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Rocky Mountain
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Fuels Planning: Science Synthesis and Integration

Environmental Consequences Fact Sheet: 11

Smoke Impact Spreadsheet (SIS) Model



Rocky Mountain
Research Station



Pacific Northwest
Research Station



North Central
Research Station

Pacific Southwest
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*Synthesizing
Scientific Information
for Fire and Fuels
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Fuels planning: Science synthesis and integration, an interagency research/management partnership to support the Ten-Year Fire Plan, led by Russell T. Graham, RMRS, and Sarah M. McCaffrey, NCRS.

What is SIS?

The Smoke Impact Spreadsheet (SIS) is a simple-to-use planning model for calculating particulate matter (PM) emissions and concentrations downwind of wildland fires. SIS conservatively predicts (that is, estimates higher than actual) downwind PM concentrations for comparison with appropriate Federal or State air quality standards. SIS is an easy-to-use replacement for the SASEM model. SIS has three main components:

- An Excel-based graphic user interface for easy data entry, model execution, and display of results.
- An emissions module that calculates emissions for broadcast burns and wildfires using the First Order Fire Effects Model (FOFEM5), and for pile burns using the CONSUME 2.1 pile wizard.
- A dispersion module that calculates downwind concentrations using the CALPUFF dispersion model.

Intended Users

Fire/fuel planning specialists and air quality specialists.

Intended Uses

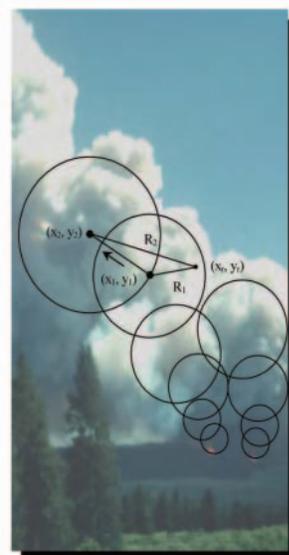
Planning tool for:

- Project development
- NEPA documents
- Burn plans
- State smoke permitting

What the Model Does

SIS is a state-of-the-science planning tool for evaluating smoke impacts of different wildland burning scenarios for all vegetation types in the United States. What SIS does:

- Predicts 1-hour and 24-hour average PM concentrations at user-defined receptors for up to 10 colocated burn units (for example, wildland fires, broadcast burns, pile burns), each with different areas and start times.
- Models impacts for daytime and nighttime meteorological conditions (wind speed, ambient temperature, stability class, mixing height) specified by the user.
- Estimates impacts using a simplified terrain profile provided by the user.
- Displays outputs in Excel tables and chart.



What the Model Does Not Do

SIS is not an operational tool for making go/no-go decisions for prescribed burns. SIS was developed as a simple model for fire and air practitioners and does not consider:

- Use of actual weather records or three-dimensional terrain data.
- Visibility impacts. The user must make a separate calculation to assess visibility impacts based on the reported concentrations.
- Trapping of fire emissions within mountain valleys.
- Spatial separation between fire sources (for example, piles or burn units). All sources are assumed to be colocated.

Required Inputs

SIS requires minimal input data and setup time by the user. The results are easy to read and understand and may be copied into other reports. The following are specific inputs needed:

- Burn name, burn type, burn acres, FOFEM5 fuel type and fuel loading by size.
- For pile burns—pile shape, dimensions, packing ratio, fuel type for pile burns, and number of piles per burning period.
- For broadcast burns—subunits, starting hour, strip width, strip length, number of strips, strip spacing, ignition rate (ft/min), and ignition time (hours).
- For meteorology—burn date, latitude, 10-meter wind speed (mph), wind direction offset (degrees), maximum temperature, Pasquill-Gifford stability class.
- For terrain—maximum distance, average elevation of burn, terrain profile.

How to Obtain the Model

The SIS setup file and users guide may be downloaded from the following Web site: <http://www.airsci.com/SIS.html>

SIS evaluates smoke impacts of different wildland burning scenarios for all vegetation types in the country (photo credit: Tom Iraci).



The model can be run using flat terrain, or using a simplified terrain profile provided by the user (photo credit: USDA Forest Service files).

Environmental Consequences Fact Sheets

Look for fact sheet topics from the Environmental Consequences Team including information about the effects of fire behavior and alternative treatment strategies, Wildlife Response Model, weed responses, riparian systems, soil erosion, restoration objectives, treated spaces, the Fire Effects Information System (FEIS), and the First Order Fire Effects Model (FOFEM).

Fuels Planning: Synthesis and Integration

This fact sheet is one in a series being produced as part of a larger project supported by the USDA Forest Service to synthesize new knowledge and information relevant to fire and fuels management. Fact sheets address topics related to stand structure, environmental impacts, economics, and human responses to these factors. Information in the fact sheets is targeted for the dry forests of the Inland West, but is often applicable across broad regions of the country. For more information, please visit our Web site at: www.fs.fed.us/fire/tech_transfer/synthesis/synthesis_index

The Fuels Planning fact sheets are based on preliminary findings. Information from fact sheets will be synthesized in an upcoming publication.