ABSTRACT

GREENWATER RIVER REDD, SCOUR, AND CROSS-SECTION ASSESSMENTS: IMPLEMENTATION OF AND RESULTS FROM A TMDL BASELINE MONITORING COMPONENT

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The Greenwater River in the Puyallup Basin of western Washington is an historic spawning river for Endangered Species Act (ESA) listed White River spring chinook. Stream temperature impairments caused this river to be placed on the state's Clean Water Act (CWA) Section 303(d) list. Reconnaissance stream monitoring identified that fish habitat parameters were impaired in addition to temperature and therefore the scope for total maximum daily load (TMDL) development was broadened to include habitat recovery. The scope also included establishment of a baseline to provide a yardstick from which to measure improvement resulting from TMDL implementation and watershed restoration. This paper presents the results of baseline monitoring that established chinook redd survival based on beginning and end of incubation channel scour, surface bed elevation, habitat, and flow data. Work was accomplished with the assistance of many individuals.

We monitored a total of 76 chinook redds during five incubation years (1996 to 2000). In addition, for four incubation years (1997 to 2000) we set up and monitored cross-sections with scour monitors in spawning habitat in two stream segments. The downstream-most cross-section was near a US Geological Survey flow gage with a 57-year period of record, providing us with peak incubation period discharge data. Redd results indicated that during 2 of 5 years 92% of redds had a good likelihood of survival. During the other 3 years redd results showed likelihood of good survival for 79%, 72% and 50% of redds. However, redd data included only scour of the surface bed; cross-section bed scour monitor data for 2 of 4 years indicated a greater level of redd loss was occurring with greater than 50% of monitors scouring to the top of the 15 cm egg pocket depth.

Scour monitor and redd site data showed a strong negative correlation between increasing annual peak incubation discharge and increasing depth of scour. There was also a strong positive relationship between the maximum annual incubation peak discharge and the percent of sites scoured to 15 cm (the top of chinook egg pocket depth), and for the maximum annual incubation peak discharge and the percent of redds with a poor likelihood of embryo survival to emergence. Based on the relationship between peak discharge and scour level, flows with a 2-year return interval are predicted to scour 25% of scour monitors to ≥15 cm; flows with a 4-year return interval scour 50% of monitors to ≥15 cm; and, flows with a 7-year return interval scour 75% of monitors to ≥15 cm.

Historically (pre-1970, n=41 years), discharges predicted to have scoured ≥50% of monitor sites in spawning habitat to the top of egg pocket depth occurred at a 5.9-year frequency. Currently

(1970 to 2000, n=16 years) these discharges are expected to occur at a 3.0-year frequency, nearly twice as often (p-value 0.0826). This research provides a useful baseline monitoring component, and provides supportive documentation for the importance of TMDL work that focuses on restoration of watershed processes (e.g. hydrology, and sediment production) that affect depth of gravel scour in Greenwater River chinook spawning habitat.

A full report is available on the web at http://www.ecy.wa.gov/biblio/0310071.html. Or you may request Ecology publication 03-10-071 (Schuett-Hames and Adams) from Ecology's publication office by phone at (360) 407-7472 or by e-mail at ecypub@ecy.wa.gov.