

Lower Coast Fork Willamette River Watershed Assessment

Chapter 7 Sediment Sources

Erosion that occurs near streams and on surrounding slopes is a natural part of any watershed. Fish and other aquatic organisms in a region are adapted to deal with a range of sediment amounts that enter streams under normal ranges of disturbance. The amount of erosion in a watershed and the sediment load in the streams vary considerably during the year, with most sediment moving during the few days that have the highest flows.

In addition, to natural levels of erosion, human-induced erosion can occur. Separating human-induced erosion from natural erosion can be difficult because of the highly variable nature of natural erosion patterns. While it is nearly impossible to specify when a human-induced change in sediment is too much for a local population of fish and other aquatic organisms to handle, in general, the greater a stream deviates from its natural sediment levels the greater the chance that the fish and other aquatic organisms are going to be affected (Watershed Professionals Network 199, VI-3).

7.1 What Natural Features In The Watershed Affect Sediment Delivery To Streams?

Slope: High gradient areas are limited to the forested fringe surrounding the watershed, specifically, the headwaters in the Coast Range and the hills surrounding Papenfus, Bear and Gettings Creeks. Steep slopes increase the risk of landslides and the amount of sediment that washes off roads in these areas.

Soil type: The erodibility of soils largely depends on their texture. Soils with a high clay or sand content are less erodible than soils with a large portion of silt (Luce & Black 1999).

Precipitation: Heavy precipitation can contribute to sediment delivery in two significant ways: 1) increasing runoff in roadside ditches and 2) saturating soils to the point at which they lose their cohesion and begin sliding (Slope and soil properties are very important in determining how much sliding occurs).

Vegetation: Vegetative cover decreases sediment delivery to streams from surface erosion. Also, well-developed root networks can decrease the potential for landslides (Burroughs & King 1999).

7.2 Potential Sources of Human Caused Sediment Delivery to Streams

Rural Road Instability

Rural roads include those located within land used for forestry, agriculture and rural homes. Rural road instability consists of wash outs or road failures and mainly occurs in steeper areas.

Improper maintenance of inboard road ditches can cause saturation of the roadbed, leading to mass wasting. Road washouts also can occur when a road adjacent to the stream is undercut and a portion of the road drops into the stream, or at stream crossings during a high flow where there was either an undersized or plugged culvert or bridge. In steeper terrain, road washouts can create shallow landslides on unstable fill or cut slope failures (Watershed Professionals Network 1999, 20).

Public agencies that maintain rural roads in this watershed are the Oregon Department of Transportation (ODOT), the Bureau of Land Management (BLM) and Lane County. Because most forestlands in the watershed are in private ownership, the majority of road washouts and instability happens on private land. In some cases, private landowners may not be able to afford to upgrade their roads and replace culverts, and therefore may experience more frequent road instability than on public lands where road maintenance is strictly regulated. Rural road instability on private lands may be significant source of sediment to local streams.

Little public information is available on culverts. The Oregon Department of Fish and Wildlife has a database but the survey data does not include culvert capacity so it was not possible to determine whether these culverts have a high potential for contributing to road washouts. This is an area that may warrant further discussion and investigation by the watershed council.

Slope Instability Unrelated to Roads

Slope instability can result in shallow or deep landslides and debris flows. Slope failure and debris flow analyses for the watershed have been conducted by the Oregon Department of forestry (2000).

Shallow landslides are the predominant type of slope failure in the watershed. A reduction in root strength following timber harvest and site preparation activities is likely a significant cause of landsliding outside the area of road construction. Areas most sensitive to loss of root strength and subsequent landsliding usually are steep (>75%) slopes in concave positions over hard bedrock in areas of high rainfall (Bureau of Land Management 1999).

Risk of debris flow is low in the watershed. **Table 7-1** lists the acres and percentage of debris flow potential in the watershed. Map figure 14 displays debris flow potential. High hazard areas are located on the western and eastern fringes of the watershed.

Table 7-1 Slope Failure Potential

Slope Failure Potential	Acres	Percent of Watershed
Moderate	10,512	11.80%
High	175	0.20%

Rural Road Runoff

“Sediment produced by forested roads through surface erosion is an important component of the sediment budget in forested basins. Roads are one of the few sites of surface erosion in most forested landscapes because they are generally maintained in a vegetation-free condition and have nearly impermeable surfaces (Luce & Black 1999).” Roads located in agricultural and rural residential areas also have the potential to deliver sediment. Key differences between typical forest roads and farm or rural residential roads in this watershed are: 1) farm/rural residential roads are mostly in portions of the watershed that are less steep than areas with forest roads and 2) farm/rural residential roads are often unsurfaced or surfaced with gravel, whereas forest roads generally are surfaced with crushed rock.

The amount of sediment that enters streams from road surface erosion depends on road conditions (i.e. vegetative cover on ditch and cutslopes, road surface, traffic), its steepness, length and connectivity to streams. Connectivity relates to the proximity of the road to streams and a direct link between a road and stream (e.g. ditch drains directly into stream). Connected roads have the potential to deliver sediment to streams. A road is considered “connected” if it is within 200 feet of a stream, according to Washington State Forest Practices Board (1993).

A local study of sediment delivery from forest road surfaces found significant differences in the mean amount of sediment delivered by roads depending on the soil type and vegetative cover in the road ditch and cutslope. They found that “cleaning ditches and removing the cutslope vegetation caused a dramatic increase in sediment production (Luce & Black 1999, 21).” The average sediment production for roads plots that were undisturbed or graded was 50 kg (110.2 lbs.) and 57 kg (125.7 lbs.), respectively. Roads that were graded, had their ditch cleaned and cutslope stripped of vegetation (shortly before the study period) produced an average of 377 kg (831 lbs.). A comparison of two study sites located on different soil types showed that a site with silty clay loams produced over 9 times more sediment than a site with gravelly loam (Luce & Black 1999).

The bureau of Land Management (BLM), Oregon Department of Transportation (ODOT) and Lane County all maintain their ditches by keeping them free from blockage and debris accumulation. However, their methods differ. Roads maintained by ODOT generally have wide corridors and shallow-sloped ditches. The shallow slopes of road shoulder allow them to mow their ditches on a regular basis to prevent vegetation from clogging the drainage-way. They avoid grading the ditch down to bare dirt in most cases, although they keep the area that is four to eight feet from the pavement free from

vegetation. A vegetation barrier is left between the bare shoulder material and the ditch to filter out sediment.

The BLM also sweeps out brush and vegetation as a primary means of keeping ditches clear of obstructions, although occasional blading to bare ground is required. This strategy has been emphasized since about 1995. Before that time ditches were bladed down to bare dirt on a standard basis. Other BLM road maintenance includes grading the surface of roads that are covered with crushed rock and cleaning culverts by digging out catch basins next to culverts with a backhoe.

Lane County ditch maintenance primarily consists of completely removing vegetation from the ditch line. The County is not able to use mowing as a regular maintenance strategy because most of the ditches along county roads are narrow and have very steep sides, making it impossible for a mower arm to maneuver through. Like the BLM, the County also maintains its rock-surfaced roads by grading. This component of road maintenance happens only during the winter months when the roads are soft enough to be re-shaped with a grader blade. Unfortunately this corresponds with times when surface runoff is the highest and newly disturbed road sediment has a greater opportunity to wash down the ditch and into a nearby stream.

Table 7-2 lists the miles of roads and percentages that are within 200' of streams for each sub-basin (see map figure 19). Road connectivity varies from 8% to 32%. The statewide connectivity average is estimated to be between 25 and 40% (Long Tom Watershed assessment 1999). The sub-basins with the greatest proportion of agricultural and urban land use have slightly less road-stream connectivity than sub-basins where forestry is present. For example, a comparison of the relationship of agriculture/rural residential land use to connectivity shows that connectivity decreases as the percentage of agriculture/rural land use increases. The exception to this is Gettings Creek where forestry is a dominant land use. This is an important consideration, since it suggests greater connectivity of forest roads, which are located in steeper portions of the watershed.

Table 7-2 Road Connectivity to Streams

Sub-basin	Miles of Road within 200' of a Stream	Total Road Miles	Percent of Roads within 200' of a Stream
Gettings Creek	26.60	82.23	32%
Hill Creek	31.50	142.40	22%
Camas Swale	37.90	217.70	17%
Bear Creek	22.30	89.70	25%
Papenfus Creek	9.70	69.10	14%
Wild Hog Creek	6.70	88.10	8%

Urban Runoff

Sediment from urban areas originates from wind-deposited soil on streets and other impervious surfaces, degrading pavement and erosion from yards and construction sites (Watershed Professionals Network 1999). The type of urban land use influences the amount of sediment yield. "Residential neighborhoods produce the least amount of

sediment per square mile. Commercial areas produce moderate loads of sediment, and heavy industrial areas produce even higher amounts. The highest amounts occur in areas that are actively being developed (Watershed Professionals Network 1999, VI-27).

A particular problem with sediment from urban areas is that pollutants are often attached to the sediment particles. Many heavy metals, toxic compounds, nutrients, and bacteria readily attach to sediment particles derived from urban sources. Of major concern are zinc, copper, oil and grease, yard pesticides, and phosphorus (Watershed Professionals Network 1999, VI-27).

7.3 Conclusions

The information presented highlights issues the council may wish to act upon. There are several sources of sediment to streams in the watershed (rural road instability and surface erosion from rural roads). Information on these sources of sediment production is lacking and may warrant further investigation. In addition, urban runoff and surface erosion from croplands and pastures are topics that may be of interest to the council.

Insufficient information includes:

- Information on culvert capacity
- Information of road washouts on private and public lands
- A comprehensive and publicly available road inventory that could inform an analysis of surface erosion potential for all roads in the watershed