5.7. Element 7: Sediment Sources Assessment.

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Sediment sources in the Jackson Creek Watershed were identified in this assessment by reviewing available literature, talking to knowledgeable parties, running an erosion prediction model, and by limited field surveys. Relevant literature consisted of broadly scoped descriptions of the Bear Creek and Rogue River systems.

There have been several soil disturbance regimes in the history of the Jackson Creek watershed, ranging from extensive mining in the late 1800s, multiple timber harvests, livestock grazing, installation of agricultural drainage and canals, and road construction. The Jackson Creek watershed is mostly composed of soils derived from felsic intrusive igneous rocks.[1] These soils are predominantly coarse sandy and/or gravelly loams with relatively high infiltration rates (2 to 4 inches per hour) (USDA NRCS, 1989). The expected 25 year rainfall event in the basin is between 3.5 and 4.0 inches in 24 hours (NOAA, 1993), therefor runoff events are infrequent on undisturbed slopes. Grain size distributions of the soils have silt and clay fractions mostly of 30% or less (USDA NRCS, 1993), which means less of the soil profile is available to be transported with low energy flows. However, coarse sandy and/or gravelly loams also have low cohesive strength, so they can be more susceptible to physical disturbances such as vehicle and livestock traffic. Physical disturbances could therefore lead to increased erosion potential.

5.7.1. Sediment Source Assessment Methodology.

The Soil and Water Assessment Tool (SWAT), which is discussed in detail in the Hydrology section of this report, was also applied to estimate the amount of erosion that could result from agricultural land. Parameters used in this model were obtained by the Oregon Water Resources Department from in-house databases.

The field surveys consisted of visual examinations of a large percentage of the basin accessible from public roads. No field survey work was done upstream of the Jacksonville City Reservoir because this water body functions as a sediment trap for the upper watershed. Very little of the South Fork Jackson Creek drainage was visually assessed, due to time constraints. Most of the field survey work was done in mid-May 2000. One storm event which produced 0.16 inches of rain in 24 hours occurred the day before the field survey began.

Information supplied by the City of Jacksonville on their reservoir showed that it originally had been built with a capacity of 76 acre-feet in 1917, but by 1999 its capacity had been reduced to 7 acre-feet, indicating that 69 acre-feet of sediment have accumulated in the reservoir. Based on calculations from topographic maps, the source area for the reservoir is approximately 2,200 acres. Assuming a uniform and constant sedimentation rate over time, this would amount to a sediment loss of 0.005 inches per year for 82 years, or a total ground lowering of about 0.4

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[1] USDA Soil Conservation Service, 1993, Soil Survey of Jackson County Area, Oregon.

inches of sediment throughout the 2,200 acres.

5.7.2. Identified Sediment Sources.

Current sediment sources identified in the Jackson Creek watershed were categorized as follows:

1. **Construction activities** -- all types of development-related earth moving and soil disturbing activities, with the exception of road-related sources
2. **Irrigation ditch sediment** -- erosion occurring within a ditch, and the sediment load from other sources that is carried by ditch water flow
3. **Agricultural runoff erosion** -- sediment mobilized on agricultural land, though not necessarily transported to a stream
4. **Road-related erosion**
5. **Quarry drainage** B sediment transported off of active and inactive quarries
6. **Forested land erosion** -- sediment mobilized on forested land, irregardless of timber harvest
7. **Streambank erosion** -- past erosion, and signs of instability which would suggest more erosion in the near future
8. **In-channel erosion** -- re-mobilization of sediment in channels, though not in irrigation ditches

Note that this sediment source assessment is not a sediment budget. Considering time restraints for this project, it was not possible to do a quantitative assessment of sediment movement through the watershed. Instead, this assessment was intended to describe the relative importance of the sediment sources identified.

5.7.2.1. Construction Activities. Construction activities can be a source of sediment in a variety of ways, including placing fill in areas where it is likely to be transported to a stream during a storm or irrigation event, and removing vegetation and re-contouring landscapes so that disturbed soil can be more readily transported during storms. During the field survey some indications of construction-related sediment sources were identified, primarily in rural-residential areas. These consisted of fill placed without erosion control, so that sediment could move via sheetwash to streams; landscaping activities occurring near streambanks so that irrigation of plants would transport sediment; and earth moving activities occurring near drainage ditches without erosion control in place. None of these sediment sources were actively eroding during the time of the field survey, though they had the potential in a moderate storm event. Based on the time the survey was completed, general field observations suggest that construction activities are not a major contributor of sediment.

5.7.2.2. Irrigation Ditch Sediment. The Jackson Creek Watershed includes some 8.5 miles of main irrigation ditches which are used to divert and convey water from upslope streams and from upper portions of Bear Creek. At least five of these ditches drain into and/or cross Jackson Creek. Field observations suggested that most of these ditches have at least partially vegetated banks, and no indications of bank failure were observed. No spoils were observed piled alongside the ditch banks. Most of the ditch flow observed was carrying significant suspended sediment loads when compared to the suspended sediment load visible in Jackson Creek upslope of Jacksonville. Jackson Creek was running with little visible suspended load until reaching the confluence with an irrigation ditch (the Phoenix Canal) at milepost 34 along Highway 238. This confluence is also a diversion point, so that the ditch actually crosses through Jackson Creek, and some of the ditch flow is captured by the creek. During the field survey Jackson Creek was observed to be carrying suspended sediment from this point downstream to its confluence with Bear Creek. As mentioned above, at least four other ditches drain into the creek below Jacksonville.

Sediment load carried in the ditches has the same sources as those for Jackson Creek. Representatives of the Medford Irrigation District contacted as part of this assessment said that their ditches normally catch sediment-laden winter runoff from upslope sources. The ditches do not carry flow in the winter, so runoff deposits sediment, which is re-mobilized during irrigation season. The Medford Irrigation District said that much of this sediment is dammed up at their ditch gates and diversion dams, and released gradually during the irrigation season.

5.7.2.3. Agricultural Runoff Erosion. As stated previously, agricultural runoff erosion in this assessment refers to sediment mobilized on agricultural land, though not necessarily transported to a stream. Using this definition of agricultural runoff erosion enables the use of models like SWAT (previously described), which in turn is based on the Modified Universal Soil Loss Equation (MUSLE). This equation addresses sheet and rill erosion, but does not account for other erosion processes which may occur (e.g., gullying, soil creep, shallow sliding, dry ravel). No erosion scars or active erosion events involving processes other than sheetwash and rilling were observed on agricultural land during the field survey.

As of 1999, most of the agricultural land in production in the Jackson Creek watershed was being used for orchard, pasture, hay, and nursery crops. Generally, agricultural practices associated with these crops are at the lower end of the erosion potential hazard, as calculated using MUSLE-type equations (like the universal soil loss and revised universal soil loss equations). According to SCS soil surveys, soils mapped in agricultural land in the watershed are also considered to have a moderate to low erosion potential. Considering the crops, soil types, climate, and slopes in the watershed, the SWAT model calculated that agricultural runoff erosion would be less than 0.5 tonnes per hectare (less than 0.2 tons per acre).

5.7.2.4. Road-related Erosion. Road-related erosion involves all erosion processes and sources associated with road design, placement, and maintenance. This includes paved roads as well as dirt roads. Road-related erosion processes are varied, and involve both the roadbed and areas away from the roadbed as sediment sources. During the field survey, many road-related erosion problems were visible. These included the following:

> **Road ditches** - Road ditches in many areas of the watershed have partially blocked culverts and sediment deposits within the ditch. Both of these signs indicate erosion and transport of sediment within the road ditch network.
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> **Road ditch drains** - Road ditch drains that were erosion problems were culverts discharging water from the road ditches away from the roadbed. Five of these were observed causing gullying of the slopes below the roadbed on the upper part of John's

Peak Road. Others were observed at the upper sections of Livingston Road.

Flow diversion and channeling - Road beds can divert flow from one area to another, thus concentrating water in a drainage not naturally sized to handle the increased flow. They can also channelize flow, leading to rilling and/or gullying of the roadbed. This was observed on some steeper portions of dirt roads within the watershed.

Stream crossings - These features can supply sediment directly to streams if they are not designed carefully. The fill used in stream crossings can readily impact streamflow, and the culvert pipe (or other water conveyance structure) can cause scouring of the streambed. One stream crossing was observed on an abandoned spur off of John's Peak Road with a partially-blocked culvert and noticeably eroding fill. Two other stream crossings - at Bridge 114 along Hanley Road, and the crossing at Ross Lane - were observed to have created large scour pools due to poorly designed water conveyance. Based on their appearance, there probably is very little sediment available to be transported from these areas, because the channels seem to have already adjusted to the increased flow energy.

5.7.2.5. Quarry Drainage. None of the quarries identified during the field survey were assessed first-hand, because access to private property was restricted. Stream channels visible downstream of four of the identified quarries did not show significant sediment loads. Ben Mundie, the geologist with the Mined Land Reclamation division of the Oregon Department of Geology and Mineral Industries (DOGAMI) responsible for inspections in Jackson County, stated that stormwater discharges from quarries historically have not been a problem in the Jackson Creek watershed, and current problems could largely be controlled through implementing "best management practices." The area should be monitored for future change in effects.

5.7.2.6. Forest Land Erosion. Forest land assessed during the field survey had few indications of erosional processes that would supply sediment to streams. No shallow or deep-seated landslide scars were observed, and the only gullying observed was the result of road drainage. Considering the nature of the soils, climate, and steepness of the upper watershed slopes, dry raveling could be a significant erosion process in forested lands, however, this process usually does not transport sediment to streams at a significant rate. Because of these factors, physical disturbances would have to occur to erode and transport significant loads of sediment from forest land. Physical disturbances are often associated with timber harvest operations, but at the time of the field survey nearly all harvest operations were taking place upstream of the Jacksonville Reservoir. There apparently have also been some recent timber harvest operations in the South Fork Jackson Creek drainage area, but this area was not visited due to time constraints.

5.7.2.7. Streambank Erosion. Streambank erosion for this assessment consists of the non-wetted portions of the channel (as observed in mid-May 2000) and the riparian zone of the stream. Factors that normally affect streambank erosion include natural strength of the soils, existence of vegetation with significant root mass, height and steepness of banks, energy of streamflows, and human/animal disturbances (including burrowing).

Most of the Jackson Creek channel downstream of the reservoir has been channelized (i.e., straightened and confined). Further, in most of the reaches, streams in the watershed have been disconnected from wetlands and floodplains. Most of the main tributaries observed have also been channelized within approximately one mile of their confluence with Jackson Creek. Rip-rap was observed through most of the urbanized areas of the stream, with a lesser amount in the reaches paralleling Highway 238. These areas would be prone more to in-channel erosion in the short term, though some bank failures were apparent in the reach paralleling Highway 238.

Lower reaches of Jackson Creek, below stream mile 4, are entrenched with bank heights reaching around 15 feet. These reaches have the potential to contribute sediment directly to the stream by bank failure due to over steepening, no matter how well vegetation is established. During the field survey there was some indication of recent bank failures in these areas, though these failures appeared to be (recently) impacting a relatively small amount (<5%) of the banks. Most of the reaches upstream of stream mile 4 had riparian vegetation sufficient to protect the streambanks from large-scale bank erosion, with the exception of the reach paralleling the highway. There were no indications of significant human/animal impacts, and it did not appear as if the energy of the stream would exceed the bank strength.

5.7.2.8. In-channel Erosion. In-channel erosion transports sediment previously deposited in a stream channel. Channel sediment deposits can be the primary source of suspended sediment in stream flow. Most of Jackson Creek and the few non-ditched tributaries observed had little indication of sediment accumulations in their channels (though it should be noted that the only areas where the channel bottom was visible was where the water was flowing clear). This implies that the stream is able to transport the majority of its sediment load to areas below Jacksonville. As noted previously, much of Jackson Creek has been channelized, resulting in increased sediment transport where a streams channel has been shortened (and therefore steepened) due to channeling. There may be sediment accumulations in the lower gradient reaches of the stream, most likely downstream of the Ross Lane crossing. Sediment deposited in irrigation ditches was previously discussed above.

5.7.3. Summary, and Future Data Requirements.

Considering the information obtained during this assessment, road-related erosion and irrigation ditch sediment appear to currently be the largest sources of sediment delivered to Jackson Creek. There is some indication that irrigation ditch sediment is in part the result of road-related erosion. Future research into sediment sources should involve a quantification of the road density in the basin, and a quantification of the amount of past erosion associated with these roads. A road-related erosion survey could be coupled with prescriptive treatments to address specific problem sites (e.g., replacing a failing culvert, outsloping a stretch of road, etc.) A detailed assessment of irrigation ditch networks should be done, along with an evaluation of the sediment sources to the ditches to determine if their sediment load from road-related, in-channel erosion, or other upslope sources.

A general field survey of the basin should also be done during or right after times of significant rainfall - preferably during the first large storms of the fall season to catch first-flush events. This would provide direct information on the importance of surface erosion from construction sites and agricultural land. As discussed previously, these types of land use did not appear to be major contributors of sediment, but there is a possibility that fall and winter management activities on these properties could mobilize more sediment than was apparent during the field survey done in May. Quarry drainage could also be more readily assessed during storms, with the assistance of DOGAMI to gain property access.

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