



Frequent sediment flushing threatens macroinvertebrate diversity in Alpine streams

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Topics: Biodiversity | Ecosystems | Climate Change & Energy

Aquatic organisms are adapted to harsh conditions at high altitudes and are tolerant of a certain level of disturbances. However, according to a study conducted in the canton of Valais, frequent flushing of water intakes leads to a dramatic decline in populations of macroinvertebrates, such as insects or worms.

Alpine streams have been extensively modified by dams and water intakes to permit hydropower exploitation. This leads to changes in flow regimes and sediment dynamics, and thus also in the distribution of animal and plant species. To keep ecological impacts to a minimum, it is important to ensure adequate minimum flows and, in addition, to restore natural sediment dynamics. A new study carried out by Eawag and Lausanne University shows that, particularly in the case of water intakes, sediment management is essential for the survival of aquatic life.

Large amounts of sand and gravel accumulate in water intakes. In highly glaciated basins, intakes may have to be flushed up to 17 times a day to empty the sediment traps. The consequences are devastating: the researchers found that during the summer months – when intake flushing is most frequent – downstream reaches of the Borgne d’Arolla (a glacial stream system in the south-west Swiss Alps) were almost devoid of life. This was due to the adverse impacts of the deposition of coarse and fine sediments. Populations only recover when the rate of disturbances is reduced in the autumn. Christopher Robinson, an aquatic ecologist at Eawag, says: “Surprisingly, macroinvertebrates were then able to rapidly recolonise the stream from tributaries.” However, species richness was relatively low, and the populations disappeared again as soon as regular flushing was resumed.

More frequent flushing due to increased sediment delivery


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ws; sediment' (88 chars) description => protected'In Alpine streams, humans have
strongly modified the interactions between hy
draulic processes, geomorphology and aquatic life through dams, flow abstrac
tion at water intakes and river channel engineering. To mitigate these impac
ts, research has addressed both minimum flows and flow variability to sustai
n aquatic ecosystems. Whilst such environmental flows might work downstream

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of dams, this may not be the case for water intakes. Intakes, generally much smaller than dams, are designed to abstract water and to leave sediment behind. Sediment accumulation then results in the need to flush intakes periodically, often more frequently than daily in some highly glaciated basins. Sediment delivery downstream is then maintained through short duration floods with very high sediment loads. Here we tested the hypothesis that sediment flushing, and the associated high frequency of bed disturbance, controls instream habitat and macroinvertebrate assemblages. We collected macroinvertebrates over a 17-month period from an Alpine stream as well as a set of lateral unperturbed tributaries that served as controls. In contrast to established conceptual models, our results showed that the stream is largely void of life during summer, but that populations recover rapidly as the frequency of intake flushing falls in early autumn, producing richer and larger populations in winter and early spring. The recovery in autumn may be due to the recruitment of individuals from tributaries. We conclude that intake flushing in summer inverts expected summer-winter macroinvertebrate abundances, and questions the extent to which environmental flows in intake-impacted Alpine streams will lead to improvements in instream macrofauna unless sediment also is managed.' (1757 chars) serialnumber => protected'0048-9697' (9 chars) doi => protected'10.1016/j.scitotenv.2018.09.180' (31 chars) uid => protected17782 (integer) _localizedUid => protected17782 (integer)modified _languageUid => protectedNULL _versionedUid => protected17782 (integer)modified pid => protected124 (integer) Gabbud, C.; Robinson, C. T.; Lane, S. N. (2019) Summer is in winter: disturbance-driven shifts in macroinvertebrate communities following hydroelectric power exploitation, *Science of the Total Environment*, 650, 2164-2180, doi:10.1016/j.scitotenv.2018.09.180, [Institutional Repository](#)

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