



## Napa County Resource Conservation District

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[NapaRCD.org](http://NapaRCD.org)

### Characteristics of Storm Proofed Roads

The following abbreviated criteria identify common characteristics of storm-proofed roads. Roads are storm-proofed when delivery to streams is strictly minimized. This is accomplished by dispersing road surface drainage, preventing road erosion from entering streams, protecting stream crossings from failure or diversion, and preventing failure of unstable fills from delivering sediment to a stream. All bare soils with potential to deliver sediment to streams should be seeded and straw mulched before any rain events occur. For typical drawings and more information related to road storm proofing visit, [NapaRCD.org](http://NapaRCD.org)

#### Storm-proofed stream crossings

- All stream crossings have a drainage structure designed for the 100-year peak storm flow (with debris).
- Culverts are set in at base of fill and at channel grade.
- Culvert inlet, outlet, and bottom are open and in sound condition.
- Culverted stream crossings have no diversion potential (functional critical dips are in place).
- Culverted stream crossing inlets have low plug potential (trash barriers installed).
- Culverted stream crossing outlets are protected from erosion (extended beyond the base of fill and/or dissipated with rock armor).
- Bridges have stable, non-eroding abutments and do not significantly restrict 100-year flood flow.
- Stream crossings on fish bearing streams meet CDFW and NMFS fish passage criteria.
- Decommissioned stream crossings have been completely excavated to original grade and side slopes are laid back to 2:1 where possible.

#### Storm-proofed fills

- Unstable and potentially unstable stream crossing and road fills are excavated or structurally stabilized.
- Excavated spoil is placed in locations where it will not enter a stream.
- Excavated spoil is placed where it will not cause a slope failure or landslide.

#### Road surface drainage

- Year round use roads are either paved or rocked well enough so that none of the native surface is visible and raindrop impact is absorbed by the applied surface.
- Un-surfaced roads are either closed during rainy periods of the year or are not used when the road surface is wet.
- All road surfaces are disconnected from streams by implementing a variety of surface drainage techniques including construction of rolling dips and /or waterbars, installing ditch relief culverts, berm removal, and road surface shaping (outsloping, insloping, or crowning).
- Ditches and cutbanks are disconnected from streams by frequently draining them with rolling dips or waterbars &/or ditch relief culverts.
- Outflow from rolling dips and ditch relief culverts do not discharge to streams or onto active (or potentially active) landslides.
- Gullies (including those below ditch relief culverts) are dewatered to the extent possible.
- Decommissioned roads have been de-compacted (ripped) and have frequently installed permanent drainage structures (cross road drain) to prevent runoff contribution to streams.