Rural Home Technology

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Gravel Road Troubleshooting Guide

This guide addresses many of the PROBLEMS that occur with camp roads, their CAUSES, APPROPRIATE SOLUTIONS and links to the text and further discussion. Although it is not possible to address every type of road situation here, I have attempted to address the major problem areas that face most rural camp and development roads. I hope this guide proves useful and I welcome any comments and feedback.

POTHOLES: depressions or holes in the road surface cause: road surface too flat combined with water and traffic

Solution: reshape or regrade to cut out the potholes and restore crown

Although potholes can also be caused by weak spots in the road base due to pockets of organic matter, rotting stumps or other base defects, the most common cause is lack of pitch causing water to puddle on the road. Restoring crown through regrading or smoothing the surface is generally required for repair. See **6.0 GRADING THE SURFACE**

DEEP MUD: that can be severe enough to close the road in the spring

Cause: poor base materials or drainage, or a combination of both

Solution: add stone, improve drainage or reinforce base with well-drained gravel or install geotextile

If a road turns to impassible mud in the spring, the only practical way to return it to service immediately is to add crushed stone (not gravel) to strengthen it. Stone is worked into the mud until the road is able to support passing loads. Though expensive, this scheme is very effective

for emergency repairs.

See article: **BUCKET OF STONE PLUS A BUCKET OF MUD**

If the repair can wait for dry weather, drainage can be improved or the road base can be reinforced with strong, well-drained gravel. A lower cost solution is to install a geotextile layer over the existing road and cover it with 4 to 6 inches of surfacing gravel. See: **Geotextiles**

MUD HOLES: small areas of deep mud or quicksand-like gravel

Cause: Springs or pockets of organic matter under the road

Solution: Add stone or drain

Small pockets of mud or mudholes can usually be repaired with the addition of crushed stone in the same manner as deep muddy roads (ABOVE). If the source of the problem is an active spring, however, it is preferable to install a subsurface drain to remove the water from the roadbed.

Removing water from under a road is very much the same as installing perimeter drains around a house.

SURFACE MUD or slick surface. Road is firm but "greasy" on top:

Cause: Surface gravel lacks stone

Solution: Resurface with better gravel or add stone to existing surface

If the surface gravel is too thin it may be worthwhile to add gravel to a greasy surface to firm it up. If there is adequate depth of surface gravel but it lacks sufficient stone aggregate to provide strength, it can be cost effective to add crushed stone only and work it into the surface. Angular 3/4" stone is preferable for this purpose. See **5.2 THE ROAD SURFACE**

RUTS or SOFT ROAD: wheels sink in but do not break through, road remains passable

Cause: same as Deep Mud or Mud Holes above but less extreme, although with additional water or traffic can often become impassable.

Solution: Same as any of the solutions for mud above.

Road rutting can be only a minor problem or can signal the start of the breakup of a road. Heavier traffic or additional stormwater or melting snow can contribute to this breakup.

Experience and an understanding of the interaction of soil and water are essential to determining the true reason for roads becoming soft and muddy and are the essential first step in choosing a solution.

The above problems are the result of too much water in a road while the following are generally associated with too little water.

WASHBOARD: the series of evenly spaced bumps that make a vehicle chatter rather than bounce around like potholes

Cause: Road surface is tearing apart through the action of passing vehicles because the surface gravel lacks fines or adequate angular stone or moisture or a combination of the three.

Solution: Regrade the road surface to cut out the washboard and add

good quality gravel with adequate sharp stone and fines. Treat with Calcium Chloride

Washboard is a direct function of traffic, especially fast moving traffic, usually on a dry road, regardless of whether it is upgrade or flat. Providing as hard and compact a surface as possible will help eliminate washboard. Good gravel with considerable fines helps to hold moisture. Calcium chloride increases the road's ability to retain moisture in dry seasons helping to consolidate it to help prevent washboard and other problems.

DUST is the result of surface fines being sucked out of the road by passing vehicles.

Cause: Too little moisture in the surface of the road and traffic moving too fast

Solution: Slow traffic through the use of speed bumps, add water to the surface, or treat with Calcium Chloride or one of the other surface stabilizers (*NOT OLD MOTOR OIL!*).

As dust lifts out of the road it not only creates a nuisance for motorists and adjacent landowners but also, as it blows away it, means a loss of the cement that helps hold the road together. This can amount to many tons of soil loss each year per mile of road. Dust also contributes to nutrient pollution because after it settles on nearby foliage or other surfaces, it can be washed off by rain and carried into surface waters.

Calcium chloride (CaCl) attracts water and holds it in the surface of the road even when applied in moderate amounts. As mentioned under Washboard, CaCl also helps to consolidate a road surface, helping to prevent other defects. In more substantial applications it can actually help reduce total maintenance costs by reducing the necessity for grading. In many situations, the cost of calcium chloride treatment can easily offset the cost of soil loss and the environmental effects of having that soil enter surface water.

See: **Stabilizing Roads with Calcium Chloride**

AGGREGATE SEPARATION, particularly on corners and hills :

Cause: stone aggregate that is too large and/or rounded

Solution: rework stone into surface and topdress with good surface gravel. Stabilize with CaCl

Crushed gravel with stone that is larger than 1" has the tendency to have the stone "kick out" on hills and curves due to wheel action, especially when the surface is dry. These "rolling stones" can also help start a washboard effect.

Reclaiming loosened stone and working it back into the surface can help save it from being lost, but in more extreme conditions the only way to keep this loss from reoccurring is to cover this larger aggregate with a couple of inches of good 3/4" or similar gravel and recompact.

See **5.2 THE SURFACE**

LOOSE SURFACES: the "squirrelly" road

Cause: Lack of fines

Solution: Cover with good surfacing gravel or mix in additional binder

While loose gravel on flat surfaces can create a headache, loose gravel on hills can be a detriment to travel, especially for light rearwheel drive vehicles such as empty pickup trucks or muscle cars. Sometimes even good gravel become loose when fines are lost to wind or to water such as the material that collects at the bottom of a washout. With care, fines can be added to this material and mixed in to reclaim it, or it can be left as base and covered with good surface gravel.

See **5.2 THE SURFACE**

WASHOUTS: rills or gullies where the soil has disappeared and been deposited downstream on the road, in the ditch, or into a waterway

Cause: too much water flowing in too narrow a channel over unstabilized soil

Solution: Slow the water down, spread it out, or stabilize the soil in its path.

Washouts that occur on road surfaces themselves are generally a result of inadequate grading that allows water to channelize rather than staying spread over the whole surface. To avoid this, roads should be properly crowned, road shoulder false berms should be removed or never allowed to form, and cross drainage should be kept free and clear of debris or deposited soil. Road surfaces need to be good quality stable gravel that resists the forces of water and traffic.

See **6.0 GRADING**, and See **5.2 THE SURFACE**

In extreme situations it may be necessary to pave the road with hottop which, if properly installed over a well-drained, stable base should provide a near permanent solution. If hottop is installed over an inadequate base it can become a liability because it cannot be regraded in the event of surface breakup.

Culverts or ditches can wash out because of inadequate design, installation or maintenance.

See **8.0 GETTING WATER AWAY FROM THE ROAD**

Trying to reclaim soil that has washed from the road and reuse it as road surface material is folly. Whatever fines were present in the gravel have left with the stormwater, leaving little more than washed sand and gravel behind. It is reasonable to replace reclaimed material back in to a gully, but it should be covered with good gravel and the crown restored or the same situation will reoccur.

WINTER WOES:

SNOWPLOW DAMAGE: dug up roads, plow berms, crowns removed, etc

Cause: Overeager or careless snow removal before roads have frozen in the Fall, and particularly, after they have thawed in the Spring

Solution: Exercise care when plowing, have prearrangements to not have roads plowed under certain conditions, or plow with front mounted grader-rake instead of a conventional snowplow.

Snowplows, especially the trip-edge type so common here in the

Northeast, are designed to cut under the snow and do not know the difference between snow and gravel. Plowing one late winter snowstorm can undo a whole season's improvements to a road, especially if plow damage goes unrepaired before spring rains take advantage of new channels made by the snowplow.

Ironically, many of these snowstorms would melt within a very few days if left alone. Therefore, the option exist for a road association to establish an agreement between road users and maintenance personnel as to when to avoid plowing because resulting damage may outweigh benefits.

Many of the towns and contractors who use front-mounted grader rakes for summer maintenance have found these units to be well suited to clear snow and slush from soft roads. Because the units are even useful for breaking up winter ice, the demand for traction sand can be reduced along with its detrimental effects on road surfaces and surface water.

See article: **SNOW REMOVAL WITH A FRONT RUNNER**

ICE DAM WASHOUTS: late winter or early spring gullies in the traveled way

Cause: unusual buildup of ice in the snowbanks alongside the plowed road keeping water from being able to run to the road ditches

Solution: Although there is no practical way to eliminate such ice dams, their effects can be reduced by cutting slots through the ice to the road ditch. This should be done as often as possible, especially on steeply sloping roads.

This particular problem seems to be the result of changing winters bringing more icy rains. If ice dams do start water washing down the road rather than to the road ditches before channels are opened up through the ice, it is important to create small dams in the water formed channels to force water into the new turn-outs or it will continue to wash down the road.