

# Role of vegetation in wind erosion and dust emission

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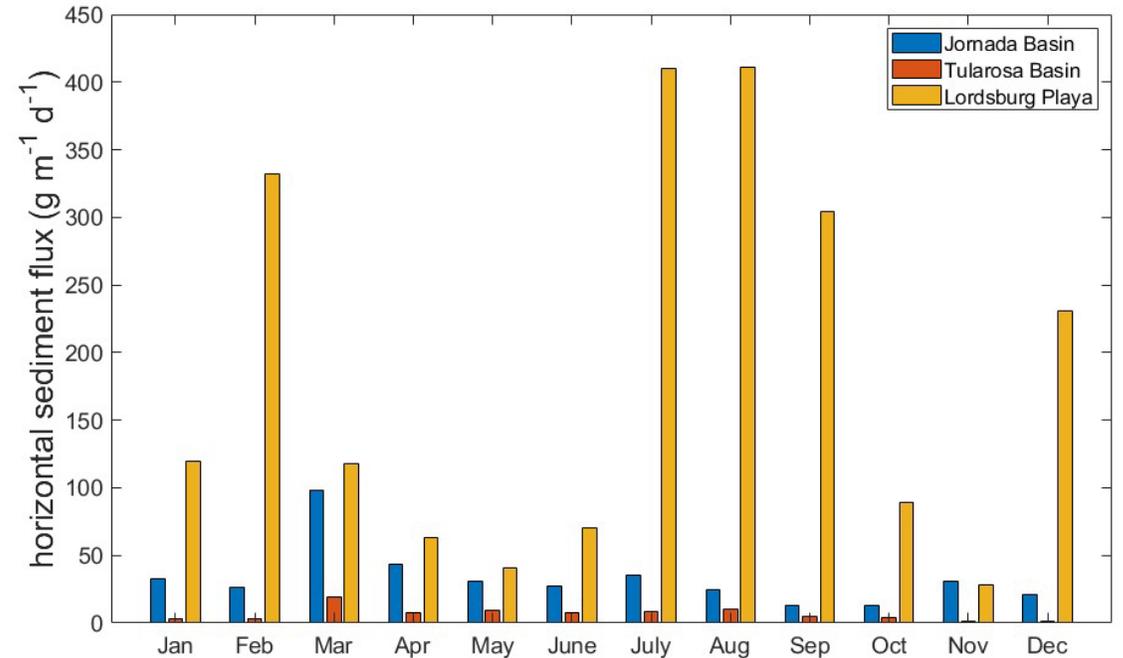
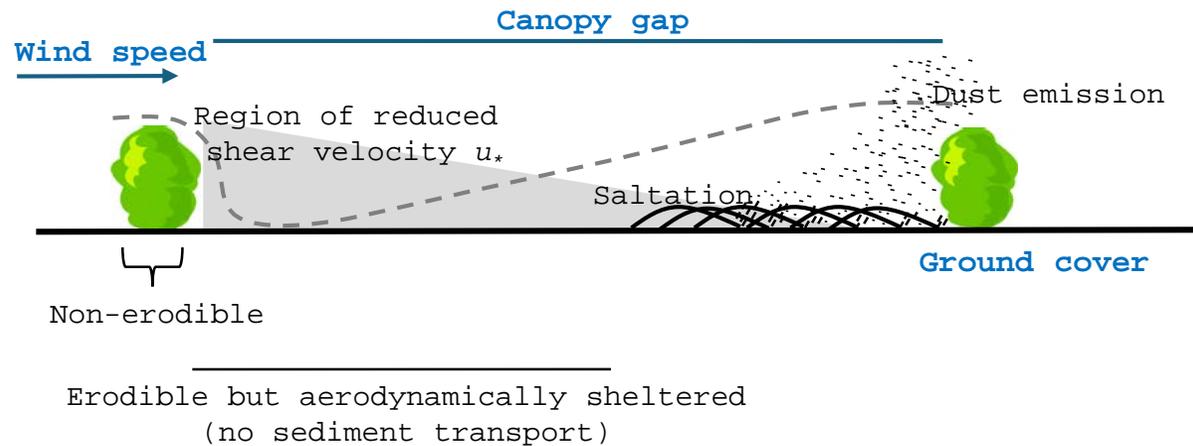
# Wind erosion and dust impacts



- Local ecosystem impacts
  - Land health and productivity
  - Vegetation feedbacks and plant community transitions
- Ecosystem services
- Human impacts
  - Health
  - Hazards
- Degraded visibility
- Downstream impacts
  - Dust on snow
  - Climate forcings

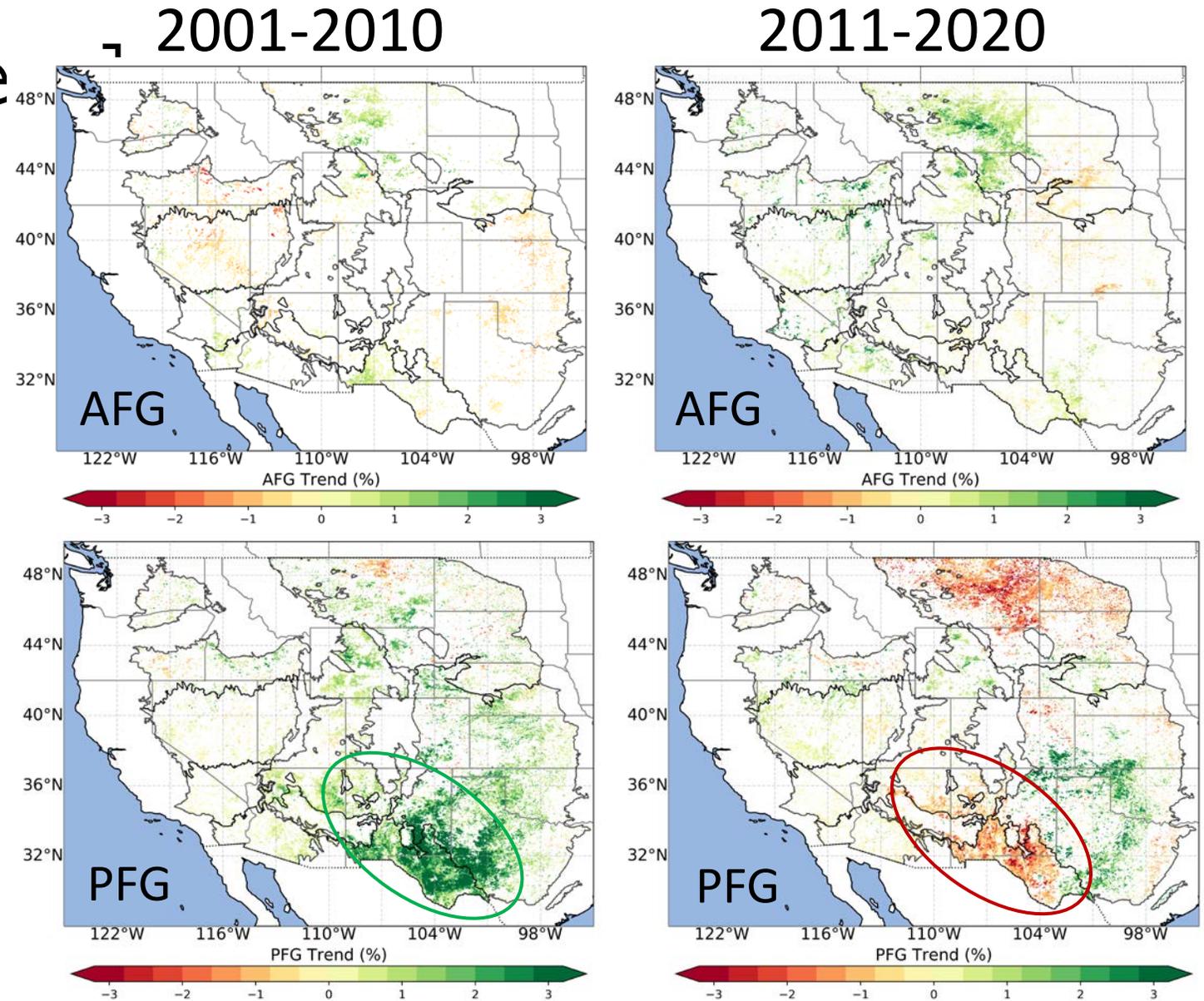
# Aeolian-vegetation interactions

- Smaller vegetation gaps provide more shelter to soil surface
- Denser vegetation cover provides more shelter



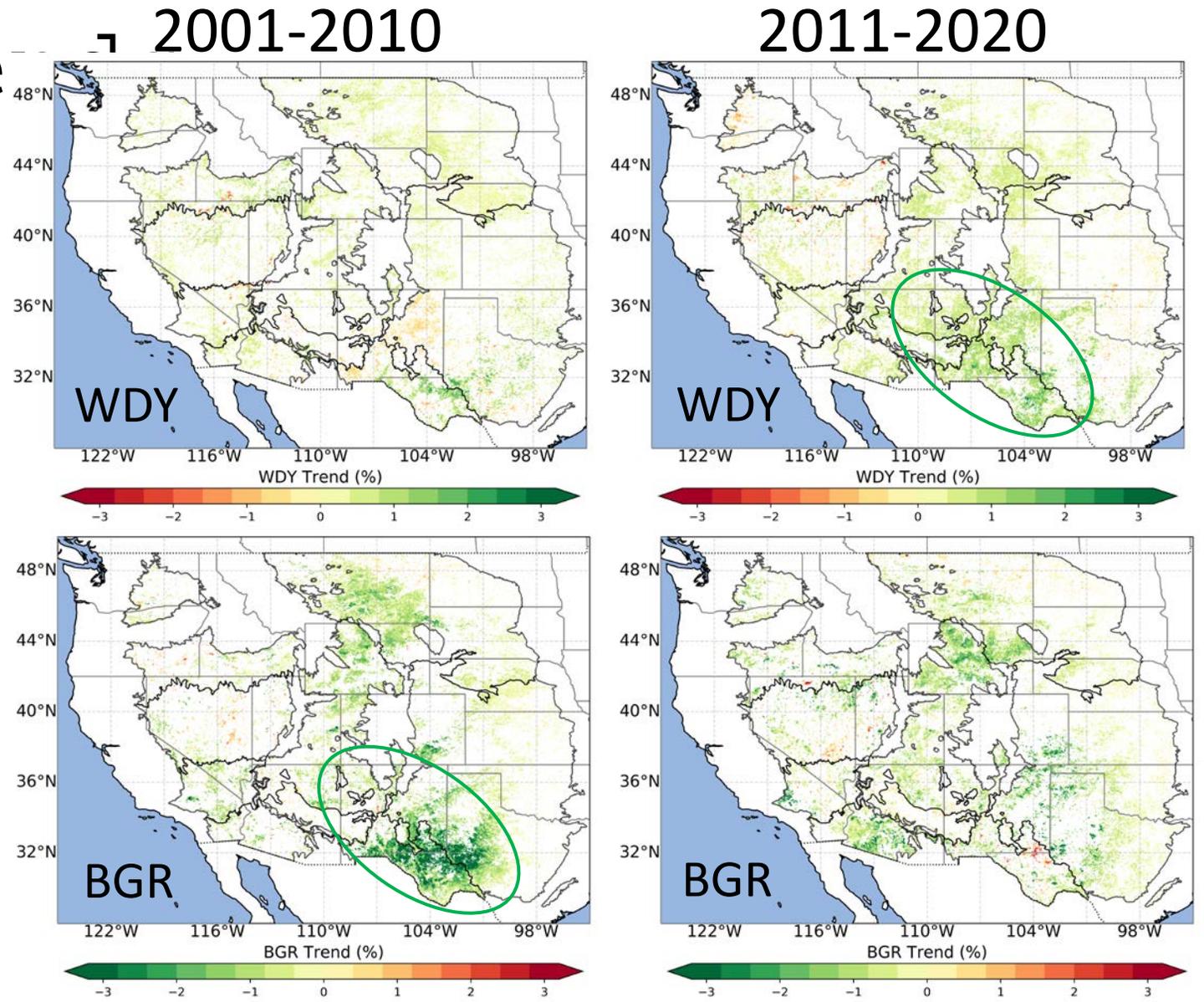
# Vegetation trends, 2001-2010

- Perennials increased from 2001-2010 but have decreased over the last decade



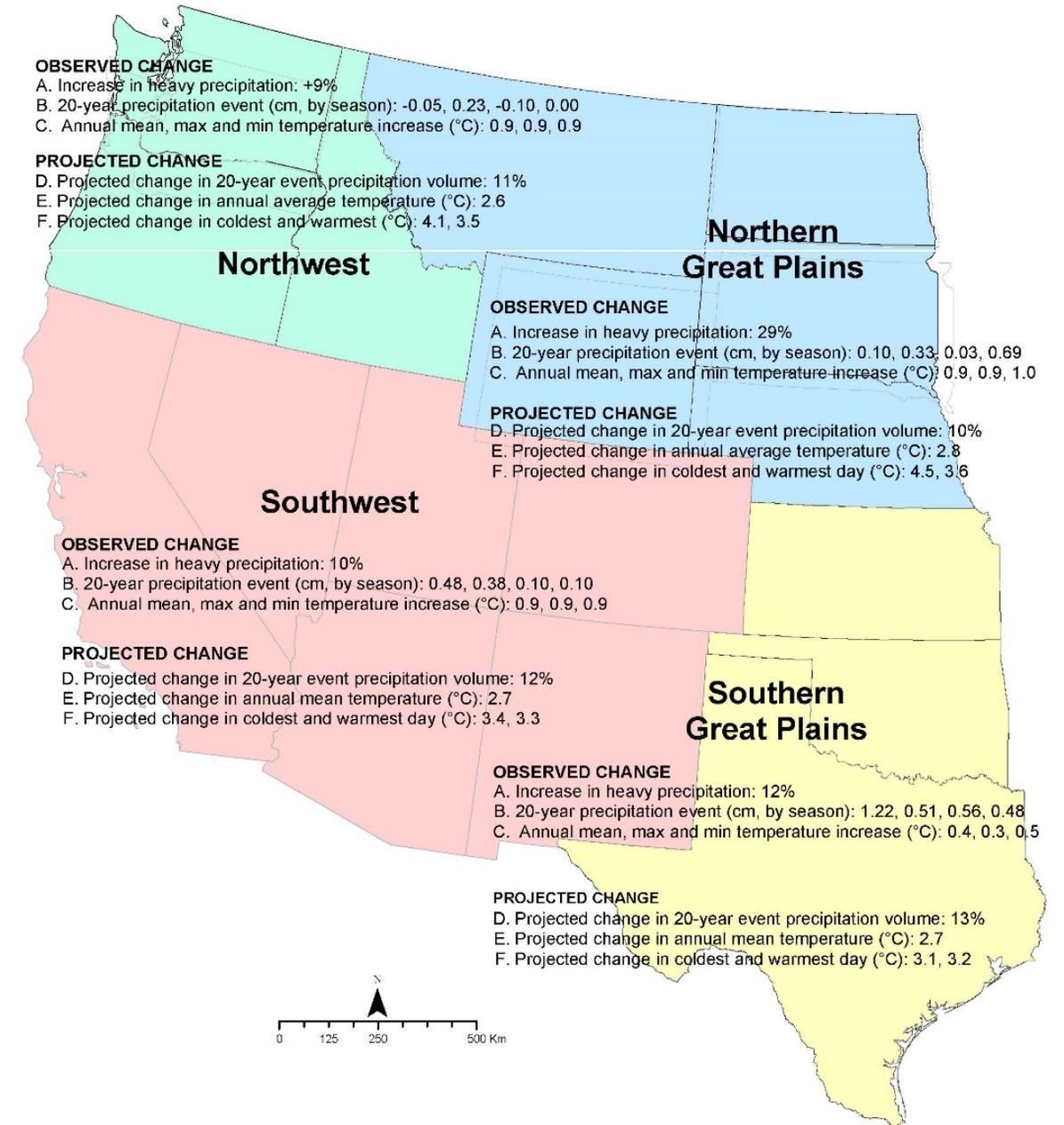
# Vegetation trend 2001-2010

- Strong trend of increasing woody cover over last decade
- Bare ground increased from 2001-2010, neutral trend from 2011-2020

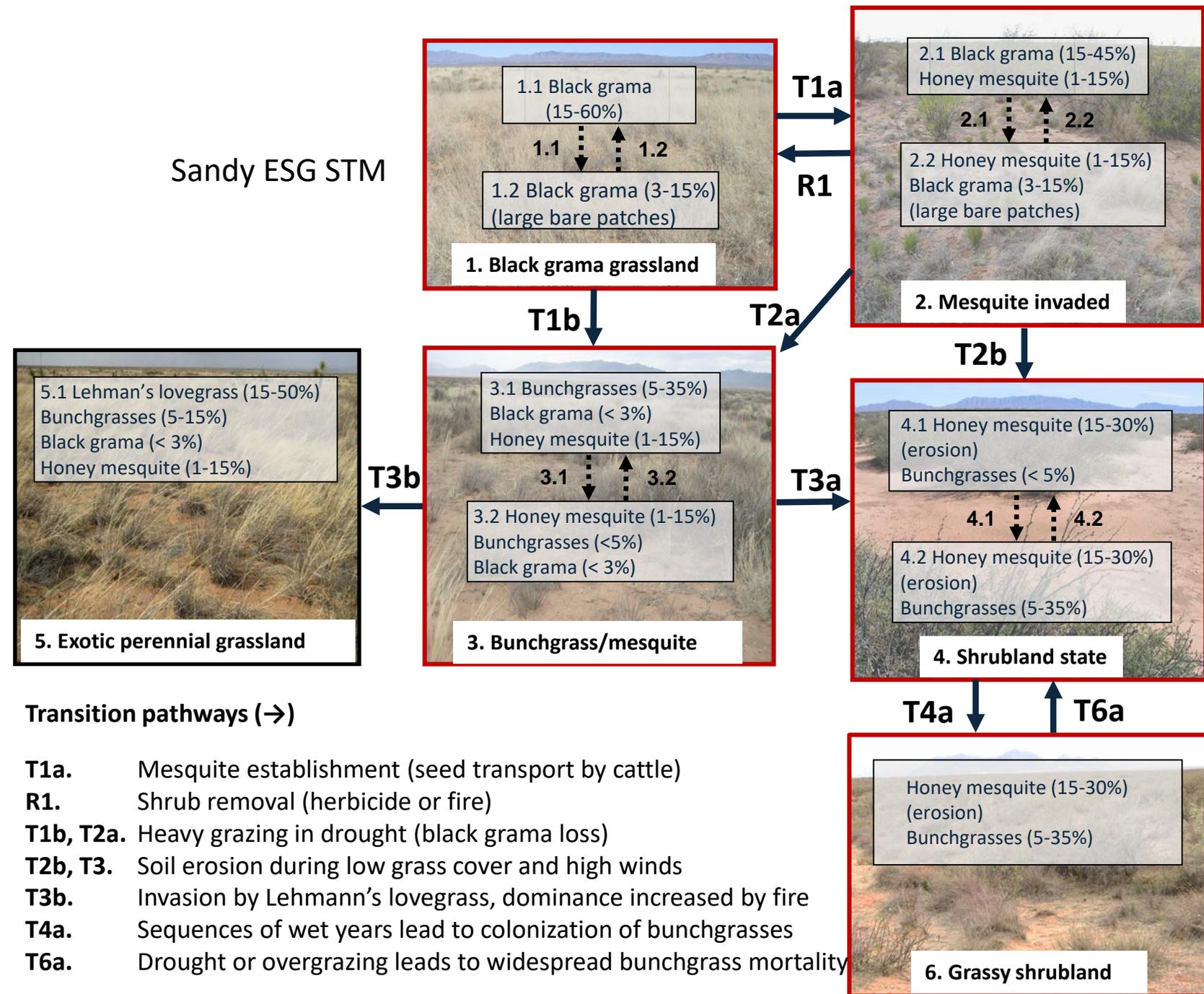


# Consequences of climate change for dust emission

- Competitive advantage for woody vegetation
- Grassland to shrubland transitions increase dust emission potential
- Increase in extreme weather events
- Wildfire frequency

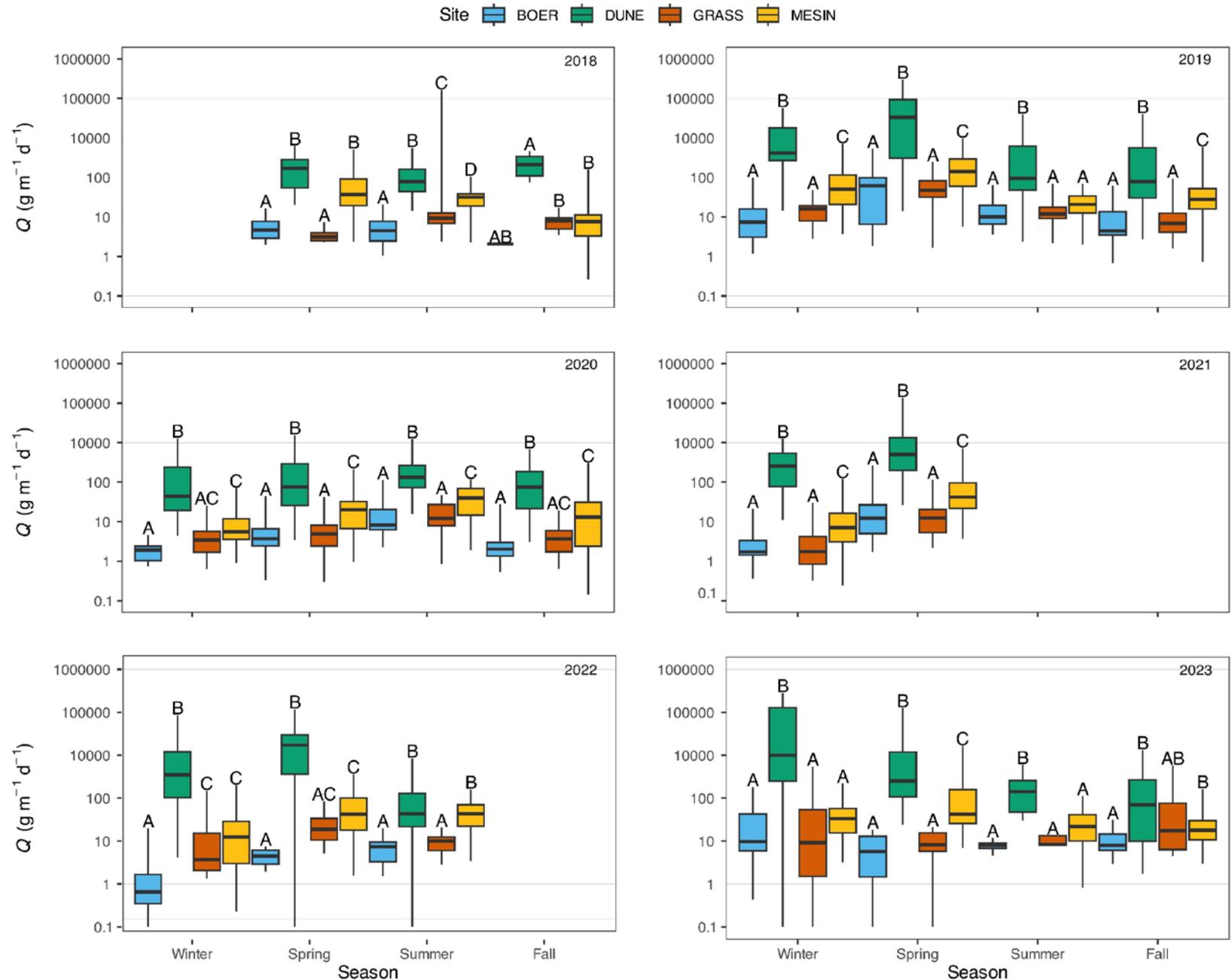


# Impact of vegetation community transitions



# Vegetation community transitions

- Pervasive vegetation changes occurring on NM rangelands have profound effects on wind erosion
- But, data also show potential for large dust reduction with effective restoration

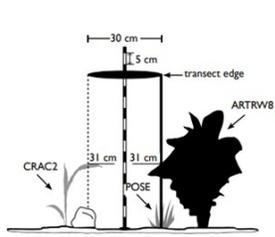


# Tools to address wind erosion and dust emission

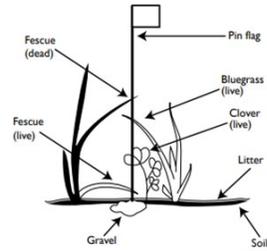
- Aeolian EROsion (AERO) model
- National Wind Erosion Research Network (NWERN; <https://winderosionnetwork.org/>)
- Landscape Data Commons (LDC; <https://landscapedatacommons.org/>)
- Rangeland Analysis Platform (RAP; <https://rangelands.app/>)

# Landscape Data Commons enables data-informed management

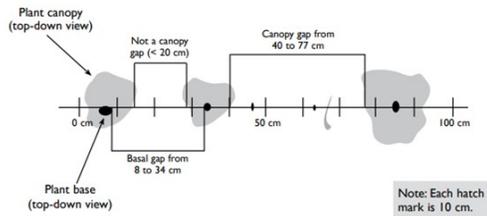
- 2004-present
- 85,000 plots sampled



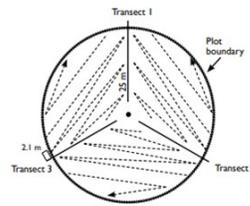
Vegetation height



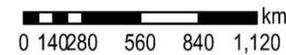
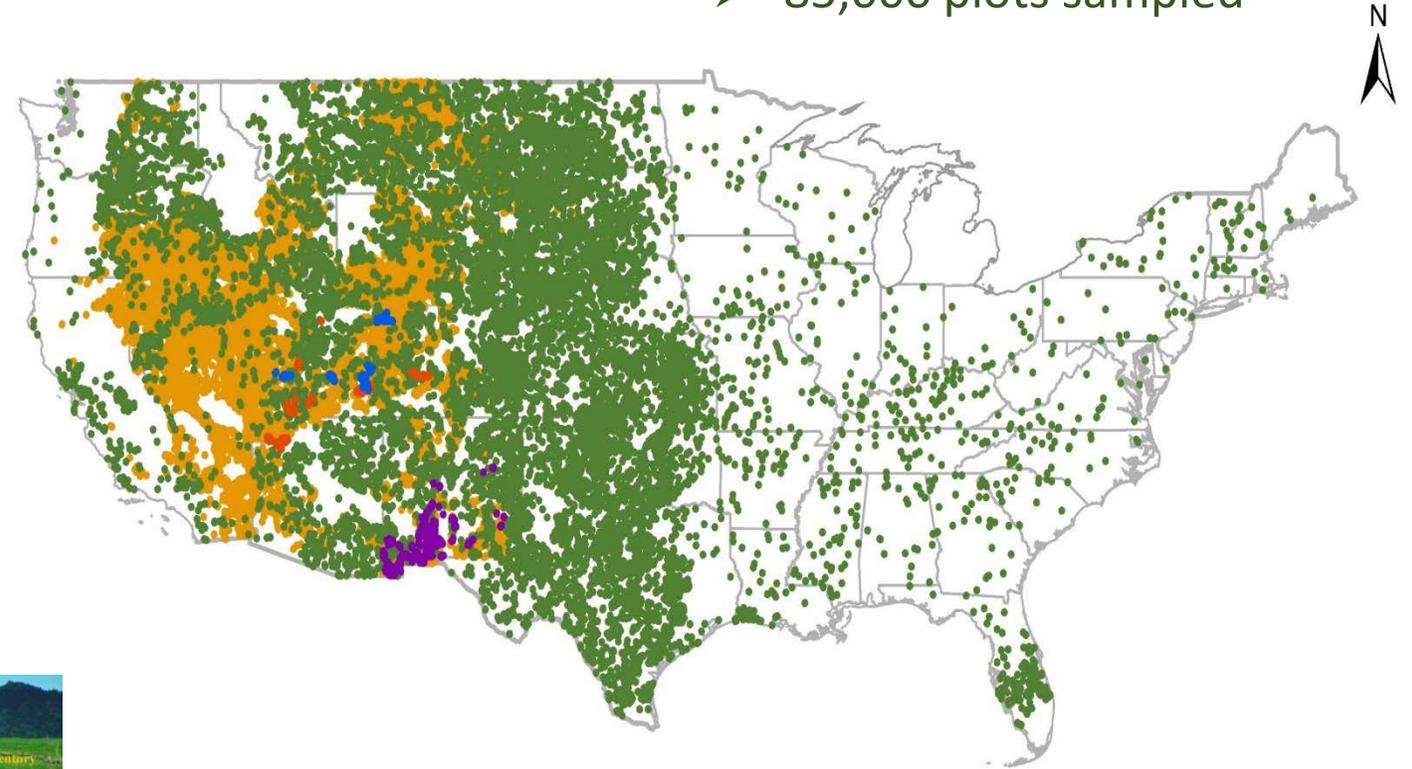
Line-point intercept



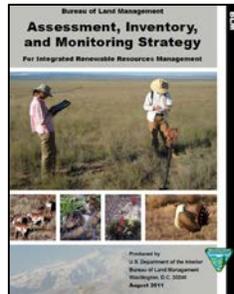
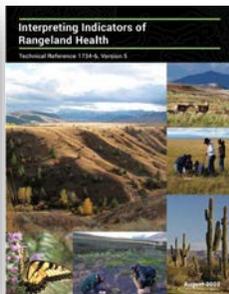
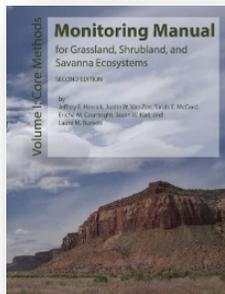
Gap intercept



Species inventory

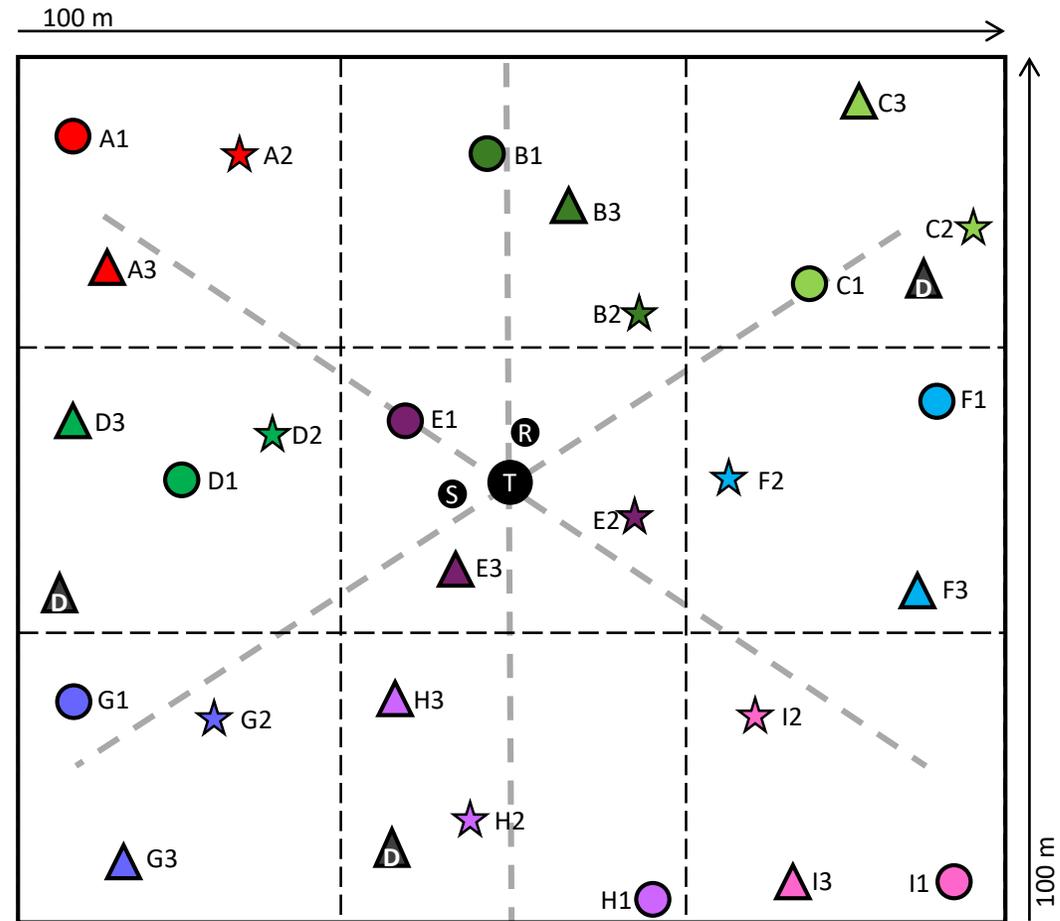
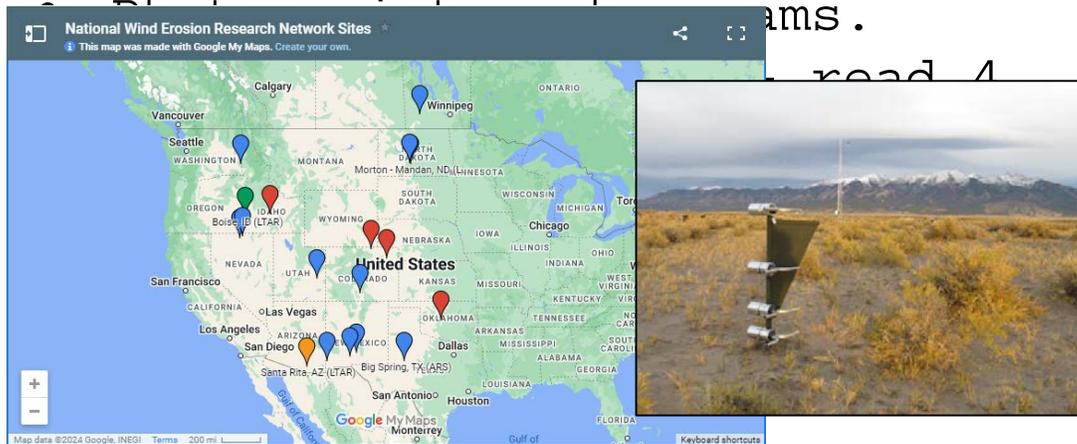
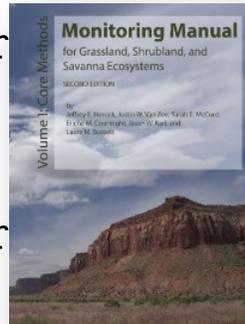


- JER-MURV
- BLM AIM
- NPS I&M
- NRI
- USGS



# National Wind Erosion Research Network

- 27 passive sediment sampler masts (MWAC).
- 2 DustTrak Environmental Monitors.
- 3 dust deposition traps
- Vegetation data:
  - LPI (foliar cover)
  - Gap intercept
  - Vegetation height
- Soil surface properties.

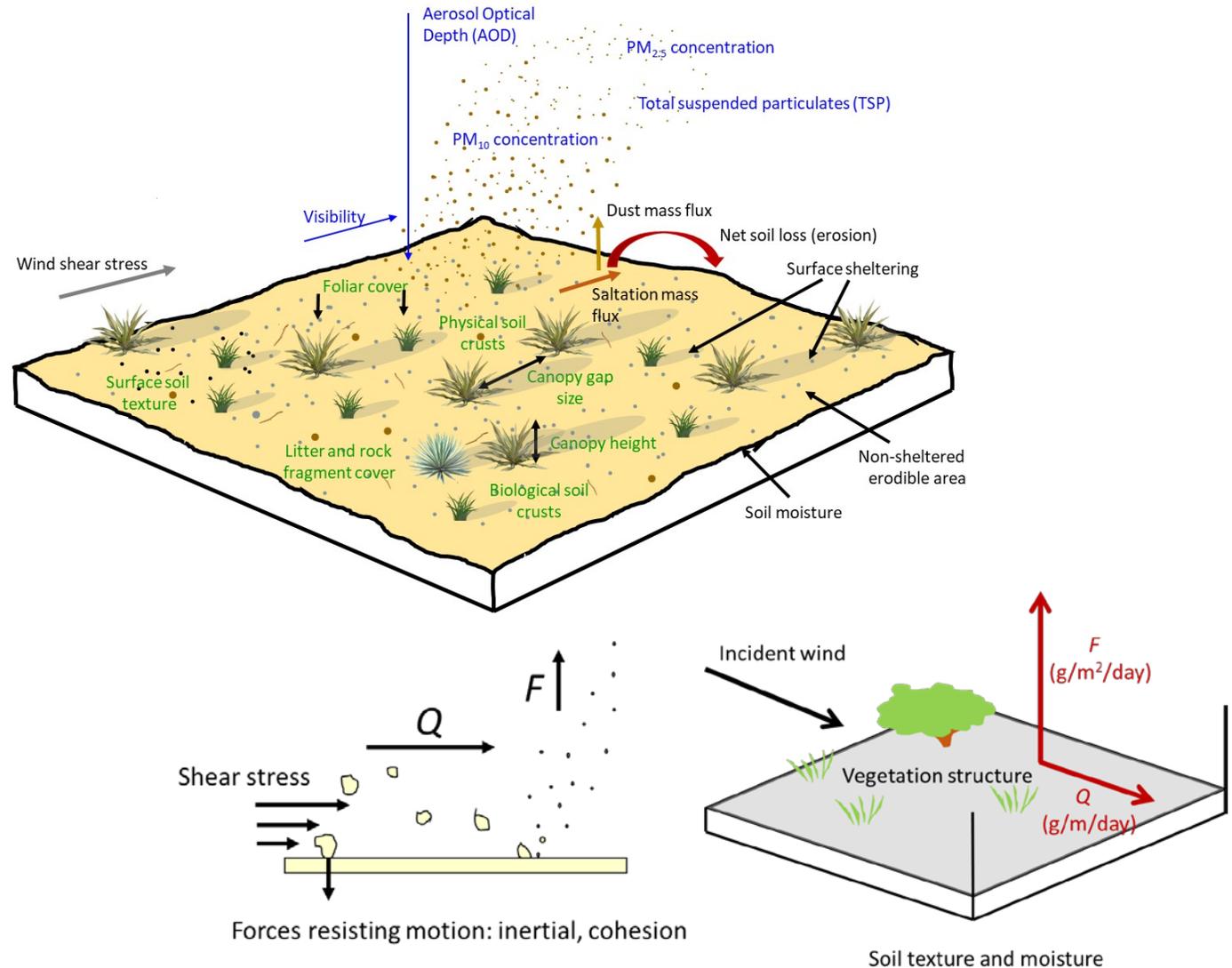


- Sample Group 1
- ☆ Sample Group 2
- △ Sample Group 3
- ⊙ 10 m meteorological tower
- ⊙ Saltation particle counter
- ⊙ MWAC sampler mast
- ⊙ Dust deposition traps
- ⊙ Rain gauge
- ⊙ Vegetation transects

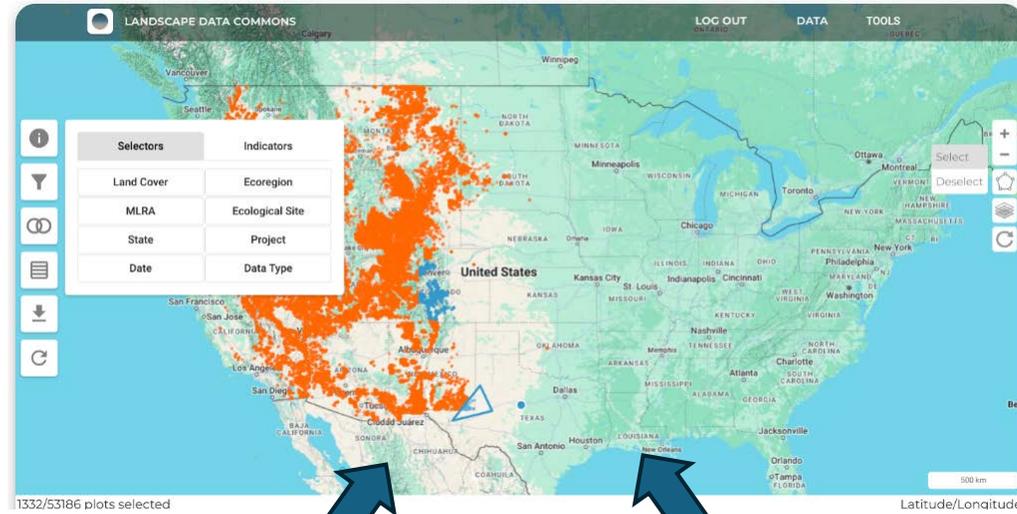
# AERO

## AEOLIAN EROSION MODEL

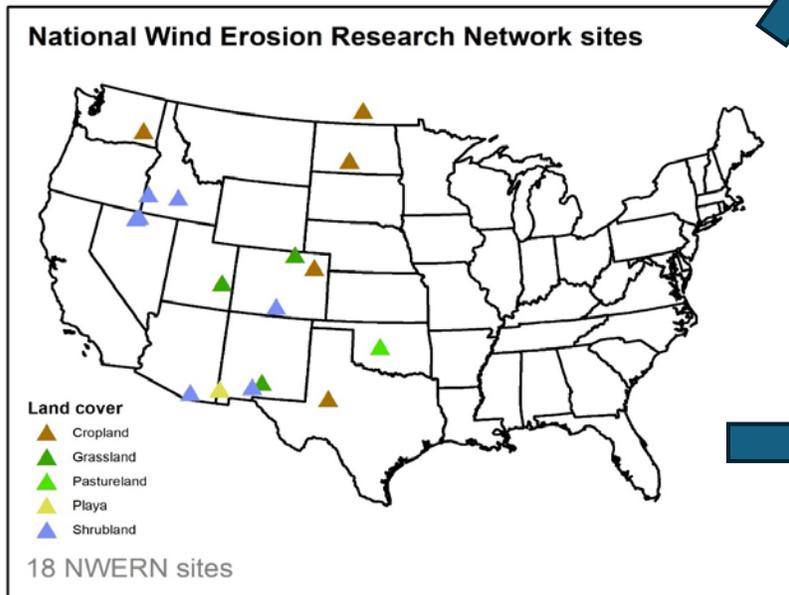
- Generalizable wind erosion model
- Leverages standardized monitoring data
- Integrated with Landscape Data Commons
- Provide decision support for land management
- Research across scales



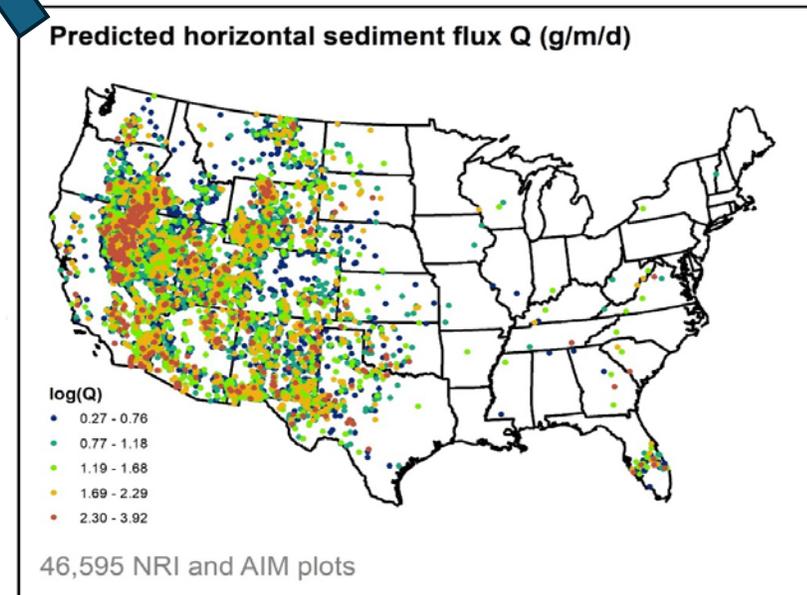
# AERO and the Landscape Data Commons



NWERN intensive research



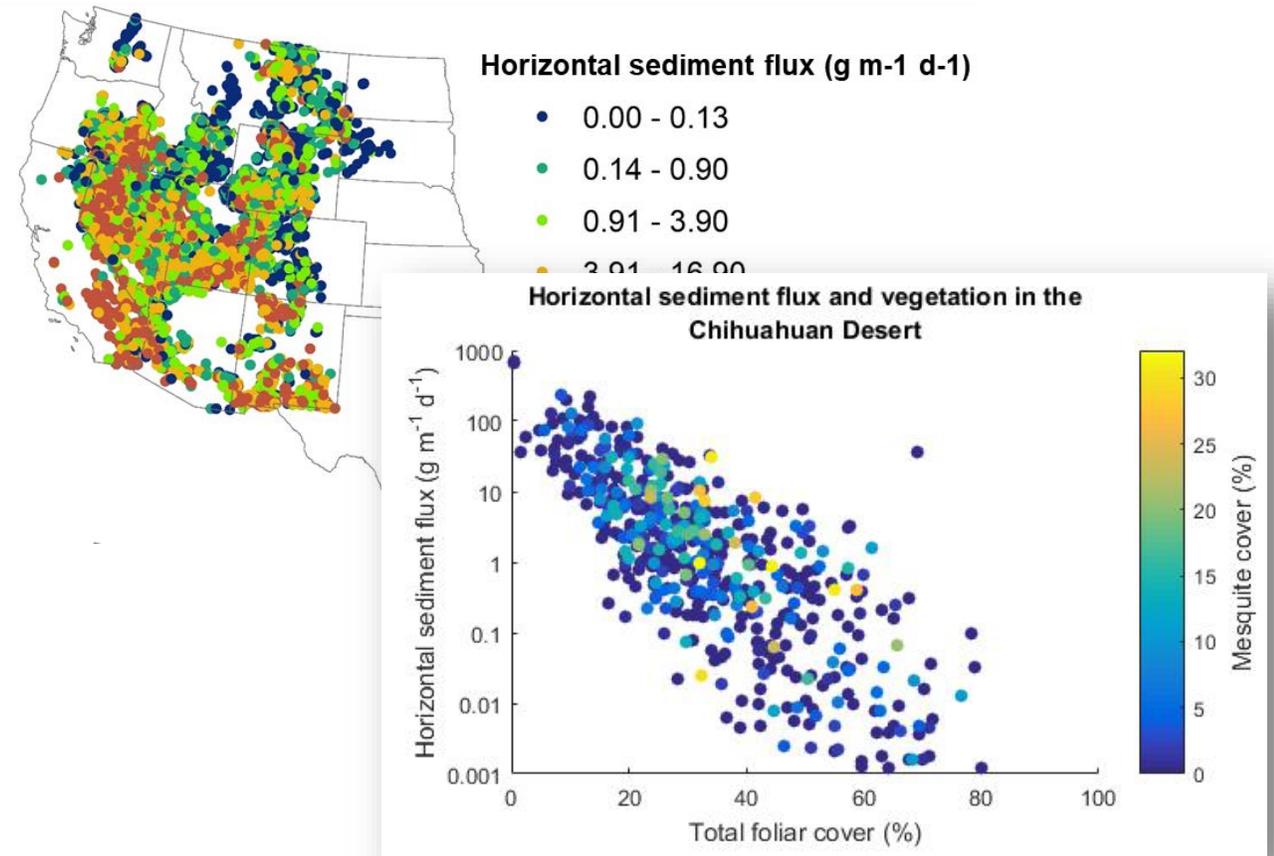
New wind erosion indicator datasets



AERO  
Aeolian EROsion Model

# Explore relationships among wind erosion estimates and indicators

- Assess impacts of management actions
- Investigate relationship among wind erosion and other indicators, e.g., species of concern
- STM concepts and benchmarks



# Critical needs

- Extend network of PM10, PM2.5 monitoring sites into dust source areas *instead of population centers*
- Resources for dust on snow—*critical issue in four corners region*. Location and ecology of source areas and dust source mitigation. Simultaneous support communities that need to adapt to changing water availability for agriculture
- More research is needed to understand wind erosion responses to rangeland vegetation change. *Need to identify important thresholds* to assess risk so that managers can prioritize conservation practices and restoration
- Understand contribution of *both* extreme high magnitude-low frequency and high frequency-low magnitude emissions to aerosol concentrations and adverse impacts
- *Anticipate* change and make no regrets management decisions