

EVALUATION OF THE EFFECTIVENESS OF FOREST ROAD BEST MANAGEMENT PRACTICES TO MINIMIZE STREAM SEDIMENT IMPACTS

FINAL FY 96 REPORT TO THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

Summary The purpose of this four year project is provide land managers and appropriate agencies with specific information on road management practices that minimize sediment entry into streams and how these practices are implemented in western Oregon. This report summarizes surface erosion, drainage and landslide data collected during FY 96, the third year of this project. Results are designed to place forest roads in a regional and spatial context.

Three papers are attached to this summary report:

- Forest Road Sediment and Drainage Monitoring Project Report for Private and State Lands in Western Oregon (February 1998);
- Storm Impacts and Landslides of 1996: Preliminary Report (especially Section C) (January 1998); and
- Forest Road Hazard Inventory Protocol (June, 1997)

A final technical paper and a road management guidebook will be produced at the end of this project.

Project Objectives

1. Develop relatively simple field methods for determination of sediment delivery potential from roads as these roads are currently maintained.
2. Survey erosion hazard, discharge structures, and potential for sediment delivery to waters of the state at randomly selected forest roads in the five western Oregon georegions.
3. Investigate road-related landslides and washouts that occurred during the storm of February 1996 and their relationship to forest practices rules.
4. Develop a comprehensive road erosion hazard inventory protocol for landowners.
5. Provide outreach and training to facilitate the use of the protocol.
6. Develop a comprehensive road management guidebook.
7. Develop a technical issue paper for the Board of Forestry.

Background

Roads are recognized as the largest source of sediment associated with forest management. This four year monitoring project was originally intended as an evaluation of whether Oregon's forest practices for roads were minimizing the delivery of sediment by means of surface erosion to waters of the state.

The major winter storm (February 5 to 8, 1996) resulted in many landslides, channel changes, and other effects to natural resources and property resources in northern Oregon. This was an unusual but extremely important storm event, the type which shapes the long-term water quality and watershed characteristics.

The storm provided a unique opportunity to test forest practices developed over the last couple of decades for landslide prevention (acute sedimentation). Therefore, investigation of road related landslides was added as an objective of this project.

Summary Methods and Principal Findings

Drainage and Surface Erosion

The principal survey of erosion source areas, road drainage and delivery to waters of the state took place during the summer and fall of 1995. Randomly selected sample areas on state and private forestlands were surveyed using a protocol developed during the first year of the project. All accessible or interconnected roads in the survey area were surveyed on-site. This survey collected information on general road characteristics, erosion source areas, and locations of water discharge and their potential for sediment delivery into waters of the state. Results are described in a report submitted last year, which was titled "Road Sediment Monitoring Project Report – Survey of Road Drainage in western Oregon" (the final FY95 report to the Department of Environmental Quality) and described in the following paragraphs.

During the summer of 1996 road drainage information was collected concurrently with the landslides information. The surface drainage information from both years is compiled in a report titled "Forest Road Sediment and Drainage Monitoring Project Report for Private and State Lands in Western Oregon" (attached), and also summarized in the following text.

Most roads were found to be in a condition where serious surface erosion was not occurring. Road drainage appeared similar to that of the original design. Prior to the Forest practices Act (1971), most roads were designed for effective transportation and not control of sediment. A fairly large percentage of cross drainage culverts were found to be at reduced capacities because of inlet blockage, although most of these blockages were not resulting in any increase in erosion or sediment delivery to streams. Based on the combined data set, twenty-five percent of road length clearly discharged into streams, and an additional six-percent may have delivered water and sediment into streams.

The most serious concerns highlighted by the monitoring of surface erosion and drainage were:

1. Lack of filtering drainage waters near streams;
2. Design and maintenance practices which contribute to steep gradient roads having cross-drainage at wider spacing than gentle road gradients; and
3. Inconsistencies in drainage practices by georegion, with special concerns in the Siskiyou georegion.

Landslides

All roads (which could be identified) in the survey areas were examined to identify and determine factors associated with new landslides, washouts, and gullies related to the drainage system. The monitoring team used the same protocol as was used during previous data collection, with some modification for collection of landslide data. The survey area included:

- A. All lands within a two mile by five mile sample area in the three areas with the greatest apparent impacts, the “red zones” which are: 1) east of Mapleton in Lane County; 2) north of Nimrod, also in Lane County; and 3) east of Tillamook. These non-random sample areas were selected to include the broadest range of management history possible, and include both harvested and unharvested areas in similar land types.
- B. All lands in three randomly selected two mile by five mile sample areas within the flood area and outside the red zones (near Dallas, Vernonia and Estacada).

Field monitoring consisted of a complete road inventory in conjunction with a road-landslide inventory. Within each 10 square mile study area, all currently used roads were either driven or walked. Currently used roads were those that had been used to access timber since 1972. Roads that had not been used since 1972 and roads that were in considerable distress prior to the 1996 flood event due to lack of recent maintenance were considered abandoned.

Road related landslides and fill washouts were located and identified to the road and segment on which they occurred. The type of erosion, mode of failure, and magnitude relative to the road was observed and recorded.

Results indicated that “Red Zone” study areas have less road miles, fewer road segments, and more drainage points than the random study areas. A total of 85 road-associated landslides were identified in the 60 square mile study area (6 study sites). The “Red Zone” study areas contain more landslides and fill washouts than do the random sites, both in total number and per road mile. The greatest number of road related landslides (29) were found in the Mapleton study site, while no landslides were found in the Estacada site. The Tillamook site had the greatest number washouts (36). In addition to sample size differences, the road construction standards, road

drainage, topography, soils, and climatic conditions unique to each study area may be contributing factors for the differences between study areas.

Most of the road-associated landslides were associated with road fill or sidecast (59 of the landslides). One factor that correlates well with these landslides is the height of the road cutslope. Thirty-one landslides were associated with road drainage (road water discharged above the landslide). There were only three landslides that occurred below the road fill/sidecast and which were also associated with road drainage. Road-associated landslides made up only about ten percent of the total landslides inventoried in the ODF storm monitoring study.

Past studies have shown that road construction and management practices can greatly increase the occurrence of landslides. Compared with past studies, on these study sites there were fewer road-related landslides as a percent of total landslides, and those landslides that did occur were smaller than in the past studies. And although the total number of road associated landslides was small, effects from individual road-associated landslides upon the stream network was at times very large. Another issue identified by this study is washout hazard, where high flows either remove stream crossing fills or gully down the road. Additional information is found the attached report titled "Storm Impacts and Landslides of 1996: Preliminary Report."

Road Inventory Protocol

One of the original objectives of this project and the Kilchis watershed road inventory was to develop a road sediment inventory protocol for use by state and private landowners. Additional emphasis was placed on this project by the *Oregon Plan for Salmon and Watersheds*. The Oregon Forest Industries council volunteered to implement a "Road Hazard and Risk Reduction Project." Forest landowners have volunteered to spend an estimated \$15,000,000 per year on this project. ODF has agreed to track landowner progress in the inventory and repair of their roads, and to repeat field monitoring on a five-year basis as long as the project is active.

To implement this project, a road inventory that assesses surface erosion, washout, landslide, and fish passage hazards was required. The surface erosion and washout parts of the inventory have been taken from the original road drainage inventory (FY95 results). The landslides and fish passage parts of the inventory were based on other ODF projects. The final "Forest Road Hazard Inventory Protocol" is attached.

This protocol is designed for forestland managers use, to provide information needed in order to prioritize road management decisions, especially maintenance and repair activities. It is intended for use over all of western Oregon. It is being used by forest landowners and watershed councils to comprehensively survey their roads for fish passage, landslide, washout, and surface erosion hazards to fish and fish habitat. Progress reports are being submitted the Governor's Watershed Enhancement Board (GWEB). Specific road repair activities have been identified, and are also being reported to GWEB as they are completed by landowners.

Summary of Work Completed

1. Developed and field tested relatively simple methods for determination of surface erosion sediment delivery potential from roads as these roads are currently maintained.
2. Performed landowner coordination and obtained permission for lands access.
3. Completed forest road drainage and sediment delivery surveys on 392 miles (including the Kilchis basin) of road on industrial, non-industrial and state lands in western Oregon.
4. Performed quality control on data collection.
5. Coordinated with Tillamook Bay NEP personnel to use data in watershed analysis.
6. Designed instrumentation for measurement of flow and sediment discharge at culverts (but did not use because of storm effects).
7. Analyzed road surface erosion data and summarized in report form.
8. Conducted planning to monitor large storm/landslide sediment inputs to streams.
9. Modified the road drainage protocol to include landslides.
10. Conducted field training sessions on use of the comprehensive road inventory protocol.
11. Inventoried 170 miles of road in six study areas and identified 85 landslides and 59 washouts associated with roads that occurred in the February 1996 extreme storm event.
12. Analyzed landslide and washout data, drafted a preliminary report, and presented information at a public briefing in Portland.
13. Provided two training sessions on road repairs for forest landowners involved in the road hazard and risk reduction project.
14. Developed priorities for road repairs to protect salmonids and watersheds.

Planned Work for Completion of this 4 Year Project

1. Write and present a comprehensive report for the Oregon Board of Forestry.
2. Develop and publish a Road Management (inventory and repair) guidebook.