The influence of levees on the stability of chinook salmon spawning habitat in the Cedar River

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Abstract: We used radio tags as scour monitors to measure the stability of chinook spawning habitat in confined and unconfined reaches of the Cedar River during the winters of 1999/2000 and 2000/2001. Radio tags, encased in buoyant carriers, were buried 20 cm (8 in.) in the streambed to represent the averaged depth of chinook salmon redds. Twelve scour monitors were placed in each of eight study reaches (96 total), four confined and four unconfined. Tags were equally spaced across the channel in 1999/2000. However, tags were placed along two longitudinal transects closest to the bank on the inside of the channel meander in 2000/2001 to better represent spawning locations (based on visual observations in 1999/2000). We also installed tags adjacent to 9 chinook salmon redds in 1999/2000. There were only two minor freshets during the winter of 1999/2000. One was approximately 2,500 cfs and the other was approximately 3,000 cfs. A total of 19 tags were scoured, 14 from unconfined areas and 5 from confined areas. Only one of the 9 tags placed adjacent to chinook salmon redds scoured. Tags in the upstream cross-sections (closer to the pools) scoured more frequently than those in downstream cross-sections (closer to the riffle). Scour appeared to be related to sediment size, with the frequency of scour being greatest in areas with mean sediment size (d50) less than 32 mm. Sediment in unconfined reaches was smaller than that in confined reaches where the mean sediment sizes were generally 45 mm and greater. Limited data suggests that scour may also be related to duration of high water. There were no flow events during the winter of 2000/2001 large enough to induce scour. However, eighteen tags were lost during the winter of 2000/2001. Thirteen of these tags were apparently dug up by spawning sockeye salmon. The other five were likely scoured following the release of water blocked by the earthquake induced landslide. Results regarding the stability of chinook spawning habitat and the influence of artificial constrictions on spawning habitat stability were inconclusive due to mild winter conditions.