REGIONAL HAZE

California Environmental Protection Agency

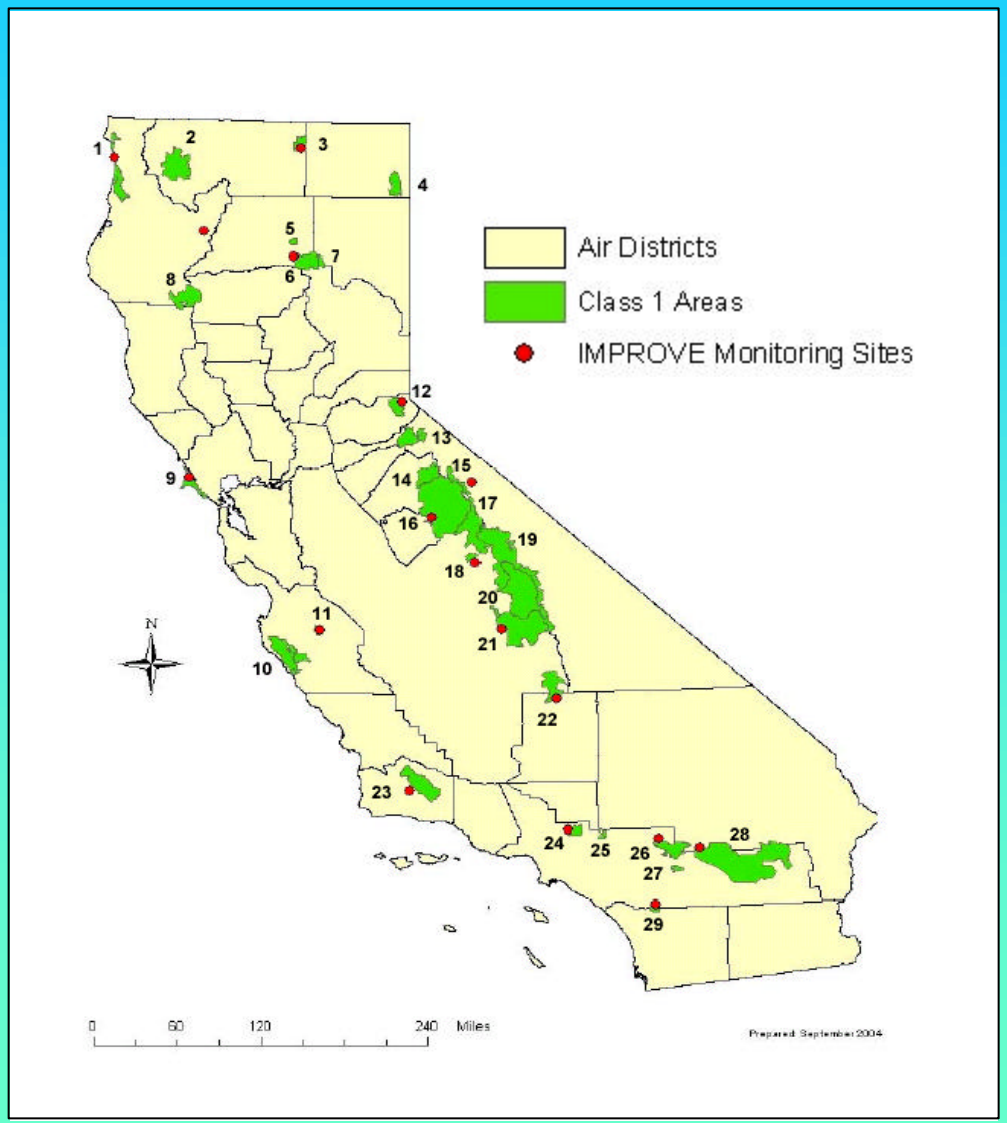
Air Resources Board

Interagency Air & Smoke Council
Sacramento
November 9, 2004

Overview for California

- **What is Regional Haze?**
  - impaired visibility
- **Where should we be concerned?**
  - 29 Class 1 areas in California; 95 in other WRAP states
- **Who, When, Why?**
  - SIP requirements
- **How will we accomplish this?**
  - what we know and what we'll need to do

California's Class 1 Areas



1. Redwood National Park
2. Marble Mountain Wilderness
3. Lava Beds National Monument
4. South Warner Wilderness
5. Thousand Lakes Wilderness
6. Lassen Volcanic National Park
7. Caribou Wilderness
8. Yolla Bolly Middle Eel Wilderness
9. Point Reyes National Seashore
10. Ventana Wilderness
11. Pinnacles National Monument
12. Desolation Wilderness
13. Mokelumne Wilderness
14. Emigrant Wilderness
15. Hoover Wilderness
16. Yosemite National Park
17. Ansel Adams Wilderness
18. Kaiser Wilderness
19. John Muir Wilderness
20. Kings Canyon National Park
21. Sequoia National Park
22. Dome Land Wilderness
23. San Rafael Wilderness
24. San Gabriel Wilderness
25. Cucamonga Wilderness
26. San Gorgonio Wilderness
27. San Jacinto Wilderness
28. Joshua Tree National Park
29. Agua Tibia

What is Regional Haze?

- **Impaired Visibility measured in Deciviews**
  - Haze index (HI) = 10 ln (b_{ext} / 10)
- **Relative significance of pollutants in West**
  - organic carbon aerosols > coarse mass > fine soil > ***sulfates*** > ***nitrates*** > elemental carbon
- **Sources of light-extinguishing emissions**
  - point, area, mobile sources
- **Factors contributing to regional haze**
  - relative humidity and temperature
  - transport: intrastate, interstate, foreign

Regional Haze Timeline

2008

- **Regional Haze SIP due January 2008**
  - coordinate with WRAP and other states

2018

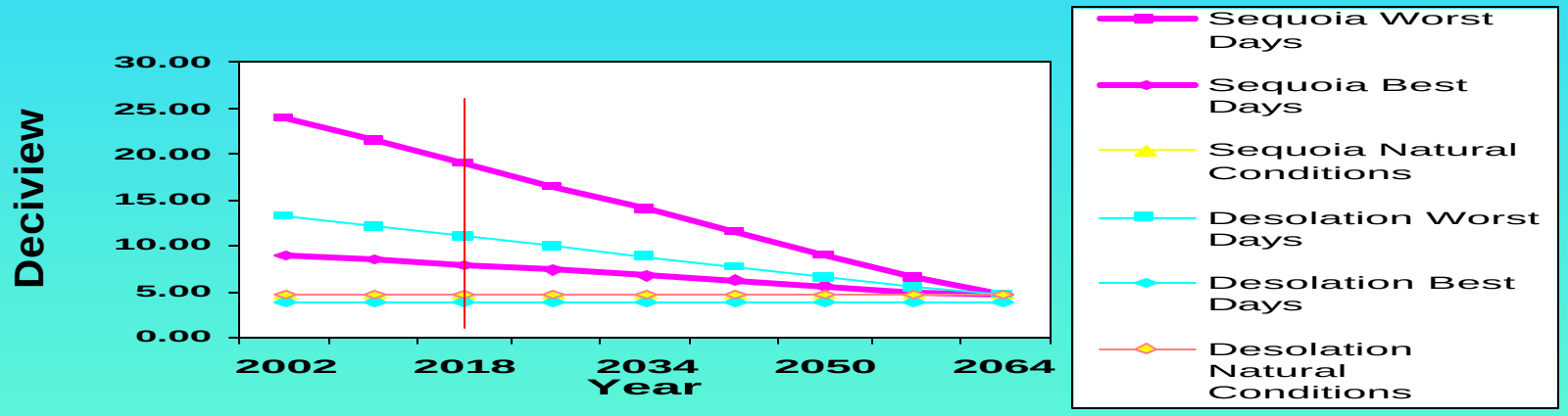
- **Reasonable Progress by 2018**
  - for all Class 1 areas
    - improve deciview average of 20% worst days
    - maintain deciview average of 20% best days
  - implement retrofit technology (BART)
  - use NAAQS measures to achieve reductions
  - periodic updates after 2008

2064

- **Natural Conditions by 2064**

Regional Haze SIP Elements

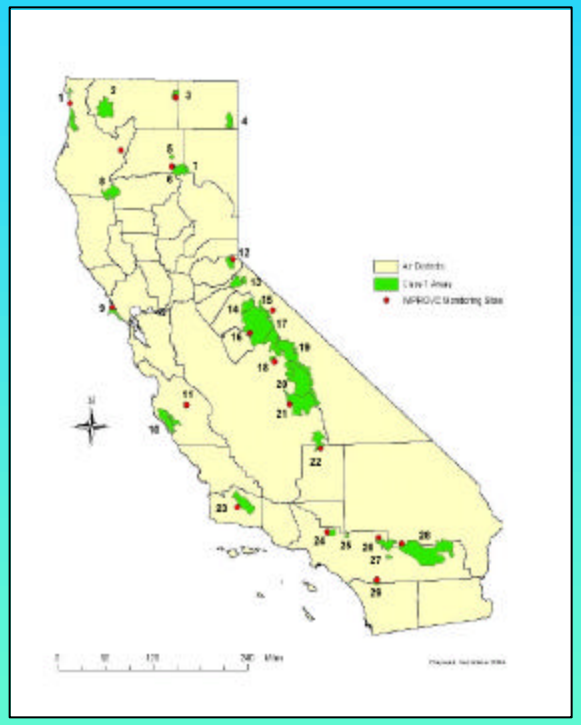
- Establish Baseline Conditions
- Calculate Reasonable Rate of Progress



- Strategy to reach the 2018 Benchmark
- Address Transport with Other States
- BART Requirement vs. Trading Alternative

Regional Haze in California

- **Current visibility**
  - southern worse than northern
  - worst days throughout year
  - causes different each month



- **Pollutants in worst months**
  - ammonium nitrate (southern)
  - ammonium sulfate (coastal)
  - organic carbon (northern, including Sierra Nevada)
  - coarse matter, fine soil (rare, episodic)

- **Baseline conditions**
  - group similar areas?
  - match pollutants and sources with monitoring results

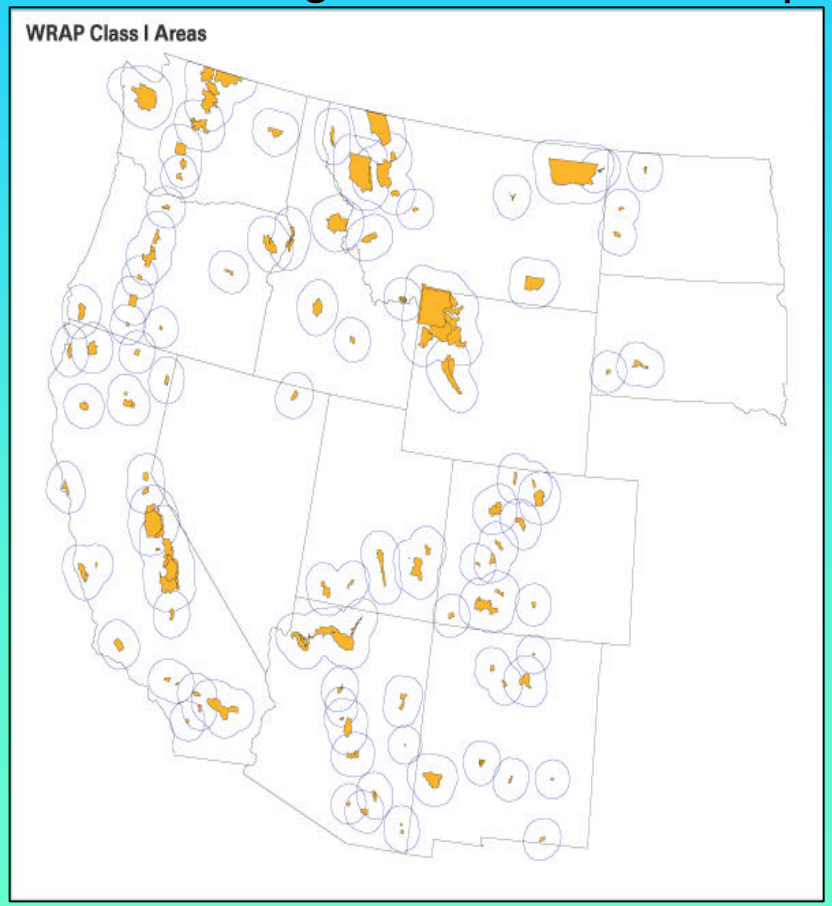
Outlook for California SIP

- **Deciview Status**
  - current trends downward due to reductions in ozone and PM emissions
  - need 15-20% reduction by 2018
- **Current Strategy for Reasonable Rate of Progress**
  - use reductions from all NAAQS SIP measures
  - local BART measures
  - SB 656 actions

Class 1 Area	Region	Average Worst	Average Best	Default Natural
Kings Canyon	Sierra Nevada	23.85	8.94	4.57
Sequoia	Sierra Nevada	23.85	8.94	4.57
Agua Tibia	Southern CA Range	23.24	10.26	4.61
San Gorgonio	Southern CA Range	21.48	7.15	4.54
San Jacinto	Southern CA Range	21.48	7.15	4.56
Point Reyes	CA Coast Range	21.21	8.39	4.83
San Gabriel	Southern CA Range	20.96	6.90	4.61
Cucamonga	Southern CA Range	20.96	6.90	4.61
Dome Land	Sierra Nevada	20.53	5.94	4.51
Joshua Tree	Mojave Desert	19.87	7.14	4.52
San Rafael	CA Coast Range	19.32	6.93	4.72
Ventana	CA Coast Range	18.61	8.66	4.76
Pinnacles	CA Coast Range	18.61	8.66	4.78
Yolla Bolly Middle Eel	Oregon/Northern CA	18.33	3.75	4.85
Marble Mt.	Oregon/Northern CA	18.33	3.75	5.1
Emigrant	Sierra Nevada	17.62	4.19	4.58
Yosemite	Sierra Nevada	17.62	4.19	4.58
South Warner	Oregon/Northern CA	17.43	4.16	4.76
Lava Beds	Oregon/Northern CA	17.43	4.16	4.93
Redwood	Oregon/Northern CA	17.53	5.23	5.25
Ansel Adams	Sierra Nevada	16.45	3.30	4.56
Kaiser	Sierra Nevada	16.45	3.30	4.57
John Muir	Sierra Nevada	16.45	3.30	4.58
Hoover	Sierra Nevada	16.21	2.82	4.56
Caribou	Oregon/Northern CA	15.64	3.45	4.73
Lassen Volcanic	Oregon/Northern CA	15.64	3.45	4.75
1000 Lakes	Oregon/Northern CA	15.64	3.45	4.76
Desolation	Sierra Nevada	13.10	3.83	4.57
Mokelumne	Sierra Nevada	13.10	3.83	4.58

WRAP: Who, Where, What

Western Regional Air Partnership



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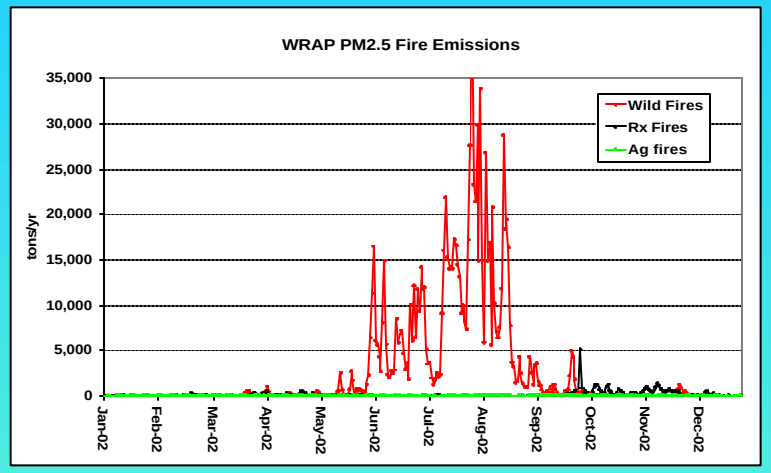
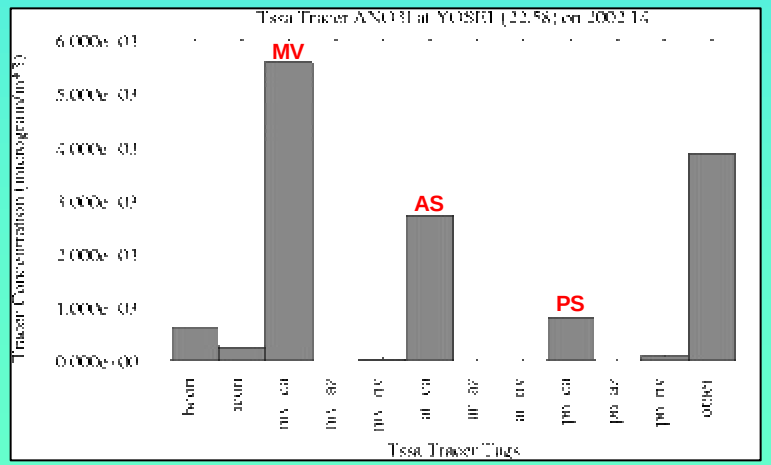
- **IMPROVE Data Analysis**
  - causes of haze
- **Emissions Inventory**
  - forums for dust, fire
- **Source Identification**
  - sources “In and Near”
  - BART-eligible
- **Modeling**
  - source attribution
  - strategy demonstration
- **Economic and Technical Analyses**

Preliminary WRAP Data

- **Inventory Analysis**
  - understand contributions
  - shared database (EDMS)
  - develop baseline
  - project strategy effects

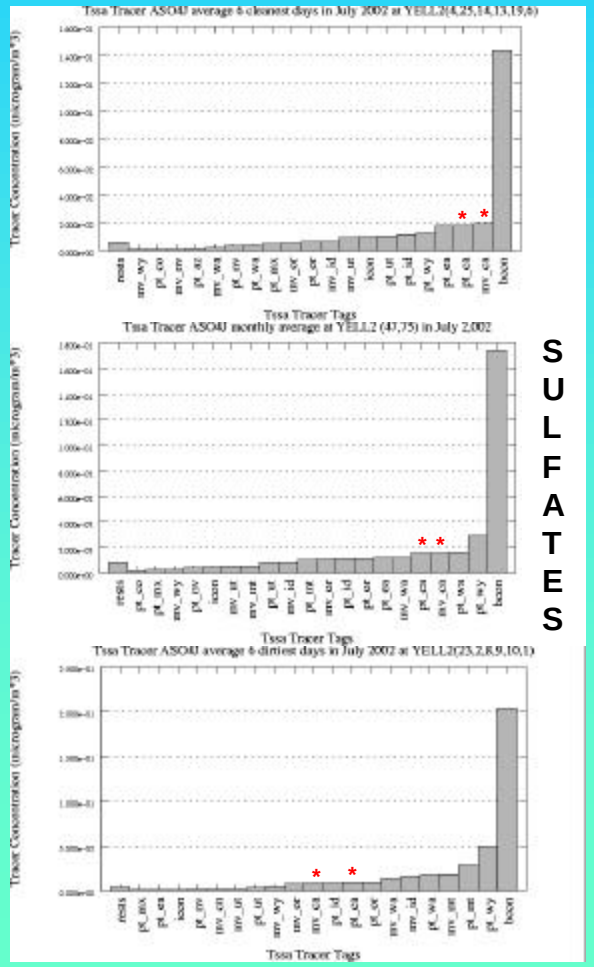


- **Source Attribution**
  - OMC, sulfates, nitrates
  - tracer studies
  - pollutant by pollutant
  - January/July averages



Source Attribution - Transport

Yellowstone National Park - July 2002 - UC Riverside Modeling

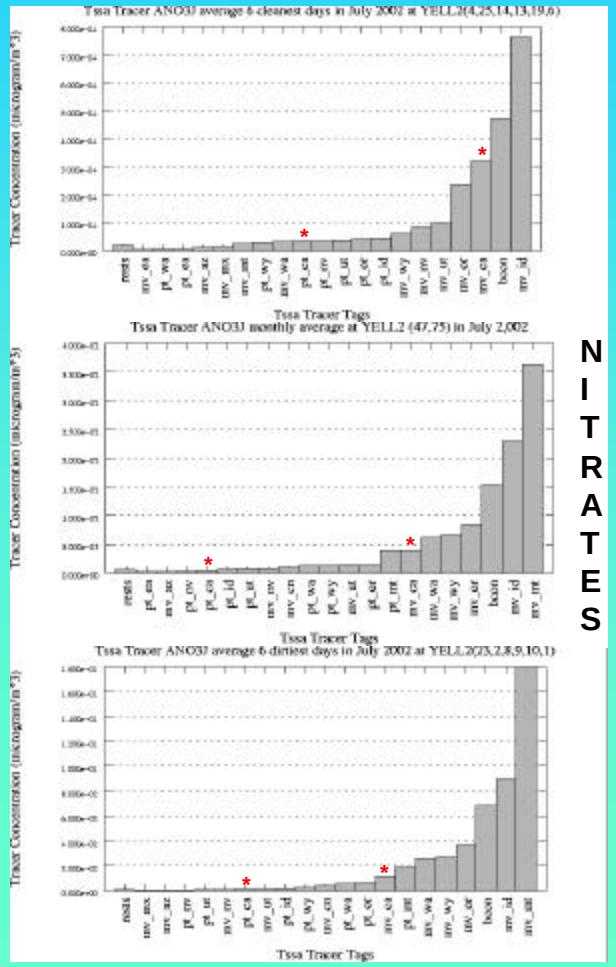


SULFATES

Best Days

Average Days

Worst Days



NITRATES

Issues and Next Steps

- **WRAP ® Technical Support Documents**
  - Monitoring data analysis for Baseline Conditions
  - Causes of Haze and Source Attribution
  - Diesel Emission Reduction Guidance and Dust Handbook
  - Future Projections and Strategy Effectiveness for WRAP Region
- **WRAP ® Policy Discussions**
  - Best Retrofit Technology and Economic Analyses
  - Potential Market Trading Program
  - Integrating Wildfire and other Natural Event contributions
  - WESTAR SIP Template
- **CA ® Coordination with NAAQS SIPs**