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Salmon organic matter and fine sediment flocculation: Implications for nutrient and sediment tracing

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This study focuses on the role of organic matter derived from post-spawning salmon carcasses on fine sediment floc formation and streambed storage processes in salmon bearing watersheds. It supplements previous Pacific salmon habitat studies which have traditionally focussed on the influence of inorganic sediment storage on intergravel water quality and discharge by addressing the role of organic matter. To assess the role these mixed origin sediments have in aquatic ecology and to determine their influence on benthic habitat, four flow-through channels and a re-circulating flume were constructed and seeded with gravel of a similar size to that observed in natal salmon streams. Flume water depths, velocity, salmon organic matter and suspended sediment concentrations were also similar to that of regional natal salmon streams. Previous investigations confirmed that the addition of salmon organic matter led to an increase in gravel stored fine sediment concentrations ($<$65um) as well as an increase in the sediment's biological oxygen demand and nutrient content. Here, a Laser In-Situ Scattering and Transmissometry Probe (LISST - Sequoia Instruments) was used to measure in-situ suspended sediment condition in the water column and flume bed. Larger fine sediment flocs ($>$100um) were observed during exposure to salmon organic matter (SOM) as well as SOM and clay. These flocs were recruited to the streambed which correspondingly showed a significant increase ($P<0.05$) in the effective particle size of streambed sediments when compared to background and clay only exposed flume gravel beds. These findings indicate that SOM increases the formation of fine sediment flocs and the transfer of both inorganic and organic matter to the streambed both of which play a role in the benthic ecology and intergravel habitat condition of natal salmon watersheds.