

Tracking Visibility Progress in the Regional Haze Rule

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Environmental Protection Agency

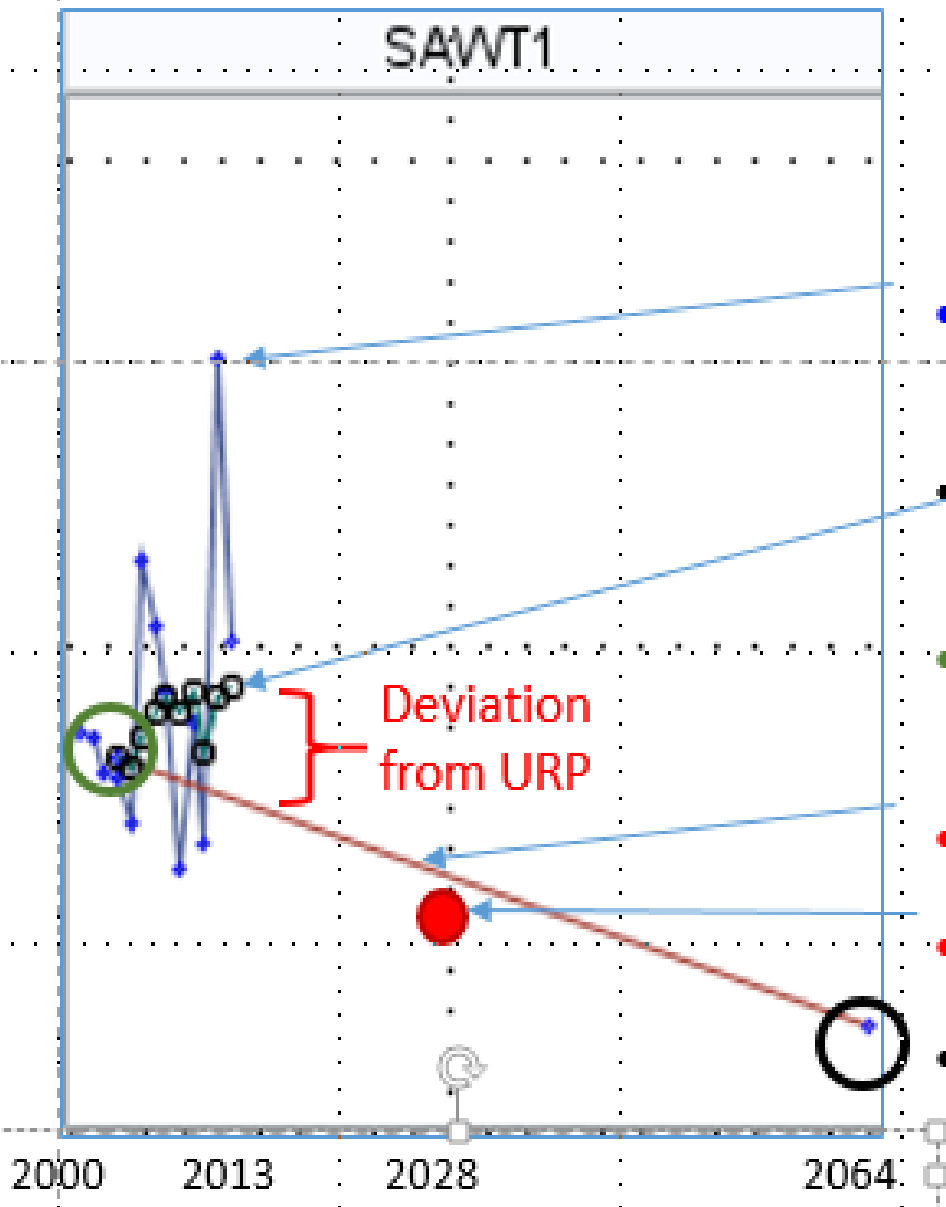
Problem

- The current tracking metric does not show steady downward progress for many western Class I areas, despite steady downward regional emissions, because of the frequent poor visibility resulting from recurring wildfires and dust storms
- The 5 base years (2000-04) and the estimates for natural conditions do not adequately reflect current impacts of extreme events

Goals

- Allow the metric to track impairment from anthropogenic sources
- Remove the random deviation from the ambient trend line associated with unusually high or low fire or dust storm activity
- Generate new Uniform Rate of Progress (URP) lines for all areas that reflect the removal of extreme events and are more even-handed across Class I areas and states with different frequencies of extreme events, to allow the ambient trend lines and the URP lines to be fairly compared

Tracking Metric Basics

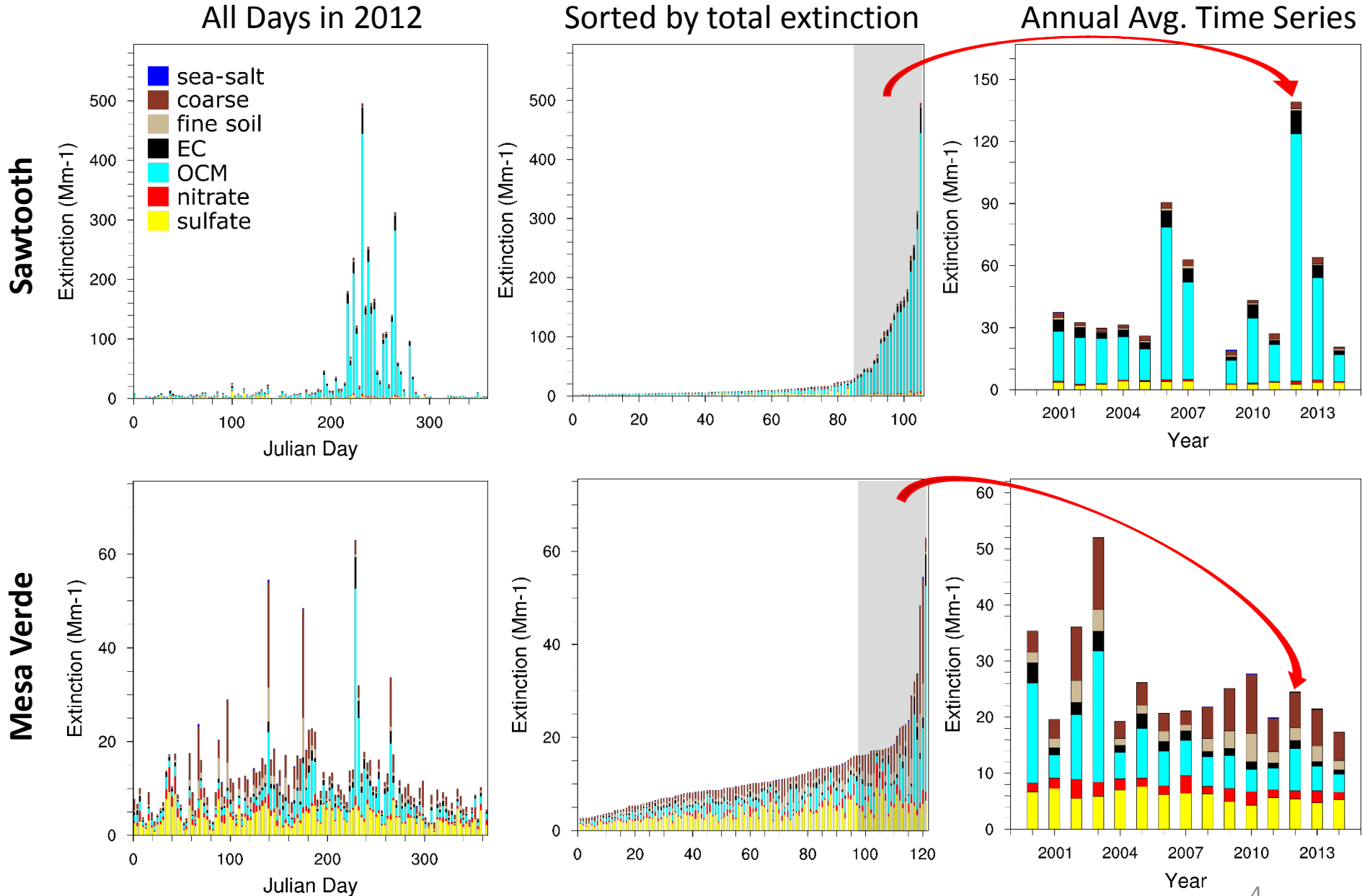


- Avg of worst 20% days per year, expressed in dv units.
- 5-yr running averages used to judge current conditions.
- Baseline: 5-yr average of annual values, 2000-2004
- Linear rate of dv change per year
- Modeled future year impairment
- Natural Conditions for 2064

How is the tracking metric used?

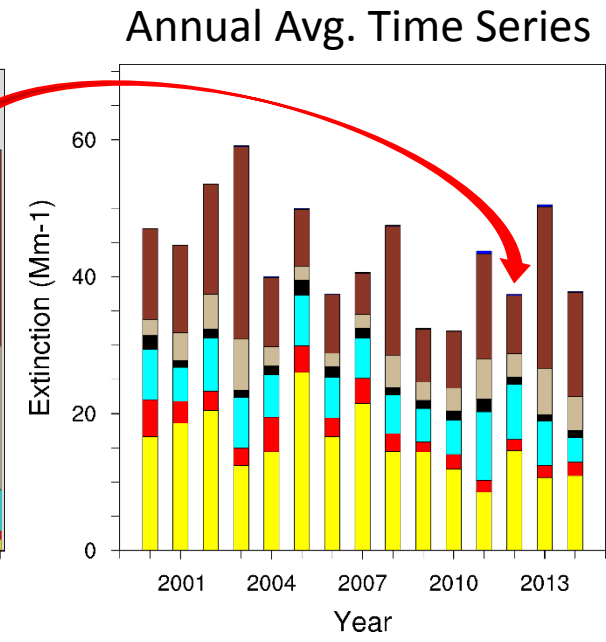
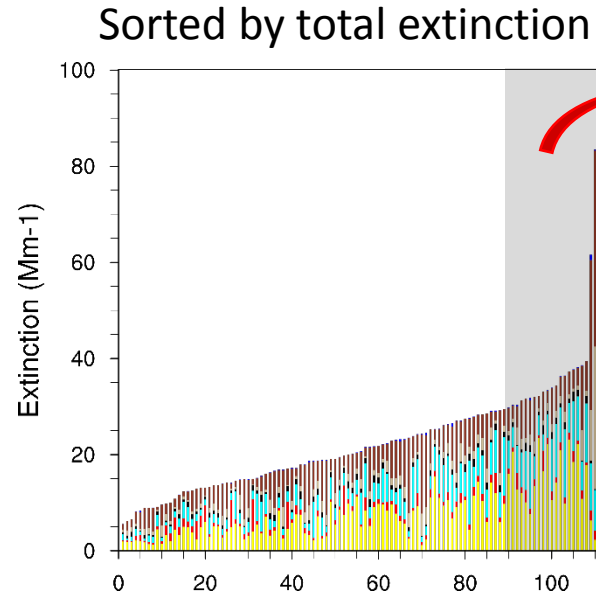
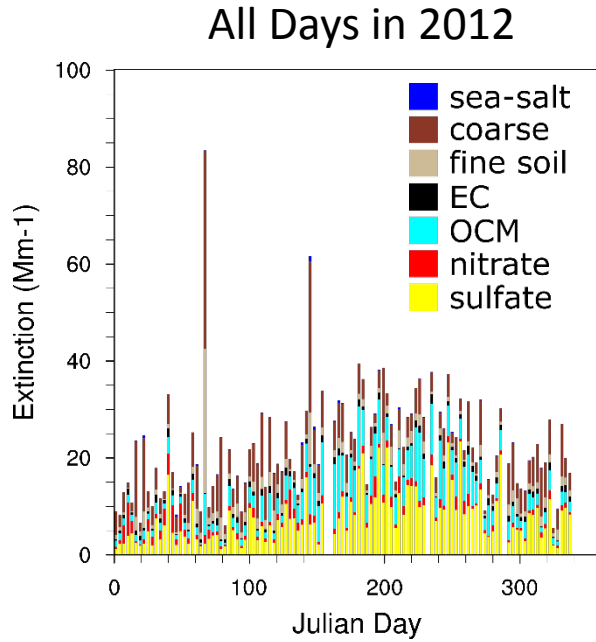
- States use baseline and current (most recent 5 years) visibility data in their periodic progress reports
 - Compare the trend in current visibility conditions with the RPGs
 - Used to communicate with the public
- The URP (glidepath between baseline and 2064) is used by states in Regional Haze SIPs as a comparison framework
 - If a state adopts an RPG that provides for slower progress than the URP, then the state must show that controls to meet the URP are not reasonable
 - Being below the URP is not a safe harbor to avoid the requirement to show that the state's control strategy is reasonable
- Once a state has determined its long-term strategy, it uses an air quality model to project the RPG for its Class I area based on the actual visibility data and emissions projections

Current Approach: Sawtooth and Mesa Verde examples with large influence from fires and dust storms

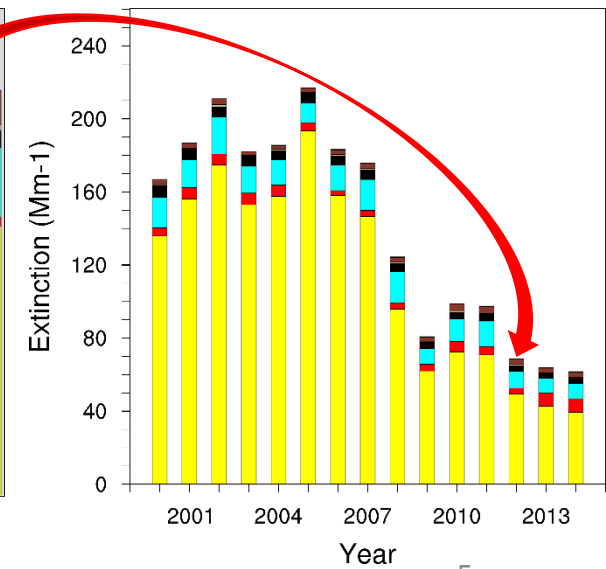
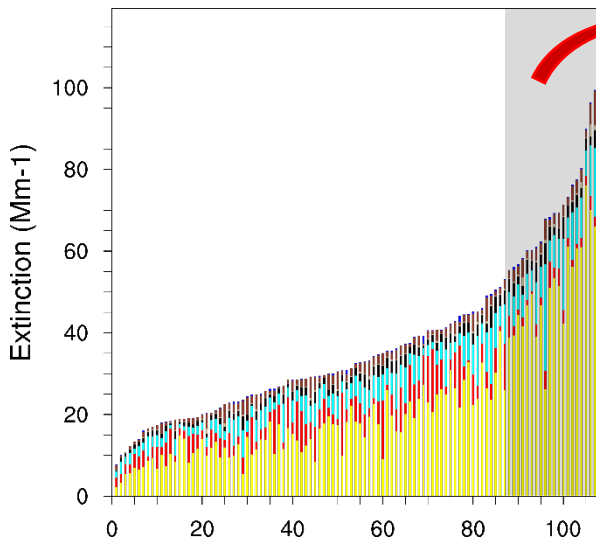
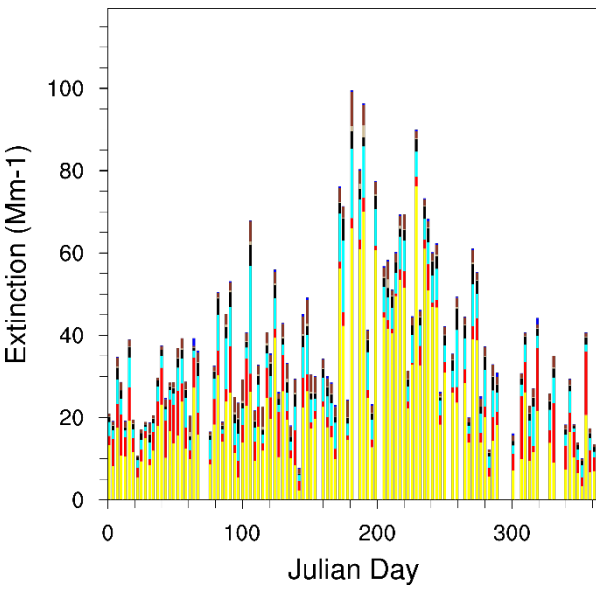


Current Approach: Guadalupe Mtns. and Shenandoah examples with smaller influence from fires and dust storms

Guadalupe Mtns.

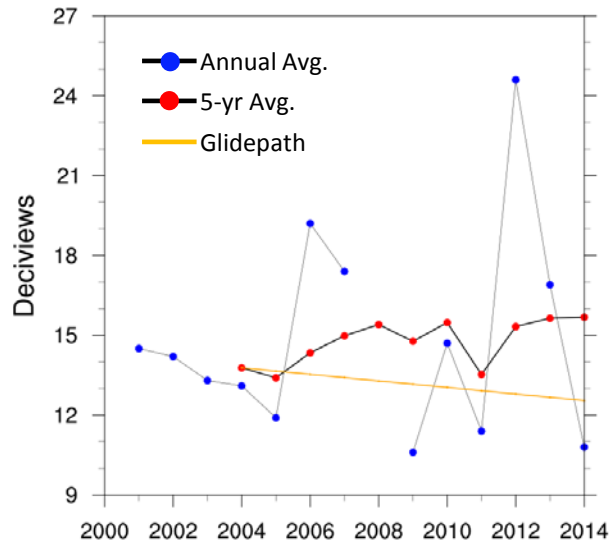


Shenandoah

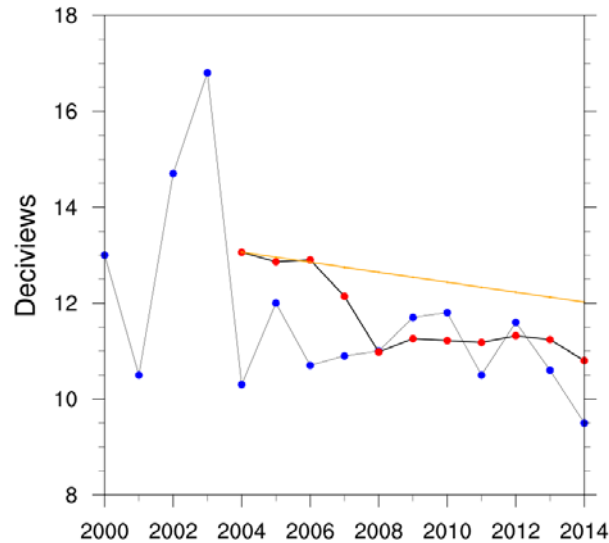


Current Approach: 2014 Glidepath Deviation for Hazyest Days

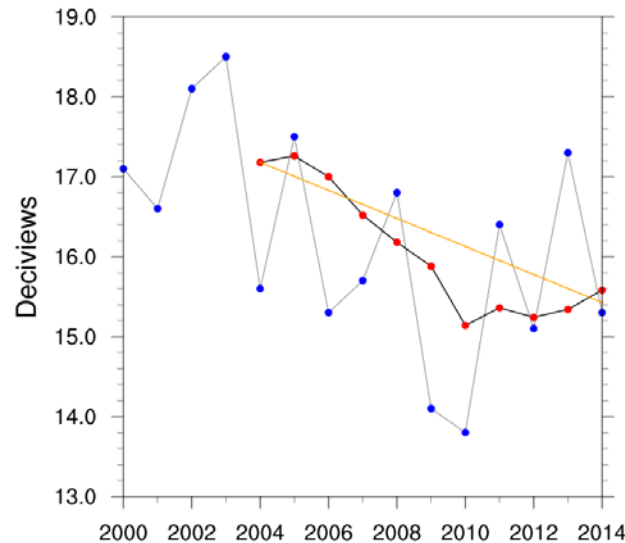
Sawtooth



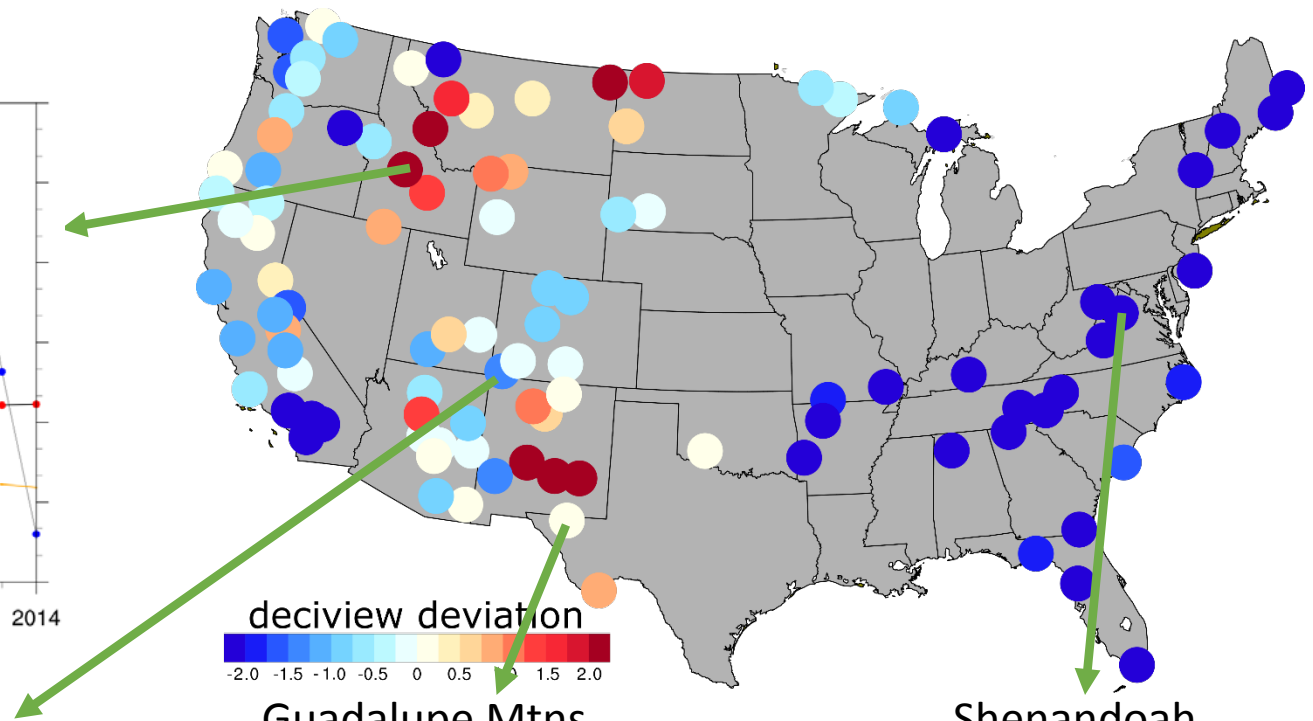
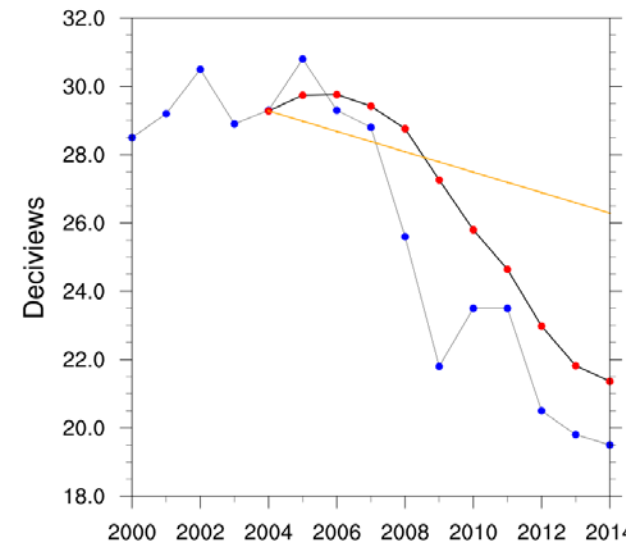
Mesa Verde



Guadalupe Mtns.

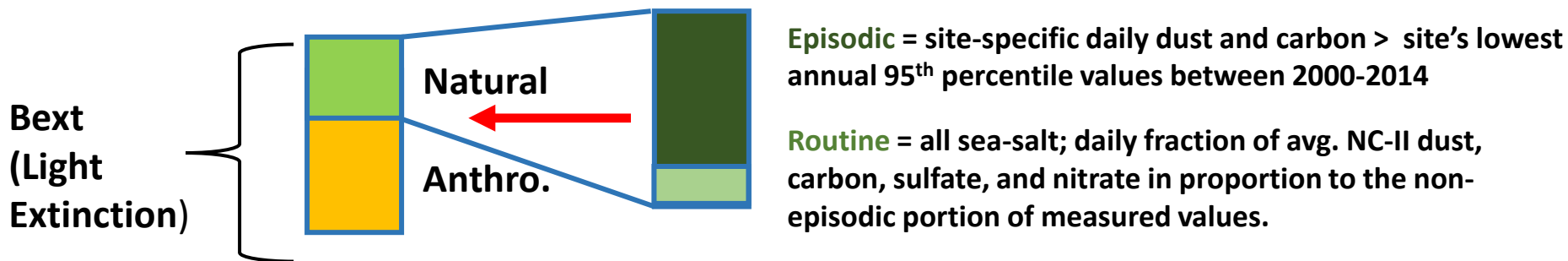


Shenandoah



Components of an Impairment-based Approach

- 1) Split each day of IMPROVE data into natural and anthropogenic extinction components



- 2) Sort: Several visibility indicators to identify the “worst” days:

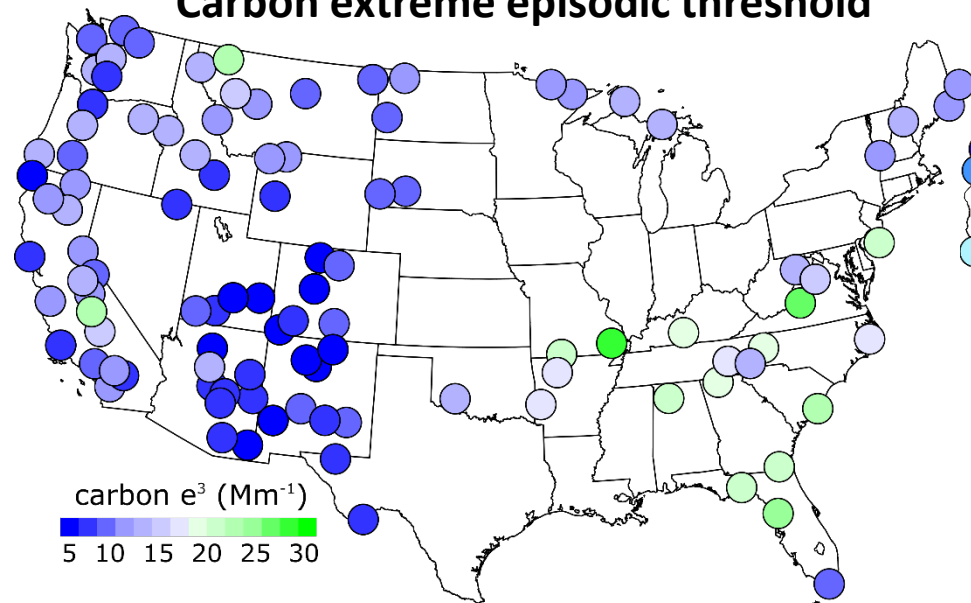
1) Current Approach = Total haze 2) Perceptible Anthro. Impairment Approach = $dv_{Total} - dv_{Nat}$



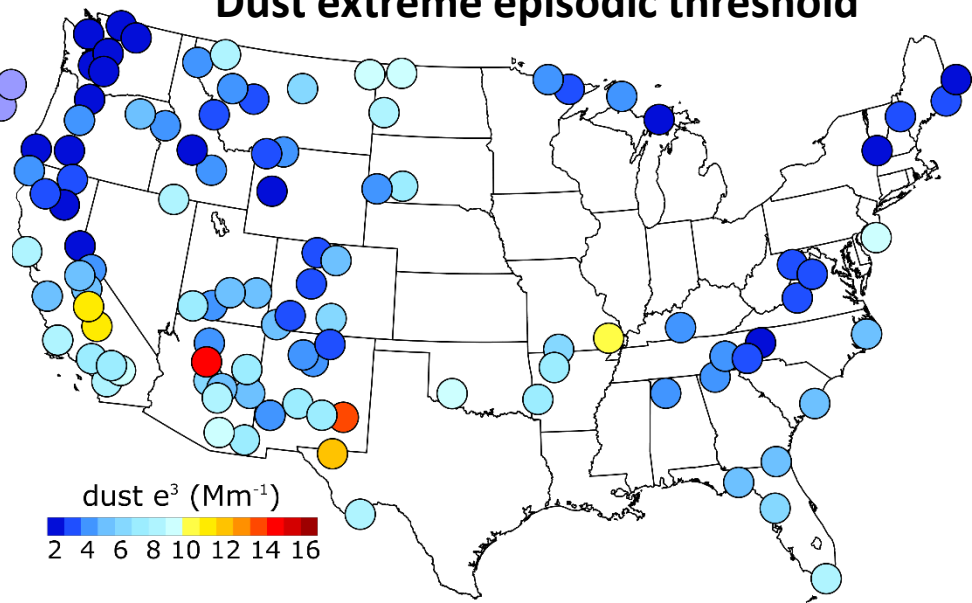
- 3) Select the 20% most impaired days

Anthropogenic/Natural Split: Episodic and Routine Natural Contribution

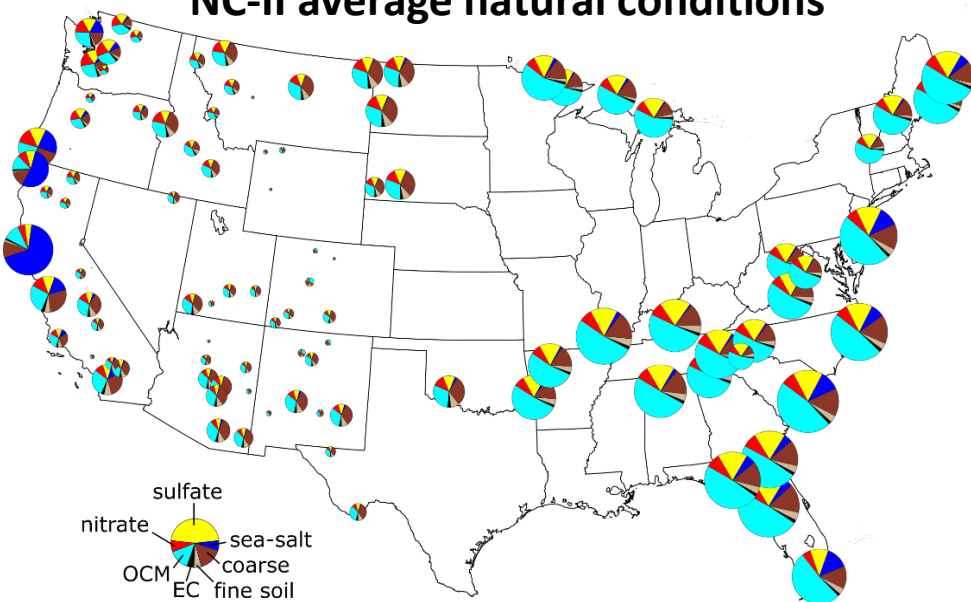
Carbon extreme episodic threshold



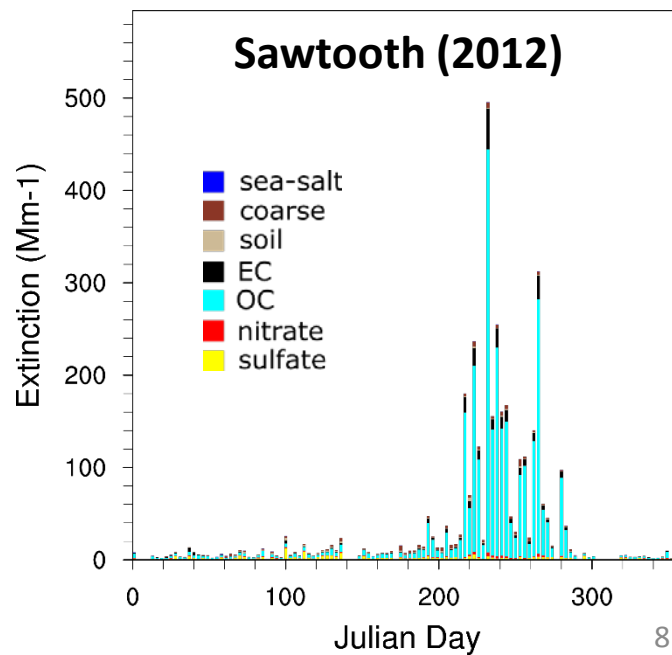
Dust extreme episodic threshold



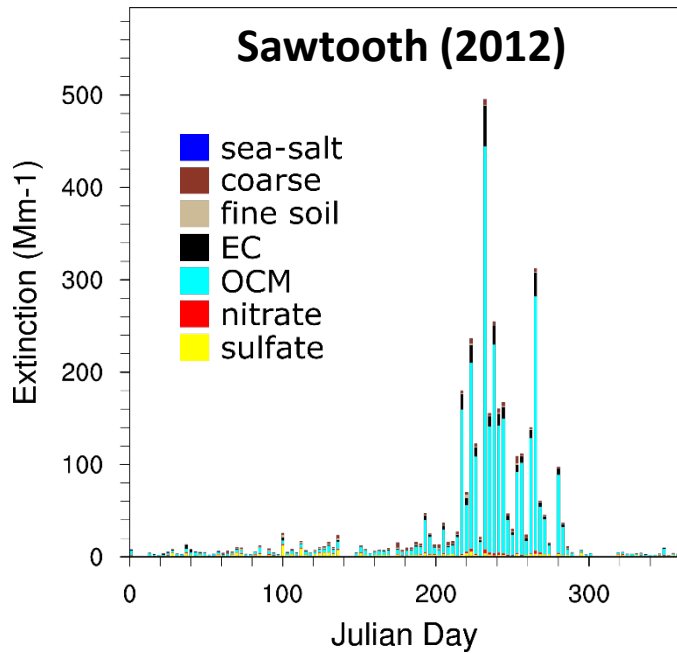
NC-II average natural conditions



Sawtooth (2012)

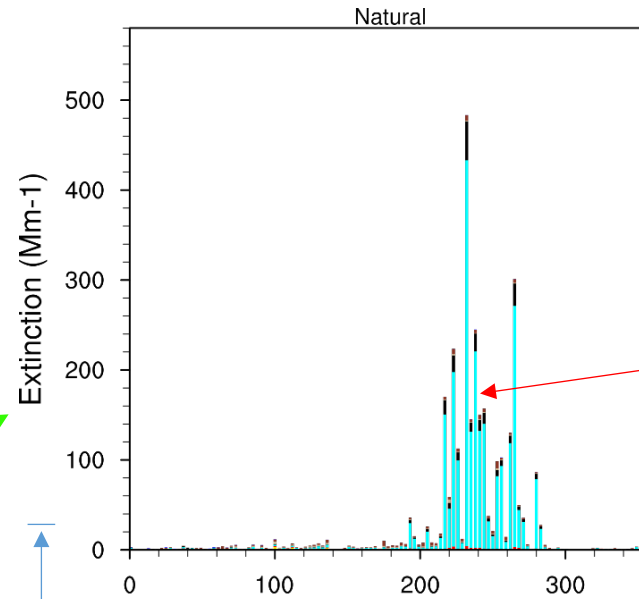


Natural and Anthropogenic Split: Sawtooth 2012

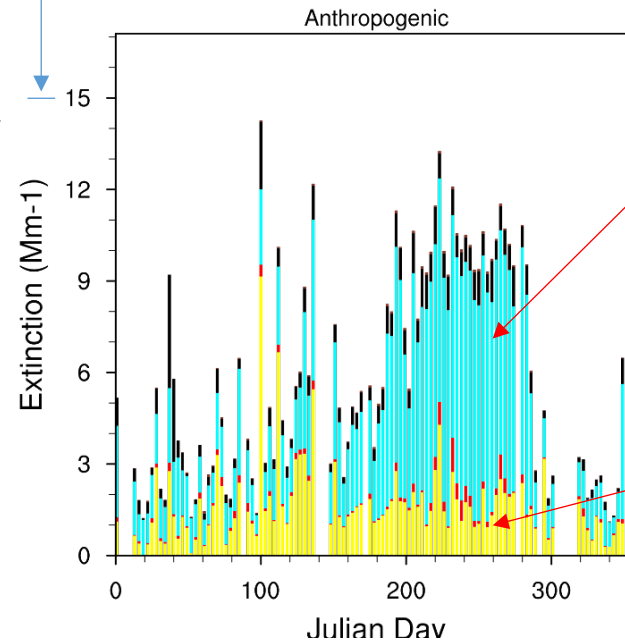


natural

anthropogenic



Includes episodic carbon from wildfires (but may still be too low)

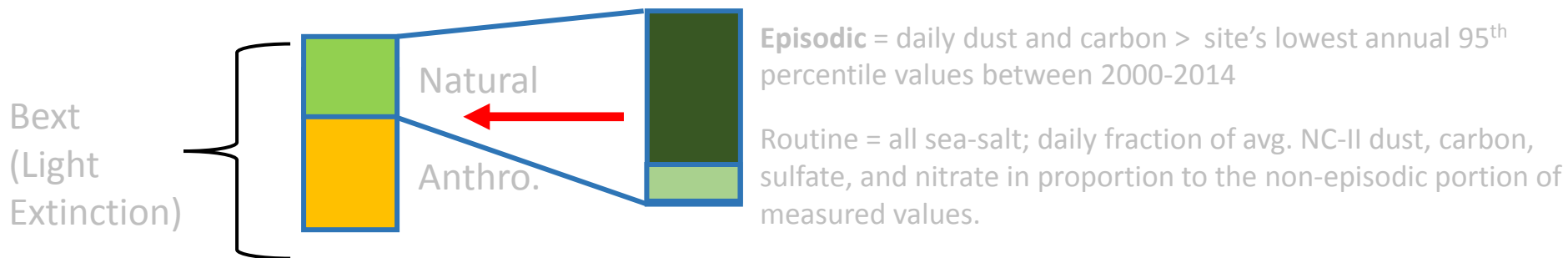


Remaining carbon considered anthropogenic (but may be too high)

Low NC-II #'s keeps most sulfate and nitrate as anthropogenic

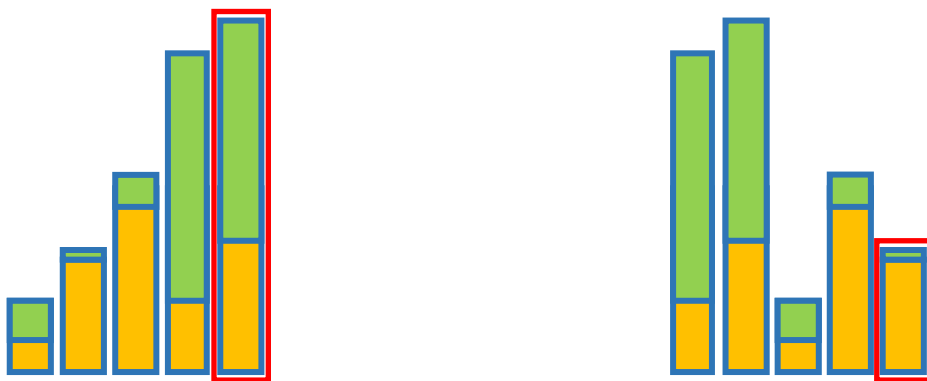
Components of an Impairment-based Approach

- 1) Split each day of IMPROVE data into natural and anthropogenic extinction components



- 2) **Sort:** Several visibility indicators to identify the “worst” days:

~~1) Current Approach = Total haze~~ 2) **Perceptible Anthro. Impairment Approach = $dv_{Total} - dv_{Nat}$**

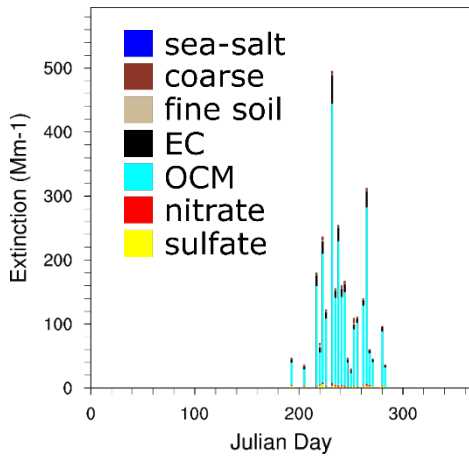


- 3) Select the **20% most impaired days**

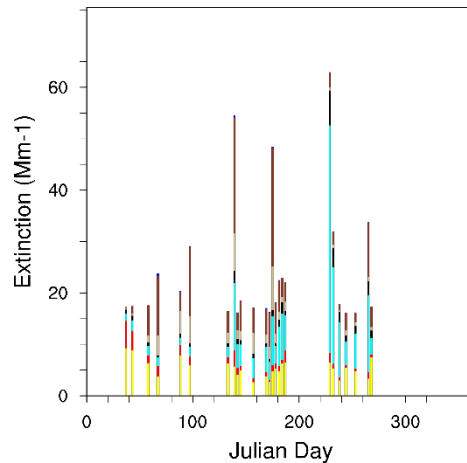
Seasonality of 20% haziest/most impaired for 2012

Current: Total extinction on the 20% haziest days

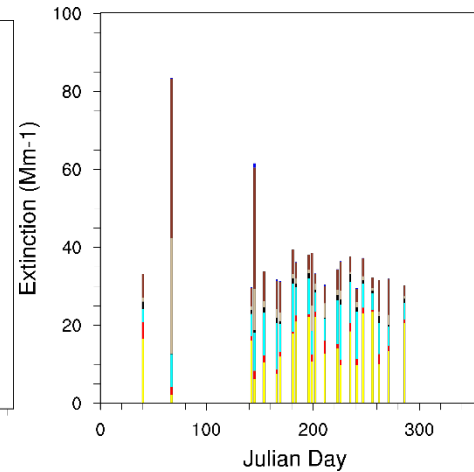
Sawtooth



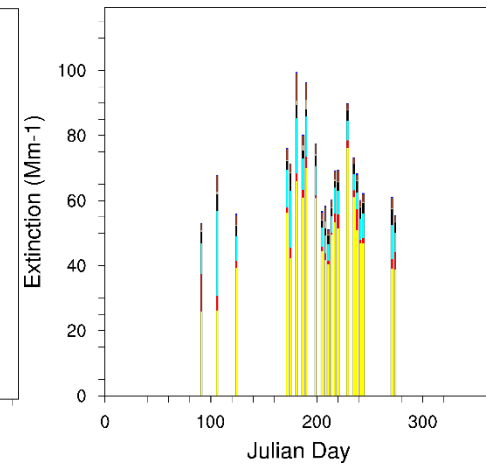
Mesa Verde



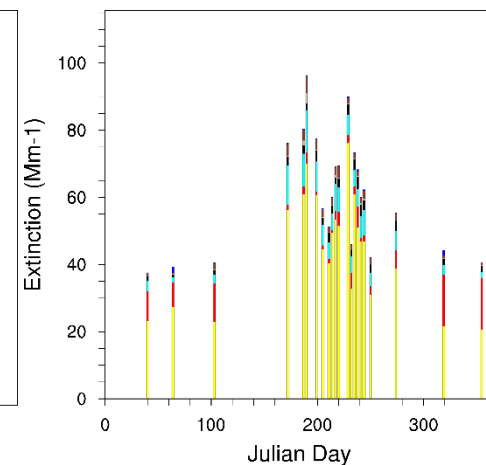
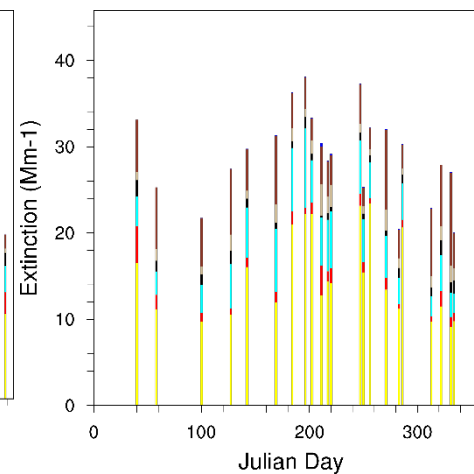
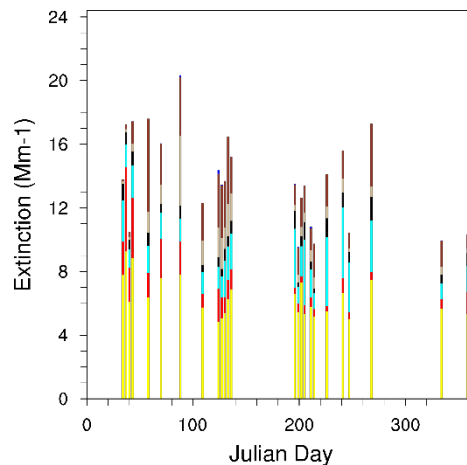
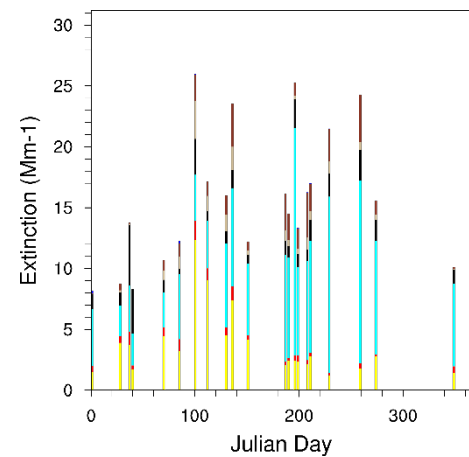
Guadalupe Mtns.



Shenandoah

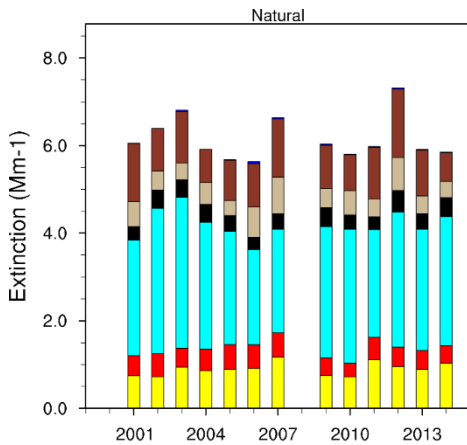


Impairment: Total extinction on the 20% most impaired days

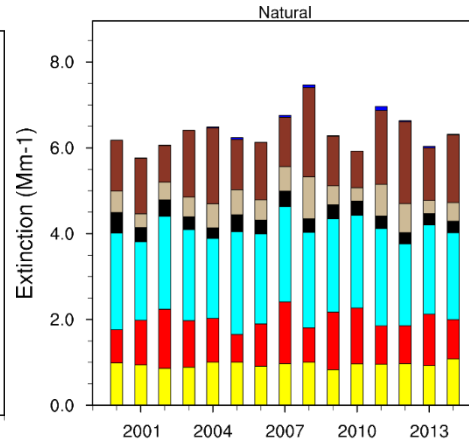


Impairment Approach: 20% Most Impaired Time Series

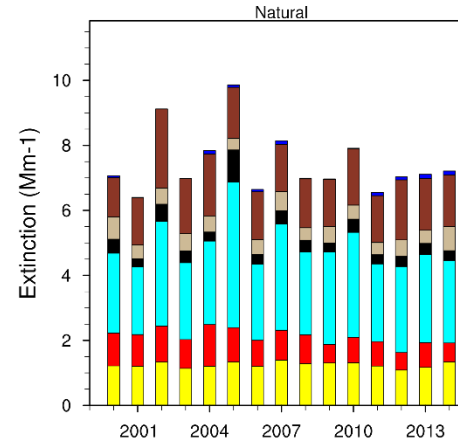
Sawtooth



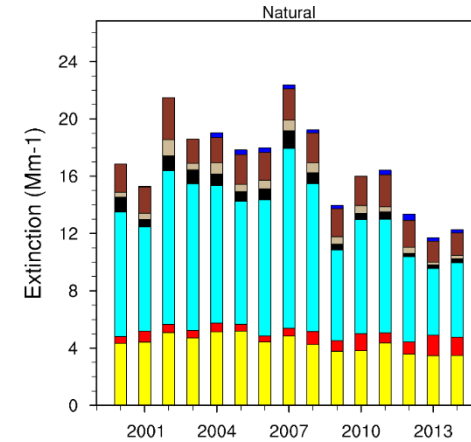
Mesa Verde



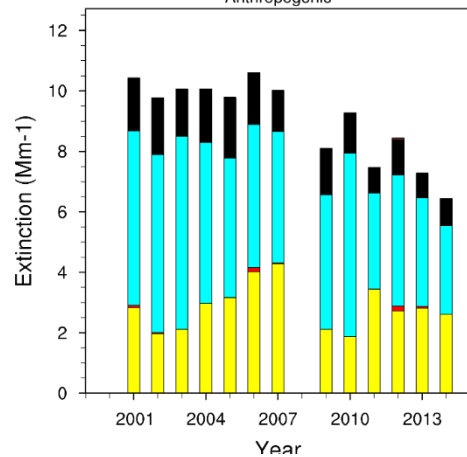
Guadalupe Mtns.



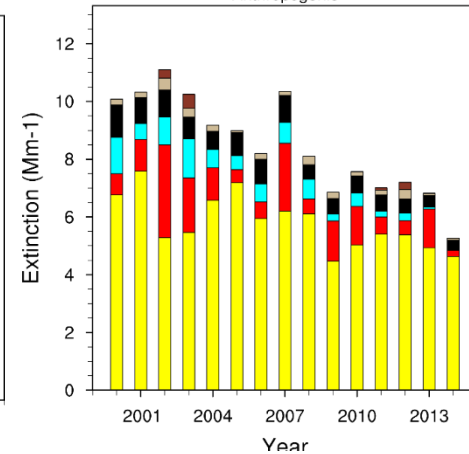
Shenandoah



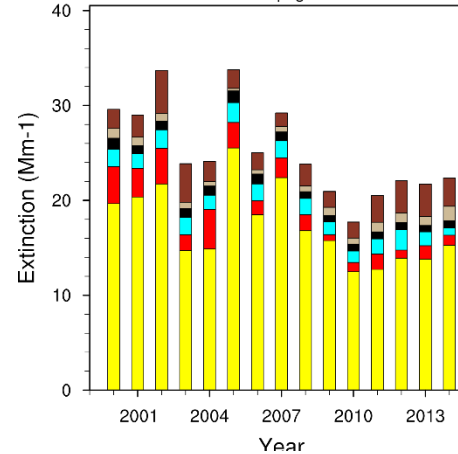
Anthropogenic



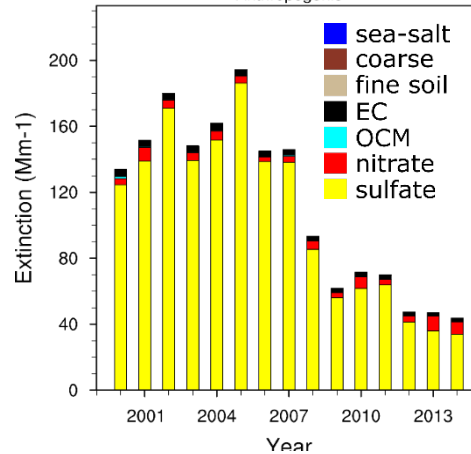
Anthropogenic



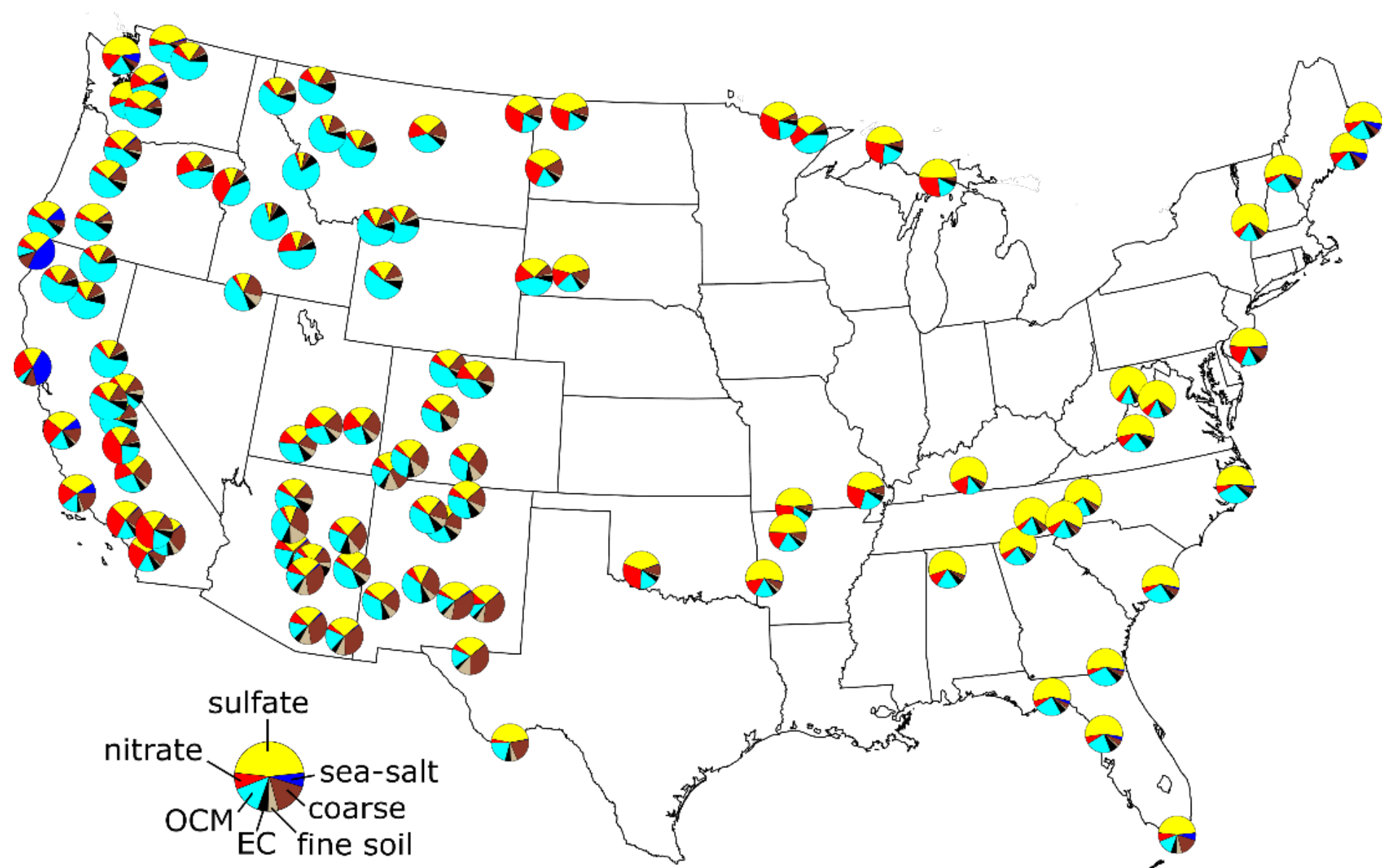
Anthropogenic



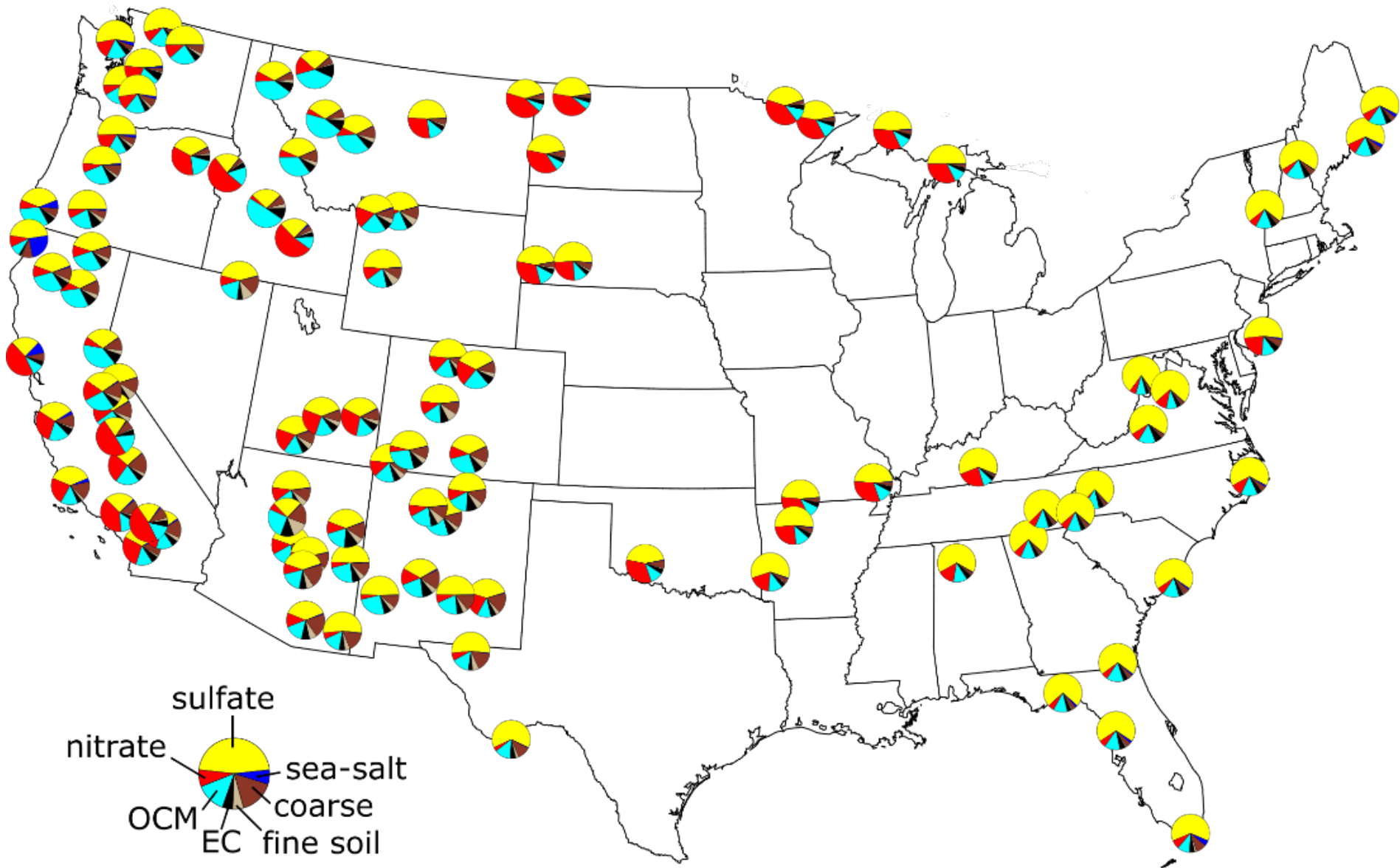
Anthropogenic



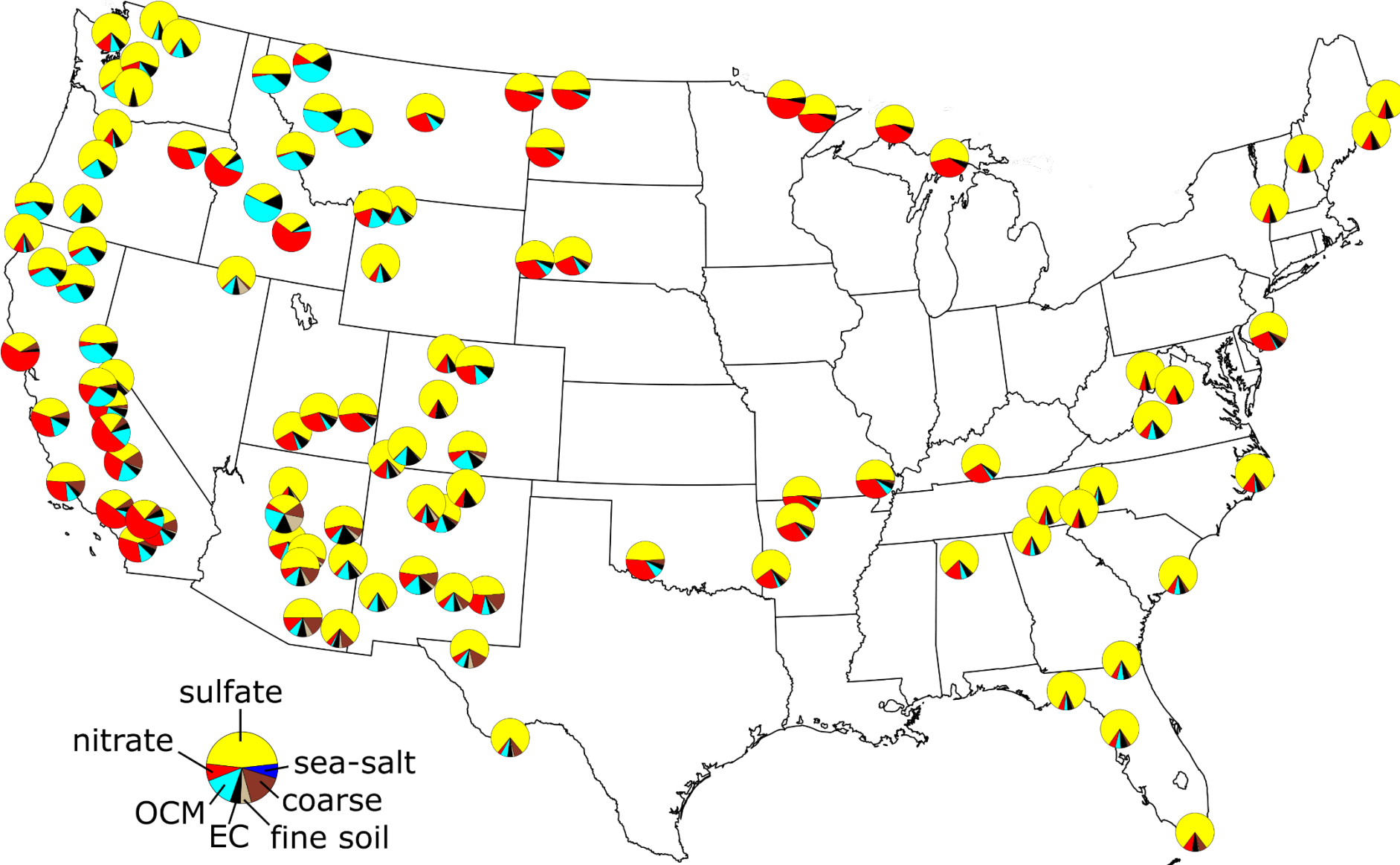
Current Approach: Total Composition of 20% Haziest Days 2010-2014



Impairment Approach: Total Composition of 20% Most Impaired Days 2010-2014



Impairment Approach: Anthropogenic Composition of 20% Most Impaired Days 2010-2014



Change in Anthropogenic Composition of 20% Most Impaired Days

2000-2004

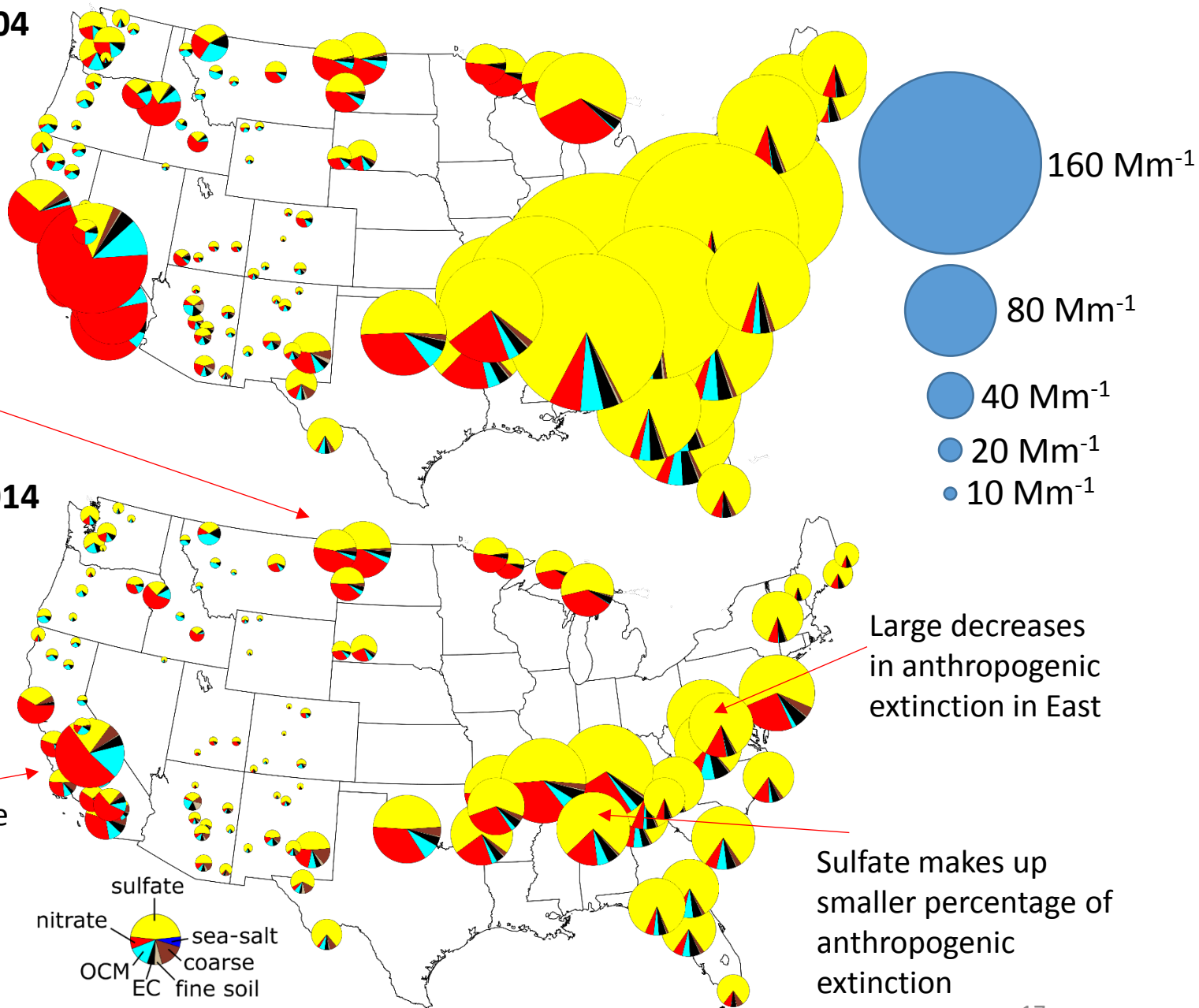
Little change or small increases in anthropogenic extinction in Dakotas

2010-2014

Large decreases in anthropogenic nitrate in California

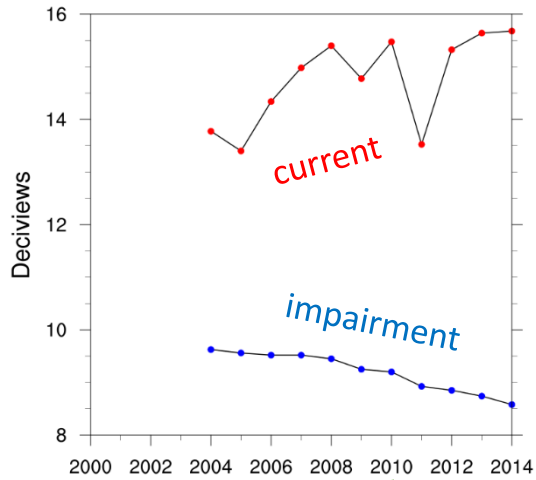
Large decreases in anthropogenic extinction in East

Sulfate makes up smaller percentage of anthropogenic extinction

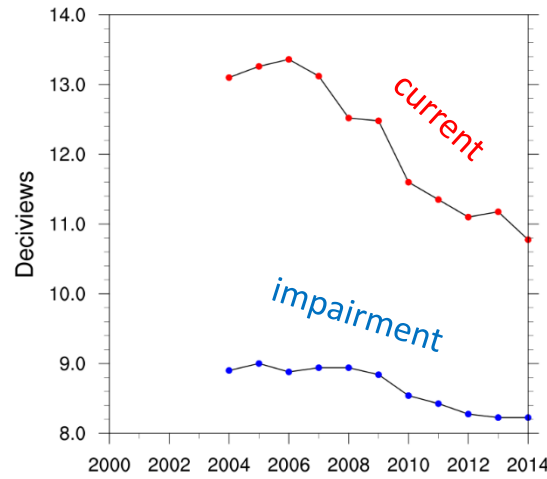


Impairment Approach: Δ slope from Current

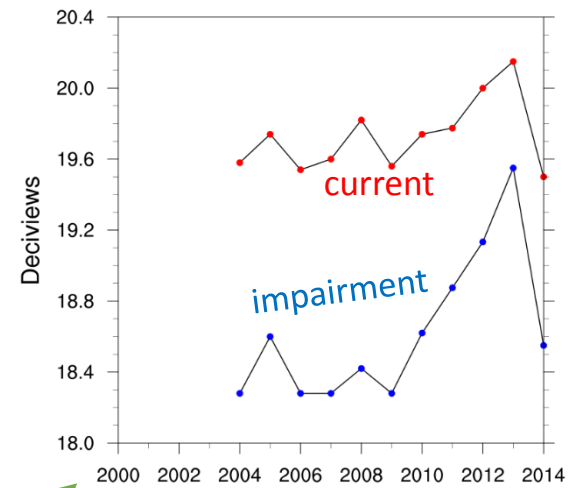
Sawtooth



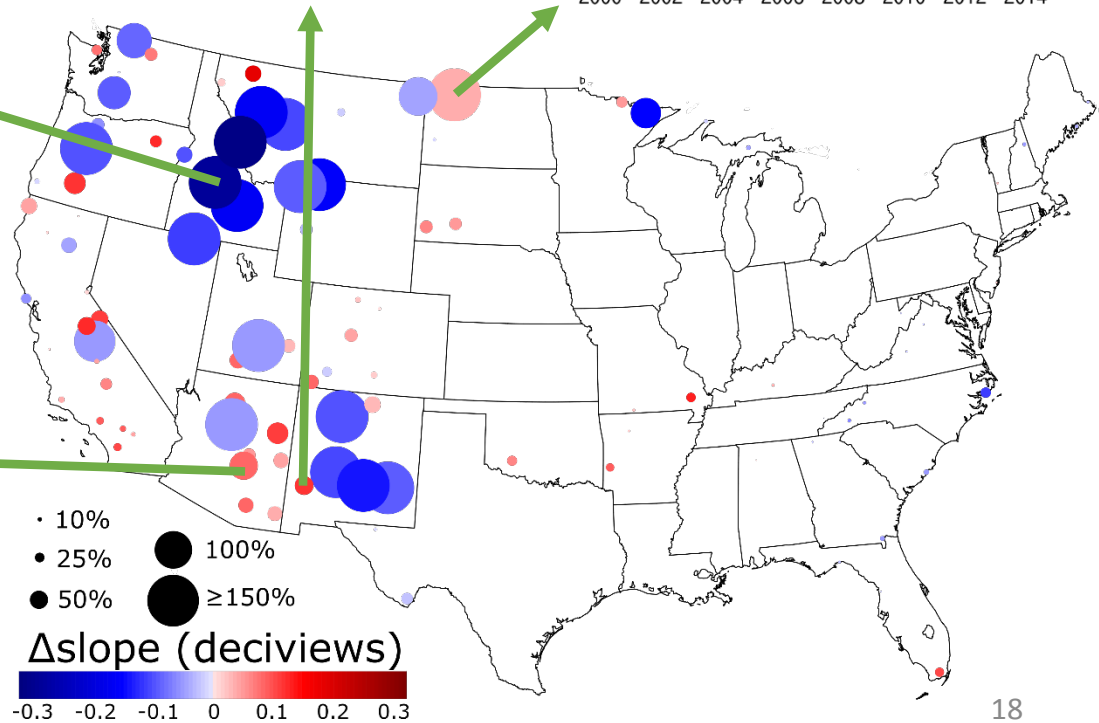
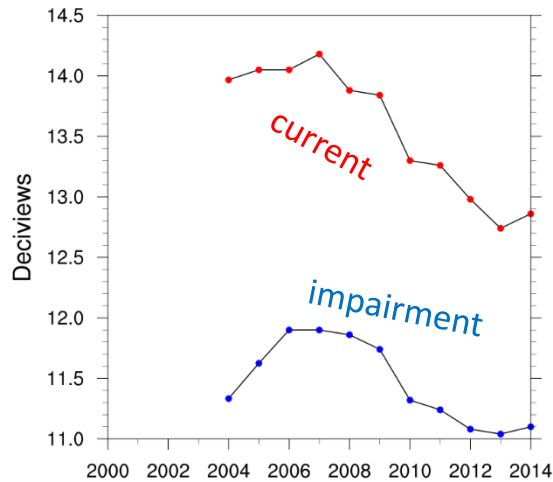
Gila Wilderness



Lostwood

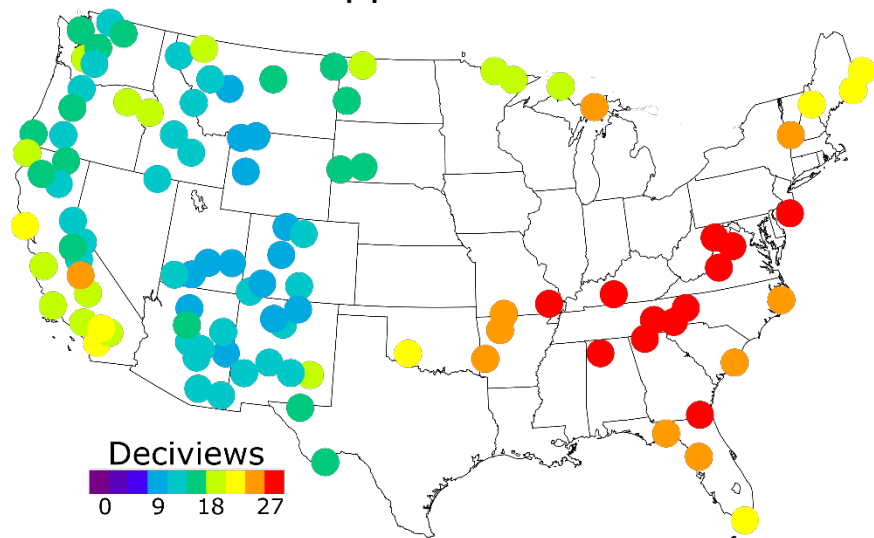


Tonto National Mon.

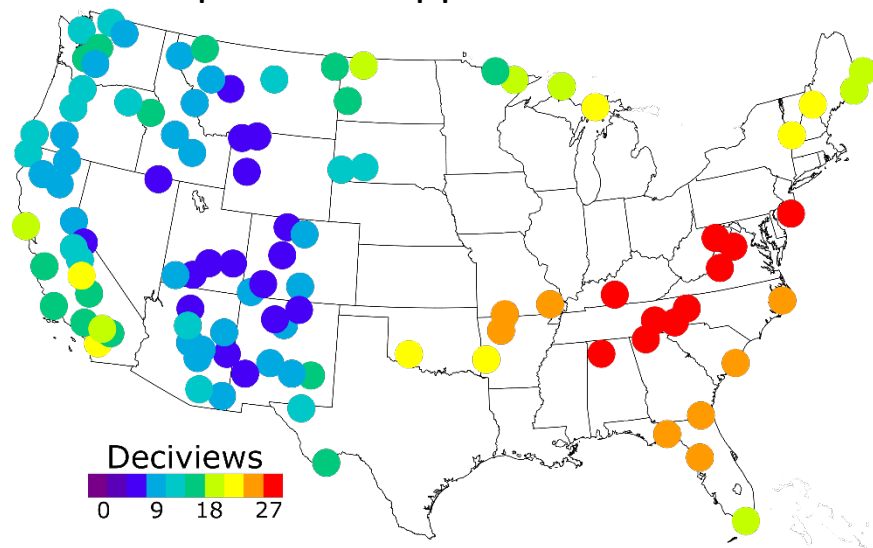


Anthropogenic/Natural Split allows us to derive a 15-year average natural condition estimate for 20% most impaired days

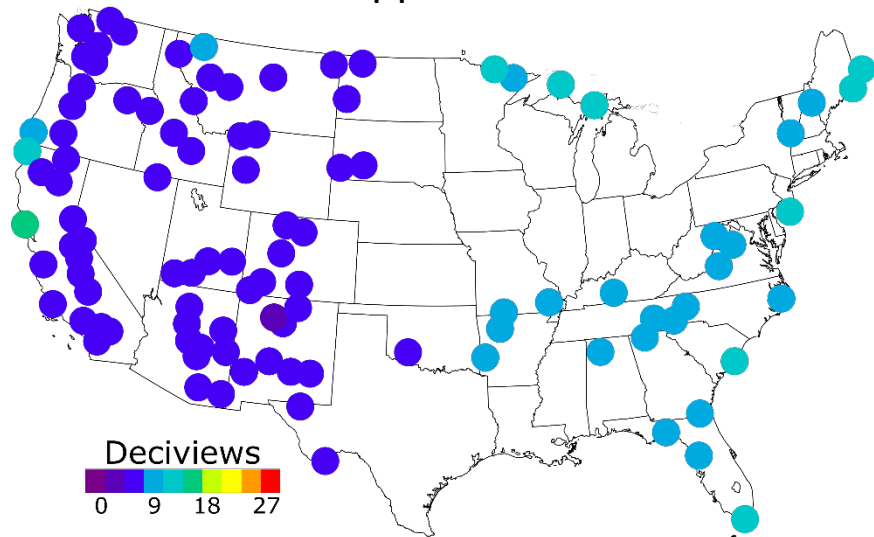
Current Approach 2000-2004



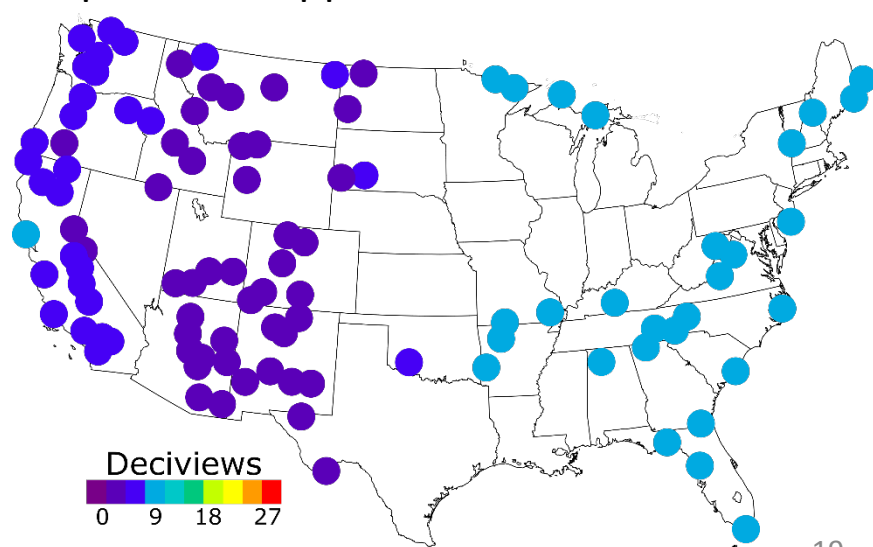
Impairment Approach 2000-2004



Current Approach NC-II 90

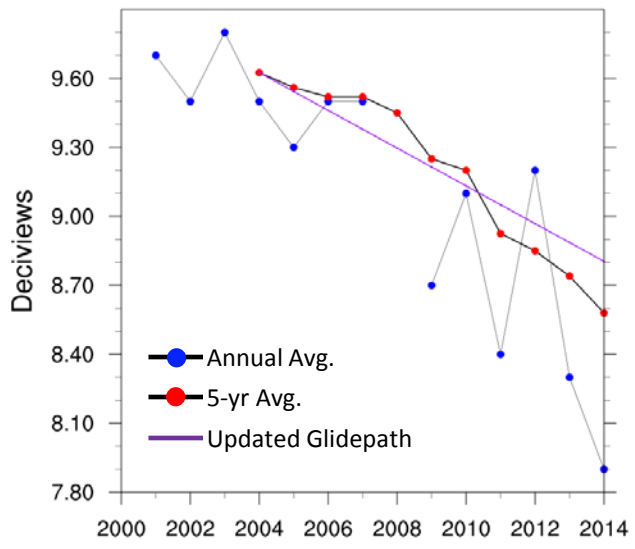


Impairment Approach-derived NC 2000-2014

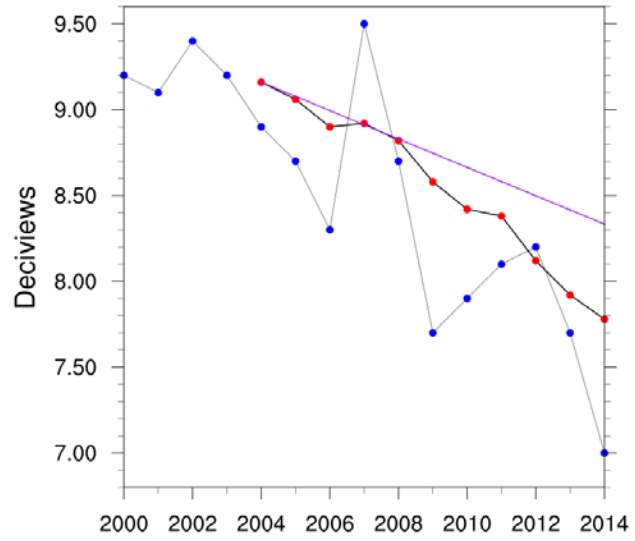


Impairment Approach: 2014 glideslope deviation using the new 2064 endpoint

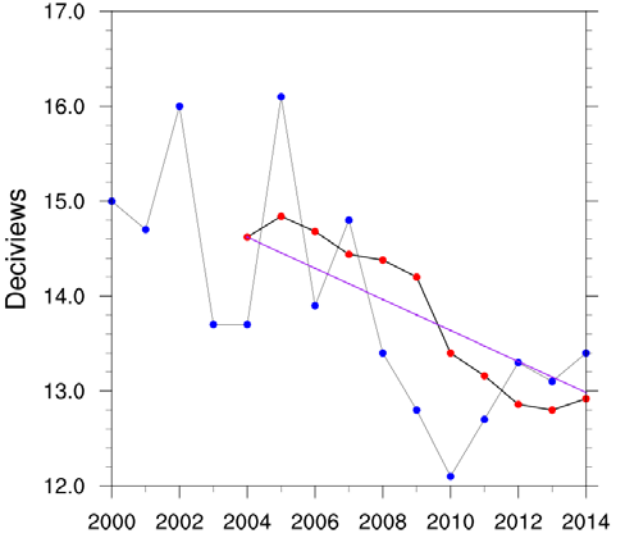
Sawtooth



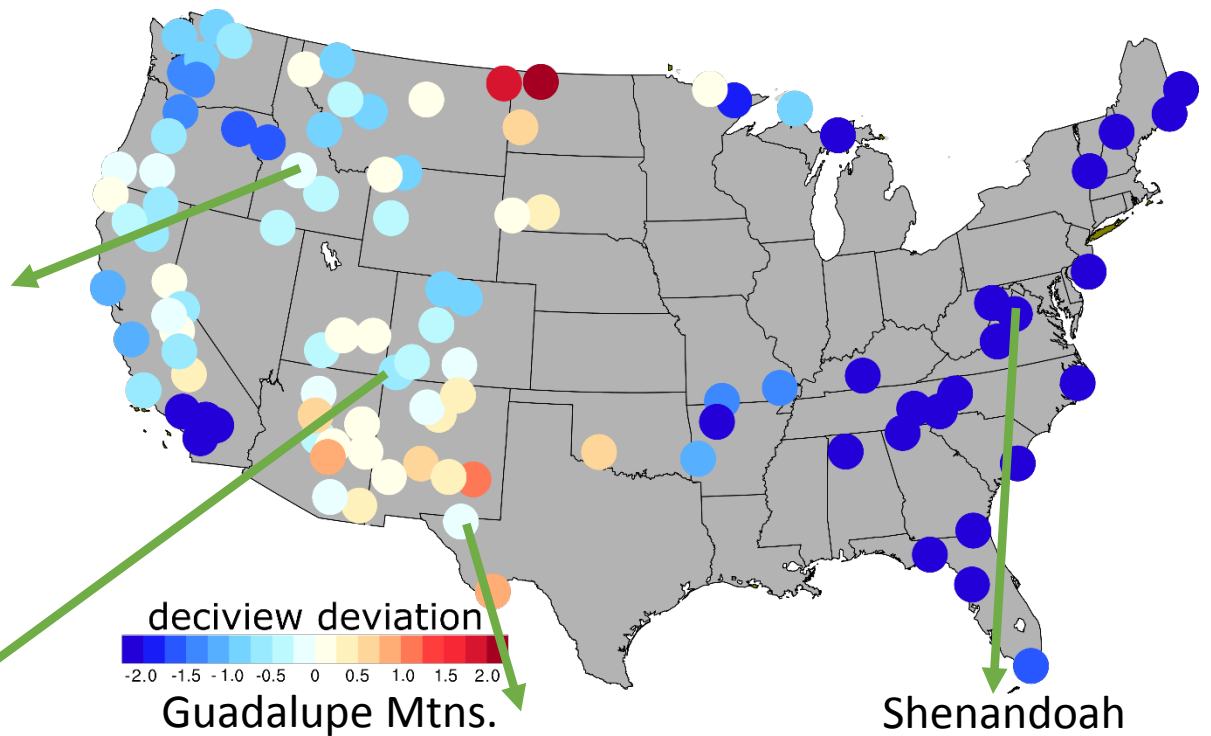
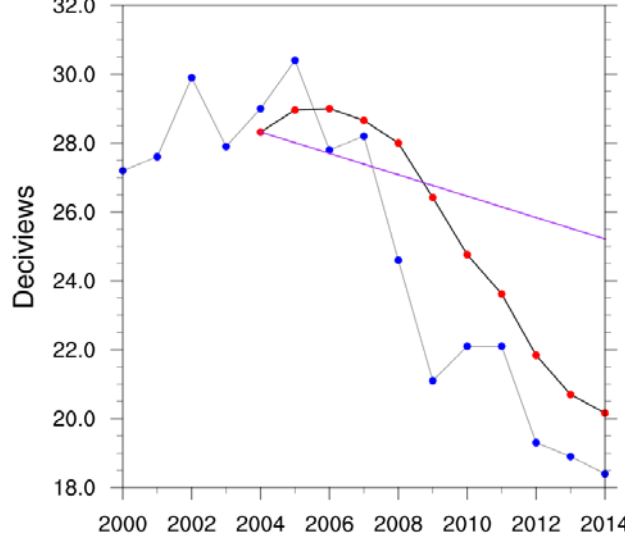
Mesa Verde



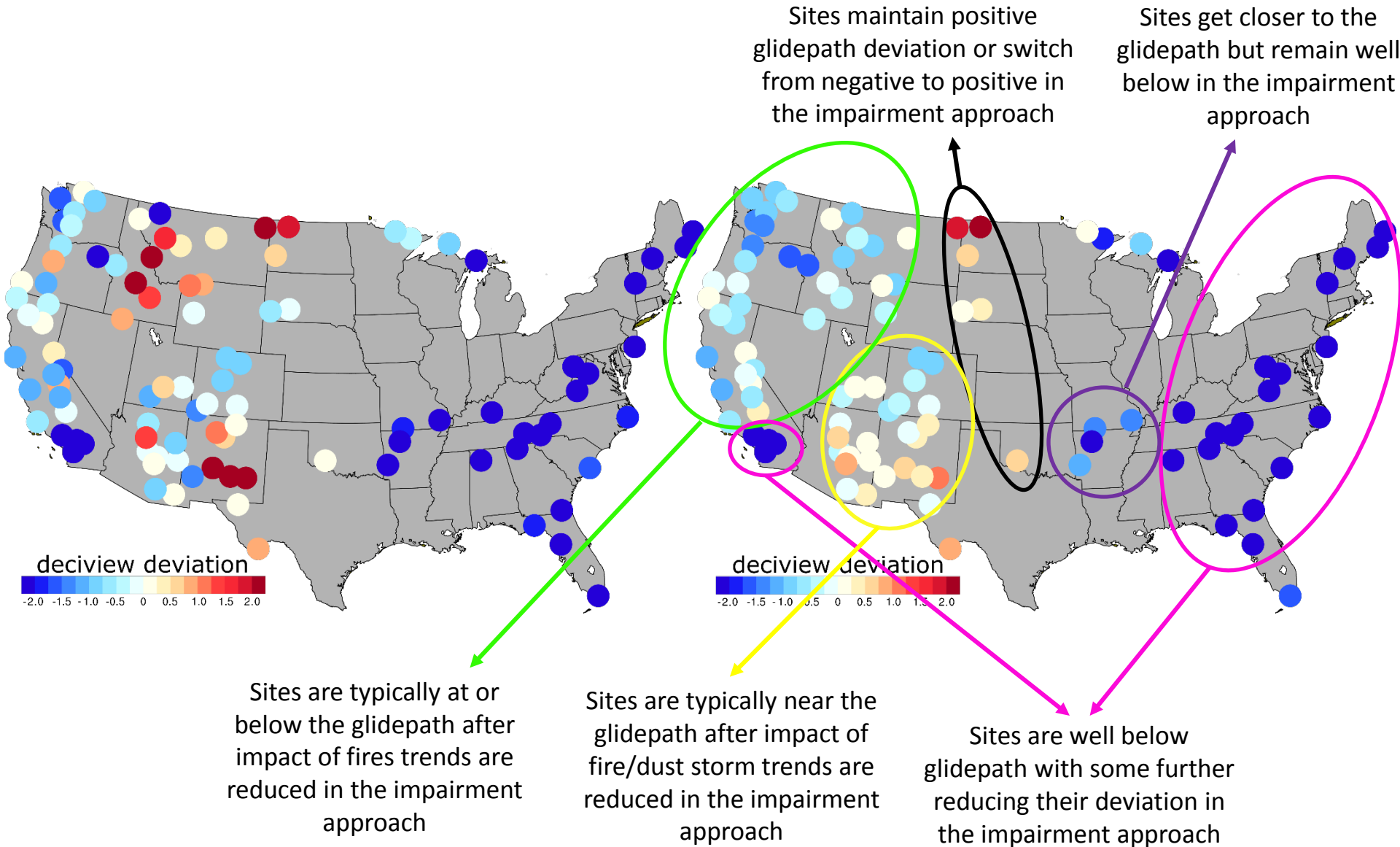
Guadalupe Mtns.



Shenandoah



Comparison of 2014 Glidepath Deviations from Current and Impairment Approaches



Summary and Potential Issues

Goals

- ✓ Metric more closely tracks impairment from anthropogenic sources
- ✓ Removed most of the random deviation from the Uniform Rate of Progress (URP) line associated with unusually high or low fire or dust storm activity
- ✓ Generated a new URP line that reasonably reflects the removal of extreme events and is more even-handed across Class I areas and states with different frequencies of extreme events

Outstanding Issues

- Previously-published estimates of natural conditions are important in the calculation of the split and affect the impairment sort
 - Presenting the results split between natural and anthropogenic sources can reveal unusual results that can seemingly be explained by “bad” estimates of natural conditions (no anthropogenic carbon in Shenandoah)
 - The practical significance of these factors for SIP development has not yet been explored, but no red flags are evident so far
- Natural conditions that are derived from the impairment approach are substantially different than the NC-II values at some sites

Timeline and Next Steps

March 2015

Discussed broad concepts with states/tribes/MJOs during RTP meetings

June 2015

Small workgroup with technical state/tribal/RPO representatives to explore options; included EPA and FLM

July-August 2015

Glidepath options and examples presented to a similar sized audience as the March 3 & 4 meeting to hear individual feedback.

Oct-Dec 2015

EPA decisions on substance of guidance and drafting of guidance document

January 2015

Assistant Administrator-level review of full external draft guidance

February 2016

External review of draft guidance

April-May 2016

Revisions based on comments

June-August 2016

Final **guidance** Issued

2018-2021

SIP submissions

IMPROVE committee begins a process for new Natural Conditions estimates???

IMPROVE committee completes the process for new Natural Conditions estimates???