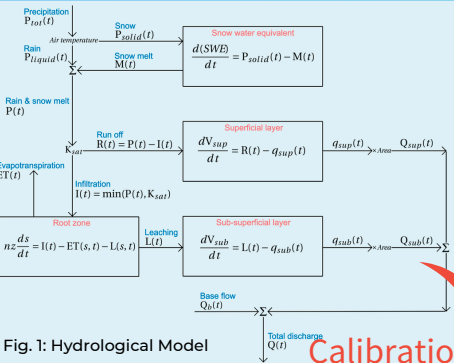


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A Residual Flow for the Tschärzsisbach !

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Objective

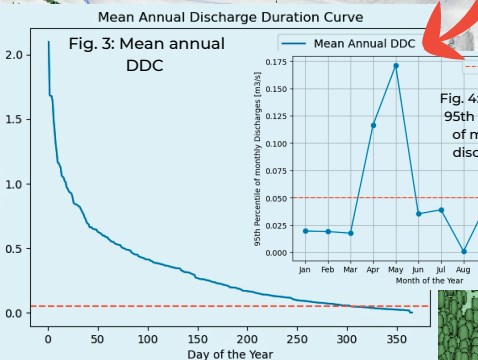
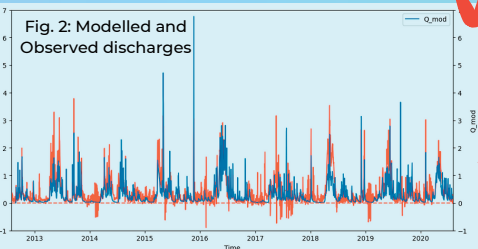
In this project we analyse and compare nine solutions for the implementation of a dotation of Arnensee's lake effluent : the Tschärzsisbach. In this lake used for hydropower, the topography and the dike building disables gravitary residual flow during 2-3 months. This touristic area is not linked to the grid and inaccessible from November to May. We investigate on which solutions are realistic and interpret the law for the most beneficial impact on the environnement.

Hydrological model

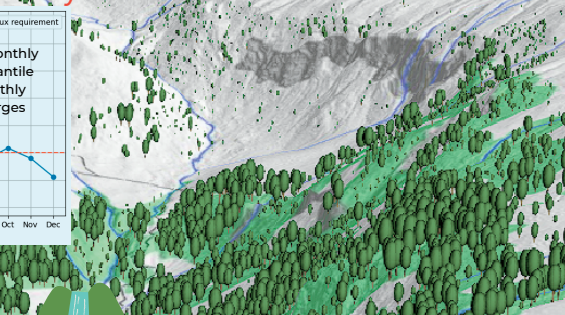
To assess the hydrological regime of the Tschärzsisbach unaltered, we produced an hydrological model of the catchment calibrated using electrical production data and precipitation recordings. From the model one can draw the Discharge Duration Curves (DDC) to estimate the needed discharge as residual flow month by month and argue for an exemption to the LEaux. These results allow to validate solutions 2 & 3 feasibility and estimate the part of the catchment needed for the wanted discharge.

The law and the science

The LEaux requires from Romande Energie to provide 50 l/s residual flow at anytime to the Tschärzsisbach. Arnensee does not enters any category enabling an exemption from the LEaux requirement. This law of 1991, aimed to protect aquatic ecosystems from human water tapping, notably hydropower. Since scientific knowledge improved regarding healthiness of ecosystems as well as hydropower drawbacks, it recently highlighted a great need of diversity in its life condition in order to maintain high biodiversity and a fair balance of power between the species. Thus we recommend to provide a seasonal residual flow enabling the same volume of withdraw but respecting seasonal sequences according to the hydrological analysis.



Monthly DDC analysis

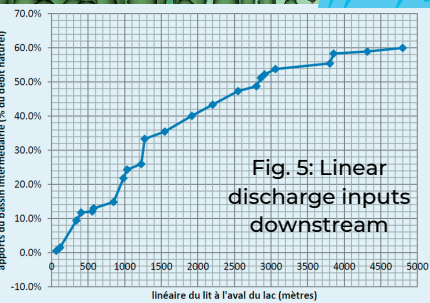


Best Solutions

- 1 Pumping-siphoning with electricity cables from Ayerne
- 2 Deviation of lateral streams using bisses*
*Valais Alpine irrigation channel
- 3 Deviation of lateral streams in a pipe flow with a turbine



	1	2	3	Weight
Expenses	0.03	0.23	1	0.2
Residual flow quality	0	1	1	0.5
Pollution reduction	1	0	0.5	0.25
Landscape Impact	0	1	0	0.05
Final Score	0.26	0.6	0.83	



Even without the residual flow, the stream observes healthy properties. Fig. 5 shows multiple affluent rapidly increasing flow in the Tschärzsisbach. The estimated gain in ecological function does not justify the use of ressources while passive solutions are available.

Conclusion

From nine different solutions, only three were retained for the multi-criterion analysis. The others were mainly logistically inapplicable or ecologically too costly. In these three solutions, two of them need an exemption from the LEaux. We think this exemption could lay the first milestones for a new obligation of the LEaux art. 31 as we consider it more beneficial for the ecosystem. The hydrological analysis revealed the Tschärzsisbach would benefit from a monthly residual flow where the total volume given would be higher than if residual flow is fixed from annual values based on the analysis. From the solutions proposed, 1 & 3 would participate to the electrification of the area, directly reducing pollution, while 2 would accentuate the picturesque of the site.