WIND EROSION HANDBOOK

August 1, 2018

Soil and Water Conservation Society
International Annual Conference
Albuquerque, NM

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NRCS Liaison to the Southwest and Southern Plains Climate Hubs

Announcing USDA's One-Stop Shop Handbook (web page) on Wind Erosion

- Hosted and sponsored by SW and SP Climate Hubs
- Combination of USDA's efforts in wind erosion control
- Agency Consideration from NRCS, Climate Hubs, FSA, ARS, RMA, others?

Wind Erosion Handbook

- Hazards and concerns of airborne particulates
- Understanding Wind Erosion
  - Climate, Wind Events, Soil Movement
- Modeling and predicting wind erosion
- Measuring airborne particulates
- Conservation Planning & Resource Concerns
- Controlling wind erosion
  - Cropland, Rangeland, Pastureland, unpaved surfaces
- USDA Programs to address wind erosion
- Glossary of Terms

Why the concern with Wind Erosion?

Dust Bowl and the Creation of the Soil Conservation Service - 1935

Why the concern with Wind Erosion?

Out of the long list of nature's gifts to man, none is perhaps so utterly essential to human life as soil.

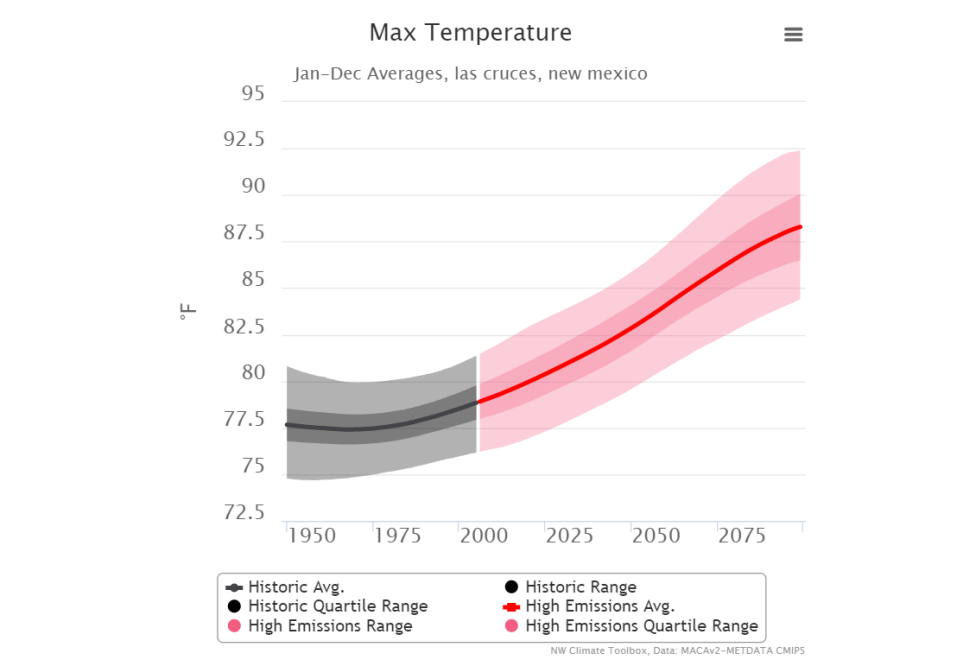
— Hugh Hammond Bennett —

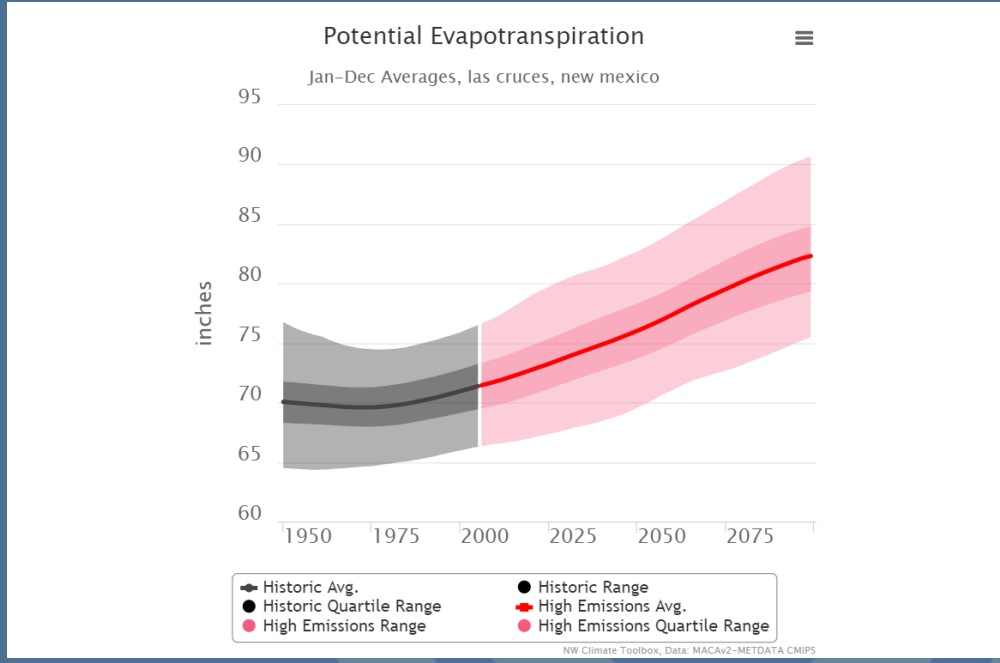
AZ QUOTES

Are we approaching a modern-day dust bowl?

- Only 10% of nation's cropland is full-time no-till
- ~20% of nation's cropland is irrigated
- Diminishing surface water supplies
- Diminishing acquifers
- Water rights favoring metropolitan interests
- Some municipalities are already paying farmers not to irrigate

Are we approaching a modern- day dust bowl? Wind Erosion





Northwest Climate Toolbox

Are we approaching a modern-day dust bowl?

- Increased temps favors shrubs
- Decreased precip favors shrubs
- Increased variability with temps and precip favors shrubs
- Increased shrubs over grass = increased wind erosion

(Gherardi and Sala, 2016)

Hazards and Concerns

- Health
- Safety
- Costs
- Productivity

Health Concerns

According to a scientific study published in October 1935, Kansas experienced its “most severe measles epidemic,” as well as abnormally high rates of strep throat, respiratory problems, eye infections and infant mortality during the intense dust storms that struck from February to May of that year.

Health Concerns

- Pollen, microscopic plant parts

Gives rise to:

- Allergic reactions- watery eyes, itchy throat, coughing, other respiratory illness

Health Concerns

- Bacteria, Viruses, Fungi, Aluminum, Heavy Metals, toxic chemicals hitching a ride on dust

Have been linked/hypothesized to:

- Triggering asthma attacks, complications with emphysema, meningitis, hand, foot and mouth disease, Gulf War Syndrome, Valley Fever, SARS, influenza, even the latest e. Coli outbreak

Photos AZ Dept. of Public Safety

Costs

- Untold billions of dollars in maintenance of machinery and clean-up costs
- Insurance claims with dust-related accidents
- Costs to interstate commerce with traffic delays and road closures

Costs

- Social costs of wind erosion in the United States estimated at $37.6 billion annually. (Uri, 2000)

Costs of Lost Productivity

- One dust storm in Australia was measured to have 2 million metric tons of suspended soil (M. Raupach, et al)
- Same study estimated the replacement nutrient value (N, P, K attached to aeolian sediment in the dust cloud) at $4 million.

Costs of Lost Productivity

Crops	Crop productivity (kg ha^{-1}) and wind erosion class				
	Very severe	Severe	Moderate	Slight	Negligible
Pearl millet (*Pennisetum glaucum*) [local name: Bajra]	118	142	277	300	658
Wheat (*Triticum aestivum*)	565	1029	1533	1783	2032
Chick pea (*Cicer arietinum*)	540	–	692	732	1112
Kharif pulses*	147	159	173	201	342
Rapeseed and Mustard (*Brassica* sp.)	435	704	970	1076	1440
Groundnut (*Arachis hypogea*)	336	612	712	862	1089

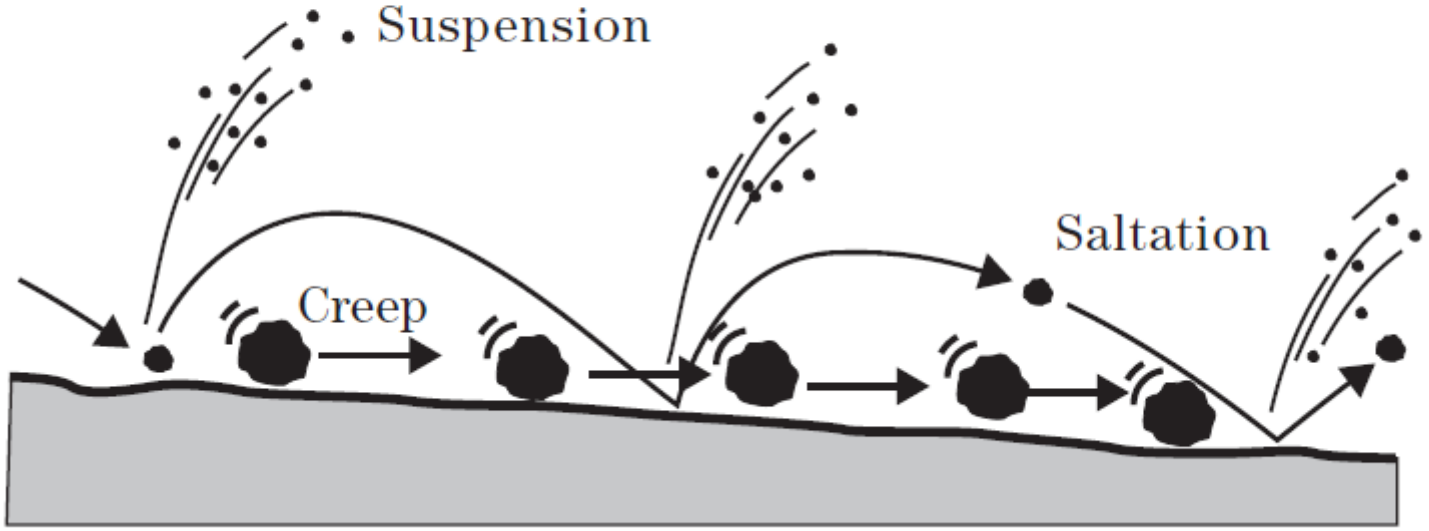
P. Santra, et al

Understanding Wind Erosion

- Climate Factors
  - Wind events
  - Wind speed
  - Wind direction
  - Local landforms

Processes of Wind Erosion

Figure 502–1 The wind erosion process



Models

- WEQ- Wind Erosion Equation
- RWEQ- Revised WEQ
- WEPS- Wind Erosion Prediction System
- AERO- Aeolian EROsion model
- WRF/CMAQ/WEPS- for forecasting dust events

Measuring Wind Erosion

- Wind Erosion Research Network- methods
- Other Passive systems
- Wind Tunnel technology
- PI-SWERL- Portable In-Situ Wind ERosion Lab

Conservation Planning Overview

- How NRCS identifies resource concerns
- How NRCS assesses extent of the problems (tools)
- How NRCS inventories the resources
- Practice selection and evaluation of alternatives
- Practice effects

Value of Soil Survey and Interpretations

- Soil Habitat for Saprophite Stage of Coccidioides
- There should be other wind erosion soil interpretations other than WEG and EI.
- Seasonal interps combining soil/climate?
- Institutionalize Pi-SWERL as part of soil survey
- Biocrusts- interps, mapping

Wind Erosion Mitigation

- Active Cropland
- Temporarily abandoned/fallow cropland
- Permanently abandoned cropland
- Range and pastureland
- Non-paved surfaces (feedlots, roads, farmsteads)

Wind Erosion Mitigation Cropland

- Roughening the surface
- Covering the surface
- Installing barriers
- Wind erosion resistant crops/plant materials

Wind Erosion Mitigation Cropland

- Vegetative Barrier 601
- Surface Roughening 609
- Stripcropping 585
- Residue and Tillage Management, No-till-329
- Residue and Tillage Management, Reduced Till 345
- Multi-Story Cropping 379
- Mulching 484
- Herbaceous Wind Barriers 603
- Hedgerow Planting 422
- Field Operations Emissions Reduction 376
- Field Border 386
- Cross Wind Trap Strips 589C
- Cross Wind Ridges 588
- Critical Area Planting 342
- Cover Crop 340
- Conservation Crop Rotation 328
- Conservation Cover 327
- Amending Soil Properties with Gypsum Products 333
- Alley Cropping 311
- Windbreak

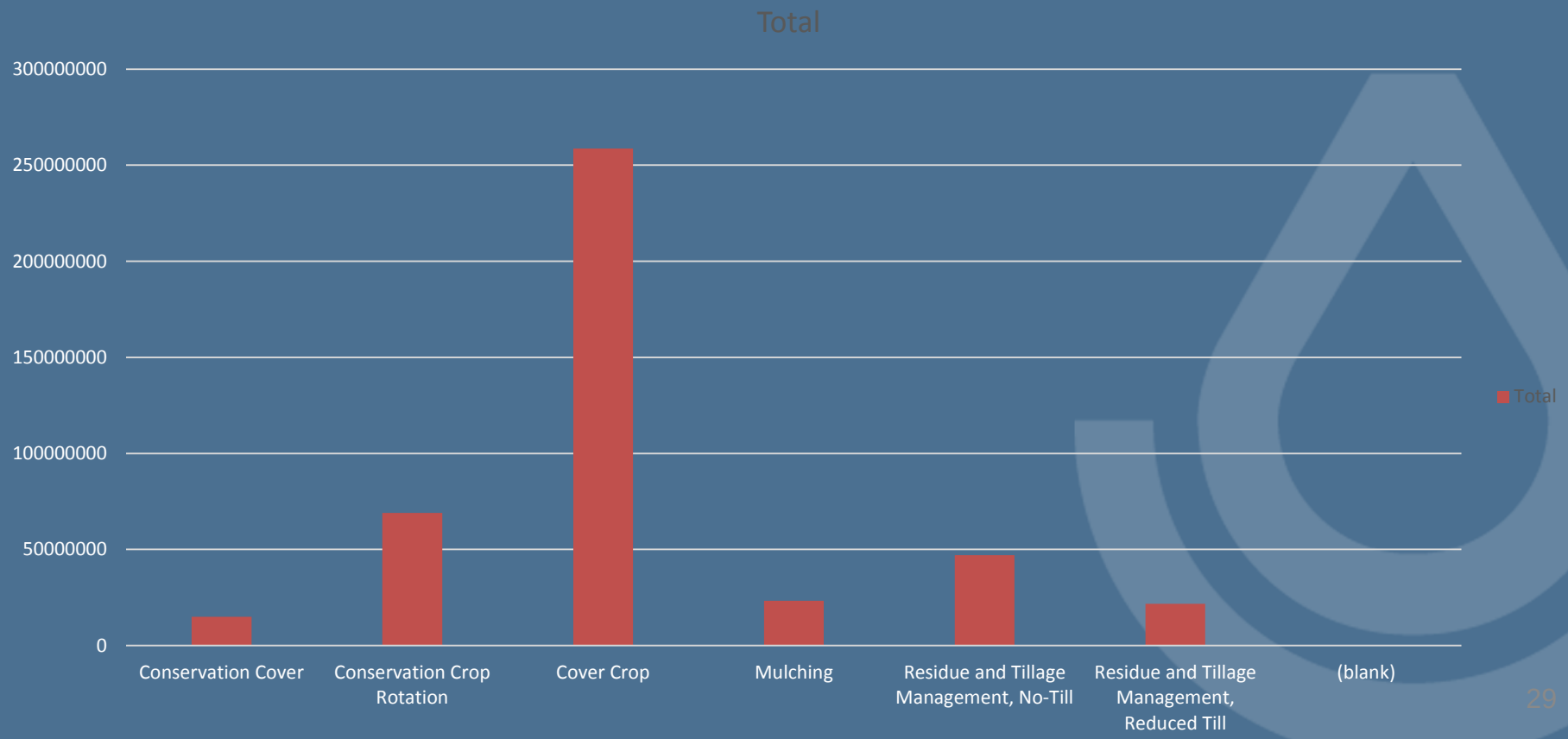
Wind Erosion Mitigation Rangeland

- Pray
- Install facilitative practices to achieve prescribed grazing
- Vegetative Manipulation
- Wind erosion resistant plant materials

Wind Erosion Mitigation Rangeland

- Watering Facility 614
- Water Well 642
- Trails and Walkways 575
- Road/Trail/Landing Closure and Treatment 654
- Riparian Herbaceous Cover 390
- Riparian Forest Buffer 391
- Restoration and Management of Rare or Declining Habitats 643
- Recreation Area Improvement 562
- Range Planting 550
- Prescribed Grazing 528
- Prescribed Burning 338
- Mulching 484
- Land Reclamation, Landslide Treatment 453
- Integrated Pest Management 595
- Herbaceous Weed Control 315
- Heavy Use Area Protection 561
- Grazing Land Mechanical Treatment 548
- Critical Area Planting 342
- Brush Management 314
- Access Control 472

Mitigation Through NRCS Financial Assistance Programs (Dollars)



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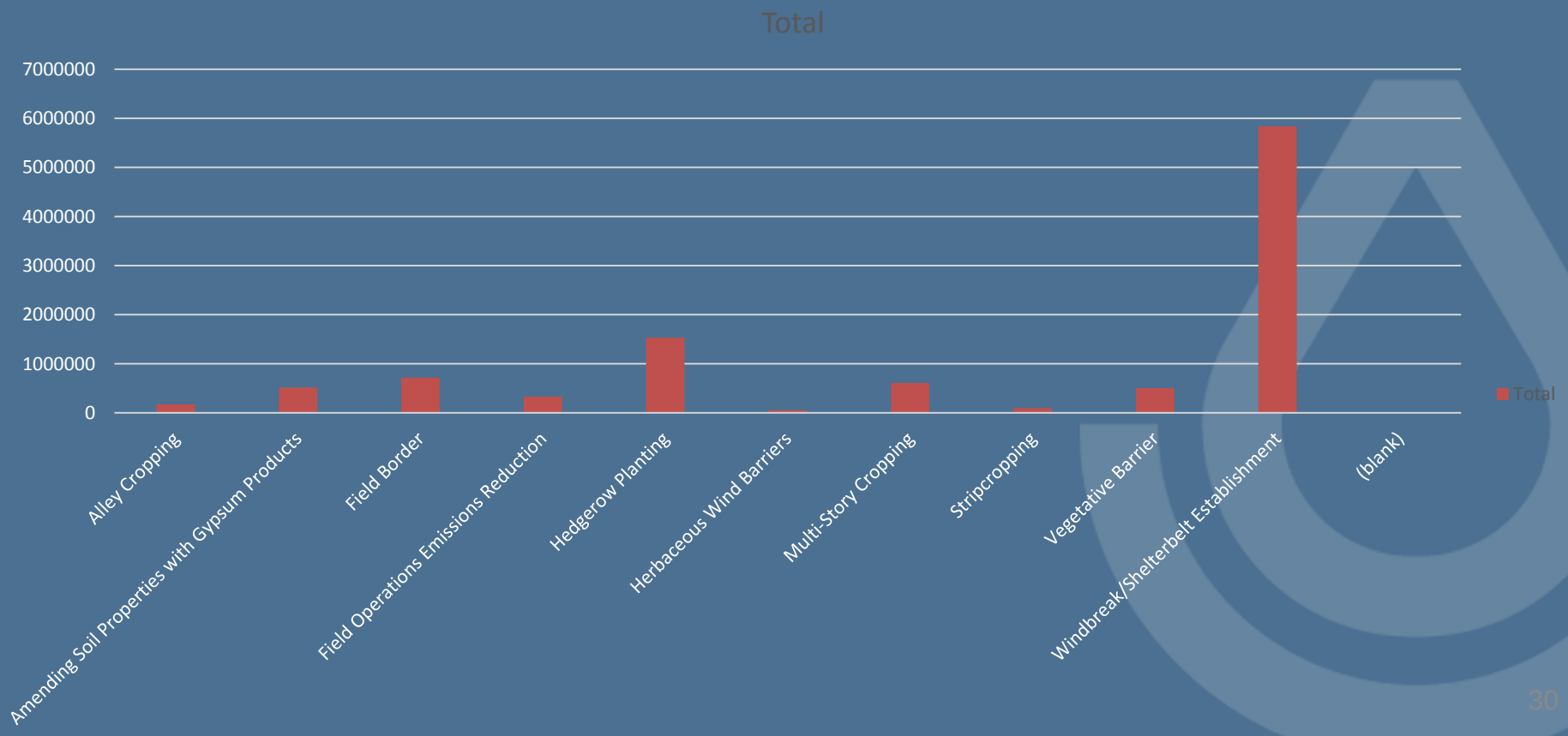

Questions?

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