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Iowa State University's Center for Transportation Research and Education (CTRE) is the umbrella organization for the following centers and programs:

- Bridge Engineering Center
- Center for Weather Impacts on Mobility and Safety
- Construction Management & Technology
- Iowa Local Technical Assistance Program**
- Iowa Statewide Urban Design and Specifications
- Iowa Traffic Safety Data Service
- Midwest Transportation Consortium
- National Concrete Pavement Technology Center
- Partnership for Geotechnical Advancement
- Roadway Infrastructure Management & Operations Systems
- Sustainable Transportation Systems Program
- Traffic Safety and Operations

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Soggy spring gravel roads: Dealing with a bumper crop of frost boils

Wind, sun, and decent weather are the only sure cures for soggy, spring gravel roads. It's clear that the best time to deal with spring frost boils is when it's dry and sunny, not in the middle of mud season when resources have been depleted after a long, wet winter.

Unfortunately, here in Iowa, even the best dry-weather efforts can't prevent the upheavals, mud, ruts, and washboards on gravel roads after a wet fall, winter, or spring. In bad winters, these distresses may even show up on paved roads, and a good crop of boils are guaranteed on most gravel roads.

What causes frost boils?

The more severe the winter, the deeper the frost layer, and that's part of the problem. Spring thaw starts from the top down, which leaves an expanded, saturated layer of mud over a barrier layer of frost and ice. Since the top four feet serve as insulation, it takes

longer for the lower ice lens to disappear. This barrier forms an impervious layer that prevents moisture from draining down or away from the surface. Because the ground is saturated, the trapped moisture can't run off either.

This trapped moisture rises and falls with temperature fluctuations and results in roadway distresses that are made even worse after a late, wet snow in March or April.

Clarence Perry, the Iowa LTAP motor grader operator training coordinator, offered some tips for dealing with muddy gravel roads both now and when it comes time to install preventive measures.

How can damage be minimized?

Most of the stopgap measures that help control and minimize spring distress on gravel roads depend on timing.

Soggy roads continued on page 2



A typical spring gravel road saturated with water and showing signs of distress.

Acronyms in Technology News

AASHTO	American Association of State Highway and Transportation Officials
APWA	American Public Works Association
CTRE	Center for Transportation Research and Education (at ISU)
FHWA	Federal Highway Administration
Iowa DOT	Iowa Department of Transportation
ISU	Iowa State University
LTAP	Local Technical Assistance Program
MUTCD	Manual on Uniform Traffic Control Devices
NACE	National Association of County Engineers
TRB	Transportation Research Board



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- ✓ Plan your work—don't start randomly hauling rock.
- ✓ Haul rock early in the day while the road is still stiff from low nighttime temperatures.
- ✓ Treat priority trouble spots—like bridge approaches and intersections with paved roads—first.
- ✓ When you feel the need—or public pressure—to haul surface material, try to do so when frozen ground will support the load.
- ✓ When you have a bad frost boil season, notice new or severe problems and put them at the top of the list for good-weather repair.

Steve Akes in Warren County recommends using a roller to compact problem areas. Akes says, "First we fix the soft spots in the worst places—pull the edges in and build up the crown—then haul some rock. We use a pull-behind roller to compact the surface to speed up the healing process and keep moisture from seeping down. All this involves workers and machines—we use two motor graders and trucks to pull the roller and haul rock—but we think rolling makes the repair last longer."

Perry also recommended back dumping as one strategy for spreading rock with a minimum of damage to the road. When it is essential to make a stretch of gravel road passable—like when you need to get a hearse into a cemetery on a dead-end road or in emergency conditions—back dumping puts a layer of rock down ahead of the truck so it doesn't have to travel directly on saturated ground.

What are some preventive measures?

The common denominator for preventive measures is to find a way for moisture to drain. This can be accomplished by

- Tiling bad places.
- Bridging over the problem area. Remove a couple feet of the surface, then use stone and engineering fabric below a final, gravel top layer.



A muddy rural intersection with heavy traffic flow starts to show signs of spring damage.

- Coring down below the frost line in the center of the road and refilling the bore hole with calcium chloride.
- The chloride helps to melt the ice lens, and the bore hole allows moisture to drain.
- Lowering side ditches lowers the water table beneath the roadway. It also helps keep the grade from becoming saturated by giving the moisture a chance to drain away during the wet season.

We're all at the mercy of the elements and mother nature. With prevention and planning, gravel roads are reliable conduits for moving crops and livestock, allowing access for emergency responders, and keeping traffic flowing for rural residents.

For more information

Contact Clarence Perry at 319-986-5751 or Steve Akes at 515-961-1050, stevea@co.warren.ia.us. ■

Tips for local road repairs

This spring's snow melt is causing roadway challenges across the state. Soggy subgrades are hard on asphalt and concrete pavements, as well as gravel roads. For information about repairs for all types of roadways, see chapter 3 of the *Local Roads Maintenance Workers' Manual*, www.ctre.iastate.edu/pubs/maint_worker/index.htm.