Prescribed Fires and Nutrient Base Cation Supplies

A Southern Perspective

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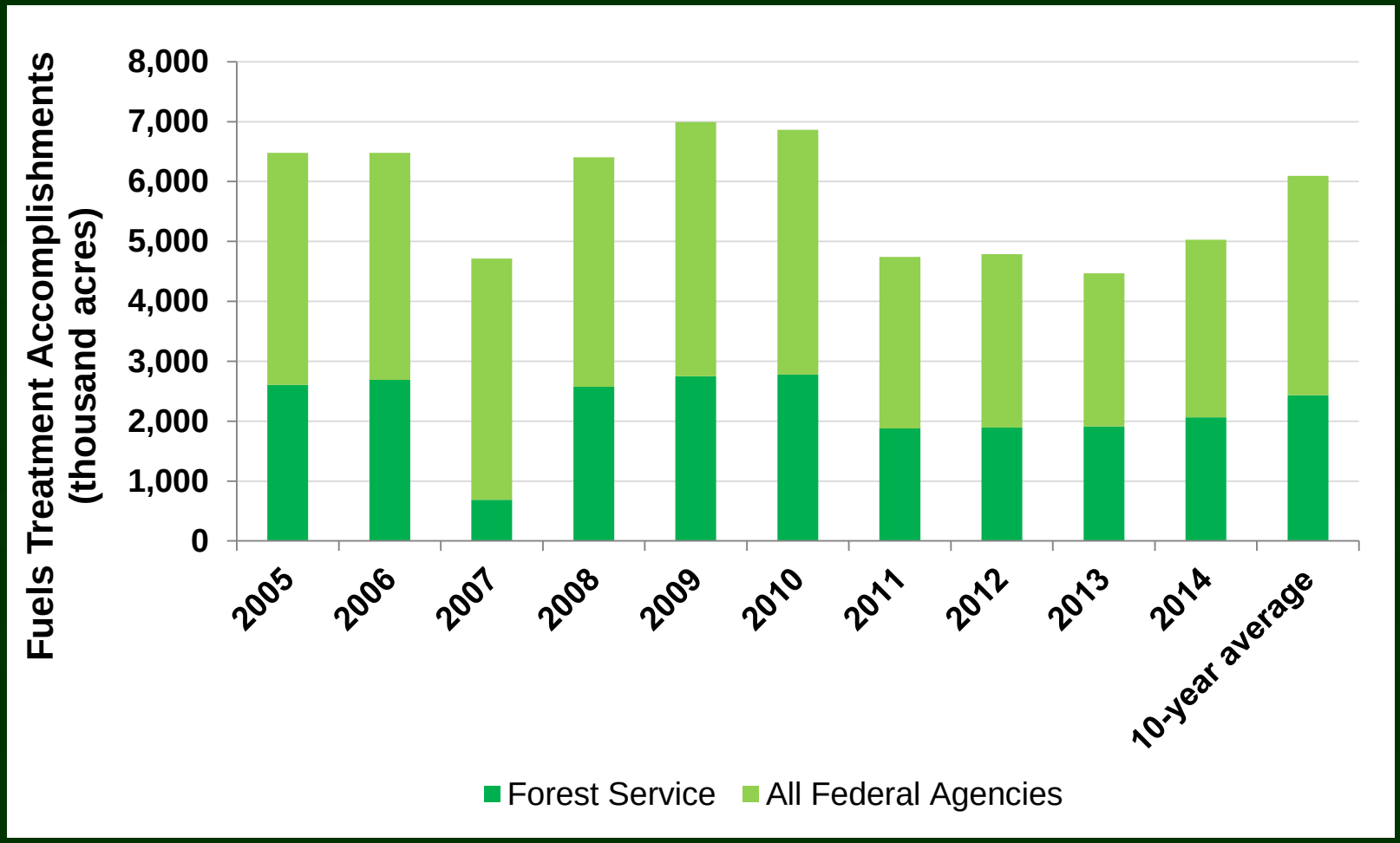
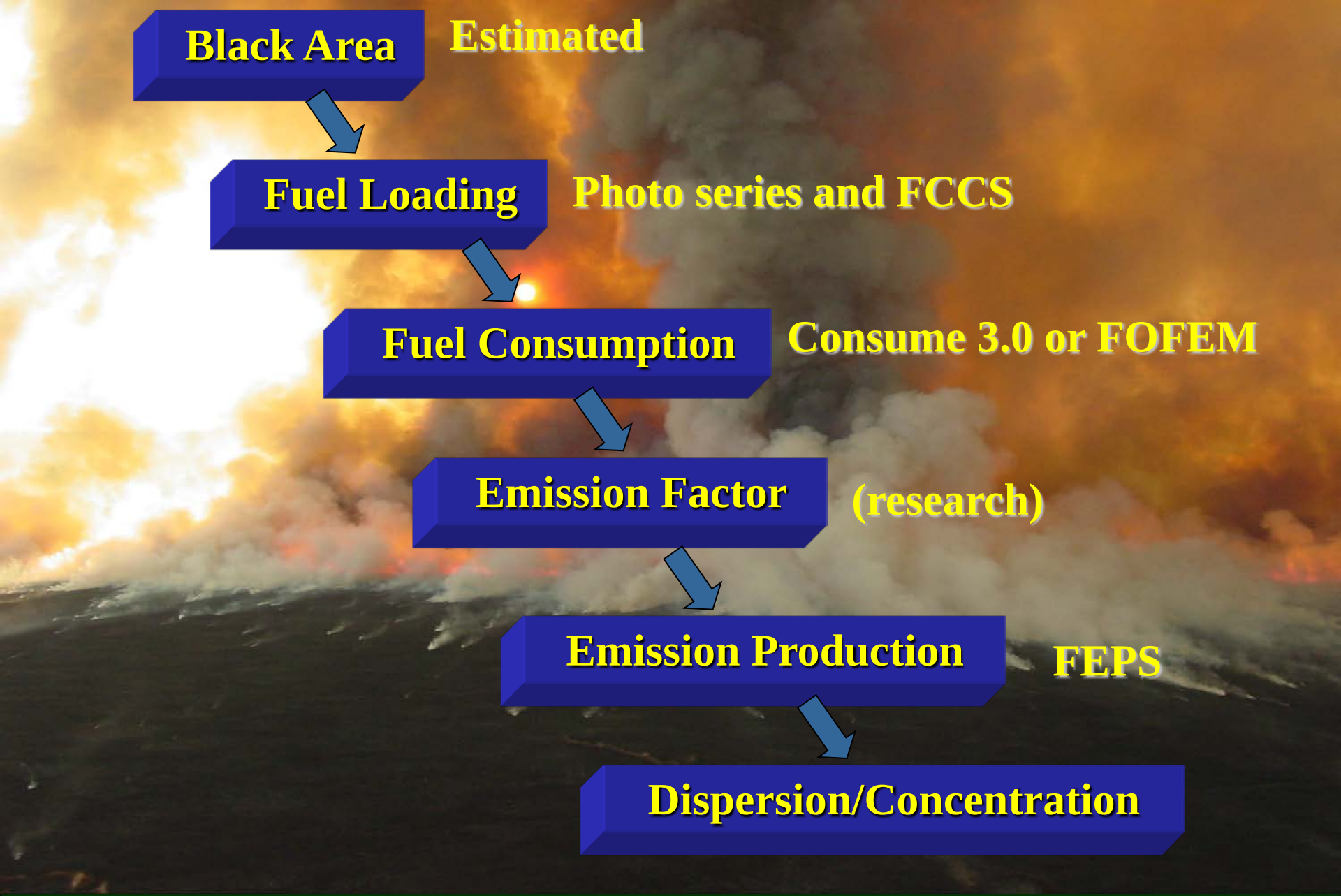
Prescribed Fires



Southern Region treats about 1.1 million acres each year


Black Area
Estimated
Fuel Loading
Photo series and FCCS
Fuel Consumption
Consume 3.0 or FOFEM
Emission Factor
(research)
Emission Production
FEPS
Dispersion/Concentration

Air Quality Index (AQI)

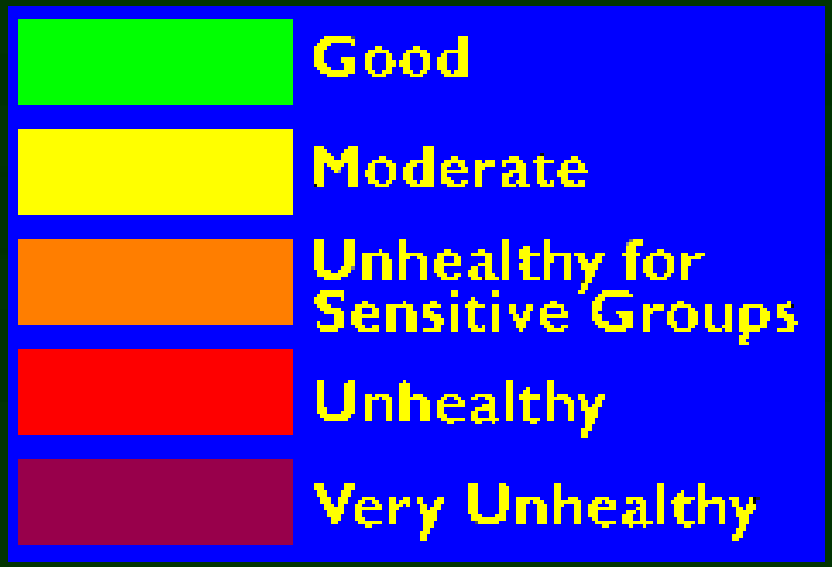
Green: No health warning

Yellow: Unusually sensitive people should consider reducing prolonged or heavy exertion

Orange: People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.

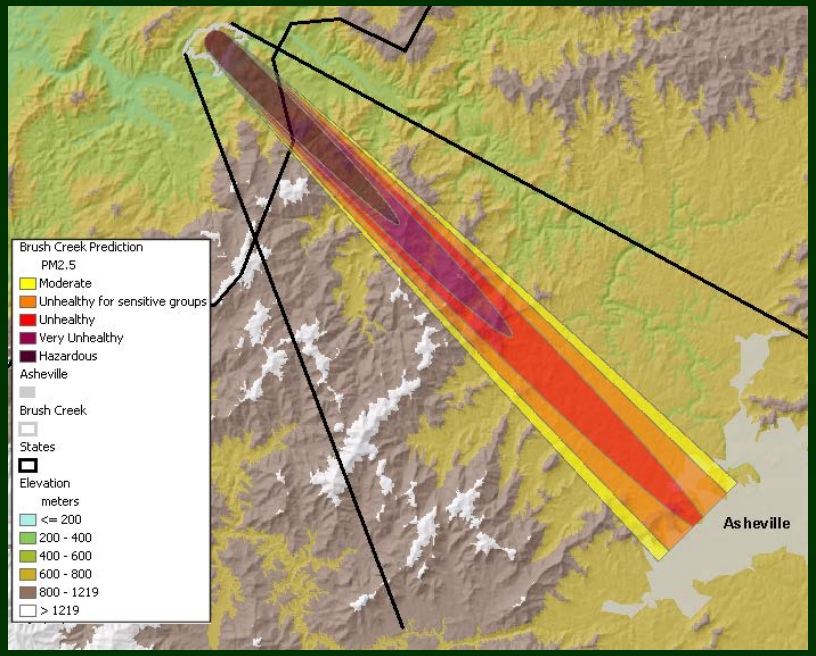
Red: People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.

Purple: People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.



Planning - VSMOKE-GIS

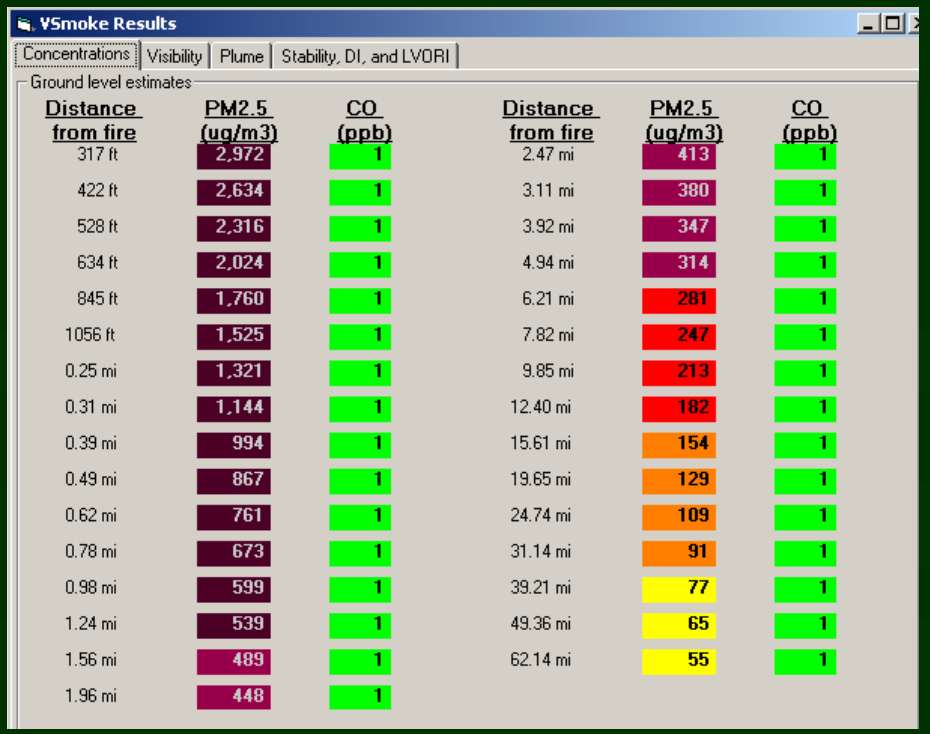
- A simple screening model to show predicted downwind concentrations of particulate matter.
- For use in flat to gently rolling terrain, and steady wind conditions.
- Use with caution in complex terrain.



Concentrations are color coded using the Air Quality Index (AQI) 1-hour values developed by California Air Resources Board.

Planning - VSMOKE

- Predicts particulate matter, carbon monoxide, and visibility estimates at 31 logarithmically spaced distances.
- Calculates Atmospheric Dispersion Index (ADI) and LVORI.
- Produces a draft report.

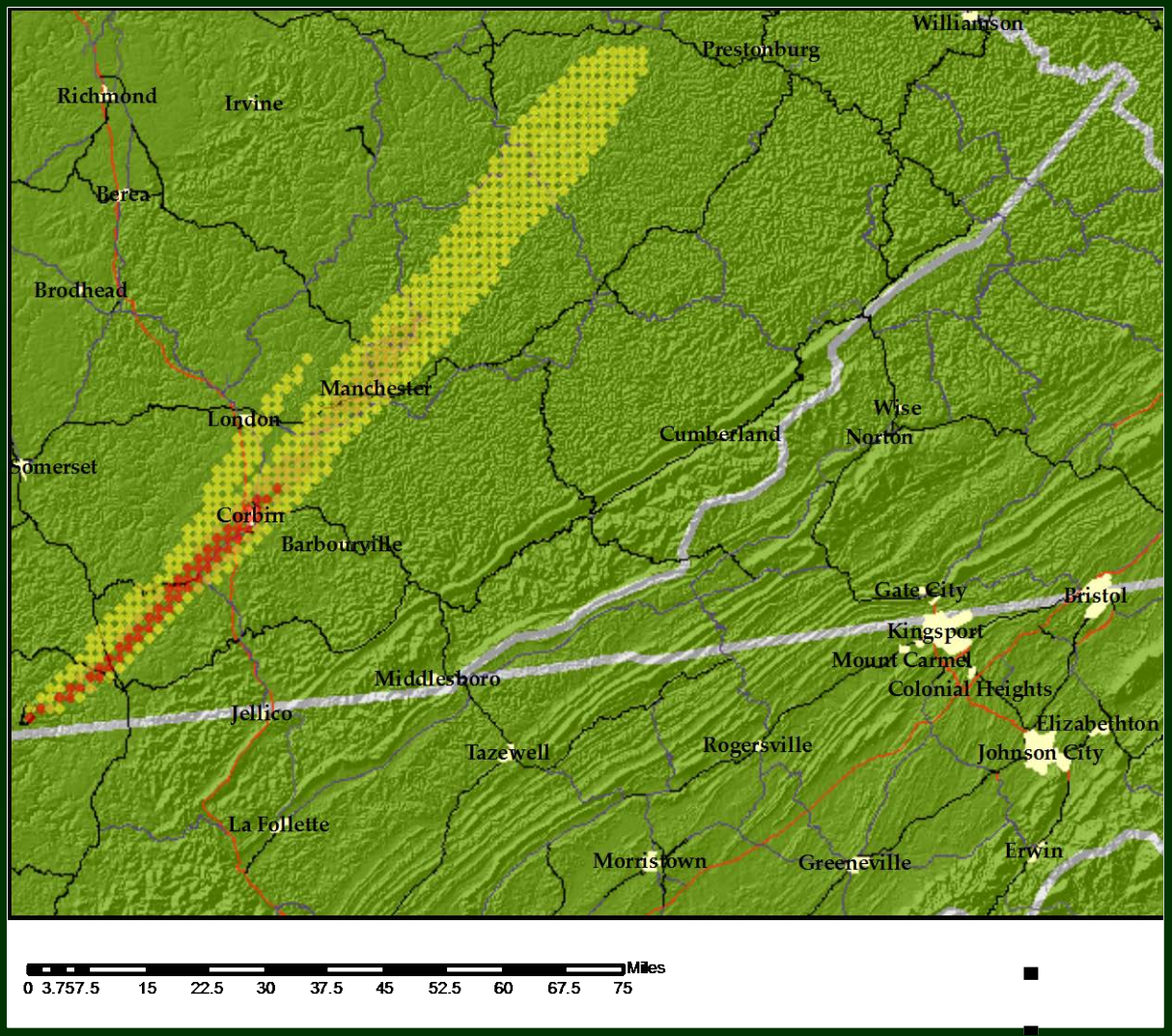


Distance from fire	PM2.5 (ug/m3)	CO (ppb)	Distance from fire	PM2.5 (ug/m3)	CO (ppb)
317 ft	2,972	1	2.47 mi	413	1
422 ft	2,634	1	3.11 mi	380	1
528 ft	2,316	1	3.92 mi	347	1
634 ft	2,024	1	4.94 mi	314	1
845 ft	1,760	1	6.21 mi	281	1
1056 ft	1,525	1	7.82 mi	247	1
0.25 mi	1,321	1	9.85 mi	213	1
0.31 mi	1,144	1	12.40 mi	182	1
0.39 mi	994	1	15.61 mi	154	1
0.49 mi	867	1	19.65 mi	129	1
0.62 mi	761	1	24.74 mi	109	1
0.78 mi	673	1	31.14 mi	91	1
0.98 mi	599	1	39.21 mi	77	1
1.24 mi	539	1	49.36 mi	65	1
1.56 mi	489	1	62.14 mi	55	1
1.96 mi	448	1			

Concentrations are color coded using the Air Quality Index (AQI) 1-hour values developed by California Air Resources Board.

Planning – CalPuff

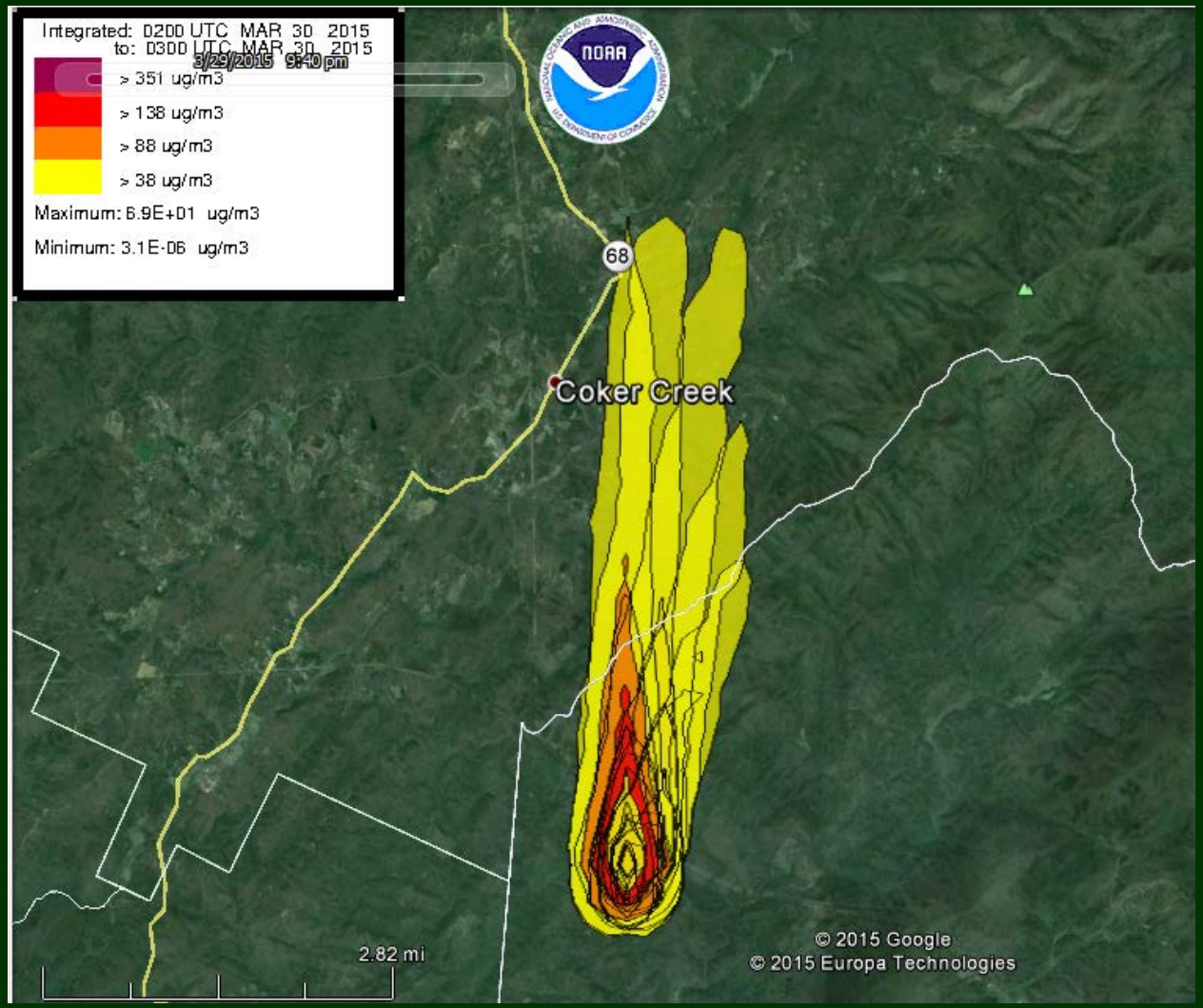
Maximum PM2.5 At Each Receptor



Air Resource Management

Operational – PC HYSPLIT

Hourly Output

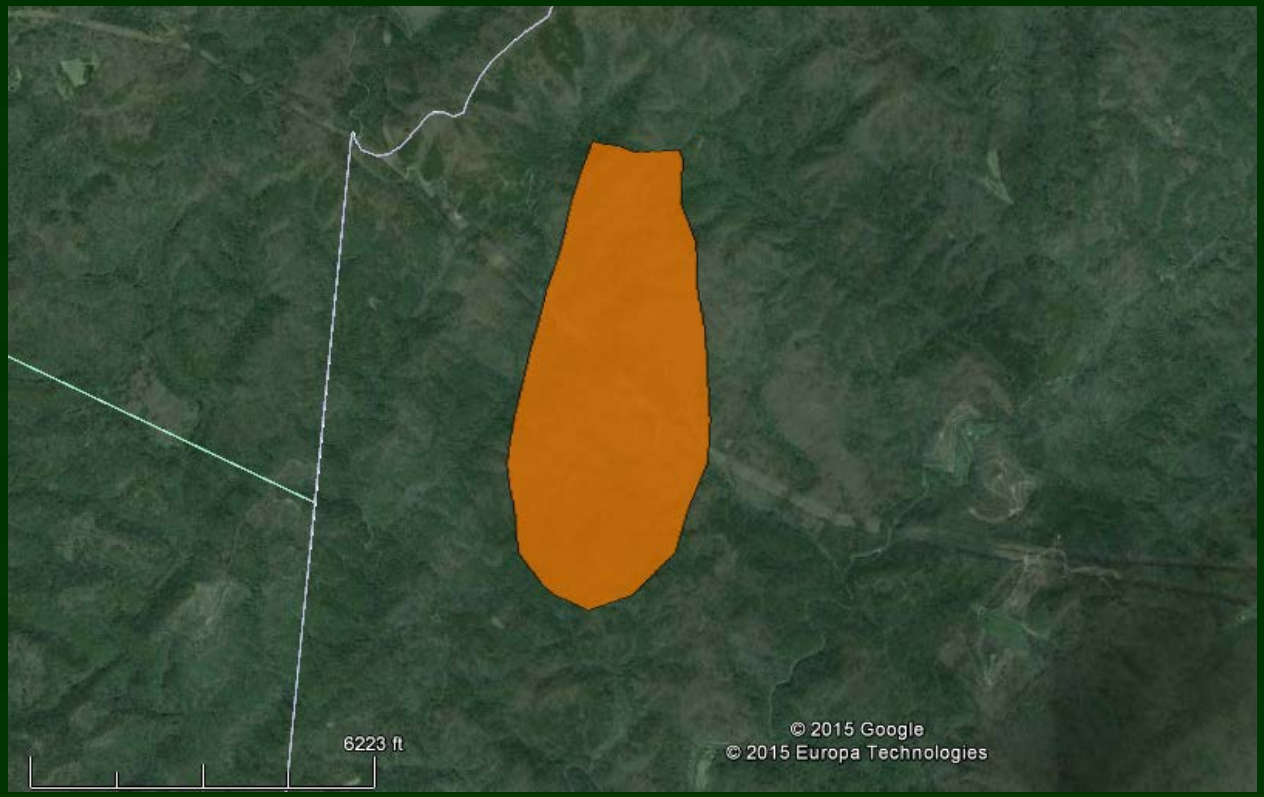


Air Resource Management

Operational – PC HYSPLIT

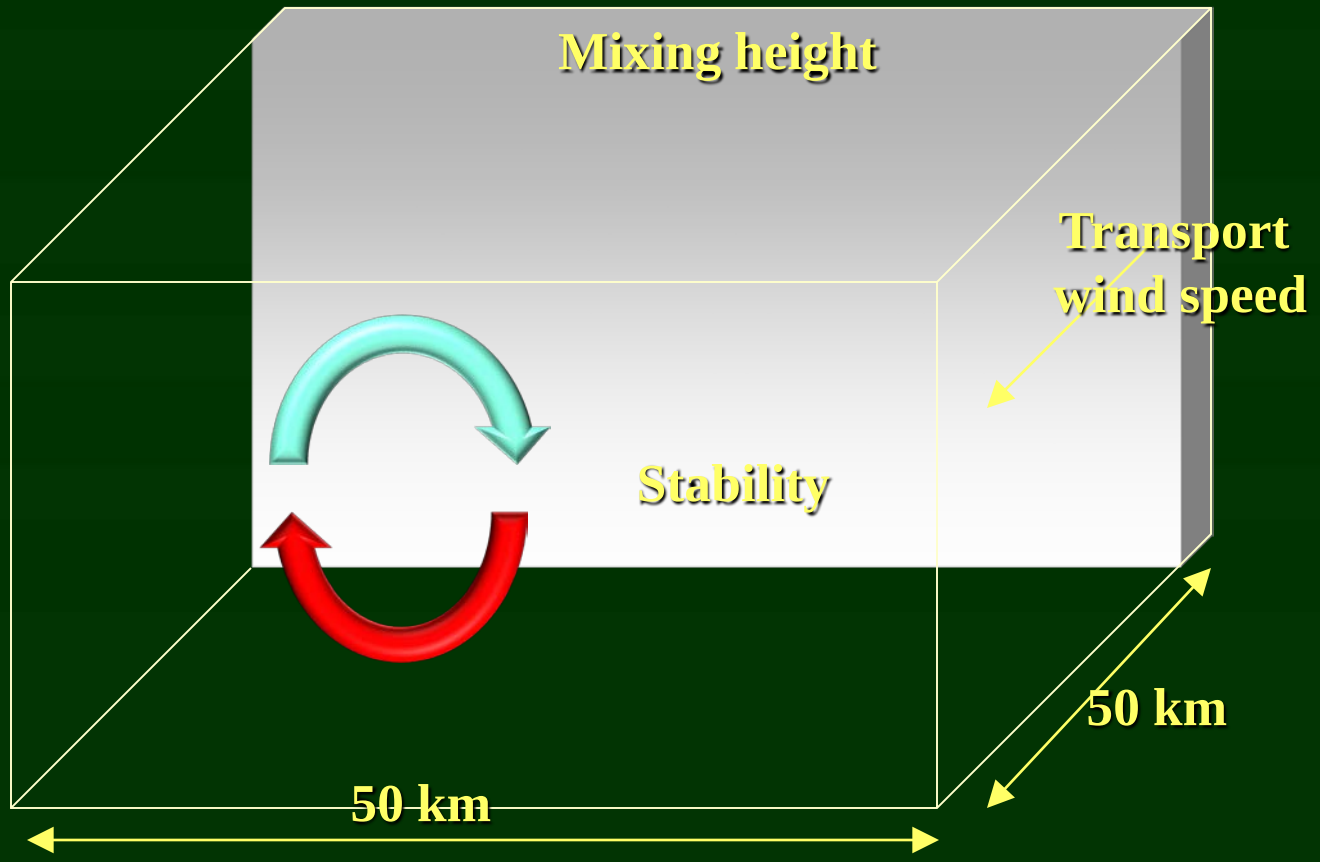
24-Hour Average Output

35 µq/m³



Atmospheric Dispersion Index (ADI)

An estimate of the capacity of the atmosphere to disperse smoke (DI >=30).



50 km = 31 miles

Air Resource Management

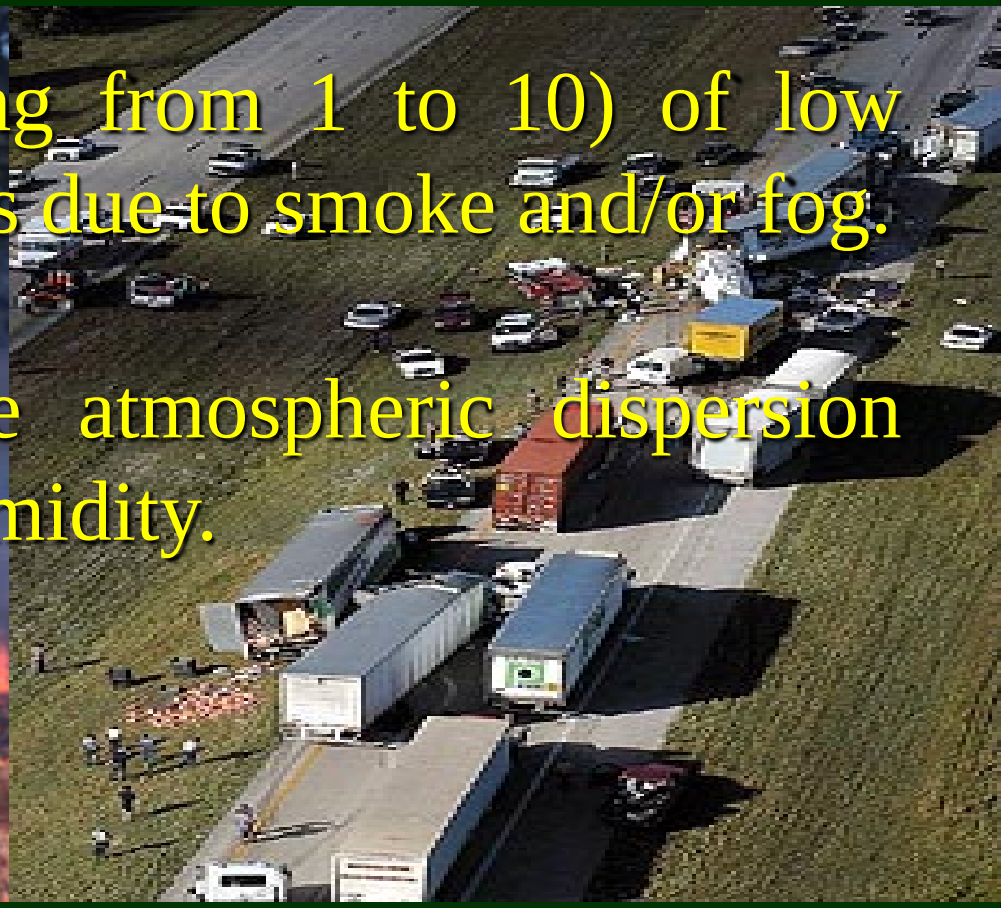
Lavdas Atmospheric Dispersion Index (ADI)

ADI	Interpretation
1-6	Very poor dispersion
7-12	Poor dispersion
13-20	Generally poor dispersion
21-40	Fair dispersion
41-60	Generally good dispersion
61-100	Good dispersion
>100	Very good dispersion

Generally burning is not allowed

Table 9.2 from Smoke Management Guidebook

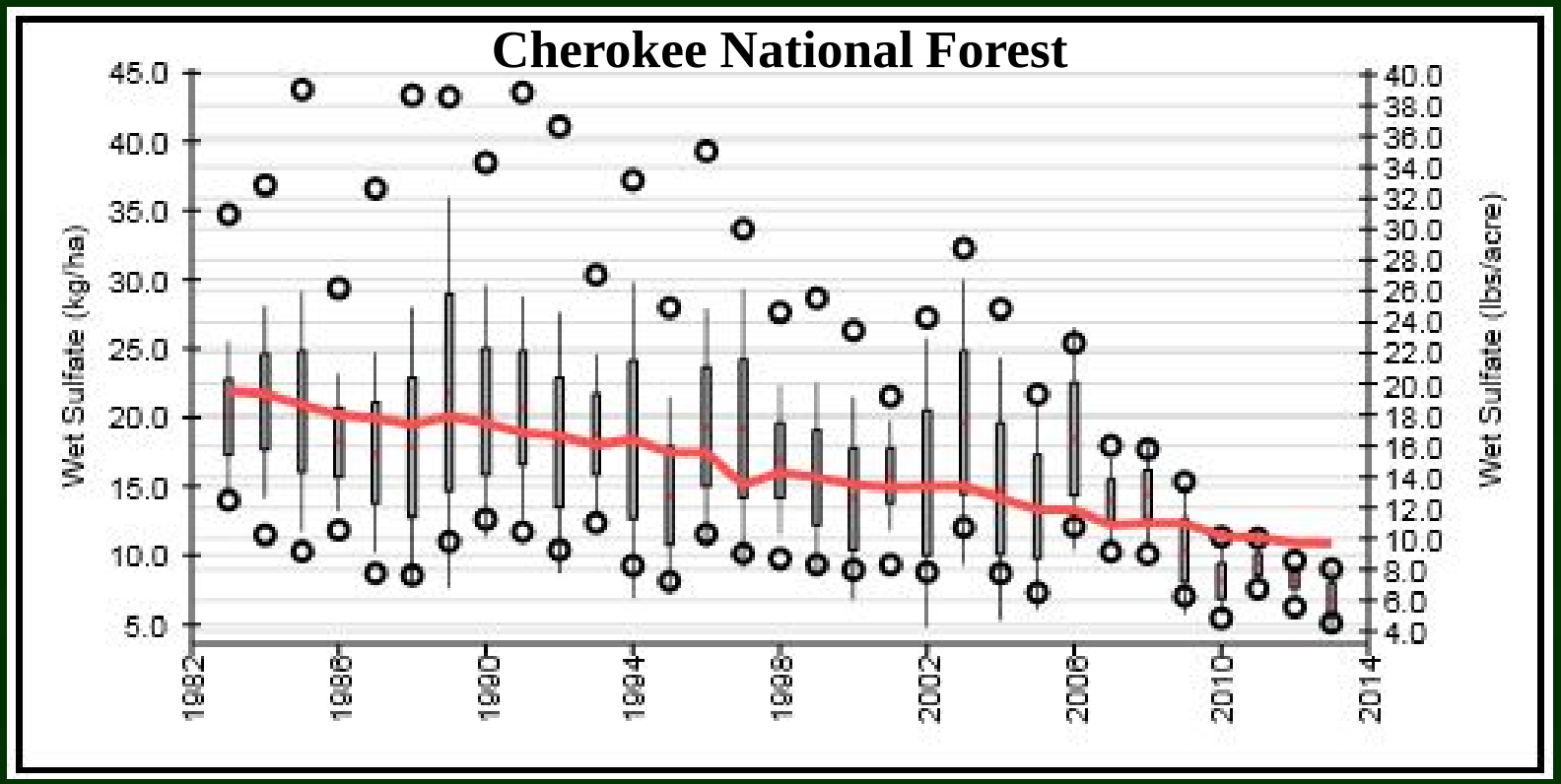
Low Visibility Occurrence Risk Index (LVORI)



A risk index (ranging from 1 to 10) of low visibility on highways due to smoke and/or fog.

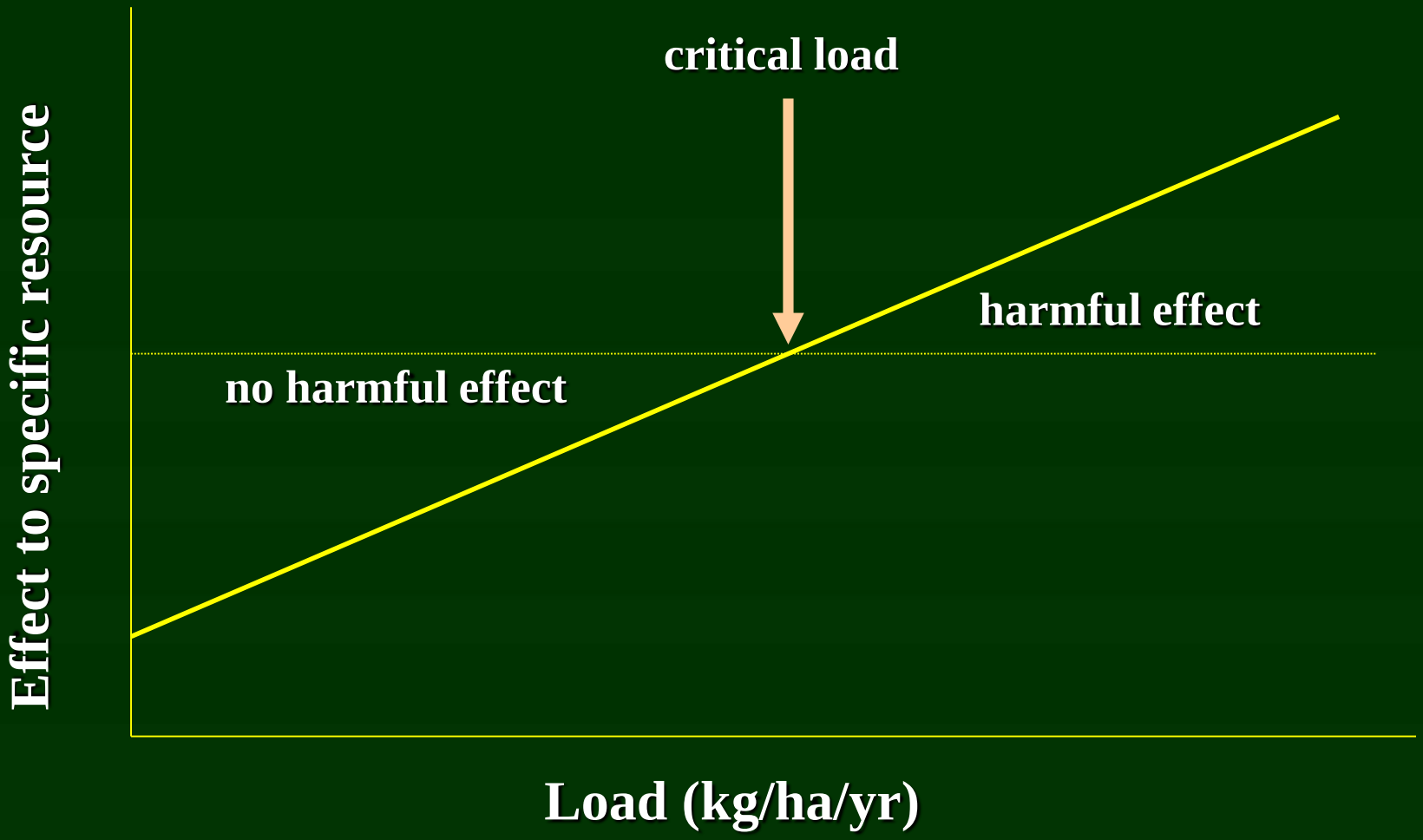
Input values include atmospheric dispersion index and relative humidity.

Do Our Watersheds Have Enough Base Cations?

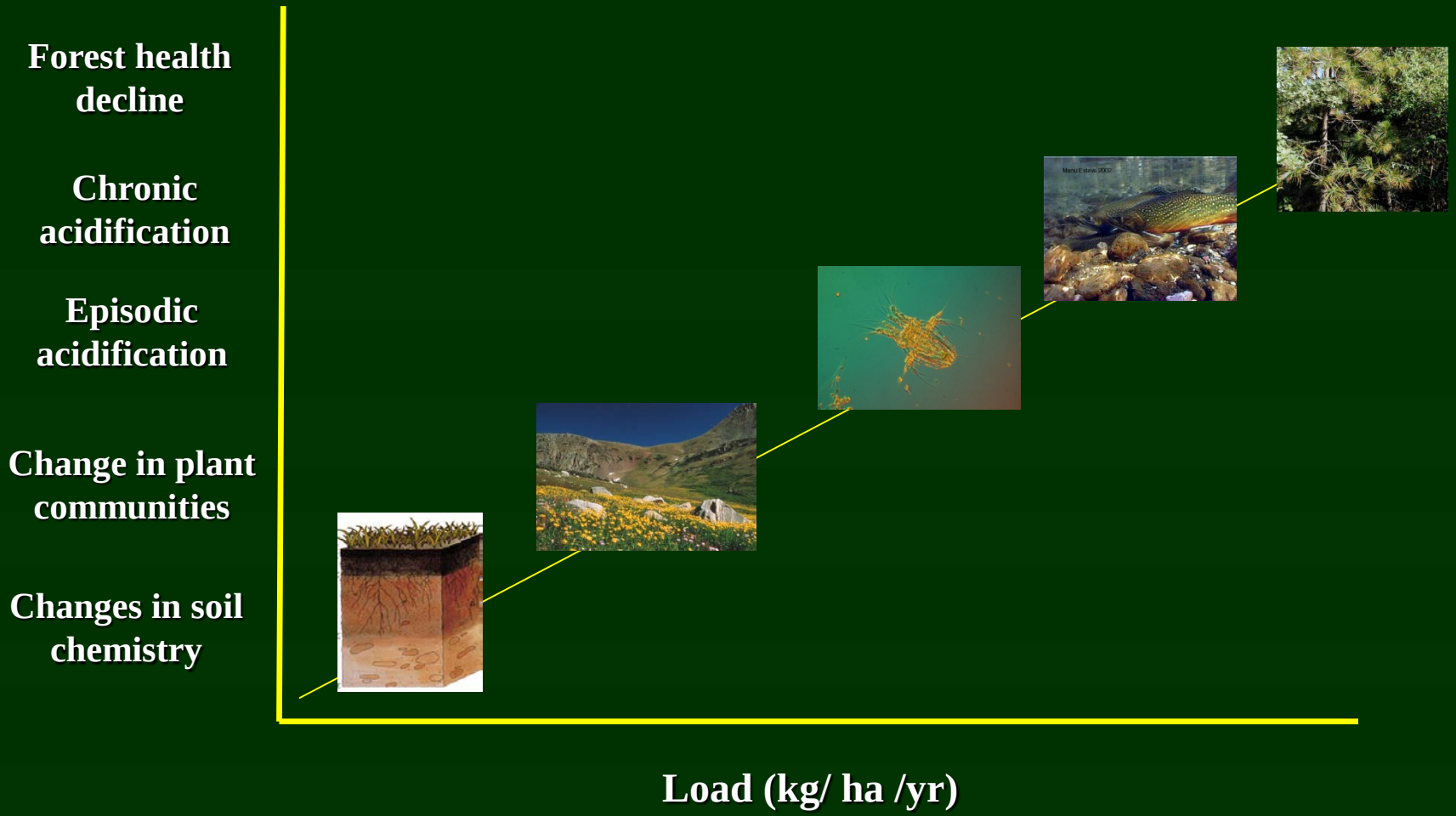


How much more does it need to decrease?

Critical Load Development



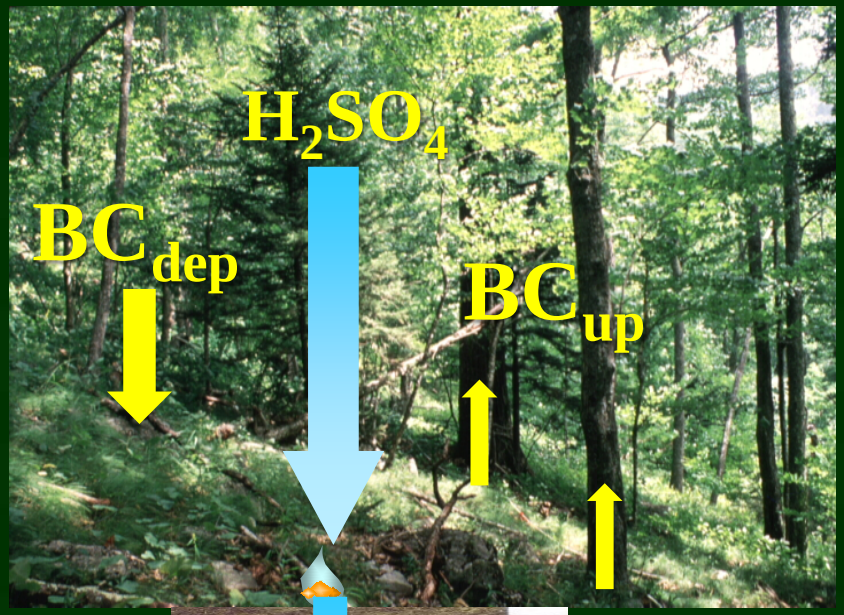
Critical Load Development



Critical loads are defined for specific indicators and effects.

Are There Enough Base Cations?

Base Cations (BC) = calcium + magnesium + potassium + sodium

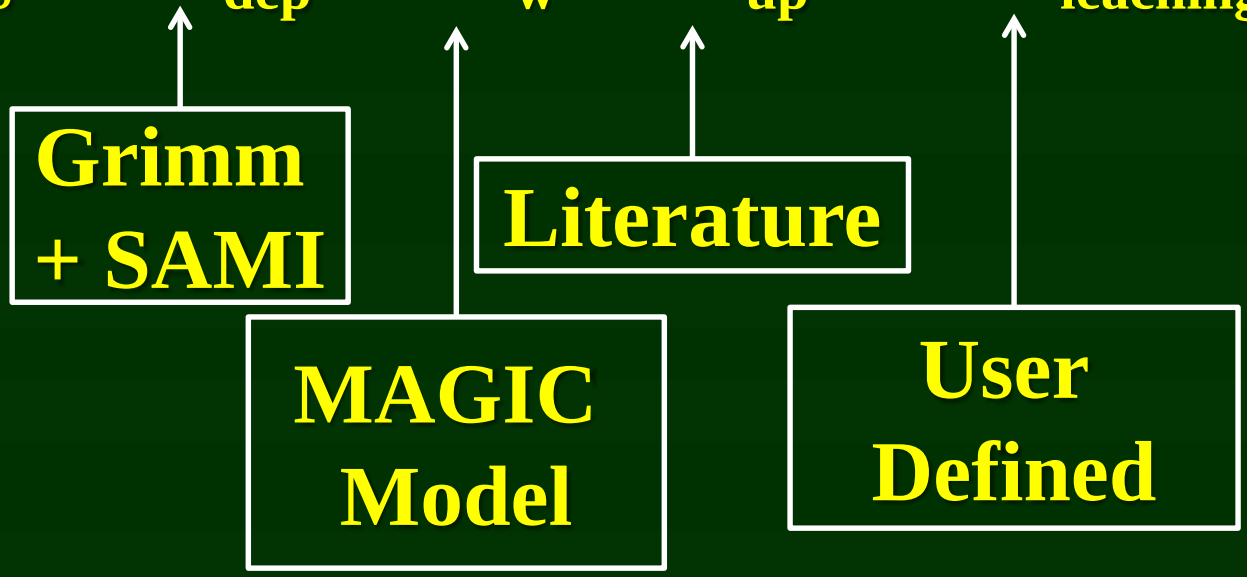


Timber harvesting does remove base cations.

Air Resource Management

Steady State Critical Load

$$CL_S = BC_{dep} + BC_w - BC_{up} - ANC_{leaching}$$



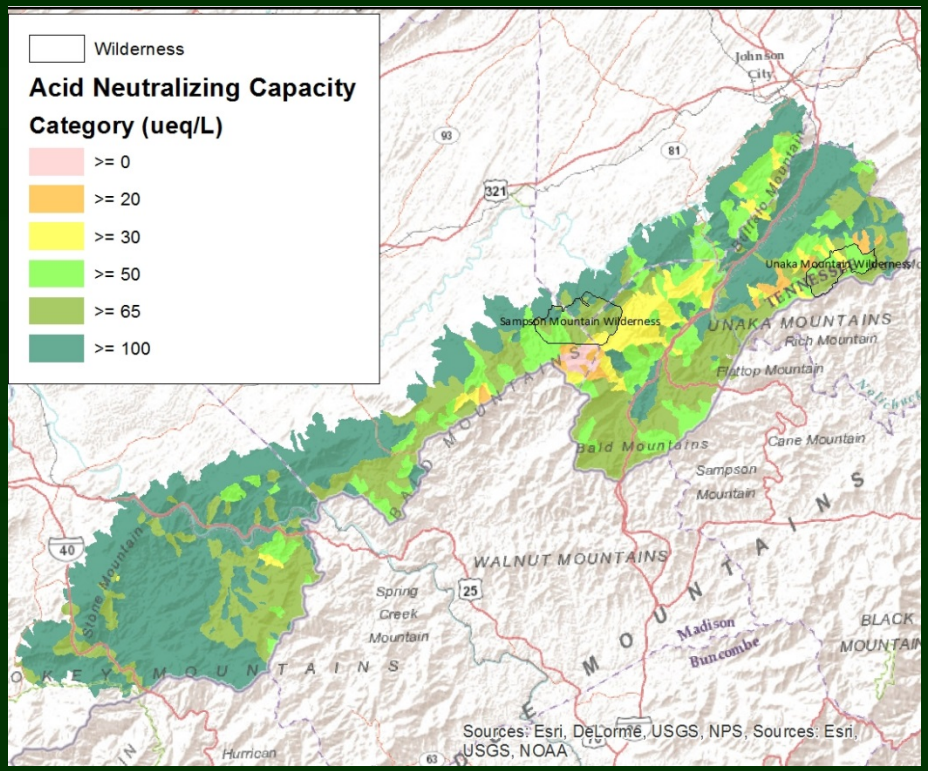
BC_{up} is set to zero if there is no timber harvesting.

Choosing the $ANC_{leaching}$

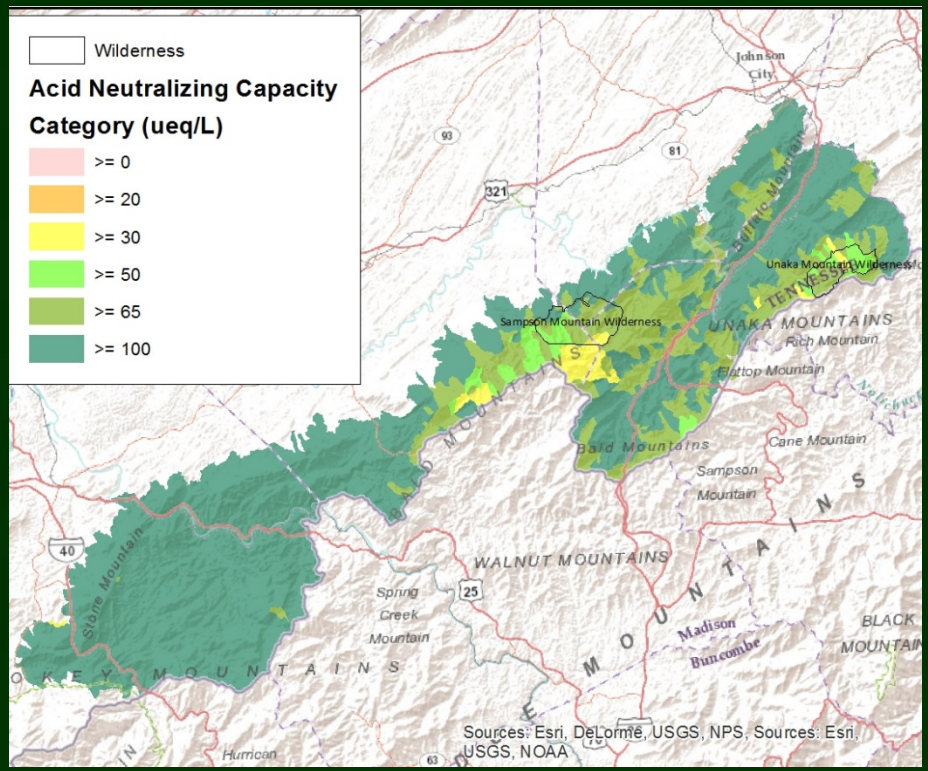
ANC Category (ueq/L)	Response
>= 100	Water chemistry should not limit the survival, reproduction, or brook trout and other aquatic species.
>= 65	Median value modelled in 1860 for 65 streams. Above 50 ueq/L expect reproducing brook trout populations where habitat is
>= 50	Below 50 ueq/L the catchment is extremely sensitive to brook trout response is variable. May be 50% less aquatic comparison to 100 ueq/L.
>= 30	Lowest value modelled for 1860. Number of aquatic species continues decline.
>= 20	Sub-lethal and/or lethal effects on brook trout and other aquatic species are possible. Below this value a sharp decline in acid aquatic insects reported in western Virginia.
>= 0	Lethal effects to brook trout are probable. The stream is likely to support only acid tolerant species, such as water striders.

2009 – 2011 Average Total Sulfur Deposition Continues

Harvest Non-Wilderness Areas



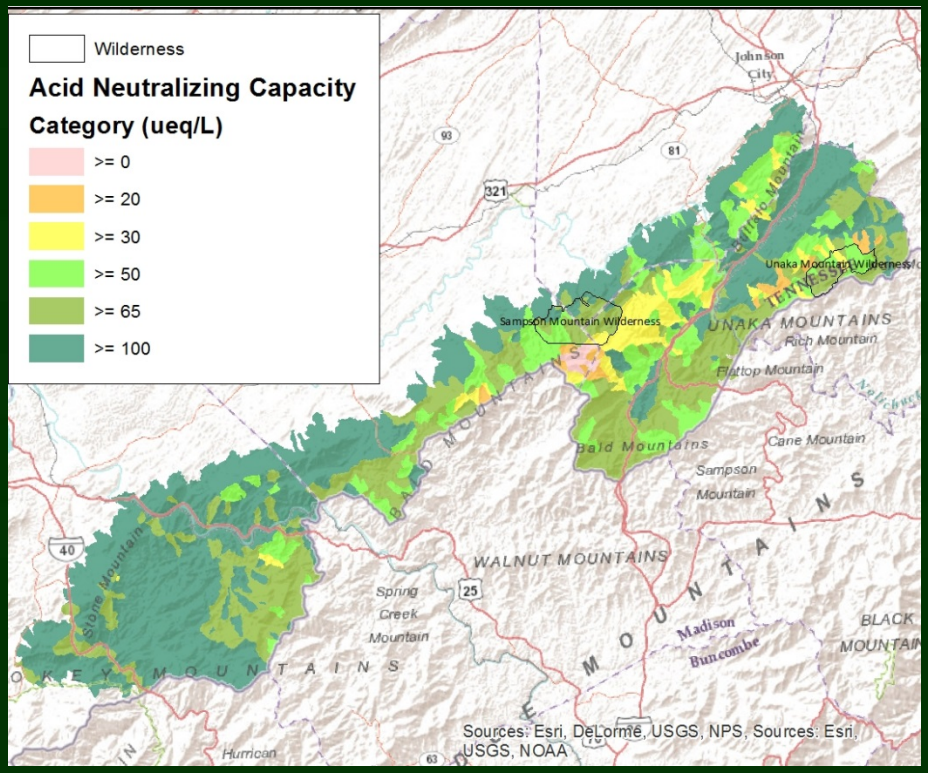
No Timber Harvesting



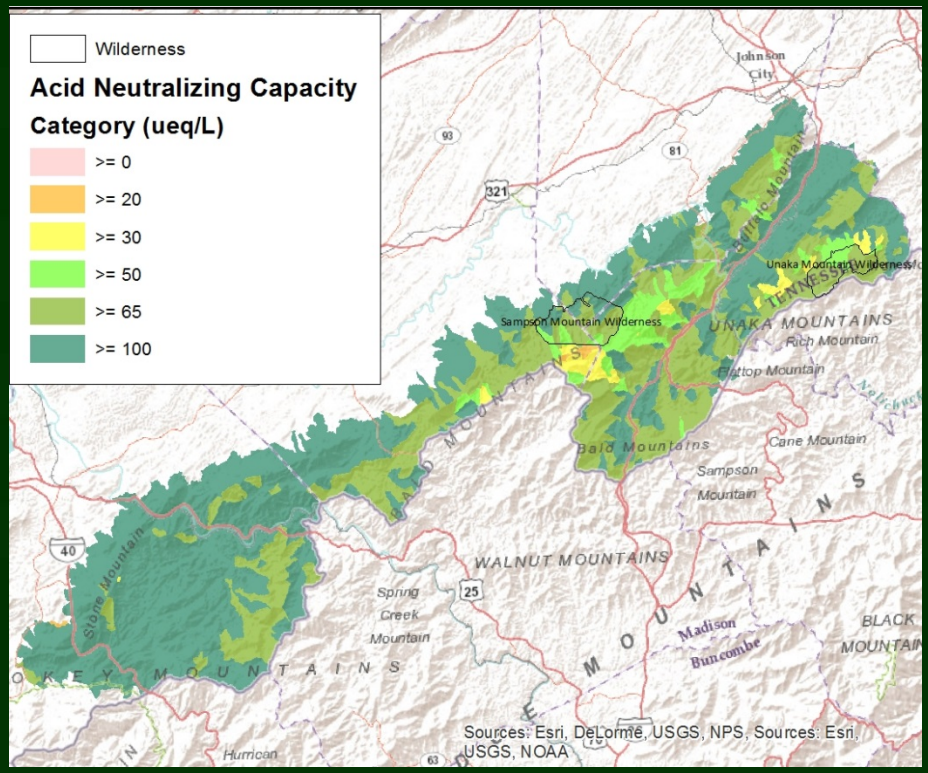
Air Resource Management

Harvest Non-Wilderness Areas

Continue Total Sulfur Deposition

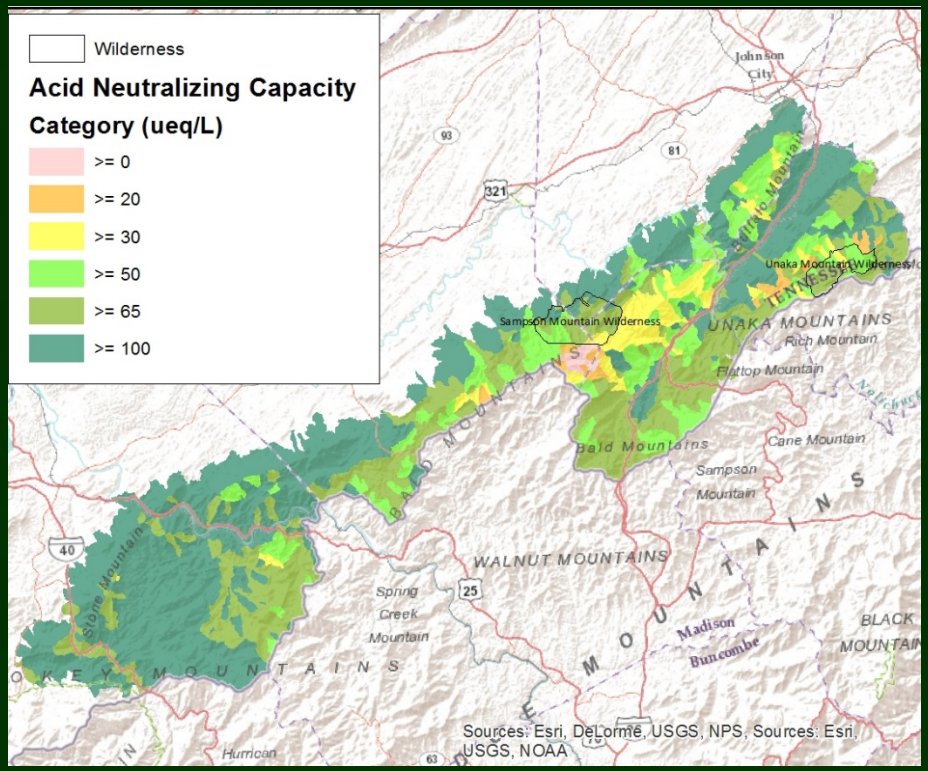


50% Reduction In Sulfur Deposition



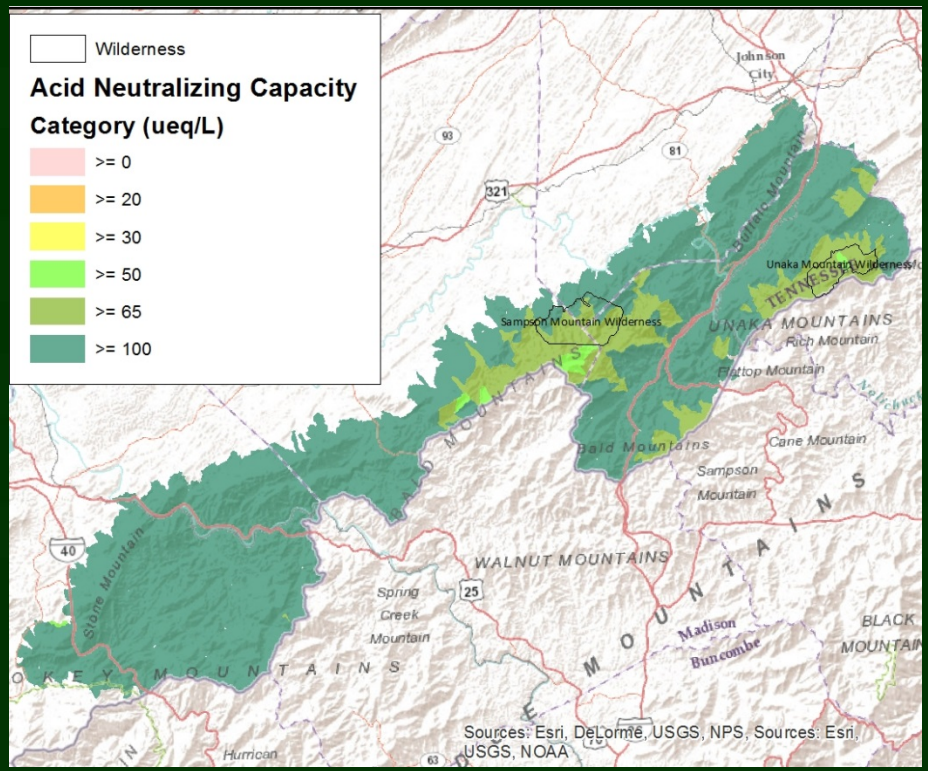
2009 – 2011 Average Sulfur Deposition Continues

Harvest Non-Wilderness Areas

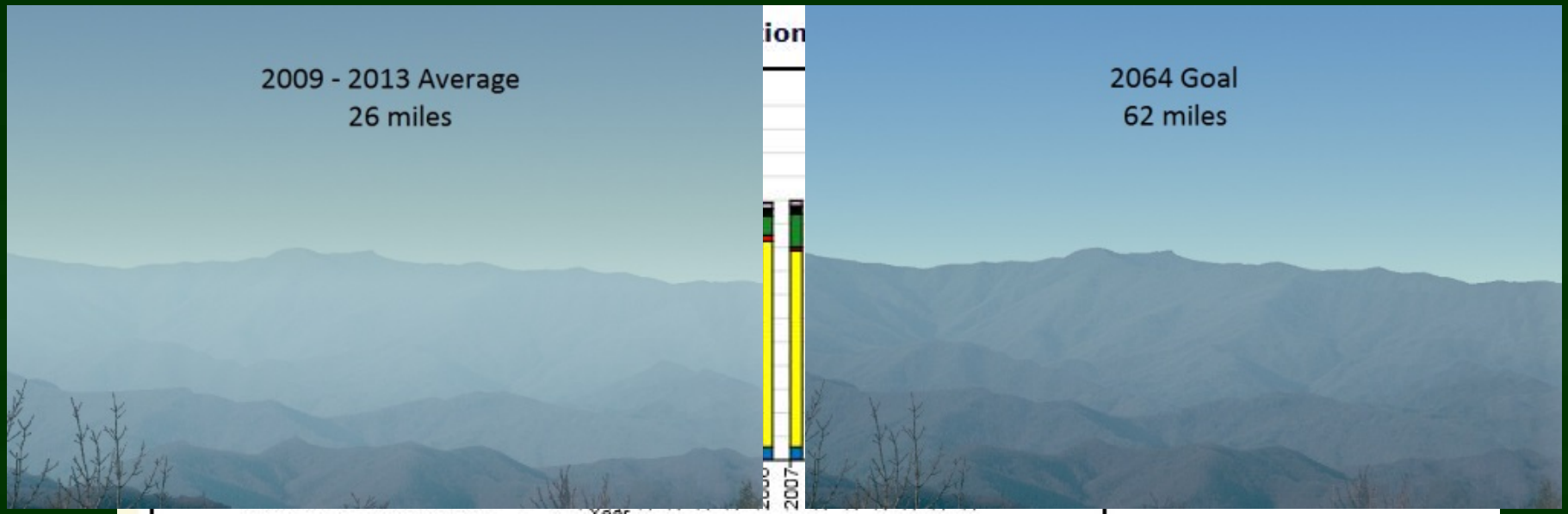


50% Reduction in 2009 – 2011 Average Sulfur Deposition

No Timber Harvesting



Decreases in Sulfur Deposition Will Continue



http://webcam.srs.fs.fed.us

USDA United States Department of Agriculture
Forest Service

Air Resource Management
Region 8 and 9

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- Prevention of Significant Deterioration
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Contact Information

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- Region 9 Contacts

Why do we monitor air quality and visibility?

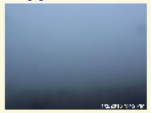
Monitoring the air quality within and near the National Forests in the Eastern (Region 9) and Southern (Region 8) Regions is one example of how the Forest Service is "caring for the land, and serving people." The air quality monitoring information is used for environmental assessments, and for our forest planning for each National Forest in the Eastern and Southern Regions. Furthermore, the Region 8 and 9 Air Resource Management staff use the information when providing technical advice to the appropriate Forest Supervisor (designated as the Federal Land Manager according to the Clean Air Act Amendments of 1977) when a new (large) stationary source of air pollution has the potential to impact any Air Quality Related Value at one or more of the 17 federally mandated **Class I areas**.

Webcams:

Joyce Kilmer

Shining Rock

Upper Buffalo



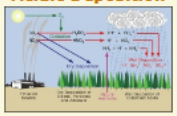
Boundary Waters

Dolly Sods

Presidential Peaks

Air Pollutants of Concern:

Acidic Deposition



Ozone