

Stream structure and habitat changes due to power station operation

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River flow regulation impact on habitat conditions in impounded river is discussed. Alteration of riverin habitat due to dam construction operates many kilometers below the dam, usually outside the boundaries of standard studies intended to delineate downstream effects of dam. The rivers of two types are under consideration in this paper: (i) lotic reaches of a plane river downstream a dam; (ii) mountain river, which periodically suffers dewatering because of flow regulation causing death of salmon fry. Experimental results of study of velocity, turbulence and pressure fluctuations and hydraulic resistance in regulated rivers are presented.

As most of fish species spawn in spring, open flow conditions are quite important, because such conditions are believed to determine the survival rate for the next year. Because of that in the first part of this work we consider a statistical model of the structure of a stream in plane river under natural conditions. This model describes the main characteristics of mean and turbulent water motion in a stream, which are further compared with those for the flow in regulated river.

In the second part of the work to estimate habitat preferences for fish we discuss the results of experiments on fish response on variation of mean velocity, turbulence intensity and pressure fluctuations of the flow conducted in a laboratory flume by different authors. The critical magnitudes for mean velocity, standard deviation of longitudinal velocity fluctuations and pressure fluctuations were determined, which can be regarded as the characteristics of suitable habitat conditions. Comparison of the velocity and pressure characteristics of the flow preferable for fish with those in natural and regulated rivers shows considerable decrease of reaches of a river suitable for fish. Change of velocity field of a nature stream due to damming significantly affects sediment transport, that defines feeding places for phyto- and zoo-plankton (food for larger organisms) and spawning grounds quality.

The results of investigation of the stream in flume modeling the mountain river are presented. Several experiments with salmon fry escaping to the deeper channel near the bank during a decrease of discharge are described.