

A gravel road winds through a forested area. The road is composed of light-colored gravel and dirt, with visible tire tracks. To the left of the road is a steep, exposed embankment of soil and rock. The surrounding area is densely wooded with tall, thin trees. The overall scene is dimly lit, suggesting a shaded forest environment.

Fundamentals of Rural Roads

Why Do We Have Roads?

- Provide access for land management and uses.
- Provide emergency access and escape routes.

Types of Roads

- Permanent, all season use roads
- Permanent, seasonal use roads
- Temporary roads and trails
- “Legacy” roads, in use or not in use

Road Standards and Design Should Suit the Uses



All season gravel road with slope protection
and armored drainage ditch.

Design Criteria

- Width, gradient, curvature
- Drainage
- Surfacing

Determined by

- Vehicles and traffic levels (“critical vehicle”)
- Seasonality of use
- Environmental constraints



All season out-sloped gravel road.

Unfortunately



Most roads are inherited and were not designed with current uses in mind.

Landowners are often faced with chronic problems caused by poor choices made in the past.



Many problems are related to drainage (or lack of it)

Inadequate Stream Crossings are a Common Problem



Undersized to handle peak flows and debris, subject to failure or chronic plugging.

Roads May Be in Unstable Locations



Tension cracks in road surface caused by interception of a spring and road base saturation.

Slope failure caused by stream undercutting on outside of meander bend.



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Roads May Have Chronic Impacts on Streams



Sediment plume caused by discharge of road runoff into stream via inboard ditch.



Roads were commonly built right up stream valleys in the “old days” often following railroad grades.

“Wish List for a Good Road”

- Designed, built and maintained to withstand stressing weather events
- Just enough road for the uses (both length and width)
- Located on stable terrain away from streams, preferably on ridges or on the contour
- Hydrologic “invisibility”

Road Drainage Impacts

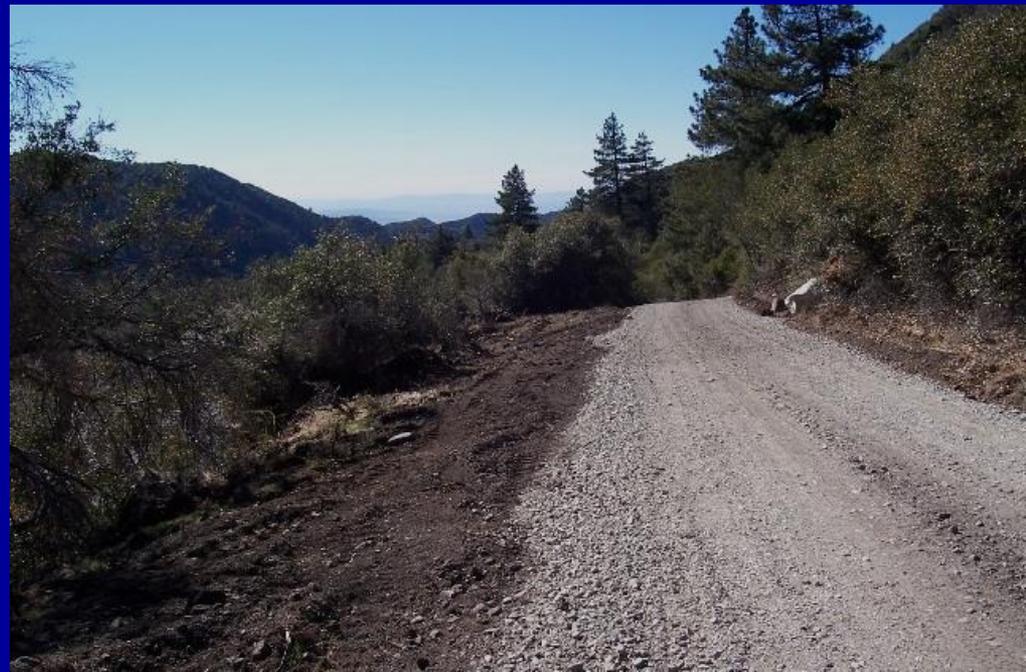
- Roads intercept streams, intercept groundwater and increase drainage density.
- Where roads intercept streams, a crossing is needed. Crossings are susceptible to failure.
- Intercepted groundwater must be drained off the road and will increase flow in receiving streams via drainage ditches.
- Roads and drainage ditches are essentially tributary streams.
- Runoff from impervious road surfaces increases peak flows.

Road Drainage Alternatives



Out-sloped road that disperses runoff and road surface erosion products onto adjacent slopes.

In-sloped road with ditch that may convey runoff and sediment directly to streams.



Road Drainage Pros and Cons

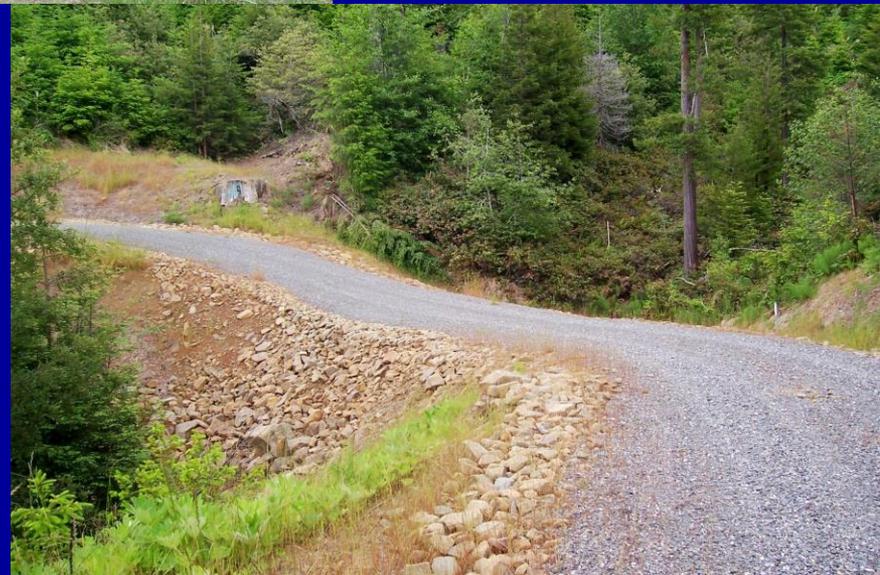
- In-sloped with ditches
 - Drain well but may be directly connected to streams and are “conveyor belts” for sediment
 - Require high level of maintenance (ditches and ditch relief culverts)
 - Permanent, year-round use roads
- Out-sloped with or without rolling dips
 - Disperse road drainage and minimize sediment delivery
 - Not suitable in all geologic types or climatic conditions
 - Seasonal, temporary, secondary and some permanent roads

Road Surfacing

Roads used only during the dry season may not require surfacing



Or, surfacing may only be required at key locations like stream crossings and wet spots



Stream Crossing Alternatives



Where suitable, low-water fords are a reasonable and cost-effective alternative to culverts and fills

Culverts and Bridges



On permanent roads, crossings should accommodate 100-year flows plus entrained debris and sediment

Culverts and Bridges (cont.)



Fish-bearing streams require special designs

Sources of More Information

Go to

http://ucanr.org/sites/forestry/Webinars/Rural_Roads_Webinar_Series/Rural_Roads_Webinar_Resources/

for a wealth of information on rural roads

A photograph of a dirt road winding through a forest. On the left side of the road, there is a significant landslide of earth and rocks. The road continues into the distance, flanked by dense trees. A bright cyan rectangular box is overlaid on the center of the image, containing text.

Thank You!

**Richard R. Harris, Ph.D.,
Northern California SAF
rrharris2464@sbcglobal.net**