

# National Wind Erosion Research Network

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Dust emissions from disturbed surfaces can impact air quality, human health, and transportation systems. Wind erosion can moderate the effectiveness of climate change mitigation and adaptation strategies, and contribute significantly to the global cost of land degradation. Land managers require information on wind erosion to assess the impacts of policy and management strategies, and the economics of remedial action or inaction.

The National Wind Erosion Research Network (Fig. 1) was established in 2014 as a collaborative effort led by the USDA Agricultural Research Service (ARS), Natural Resources Conservation Service (NRCS), and the Department of the Interior's Bureau of Land Management (BLM).

The Network has three aims: (1) provide data to support understanding of basic wind impact across land use types, land cover types, and management practices, (2) support development and application of models to assess wind erosion and dust emission and their impacts on human and environmental systems, and (3) encourage collaboration among the wind erosion research community and resource managers.

The Network currently consists of thirteen intensively instrumented sites providing measurements of wind sediment transport rates, meteorological conditions, and soil and vegetation properties that influence wind erosion. Network sites are located across rangelands, croplands, and deserts of the western US.

The Mandan National Wind Erosion Research Network site is managed by the USDA Northern Great Plains Research Laboratory (NGPRL) and is part of the Long Term Agro-ecosystem Research (LTAR) network. The site is located on the Missouri Plateau within the Temperate Steppe Ecoregion of North Dakota, approximately 3.7 miles south of Mandan. The site is at an elevation of 1946 feet above sea level.

The Mandan Network site is located within a lease of 380 acres leased by the Area 4 Soil Conservation District (SCD). Since 1984, producers within the SCD have provided this land to NGPRL scientists to address production and environmental problems associated with dryland cropping systems. All crop production is under no-till management, and a broad portfolio of crop diversity treatments are investigated varying in scale (.024 to 27 acres) and duration (6 to 27 years).

Managing and planning for the impacts of wind erosion requires an understanding of the underpinning sediment transport processes and their interactions. This understanding is derived from field and laboratory studies of wind processes, and through conceptual and numerical models that explore interactions with biogeochemical, ecological and human systems. Application of this understanding requires that knowledge of

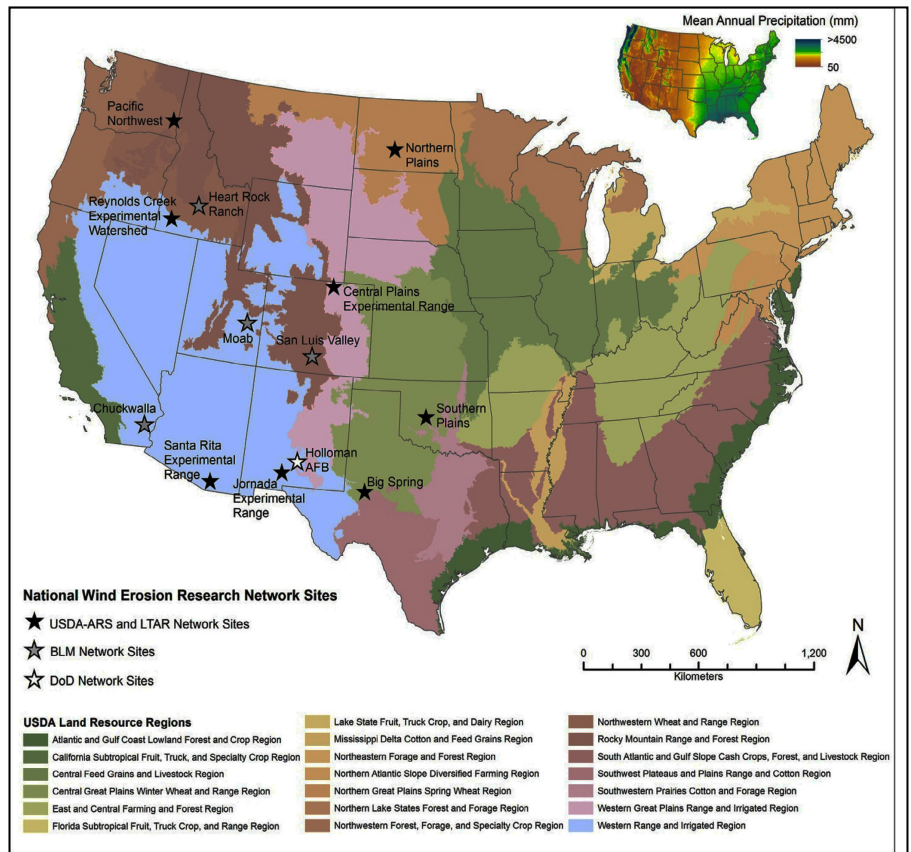


Fig. 1 National Wind Erosion Research Network

wind processes can be reliably up-scaled to represent the many complex dynamic interactions within fields, across regions, and globally. Predictive models, developed from theory and empirical observation, play an important role in up-scaling process understanding.

Examples of the diverse research questions currently being addressed through the National Wind Erosion Research Network include:

1. What is the spatial variability in aeolian sediment transport and what are appropriate sampling resolutions for measuring and monitoring wind erosion across land use and land cover types?
2. How can remote sensing technologies (airborne and space-borne) be applied in new ways to measure land surface aerodynamic properties for integration into monitoring programs and models?
3. How can the effects of land management on wind sediment transport be captured in physically-based and generalizable numerical models that have application across land cover types?
4. How can the accessibility of wind erosion/dust emission models to resource managers be improved to inform decision making, planning and policy?

It is anticipated that the National Wind Erosion Research Network will raise public and policy awareness regarding the significance of wind erosion processes for Earth systems and society.

By employing an intensive and standardized sampling design, and receiving ongoing input from collaborating partners as to projected management and research needs, the Network will produce novel outcomes for basic and applied wind erosion research across land use systems and across scales.

This impact is particularly relevant today during a time of global environmental uncertainty arising from intensifying land use pressures, land degradation, and increasing climatic variability and climate change. Mitigating and adapting to these changes requires an understanding of the biophysical drivers, and the capacity to act through management strategies and policy in ways that promote ecosystem goods and services and the diverse socio-economic and cultural systems that depend on them.

In support of Network activities, <http://winderosionnetwork.org> was developed as a portal for information about the Network, providing site descriptions, measurement protocols, and data visualization tools to enable teamwork with scientists and managers interested in the Network and accessing Network products.

Webb, Nicholas P., et al. 2016. "The National Wind Erosion Research Network: Building a standardized long-term data resource for aeolian research, modeling and land management." *Aeolian Research* 22: 23-36. <http://www.sciencedirect.com/science/article/pii/S1875963716300568>

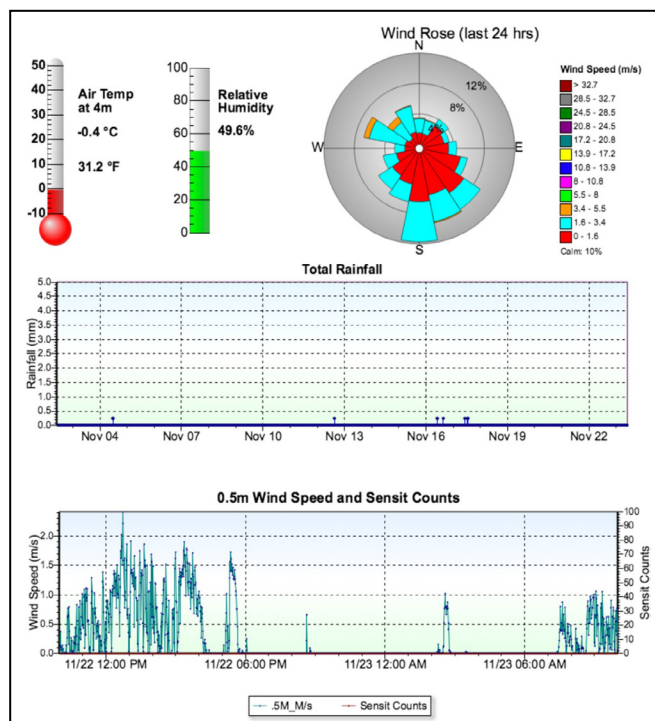


Fig. 2. Example data visualization tools provided online for each National Wind Erosion Research Network site. Meteorological data are updated hourly by direct transmission from the Network sites to a serve. The graphs are interactive, allowing users to explore in detail the latest observations, while raw data from all meteorological sensors are publicly available through the Network Data Portal (<http://winderosionnetwork.org/data-portal/access-data>).



National Wind Erosion Research Network site on the Area 4 SCD Cooperative Research Farm in Mandan.