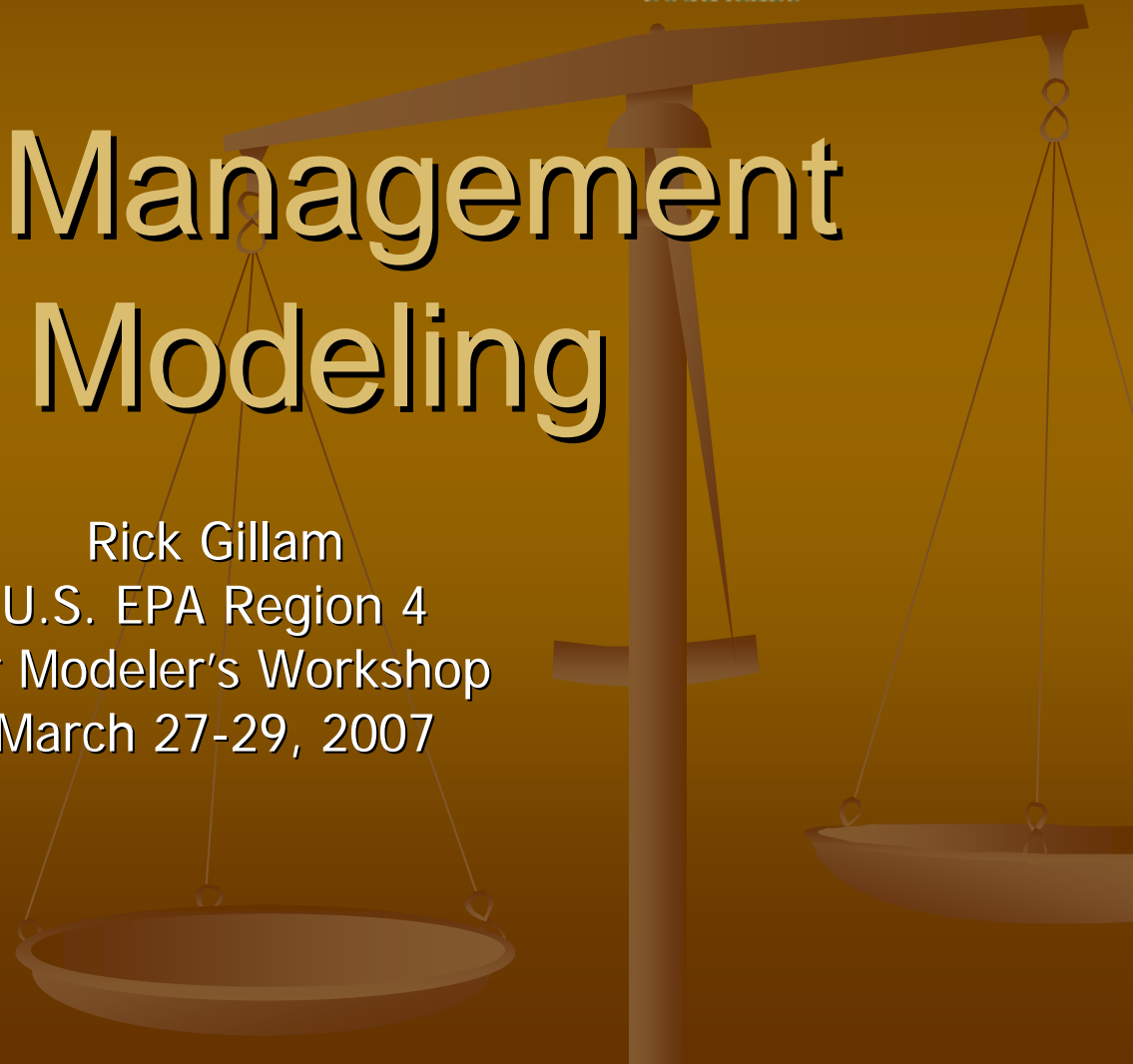




Region 4
serving the
southeast

Smoke Management and Modeling

Rick Gillam
U.S. EPA Region 4
Air Modeler's Workshop
March 27-29, 2007



To Burn or Not to Burn, That is the Question...



http://www.dnr.sc.gov/news/Yr2006/june12/june12_burn_pic.html



www.valleyair.org/images/Rx-bur1.jpg

Benefits of Prescribed Burning



- Reduce Hazardous Fuels
- Improve Wildlife Habitat
- Prepare Sites for Seeding or Planting
- Dispose of Logging Debris
- Manage Competing Vegetation
- Control Insects And Disease
- Perpetuate Fire-dependent Species

Air Quality Impacts from Fires

http://www.delalbright.com/Images/Articles/fire_icecloud.jpg

- Wildland and Prescribed-burn fires release large amounts of criteria pollutants - PM, CO, SO₂, NO_x, and VOCs.
 - Tests indicate that at least 90% of smoke emissions can be classified as PM₁₀ and at least 70% are PM_{2.5}
- Emissions can affect local & regional air quality and impair visibility

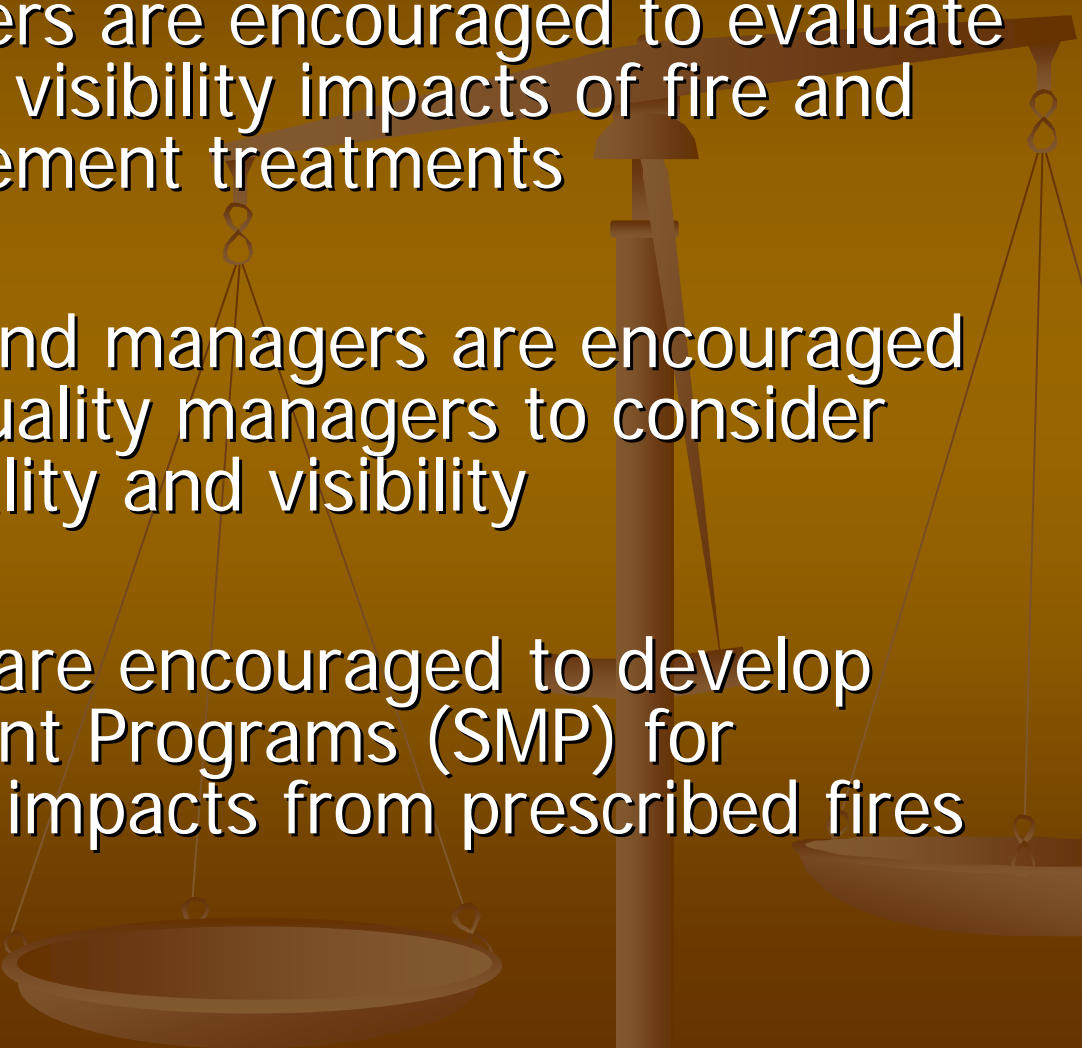


http://www.fws.gov/fire/news/headline_stories/prescribed_burn_cedar_island.shtml

EPA Smoke Management Policy

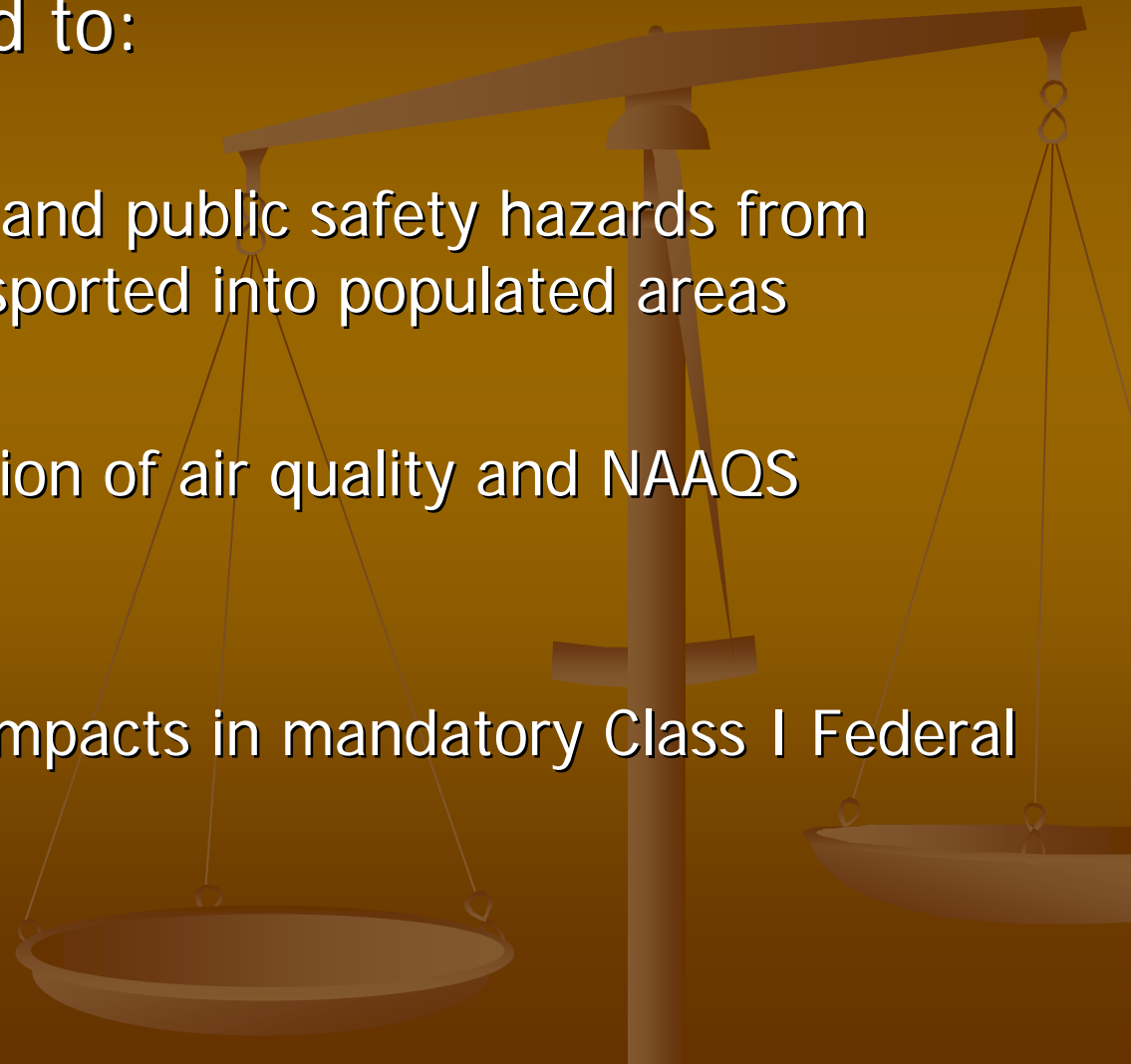
- **1998 Interim Air Quality Policy on Wildland and Prescribed Fires**
 - Attempts to Integrate 2 Public Policy Goals:
 1. To allow fire to function in its natural role in maintaining healthy wildland ecosystems
 2. To protect public health and welfare by mitigating the impacts of air pollutant emissions on air quality and visibility
 - Available on the following website:
<http://www.epa.gov/ttn/oarpg/t1/memoranda/firefnl.pdf>

Key Elements of EPA's Policy

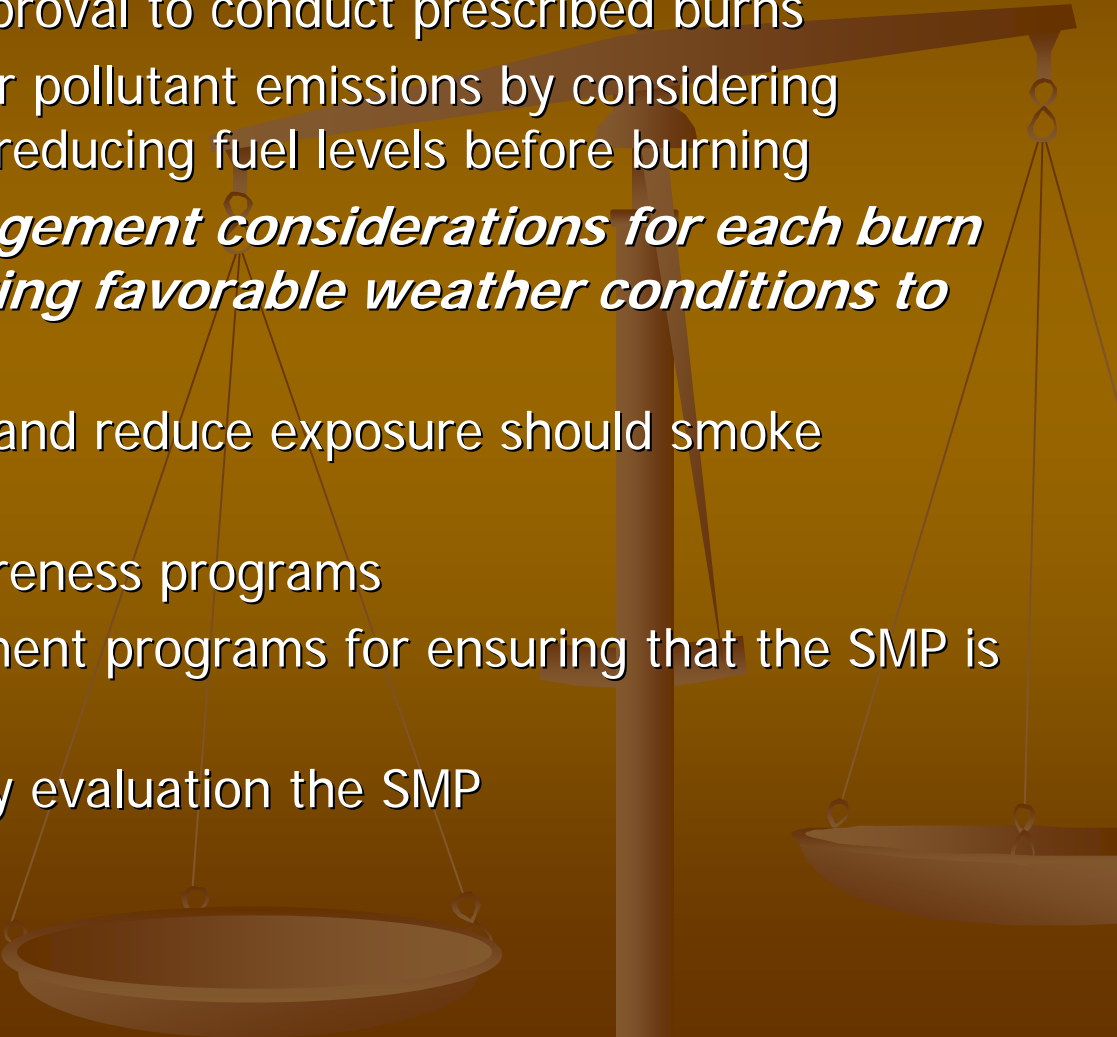
- Air Quality Managers are encouraged to evaluate the air quality and visibility impacts of fire and other land management treatments
 - Wildland owners and managers are encouraged to work with air quality managers to consider impacts on air quality and visibility
 - States and Tribes are encouraged to develop Smoke Management Programs (SMP) for addressing smoke impacts from prescribed fires
- 

Smoke Management Programs

- SMPs are designed to:
 - Mitigate nuisance and public safety hazards from smoke being transported into populated areas
 - Prevent deterioration of air quality and NAAQS violations
 - Address visibility impacts in mandatory Class I Federal areas



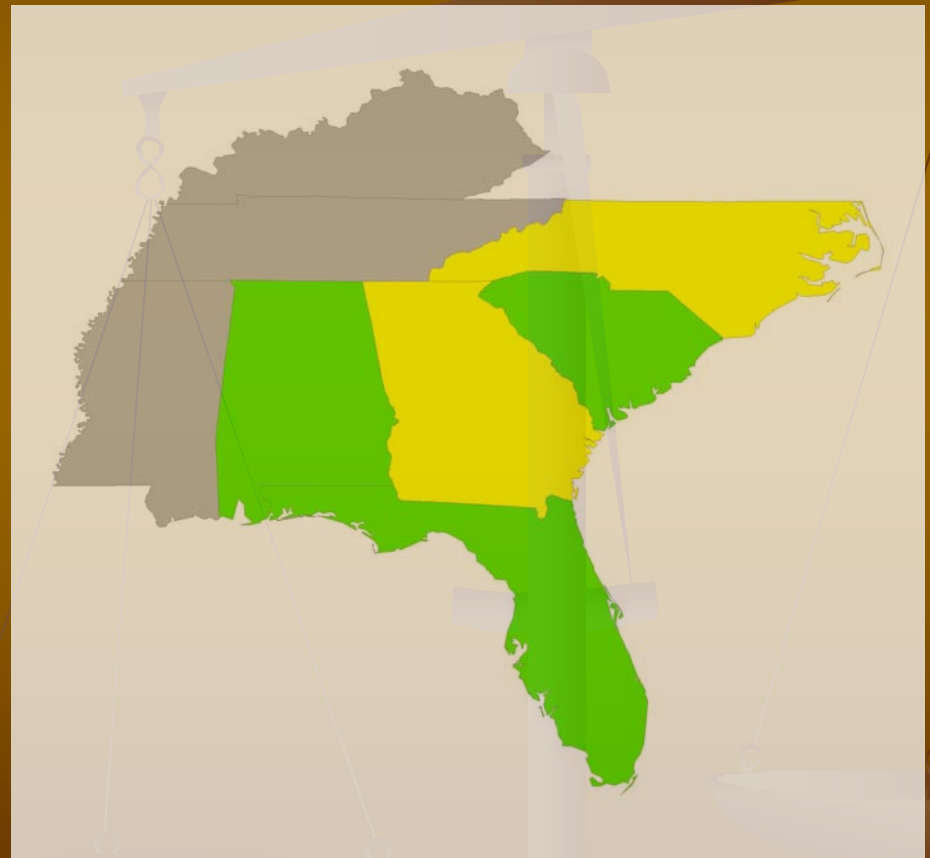
Basic Requirements of a SMP

- A process for granting approval to conduct prescribed burns
 - Methods for minimizing air pollutant emissions by considering alternative treatments or reducing fuel levels before burning
 - *Outlining smoke management considerations for each burn (e.g., burning only during favorable weather conditions to minimize smoke)*
 - Plans to notify the public and reduce exposure should smoke intrusions occur
 - Public education and awareness programs
 - Surveillance and enforcement programs for ensuring that the SMP is effective
 - Procedures for periodically evaluation the SMP
- 

States in EPA Region 4 with Certified SMPs

- Florida
- South Carolina
- Alabama

- North Carolina & Georgia are currently developing SMPs



Exceptional Events Rule



- 3/1/2006 – EPA Proposed Rule
 - Establish criteria and procedures for use in determining if air quality monitoring data has been influenced by exceptional events
- 3/14/2007 – Final Rule Signed (72 FR 13560, 3/22/2007)
 - Addresses Prescribed Fires
 - Continues to endorse 1998 Interim Policy and require Smoke Management Programs (SMPs) or implementation of “basic smoke management practices” for a smoke impacts on air quality from prescribed fires to be considered an “exceptional event” (EPA must also agree that the fire meets the definition of an exceptional event)

2/28/2007 Atlanta Smoke Incident



■ Smoke clouds metro area

Forestry service conducts controlled burn

By [STACY SHELTON](#), [SAFED AHMED](#), The Atlanta Journal-Constitution, Published on: 02/28/07

■ Smoke slipped up on experts

Agencies meet today on what went wrong in fires that sent area pollution off charts

By [Stacy Shelton](#), The Atlanta Journal-Constitution, Published on: 03/02/07

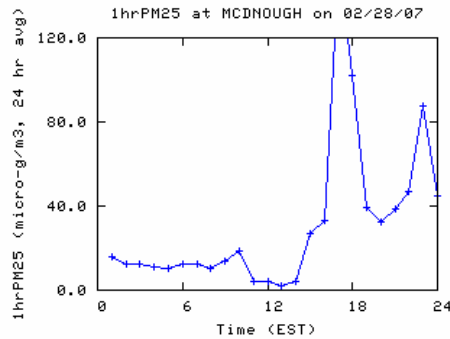
■ Agencies analyze why smoke drifted into metro Atlanta skies

By [Stacy Shelton](#), The Atlanta Journal-Constitution, Published on: 03/16/07

Atlanta PM2.5 Levels on 2/28/07

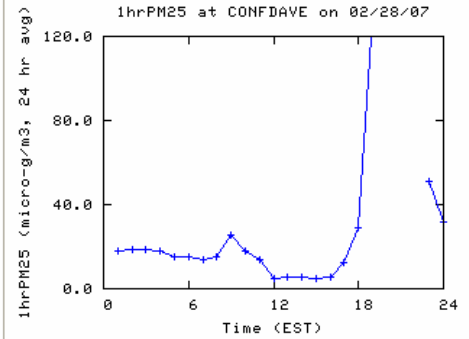
1hrPM25 (micro-g/m3, 24 hr avg) at MCDNOUGH on 02/28/07

Hours 1-8	Hours 9-16	Hours 17-24			
01	15.8	09	14.1	17	151.7
02	12.5	10	18.8	18	101.8
03	12.5	11	4.2	19	39.3
04	10.7	12	3.9	20	32.4
05	10.5	13	2.4	21	38.4
06	12.4	14	4.1	22	47.0
07	12.3	15	26.9	23	87.6
08	10.6	16	33.3	24	45.0



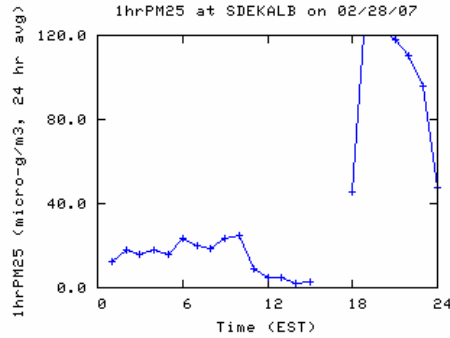
1hrPM25 (micro-g/m3, 24 hr avg) at CONFDAVE on 02/28/07

Hours 1-8	Hours 9-16	Hours 17-24			
01	17.7	09	25.2	17	12.5
02	18.8	10	17.6	18	29.3
03	18.7	11	14.0	19	135.0
04	18.2	12	4.8	20	148.9
05	15.4	13	5.5	21	132.5
06	15.2	14	5.7	22	N/A
07	13.8	15	4.6	23	50.8
08	15.5	16	5.5	24	31.5



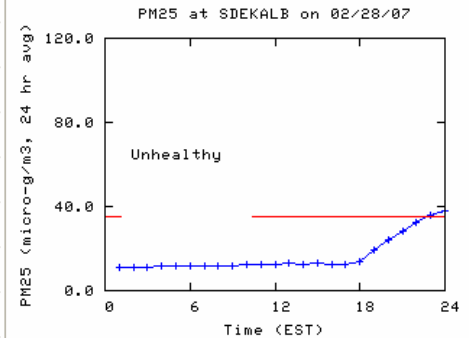
1hrPM25 (micro-g/m3, 24 hr avg) at SDEKALB on 02/28/07

Hours 1-8	Hours 9-16	Hours 17-24			
01	12.2	09	23.4	17	N/A
02	17.9	10	24.7	18	45.4
03	15.6	11	9.1	19	142.5
04	17.6	12	4.8	20	124.6
05	16.1	13	4.5	21	117.6
06	23.2	14	2.0	22	110.3
07	20.2	15	2.7	23	96.0
08	18.7	16	N/A	24	47.4



PM25 (micro-g/m3, 24 hr avg) at SDEKALB on 02/28/07

Hours 1-8	Hours 9-16	Hours 17-24			
01	11.0	09	12.0	17	12.5
02	11.2	10	12.4	18	14.1
03	11.3	11	12.6	19	19.6
04	11.4	12	12.7	20	24.3
05	11.4	13	12.8	21	28.6
06	11.6	14	12.6	22	32.6
07	11.8	15	12.8	23	36.2
08	11.7	16	12.4	24	37.8



After Action Review



GEORGIA FORESTRY COMMISSION

Georgia Forestry Commission Headquarters

Dry Branch, Georgia

March 15, 2007

Agenda

- 10:00am – 10:15am Welcome and Introduction
- 10:15am – 10:40am Oconee National Forest- Burn Plan for 2/28
- 10:40am – 11:05am Piedmont National Wildlife Refuge- Burn Plan for 2/28
- 11:05am – 11:30am Dr. Jim Paul- Fire Weather Forecast
- 11:30am – 11:55am USFS Bill Jackson- Smoke Plume Modeling
- 11:55am – 12:20pm EPD Bill Murphy- Atlanta Air Quality
- 12:20pm – 12:45pm GFC Alan Dozier- Permit System for Outdoor Burning
- 12:45pm – 1:45pm Working Lunch Provided for Panel Members
- 1:45pm – 2:15pm Panel Presentation

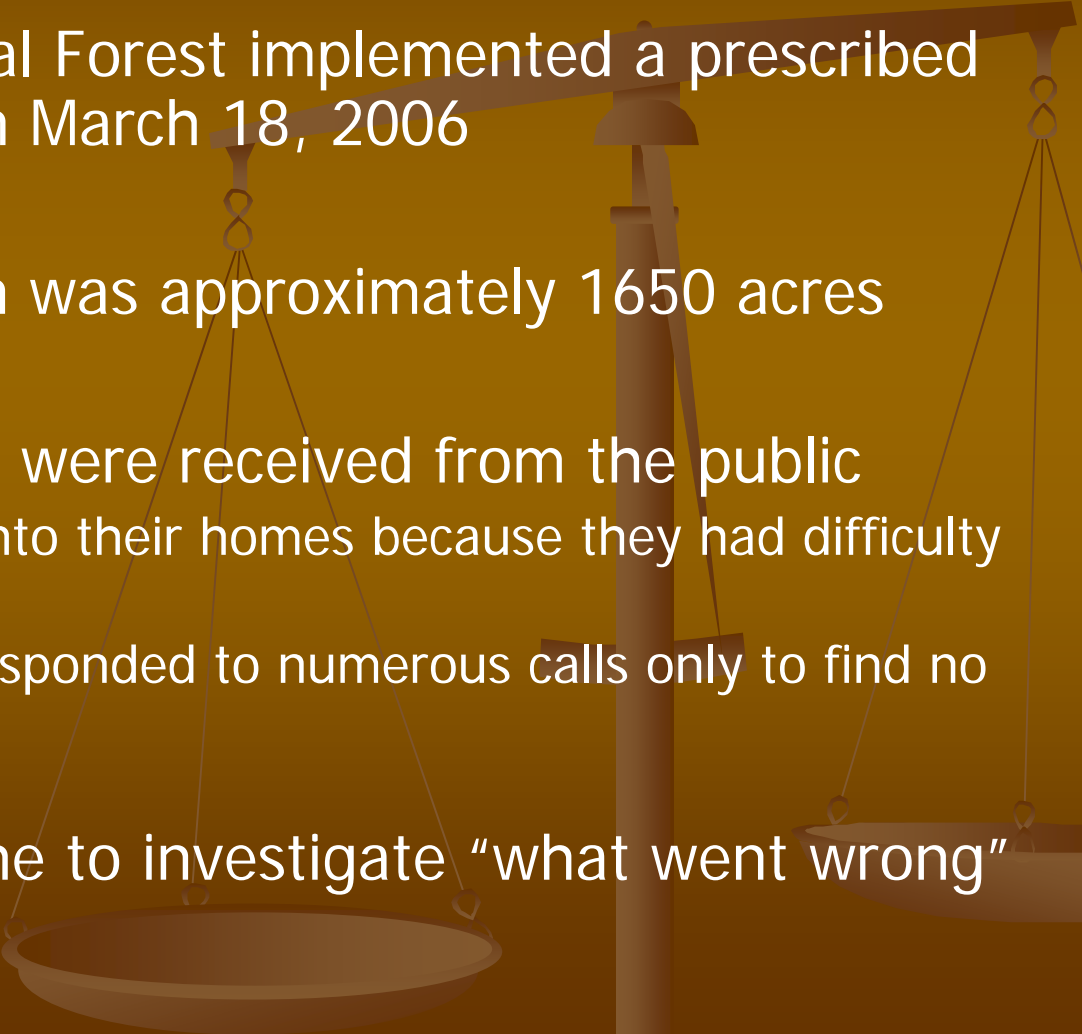
Adjournment

Panel Members:

Mark Melvin- Joseph E. Jones Ecological Center
Scott Tanner- Georgia Wildlife Heritage Council
Mike Harris- Georgia DNR Non-Game Wildlife Section
Glenn Dowling- Georgia Wildlife Federation
Jimmy Johnston- Georgia EPD
Bill Murphy- Georgia EPD
Rick Gillam- U.S. EPA

Moderator Eric Robinson- Carl Vinson Institute.

Similar Incident in Ashville, NC on 3/18/2006

- The Cherokee National Forest implemented a prescribed fire at Brush Creek on March 18, 2006
 - The Brush Creek burn was approximately 1650 acres
 - Numerous complaints were received from the public
 - Some people moved into their homes because they had difficulty breathing
 - Local fire personnel responded to numerous calls only to find no wildfire was present
 - Modeling analysis done to investigate “what went wrong”
- 

Modeling Evaluation of Asheville Incident

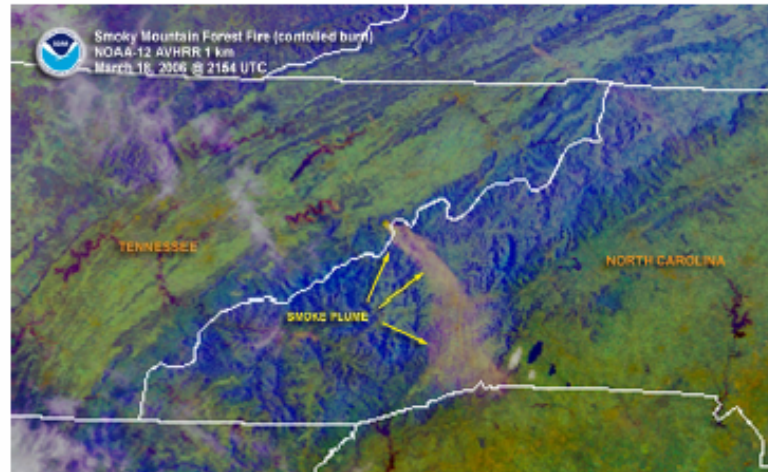
A Technical Evaluation of Smoke Dispersion from the Brush Creek Prescribed Fire and the Impacts on Asheville, North Carolina

William A Jackson
Air Resource Specialist
Cherokee National Forest

and

Gary L. Achtemeier
Scott Goodrick
Research Meteorologist
Southern Research Station

February 7, 2007



<http://199.128.173.141/smoke/March06/>

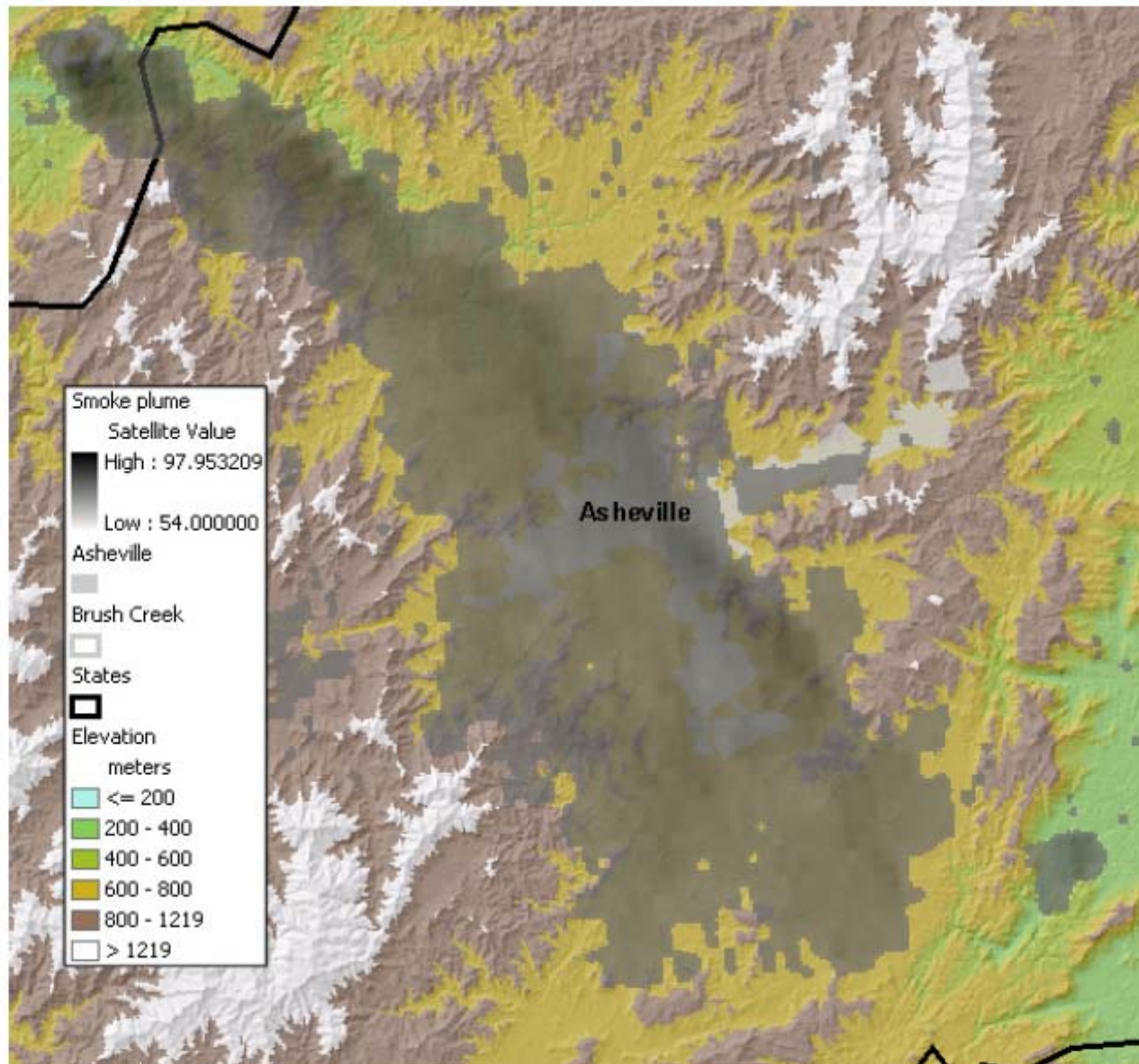


Figure 2. Smoke plume image processed from the Polar satellite (received from National Oceanic and Atmospheric Administration) showing the cloud of smoke from the Brush Creek prescribed fire at 5:15 PM.

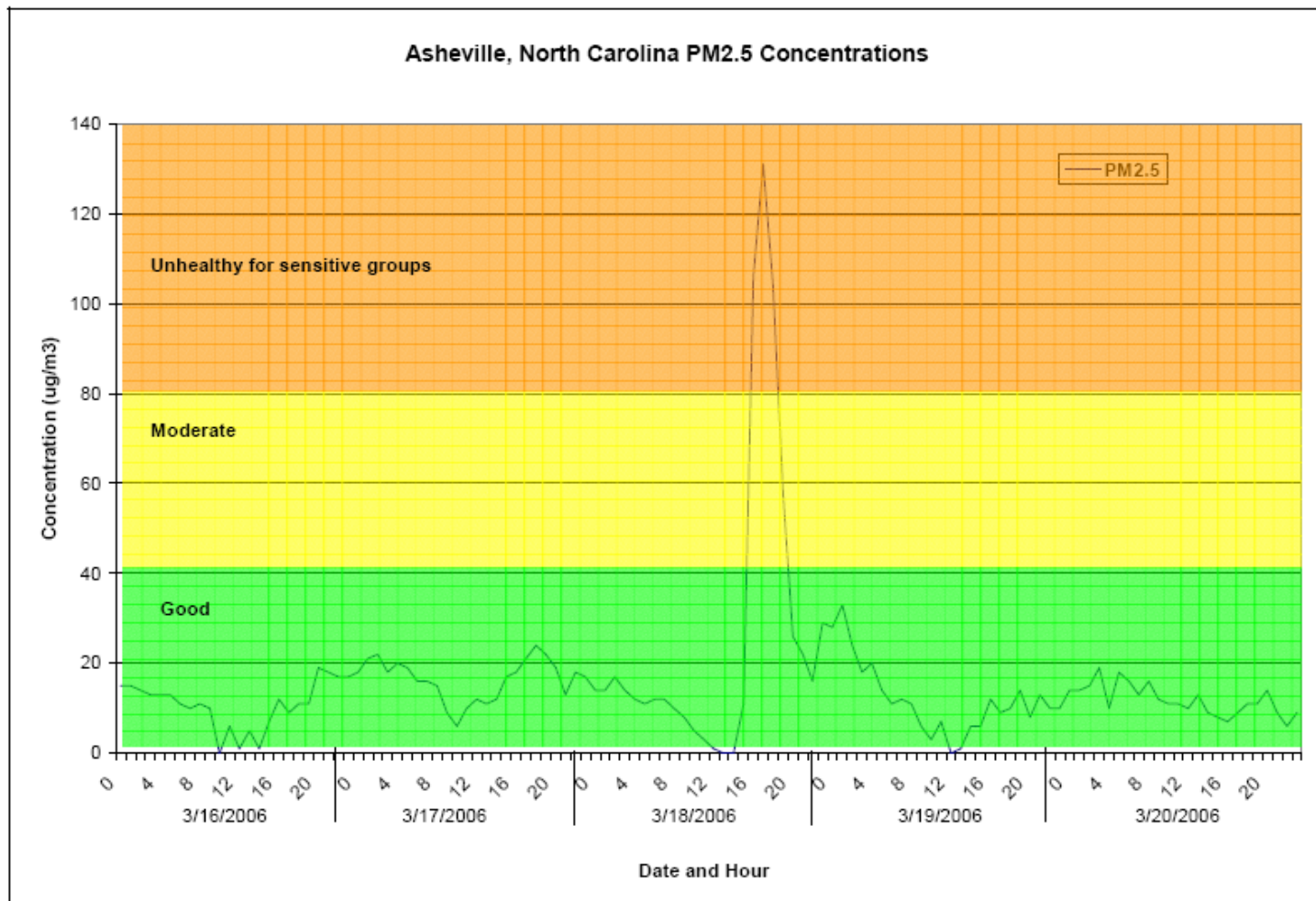
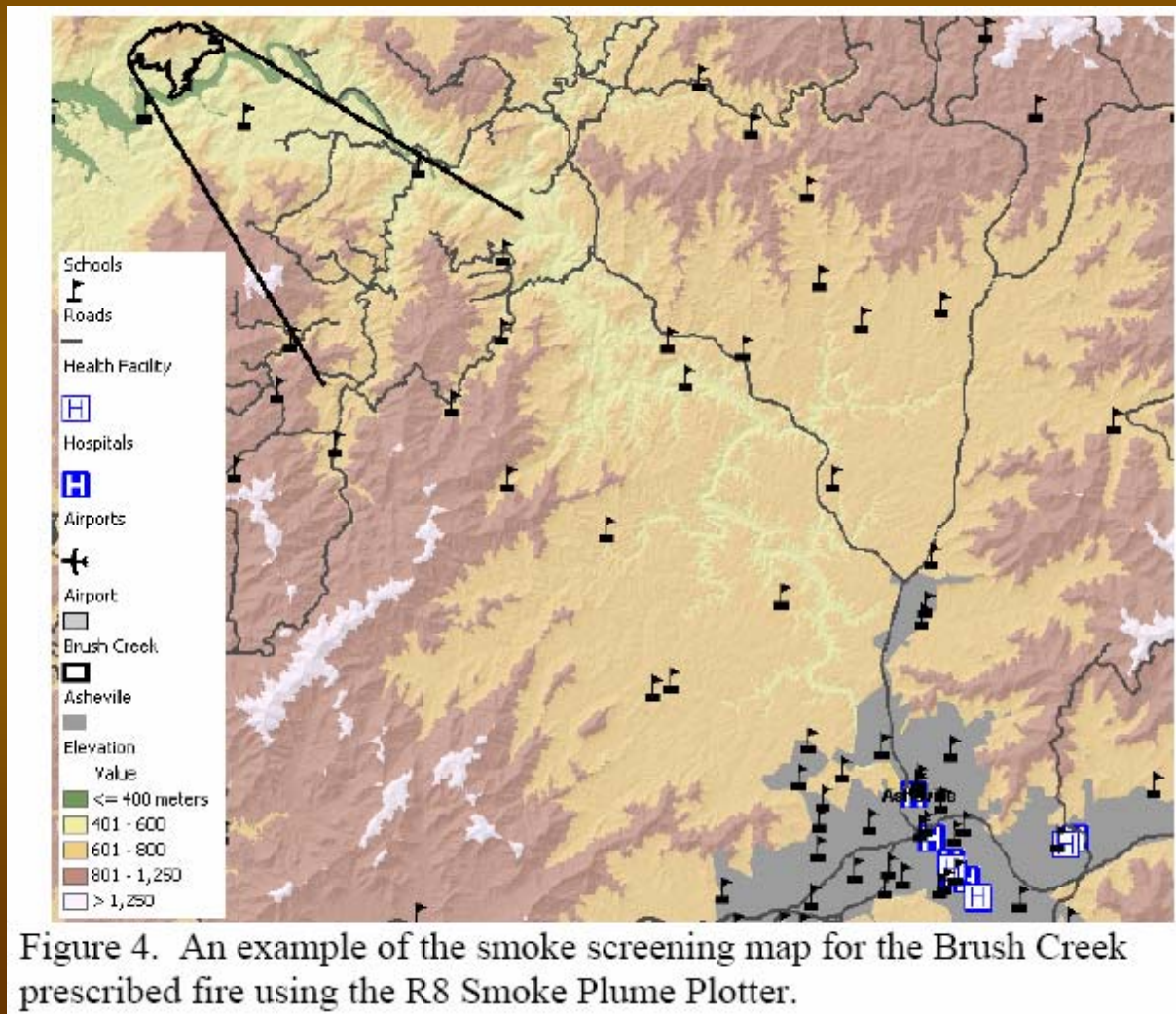
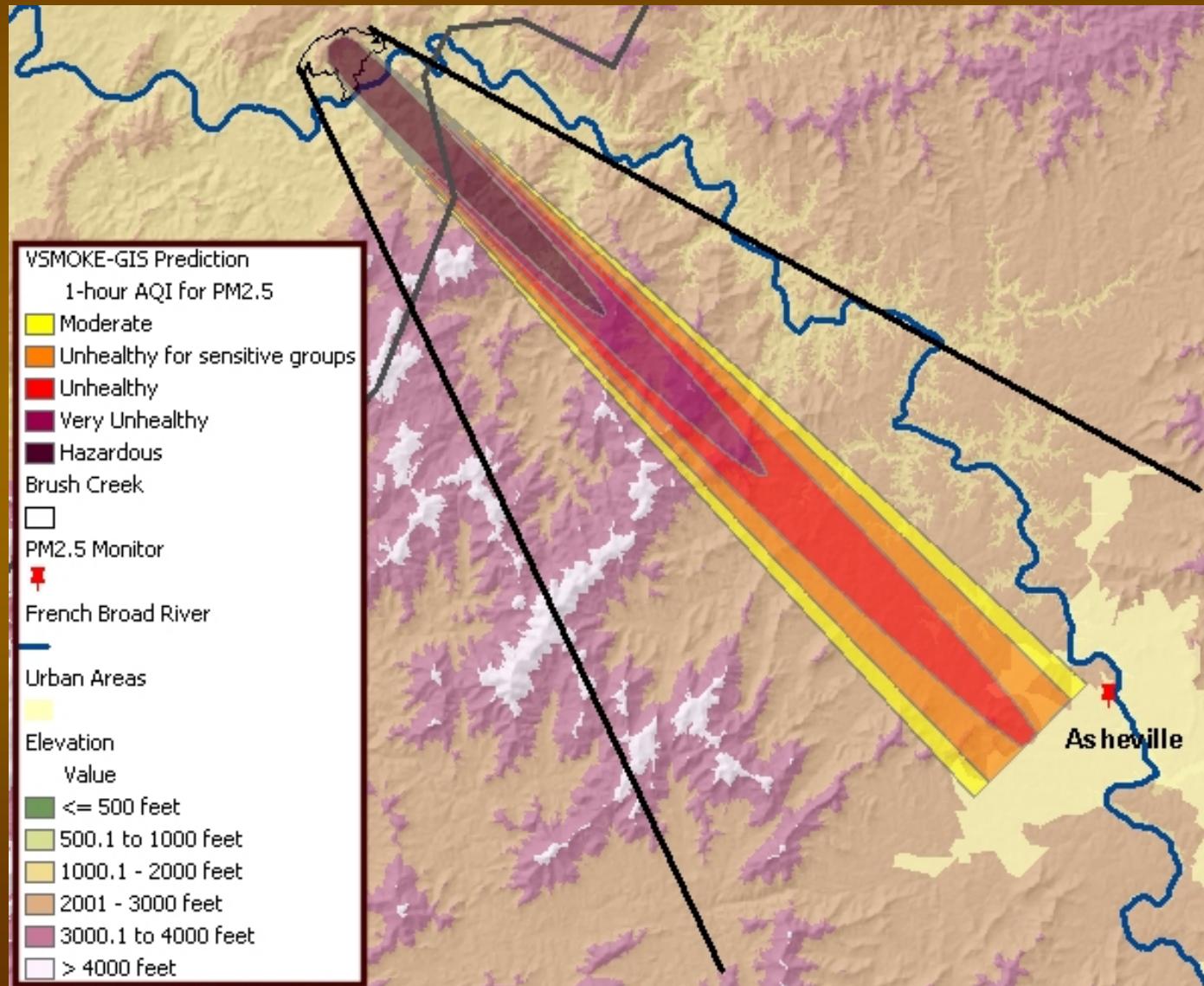


Figure 3. Fine particulate matter concentrations (micrograms per cubic meter) measured at the Buncombe County Board of Education monitoring site in Asheville, North Carolina between March 16 and March 20, 2006. Elevated fine particulate matter concentrations on March 18, 2006 were a result of emissions from the Brush Creek prescribed fire conducted in Cocke County, Tennessee.

Burn Plan Did Not Include Dispersion Modeling



VSMOKE-GIS Model



BlueSky Modeling Framework

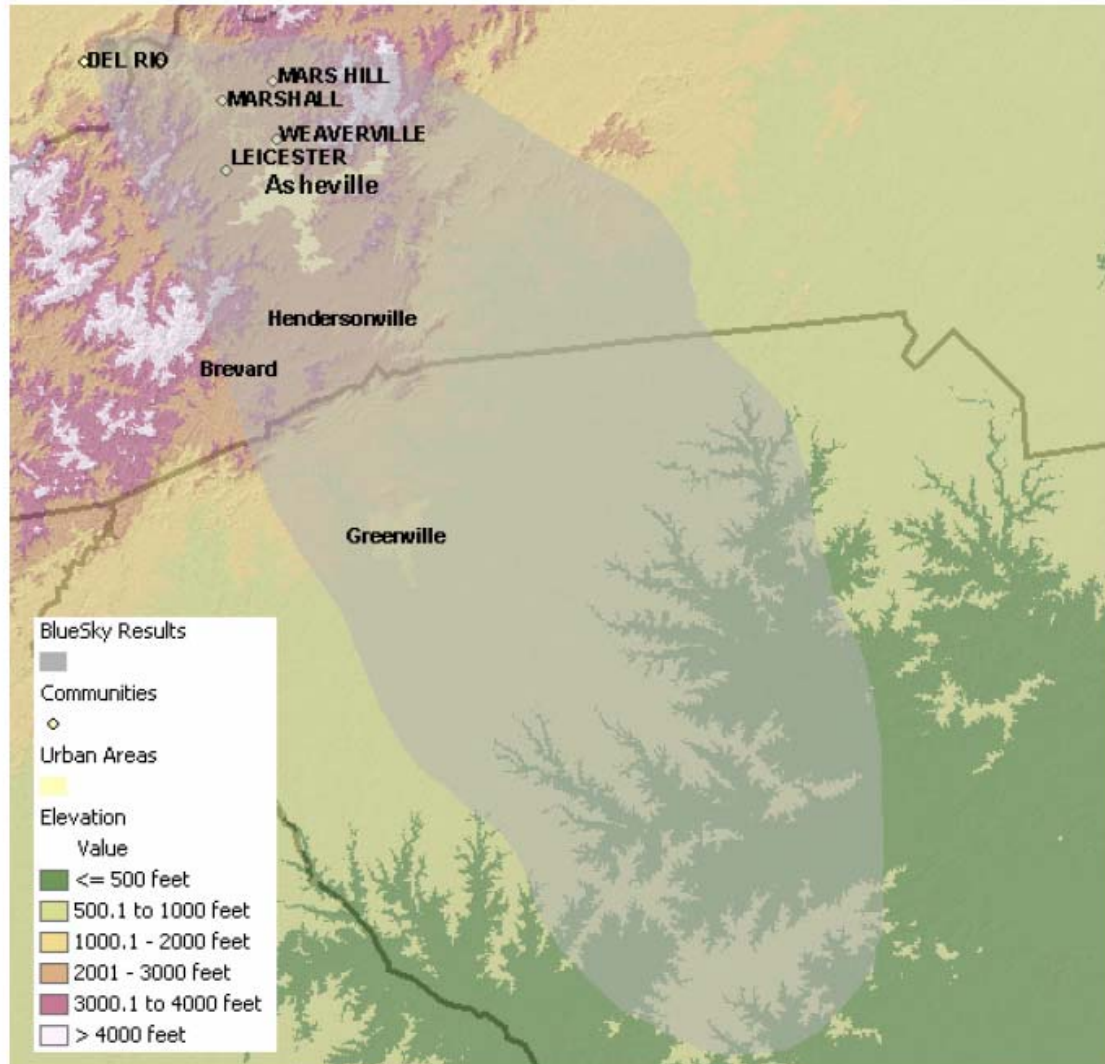


Figure 11. Results from the BlueSky Modeling Framework showing the location of the Brush Creek plume at 10:00 PM.

Daysmoke Model

Three Plume Cores - Hot

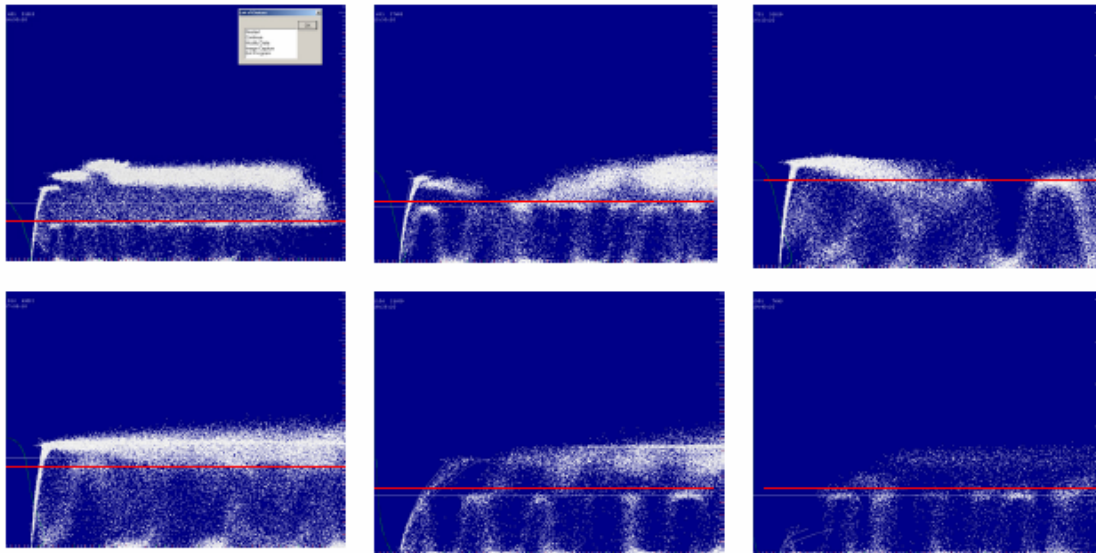
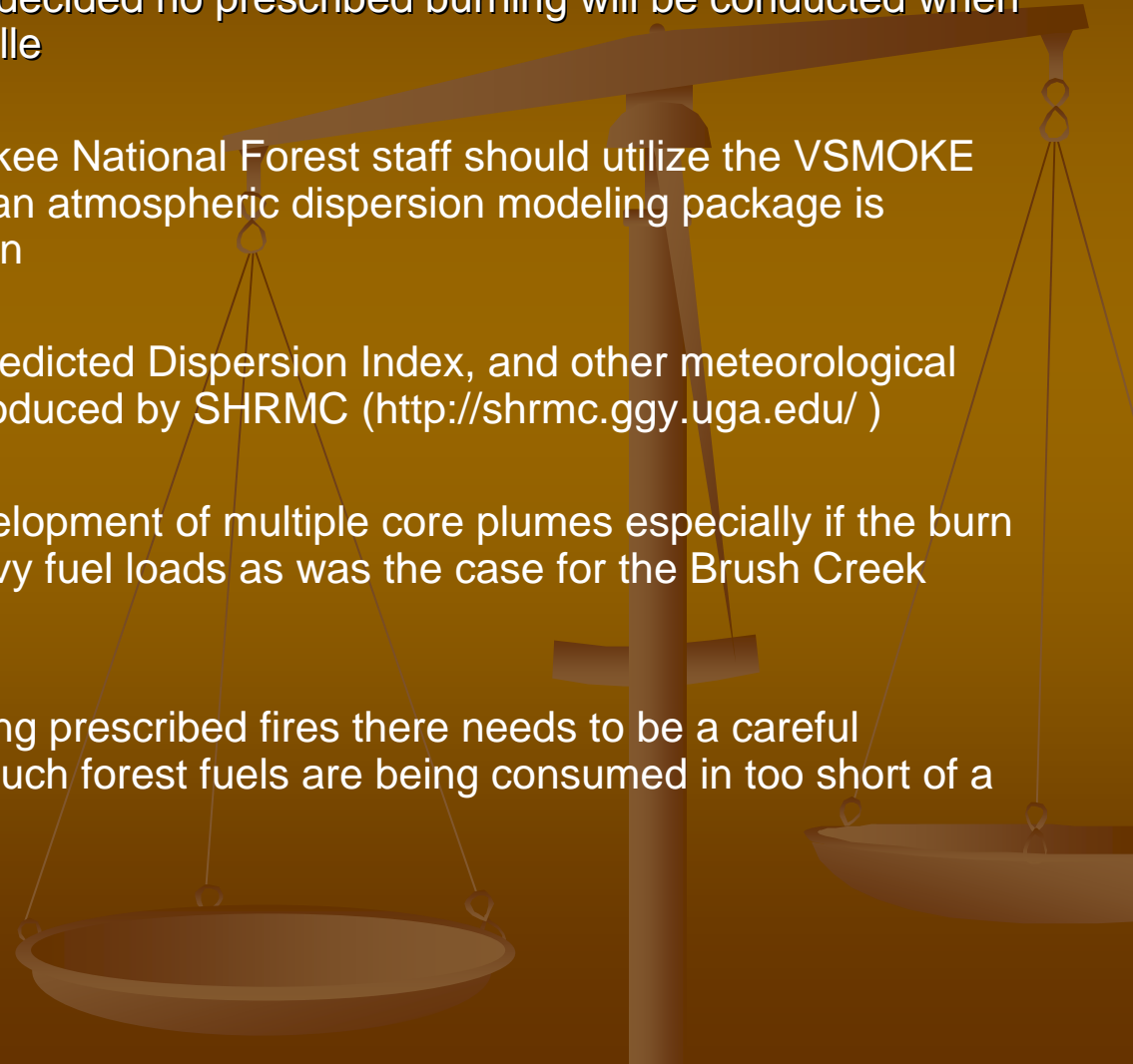


Figure 16. Six panels read from left to right showing the history of a three-core plume simulated by Daysmoke for the Brush Creek fire. Times are 2:30, 3:30, 4:10, 5:05, 6:25, and 7:40 PM EST. The red lines identify top of the mixing layer.

Findings and Recommendations

- Cherokee National Forest staff decided no prescribed burning will be conducted when winds are blowing toward Asheville
- Report recommends the Cherokee National Forest staff should utilize the VSMOKE and VSMOKE-GIS model until an atmospheric dispersion modeling package is available for mountainous terrain
- Forest staff should utilize the predicted Dispersion Index, and other meteorological results from the MM5 model produced by SHRMC (<http://shrmc.ggy.uga.edu/>)
- Plan burns to minimize the development of multiple core plumes especially if the burn involves the combustion of heavy fuel loads as was the case for the Brush Creek burn
- When planning and implementing prescribed fires there needs to be a careful evaluation to determine if too much forest fuels are being consumed in too short of a time period



Questions?

