Lessons from Three White Sturgeon Recovery Plans

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Extended Abstract: Three unique recovery plans have been developed for white sturgeon (*Acipenser transmontanus*) populations in the Nechako, Upper Columbia (upstream of Grand Coulee Dam), and Kootenay Rivers. All three populations are genetically and geographically distinct, with the Kootenay population showing the clearest genetic distinctions. Continued recruitment failures in all three cases mean that population recovery is urgently needed. Current populations number about 570, 1200, and 1400 for the Nechako, Upper Columbia, and Kootenay Rivers, respectively. Failure to successfully restore recruitment within these populations will lead to their functional extinction in 20 years or less, which is less than half a generation for this long-lived species.

Despite significant effort and learning, particularly in the case of the Kootenay River population (Kootenai in the U.S.), uncertainty remains about the precise mechanism(s) behind recruitment failure. Rapid action is needed and highly desirable, but there are high costs associated with such action; therefore, every effort should be made to establish a comprehensive understanding of anthropogenic changes in each watershed. Comparison between the three populations and their recovery plans offers an important tool to build such an understanding.

The longevity of white sturgeon allows historic recruitment to be examined by back calculation from present age structure. White sturgeon typically spawn during the snowmelt freshet period, and freshet magnitude appears to positively influence recruitment. The presence of dams on all three rivers, with attendant decreases in freshet flows, provides a strong indication that flow regulation is a major causal factor in recruitment failure; however, comparison of the historic recruitment for each population suggests additional contributory factors are present.

The Upper Columbia population shows a classic recruitment failure pattern. Relatively stable recruitment occurred until the completion of the Keenleyside and Mica Dams in 1968 and 1974, respectively. In the Nechako case, the Kenney Dam was completed in 1952, but recruitment declines occurred in the 1960s, suggesting that factors in addition to flow regulation played a significant causal role in recruitment declines. Geomorphological changes in bed substrates and the loss of side-channels have occurred, and appear to have contributed to recruitment declines in the Nechako case. Geomorphological changes have also received considerable attention in the case of the Kootenay River population, but relatively little attention in the case of the Upper Columbia River population.

Comparison of recruitment histories for the Nechako and Kootenay River populations suggests that consideration of historic events is important in understanding recruitment failure. In the Kootenay case, low recruitment prior to 1955 was followed by a distinct recruitment peak in 1961 and very low recruitment since 1974 when the Libby Dam was built. The present population appears to be largely the result of high recruitment that centered around 1961, a high flow year. The presence of low recruitment that appears to have preceded the completion of Libby Dam, suggests that floodplain abstraction due to dyking in the 1930s and 1940s could have contributed to low recruitment. Currently, flow regulation likely prevents further recruitment events such as those which occurred in 1961. While both flow regulation and the loss of floodplain habitat were considered in the recovery plan for the Kootenay population, mitigation through flow restoration has received greater attention to date. It is unclear whether sustained recruitment could occur if only one of these two factors was restored.

Challenges to mitigative action are numerous. Ongoing uncertainty regarding the precise mechanisms of recruitment failure means that many reasonable hypotheses remain. Sequential testing of these hypotheses would be time consuming, especially considering multi-year lags between recruitment and juvenile detection; therefore, a less methodical approach, such as a ‘shotgun’ reverse titration design whereby multiple factors are tested concurrently with subsequent removal to identify the importance of various factors, is preferred. While this approach may have the greatest chance of successful recruitment restoration, it is also the most expensive.