# Gravel Road Maintenance Basics

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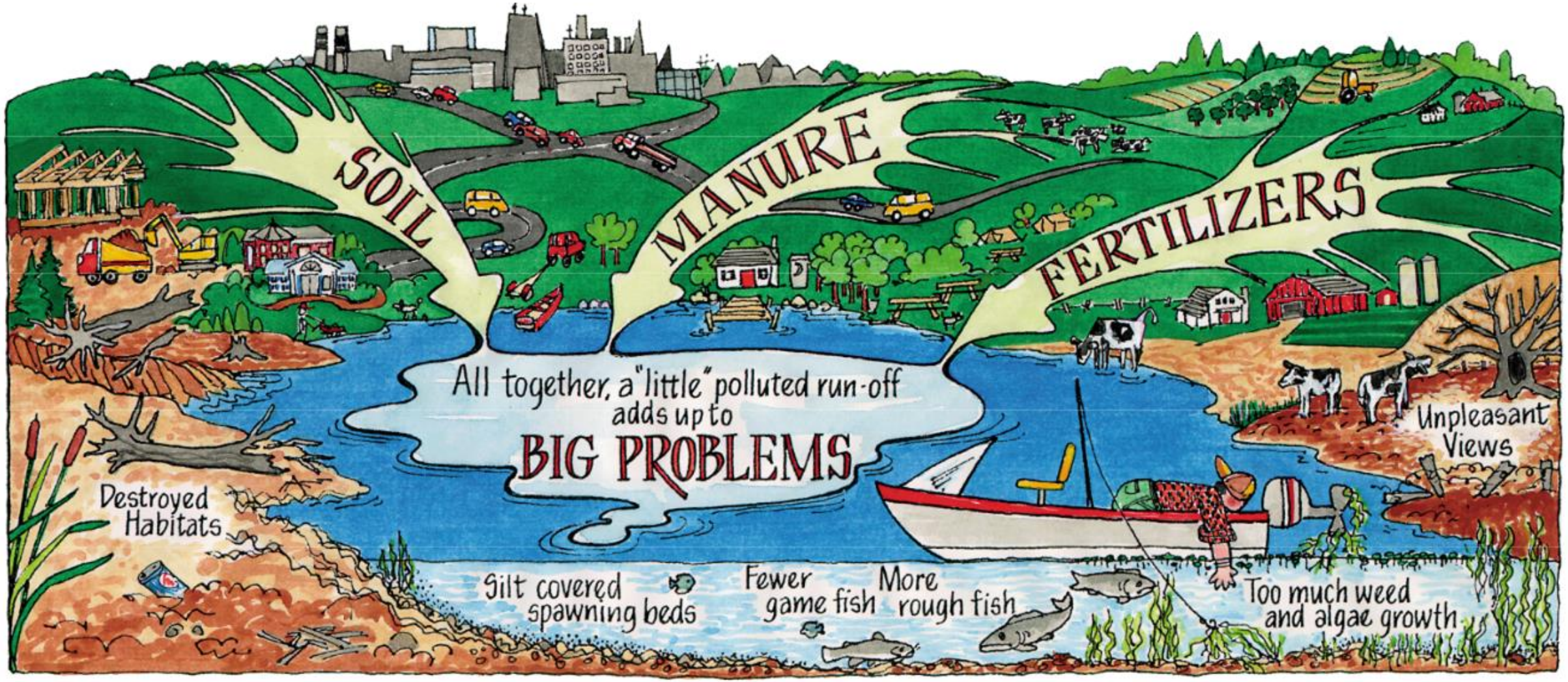
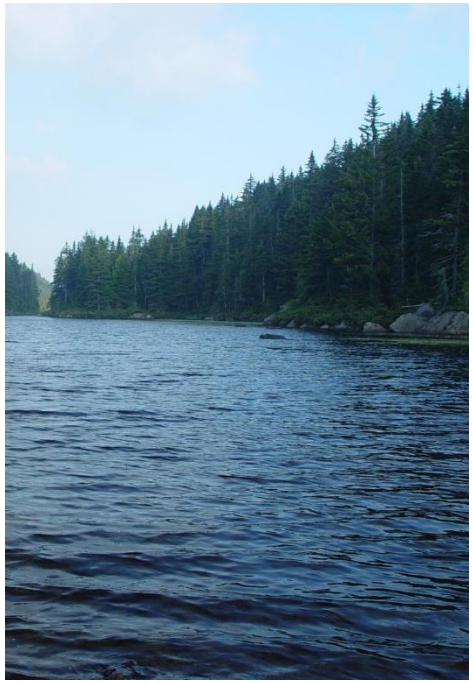
Nonpoint Source Training Center

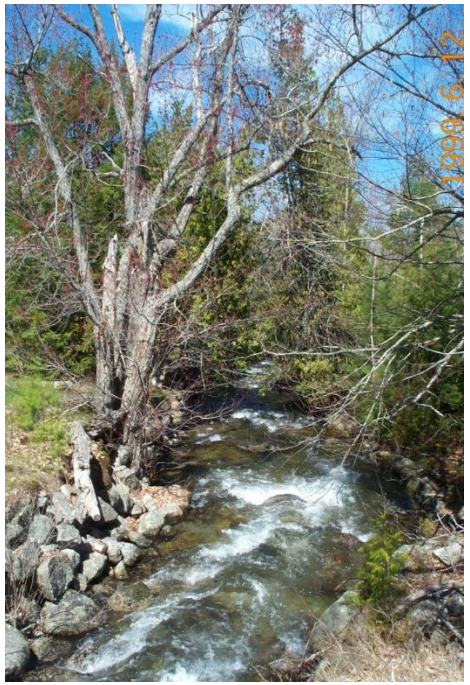
# Watershed


SOIL
MANURE
FERTILIZERS
All together, a "little" polluted run-off adds up to
BIG PROBLEMS
Destroyed Habitats
Silt covered spawning beds
Fewer game fish
More rough fish
Too much weed and algae growth
Unpleasant Views

# Maine's Natural Resources



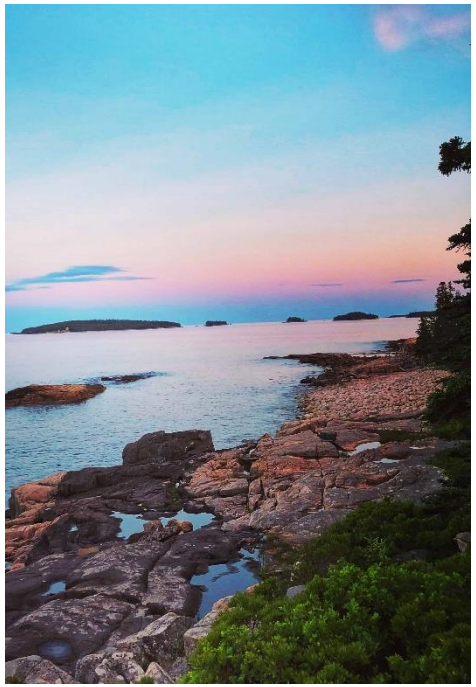
~6,000 Lakes & Ponds



>45,000 Miles of Rivers & Streams

5 Million Acres of Wetlands

157,500 acres of Coastal Wetlands



3478 miles of Coastline

Maine has over **30,000** miles of roads

# It all adds up!

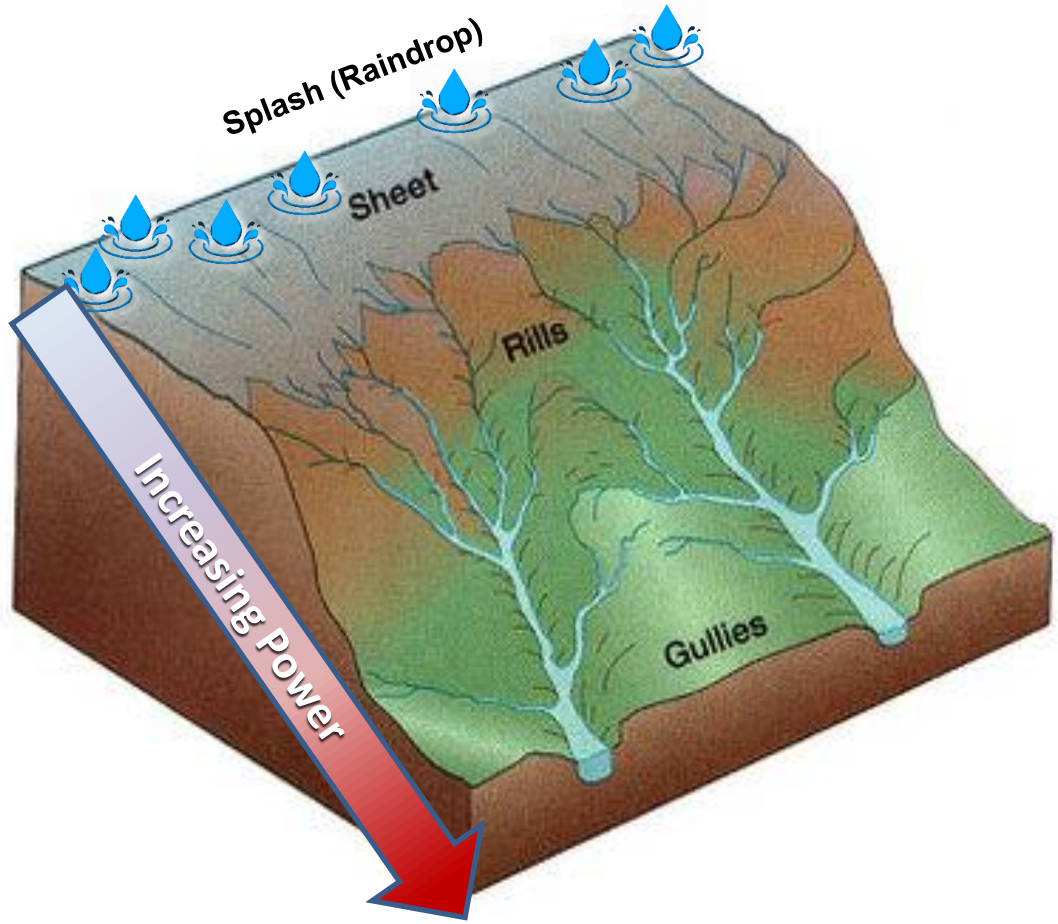
# The Power of Water

## Water needs power to be able to erode the soil

**(Power = Velocity x Depth)**

Increase Water Depth → Increase Power
Increase Water Velocity → Increase Power

Increase Power →Increase Erosion

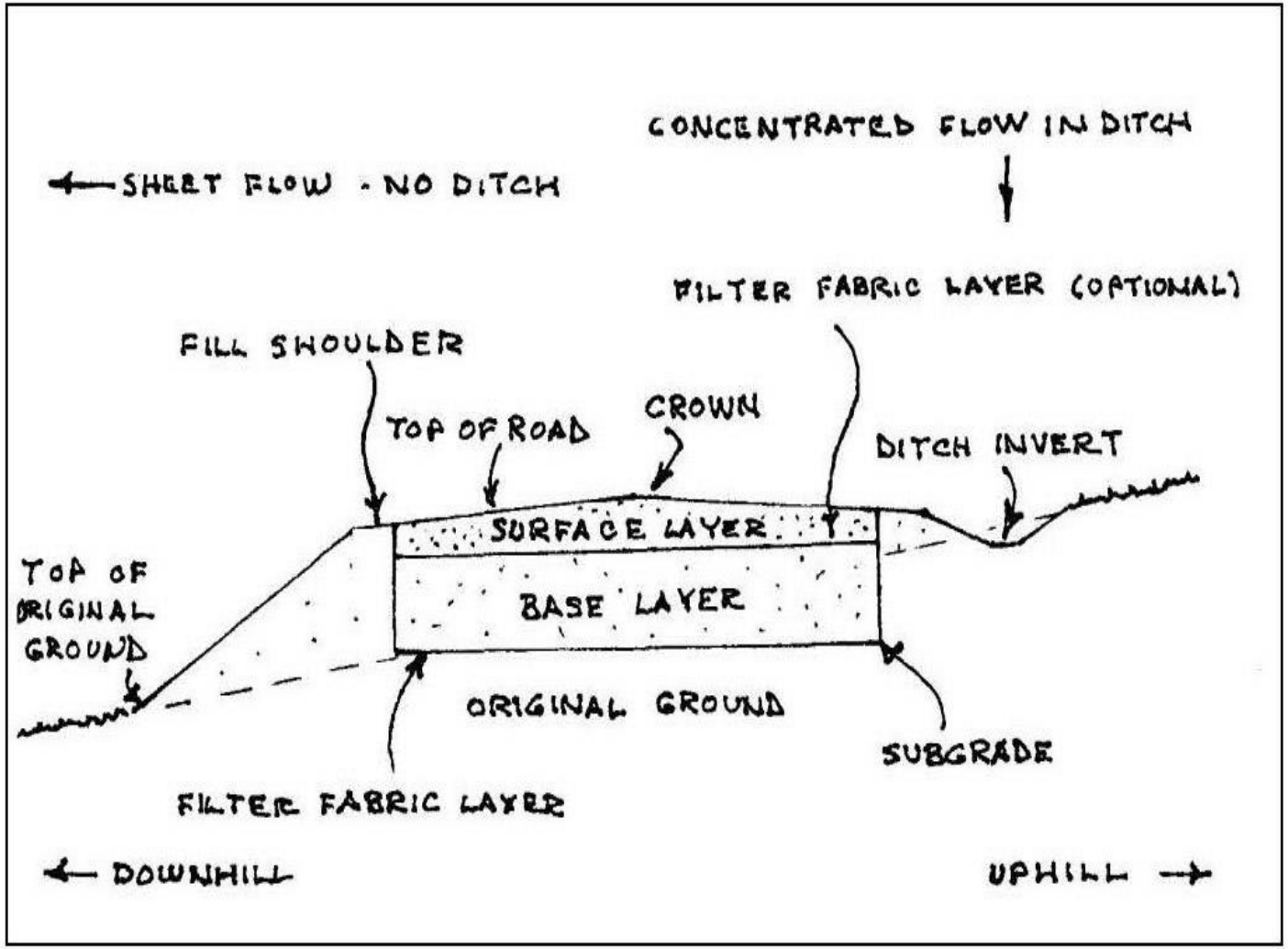


# A Good Gravel Road?

1. Rideability, access, safety
2. Protects Water quality

A good road is <u>designed</u> to support travelling vehicles and provide stable drainage from power of water

# What Makes a Good Gravel Road?




**Crown/Superelevation:** 4%, ½ in per foot

**Surface layer:** 4-6 inches when compacted; 12 inches over geotextile

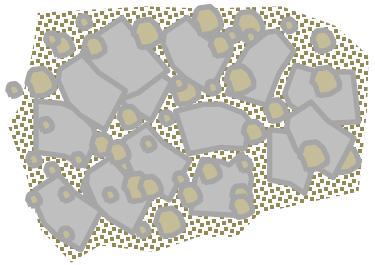
- Hard pack gravel
- Blue stone gravel (limited availability)
- Reclaimed asphalt

**Base layer:** 12-18 inches thick

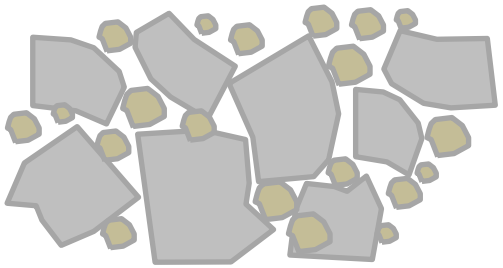
- Open, draining gravel with larger aggregate

# Gravel

## Surface

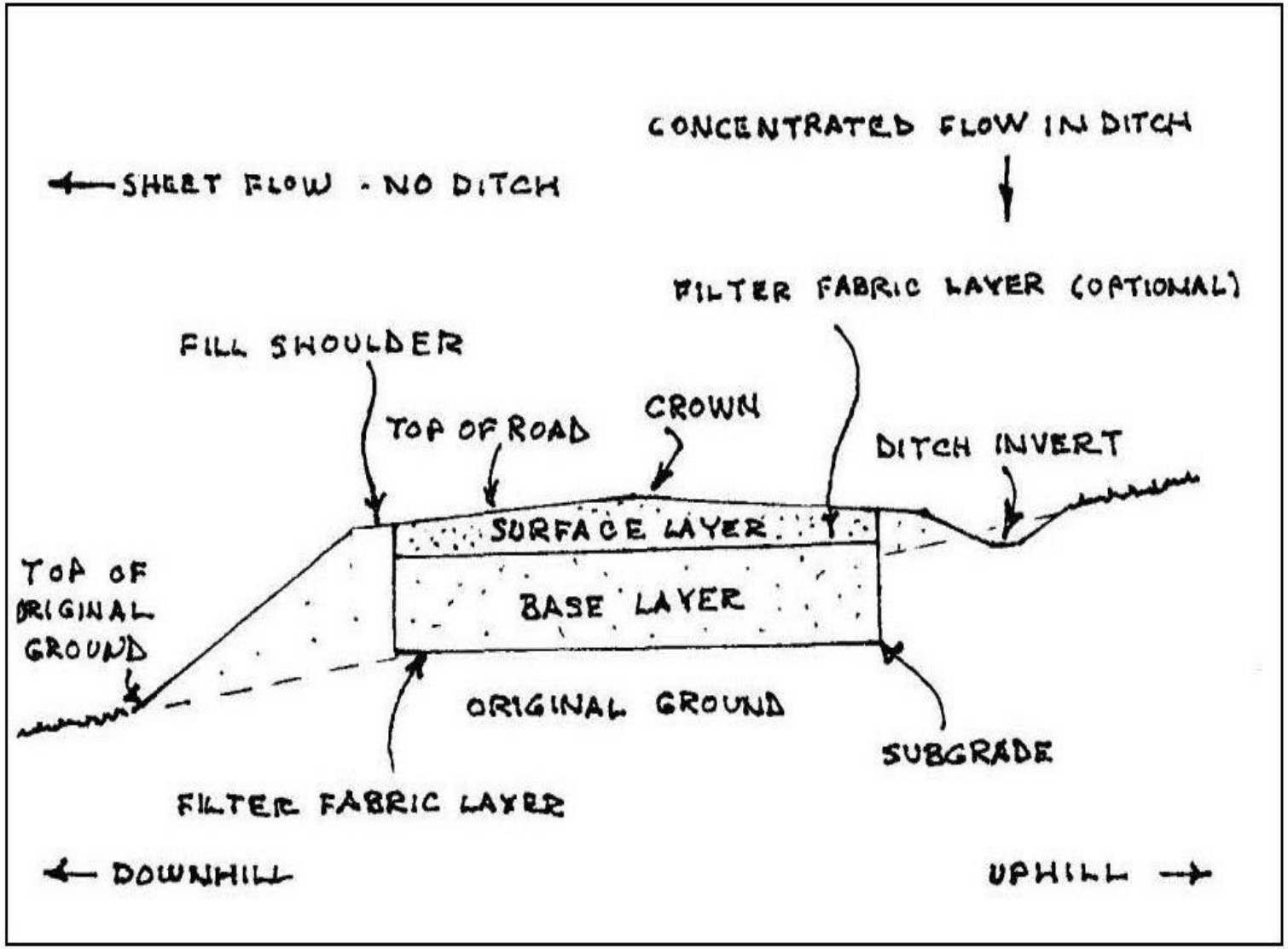


## Base



| Recommended Specifications for Well-Graded Gravel Material for Roads | | | |
|---|---|---|---|
| **Road Base Material** | | **Road Surface Material** | |
| *All material less than 6" in size* | | *All material less than 2" in size* | |
| % by Weight | Is Smaller Than | % by Weight | Is Smaller Than |
| 78-100 | 1 ½" | 85-100 | ¾" |
| 55-75 | ¾" | 70-100 | ½" |
| 30-55 | ¼" | 55-85 | ¼" |
| 8-22 | #40 (sand) | 20-35 | #40 (sand) |
| 0-7 | #200 (silt) | 7-12 | #200 (silt) |

# Basic Gravel Road Design



# Road Surface Problems:

# Tire Rutting/ Soft road

- Poor road base material does not drain efficiently
- Road is too low and the base is in the water table
- Poorly drained native soils that may be unsuitable
- Insufficient road base thickness
- Insufficient ditching/drainage

Photo: Josh Platt

## How to Fix it:

- Reconstruct with proper road base
- Build up road elevation
- Woven geotextiles under surface material
- Improve ditching
- Remove edge dams

# Road Surface Problems:
# Muddy/Slippery Surface

- Poor road surface material containing too many fines + drainage issue
- Insufficient crown or superelevation

## How to Fix it:

- Install new surface material or blended with existing surface
- Re-slope/crown road through grading

# Road Surface Problems:
# Dust

Sign of poor road surface material with too many fines

## How to Fix it:

- Apply new road surface material with the proper soil gradations
- Use of calcium chloride or other polymers as dust suppression

# Drainage Problems:
# Potholes

- Sign of poor road drainage
- Caused by continual suspension and splashing out of fines

## How to Fix it:

- Remove debris from pothole and “cut out” pothole by removing portion of surface
- Fill pothole with appropriate surface gravel and compact
- Regrade road surface to establish/maintain proper crown

# Road Surface Problems:
# Loose Gravel

Poor surface material that lacks fines due to dusting, winter sand or erosion

## How to Fix it:

- New road surface material is needed

# Road Surface Problems:
# Washboarding

- Sign of poor material (too few fines) and fast vehicle speeds

## How to Fix it:

- Check gradation of road material and adjust as necessary.
- A grader should be used to remove washboarding and mix road materials
- Alternative road surface materials may be necessary in certain high stress areas

# Road Surface Problems:
# Longitudinal erosion of road surface

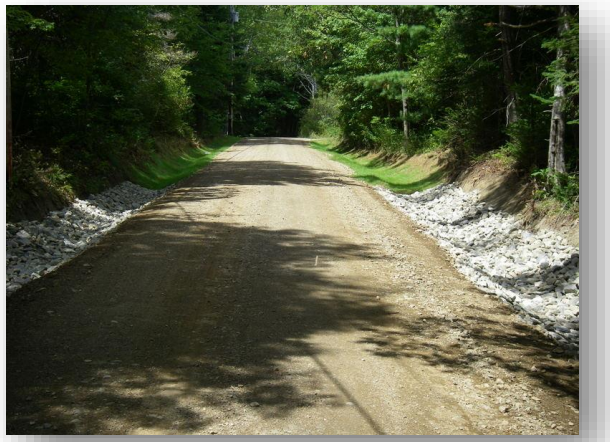
- Flat or u-shaped road
- Edge dams
- Water is traveling in a wheel rut
- Road ditch is not large enough
- Snow banks may be preventing drainage in early spring

## How to Fix it:

- Add crown or superelevation
- Edge needs to be graded
- Road needs to be regraded
- Turnouts or larger ditches
- Plow wider area of roadway

# Drainage Problems:
# Ditch erosion

- Slope of ditch is too steep to handle flow without additional protective measures (vegetation, riprap, turnouts)
- Ditch is too small to handle the volume of water
- Bottom of ditch is too narrow (V-shaped) and needs to be widened
- Ditch may just need some maintenance to remove debris or accumulated road sand



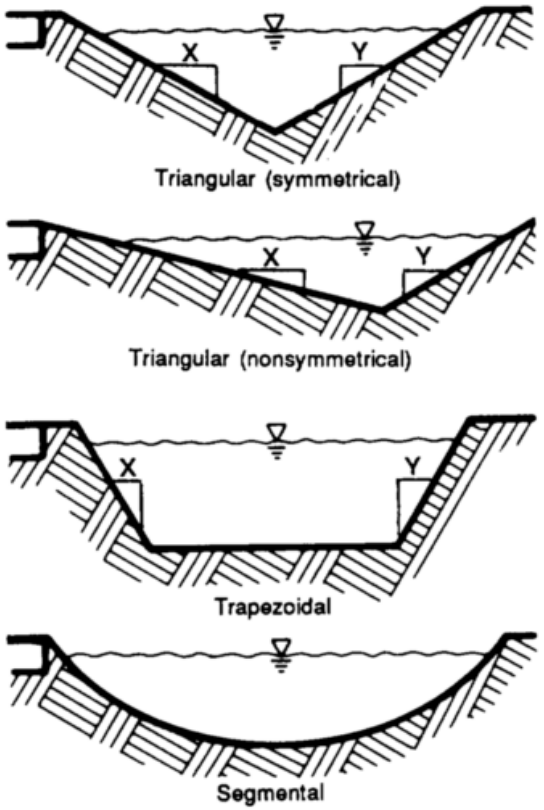
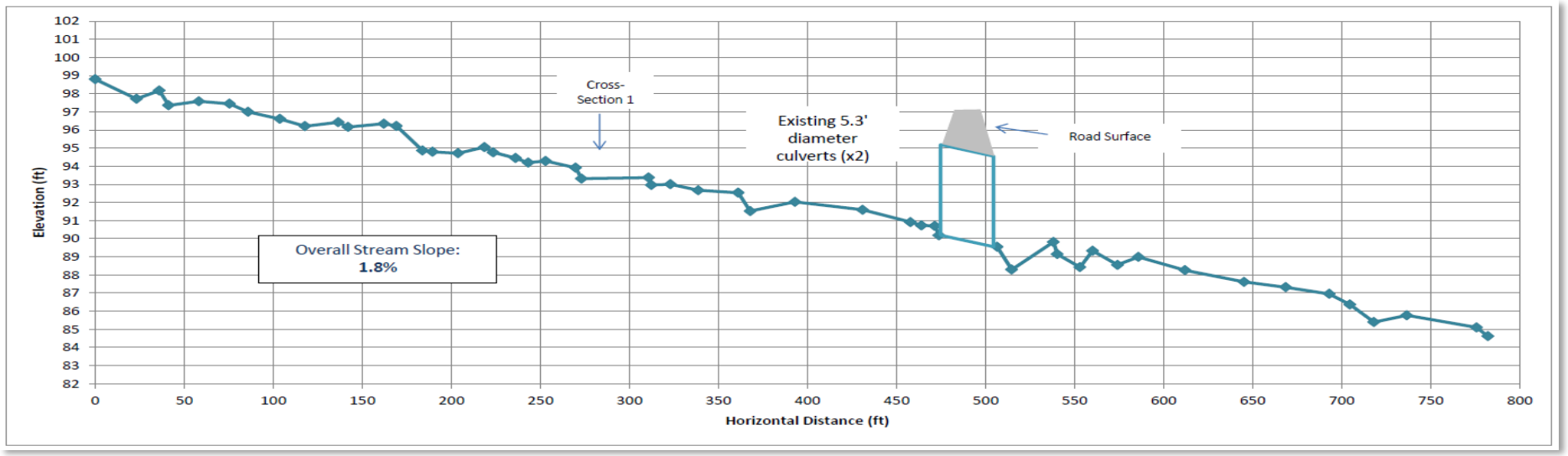



*Figure 6-23. Ditch cross sections*

# Drainage Problems:
# Ponding on uphill side of road




- Culvert set too high
- Culvert too small for drainage area
- Improper culvert slope
- Culvert has heaved or ends have turned up
- Road has created groundwater/surface water dam

# Drainage Problems:
# Water overflows road at culvert

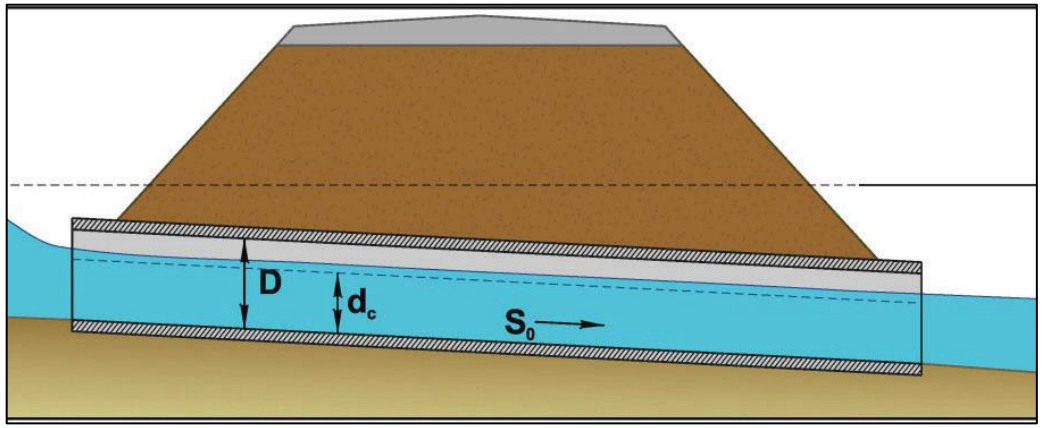
- Culvert is too small for drainage area
- Culvert is plugged with sediment or debris
- Culvert has been crushed and needs replacement

## How to Fix it:

- Size culverts in relation to the drainage area. Minimum recommended culvert diameter is 18 inches.
- Add rock sandwiches for groundwater & wetland crossings
- Add cross culverts or turnouts
- Regular inspection & cleaning of ditches and culverts
- Add gravel to build up profile

# Drainage Problems:
# Culvert fills with sand/debris

- Culvert placed with too little or no pitch
- Culvert outlet structure clogged and in need of cleaning.
- Culvert inlet basin full or not deep enough. There is upstream erosion that needs to be fixed.
- Culverts too far apart in areas of steep slopes




# Drainage Problems:
# Crushed or lifting culvert

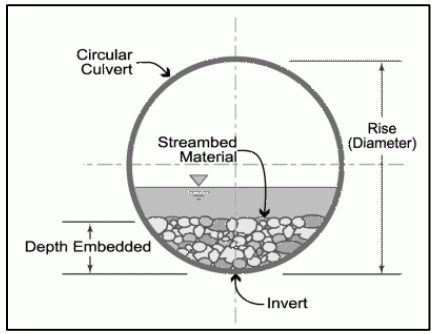
Culverts should be covered with at least one foot of fill. Compact soil in “lifts” or layers of 6 inches.

- Improper installation (lack of compaction, too little cover)
- Culvert has been weakened by rust and needs replacement. Culvert was not designed to handle loads from heavy trucks and equipment.

# Drainage Problems:
# Culvert end erosion

- Insufficient armoring of culvert ends
- Culvert is too short and doesn't allow for proper protection of the side slopes
- Water is seeping alongside the culvert. Install inlet anti-seep collar

# Water Quality & Habitat:
# Stream Crossings



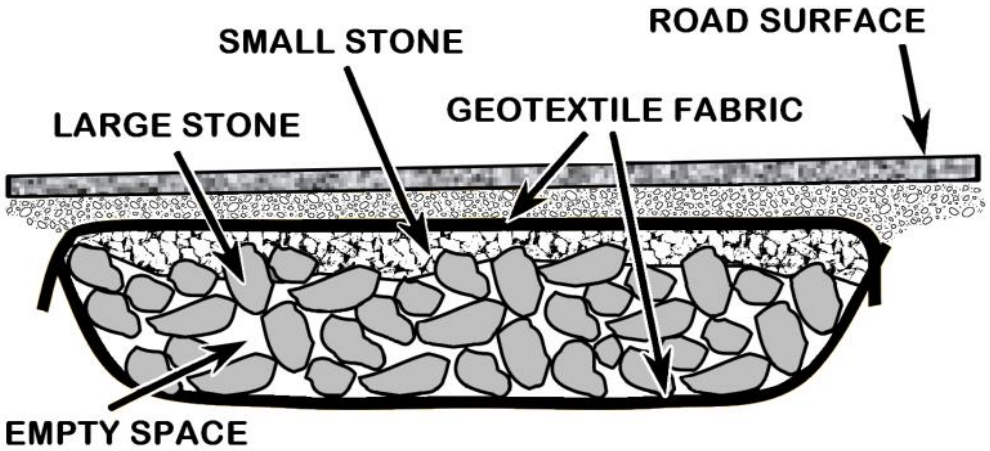

- Culvert installed at wrong pitch
- Culvert not embedded deep enough
- Fish passage issues
- Ditch directly outfalls into stream
- Problems with multiple pipes
- Compliance with DEP exemption & ACOE

## Stream Smart: 4 S's

- Span the stream
- Set the elevation right
- Slope matches stream
- Substrate in the crossing

# Water Quality & Habitat:
# Wetland Crossings

- Effective for the crossing of wetlands or in road cuts where the groundwater is intercepted
- Re-connects natural hydrology strengthens road and prevents groundwater from wicking into the road fill
- Culverts at least every 50 feet

# Do You Need a Permit?

| DEP-Related Permits for Certain Camp Road Work Near Water | | | |
|---|---|---|---|
| | **In or within 75 feet** | **Within 250 feet** | **Contact** |
| **Lake, Pond, River, Wetland, Tidal area** | Required permits:<br>• NRPA<br>• Shoreland zoning | Required permits:<br>• Shoreland zoning | NRPA – DEP<br><br>Shoreland zoning – Town Code Enforcement Officer ** |
| **Stream** | Required permits:<br>• NRPA *<br>• Shoreland zoning | | |

*Replacement of stream crossings, maintenance & repair are exempt from permitting, but conditions apply

** A DEP-certified contractor may be required

Contact:

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***www.maine.gov/dep***