



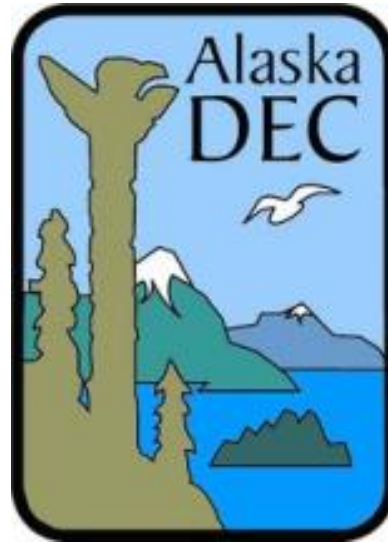
Introduction to Dust Suppressants

ITEP Road Dust Management Series: Webinar 2 of 4



June 18, 2020

Acknowledgments



ALASKA NATIVE
TRIBAL HEALTH
CONSORTIUM





Facilitator

Mansel A Nelson

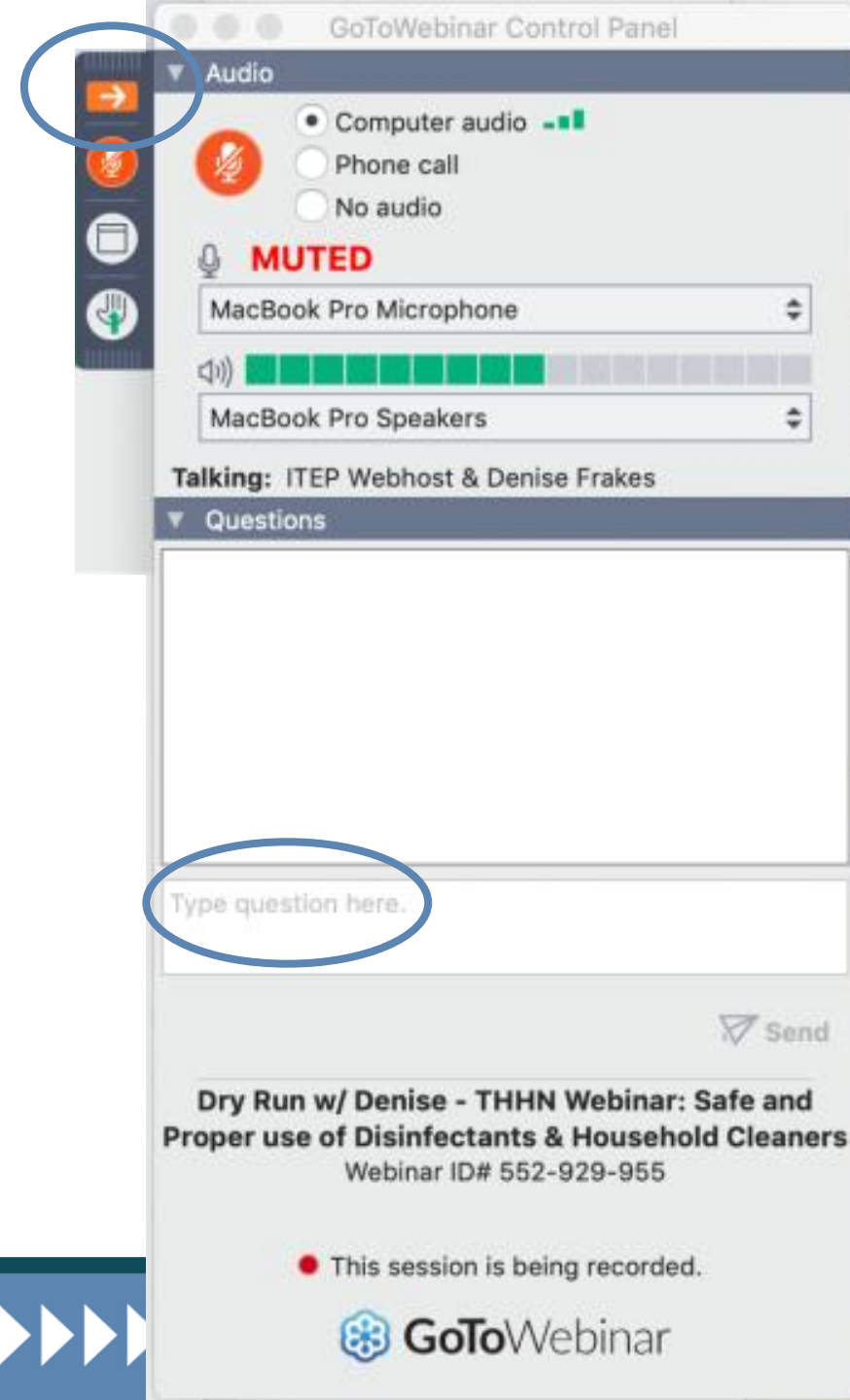
Institute for Tribal Environmental Professionals (ITEP)

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Welcome to Today's Webinar

If your webinar control panel on the upper right side of your screen is minimized, you can click on the orange arrow on the grab tab **to access the audio and questions box.**



The screenshot shows the GoToWebinar Control Panel interface. At the top, the title bar reads "GoToWebinar Control Panel". Below this, there is a "Grab" tab with an orange arrow icon, which is circled in blue. The "Audio" section is expanded, showing options for "Computer audio" (selected), "Phone call", and "No audio". A red "MUTED" indicator is visible. The microphone is set to "MacBook Pro Microphone" and the speakers to "MacBook Pro Speakers". A volume bar is shown below. The "Talking" section indicates "ITEP Webhost & Denise Frakes". The "Questions" section is expanded, showing a text input field with the placeholder "Type question here." circled in blue, and a "Send" button. At the bottom, the webinar title "Dry Run w/ Denise - THHN Webinar: Safe and Proper use of Disinfectants & Household Cleaners" and ID "Webinar ID# 552-929-955" are displayed. A red dot indicates "This session is being recorded." and the GoToWebinar logo is at the bottom.



Webinar Logistics

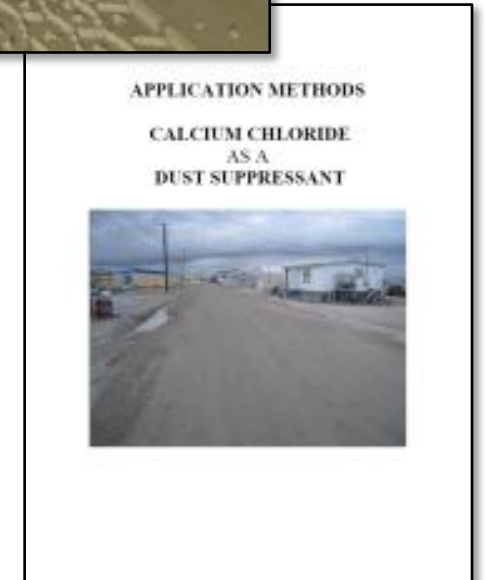
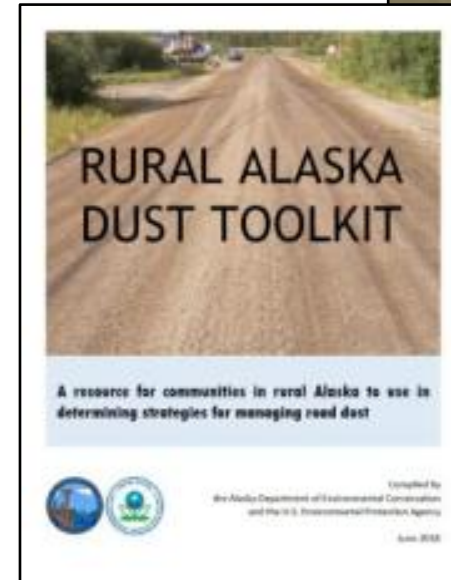
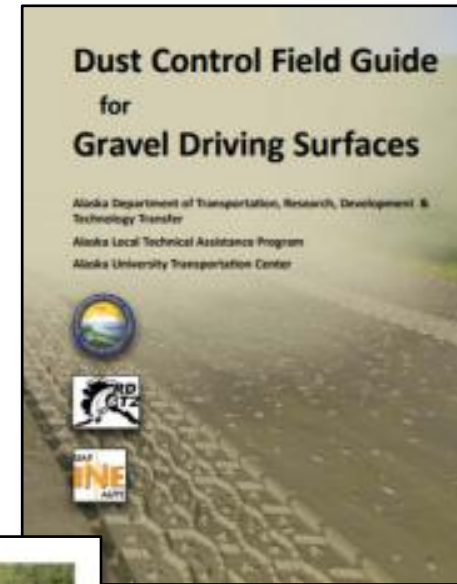
- Webinar is being recorded
 - URL for the recording will be in post-webinar email and posted at <https://bit.ly/RoadDust>
- Questions
 - Use the Question box in the control panel to submit questions any time
 - You can use the GroupMe app on your computer or phone to submit questions
 - You can email Gay.Santina@epa.gov for any further questions
 - We will check in on questions mid way through the webinar
- Please complete the webinar feedback survey
 - Link for the feedback survey will be in post-webinar email
- Training Certificates are available for everyone who completes all 4 webinars
 - Webinar #3 will be in July (date TBD)



Webinar Materials

The following materials from the webinar will be available via a URL that will be sent in the post-webinar email:

- Vocabulary / Presenter Bios
- Slides from Webinar #2
- Dust Control Field Guide
- Calcium Chloride Application Guide
- Rural Alaska Dust Toolkit



Presenters



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Poll 1

Which of the following best describes your role?

- IGAP or other Environmental Staff
- Transportation Coordinator
- Community or Tribal Leader
- Federal or State Partner
- Other





Getting Started:
Assessing the Need for Dust Suppressants



Webinar Overview

- Assessing the need for dust suppressants
- How to select and apply dust suppressants
- Types of dust suppressants
 - Road watering, salts, synthetic palliatives
 - Relative cost, longevity, impacts, how they work, equipment needs
- Soil stabilization
- Funding and partnerships



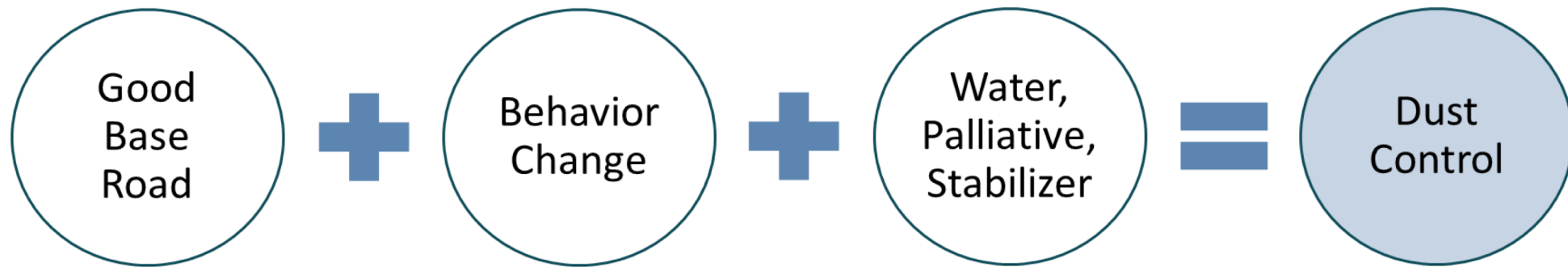
Suggested Dust Management Approaches

Based on Rainfall	Suggested Dust Management Level		Based on Road Usage
12-20 dusty days (May-Sept)	Level 1: Institutional Controls (i.e. changes to driving behavior)		< 25 vehicles/day
21-30 dusty days (May-Sept)	Level 2: Institutional Controls + Road Watering		25-75 vehicles/day
31-50 dusty days (May-Sept)	Level 3: Institutional Controls + Chemical Stabilization (i.e. palliatives)		75-500 vehicles/day
51-61 dusty days (May-Sept)	Level 4: Aggregate Stabilization	(ex. chip seals)	500-1,200 vehicles/day
		(ex. pavement)	> 1,200 vehicles/day



Additional Considerations

- The appropriate level of dust management will vary by climate, region, soil type, and traffic
- These approaches should build on each other
- Good road design and maintenance, paired with behavior change, are key components of dust management at all levels



*Communities can have **immediate impacts** by supporting behavior change and starting with a good base road.*



Types of Dust Monitoring

- Compliance-based
 - Hi-Vol samplers
 - Opacity
- Non-regulatory measurements
 - Portable monitors (ex. DustTrak)
 - Low-cost sensors (ex. PurpleAir)
 - Visual monitoring (using photos and observations)



Road Dust Vocabulary

- **Surface course:** the top layer of the road that is directly driven on
- **Aggregate:** a mixture of different sized crushed rock that makes up the road surface
- **Fines:** the smaller (fine) pieces of crushed rock material that is part of the aggregate and makes up the road surface
- **Plasticity:** a measure of the quality of the binding particles in a clay soil; higher clay content of soil generally indicates higher plasticity
- **Dust suppressant / dust palliative:** substances applied to the surface of a road to control and reduce the generation of dust
- **Chip seal/high float:** a road type made up of one or more layers of asphalt and aggregate





General Considerations:

How to Select and Apply Dust Suppressants





Prioritize Areas for Dust Suppression

- Roads that are used the most
- Roads near places where people congregate (school, community hall, store, clinic, etc.)
- Roads outside of homes where individuals with respiratory issues live (young, elderly)
- Roads close to environmentally sensitive areas
- Roads near subsistence and food preparation areas

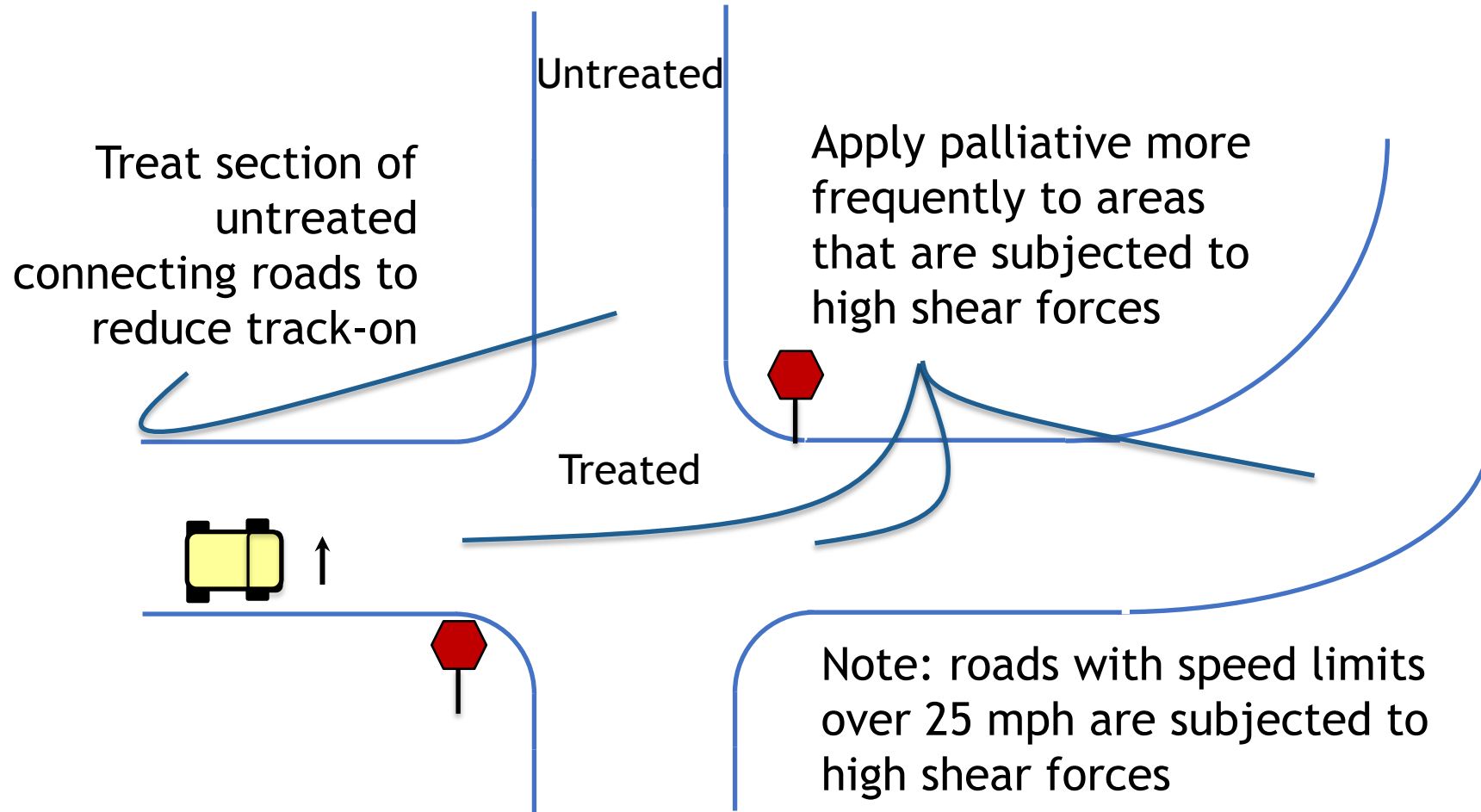


General Considerations for Dust Suppressants

- **Plan, assess, prioritize, budget**
- Start with a good base road
- Consider track on / track off
- Chemical Palliatives
 - Requires periodic reapplication
 - Consider recompacting every few weeks
 - Wear and abrasion is minimized with good driving habits
- Pavements
 - Requires annual maintenance
 - Encourages increased use for skateboards, bicycles, and those in wheelchairs (Alaska villages)



Product Application and Maintenance



Types of Dust Suppressants

> 250 on the market!

- **Water**
- **Water-attracting salts:** *calcium chloride, magnesium chloride, sodium chloride*
- **Organic non-bituminous binders:** *lignosulfonates, tall oil, pine tar*
- **Synthetic oils:** *proprietary formulations*
- **Electrical-chemical stabilizers:** *enzymes, sulfonated oils, ionic*
- **Bitumen asphalt and tar:** *cutback asphalts, emulsified asphalts*
- **Synthetic polymer emulsions:** *polyvinyl acetate, vinyl acrylic*





Dust Suppressants Commonly Used in Alaska

Water

Calcium chloride

Synthetic fluids



How do Palliatives Work?

- Binding particles together
 - Gluing
 - Chemical bonding
 - Cohesion
- Wetting particles
 - Increases weight
 - Increases cohesion



Untreated Road Material



Treated Road Material



Application Methods

- Topical or surface application
 - Liquid or dry followed by liquid
- Blended
 - Liquid or dry followed by liquid
 - May be blended in the top 1-4 inches

Base the application method on the equipment you have and the product you will be using



Selecting a Palliative

Palliative Family	Climate			Plasticity Index				Fines (%Passing 200 sieve)				
	Dry	Damp	Wet	<3	3-5	6-15	>15	<5%	5-10%	11-20%	21-30%	>30
Water	N	Y	Y	M	M	Y	Y	Y	Y	Y	N	N
Salts	N	M	Y	M	Y	Y	N	N	M	Y	M	N
Organic non-bituminous	Y	Y	N	M	Y	Y	N	N	M	Y	Y	N
Synthetic Fluids	Y	Y	M	M	Y	Y	N	N	M	Y	Y	M
Electrical chemical stabilizers	N	Y	Y	N	N	M	Y	N	N	M	M	Y
Bitumin asphalt and tar	Y	Y	M	Y	Y	M	N	M	Y	Y	Y	N
Synthetic polymer emulsions	Y	Y	M	M	Y	Y	N	M	Y	Y	Y	N

- If YYY then strongly consider
- If YYM then consider
- If YMM then maybe consider
- If any criteria is N don't consider

higher plasticity index = higher clay content





Questions?





Level 2 Dust Management:
Institutional Controls & Road Watering



Road Watering

- **Relative cost:** inexpensive
- **Longevity:** 30min – 2hrs
(depending on temperature and humidity)
- **Impact:** not a hazard, can be applied anywhere
- **Best for:** soils with higher plasticity because they hold onto water better
- **Works by:** wetting particles





Applying Water

- **Equipment needs:** requires minimal equipment
- Topical application
- Frequent application improves performance
- Enough should be applied to wet the road, but not flood it
- Needs to be uniformly applied to prevent erosion
- Requires a permit for the water source being used





Level 3 Dust Management:
**Institutional Controls & Chemical
Stabilization**



Salt-Based Palliatives

Calcium Chloride, Sodium Chloride, Magnesium Chloride

- **Relative cost:** mid-range
- **Longevity:** 1 – 3 years
- **Impact:**
 - Corrosive to vehicles (don't use at airports!)
 - Sometimes slippery during/after rainfall
 - Has a bitter taste if it comes in contact with food
 - Mucus irritant, but no long-term health effects
 - Can impact water quality
- **Best for:**
 - Areas with >34% relative humidity
 - Roads with 10-15% fines content
- **Works by:** absorbing water from the atmosphere and reducing the evaporation rate





Applying Salt-Based Palliatives

- May be applied dry (flake), or as a blended brine (liquid)
- Application rate: 1-1.5% salt by weight
 - **Flake:** 1.0 – 1.5 lb/yd²
 - **Pellet:** 0.8 – 1.3 lb/yd²
 - **Liquid:** 0.2 – 0.3 gal/yd²
@ 33-35% salt by weight (~2.8 lb/gallon)
- **Equipment needs:**
 - Water truck and sprayer
 - Grader and compaction equipment (can use grader or truck)



Synthetic Fluid Palliatives

SoilTac, EnviroKleen, EK-35 (examples of products frequently used in Alaska)

- **Relative cost:** more expensive than salt-based palliatives
- **Longevity:** 1 year on roads, 2 years on runways
- **Impact:**
 - Non-corrosive, but difficult to wash off vehicles
 - Naturally clear liquid but may have additives
 - Generally non-toxic unless pure product is consumed in excess
- **Best for:**
 - Roads with 9-12% fines content
 - Roads that are near sensitive areas (generally in town or at airports)
 - Roads that are well-maintained and already have a good surface course
- **Works by:** binding fines together and decreasing moisture loss from soil

Palliative Predicted LD50s	Toxicity Scale by Oral Rat LD50s	Common Household Product LD50s
EK-35 (1,060-1,753) EnviroKleen* (>2,811->4,143) Durasoil* (>3,409->14,173)	Slightly Toxic LD50 = 500 - 5,000 (1 pint)	Bug spray (1,747) Aspirin (1,500) Salt (>3,000)
Durasoil* (>3,409->14,173)	Practically Non-Toxic LD50 = 5,000 - 15,000 (1 quart)	Baby foaming shampoo & wash (>5,000) Air freshener & deodorizer (5,800) Hand sanitizer (7,060) Bar soap (12,600) Hand & body lotion (12,600)

Applying Synthetic Fluid Palliatives

- **Equipment needs:** requires minimal equipment to apply, but uniform application critical
- Application rate: 30-40 sf/gal
- UAF Dust Column can be used to test the needed application rate and how effective it will be for different soil types
- May be blended using suppliers' recommendations
- Can be frozen and is a liquid <-40 F
- Must be mindful of weather forecast when applying the product or risk the product washing off in the rain afterwards



Vegetable Oils

- Often waste products from food industry
- Sometimes creates an odor and attracts animals
- Not very effective (Han, 1992)
- Little binding power
- Becomes brittle as it oxidizes, which may be a health hazard



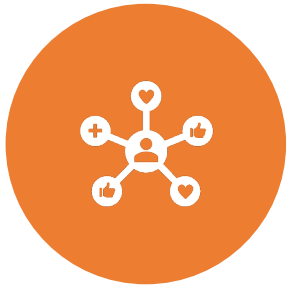
Observe and Re-apply Palliative as Needed

- Observe and photograph dust production behind vehicles every few weeks
- When noticeably dustier, re-apply palliative to dusty areas, possibly at a lower rate



Managing Expectations

Road treatments must be coupled with improved driving habits and will take time...



Be mindful of what's possible to do with the resources available



Understand community limitations



Don't promise more than you can deliver



Develop a multi-year improvement plan and sustain efforts





Level 4 Dust Management:
Soil Stabilization or Pavement



Chip Seals and High Float

- **Relative cost:** high
- **Longevity:** ~7 years
- **Best for:** roads that are well-maintained, have a strong base, and good drainage
- **Works by:** binding aggregate with asphalt
- **Equipment needs:**
 - Grader and compaction equipment
 - Chip spreader and distributor



Hot Mix Asphalt Pavement

- **Relative cost:** highest
 - Annual maintenance
- **Longevity:** ~15-20 years
- **Best for:** roads that are well-maintained, have a strong base, and good drainage
- **Works by:** binding aggregate with asphalt
- **Equipment needs:**
 - Paving machine
 - Grader and 2-3 compactors
 - Loader and several haul trucks
 - Crusher if aggregate is crushed on site



Poll 2

**What sources of funding does your community currently use to support dust management work?
(select all that apply)**

- IGAP grant
- MOU with City Government
- BIA transportation funds
- Other Federal funding
- Other State/Local funding





Other Considerations:
Funding and Partnerships



Purchasing/Equipment Needs



- Level 1: Behavior Change
 - Speed signs or "dust sensitive" signs
 - Radar gun to measure speeds
 - Graders and other equipment for road maintenance
- Level 2: Road Watering
 - Application equipment
- Level 3: Dust Suppressants
 - Dust suppressant products
 - Application equipment
 - Lab testing of local roads materials to identify an appropriate palliative and application rate
 - Freight/shipping
- Level 4: Soil Stabilization
 - Pavement



Key Partners in Your Community

- **Environmental Department (IGAP Program)**
Help with air quality assessment, community outreach and education, partnership building
- **Transportation Staff**
Roads inventory, knowledge of funding streams, expertise in dust control (water or palliative application), etc.
- **Clinic Staff**
Health expertise, knowledge of respiratory and cardiovascular illness in the community, could support outreach and education, know whether more patients come in on dusty days
- **School/Youth**
Involve youth in projects (dust sampling, community outreach on speed reduction, etc.)





Questions?





Rural Alaska Dust Partnership

Working together to implement sustainable solutions for dust management