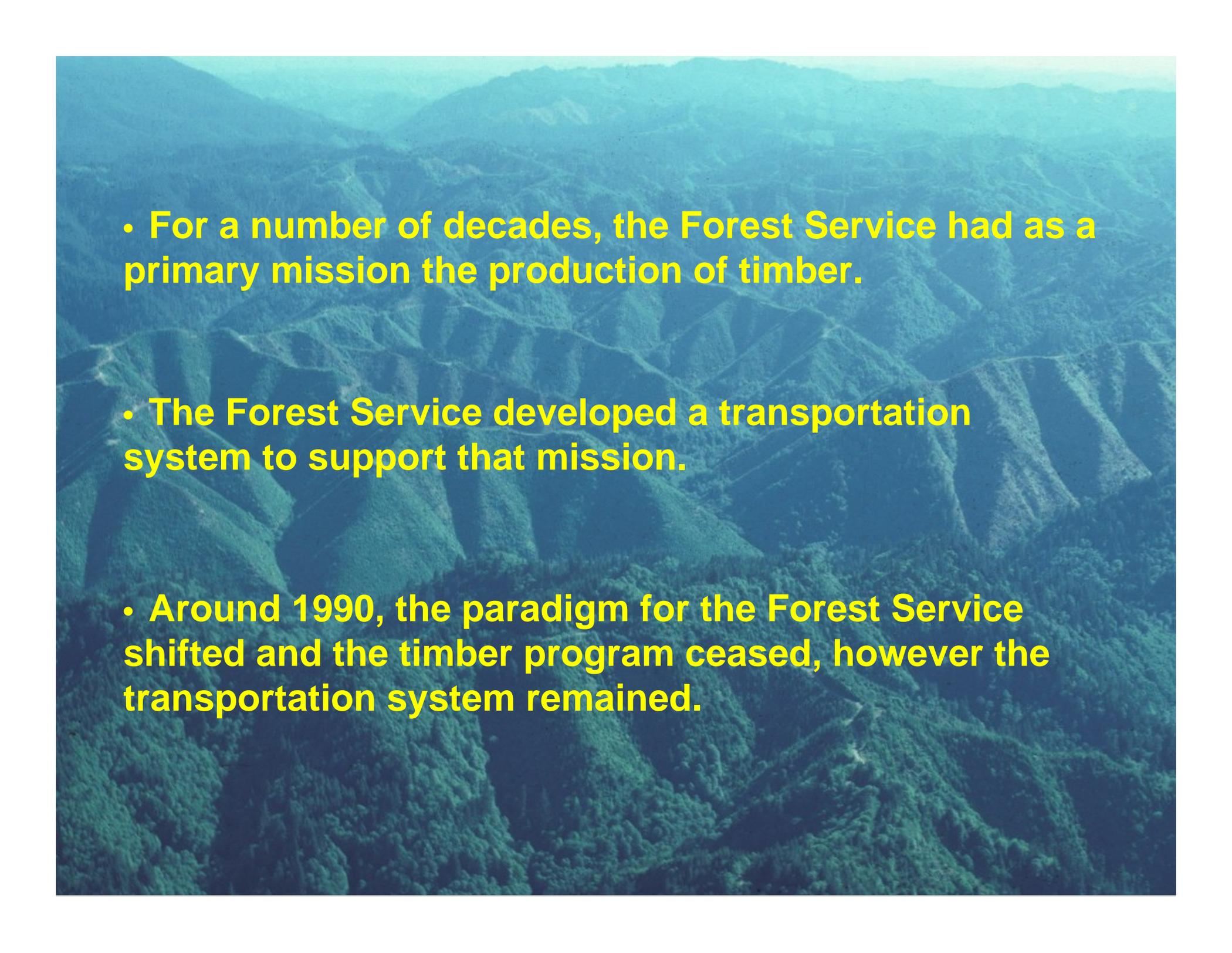


# **Forest Roads**

**Arne Skaugset**  
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- 
- An aerial photograph of a vast, hilly forest landscape, overlaid with a blue color filter. The terrain is characterized by numerous ridges and valleys, with dense green forest covering the slopes. The perspective is from a high vantage point, looking down and across the terrain. The text is overlaid on the left side of the image.
- For a number of decades, the Forest Service had as a primary mission the production of timber.
  - The Forest Service developed a transportation system to support that mission.
  - Around 1990, the paradigm for the Forest Service shifted and the timber program ceased, however the transportation system remained.

Culvert markers make inspection easier and reduce accidental damage from heavy equipment. Make it permanent.

Protect the culvert inlet from being covered by road fill.

Skewing the culvert at least 30 degrees from perpendicular to the road surface helps improve inlet efficiency.

Protect the outlet from being covered by road fill.

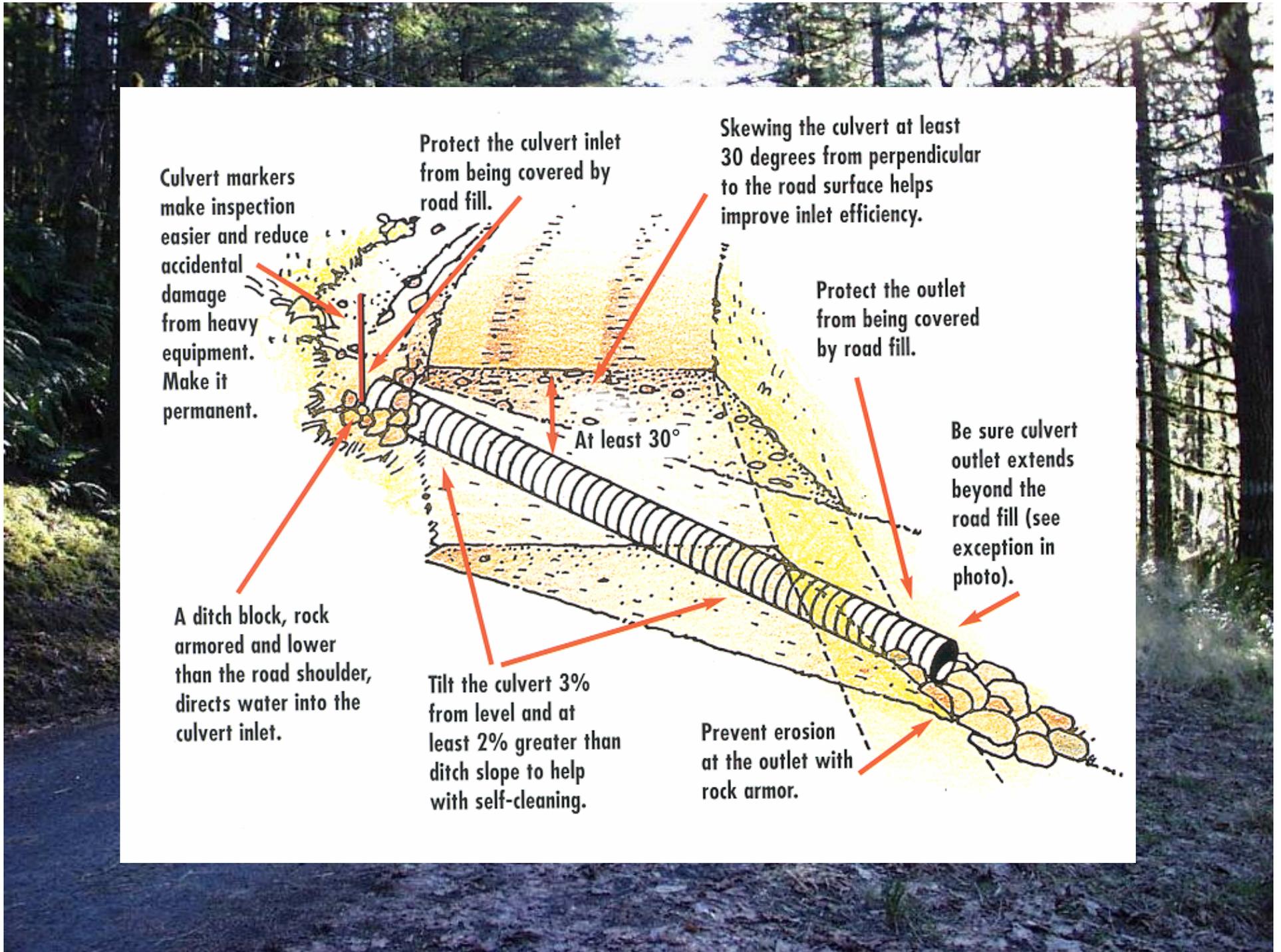
Be sure culvert outlet extends beyond the road fill (see exception in photo).

A ditch block, rock armored and lower than the road shoulder, directs water into the culvert inlet.

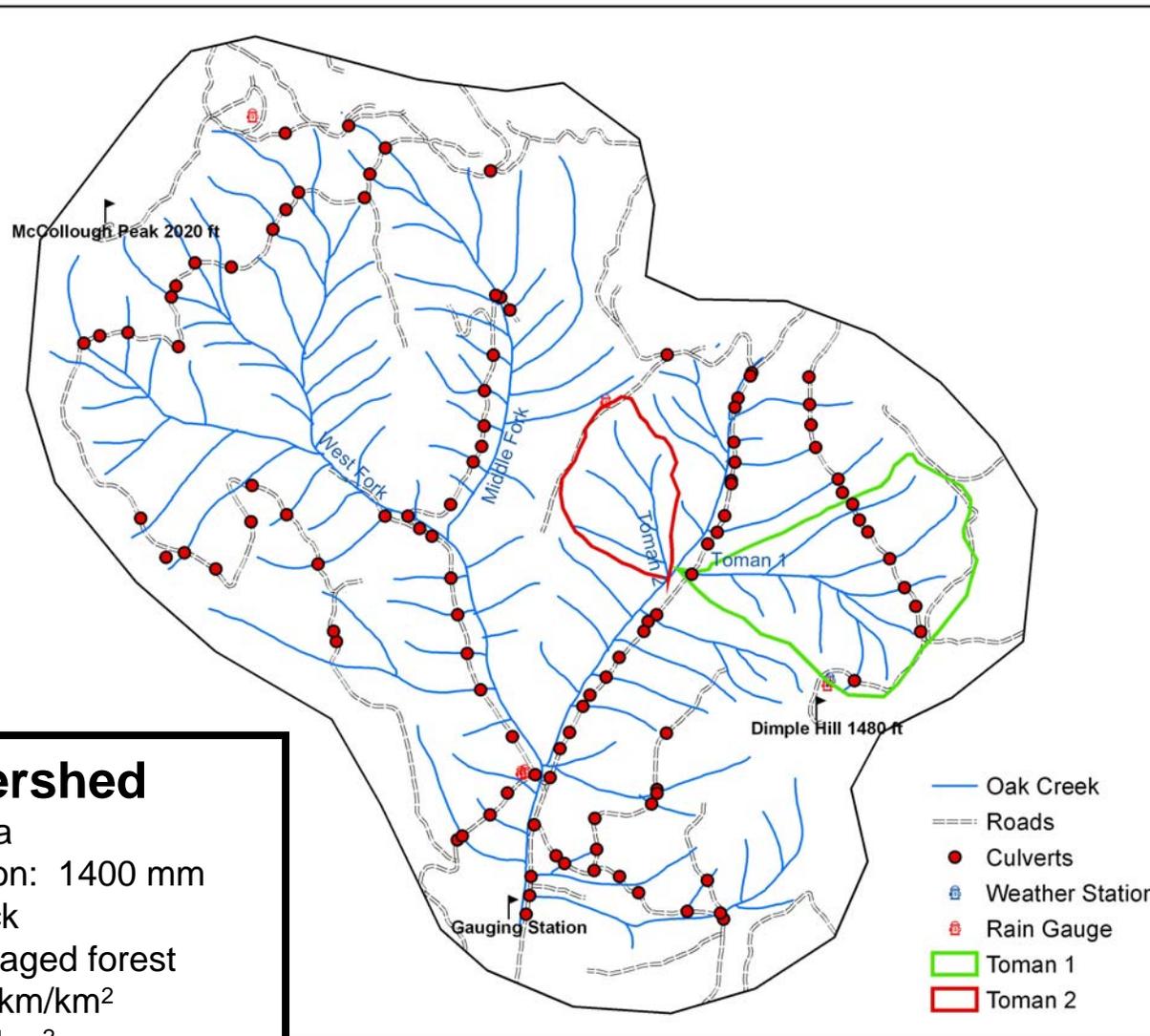
Tilt the culvert 3% from level and at least 2% greater than ditch slope to help with self-cleaning.

Prevent erosion at the outlet with rock armor.

At least 30°



## Oregon Locator Map



## Oak Creek Watershed

Watershed area: 824 ha

Mean annual precipitation: 1400 mm

Geology: Basalt bedrock

Land use: Actively managed forest

Drainage density: 0.64 km/km<sup>2</sup>

Road density: 0.6 km/km<sup>2</sup>

Road length: 4.6 km

Stream length: 4.9 km

Road culverts: 23 stream crossings

76 drainage relief

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# Consequences

- In landslide prone terrain in incidence of landslides from roads increases drastically.
- The road surface and the road ditch are a source of surface erosion.
- Where the road is connected to the stream, this is point of direct entry for sediment to the stream.
- Roads are hypothesized to effect watershed hydrology (increased peak flows).



United States  
Department of  
Agriculture

Forest Service

Pacific Northwest  
Research Station

General  
Technical Report  
PNW-GTR-509  
May 2001



# Forest Roads: A Synthesis of Scientific Information

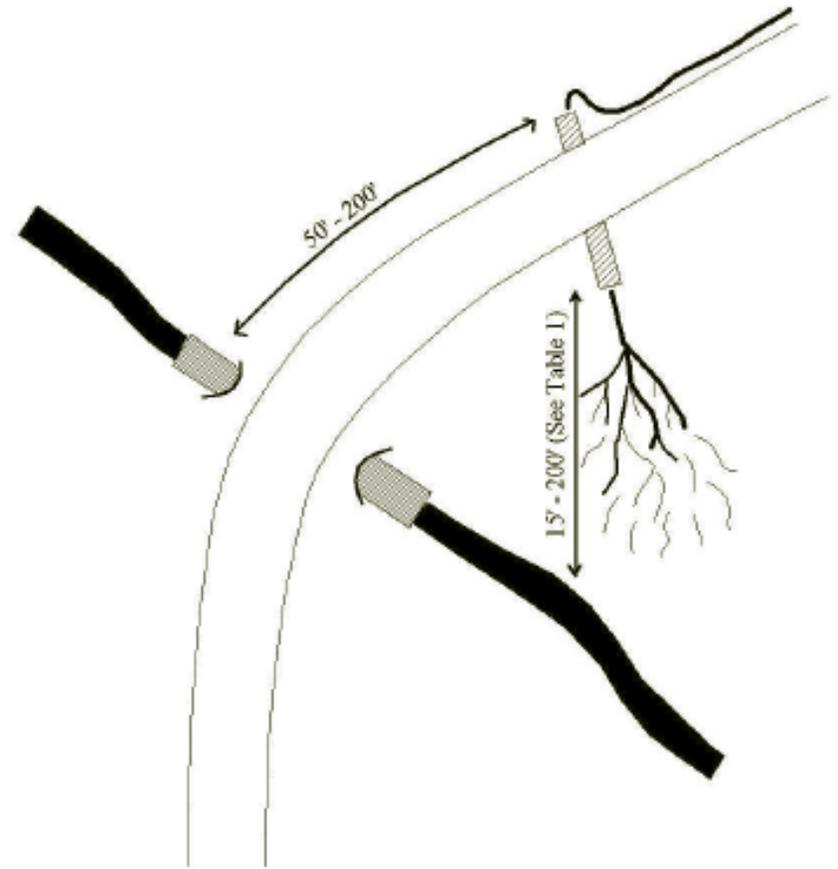
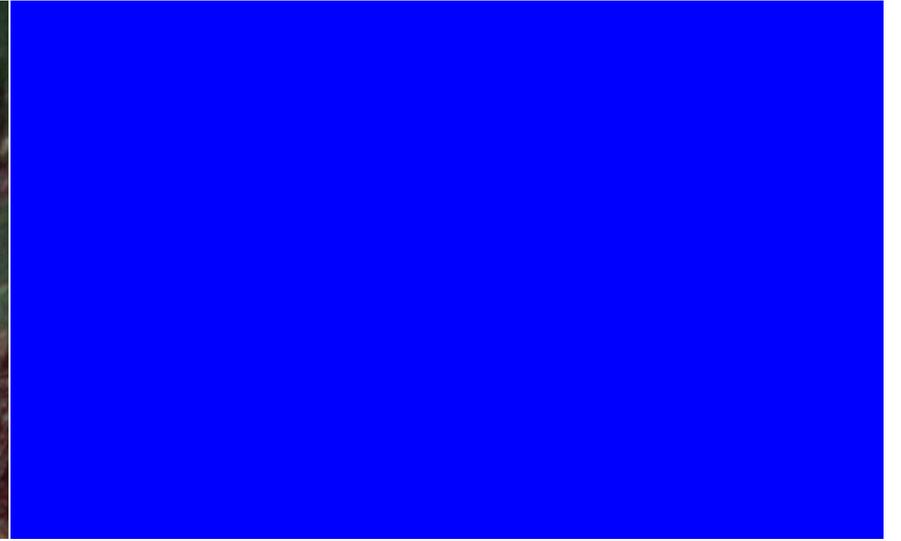
## PNW-GTR-509







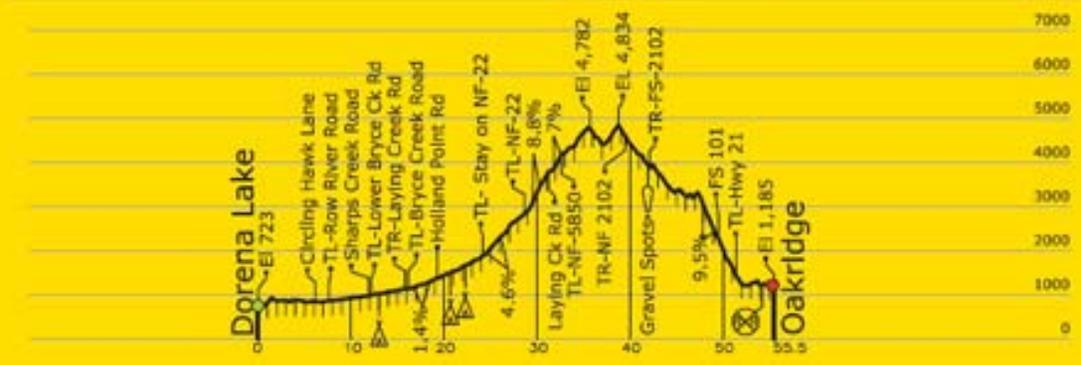
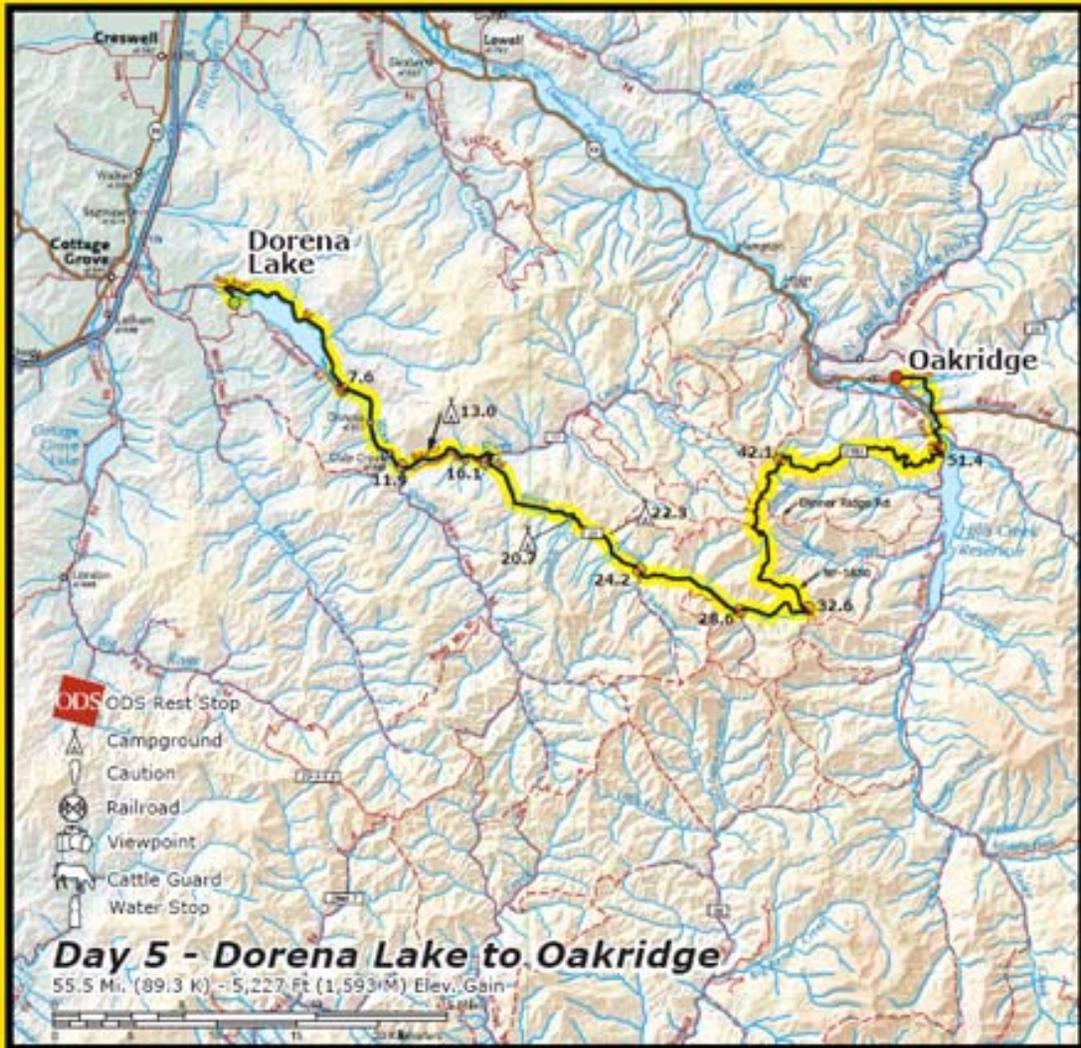




# Road Improvements

- Reduced road densities ( $>5$  to  $< 2$  mi/mi<sup>2</sup>) and much better road locations.
- Road/stream connectivity is reduced ( $>70\%$  to  $<20\%$ ).
- Fish passage and debris passage mandated for stream crossing culverts.
- Spacing of drainage relief structured improved

The practice of building and maintaining roads has improved drastically in recent decades. The technical literature from the first entry doesn't adequately portray contemporary practices.

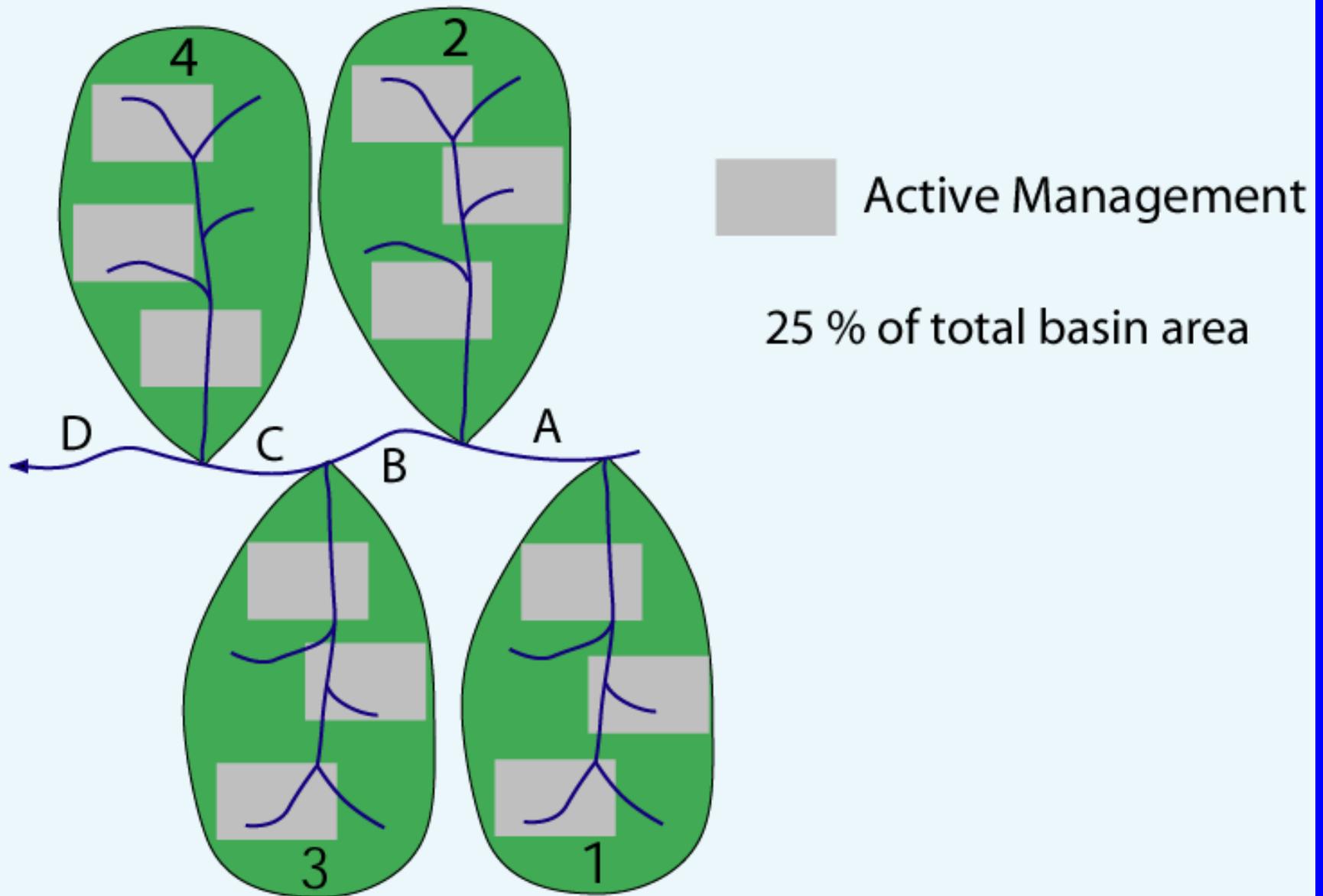


# Users of Forest Service Roads

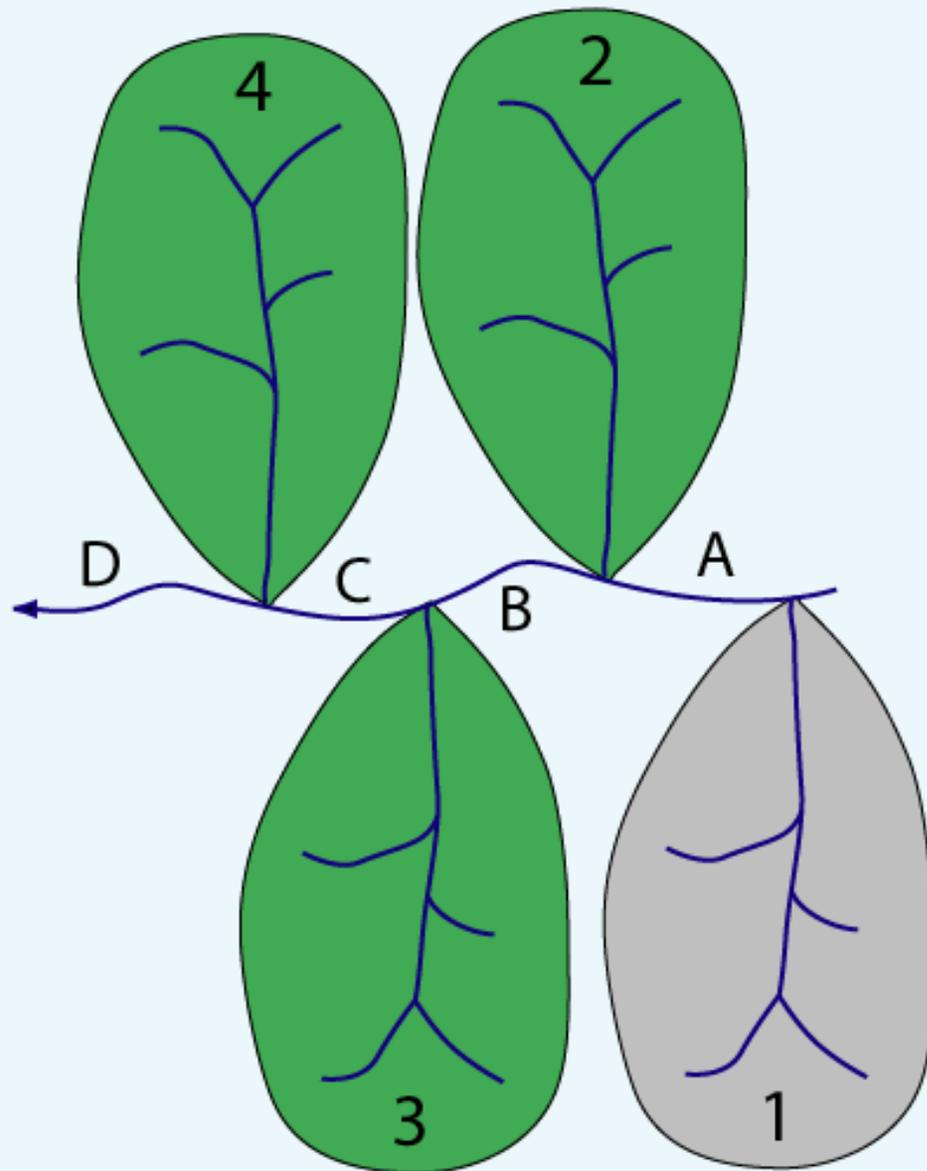
- Forest managers want access.
- Recreation.
- Forest health/biomass/fuel program.
- Fire suppression.

**There will always be a need for and a demand for a transportation system on the Forest Service. The type of transportation will change from the one that currently exists, but the need for one will not go away.**

## Staggered Setting Scenario



# Minimum Fragmentation Scenario



Active Management

25 % of total basin area

# New Road Paradigm

- Old paradigm – capital improvement project that consisted of a permanent, all weather transportation system.
- New paradigm – a “key” or administrative road system that is permanent and all weather.
- New paradigm – local projects road systems that may or may not be all weather but are temporary, i.e. no pipes.

# Concluding Thoughts

- **Budget – current budget for roads in the Forest Service is inadequate to address the “legacy road” problem.**
- **Personnel – if the budget was adequate to address the “legacy road” problem, the amount and quality of trained people to address the problem is woefully inadequate.**

# Concluding Thoughts

- **Currently, Forest Service personnel must opportunistically and creatively use projects to address the “legacy roads” problem.**
  - **West side: commercial thinning projects.**
  - **East side: salvage logging after fires.**
- **Non timber projects, i.e. fire suppression, fuels/biomass projects, and recreation, among others, that don't have an explicit budget component to support the transportation system.**

# Concluding Thoughts

- A new paradigm for forest roads does exist, however it is ad hoc.
- An research program needs to be put into place to determine how one builds a temporary road.
  - Road decommissioning
  - Pipe free roads
  - Outslopes and rolling dips

A photograph of a gravel path in a forest. The path is covered with fallen leaves and leads into the distance. The trees are mostly green, with some yellow and orange leaves visible, suggesting autumn. The text "Thank You" is written in a yellow, cursive font across the middle of the path.

*Thank You*