MANAGING RURAL ROADS

WHY DO WE CARE?

- Accessibility/Emergency Access
- Liability, Costs, Property Values
- Water Quality
Most Common Road Problems

- Road Drainage – Water ponding, flooding, etc.
- Roadbed Erosion – Rutting, Pot Holes, etc.
- Cut Slope Failure
- Fill Slope Failure
- Road Ditch Erosion
- Roadside Erosion
- Streambank Erosion
- Landslide
- Road Washout
Most Common Causes

- **Initial Design** – Orientation, Location
- **Drainage Treatment** – Inlet & Outlet Control
- **Construction** including base material
- **Unsupported cut slopes**
- **Un-compacted fill slopes**
- **Too few cross drains**
- **Undersized cross drains/culverts**
- **Lack of regular maintenance**
ROAD DRAINAGE

Poor road drainage

WATER FLOWS DOWNHILL

*Out-Slope Verses In-Slope Roads*

From Lee Benda
WAYS TO DRAIN A ROAD

Get the water off the road quickly!

ROAD SHAPE
- Outslope
- Inslope
- Crown

CROSS DRAINS
- Rolling Dips, Water Bars
- Road ditch culverts

Outsloped Roads
No Inside Ditch

Insloped Roads
Inside Ditch
3% to 4% road outsloping with no ditch drains vineyard and road runoff

OUTSLOPE PROBLEMS

Wheel Ruts

Berm
**LIMITATIONS**

**OUTSLOPING**

- **Good**
  - Less Expensive, less cut, less maintenance
- **Problems:**
  - Wheel ruts decrease effectiveness
  - Safety on steep grades & poor base

**INSLOPING w/ & w/o DITCH**

- **Good**
  - Safer on steeper grades & winter use
- **Problems:**
  - Need lots of culverts to drain & ditches
  - More Expensive. More Maintenance

**CROSS DRAINS**

**GET WATER OFF THE ROAD**

- **Rolling Dips**
- **Waterbars**
- **Berm Breaks**
- **Ditch Relief Culverts**
- **Stream Crossings**
CROSS DRAINS

WRONG

RIGHT

= Rolling Dip

From Bill Birmingham, NAPA RCD
DIP MAINTENANCE

CHECK AND MAINTAIN DIP SPACING TYPICALLY 100 TO 175 FT (DIRT AND ROCKED ROADS). Beware of Release Points. Breach Berms
BUILDING A DIP

INSLOPE Roads & DITCHES

Long Inside Ditch
ROADSIDE DITCHES

Work Well for All Season & Wet Roads

DITCH RELIEF
Get local drainage out of the ditches and safely across the roadway

STREAM CROSSING
Convey concentrated flow from streams safely across/under the roadway
DITCH RELIEF CULVERTS

Place culverts at frequent spacings, low points in road profile, or at points of concentrated drainage & Stream Crossings. Discharge over dissipater, into trees and/or over “saddles”
Shot Gunned Culvert
FLAT CULVERT
Plugged, Shallow, Damaged & Not Functional

CULVERTS
18” Min. Diameter Location, Depth & Grade are Critical
CULVERT INLETS

EARTH:
CAN BE PRONE TO PLUGGING & DAMAGE

ROCK: BETTER

DITCH RELIEF CULVERTS

THE BASICS REVISITED

NEVER USE < 18 INCH DIAMETER

*Unless Site Conditions Dictate Otherwise*

INSTALL CULVERTS ON A MINIMUM SLOPE OF 5%

*To Insure Sediment Transport*

PROVIDE INLET AND OUTLET PROTECTION

• ENERGY DISSIPATOR/DRAIN EXTENSION
• TRASH RACK/DEBRIS CATCHMENT

PROVIDE ALTERNATE FLOW PATH (CRITICAL DIP)
CULVERT INLET PROTECTION

GRATES/“Trash Racks”

*Poor Choice*
Road Ditch MAINTENANCE

- CHECK Condition (Sediment/debris?)
- CHECK FOR EROSION
- INSTALL MORE CROSS DRAINS
- MAINTAIN ASAP!

CULVERT MAINTENANCE

- CHECK SIZE & CONDITION
- INLET or OUTLET PLUGGED?
CULVERT MAINTENANCE

PIPE CONDITION
- RUSTED, CRUSHED
- SOIL PIPING
- UNDERSIZED

CULVERT INLET PROTECTION

FAILING CUT BLOCKING CULVERT INLET
- RETAIN CUT, RELOCATE, OR ADD DROP INLET
STREAM CROSSINGS
Arch/Bottomless Better. Headwall Needed

Culvert Location/Outlet Protection
Under Sizing = Plugging, etc.

1 Larger Pipe w/ Headwall is Better
SHALLOW CULVERTS CAUSE
Outlet Scour
Inlet Sedimentation

PLACE AT NATURAL GRADE, WHERE FEASIBLE
CHANNEL AGGRADATION

Pipe is too small or too flat

LOCALIZED OUTLET SCOUR

From PWA 2014
GOOD OUTLET PROTECTION

SLOPE DRAIN CONVEYS DITCH FLOWS

ROCK DISSIPATES INCREASED VELOCITY AT OUTLET.

CHEAP – PLACE SINGLE “T” POST UPSTREAM A DISTANCE OF 2X PIPE DIAMETER. CLEAN OFTEN!
Washing Out

Causes:
- Lack of alternate flow path (critical dip);
- Cut slope failure into ditch; Fill failure
- Undersized culvert not installed on natural grade;
- Plugged culvert

Bill Birmingham, NAPA RCD
KEEP CONCENTRATED FLOW IN ITS NATURAL PATH – DIVERSIONS OFTEN HAVE UNINTENDED CONSEQUENCES
CRITICAL DIPS

WET MUDDY ROAD

- Drain road with ditch
- Elevate road
- Regrade
- Add more cross drains
- Rock road surface
- Place rock over fabric
- Use the correct rock
- Add subdrain
- Clear tree canopy
- More sunlight
POT HOLES

Compacted Back Fill/Asphalt
Correct Drainage Problems, Rock/Pave Rd.

ROCK ROAD SURFACE
PLACE ROCK OVER FABRIC
USE THE CORRECT ROCK
WASHBOARDING

DUE TO USE HIGH SPEEDS
Reshape
USE CORRECT ROCK AGGREGATE

FOR MORE INFORMATION

• THE RCD OF SANTA CRUZ COUNTY
  • RCDSANTACRUZ.ORG
  • 831.464.2950
• “Maintaining Your Private Road” Guide
  • Road Walks/Assessments

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