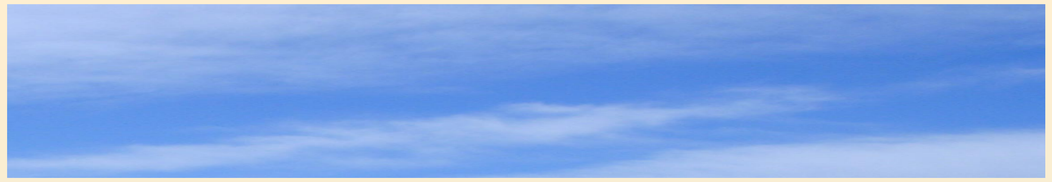
The National Wildfire Coordinating Group (NWCG) Smoke Committee (SmoC) Support and Development of Regional and National Emission Inventory Efforts

Pete Lahm[1] Gary Curcio[2] Claudia Standish[3] Susan O'Neill[4]

1) USDA Forest Service 2)North Carolina Division of Forest Resources 3) USDOI Bureau of Land Management 4) USDA Natural Resources Conservation Service

NWCG Smoke Committee (SmoC) is one of 14 Committees chartered under NWCG and providing interagency leadership, coordination and integration of air resource and fire management objectives to support overall land management goals. In a time where fuel treatment programs have never been more important for ecosystem health and public safety, and national ambient air quality standards designed to protect human health are tightening, the need for addressing smoke issues has never been more critical, including the building of better emission inventory databases.

SmoC Membership: SmoC works with an interagency membership of air quality and land management experts from the federal and state land management agencies, associate members from clean air agencies, agencies who work with private land managers, and other subject matter experts.

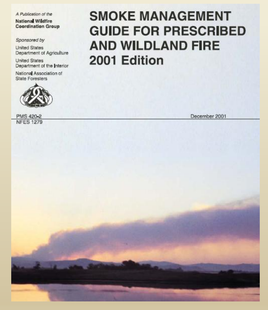


SmoC efforts are involved in emission inventory work;

- attempting to bring cohesion to federal land management (FLM) fire reporting systems and giving input as to how they can be tailored to smoke/fire needs;
- analyzing how fire is included in the 2008 EPA National Emission Inventory (NEI) and the EPA greenhouse gas emission inventory efforts;
- tracking how fire is included in the black carbon emission inventories being put together by executive order and congressional mandate; and
- supporting new innovative fire EI efforts such as SMARTFIRE2.

SmoC Subcommittees:

Technical Smoke Topics Subcommittee
Project: Smoke Monitoring
Project: Revision of the 2001 Smoke Management Guide



Training Subcommittee: Developing smoke management training for the wildland fire community and air agencies.

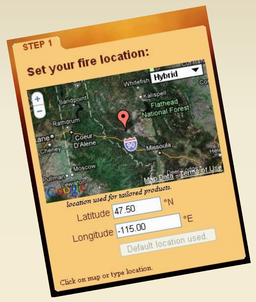
Smoke Managers Subcommittee - Subcommittee membership reflects a national mix of people such as smoke managers who are local/ state/ tribal/ federal employees who work with air quality regulators and land managers to assist in any or all of the planning, operation and monitoring phases of prescribed and wildland fires.

SmoC Training

University of Idaho — UI Home | Contact UI | Search

Wildland Fire at the College of Natural Resources

Air Quality Educational Resources
The National Wildfire Coordinating Group's (NWCG) Smoke Committee (SmoC) and the University of Idaho have developed a range of educational materials to further knowledge of air quality and smoke management. These resources address:
Smoke Management and Air Quality for Land and Air Managers
Case Studies
Online Workshops - **"Effective Communication for Smoke Management in a Changing Air Quality Environment"**
AQ Library
Smokepedia



Wildland Fire Decision Support System (WFDSS) Air Quality Portal

A new "one-stop shopping" air quality portal site is providing wildland fire decision makers with access to a variety of real-time and forecast air quality information. WFDSS-AQ can be accessed by clicking Fire Related Links > Weather Related Links > Air Quality within WFDSS. It can also be accessed by non-federal air quality agencies at: http://firesmoke.us

Smoke Monitoring

- Providing technical leadership in air/smoke modeling, emissions inventory, & smoke management tools (Atmospheric Dispersion Models (HYSPLIT& VSMOKE) & EBAMS) used on fire management burns) . SmoC is currently assisting in developing a Smoke Cache of PM2.5 Samplers.

SmoC Communications

Public Announcements from My Fire Community website:
http://www.myfirecommunity.net "Air Quality and Fire Issues "
National Smoke Management Website: http://www.nifc.gov/smoke

Leadership:

Pete Lahm, Chair, Forest Service, plahm@fs.fed.us and pete.lahm@gmail.com, 202-205-1084
Susan O'Neill, Vice Chair, Natural Resources Conservation Service, susan.oneill@por.usda.gov, 503-273-2438
Mark Fitch, National Park Service, Chair Technical Smoke Topics Subcommittee, mark_fitch@nps.gov, 208-387-5230
Ron Sherron, Forest Service, Chair Training Smoke Managers Subcommittee, sherron@fs.fed.us, 602-771-2277
Claudia Standish, Bureau of Land Management, Vice-Chair Smoke Managers Subcommittee, Claudia_Standish@blm.gov, 505-476-4332
Lisa Bye, Bureau of Land Management, Co-Chair Training Subcommittee, Lisa_Bye@blm.gov, 505-954-2191
Julie Oliver, National Association of Clean Air Agencies, Washington State, Co-Chair Training Subcommittee, joli461@ecy.wa.gov, 360-407-6839

www.nifc.gov/smoke

Smoke Management - Overview

The information within these pages is offered by the Interagency Smoke Committee (SmoC). SmoC is chartered by the National Wildfire Coordinating Group (NWCG) to provide leadership, coordination and integration of air resource and fire management objectives.

Managers of wildland fire, whether responding to wildfires or planning and implementing prescribed fires, must understand the reasons and methods for minimizing negative impacts from smoke. Managers already know that protecting human life is the foremost priority in all aspects of wildland fire management (including smoke); protecting natural resources and personal property are secondary priorities. This website provides fire managers with information necessary for understanding the legal and operational aspects of smoke management.

The legal foundation of smoke management is the Clean Air Act which establishes primary (public health) and secondary (welfare and environmental quality) standards for controlling air pollution. The Act also requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) to control pollution and protect public health, safety, and welfare. The Clean Air Act establishes state-level responsibilities for preventing and controlling air pollution. Many of the specific requirements for smoke management are therefore found in State Implementation Plans (SIP) and Smoke Management Programs (SMP). In addition to specific SIPs and SMPs, fire managers should be familiar with EPA's Interim Air Quality Policy on Wildland and Prescribed Fire.

Emissions from wildland fires are subject to the laws, regulations, and policies at state and national levels because of the types of pollutants contained in smoke. The major components of smoke are water vapor and carbon dioxide. However, smoke also contains the pollutants carbon monoxide, nitrogen oxide, hydrocarbons, and particulate matter. Because of its very small size (similar to pollen), fine particulate matter can easily penetrate deep into lung tissue, causing severe respiratory and cardio-vascular disease. This pollutant also can significantly reduce visibility on highways by scattering and absorbing light, resulting in unsafe driving conditions. Therefore, particulate matter is the pollutant of primary concern for smoke management. In order to comply with the law, fire managers must understand how particulate matter affects public health, reduces visibility on highways and near airports, and impacts scenic vistas within Class I areas such as wilderness areas, national parks, and wildlife refuges.

This website is organized to allow visitors to learn about:

- Laws, regulations, and policies at the federal, state, and agency levels.
- Preparing environmental analyses on smoke impacts to air quality under the National Environmental Policy Act (NEPA).
- Tools for managing smoke such as smoke dispersion models, weather and smoke forecasts, and monitoring equipment and methods.
- Publications and other links with important information on smoke management.

National Interagency Fire Center

NIFC Home
Aviation
Communications/Radios
Fire Information
NICC
Policies
Prevention/Education
Safety
Training/Qualifications
Fire Programs
Fire Equipment

www.nifc.gov/smoke

Smoke Management - Emissions

Wildland fires emit particulates and trace gases that influence the chemical composition of the atmosphere and affect the health and safety of firefighters and the public. This page provides basic information for understanding the influence of these emissions on the quality of the air we breathe as well as issues such as climate change.

Background Information
Comparison of Historic and Contemporary Wildland Fire and Anthropogenic Emissions (ppt)
Chemical Composition of Wildland Fire Emissions
Emission of trace gases and aerosols from biomass burning

Emission Inventories
National Emission Inventory (NEI)
EPA National Emissions Inventories
Greenhouse Gas Inventory
US EPA Greenhouse Gas Inventory Report

Emission Categories
Toxics
2002 National Air Toxics Assessment
2008 FACT Briefing Paper: Mercury Emissions from Wildland Fire
Mercury Emissions from Fires: An Outline Summary
Criteria Pollutants
What are the Six Common Air Pollutants?

Research Papers: Fire Emissions and Criteria Pollutants
Ozone:
Impact of Wildland Fires and Prescribed Burns on Ground Leel Ozone Concentration
Particulate Matter:
Simulation of Air Quality Impacts from Prescribed Fires on an Urban Area
Air Quality Impacts from Prescribed Fire Under Different Management Practices

Public Health and Safety
Wildfire Smoke: A Guide for Public Health Officials (revised July 2008)
Dr. Harriet Ammann's Presentation on Effects to Public Health
The Air Quality Index and Public Health

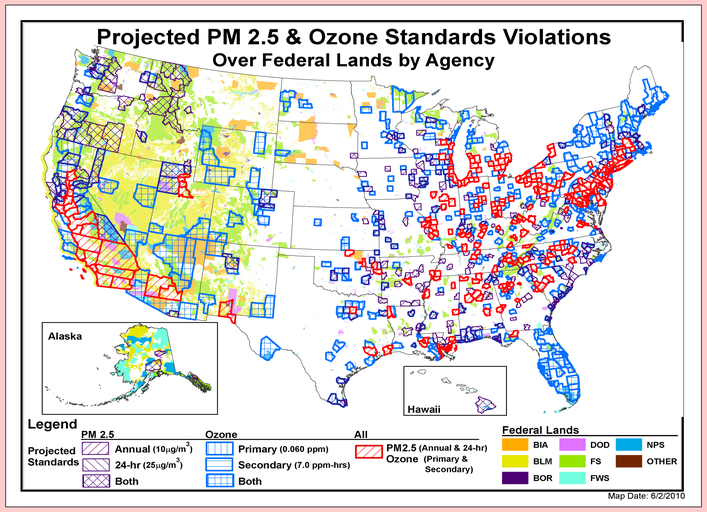
Firefighter Health and Safety
Baseline Measurements of Smoke Exposure Among Wildland Firefighters
Understanding the Health Hazards of Smoke for Wildland Firefighters
Health Hazards of Smoke - Research Abstracts
Summary page of research regarding Effects of Smoke Exposure on Firefighter Health by the USFS Fire and Environmental Research Applications (FERA) Team

"Fire Management Tools That Advance North Carolina's Smoke Management Program And Development of Emissions Inventory" – A Case Study at Camp Lejeune / Jacksonville, North Carolina

Gary Curcio[1], Jim Reardon [2]

1) NC Division of Forest Resources 2) USDA – Forest Service

The advancement of the North Carolina Smoke Management Program (SMP) is dependent on the integration of science and the effective use of fire management tools. Many natural resource management agencies in North Carolina are planning to increase controlled burning acreages at a time of changing air quality standards. In the future burning programs will need to meet the combined pressures of the new regulatory environment and the increasing complexity of NC's air-sheds due to the growth of urban/forest interface as well as the air-sheds climatology.



If proposed most stringent levels are adopted.

- 0.060 ppm (ozone primary)
- 7 ppm-hrs (ozone secondary)
- 25 µg/m³(PM2.5 24-hr)
- 10 µg/m³(PM2.5 annual)

Potential NAA:

- 208 million acres Federal Lands
- 391 million acres non-Federal Lands

Increased burning opportunities and the maintenance of existing prescribed burning programs are dependent on better, finer scale tools and real time data that can provide timely information that support burning decisions. In North Carolina, thick organic soils along the coastal plain are a unique factor in the decision making process and tools such as Estimated Smoldering Potential (ESP) in Organic Soils and the National Fire Danger System (NFDRS) can provide valuable insight on burning conditions.

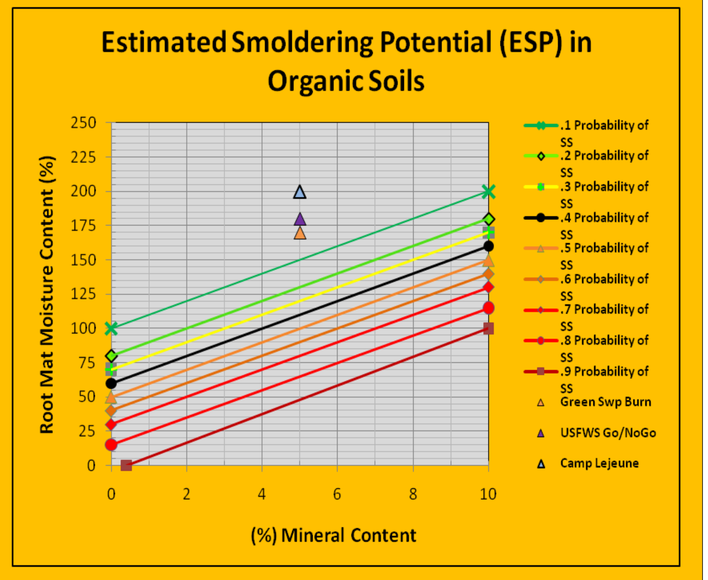
On April 6th , 2010 a 100 acre pocosin burn unit was successfully burned. It validated ESP, NFDRS, atmospheric dispersion models (VSMOKE & HYSPLIT) and the empirical adjustment of pocosin brush fuel model loadings. The Camp Lejeune case study under Operational Research Evaluation Burns (OREBS), used available fire practitioner tools . ESP and NFDRS models were used to provide input into fire emission and dispersion models. The use of these models support control burning as well as provide insight to the needed development of a real time electronic emissions database.

OREBS has established the conduit for the introduction of new science & tools into NC's SMP whereby opportunities for natural resource burning has increased. The following burns have been completed using new science and tools. The present SMP would not have permitted these burns to take place.

Fiscal Year	Tract Units	Acres Burned	Burning Days
2004	14	8,422	5
2005	4	8,116	3
2006	47 (14)	20,723 (90)	17 (2)
2007	20	6,729 *	5
2008	Burn Ban	Burn Ban	Burn Ban
2009	10 + (1)	10,820 + (618)	5 + (1)
2010	?	?	?
Totals	95 + (15)	53,840 + (708)	35 + (3)

Smoke Management Tools used for the Camp Lejeune Burn Unit included: VSMOKE & HYSPLIT (atmospheric dispersion models), FEPS (Fire Emissions Production Simulator), NFDRS (burning conditions assessments), NFDRS Point Forecasts, NWS Fire Weather & Spot Forecasts, RAWS, Drying Fuel Ovens, E-fuel moisture sticks, Organic Root Mat ESP Model , & Upper Air Soundings.

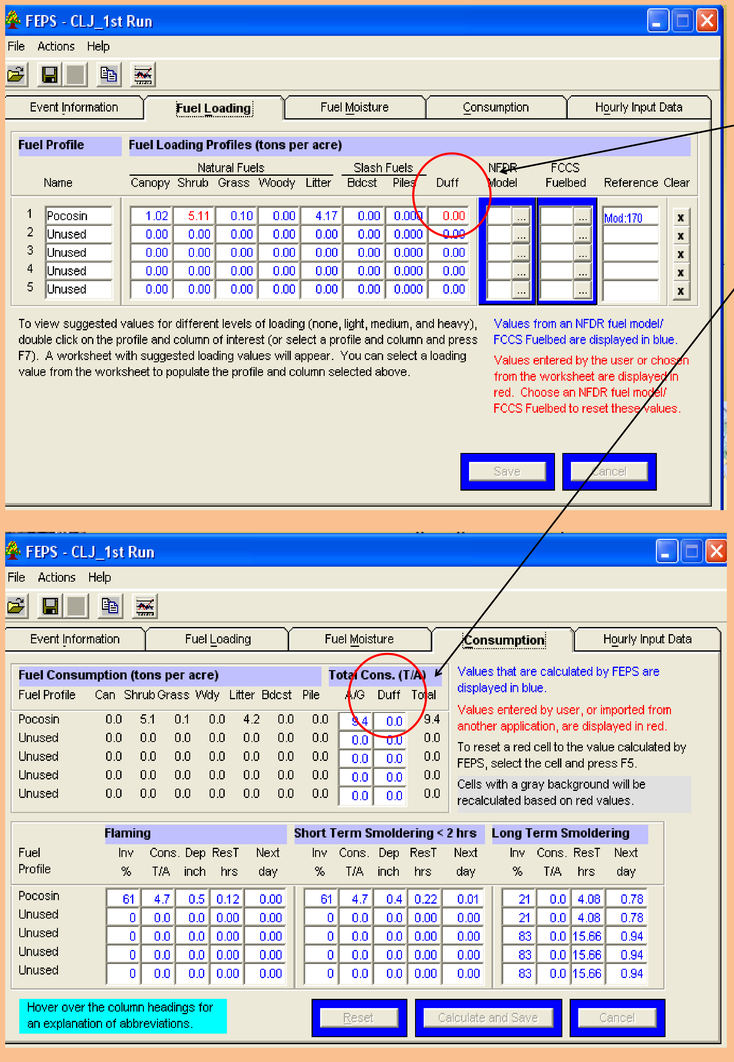
Ground fire in organic soil is an important concern in the management of wetlands. It presents emission and containment challenges. It is also an important process in the maintenance of diverse wetland communities. Previously, tools for evaluating the potential for ground fire in wetlands have been limited. Guidelines used in fire planning and suppression were based largely on local experience. The smoldering limit relationship of the ESP model complimented with National Fire Danger Rating System provides fire practitioners the means to assess the likelihood of sustained smoldering in organic soils.



Station ID	Obs Dt	Tm	O T	MSGC	WS	WDY	HRB	1H	10	HU	TH	XH	IC	SC	EC	BI	SL	R	KBDI
319505	040710	13	F	7O1P3	11	70	7	7	11	15	18	18	29	43	44	97	4	H	171
319505	040710	13	F	7G1P3	11	70	7	7	11	15	18	18	28	12	30	46	3	M	171
319505	040610	13	O	7O1P3	7	70	6	7	8	15	19	19	24	28	47	82	4	H	154
319505	040610	13	O	7G1P3	7	70	6	7	8	15	19	19	23	8	31	37	3	M	154

Dead fuel moistures from Fire Family Plus runs and empirical data, indicate that 1 and 10 fuel class sizes are totally available for consumption, while 100 and 1000 hrs fuel classes are just starting to become available. This is information is essential input for FEPS. However, the burn's operational time necessitated the use of NFDRS Point Forecast's higher moisture values.

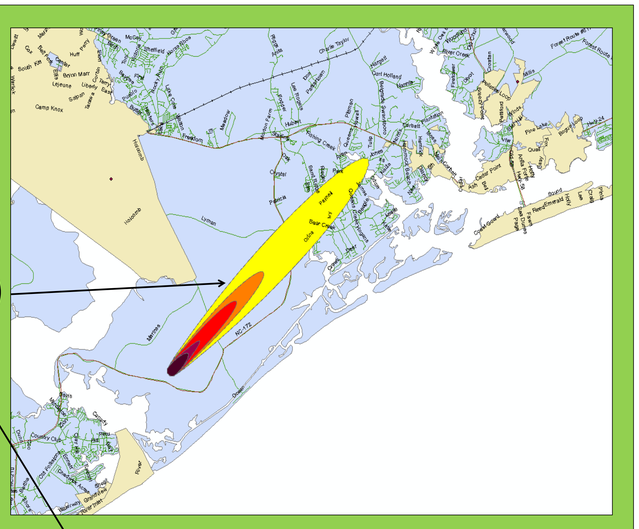
ESP permits the exclusion of organic root mat (soils) in emission estimates calculated by FEPS.



In NC 1 inch of organic soil is estimated to contribute 16 tons per acre to fuel loading estimates. However, duff consumption can be eliminated from emission calculations due to ESP's predictions that show that the probability of sustained smoldering is below 10%.

Post burn evaluation reveals no ground ignitions in the organic soil. However, pre-burn emissions were underestimated as higher moisture contents were used.

With a FEPS file completed, Atmospheric Dispersion Model runs (VSMOKE displayed) can be initiated and impacts to smoke sensitive areas can be evaluated.



Go / No-Go Decisions can be determined by reviewing VSMOKE modeled PM concentrations & visibility impacts downwind.

Distance from fire	PM2.5 (ug/m3)	CO (ppm)	Distance from fire	PM2.5 (ug/m3)	CO (ppm)
328 ft	3,623.87	38.95	2.47 mi	226.76	4.12
413 ft	3,145.57	34.05	3.11 mi	173.02	3.57
518 ft	2,714.52	29.63	3.92 mi	129.76	3.13
656 ft	2,329.98	25.68	4.94 mi	96.84	2.79
823 ft	1,990.41	22.20	6.21 mi	72.85	2.54
1037 ft	1,693.45	19.16	7.82 mi	55.90	2.37
0.25 mi	1,436.03	16.52	9.85 mi	44.19	2.25
0.31 mi	1,214.60	14.25	12.40 mi	36.20	2.17
0.39 mi	1,025.38	12.31	15.61 mi	30.82	2.11
0.49 mi	864.37	10.66	19.65 mi	27.27	2.07
0.62 mi	726.54	9.24	24.74 mi	25.24	2.05
0.78 mi	605.05	8.00	31.14 mi	24.06	2.04
0.98 mi	497.13	6.89	39.21 mi	23.28	2.03
1.24 mi	427.23	6.18	49.36 mi	22.69	2.03
1.56 mi	357.20	5.46	62.14 mi	22.21	2.02
1.96 mi	289.26	4.76			