DUST CONTROL MANAGEMENT

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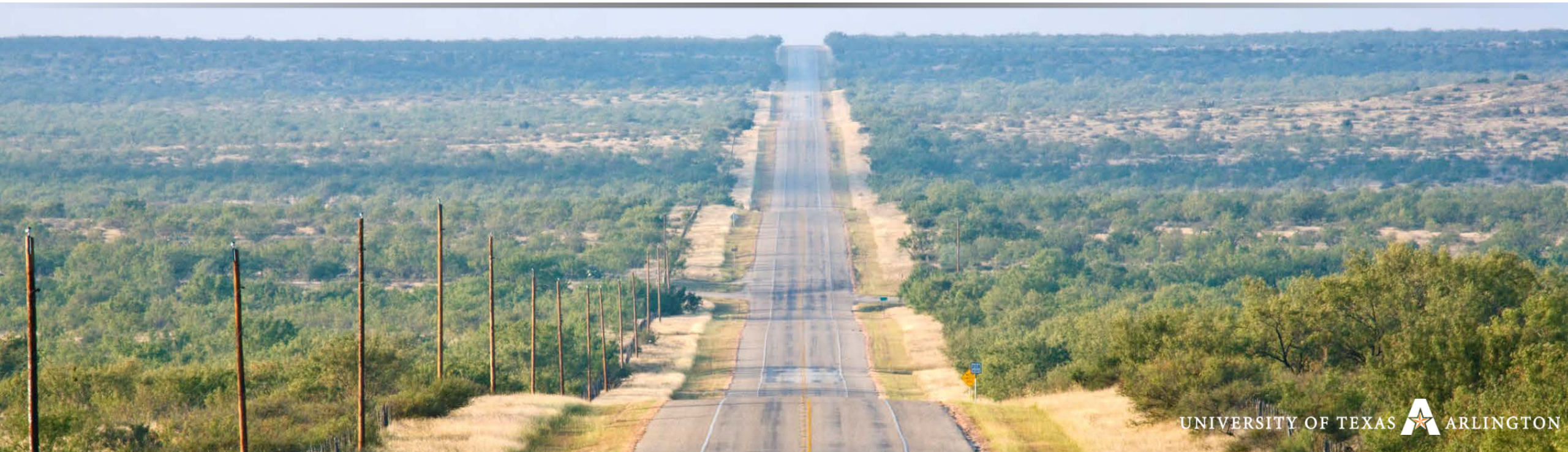


Unpaved roads are an integral and strategic part of the national road network and successfully function for years when properly constructed and maintained. But they don’t stand up to traffic without some occasional maintenance.

Unpaved Roads

- 35% of all US roads are unpaved *(2012)*
- Most unpaved roads serve agricultural and residents
- Budget constraints mean more unpaved roads

Raveling

Dusty when dry

Slippery when wet

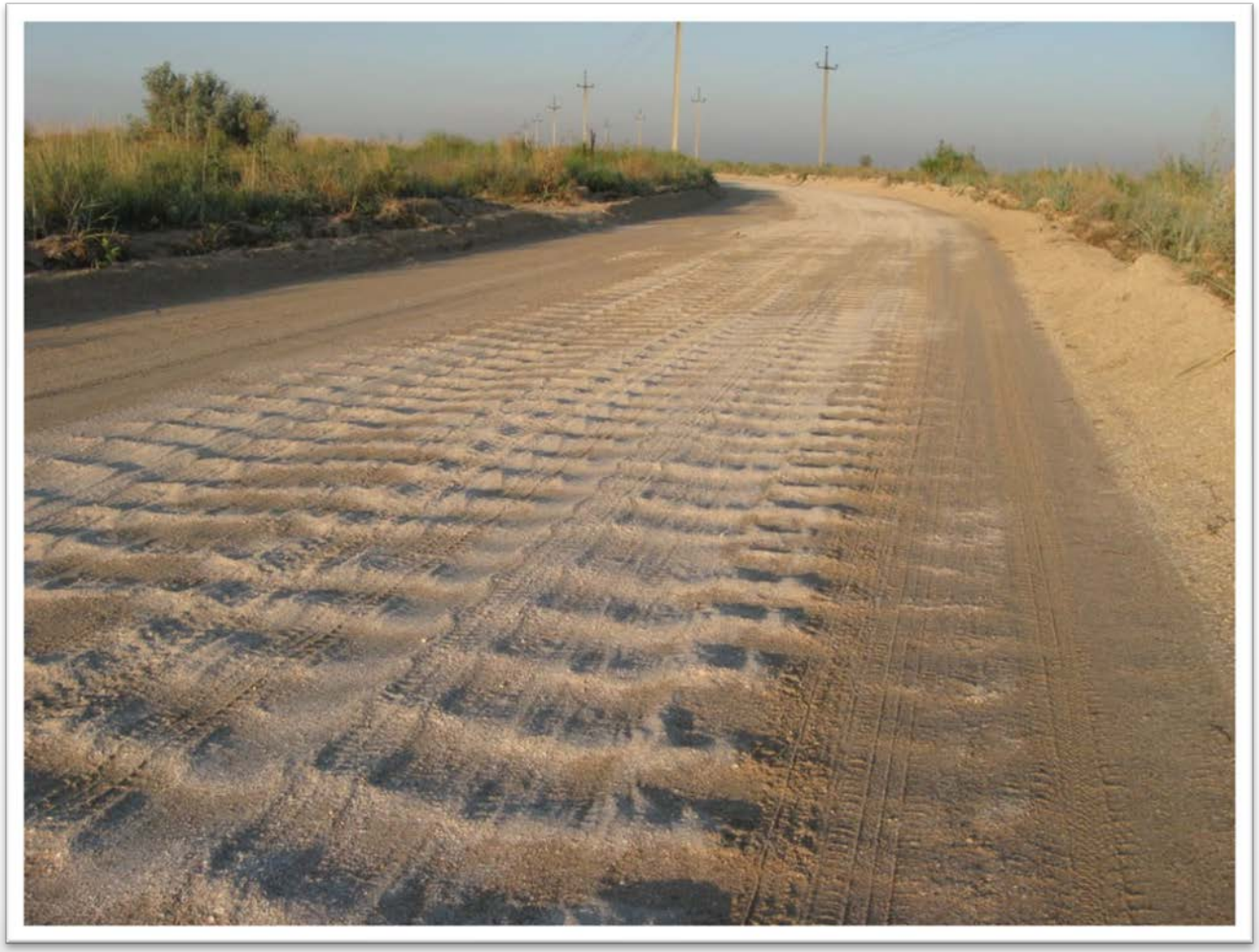
Impassable

Fines Control

- Often determined by the quality and type of gravel
- Important to control for a variety of reasons

Lost Fines Results

- Lost aggregate
- Washboard effect
- Potholes and flying rock
- Broken headlights and windshields
- Lost money
- Challenging public relations



Know Your Material

The performance of unpaved road treatments is primarily influenced by how well the treatment is matched to the material properties of the wearing course materials

Consider: Traffic volume and type, road geometry and climate

Issues: Material properties, the way the road is constructed and maintained

A finished road is only as good as the materials that form the riding surface!

Dust Control

- Good surface compacts well
- Less maintenance needed

Crown and Drainage

Good drainage is imperative for optimal performance of unpaved roads, especially in terms of all-weather passability, reducing slipperiness and erosion, and preventing potholes

Why Is Dust Control Important?

Air Quality

Water Quality

Reduced Agency Cost

User Issues

Chemical Treatment

Maintaining

Air Quality

- Human health
  - Respiratory issues, Residences coated with dust, Accident risk due to drivers' reduced visibility
- Livestock (and game) health
  - Increased dental wear due to chewing vegetation coated in dust, Respiratory issues
- Crops (and other vegetation)
  - Problems related to coating crops with dust
- Equipment and Vehicle Damage
  - Reduced life of air filters, Damage related to dust throughout any machine exposed to dust

Water Quality

Runoff into adjacent waterways

Reduced Agency Costs

- Less frequent routine blading due to stabilizing effects
- Less surfacing material loss
- Lowered dust loss, leading to less frequent regravelling

User Issues

- Wet-weather performance
  - Increased rutting because of higher moisture contents
  - Increased accident risk because of slippery conditions
- Dry-weather performance
  - Improved visibility leading to safer travel
  - Better crust formation reduces washboards (rhythmic corrugations)
  - Retention of fines, preventing washboarding and raveling
  - Tolerate some roughness but preserve a durable, drainable crust

Appropriate Chemical Treatment

- Understanding additive categories
- Choosing the right chemical treatment

Applying Chemical Treatments

- Preparing the road
- Safety and environmental considerations
- Spray-on application process
- Mix-in process

Maintaining Treated Roads

- Preventing damage to crusts

Why Chemical Dust Control?

Depending on the situation, treating an unpaved road with an appropriate additive generally limits the fines loss. Fines are the “glue” that holds the larger aggregates of an unpaved road together to form the surface layer.

Selecting a Treatment

There are more than 200 proprietary unpaved road additives on the market in the United States, ranging from general purpose dust controls that work well under a range of conditions to soils specific stabilizers that have been developed to improve the properties of certain high clay content soils. Most additives can be categorized, based on chemistry, to aid selection for a specific additive. To properly select an additive for a roadway, the material properties, geometry, traffic levels, and climate must be known.

Dust Suppressant Categories

Water

- Attributes
  - o Normally readily available
  - o Generally inexpensive

- Limitations
  - o Not long lasting

Dust Suppressant Categories

Calcium Chloride / Magnesium Chloride

- Attributes
  - o Absorbs water out of the atmosphere
  - o Treated road can be regraded and recompacted with less concern for losing moisture and density

- Limitations
  - o Doesn't perform as well as MgCl2 in long dry spells
  - o Corrosive to metal

Calcium Chloride

Magnesium Chloride

Dust Suppressant Categories

Lignin Derivatives

- Attributes
  - Greatly increases dry strength of material under dry conditions
  - Can be reworked with a grader if surface is moist
- Limitations
  - Corrosion of aluminum and its alloys
  - Becomes slippery when wet, brittle when dry

Lignosulfonate road

Dust Suppressant Categories

Asphalt Based

- Attributes
  - Binds the surface particles because of asphalt adhesive properties
  - Serves to waterproof the road

- Limitations
  - If too many fines in surface and high in asphaltenes, it may form a crust and fragment under traffic and in wet weather

Dust Suppressant Categories

Synthetic Polymer Emulsions

- Attributes
  - Binds surface particles
  - May increase shear strength of material
- Limitations
  - Difficult to maintain as a hard surface
  - Performs best if mixed in place

Synthetic Polymer

Dust Suppressant Categories

Portland Cement

- Attributes
  - Binds surface particles
  - May increase shear strength of material
- Limitations
  - May be more expensive
  - Performs best if mixed in place

Dust Suppressant Categories

Seal Coats (Chip Seals)

- Attributes
  - o Waterproofs
  - o Improves skid resistance
- Limitations
  - o Adds little structural strength
  - o Cannot significantly improve ride

Dust Suppressant Categories

Asphaltic Concrete Pavement (ACP)

- Attributes
  - o Can correct some surface irregularities
  - o Smoother and quieter roads
- Limitations
  - o Higher Costs
  - o Cracking Potential

Application and Compaction

Proper application and compaction are critical

Spraying the additive

Compaction with rubber-tired roller

Road before treatment

Road after treatment

Planning An Unpaved Road Improvement Program

Designing and implementing an unpaved road improvement program requires a comprehensive understanding of specific site, road, and traffic characteristics and, depending on how a practitioner goes about it, can lead to different decisions about what is the most appropriate dust control solution for an unpaved road.

Planning An Unpaved Road Improvement Program

Data Gathering:

The first task in establishing an unpaved road improvement program, with specific emphasis on using chemical treatments, is to document the features of the unpaved roads in the network. This includes a survey of the road and adjacent land, and possibly working with the road users and those who live next to it to understand public perceptions of problems with the road.

Planning An Unpaved Road Improvement Program

Ranking:

Based on the data collected, the road manager will need to rank the roads for improvement. The criteria used for this condition ranking will initially depend on the type and levels of distress, but may also be influenced by public complaints, political intervention, and/or funding mechanisms.

References

Publication No: FHWA – CFL/TD-13-001: January 2013
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www.fhwa.dot.gov/clas/pdfs/UnpavedRoadDustManagementASuccessfulPractitionersHandbook.pdf

Publication No: FHWA –OTS-15-0002: August 2015
Gravel Road Construction and Maintenance Guide
https://www.fhwa.dot.gov/construction/pubs/ots15002.pdf

- TxLTAP -

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