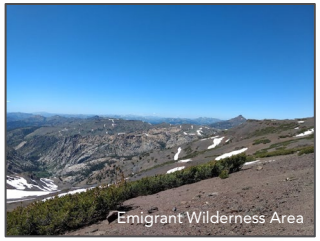


Public Workshop #2
California's State Implementation Plan For Regional Haze

March 4, 2022

CARB


Redwood National Park

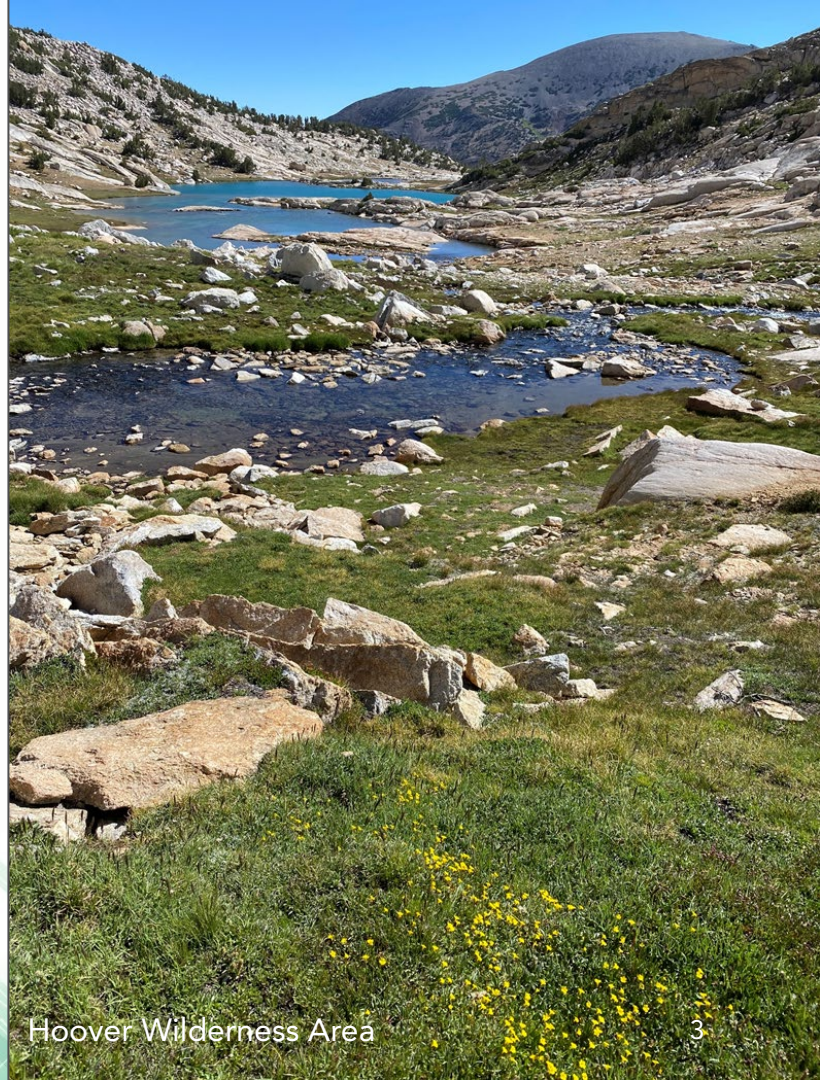
Workshop Format

- Staff Introductions
- Staff Presentation
- Questions and Comments

CARB

Staff Presentation

- Background
- Visibility Conditions
- Emission Reductions
- Reasonable Progress Goals
- Schedule



Hoover Wilderness Area

Background

- 1977 Clean Air Act Amendments
- 1999 Regional Haze Rule
- 2017 Regional Haze Rule Revisions

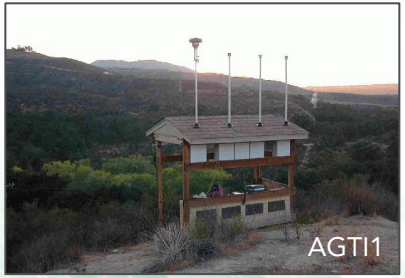
Map Source: U.S. EPA

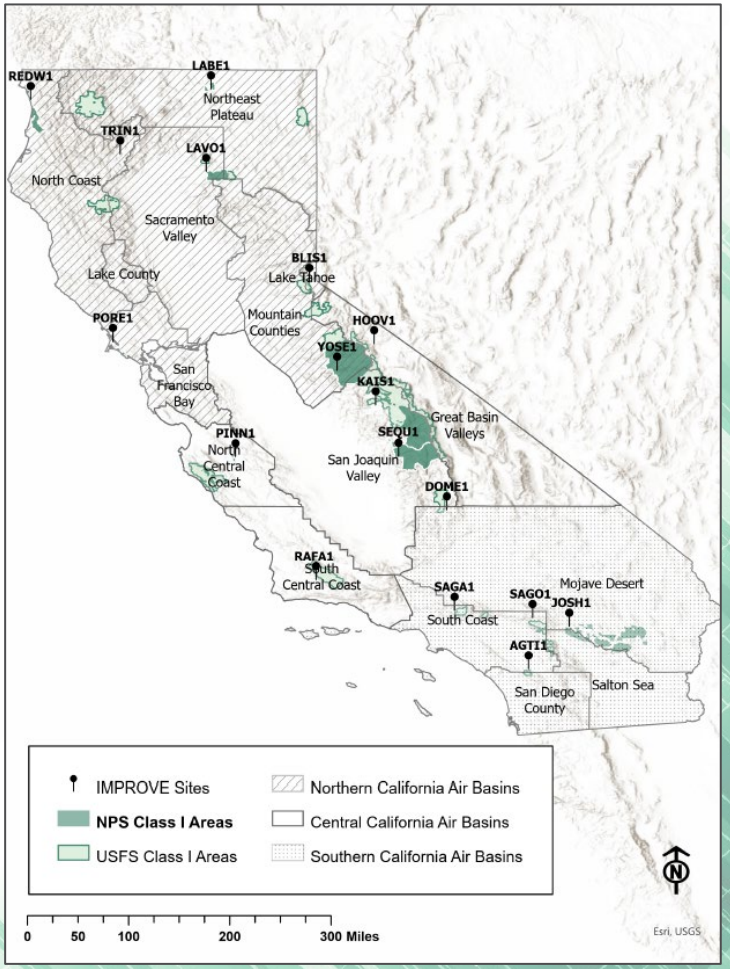
CARB

Visibility Conditions

Network of IMPROVE Monitoring Sites

- 17 sites in California
- 24-hour samples collected every three days

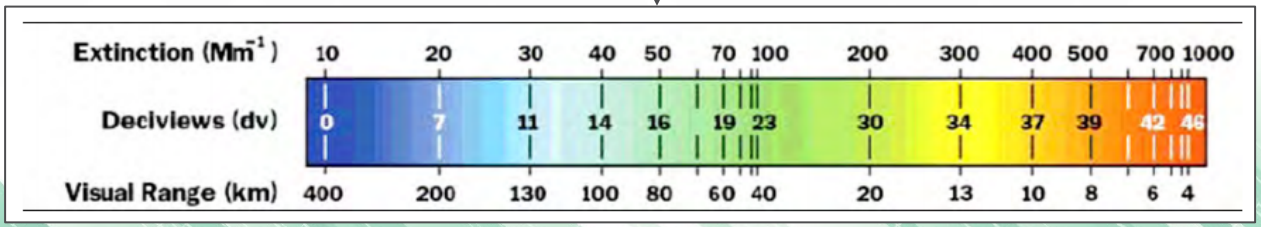




CARB

Visibility Conditions – Metrics

Collect PM → Analyze PM (ug/m^3) → Calculate Light Extinction (Mm^{-1}) → Calculate Impairment (dv) → Remove Episodic Events (Wildfire) → Most Impaired Days / Clearest Days



CARB

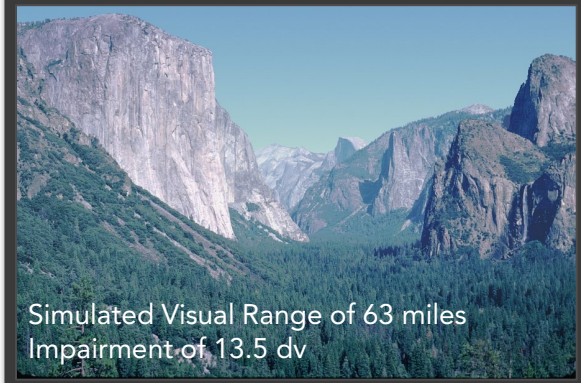
Visibility – Simulated Conditions for Impaired & Clear Days

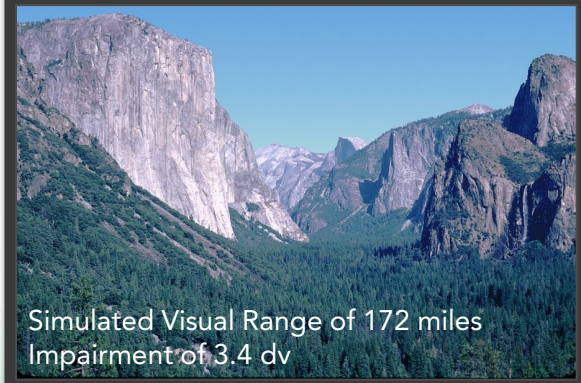
Monitoring Site

	YOSE1	
Most Impaired Days	63	76
Clearest Days	172	181

Baseline Period 2000-2004

Current Period 2014-2018





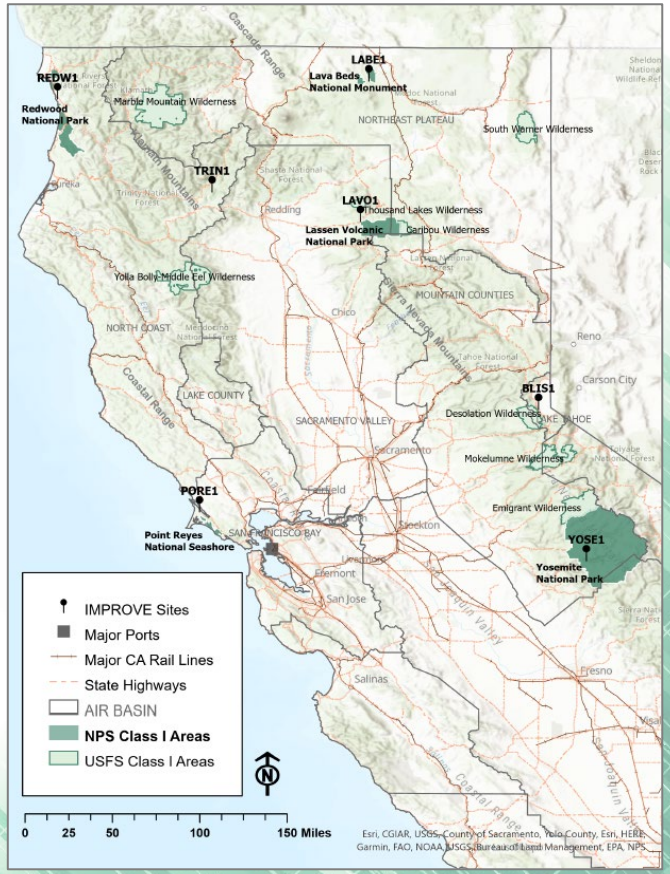
Source: http://vista.cira.colostate.edu/Improve/winhaze/

CARB

Northern CA – Visibility on the Most Impaired Days

Site	Class 1 Areas	2000-2004 (miles)	2014-2018 (miles)
LABE1	Lava Beds NM South Warner WA	78	92
REDW1	Redwood NP	62	69
TRIN1	Marble Mountain WA Yolla Bolly-Middle Eel WA	73	86
LAVO1	Caribou WA Lassen Volcanic NP Thousand Lakes WA	77	87
BLIS1	Desolation WA Mokelumne WA	88	96
PORE1	Point Reyes NS	35	52
YOSE1	Emigrant WA Yosemite NP	63	76

National Monument (NM); National Park (NP); National Seashore (NS); Wilderness Area (WA)



CARB

Northern CA – Visibility on the Clearest Days

Site	Class 1 Areas	2000-2004 (miles)	2014-2018 (miles)
LABE1	Lava Beds NM South Warner WA	176	189
REDW1	Redwood NP	132	143
TRIN1	Marble Mountain WA Yolla Bolly-Middle Eel WA	172	178
LAVO1	Caribou WA Lassen Volcanic NP Thousand Lakes WA	185	194
BLIS1	Desolation WA Mokelumne WA	189	202
PORE1	Point Reyes NS	85	107
YOSE1	Emigrant WA Yosemite NP	172	181

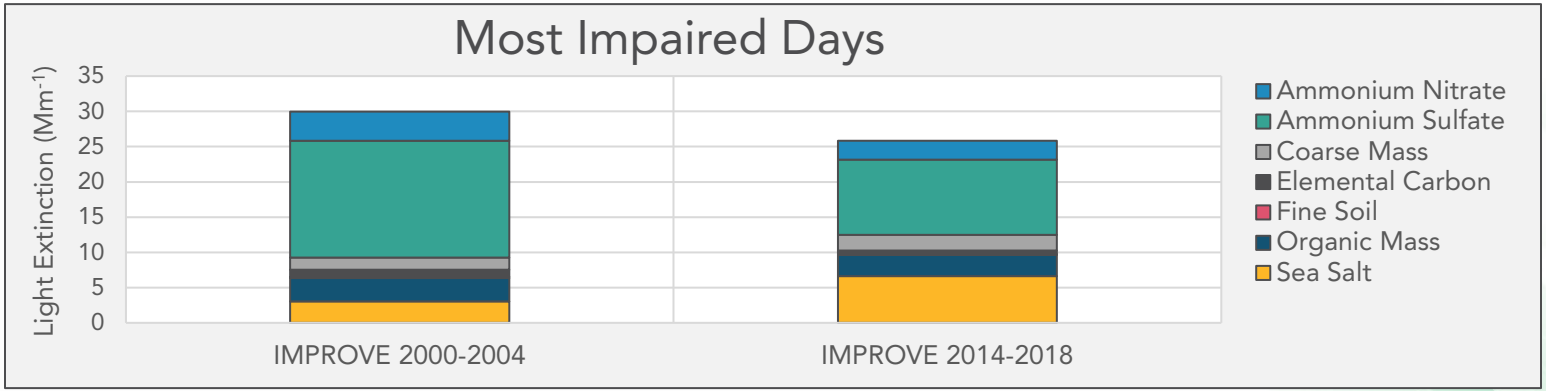
National Monument (NM); National Park (NP); National Seashore (NS); Wilderness Area (WA)

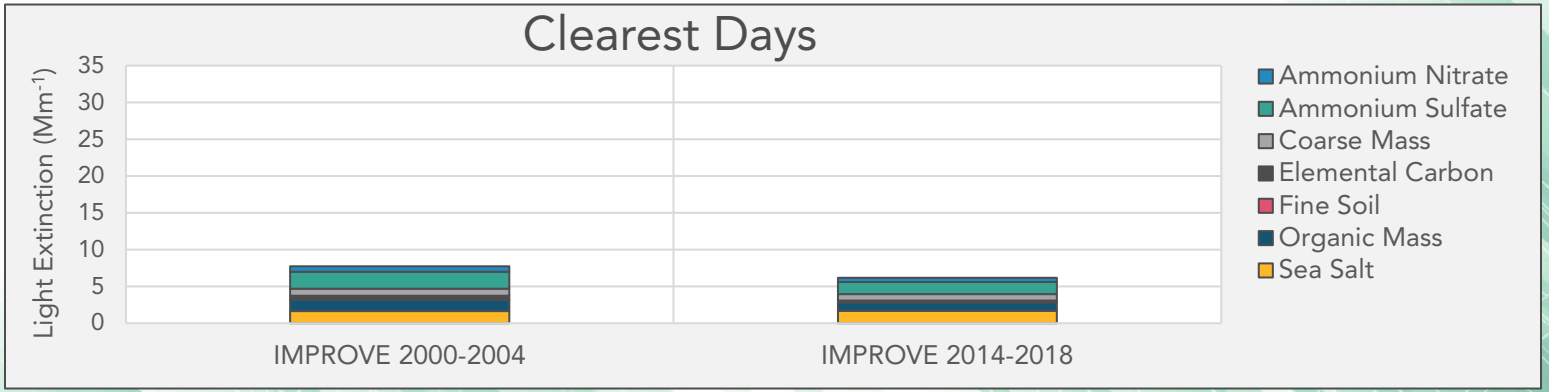

Lassen Volcanic National Park


Yosemite National Park

CARB

Redwood National Park - PM Composition



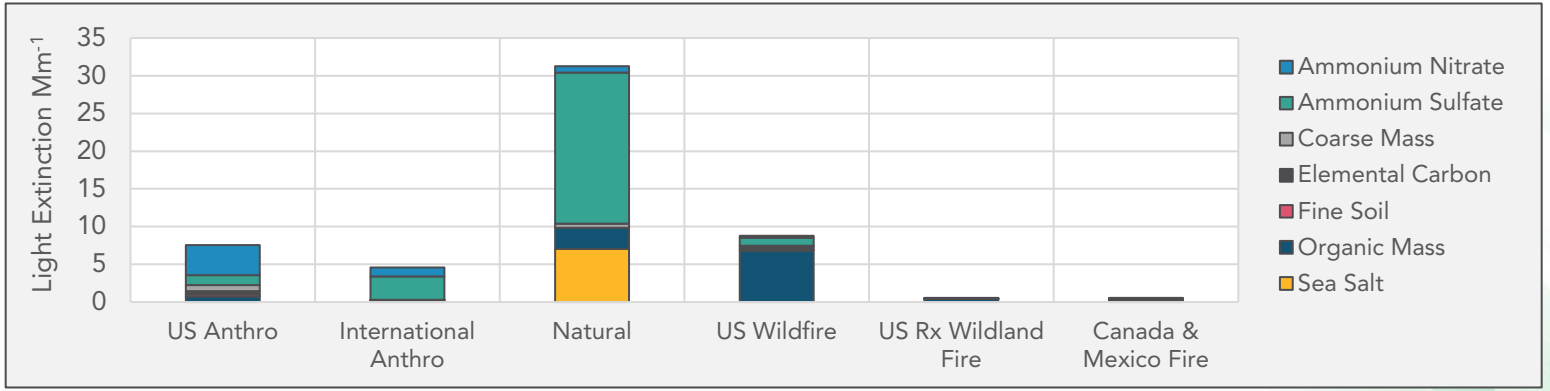


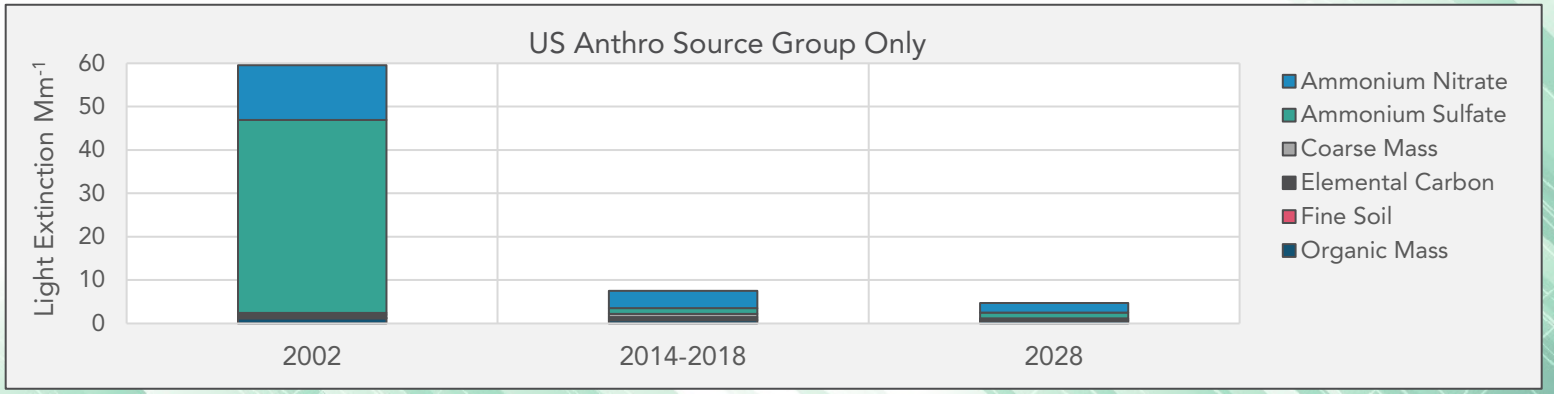
CARB

Common Sources of PM

PM Species	Human Sources	Natural Sources
Ammonium Nitrate	Motor vehicles, industrial boilers, other combustion processes, agriculture	Soil, lightning, fire
Ammonium Sulfate	Coal-fired power plants, diesel engines, industrial boilers	Volcanoes, fire, oceanic emissions, geothermal activity
Coarse Mass	Construction, roads, residential wood burning	Wind-blown dust, fire
Elemental Carbon	Residential wood burning, motor vehicles	Fire
Organic Mass	Motor vehicles, commercial cooking, commercial solvents, incineration, residential heating	Vegetation, fire
Sea Salt	--	Ocean spray, dry lakebeds
Fine Soil	Off-road vehicles, agriculture, deforestation, unpaved roads	Soil resuspension, dust storms

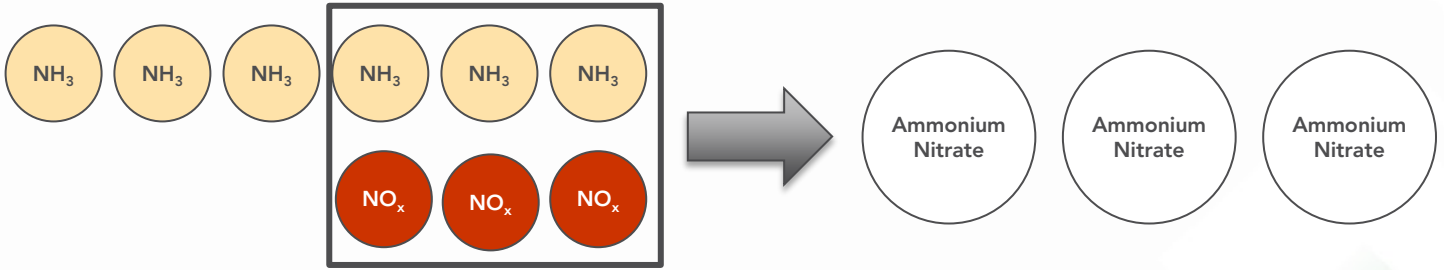
Redwood National Park - PM from Source Groups



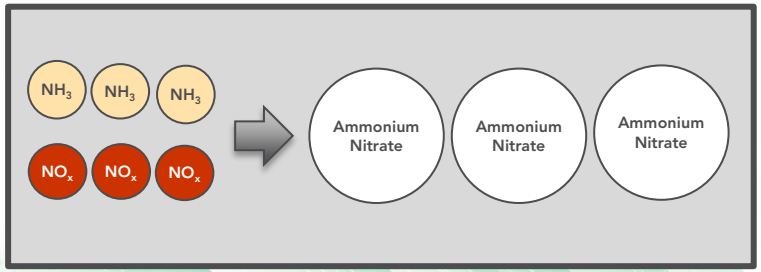


CARB

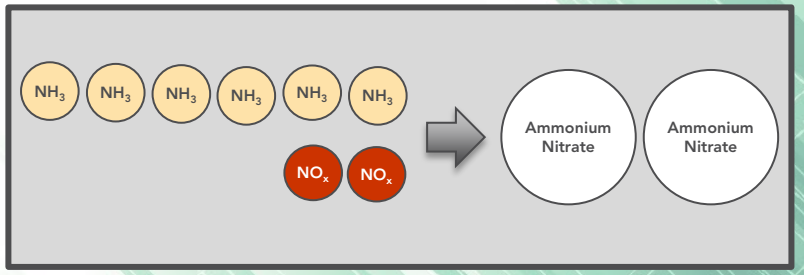
Secondary Particle Formation



Reducing *More* Abundant Precursor *Less* Effective in Reducing Nitrate

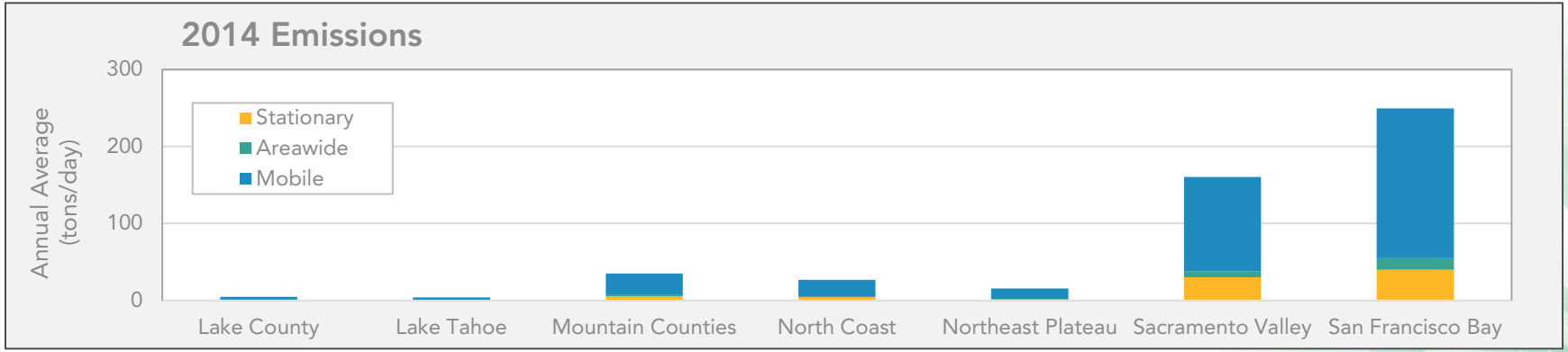


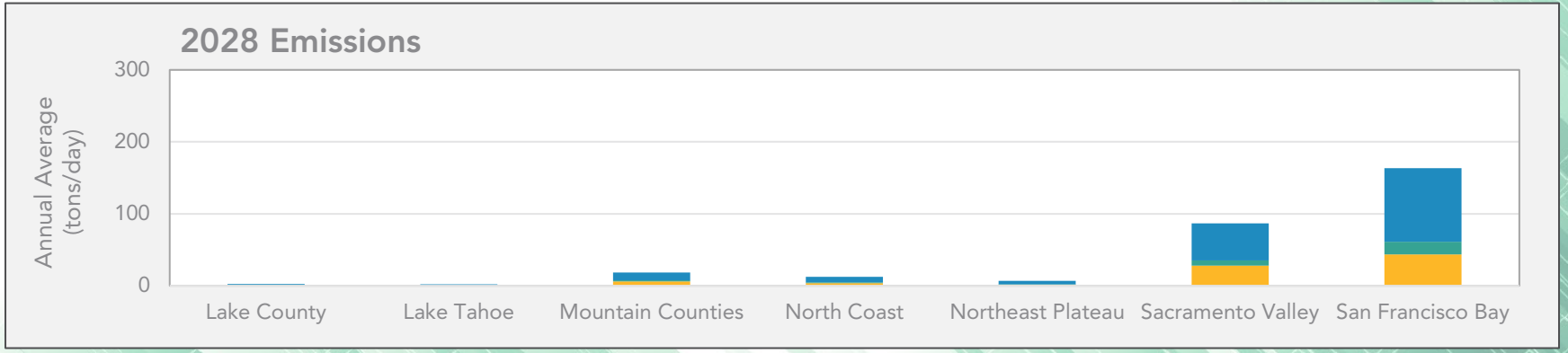
Reducing *Less* Abundant Precursor *More* Effective in Reducing Nitrate



CARB

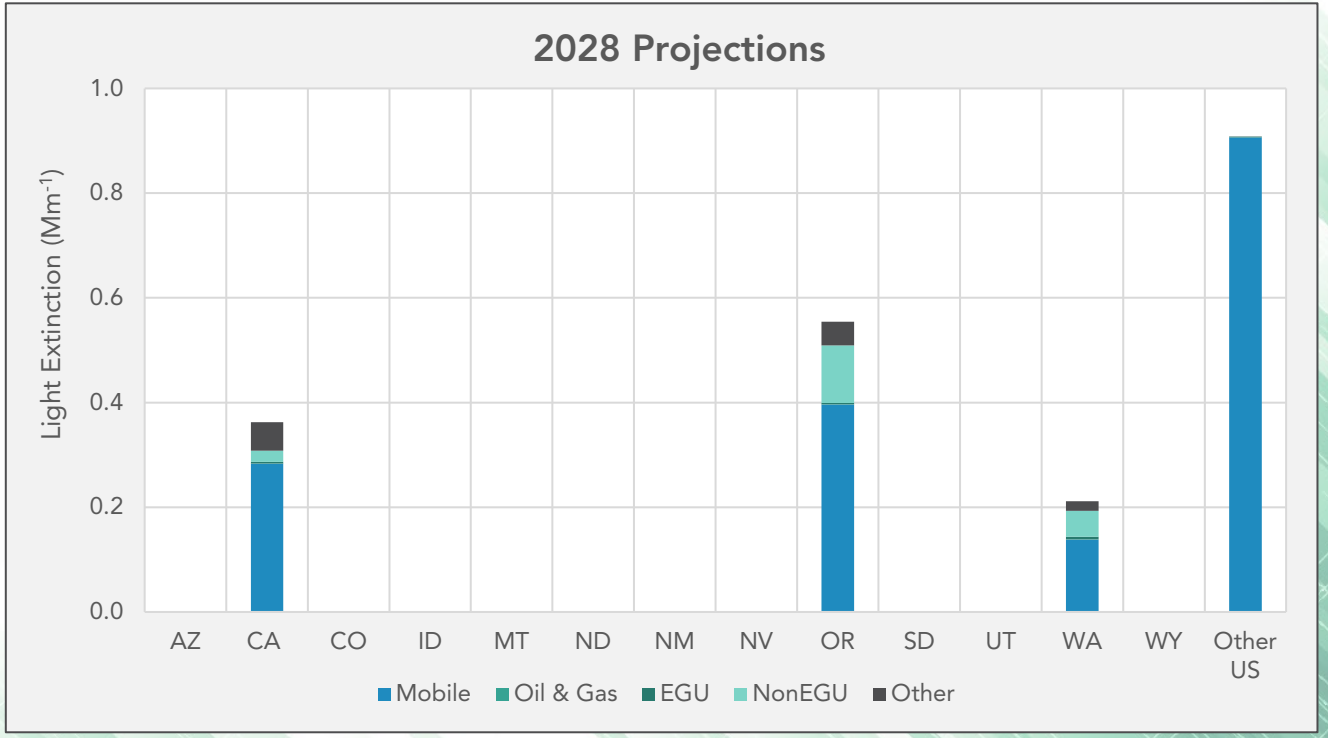
Northern CA Air Basins - NOx Emissions





CARB

Sources – Redwood National Park

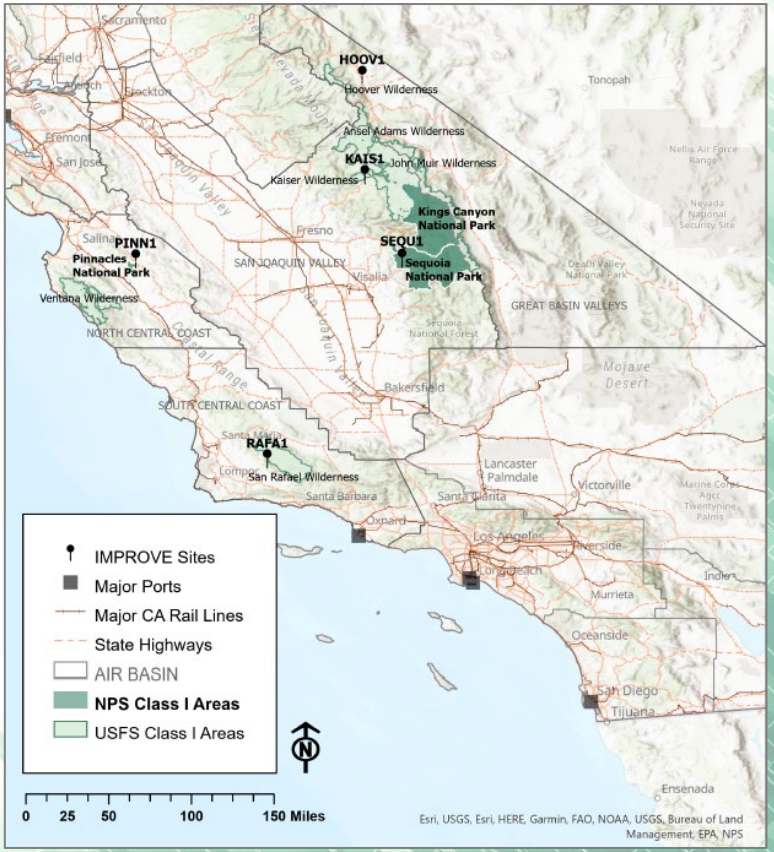


CARB

Central CA – Visibility on the Most Impaired Days

Site	Class 1 Area(s)	2000-2004 (miles)	2014-2018 (miles)
HOOV1	Hoover WA	100	111
KAIS1	Ansel Adams WA John Muir WA Kaiser WA	67	81
PINN1	Pinnacles NP Ventana WA	44	59
SEQU1	Kings Canyon NP Sequoia NP	24	38
RAFA1	San Rafael WA	43	59

National Park (NP); Wilderness Area (WA)



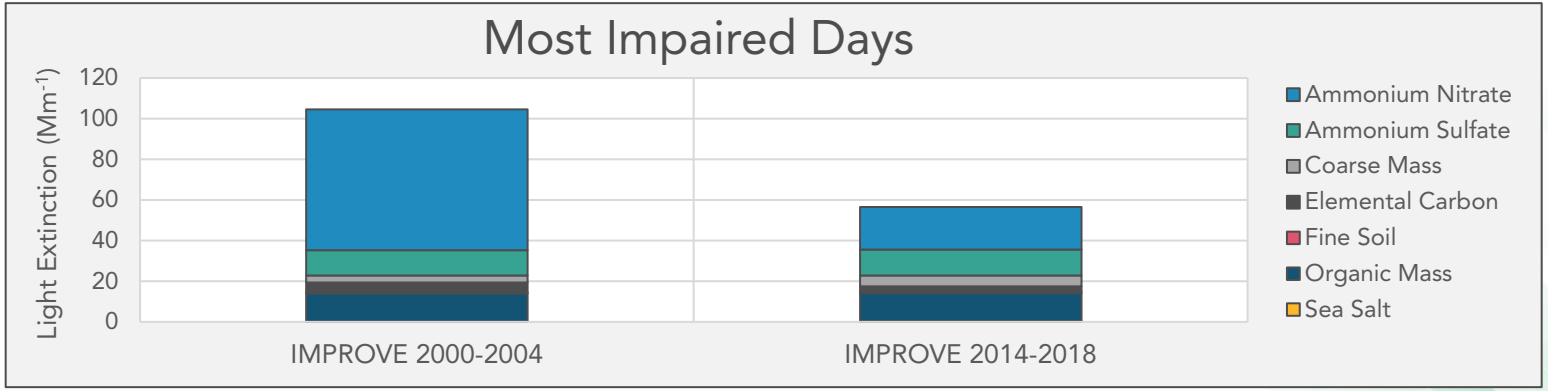
Central CA – Visibility on the Clearest Days

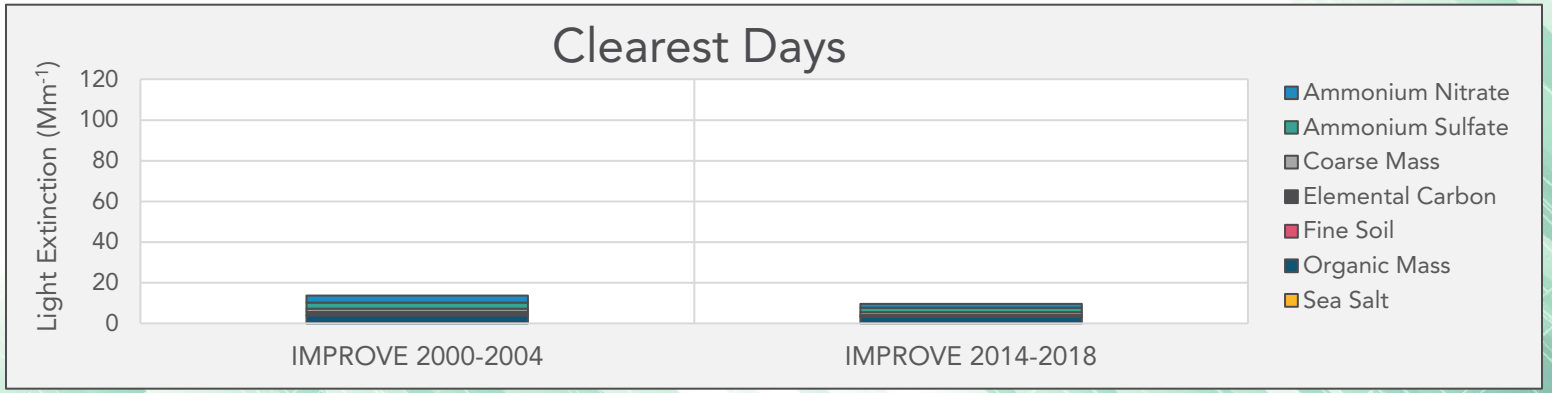
Site	Class 1 Area(s)	2000-2004 (miles)	2014-2018 (miles)
HOOV1	Hoover WA	211	219
KAIS1	Ansel Adams WA John Muir WA Kaiser WA	193	209
PINN1	Pinnacles NP Ventana WA	100	112
SEQU1	Kings Canyon NP Sequoia NP	101	120
RAFA1	San Rafael WA	127	148

National Monument (NM); National Park (NP); National Seashore (NS); Wilderness Area (WA)

CARB

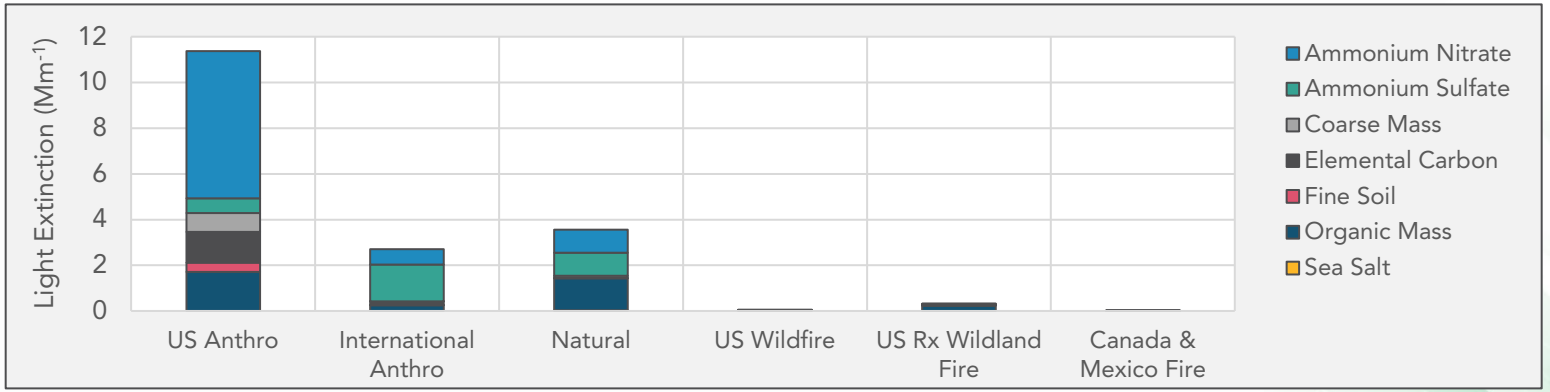
Sequoia National Park - PM Composition

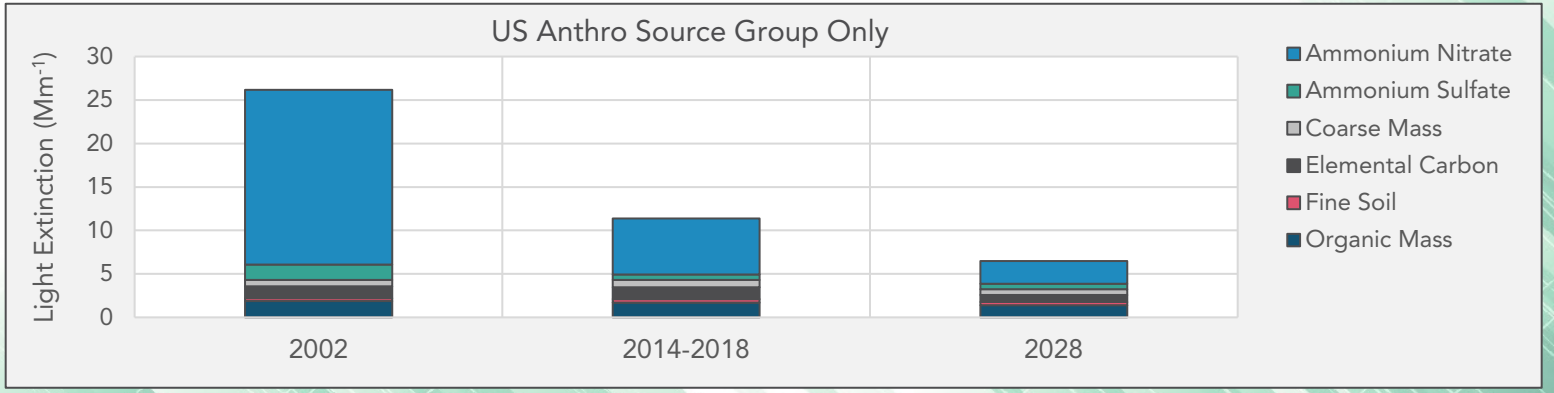




CARB

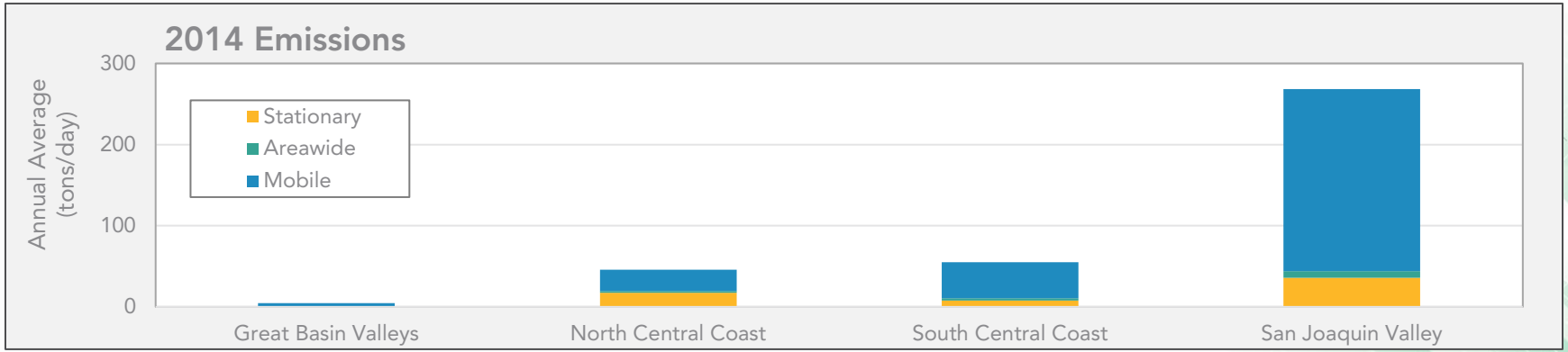
Sequoia National Park - PM from Source Groups

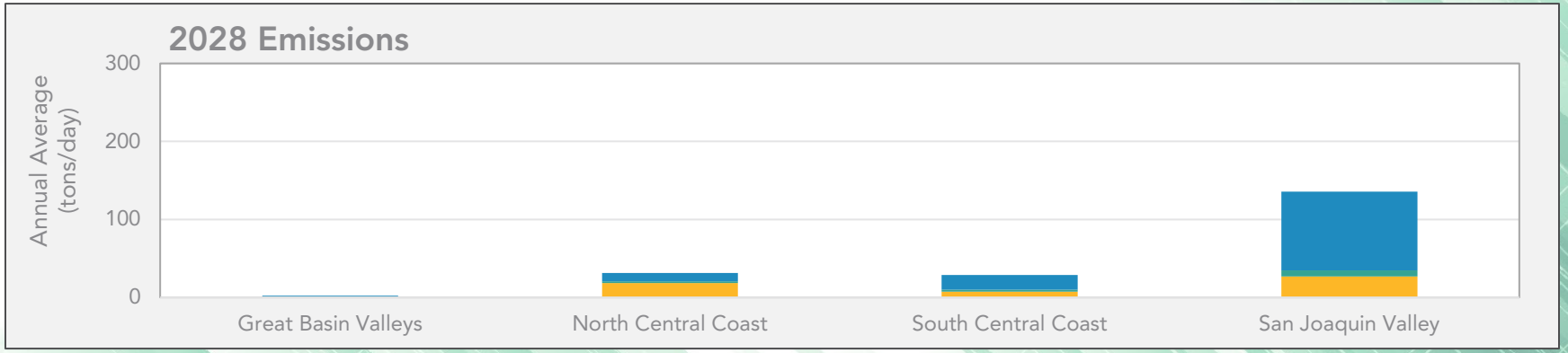




CARB

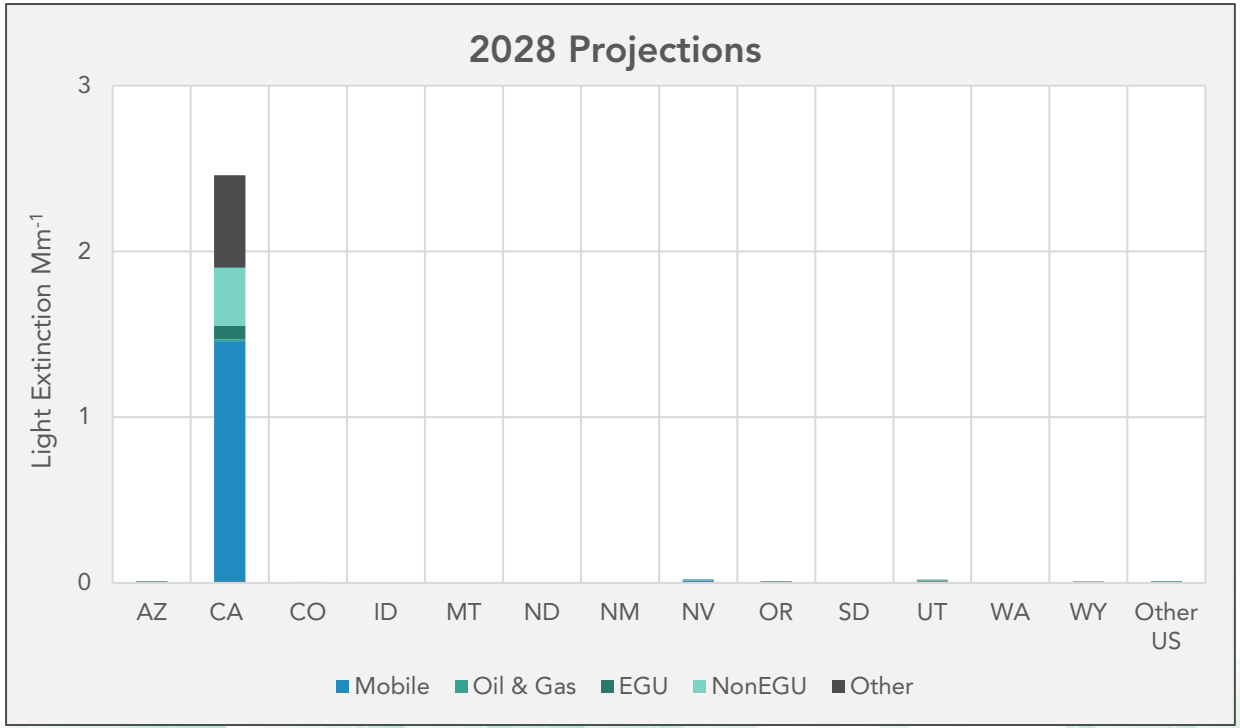
Central CA Air Basins - NOx Emissions

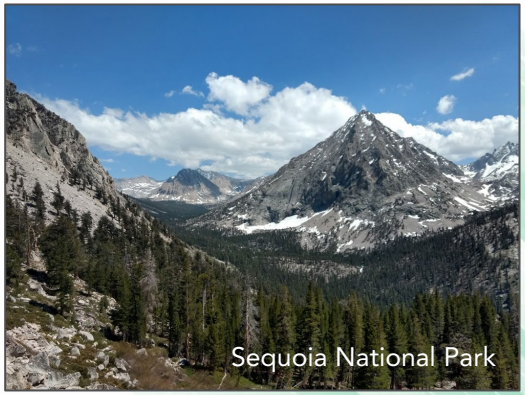




CARB

Sequoia National Park - Sources



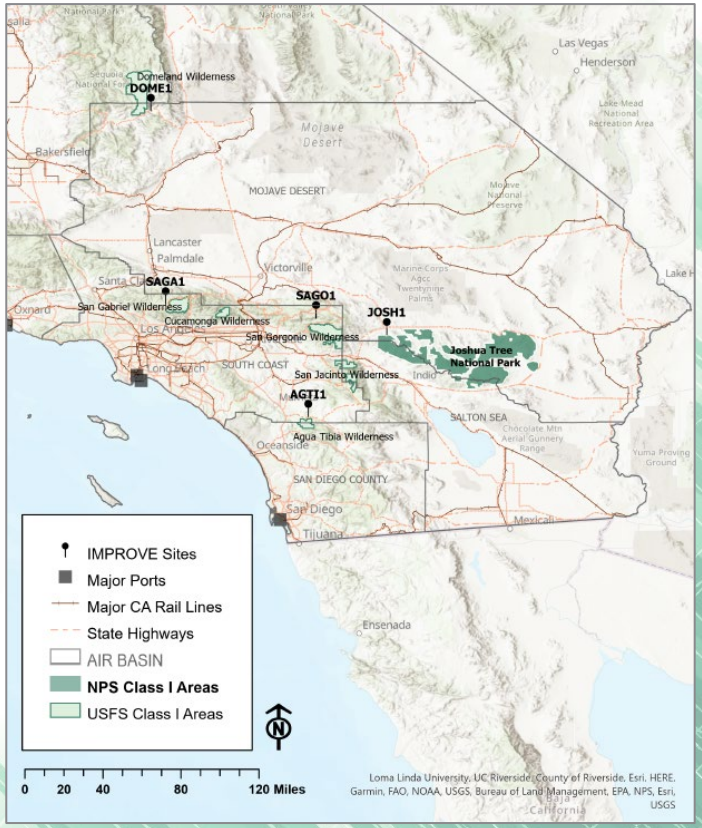


CARB

Southern CA – Visibility on the Most Impaired Days

Site	Class 1 Area(s)	2000-2004 (miles)	2014-2018 (miles)
DOME1	Domeland WA	43	54
SAGA1	San Gabriel WA Cucamonga WA	40	65
SAGO1	San Gorgonio WA San Jacinto WA	32	57
JOSH1	Joshua Tree NP	41	67
AGTI1	Agua Tibia WA	28	47

National Monument (NM); National Park (NP); Wilderness Area (WA)



CARB

Southern CA – Visibility on the Clearest Days

Site	Class 1 Area(s)	2000-2004 (miles)	2014-2018 (miles)
DOME1	Domelands WA	146	156
SAGA1	San Gabriel WA Cucamonga WA	150	183
SAGO1	San Gorgonio WA San Jacinto WA	141	174
JOSH1	Joshua Tree NP	132	151
AGTI1	Agua Tibia WA	93	120

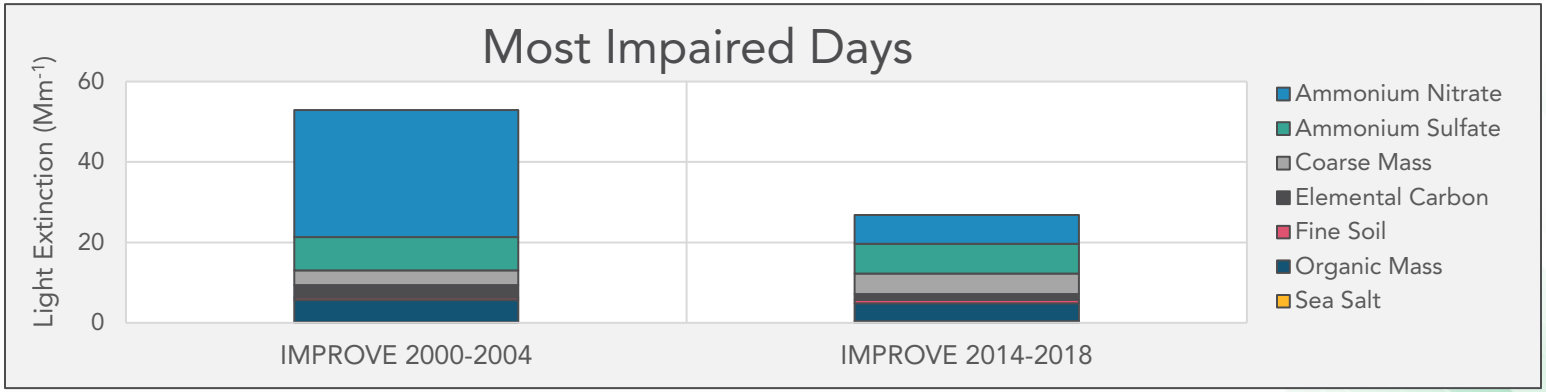
National Park (NP); Wilderness Area (WA)

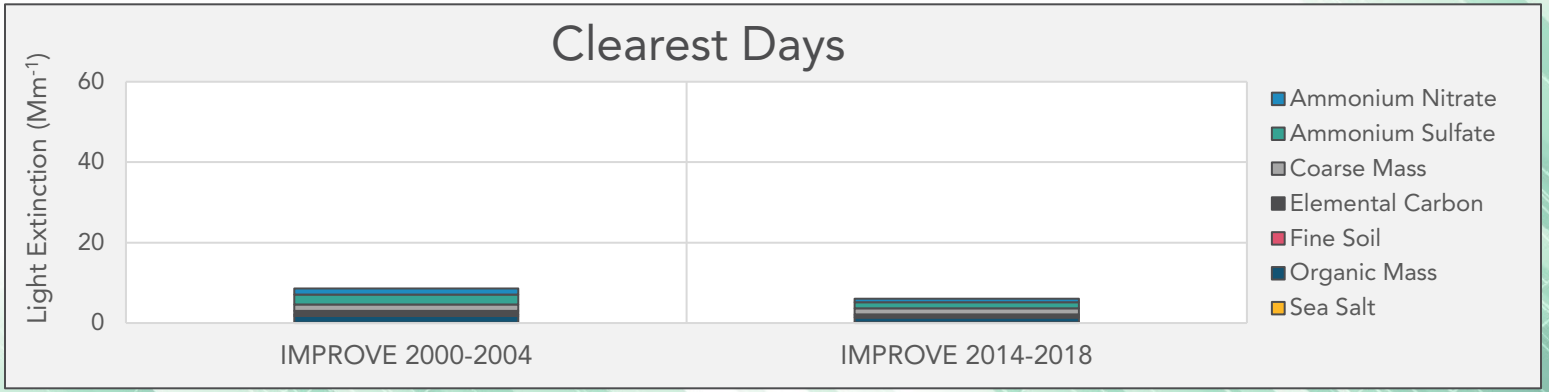

Domeland Wilderness Area


San Jacinto Wilderness Area

CARB

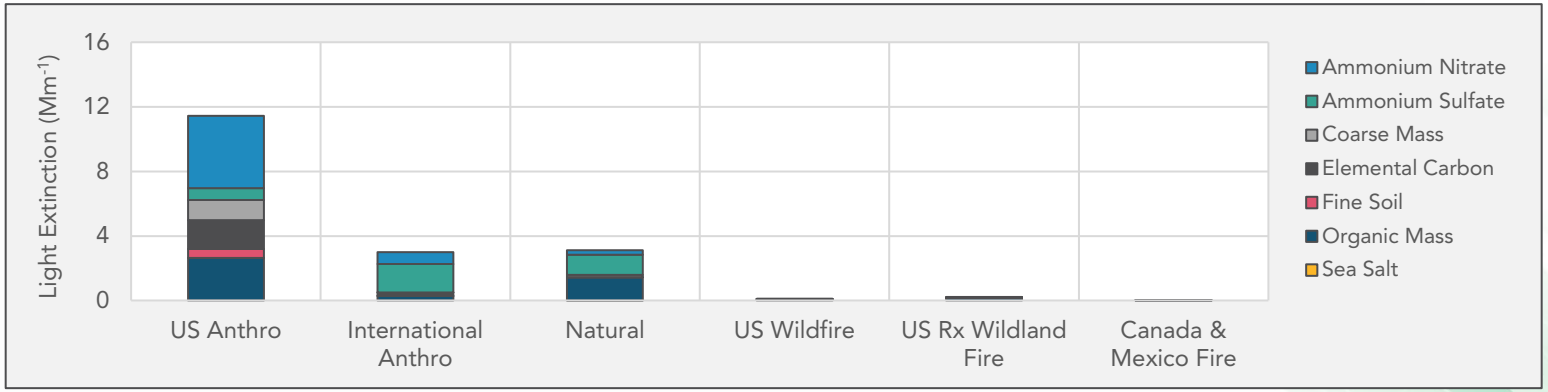
Joshua Tree National Park - PM Composition

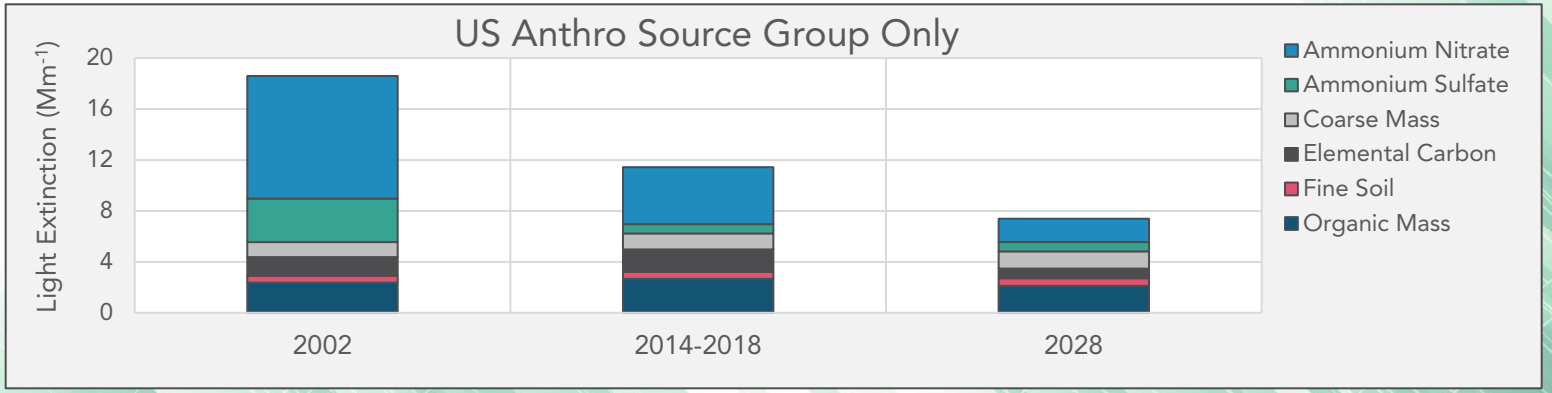




CARB

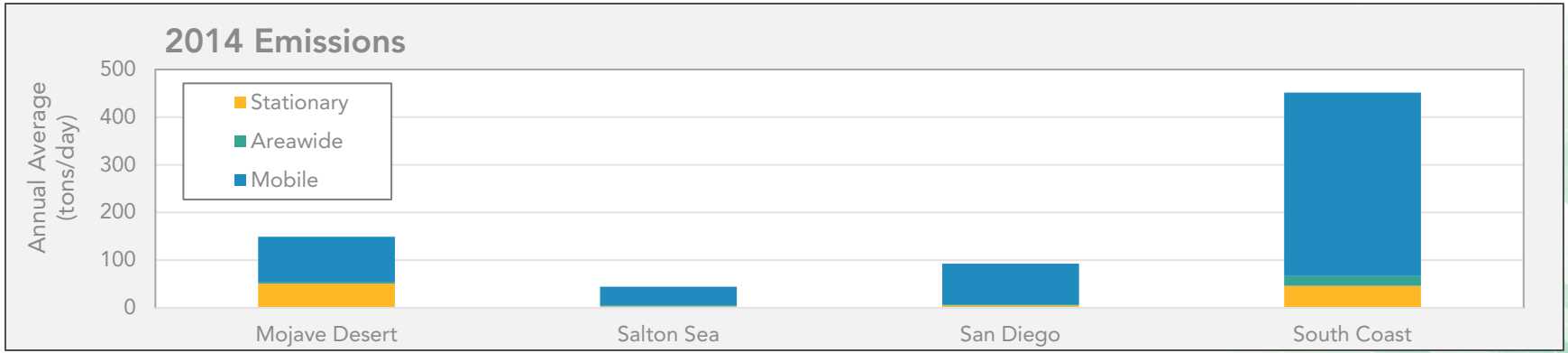
Joshua Tree National Park - PM from Source Groups

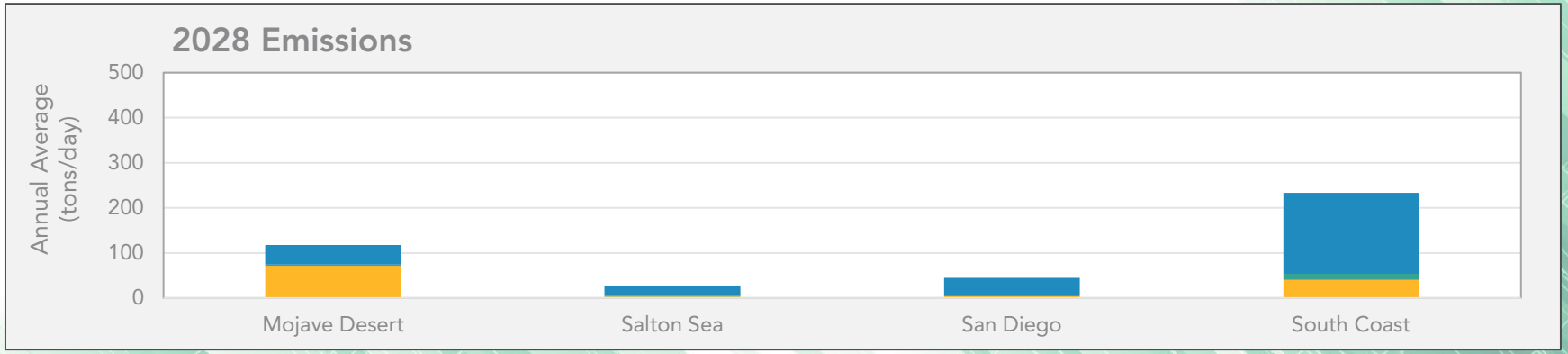




CARB

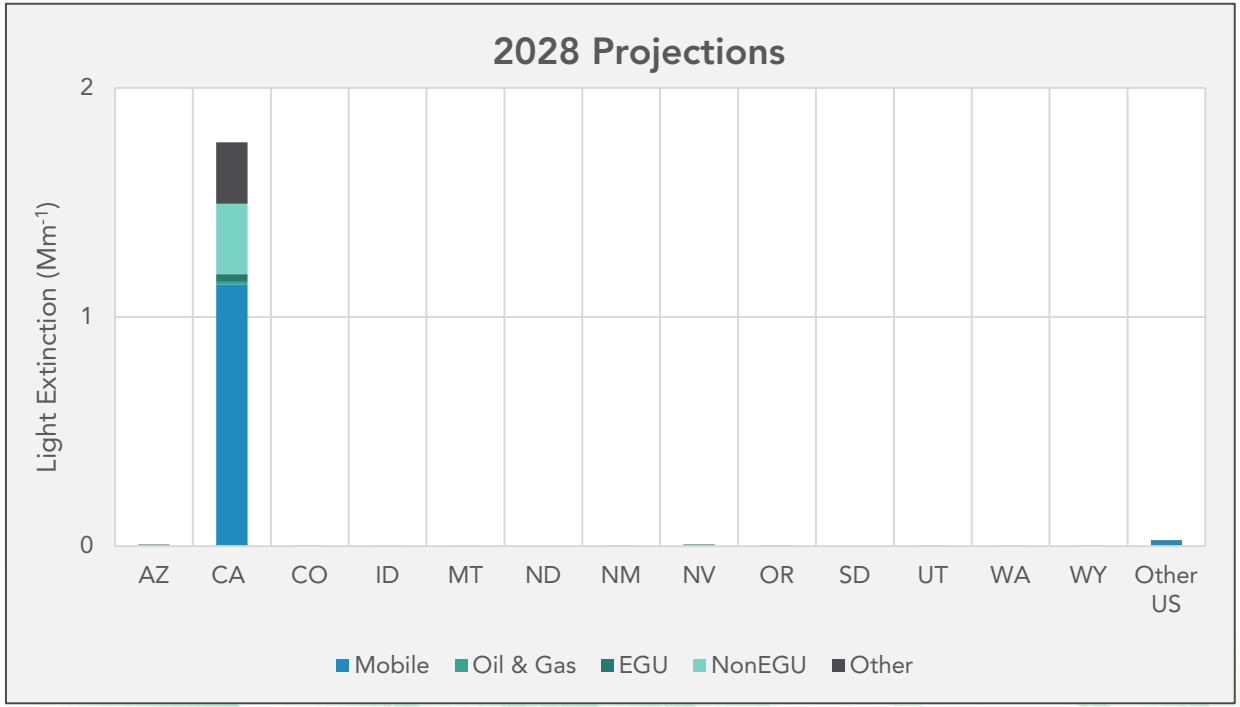
Southern CA Air Basins - NOx Emissions





CARB

Joshua Tree National Park - Sources



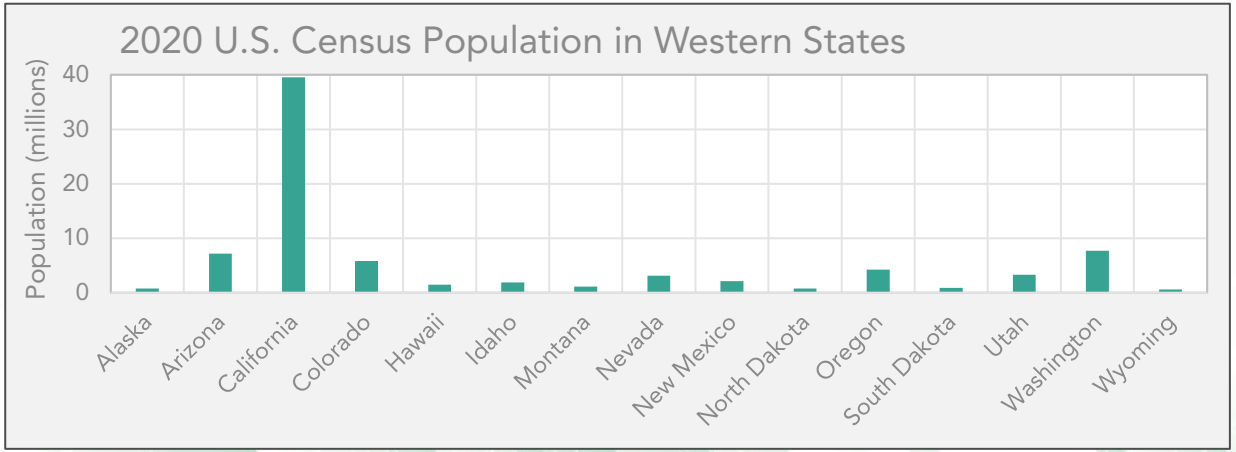
CARB

Break for Questions

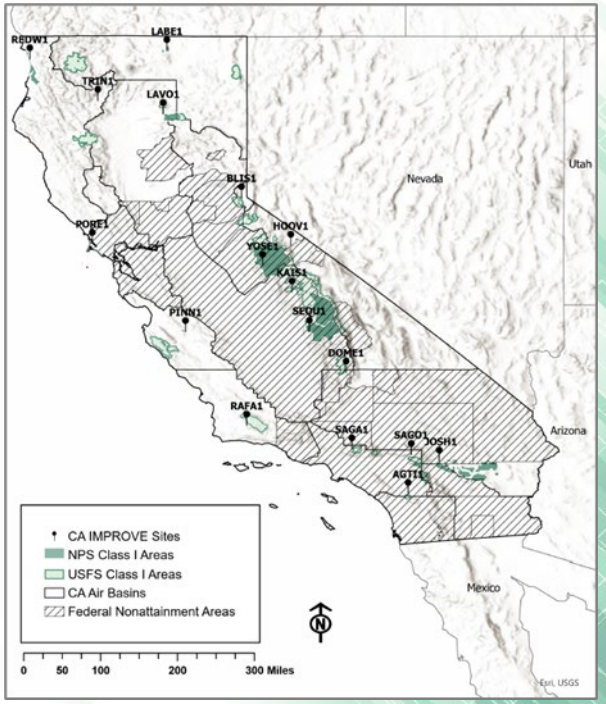
CARB

State Specific Considerations

- Large population
- Large transportation infrastructure
- Widespread air quality challenges



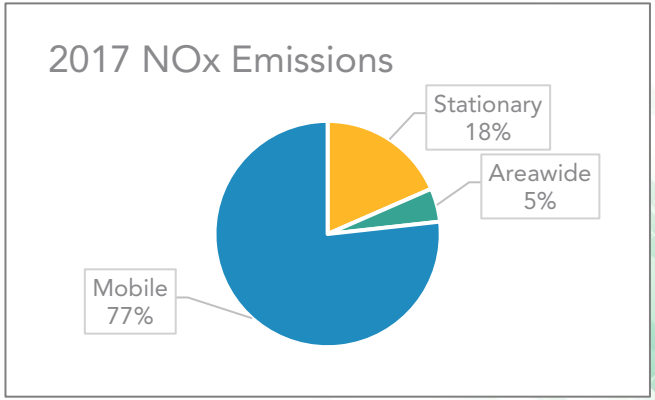
Federal Nonattainment Areas

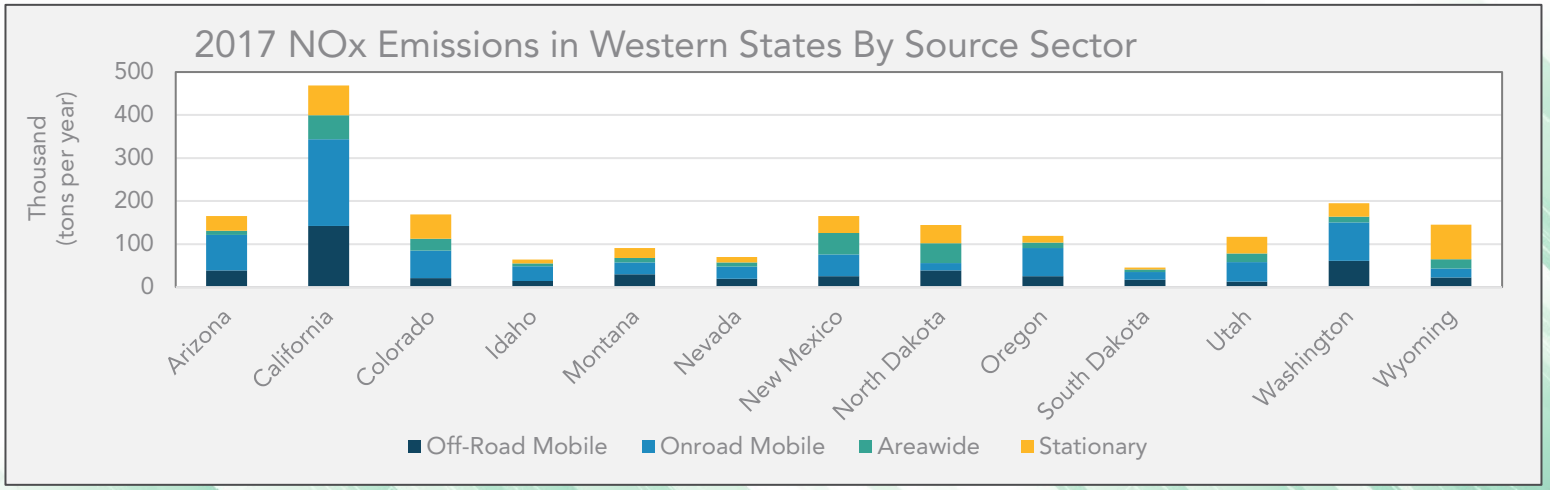


CARB

State Specific Considerations

Mobile source emission reductions are key
- NAAQS attainment
- Improving visibility





CARB

Integrated Planning Process

- Air Quality Targets
- GHG Reduction Goals
- Community Risk Reductions

Mobile Source Strategy

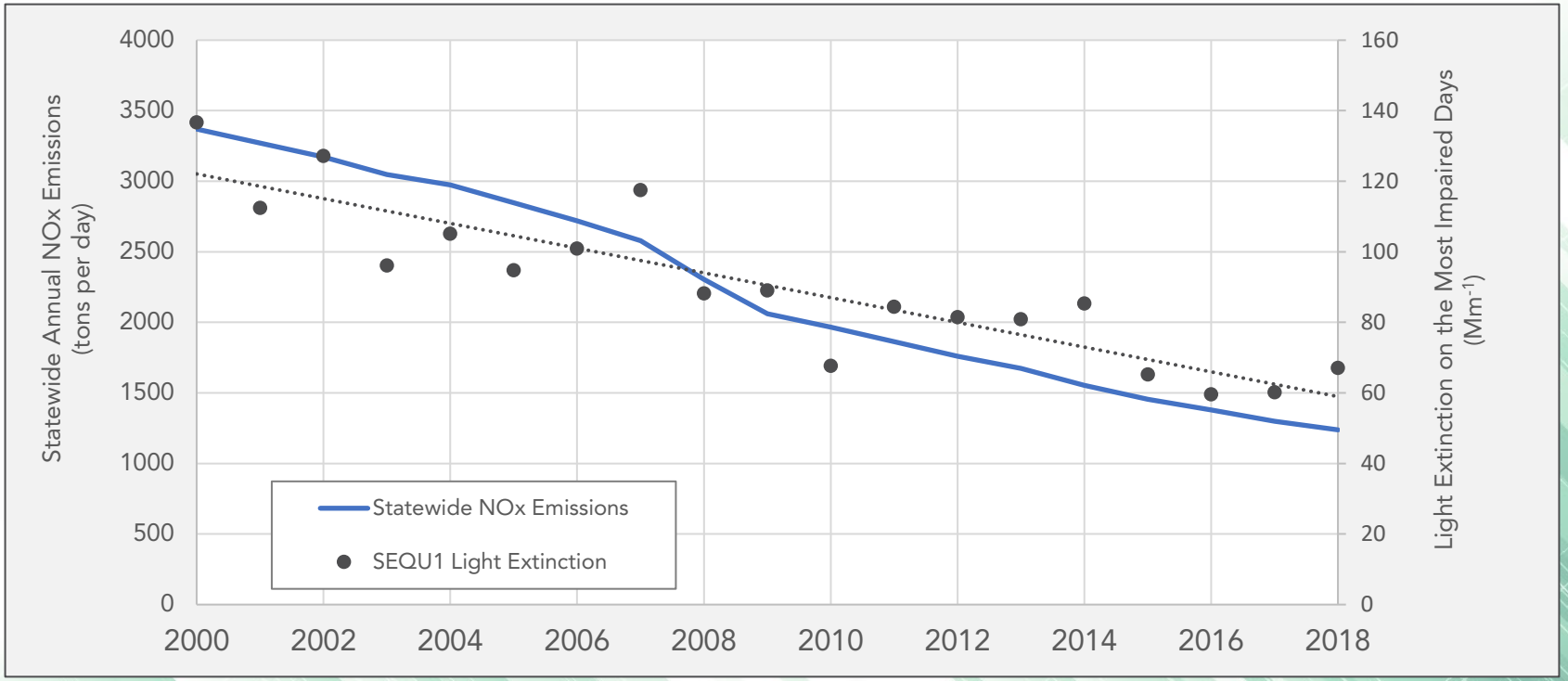
- State SIP Strategy
- Scoping Plan Updates
- Community Emission Reduction Plans
- Other Planning Responsibilities


Lava Beds National Monument


Mokelumne Wilderness Area

CARB

Integrated Planning is Working for Visibility



CARB

Consideration of Four Reasonable Progress Factors: Embedded in CARB's Rulemaking Process

- Cost of compliance
- Time necessary for compliance
- Energy and non-air quality impacts of compliance
- Remaining useful life of affected sources

CARB

NOx Focused Strategy: Source Groups Considered

Mobile Sources

- Light & medium-duty
- Heavy-duty trucks
- Off-road equipment
- Trains
- Ocean-going vessels

Stationary Sources

- NOx Q/d
- Device level inventories
- Controls and operations
- Proceed with evaluation

Control Measures for Selected Source Sectors: Four Reasonable Progress Factors Considered

Light and medium-duty vehicles	Advanced Clean Cars II
Heavy-duty trucks	Omnibus; Inspection & Maintenance Program; Advanced Clean Trucks
Off-road equipment	Small Off-Road Engine Amendments Transport Refrigeration Units Amendments
Trains	In-Use Locomotive Regulations
Ocean-going vessels	At-Berth Regulation Amendments
Stationary (Collins Pine)	Selective non-catalytic reduction for wood-fired boiler

CARB

Emission Reductions through 2028

Implementation of adopted measures

- Reduction of more than 400 tpd NOx

Commitment to Adopt and Implement New Measures

- Reduction of additional 40 tpd NOx

Measure	Estimated NOx Benefit
Heavy-Duty Omnibus	9 tpd
Heavy-Duty Inspection & Maintenance Program	28 tpd
Advanced Clean Trucks	2 tpd
Advanced Clean Cars II	1 tpd

New Measures Proposed in 2022 State SIP Strategy

On-Road

- Advanced Clean Fleets
- Zero-Emission Trucks
- New Motorcycle Emission Standards
- Clean Miles Standard

Off-Road

- Tier 5 Off-Road Engine Standard
- Amendments to In-Use Diesel-Fueled Fleets
- Zero-Emission TRU Part II
- Commercial Harbor Craft
- Cargo Handling Equipment
- Off-Road Zero-Emission Targeted Manufacturer Rule
- Spark-Ignition Marine Engine Standards

Other

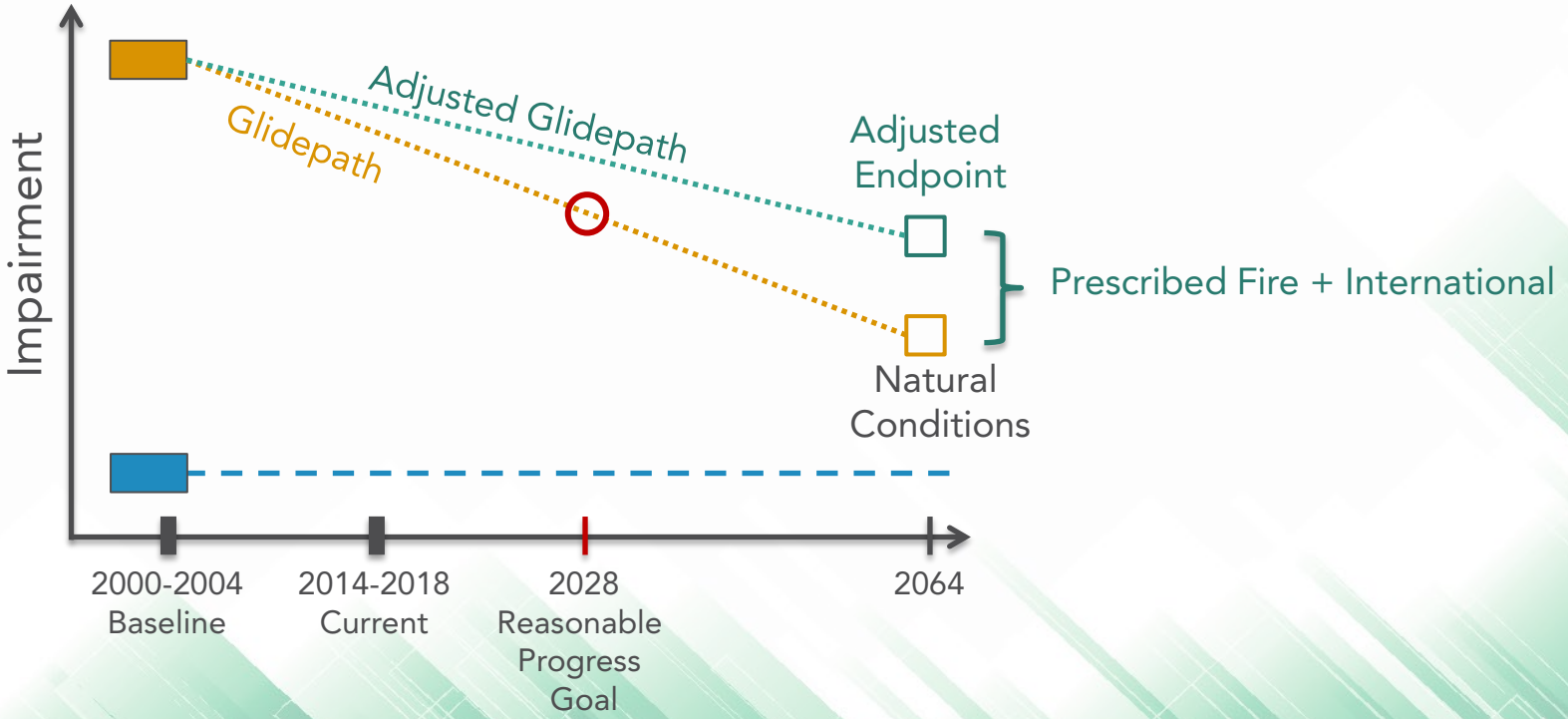
- Consumer Products
- Zero-Emission Standard for Space & Water Heaters

Primarily Federally-Regulated

- In-Use Locomotives
- Measures for Aviation Emissions Reductions
- Measures for Ocean-Going Vessel Emission Reductions

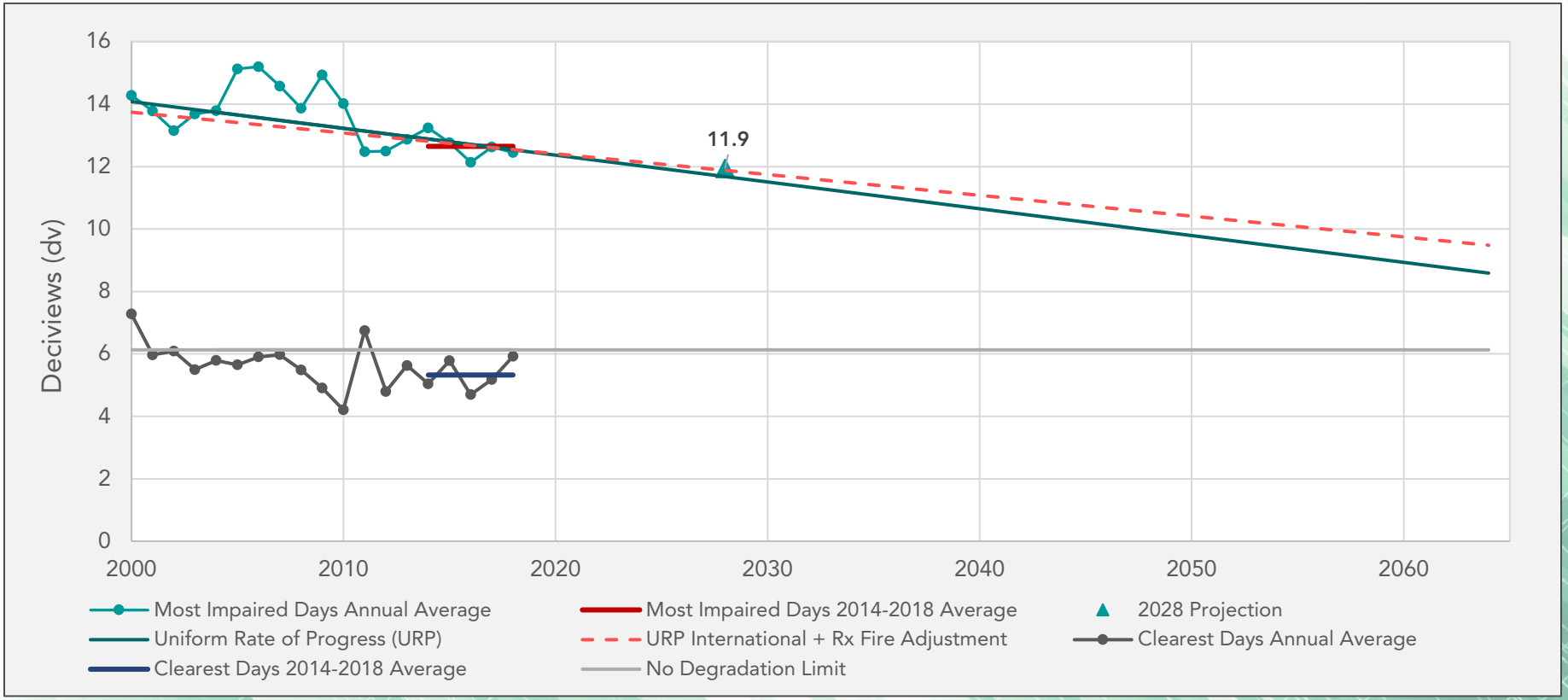
CARB

Visibility Conditions – Projections & Thresholds



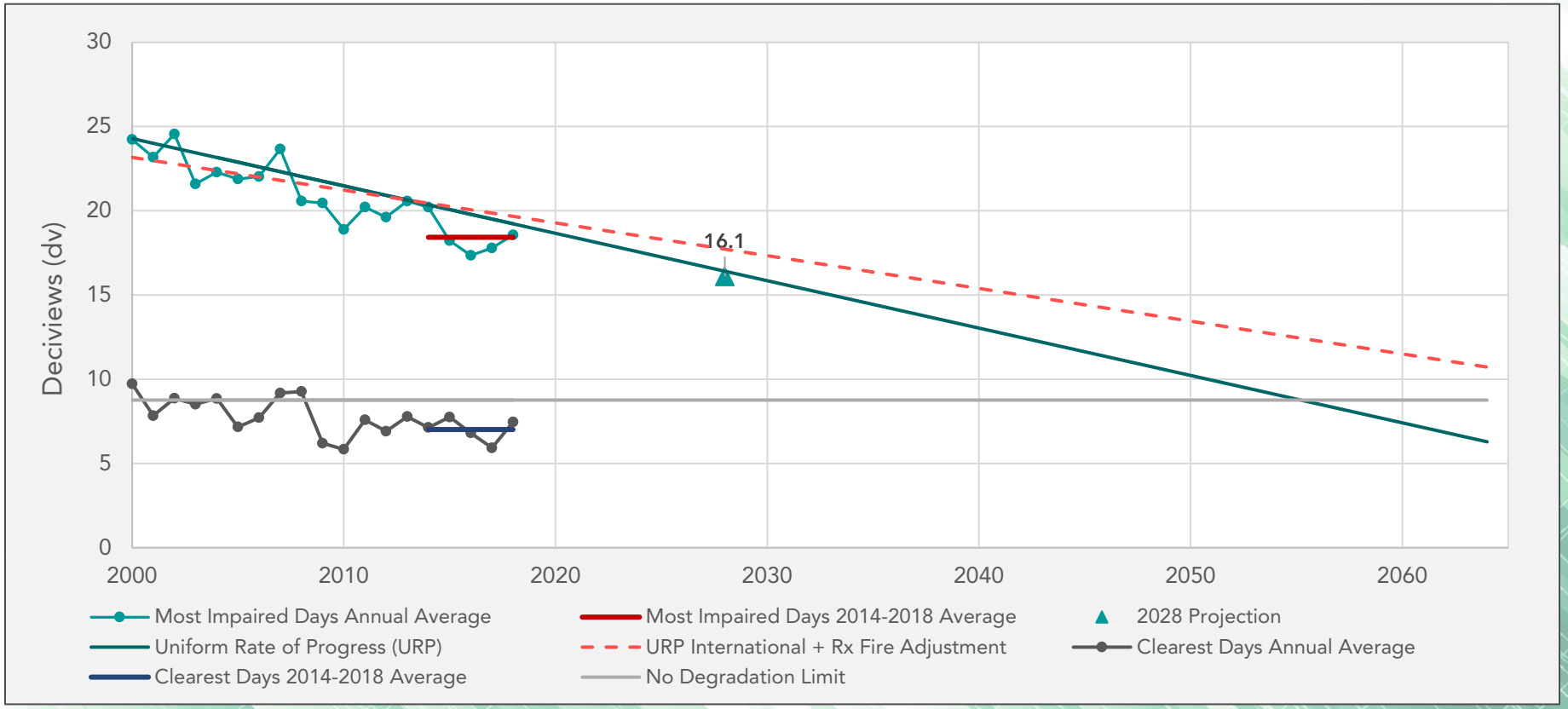
CARB

Redwood National Park - Tracking Metrics



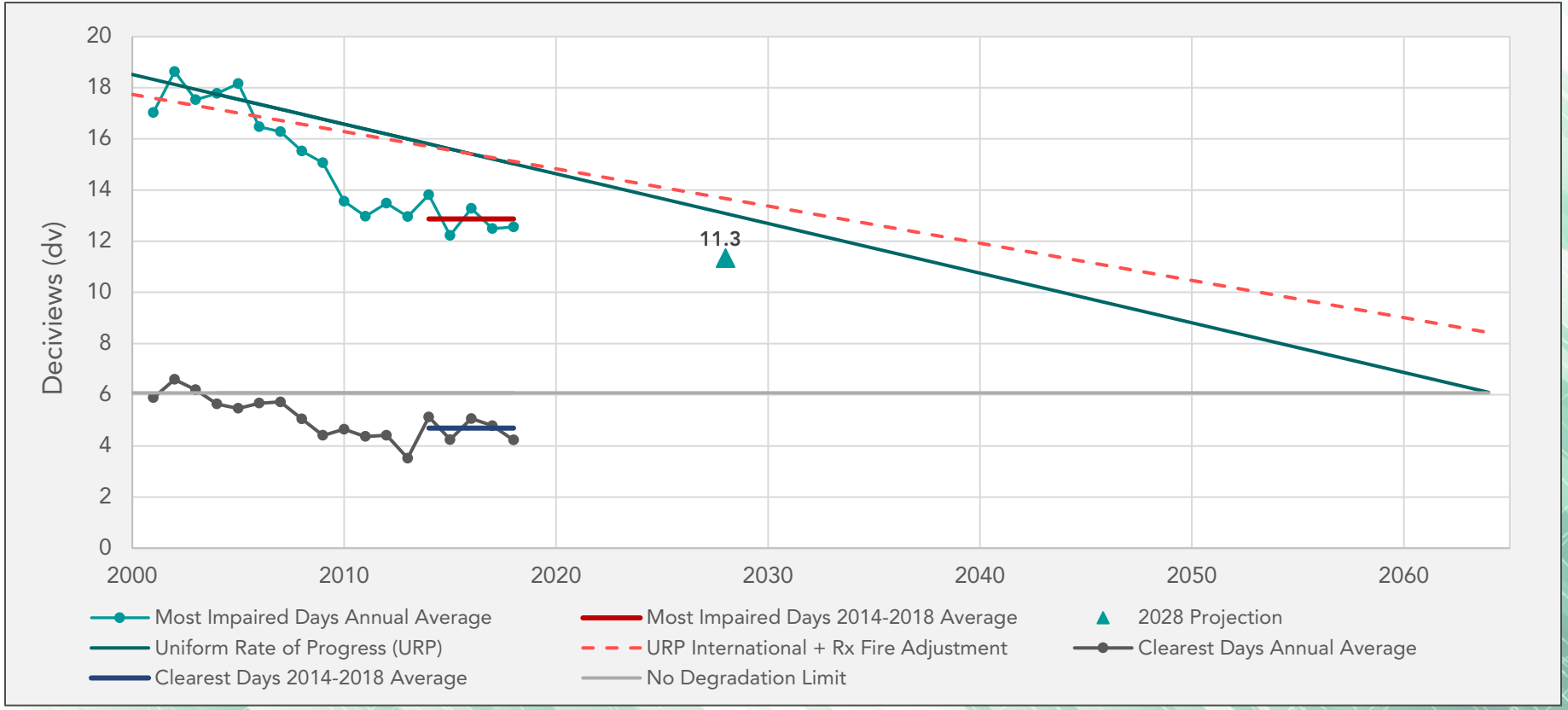
CARB

Sequoia National Park - Tracking Metrics



CARB

Joshua Tree National Park - Tracking Metrics



CARB

Northern California – Most Impaired Days

Site	2000-2004 Baseline Visibility (dv)	2014-2018 Current Visibility (dv)	2028 with Adjusted URP (dv)	2028 Progress Goal (dv)
LABE1	11.3	9.7	9.5	8.9
REDW1	13.7	12.6	11.9	11.9
TRIN1	11.9	10.4	10.6	9.5
LAVO1	11.5	10.2	9.9	9.4
BLIS1	10.1	9.3	8.6	8.3
PORE1	19.4	15.3	15.7	14.4
YOSE1	13.5	11.6	11.3	10.4

Central California – Most Impaired Days

Site	2000-2004 Baseline Visibility (dv)	2014-2018 Current Visibility (dv)	2028 with Adjusted URP (dv)	2028 Progress Goal (dv)
HOOV1	8.9	7.8	8.0	7.1
KAIS1	12.9	11.0	11.5	9.8
PINN1	17.0	14.1	13.6	13.0
SEQU1	23.2	18.4	17.7	16.1
RAFA1	17.3	14.1	13.6	13.0

Southern California – Most Impaired Days

Site	2000-2004 Baseline Visibility (dv)	2014-2018 Current Visibility (dv)	2028 with Adjusted URP (dv)	2028 Progress Goal (dv)
DOME1	17.2	15.1	13.7	13.7
SAGA1	17.9	13.2	13.5	11.5
SAGO1	20.4	14.4	15.1	12.0
JOSH1	17.7	12.9	13.7	11.3
AGTI1	21.6	16.3	17.0	14.5

Summary

- Visibility is improving across California
- Emissions are decreasing
- Mobile source emission reductions are key
- Assessment of sources causing impairment continues in future planning periods

CARB


Lava Beds National Monument

Schedule

- FLM Review Period: February 9 through April 11
- Post Draft: May 2022
- Board Consideration: June 2022
- Submit to U.S. EPA: Summer of 2022

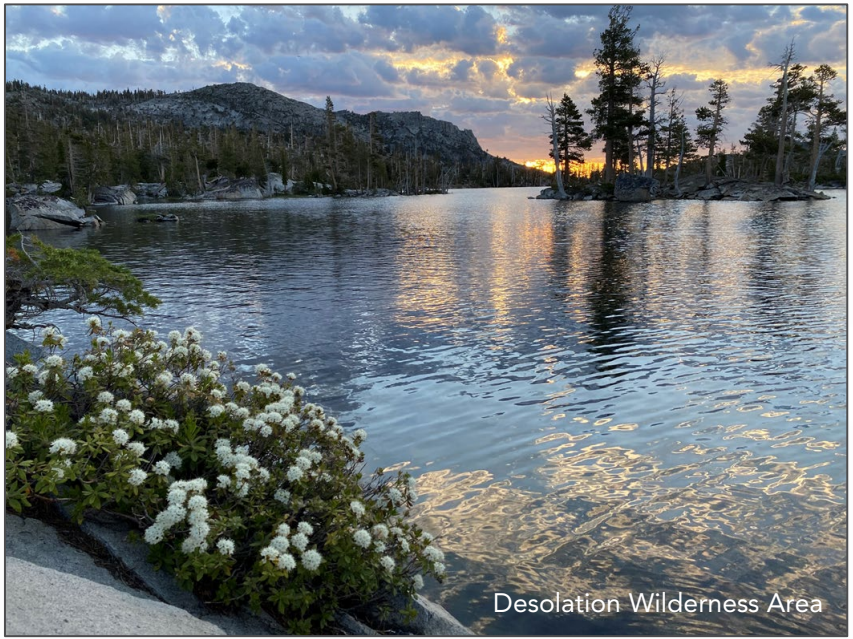
Regional Haze Contacts

Rebekka Fine, Lead Staff
Email: rebekka.fine@arb.ca.gov

Ali Adams, Manager
Email: alicia.adams@arb.ca.gov

Sylvia Vanderspek, Branch Chief
Email: sylvia.vanderspek@arb.ca.gov

CARB



Thank you!

CARB

Photography Credits

Slide 1: John Muir Wilderness Area, courtesy of Rebecca Garcia; Ansel Adams Wilderness Area, courtesy of Rebekka Fine; Domeland Wilderness Area, courtesy of Jeff Kessler; Emigrant Wilderness Area, courtesy of Jeff Kessler; Hoover Wilderness Area, courtesy of Nicole Dolney

Slide 2: Redwood National Park, courtesy of Jeff Kessler

Slide 3: Hoover Wilderness Area, courtesy of Nicole Dolney

Slide 5: IMPROVE monitoring sites, http://vista.cira.colostate.edu/Improve/monitoring-site-browser/

Slide 8: Lassen Volcanic National Park, courtesy of Michele Houghton; Yosemite National Park, courtesy of Josh Berghouse

Slide 15: Redwood National Park, courtesy of Jeff Kessler

Slide 17: Kings Canyon National Park, courtesy of Jeff Kessler; Ventana Wilderness Area, courtesy of Jeff Kessler

Slide 21: Sequoia National Park, courtesy of Jeff Kessler

Slide 23: Domeland Wilderness Area, courtesy of Jeff Kessler; San Jacinto Wilderness Area, courtesy of Jeff Kessler

Slide 27: Joshua Tree National Park, public domain photographs courtesy of NPS

Slide 28: San Gabriel Wilderness Area, courtesy of Jeff Kessler

Slide 31: Lava Beds National Monument, courtesy of Kathy Leuterio; Mokelumne Wilderness Area, courtesy of Jeff Kessler

Slide 37: Joshua Tree National Park, public domain photograph courtesy of NPS

Slide 46: Lassen Volcanic National Park, courtesy of Jeff Kessler; Hoover Wilderness Area, courtesy of Nicole Dolney; Point Reyes National Seashore, courtesy of Jeff Kessler; San Jacinto Wilderness Area, courtesy of Jeff Kessler

Slide 48: Desolation Wilderness Area, courtesy of Nicole Dolney