

Attachment B
Smoke Management Guidelines
Date: March 5, 2010

Smoke management is becoming a larger concern with respect to public health and environmental quality. The DNR shall strive to ensure the goals of the Clean Air Act as enacted through the DNR's regulatory authority are satisfied in these small-scale natural resource burns.

The following smoke management guidelines are recommendations. The guidelines are not inclusive of all smoke management techniques and are not meant to limit prescribed burning activities. Rather, these guidelines are intended as interim recommendations until such time as the U.S. Environmental Protection Agency (EPA) or the Iowa DNR Air Quality Bureau (AQB) promulgates rules, policies or guidelines to specifically address natural resource burning and smoke management.

Additionally, AQB is currently evaluating the need for a statewide Smoke Management Program (SMP) and is considering amending state air quality rules for open burning to specifically address prescribed natural resource burning. At such time as a statewide SMP or new air quality rules for prescribed burning become final and effective, these guidelines may be revised, if appropriate.

Smoke Management Plan (Basic Smoke Management Practices)

Each DNR prescribed burn plan (Burn Plan) shall include a smoke management plan that describes the basic smoke management practices to be employed for the prescribed burn. The designated Burn Leader shall ensure that all DNR staff, volunteers and contractors participating in the prescribed burn adhere to the smoke management plan.

Each smoke management plan included in a DNR Burn Plan shall address the following elements:

1. Actions to minimize smoke impacts
2. Smoke dispersion map, including:
 - Predicted smoke behavior
 - Expected smoke dispersion area
 - Smoke sensitive sites within the smoke dispersion area
3. Notifications
4. Smoke monitoring

1. Actions to minimize smoke impacts

The DNR will take appropriate and reasonable actions to keep smoke away from smoke sensitive sites. Examples of smoke sensitive sites include: residential dwellings, businesses, schools, airports, nursing homes, childcare facilities, livestock facilities, hospitals, and roads. The Burn Plan should describe how smoke impacts to the public will be minimized or mitigated before, during, and after the burn.

Depending on the objectives of the burn and current weather and fuel conditions, mitigation techniques may include, but are not limited to, the following:

- Reduce the fuel loading in the burn area by mechanical means
- Reduce the size of the burn area
- Use frequent, low-intensity burns to gradually reduce fuels
- Reduce the amount of fuel consumed by the fire by burning when fuel moistures for larger fuels are high

- Rapid and complete mop-up after the burn or mop-up of certain fuels.

In addition to providing notification of the burn (see #3 below), DNR may, as appropriate, include in its notification suggested actions that smoke sensitive individuals may take to minimize their exposure. Suggestions may include, but are not limited to: leaving the area during the burn, remaining indoors, avoiding rigorous activities, and avoiding exposure to other respiratory stressors.

If the National Weather Service (NWS) has issued an air pollution alert, the Burn Leader will be prepared to safely halt the burn at the closest existing fire break and will not ignite any additional burns until the NWS has lifted the air pollution alert.

2. Smoke Dispersion Map

Each Burn Plan should include a smoke dispersion map. The purpose of the smoke dispersion map is to assist the burn plan writer, the Burn Leader and other prescribed burn participants in determining proper smoke mitigation options, estimating smoke dispersion, establishing the public notification area, and selecting appropriate smoke monitoring activities.

In general, the smoke dispersion map should identify adjacent land owners and all downwind smoke sensitive sites that are could experience smoke from the prescribed burn. A description accompanying the map should explain how the burn plan writer estimated the smoke dispersion area for the burn. If the burn plan writer has determined that a smoke dispersion map is not necessary, the Burn Plan shall include an explanation of why a smoke dispersion map is not needed.

Predicted smoke behavior

There are many methods for predicting smoke behavior from prescribed natural resource burning. As of the date of this Policy, the U.S. Environmental Protection Agency (EPA) has not officially recommended or approved specific tools or models for estimating air quality impacts from prescribed natural resource burning. However, the U.S. Forest Service (USFS) and other federal land management agencies have developed several tools for smoke prediction and for estimating the air quality impacts from prescribed burns.

AQB Analysis

Air quality impacts from prescribed burns are affected by numerous factors, including, but not limited to: fuel characteristics, fuel conditions, size of the burn area, meteorological conditions and burning techniques. To assist in estimating possible air quality impacts from prescribed burns in Iowa, AQB staff collaborated with both DNR and non-DNR prescribed burn professionals and USFS smoke prediction experts to develop an air quality analysis.

Because of the numerous variables inherent in prescribed burning, the analysis necessitated making a number of assumptions. Additionally, the analysis was specifically designed to produce results that are conservative. The analysis is best used as a tool in conjunction with actual, on-site fuel bed information and based on the expected meteorological conditions on the day of the burn.

AQB analyzed eight Iowa burn scenarios using USFS software to estimate air pollution concentrations. Based on the air quality analysis, it is recommended that the DNR consider notification of the smoke sensitive sites located downwind and within the distance specified for the following burn scenarios:

- Prairie burn (1 acre or less) = 0.25 miles from the burn area.
- Prairie burn (1.5 acres -10 acres) = 1 mile from the burn area.
- Prairie burn (10.5 acres -50 acres) = 1.5 miles from the burn area.

- Prairie burn (50.5 acres -100 acres) = 2 miles from the burn area.
- Prairie burn (over 100 acres) = 3 miles from the burn area.
- Forest burn (5 acres or less) = 1.5 miles from the burn area.
- Forest burn (5.5 acres -10 acres) = 2.5 miles from the burn area.
- Forest burn (10.5 acres - 50 acres) = 4 miles from the burn area.
- Forest burn (50.5 acres -100 acres) = 5 miles from the burn area.

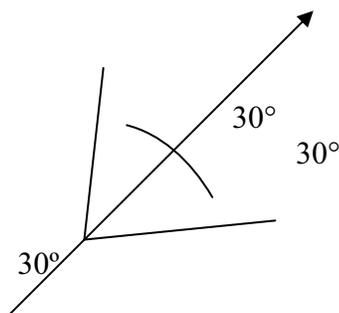
Note: With the exception of the 1 acre prairie scenario, the acreages and distances from the air quality analysis are shown here rounded to nearest half acre and half mile. Additionally, the scenario "Prairie Burn (over 100 acres)" was not included in the air quality analysis, but was very generally estimated based on the results from the other, modeled scenarios.

AQB's complete analysis, including descriptions of the USFS software, the assumptions used for the analysis, and the software inputs and outputs for the analysis, is available from AQB upon request.

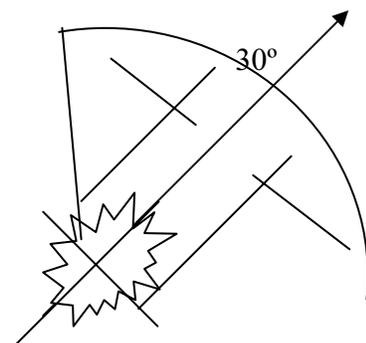
Smoke Dispersion Area

The goal of proper smoke management is to perform the burn when atmospheric conditions will disperse the smoke so that air quality standards to protect public health will not be violated. Unless the burn plan writer has determined that it is unnecessary, the Burn Plan should include a map showing the expected smoke dispersion area. One method that may be used to determine the smoke dispersion area is as follows:

1. Locate on a map the prescribed fire and all potential smoke sensitive sites that could be affected. The distances indicated above from the air quality analysis may be used. However, a site-specific analysis or other factors may indicate that an alternative distance is more appropriate.
2. Determine the optimal transport wind (wind direction) for the burn that will, to the extent practicable, have the least impact on smoke sensitive sites while also achieving the natural resource objectives for the burn.
3. Draw a line representing the centerline of the path of the smoke plume using the optimal transport wind identified in the previous step.
4. To allow for horizontal dispersion of the smoke, as well as shifts in wind direction, draw two other lines from the burn at an angle of 30 degrees from the centerline(s). If a prescribed fire is represented as a spot, draw as in Figure A. If larger, draw as shown in Figure B.



A



B

Smoke sensitive sites

All smoke sensitive sites within the predicted smoke dispersion area should be identified on the smoke dispersion map.

Other considerations for smoke dispersion and smoke sensitive sites

Each Burn Plan should indicate how the Burn Leader will assess meteorological and air quality conditions prior to the burn and on the day of the burn to ensure that conditions are within prescription and that impacts to smoke sensitive sites will be minimized.

A valuable resource for smoke management planning and meteorological information is the National Weather Service (NWS) Fire Weather Planning program. This easy to access forecast provides specific burn parameters essential for smoke management, such as transport winds, precipitation, temperature, relative humidity and smoke dispersion. Another available resource to check air quality conditions prior to and on the day of the burn is EPA's AIR NOW website.

3. Notifications

As an essential aspect of basic smoke management techniques, DNR shall make a reasonable effort to notify all adjacent land owners and other smoke sensitive sites identified on the smoke dispersion map. A description of the notification strategy shall be included in the Burn Plan.

The DNR shall provide pre-burn season notification to adjacent land owners and smoke sensitive sites in the area. The DNR shall determine the best notification method for the affected area and shall establish how far in advance the pre-burn season notification shall occur. Pre-burn season notification methods may include, but are not limited to: press releases, radio or TV announcements, newsletter articles (electronic or hard-copy), website postings, in-person notification, phone notification, USPS notification, e-mail notification or hand-delivered notification. In some cases, it may be appropriate to provide follow-up notification closer to the anticipated burn date to adjacent land-owners and other smoke sensitive sites. Examples of other smoke sensitive sites that should be considered for follow-up notification closer to the anticipated burn date include sites occupied by citizens who expressed health-related concerns to the DNR in response to the pre-season notification, as well as schools, day cares, hospitals, churches, and retirement or nursing homes..

The DNR shall also coordinate to the extent practicable with the immediate Environmental Services Division (ESD) Field Office to notify the field office prior to the burn. This notification ensures that field office staff is knowledgeable of the burn and can work cooperatively with the burn crew and the public if the field office receives complaints.

4. Smoke Monitoring

The Burn Plan shall include a description of how the burn crew will monitor the smoke plume during the burn to ensure that unanticipated smoke impacts do not occur. Smoke monitoring will help ensure that any needed mitigation activities will be underway as quickly as possible.

Smoke monitoring should match the size of the fire. For small or short duration fires (less than one day), such as most prairie burns or small forest burns, visual monitoring of the smoke plume and monitoring complaints from the public should be sufficient. Other monitoring techniques may include, but are not limited to:

- Posting personnel at vulnerable roadways to look for visibility impacts;
- Posting personnel at other smoke sensitive areas to look for smoke intrusions;
- and
- Continuous tracking of meteorological conditions (such as spot forecasting) during the fire.

Air Quality & Smoke Management Resources:

- **EPA AIR NOW website** - <http://airnow.gov/>: Includes interactive maps showing current national, regional, state and local air quality. Includes links to other air quality resources.
- **NWS Fire Weather Planning Forecast website** - <http://www.crh.noaa.gov/dmx/firewx.php> or www.weather.gov/dmx (click on Fire Weather link): Get fire weather and smoke management information for Iowa, including transport wind, mixing height, relative humidity and smoke dispersion. Request a spot forecast and get other fire weather information.
- **NWCG Smoke Management and Smoke Committee websites** - <http://www.nifc.gov/smoke/> and www.myfirecommunity.net (join the Air Quality and Fire Issues group): Sharing information on smoke management issues, air quality regulations, strategies for managing smoke from wildland fire, approaches to technical smoke questions, and fire environment issues that affect smoke generation, transport, impacts and measurement. Links to other smoke management resources.
- **DNR Air Quality Bureau website**- www.iowacleanair.com or www.iowadnr.gov/air/: Or call 515-242-5100
- **DNR ESD Field Services Bureau website**- www.iowadnr.gov/fo/index.html: Includes list of ESD field offices and their jurisdictions.
- **USFS Fire and Environmental Research website** – <http://www.fs.fed.us/pnw/feral/>: Research and development in fuels and combustion science including tools and software for predicting fire behavior and air pollutant emissions from prescribed burning.