Title:
Yakima River Floodplain Mining Impact Study

Authors:
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Presentation Summary:

For more than 100 years, numerous Yakima River floodplain mines have been a source of regionally significant construction aggregate. These mines have severely disrupted river channels and riparian communities. Depending on their location relative to the river and amount of flow, mine pits may be captured by the river, resulting in erosion, altered sediment transport regimes, and channel shifts that can damage highways and developments. Engineered structures that protect ponds and infrastructure also change river dynamics.

Ten ponds, located from Cle Elum to Richland WA, were selected as study sites to assess existing physical and ecological conditions and to provide reclamation recommendations. Data collection began in April 2002 and continued through mid-November 2002. Efforts, divided among the agencies, Yakima County, and the Yakama Nation, followed standard protocols. Study Team members calibrated equipment to assure uniformly high quality results. The following parameters were assessed:

- Pond area, depth, volume, and bottom sediment;
- Water temperatures in the ponds and river reaches adjacent to them, as well as differences among sampled sites;
- Fish assemblages in the ponds and river nearby; and
- The populations of benthic macroinvertebrates and differences among them, and aquatic and terrestrial plants.

Bathymetry of each pit pond was measured once during the study period. Sediments collected from the pit and from the river nearby were qualitatively examined or sent to a laboratory for sieve analysis. Water temperatures in the pond and river were measured at 2-hr intervals throughout a fairly uniform study period by equipment tethered to the bank or suspended in the pond. Maximum and minimum water and air temperatures taken in the sites' riverine and riparian areas were analyzed for trends.

Fish were sampled in the ponds and river reaches adjacent to the ponds, typically once at each site during the summer or fall. Backpack and driftboat electroshockers, shoreline live trap nets, and divers sampled 200 or more fish per river or pond site wherever possible. Benthic macroinvertebrates were collected in replicate gravel-filled baskets placed in the ponds and were collected in the river upstream and downstream each pond site using a standard kick-net method. Water quality parameters, stream wetted width, stream velocity and gradient, macrophyte communities, and other variables were also measured at each site. Statistical analysis of the

relations of the benthic community and the physical/chemical conditions led to conclusions regarding the biologic condition of the site.

Ecological analysis of the ponds showed that temperature and fish assemblages fell into three groupings: upper, middle and lower river reaches. In general, river and pond water temperatures were lower at the sites at higher elevation (upper reach). Large percentages of days exceeded the proposed 7-day average of the daily maximum temperature (7-DADMax) (16°C, higher than the current DOE standard) for spawning and rearing in the middle and lower reaches in summer and fall; somewhat fewer days exceeded the 7-DAD maximum temperature of 17.5°C in these two reaches. Fish in these three broad ecological reaches were considered in two groups: native (managed) salmonids, and exotic competitor or predator species. If connected, riparian zone gravel pit ponds in the upper reach have potential for providing high-quality native salmonid habitat; these species are already present in the river adjacent to the ponds. Fewer salmonids are present in the middle river reaches and present only in Edler Pond 3 (post-breach). The lower reach is poor late spring, summer, and early fall habitat or salmon rearing under current water management practices. The warmer water here favors the exotic competitors and predators, at least seasonally. These non-native fish species do not thrive in the cooler up-river sites.

Analysis of the benthic macroinvertebrates shows that, in general, the sampled sites above the studied ponds were in better biological condition than those below. The benthic macroinvertebrate communities are fairly similar at the sites within each reach, but there is an overall change in communities from upper to lower reaches, as determined with temperature and fish assemblages. Precisely what governs the “breaks” in community composition among reaches is not yet clearly understood, however, are linked with water quality, quantity, and geomorphic conditions.

It has become clear from the results of this study that geomorphic conditions at each site must be carefully considered when proposing to connect abandoned gravel pit ponds to the river to create new side channel habitat. The potential for uncontrolled avulsion at some sites is a challenge in the design of the connection, especially with regard to the area available for channel migration. Natural avulsion can cause damage to nearby property and infrastructure, particularly where the river captures a large, deep pond. However, this study shows that the upper reach ponds offer opportunities for developing high-quality salmonid habitat (if large northern pikeminnow populations are removed or can be managed). Central to success of pond reclamation for fish enhancement will be designing a connection to the river that minimizes areas of slow water and that will carry flow sufficient to add suitable sediment to the in-stream habitat being created. Ponds low in the river are sources of exotic competitor/predatory species leakage and are poor candidates for developing salmonid habitat under the current water management regime which causes the adjacent river reaches to be unsuitable for salmonid utilization a significant part of the year. Monitoring the benthic invertebrate community will track changes and assess the ecological health at connected sites.