Using Turbidity Monitoring and LiDAR-Derived Imagery to Investigate Sources of Suspended Sediment in the Little North Santiam River Basin, Oregon, Winter 2009–2010

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The Little North Santiam River Basin is a 111-square-mile watershed located in the Western Cascades of Oregon. The Little North Santiam River is a major tributary to the North Santiam River, which is the primary source of drinking water for Salem, Oregon, and the surrounding communities. Consequently, adverse water quality conditions in the Little North Santiam River, such as high turbidity, affect treatment and delivery of the drinking water. Between 2001 and 2008, suspended sediment from the Little North Santiam River accounted for 69% of the total load that passed the treatment plant. Recent studies suggest that much of this sediment originates from landslide activity in the basin. Using airborne Light Detection and Ranging (LiDAR)-derived imagery, 401 landslides were mapped. Landslide types vary by location, with deep-seated earth flows and earth slumps common in the lower basin and channelized debris flows prominent in the upper basin. Over 37% of the lower basin shows evidence of landslide activity compared to just 4% of the upper basin. Instream turbidity monitoring and suspended-sediment load estimates during the winter of 2009–2010 demonstrate a similar distribution of sediment transport in the basin. During a 3-month study period, from December 2009 through February 2010, the lower basin supplied 2,990 tons, or 91% of the suspended-sediment load to the Little North Santiam River, whereas the upper basin supplied only 310 tons of sediment. One small, 23-acre earth flow in the lower basin, the Evans Creek Landslide, supplied 28% of the total suspended-sediment load.