Conditions" category, which is reflective of concentrations at downwind distances of one-quarter mile to several miles. There are six categories:

	Dispersion Conditions	Color of Map	Category
	Excellent	Dark Green	6
	Good	Green	5
	Moderately Good	Light Green	4
	Moderately Poor	Beige	3
	Poor	Orange	2
	Very Poor	Red	1

This color scheme is utilized in the map for current dispersion conditions as well as in the NAM-based forecast tables. "Excellent (6)" indicates the lowest possible downwind concentrations, while "Very Poor (1)" indicates the highest downwind concentrations. The green colors thus represent the recommended times for the near-surface release of gases and particulates. Of course, "Excellent (6)" is better than "Good (5)," and "Good (5)" is better than "Moderately Good (4)." The beige color for "Moderately Poor (3)" signifies acceptable conditions if the area downwind is not one of concern. "Poor (2)" and "Very Poor (1)" represent times to avoid.

The Advisor is such that during the daytime "Excellent (6)" through "Poor (2)" categories can occur, while during the nighttime only "Good (5)" through "Very Poor (1)" conditions can occur. During the daytime, "Excellent (6)" and "Good (5)" conditions occur during times of strong to moderate solar radiation or strong winds. During the nighttime, "Very Poor (1)" and "Poor (2)" conditions are associated with light winds and mostly clear skies, which lead to surface temperature inversions that greatly reduce dispersion.

The advisor-calculated dispersion categories are best applicable for flat, uniform terrain and no precipitation. Under



light wind conditions, especially on clear nights, gases and particulates tend to “drain” gravitationally down slope and dispersion conditions may be worse than what the advisor suggests, especially in valleys. With variable terrain and vegetation (e.g., forested, hilly terrain), results also may be different. During periods of precipitation, dispersion may be enhanced, resulting in better dispersion conditions than the advisor suggests. In general, the Oklahoma Dispersion Advisor provides useful information for the wide range of situations to be encountered throughout Oklahoma. It is not designed to take local topography and vegetation into account.

Wind Conditions

Both current and forecast wind conditions are available to help determine transport direction. A variety of maps indicating current wind conditions are available using the most recently observed conditions from the Oklahoma Mesonet. Wind vector maps are available, where the arrow points in the direction the wind is moving and the length of the arrow is proportional to wind speed. Some Mesonet maps show wind conditions using wind barbs.

Winds blow from the flag end of the line segment toward the solid circle at the Mesonet station’s location. The wind speed is illustrated by flags of varying lengths. A short flag represents 5 miles per hour. A long flag shows a 10-mile per hour average wind speed. Short and long flags can be combined to indicate average wind speeds that are up to 45 miles per hour. A pennant represents 50 miles per hour average wind speed. Calm conditions are denoted by a small circle surrounding the Mesonet site location.

The NAM forecast tables are available in 1-hour and 3-hour increments through the duration of the forecast period. Wind directions are denoted by appropriate lettering: a north wind (wind from the north) by N; an east wind by E; a south wind by S; and a west wind by W. A direction denoted by WSW, for example, means a wind from the west-southwest. Wind speeds in miles per hour are listed along with other weather variables and dispersion conditions.

General Recommendations

With respect to the Oklahoma Dispersion Advisor maps and tables, the following general recommendations regarding dispersion can be made:

“Excellent (6)” to “Moderately Good (4)” Dispersion Conditions:

In general, activities involving the near-surface release of gases and particulates should be planned for those times showing “Excellent,” “Good,” or “Moderately Good” dispersion conditions (the green colors). An exception would be if the wind direction were such that it would carry the gases and particulates toward an adjacent sensitive area (e.g., a non-targeted field or very close neighbor).

“Moderately Poor (3)” Dispersion Conditions:

Times showing “Moderately Poor” conditions might be acceptable if the wind direction were such that it would carry the gases and particulates away from areas of concern. With winds blowing toward areas of concern, it is best to avoid “Moderately Poor” conditions.

“Poor (2)” to “Very Poor (1)” Dispersion Conditions:

Times showing “Poor” to “Very Poor” conditions should generally be avoided, especially if your topography is such that you have problems with gravitational drainage into sensitive areas during light wind conditions. If the wind directions during “Poor” or “Very Poor” conditions are away from areas of concern, it might be possible to conduct a particular activity (but not pesticide application, which requires turbulence for adequate penetration into or onto the target area). However, to be on the safe side, it is best to avoid such times.

Again, these recommendations apply to dispersion alone (and, in particular, the levels of downwind concentrations) and by themselves may not indicate appropriate conditions for a particular activity. Rainfall, for example, is not considered in creating the dispersion maps, so that periods having rain may still show acceptable dispersion conditions.

Another example has to do with wind speed. The advisor may indicate “Good (5)” to “Excellent (6)” dispersion conditions, but wind speeds could be in the 20 to 40 mile per hour range. A prescribed burn or pesticide application would not be recommended under such windy conditions.

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