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Project Summary

Documentation of AIRS AMS National Methodologies

E. Sue Kimbrough

The report provides, to states and other participants (e.g., Regional Offices, Headquarters, other federal agencies) and users of the Area and Mobile Source Subsystem (AMS), an understanding of the estimation procedures that will be used by the national component of AMS to generate emissions estimates for area and mobile source categories. It discusses general methodology and assumptions as well as the original source of algorithms, activity levels, and emission factors necessary to calculate emissions for each area and mobile source in AMS. The report presents methodologies for all identified sources not defined as point sources. Area and mobile sources are divided into seven major groups: stationary source fuel combustion, mobile sources, industrial processes, solvent utilization, solid waste disposal, natural sources, and miscellaneous area sources. Historically, these methodologies have been referred to as the National Emissions Data System (NEDS) methods and to some extent are documented in area source documentation for the 1985 National Acid Precipitation Assessment Program (NAPAP) inventory; however, the NAPAP documentation does not include certain initial data calculations. In addition, over the years numerous changes have occurred to the sources of the data that "feed" these methodologies. These initial data calculations and source data changes are included in the report.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The U.S. Environmental Protection Agency's (EPA's) Office of Air Quality Planning and Standards (OAQPS) in Research Triangle Park, NC, is in the process of developing a nationwide database of estimated air pollutant emissions from area and mobile sources known as the Aerometric Information Retrieval System (AIRS) Area and Mobile Source Subsystem (AMS).

The purpose of this document is to provide states and other participants and users of AMS (e.g., Regional Offices, Headquarters, other federal agencies) with an understanding of the estimation procedures that will be used by AMS to generate emissions estimates for area and mobile source categories. General methodology and assumptions are discussed as well as the original source of algorithms, activity levels, and emission factors necessary to calculate emissions for each area and mobile source in AMS.

The document presents methodologies for all identified sources not defined as point sources in a specific geographic region. Area sources include all mobile sources, and stationary sources too small, difficult, or numerous to classify as point sources. Area and mobile sources are divided into seven major groups: stationary

source fuel combustion, mobile sources, industrial processes, solvent utilization, solid waste disposal, natural sources, and miscellaneous area sources.

Activity levels are derived primarily from related information published by other federal agencies, supplemented by special data developed by EPA for the purpose of developing AMS emission inventories. Published data such as fuel use by state, motor vehicle miles of travel by state and county, and forest fire acres burned by state are used with related data such as employment, population, and miscellaneous geographic or economic data to derive annual county estimates of the activity levels for each of the National Emissions Data System (NEDS) area source categories. The activity levels derived are adjusted to account for point source activity (such as fuel use by point sources) so that the area source data reflect only the activity levels (and resulting calculated emissions) that are not accounted for by point sources. The source of this point source data is the AIRS Facility Subsystem (FS). Point source emissions data are submitted annually by each state to EPA for inclusion in the AIRS FS.

Area and mobile source emissions estimates for seven pollutants—particulate matter >10 μm (PM_{10}), total suspended particulate matter (TSP), sulfur dioxide (SO_2), nitrogen oxides (NO_x), reactive volatile organic compounds (VOCs), carbon monoxide (CO), and lead (PB)—are calculated for each area and mobile source category utilizing appropriate emission factors which are contained in the AMS emission factor file. For many categories, the same emission factors are used for all counties; however, for some source categories, state or county specific emission factors account for local variables that affect emissions. The more specific emission factors are used in AMS calculations for all highway motor vehicle categories, fugitive dust categories, and selected other categories in a few counties where data are available to develop more applicable emission factors than the national emission factors.

Emissions estimates are updated annually by AMS which first estimates activity levels for each county and then applies the appropriate emission factor and any applicable control efficiency. County emissions estimates are then summed to produce national emissions estimates.

Background

Historically, NEDS has been the computer system that the U.S. EPA has used to calculate, store, and retrieve area and mobile source emissions for the following criteria pollutants: TSP, SO_2, NO_x, VOCs, and CO. EPA is in the process of designing and developing a new data subsystem in the AIRS called the AMS, which will replace NEDS.

AMS will use state-of-the-art database management software with user-friendly menus and screens. The goals of AMS are: 1) provide storage and reporting capabilities for area and mobile source emissions and related data required by EPA regulations and the Clean Air Act; 2) replace the existing system used to store and report these data with a state-of-the-art system; 3) promote information sharing among EPA offices and state and local air agencies; 4) provide the ability to interact with other EPA databases; and 5) provide enhanced data processing services to the EPA and state and local user community.

With passage of the Clean Air Act Amendments (CAAA) of 1990 in November 1990, a data system that tracks area and mobile source emissions inventory data became critical to the needs of the Agency. In particular, an area and mobile source data system will be needed to support implementation of Title I of the CAAA. This takes the form of 1) storing area and mobile source emissions data as reported by state and local air agencies; and 2) developing comprehensive capabilities to support CAAA regulatory reporting, tracking, and analytical requirements.

Emissions inventory data reported to AMS by state and local air agencies in support of Title I of the CAAA involve reporting emissions inventory data for non-attainment areas only. AMS, in addition to supporting Title I requirements, will include a national component that will include emissions inventory data that may be used for regional modeling. Since regional models require data for both non-attainment and attainment areas and generally require consistent emission estimation methodologies throughout the modeling domain, this national component will generate emission estimates using a consistent methodology for area and mobile source categories for all areas of the U.S.—non-attainment and attainment areas.

In order to accommodate the need to support Title I activities and regional modeling needs, a basic design decision has been made to develop AMS using what may be described as a "parallel approach." The definition of parallel approach is that EPA would prepare area and mobile source data for all counties in the U.S. Any state data submitted would reside in "parallel" with the EPA prepared data. As a result of this parallel approach, AMS will consist of two components—a national component and a state component.

Ideally, a more integrated or hybrid approach would be better. (In the hybrid approach, EPA would prepare area and mobile source data for all counties in the U.S. Any state data submitted would replace EPA prepared data for source categories in those counties.) However, implementation of the hybrid approach will not be attempted in the base system until: 1) better methodologies are available from emission inventory research projects currently underway and the states become familiar with an AMS system, and 2) a plug-in methodology capability is fully introduced. The emission estimation procedures described below will be used within the national component of AMS.

Historically, these methodologies have been referred to as the NEDS methods and are described in area source documentation for the 1985 National Acid Precipitation Assessment Program (NAPAP) inventory. Much of the narrative from that documentation has been used in the preparation of this report, since the basic concepts for the estimation of the emissions have remained comparable to the methods described in earlier documents. Currently, a number of emissions inventory research projects are underway and should provide improved emission estimation procedures. When these new procedures are available, they will be implemented in AMS.

Stationary Source Fuel Combustion

Stationary source fuel combustion which contributes to area source emissions has been divided into three major categories: Residential Fuel, Commercial and Institutional Fuel, and Industrial Fuel. Collectively, these categories account for all stationary fuel combustion activity not usually reported as point sources. Each category is further subdivided into the following fuel types: anthracite coal, bituminous coal, distillate oil, residual oil, natural gas, liquefied petroleum gas (LPG), wood, industrial coke, and process gas. Methodologies for activity level estimation and emission factor derivation are discussed for each category and fuel type.

In the following methodologies for the calculation of activity levels, consumption is determined for each type of fuel using two general steps:

1) County consumption is calculated using an algorithm which is based on significant variables for which county-specific data are available (e.g., degree days, number or rooms per dwelling, number of dwellings).

2) Resulting county consumption estimates are normalized to reflect published state consumption data by the equation:

$$NCC = ECC \frac{PSC}{ESC}$$

where:

NCC = Normalized county consumption
ECC = Estimated county consumption
PSC = Published state consumption
ESC = Estimated state consumption (summation of estimated county consumption)

Residential Fuel

The residential fuel category estimates emissions for residential activities which utilize fuel for water heating, space heating, and cooking. Emissions contributed by residential fuel consumption are broken down into six categories according to fuel type: anthracite coal, bituminous coal, distillate oil, natural gas, LPG, and wood. Emissions from the residential residual oil consumption category are considered to be negligible; therefore, no methodology exists for this category. For each listed fuel type, activity levels measured by fuel quantity consumed in weight or volume units are multiplied by emission factors to obtain emissions estimates. Methodologies for activity levels and emission factors are discussed in turn.

Commercial and Institutional

Area source emissions from fuel use by commercial and institutional sources consist of emissions from all fuel burned in stationary sources that are not included under residential sources, industrial sources, power plants, or commercial point sources. Examples of commercial/institutional area sources are hospitals, hotels, laundries, schools, and universities. Fuel types included in the discussion of activity levels and emission factors are anthracite coal, bituminous coal, distillate oil, residual oil, natural gas, LPG, and wood.

Activity levels are estimated for anthracite coal, bituminous coal, distillate oil, residual oil, natural gas, and LPG. Currently, AMS does not employ a methodology to estimate wood consumption at commercial/institutional sources. Emissions from this source are considered negligible compared to those from other sources.

Industrial

Area source emissions generated by the industrial fuel consumption sector which are not accounted for by point source categories are discussed for the following fuel types: anthracite coal, bituminous coal, distillate oil, residual oil, natural gas, LPG, wood, and process gas. Methodologies for consumption and emission factor computation are presented as available.

A procedure was developed for the allocation of state industrial area source consumption of bituminous coal, distillate oil, residual oil, natural gas, and LPG. The procedure for estimating industrial bituminous coal area source consumption has been adjusted and applied to estimating industrial anthracite coal area source consumption. Originally, the procedure for industrial natural gas consumption called for the inclusion of industrial LPG consumption. LPG will now be estimated separately. In addition, industrial natural gas consumption by boilers and internal combustion (IC) engines will be estimated separately.

Procedures for estimating coke, wood, and process gas activity levels have not been developed. Industrial area source consumption of these fuels is assumed to be negligible.

Mobile Sources

Mobile sources which contribute to area source emissions are divided into five major categories: Highway Vehicles, Off-Highway Vehicles, Railroad Locomotives, Aircraft, and Marine Vessels. For each of the above categories, methodologies for activity level and emission factor estimation are discussed.

Highway Vehicles

AMS disaggregates motor vehicles into eight EPA vehicle categories on the basis of use and gross vehicle weight for the purpose of calculating emissions:

- Light Duty Gasoline Vehicles — LDGV
- Light Duty Gasoline Trucks - 1 — LDGT1
- Light Duty Gasoline Trucks - 2 — LDGT2
- Heavy Duty Gasoline Vehicles — HDGV
- Motorcycles — MC
- Light Duty Diesel Vehicles — LDDV
- Light Duty Diesel Trucks — LDDT
- Heavy Duty Diesel Vehicles — HDDV

LDGVs are defined as gasoline powered passenger vehicles weighing 8500 lb* or less. LDGT1s include gasoline cargo vehicles weighing 6000 lb or less. LDGT2s include gasoline cargo vehicles weighing between 6001 and 8500 lb. Heavy duty vehicle categories separate diesel and gasoline powered trucks and buses weighing more than 8500 lb. MCs are defined as any motor vehicles designed to travel with not more than three wheels in contact with the ground, and weighing less than 1,500 lb. LDDVs are defined as diesel powered passenger vehicles weighing 8500 lb or less. LDDTs include diesel cargo vehicles weighing 8500 lb or less.

While vehicle miles travelled (VMT) are determined for each vehicle class and road class, fuel consumption is determined only for each vehicle class. Emission factors in grams per mile obtained from the execution of the MOBILE model are applied so as to determine emissions for vehicle type and speed class. VMT is determined for the following road classes:

*Assumed Speed, mph***	*Road Class*
55	Urban Interstate
55	Rural Interstate
55	Urban Other Freeways and Expressways
55	Urban Other Principal Arterials
55	Rural Other Principal Arterials
55	Urban Minor Arterials
55	Rural Minor Arterials
45	Rural Major Collector
45	Rural Minor Collector
45	Rural Local
19.6	Urban Collector
19.6	Urban Local

Off-Highway Vehicles

Emissions from off-highway vehicles are generated by activities of gasoline and diesel vehicles which do not utilize road systems. Vehicles contributing to off-highway emissions are divided into six general

* 1 lb = 0.454 kg
** 1 mph = 1.609 km/h

categories: farm equipment, construction equipment, industrial equipment, lawn and garden equipment, motorcycles, and snowmobiles. While gasoline is consumed by all six categories, diesel fuel is utilized only by farm equipment, construction equipment, and industrial equipment.

In general, consumption is estimated by one of the following methods:

1) Apportionment of national fuel consumption to counties on the basis of employment, population, etc.
2) Calculation of county or state totals by applying fuel consumption rates to average usage figures and equipment populations.

Consumption estimation methodologies are described for each category by fuel type.

Aircraft

Emissions estimates for aircraft are divided into three categories: commercial, military, and civil. Activity levels and emission factors, measured relative to units of aircraft landing and takeoff cycles (LTOs) by county, are multiplied by emission factors to obtain emissions estimates.

Activity level is measured by LTOs using either operation records from county airports or aircraft registration data, depending on the location of Federal Aviation Administration (FAA) airports. For these calculations, an operation, as defined by the FAA, consists of either a takeoff or a landing.

Weighted average emission factors are computed for each type of aircraft within each aviation category. In some categories, flying hours are used as a unit of measure assuming that the number of flying hours are proportional to LTOs. Emission factors are then combined using aircraft type population data from Jane's and FAA Aviation Forecasts to form one factor for each pollutant.

Marine Vessels

Marine vessel categories for which emissions estimates are discussed include coal vessels, distillate oil vessels, residual oil vessels, and gasoline vessels. Final estimates are measured in gallons of fuel consumed. Emissions from coal vessels have not been estimated because emissions from this source are considered negligible compared to other area sources. Consumption methodologies and emission factor derivation are presented for each category.

Railroad Locomotives

This category includes fuel utilized by railroad locomotives and fuel used by railroad stations and workshops for space heating. The latter fuel consumption has been included primarily because it is difficult to separate from total railroad fuel use and is considered insignificant compared to locomotive consumption. The primary fuel consumed by railroad locomotives is distillate oil (diesel fuel). The activity level, measured in thousands of gallons, is multiplied by emission factors to produce emissions estimates.

The methodology used to estimate distillate oil consumption involves the allocation of published state consumption of distillate oil by railroad locomotives to the county level on the basis of current population distribution.

Gasoline Marketing Operations

This source category covers evaporative losses of VOCs from gasoline marketing operations such as filling losses from loading underground storage tanks at service stations, and spillage and filling losses from filling automobile tanks. Gasoline evaporative losses at refineries or bulk distribution terminals are not included. Emissions from refineries are assumed to be accounted for in point source categories.

The activity level for this category, measured by retail gas sales in thousands of gallons, is multiplied by emission factors to generate emissions estimates.

Retail sales of gasoline include all sales of gasoline for highway use, aviation use, and for use by the construction equipment, industrial equipment, and farm equipment off-highway subcategories. Sales to the above user categories are estimated separately and summed to generate total county sales.

State retail sales of gasoline for highway and marine use are allocated to each county according to the county's proportion of the statewide gross dollar receipts from gasoline service stations. Published state aviation retail sales of gasoline are allocated to the county according to the total LTO cycles in the county for each of the military, civilian, and commercial aircraft categories.

County retail sales of gasoline for off-highway sources are assumed to be the same as consumption derived in the activity levels section of Farm Equipment, Construction Equipment, and Industrial Equipment under Off-Highway Sources

Unpaved Roads

Vehicle traffic over unpaved roads, parking areas, and recreational areas generates fugitive dust emissions which are estimated in NEDS. Primary factors which affect the amount of dust generated are vehicle speed, surface type, wind speed, surface moisture, and type of vehicle. Methodologies for the estimation of activity level measured in vehicle miles travelled (VMT) and for emission factor derivation are described.

The methodology developed to determine the county VMT on unpaved roads is based on regression analysis of data collected for VMT per county and mileage of unpaved roads per county. County road mileages for this study were obtained from state transportation or highway departments. VMT was found to be dependent on the county population and mileage of unpaved roads in the county.

Industrial Processes

Industrial processes are very properly considered as point sources in most emission inventories and in the recent past have not been considered to be significant contributors to area source emissions. However, there may be many industrial processes that are too small to be considered point sources, but collectively may contribute substantially to the overall total. At the present time, no methodologies are available to estimate activity levels on a county basis.

Construction

Road and building construction activities generate particulate emissions. Principal activities in construction which cause dust emissions are land clearing, excavation, and vehicle traffic around the construction site. Variables known to affect emissions are soil type, moisture, wind speed, and type of operations on-site. At present, no methodology is available to estimate activity level at the county level. However, emission factors are available from AP-42.

Solvent Utilization

This area source category documents the estimation procedures for evaporative losses of VOCs from solvent usage by area sources. Organic solvent usage is divided into seven major categories: surface coating operations, dry cleaning operations, degreasing operations, graphic arts, rubber and plastics, miscellaneous industrial operations, and miscellaneous non-industrial operations. Surface coating is further divided into the following subcategories: architectural coatings, auto refinishing, textile products, flatwood products, wood furniture, metal furniture, paper, plastic products, cans, metal coils, miscellaneous finished metals, electrical, large appliances, magnet wire, motor vehicles,

aircraft, marine, railroad, and miscellaneous manufacturing operations. In each category, use of specific solvents is identified and enumerated to compute total solvent usage in tons per year.

The methodology for allocating organic solvent consumption by county consists of apportioning national consumption of 20 primary solvent groups by major user category according to county population or employment data. User categories are listed in Table 1. Table 2 lists the primary solvent groups used to determine losses from organic solvent consumption. The category "Special Naphthas" includes the aliphatic naphthas such as V. M. P. naphthas, Stoddard solvent, rubber solvents, and mineral spirits.

National consumption of the primary solvent groups is distributed to each of the user categories according to the percentage of total solvent consumption used by the user category. Percentage usage obtained from published sources is compiled for each user category in Table 2. National area source solvent use estimates are determined by subtracting point source solvent use or emissions for each user category from total solvent use for each user category.

County consumption for each solvent group and user category is then computed by allocating calculated national area source consumption on the basis of applicable county SIC area source employment or population as shown in Table 1. For example, in the degreasing processes use category, total solvent use is allocated to each county in proportion to the county area source employment for SIC groups 34 through 39. Area source employment is determined by subtracting point source employment from total county employment for each SIC category. For dry cleaning applications, the county-wide allocation is made on the basis of total employment in SIC groups 7215, 7216, and 7218. To reflect the unequal solvent use in particular establishments within SIC groups, consumption is multiplied by a factor which compares the number of individuals in the county in each area source user category to the number of individuals in the nation in each area source user category. County consumption of each solvent type is then summed for each county to yield a total county consumption.

Solid Waste Disposal

The area source category for solid waste disposal includes on-site refuse disposal activities by residential, commercial/institutional, and industrial sectors. In this section, emissions from the disposal practices of open burning and on-site incineration are discussed separately. Solid waste generation in hundreds of tons is used as a measure of activity level.

Table 1. *User Categories*

User Categories	*Population or Employment by SIC Used for Country Allocation*
Surface Coating	
Architectural Coatings	*County Population*
Auto Refinishing	*SIC 7535*
Textile Products	*SIC 22*
Flatwood Products	*SIC 243 + 244*
Wood Furniture (SIC 25 partial)	
Metal Furniture (SIC 25 partial)	
Paper	*SIC 26*
Plastic Products	*SIC 308*
Cans	*SIC 341*
Metal Coils	*SIC 3498*
Misc. Finished Metals	*SIC 34-(341 + 3498)*
Electrical	*SIC 35*
Large Appliances	*SIC 363*
Magnet Wire	*SIC 36 - 363*
Motor Vehicles	*SIC 371*
Aircraft	*SIC 372*
Marine	*SIC 373*
Railroad	*SIC 374*
Miscellaneous Mfg.	*Total Mfg. - Above SIC employment*
Degreasing	*SIC 34 thru 39*
Dry Cleaning	*SIC (7216 x 2) = 7215 + 7218*
Graphic Arts	*SIC 264 + 265 + 27*
Rubber & Plastics	*SIC 30*
Miscellaneous Industrial	*Summation of CBP* employment in SIC's 20 thru 39*
Miscellaneous Non-Industrial	*County Population*

* *County Business Pattern*

Natural Sources

Natural sources are known to be significant contributors to area source emissions. Natural sources may include: biogenic sources, wind erosion, lightning, geothermal sources, and open-water sources. However, while there are numerous methodologies for estimating emissions from natural sources, there remains disagreement among the experts as to the most appropriate methodology to use for estimating emissions from this category.

Miscellaneous Area Sources

Area sources which are not defined by Stationary Source Fuel Combustion, Mobile Sources, Industrial Processes, Solvent Utilization, Solid Waste Disposal, or Natural Sources categories are compiled in the miscellaneous area sources category. The importance of these area categories is that, while total emissions from each source are relatively small compared to the major categories, emissions at a particular time may be significant.

As presented, identified miscellaneous area sources include: Acres Under Cultivation (Land Tilling), Agricultural Burning, Forest Wildfires, Managed Burning, and Structural Fires.

Agriculture Production—Crops

Acres Under Cultivation (Land Tilling)

Fugitive dust emissions result from various soil preparation operations which include rough plowing, mulch plowing, and the cutting of narrow slits into the sod for seed and/or fertilizer. Variables known to affect the quantity of dust generated are soil type, surface moisture, resulting tool speed, type of equipment, and wind speed. However, no methodology has been developed to adequately estimate emissions. For previous inventories, activity levels are estimated using the number of acres tilled as obtained from the Census of Agriculture. It was assumed that each acre of

Table 2. *Percentage End Use of Solvents by Major Solvent Category*

Solvent Type	Surface Coating	Degreasing	Dry Cleaning	Graphic Arts	Rubber & Plastics	Miscellaneous Industrial	Miscellaneous Non-Industrial
Special Naphthas	48.7	6.7	2.0	6.4	9.6	7.1	10.7
Perchloroethylene		10.0	53.0				4.0
Ethanol						26.0	
Trichloroethylene		80.0					5.0
Isopropanol	15.0					9.0	37.0
Acetone	17.0						11.5
Glycol Ethers	43.0					10.0	
Cyclohexanone						5.0	
Methyl Ethyl Ketone	69.4					10.0	
Ethyl Benzene							0.5
Propylene Glycol					54.0	4.0	6.0
Methanol						8.0	15.0
Butyl Acetate	65.0			5.0			3.0
Ethyl Acetate	41.0				8.0		13.0
Butyl Alcohols	15.5					1.8	1.3
Methyl Isobutyl Ketone	65.5					8.0	18.0
Monochlorobenzene		21.0				21.0	11.0
o-Dichlorobenzene						25.0	5.0
p-Dichlorobenzene					23.0		46.0
All Other Solvents*							

* *All Other Solvents are assumed to be the summation of 1.8% of the total solvent used in surface coating, graphic arts, miscellaneous industrial, and miscellaneous non-industrial.*

harvested cropland is tilled three times per year. The resultant activity levels were reported in thousands of acres.

Agricultural Burning

This miscellaneous area source category estimates emissions from agricultural burning practices routinely used to clear and/or prepare land for planting. Specific operations include grass stubble burning, burning of agricultural crop residues, and burning of standing field crops as part of harvesting (e.g., sugar cane). Emissions estimates are generated by multiplying the number of acres burned in each county by a fuel loading factor and the emission factor for each pollutant.

The original methodology estimated the 1974 activity level in terms of acres burned per state. It is assumed that the total quantity of agricultural products burned in 1974 is the same quantity which will be consumed by fire each year. If no specific crop data were available, it was assumed that the number of acres burned annually are divided equally between sugar cane and field crops. For the purposes of these calculations, fuel loadings for grass burning are 1 to 2 tons per acre;* for sugar cane burning, fuel loadings range from 6 to 12 tons per acre.

If new state, regional, or national estimates are available, the existing county data will be updated by the same percentage as the relative state, regional, or national percentage increase or decrease.

Other Combustion

Area sources which are defined as Other Combustion include such categories as forest wildfires, managed burning, and structural fires. The importance of these area categories is that, while total emissions from each source are relatively small compared to the major categories, emissions at a particular time may be significant.

Forest Wildfires

Each year emissions are generated by forest wildfires covering large tracts of forested land. For this category, emission estimates are generated by multiplying the number of acres burned per county by a fuel loading factor and then the emission factor.

In the original methodology, state estimates of wildfire activity were allocated to the county level on the basis of forest acreage per county. These wildfire statistics were obtained, reported in number of acres burned, from contact with state forestry officials and from state land use maps for the base year 1974. Since 1974, the wildfire activity level for each county from the previous year has been updated with wildfire statistics from the U.S. Forest Service. Regional fuel loading factors in tons per acre for each EPA region are applied to state averages within each region to yield tons consumed.

Managed Burning (Slash/ Prescribed Burning)

Managed burning activities included in this area source category are slash burning and prescribed burning. In slash burning operations, waste from logging operations is burned under controlled conditions to reduce fire hazards and remove

* 1 ton/acre = 0.224 kg/m²

brush considered to host destructive insects. Prescribed burning is used as a forest management practice to establish favorable seedbeds, remove competing underbrush, accelerate nutrient cycling, control tree pests, and contribute other ecological benefits.

For this category, emissions estimates are generated by multiplying the number of acres burned in each county by a fuel loading factor and the emission factor for each pollutant.

Original state estimates of acreage consumed by both managed burning techniques were determined for the NEDS inventory year of 1974. Individual state officials and the U.S. Forest Service were contacted to provide estimates of acreage burned, burning technique, and fuel loading ratios. AMS uses state data generated for 1974 which was allocated to the county level according to forest acreage per county as obtained from contact with local officials or state land use maps. If not provided, fuel loadings for slash burning and prescribed burning are 75 and 3 tons per acre, respectively.

If new state, regional, or national estimates are available, the existing county data will be updated by the same percentage as the relative state, regional, or national percentage increase or decrease.

Structural Fires

Structural fires have been included in AMS because building fires have been identified in the production of short-term emissions of air contaminants. Activity level for this category, measured by the total number of fires per county, is multiplied by a loading factor and the emission factor to obtain emissions estimates.

The total number of building fires is obtained from the most recent statistics from the National Fire Protection Association (NFPA). In absence of county level allocation data, it is assumed, based on the nationwide NFPA figures, that an average of four fires per 1,000 population occur each year. Estimates of the material burned is obtained by multiplying the number structural fires by a fuel factor of 6.8 tons* of material per fire.

If new state, regional, or national estimates are available, the existing county data will be updated by the same percentage as the relative state, regional, or national percentage increase or decrease.

* 1 ton = 907 kg

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E. Sue Kimbrough is the EPA Project Officer, (see below).
The complete report, entitled "Documentation of AIRS AMS National Methodologies," (Order No. PB92-132869/AS; Cost: $26.00, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650

The EPA Project Officer can be contacted at:

Air and Energy Engineering Research Laboratory
U.S. Environmental Protection Agency
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