Technical Report #11

Thompson Watershed Analyses: Beatrice Creek, Boiling Springs Creek, Murr Creek

Overview

In May 1997, Plum Creek Timber Company, L.P., initiated a watershed analysis in three tributaries to the Thompson River in western Montana: Beatrice Creek, Boiling Springs Creek, and Murr Creek. Watershed analysis is a process to address the cumulative effects of forest practices on two areas of public resources: fish habitat and water quality. The potential and existing resource conditions are described in the report, as are the relevant physical processes that affect the resource condition. The purpose of this report is to present results of the resource assessment and provide documentation and justification for identifying sensitive areas.

Key Points

Watershed analysis is conducted by studying separate **modules.** The modules studied in this Technical Report include the following:

- Mass wasting
- Surface erosion
- Hydrology
- Riparian function
- Channel condition
- Fish habitat

Once the analysts had worked through the modules, the information was brought together with the data from other modules to develop a more complete picture of the watersheds.

Supporting Technical Information

Plum Creek owns 52.4 percent of the analysis watersheds. The Forest Service manages 43.8 percent of the analysis area and the State of Montana manages 3.7 percent. Private lands comprise only 30 acres of the total analysis area, entirely within the Murr Creek watershed. The dominant land use in these watersheds is forestry. A secondary use is cattle grazing. In addition, all three watersheds are used by the public for recreation, primarily hunting and firewood cutting. This section summarizes the findings of the watershed analysis in each of the subject modules.

Mass Wasting. Landslides and other mass wasting features are rare. In the 50 square mile analysis area, only five modern-era mass wasting sites were identified. Four of these related to forest management and were caused by (1) steep road cutslopes with groundwater seeps, (2) poorly drained roads, and (3) poorly constructed road fills with groundwater seeps. However, none of these landslides delivered sediment to streams. Because of the relatively gentle slopes in the analysis watersheds, standard Best Management Practices (BMPs) minimize mass wasting.

Surface Erosion. Surface erosion from hillslopes and roads occurs when soil is exposed to surface water flow. Although there are local areas of soil disturbance on recently harvested hillslopes, field results show that BMPs prevented sediment delivery to streams. The road erosion

assessment compared sediment delivery from roads to natural background sediment. Roads in Beatrice and Boiling Springs Creek watersheds contribute more than 50 percent of the background erosion rate, and road erosion in Murr Creek contributes less than 50 percent. Most of the sediment delivered to streams occurs at key points along roads. For example, in Boiling Springs the top nine contributing locations deliver 76 percent of the road sediment volume. Sediment delivery may be reduced by adding drainage at stream crossings.

Hydrology. This module evaluated how streamflows have been altered by timber harvest. Because current forest vegetation is similar to the vegetation pattern in which the streams evolved, peak streamflows were modelled to be within 10 percent of background.

Riparian Function. This module evaluated the condition of riparian areas based on their ability to supply large woody debris (LWD) to stream channels and provide shade to maintain stream temperatures. More than 79 percent of riparian areas in the three study watersheds have a moderate-to-high potential for adding LWD to streams. Also, canopy cover of the stream channel network is generally sufficient to keep stream temperature below 15^{o}C.

Channel Condition. Stream channel gradient (slope, or steepness) is a major predictor of the shape, depth, and flow of the channel, which in turn predicts habitat potential. In the three watersheds analyzed, 14 percent of the stream segments have low stream gradients (less than 4 percent), while the remaining 86 percent have high stream gradients (greater than 4 percent). Actual and potential fish habitat is significantly greater in the low gradient group compared to the high gradient group. Lower-gradient stream segments tend to be more sensitive to watershed disturbance, with some exceptions.

Fish Habitat. Goals of the fish habitat module are to document existing and historic fish distribution, assess current habitat conditions, identify important habitat, and identify impacts to habitat from land management. Trout and char species in the analysis area include brook, bull, cutthroat, and rainbow trout. Brook and rainbow trout are non-native species, which were stocked as early as the 1930s. Although natural barriers to fish passage are present, no man-made barriers to fish movement were found in the analysis area. Fish habitat conditions varied from poor to good in the analysis watersheds and were largely a function of channel type.

Conclusion and Implications

Stream channels are shaped by a number of variables that interact to create a unique stream. Some variables, such as the gradient, valley confinement, and drainage area of a stream, are relatively unchanged by human activities. Other variables, such as the amount of coarse and fine sediment, the amount of large wood in the stream channel, and the volume and timing of flood events, can be influenced by management activities. Gathering this information allows managers to develop management practices to minimize or prevent problems in sensitive areas.