

## RIVERBED MORPHOLOGY



Universität Bern

Report Geodata analysis and modelling

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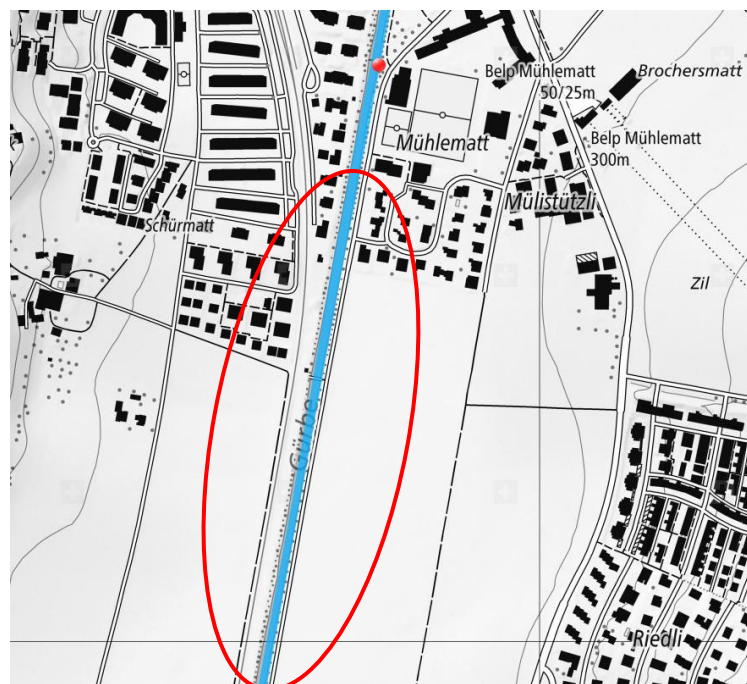
# 1 Introduction

For some time, individual river sections in Switzerland have been revitalized and upgraded ecologically. A common measure to increase the morphological diversity and habitat diversity in a body of water are river widenings. Such interventions in a watercourse make new demands on flood protection. Numerical models are helpful for the planning of structural measures in order to analyze the manifold consequences of an intervention and to better harmonize the various interests of use. In particular, numerical simulations are suitable for flood prevention, the preparation of hazard maps, the regulation of rivers and lakes, and the dimensioning of watercourses. In addition, morphological developments can be investigated and the habitat diversity of a body of water can be determined by means of suitable indices (Angelone et al.).

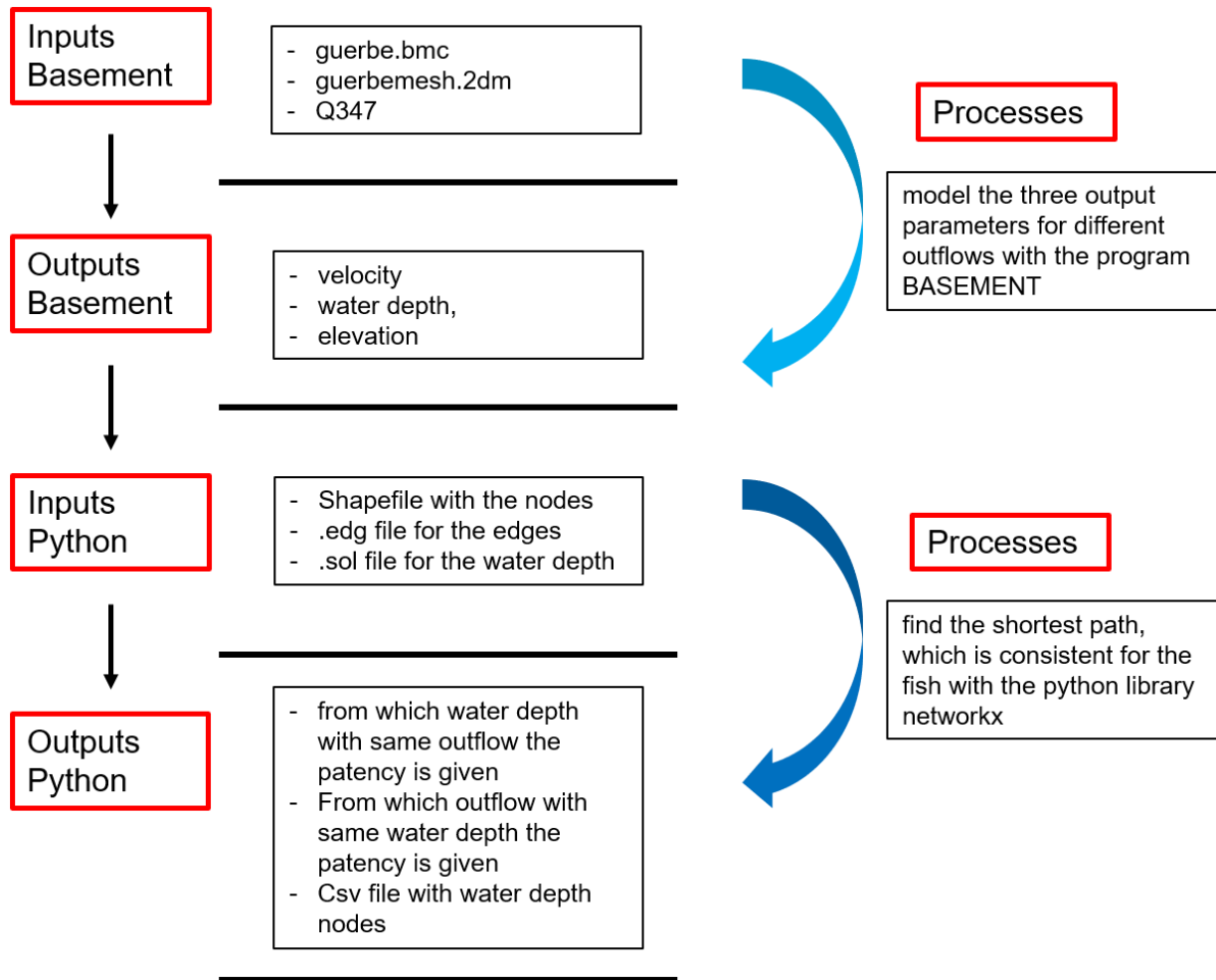
The study area is the fish migration in the river, whereby the boundaries are naturally given by the riverside. When it gets dry and less water flows down the river, the fish have a double stress: lower water depths and increased water temperatures. For the free fish migration, the water depth must be at least 20 centimeters (LfU 2005:46) and good water quality guaranteed. (different depending on the fish species). It may even happen that fish migration is no longer guaranteed. For various calculation such as water withdrawals or discharges, the Q347 is used for low water. The target is a model that shows fish passage at low water (Q347) in the Gürbe River.

Abfluss	<b>Gürbe - Belp, Mülimatt</b>								LH 2159	
Débit	Koordinaten		Höhe		Fläche		Mittlere Höhe		Vergletschung	
	Coordonnées	604810 / 192680	Altitude	522 m ü.M.	116 km²		Altitude moyenne	846 m ü.M.	Extension glacier	0 %
Portata	Coordinate		Altitudine		Superficie		Altitudine media		Ghiacciaio	

Dauer der Abflüsse	(erreicht oder überschritten)			Débits classés				(atteints ou dépassés)				Durata delle portate				(raggiunte o sorpassate)			
Tage/Jours/Giorni	1	3	6	9	18	36	55	73	91	114	137	160							
2015	30.1	20.7	13.5	8.80	6.85	3.84	3.18	2.88	2.58	2.26	2.00	1.83	m³/s						
1923 - 2015	16.3	12.2	9.71	8.47	6.60	4.95	4.10	3.56	3.16	2.78	2.48	2.22	m³/s						
Tage/Jours/Giorni	182	205	228	251	274	292	310	329	347	356	362	365							
2015	1.68	1.49	1.21	1.00	0.92	0.85	0.79	0.73	0.67	0.61	0.55	0.53	m³/s						
1923 - 2015	2.01	1.82	1.63	1.47	1.31	1.19	1.06	0.92	0.75	0.64	0.48	0.22	m³/s						



## 2 Workflow Conceptual Modell



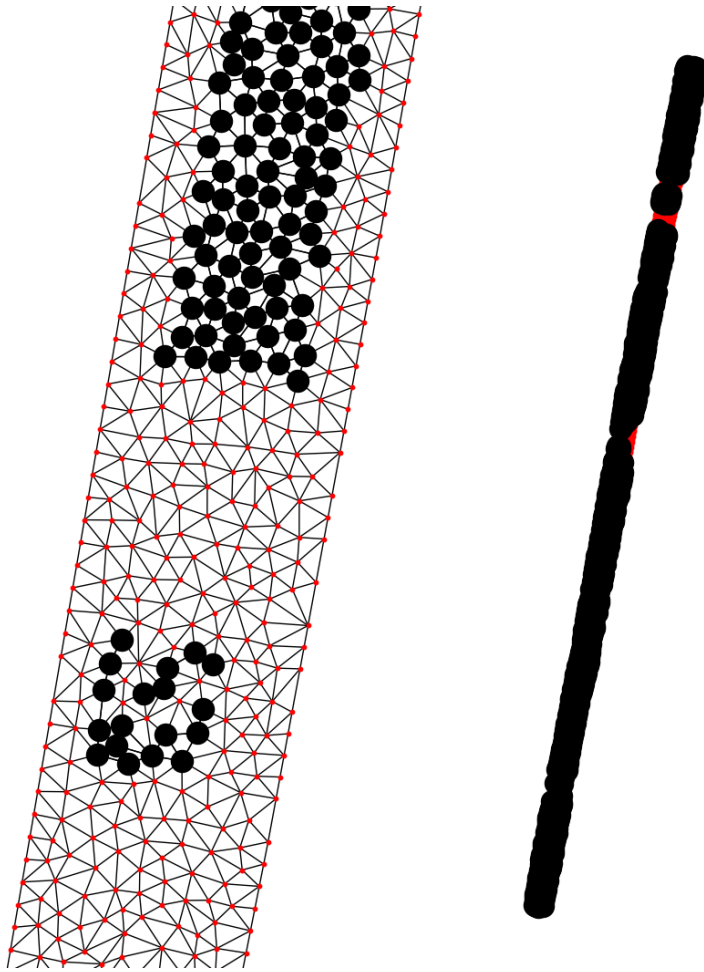
### Hydrograph:

time_in_seconds	m3_per_seconds	time_in_seconds	m3_per_seconds
0.0	0.50	24000.0	0.80
4000.0	0.55	28000.0	0.85
8000.0	0.60	32000.0	0.90
12000.0	0.65	36000.0	0.95
16000.0	0.70	40000.0	1.00
20000.0	0.75		

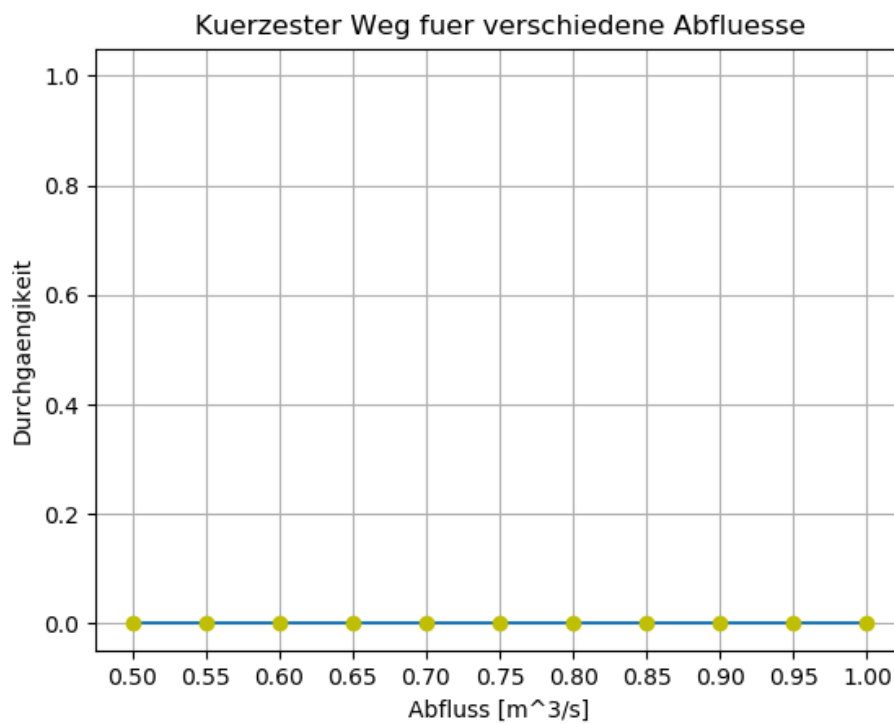
### There are 2 options:

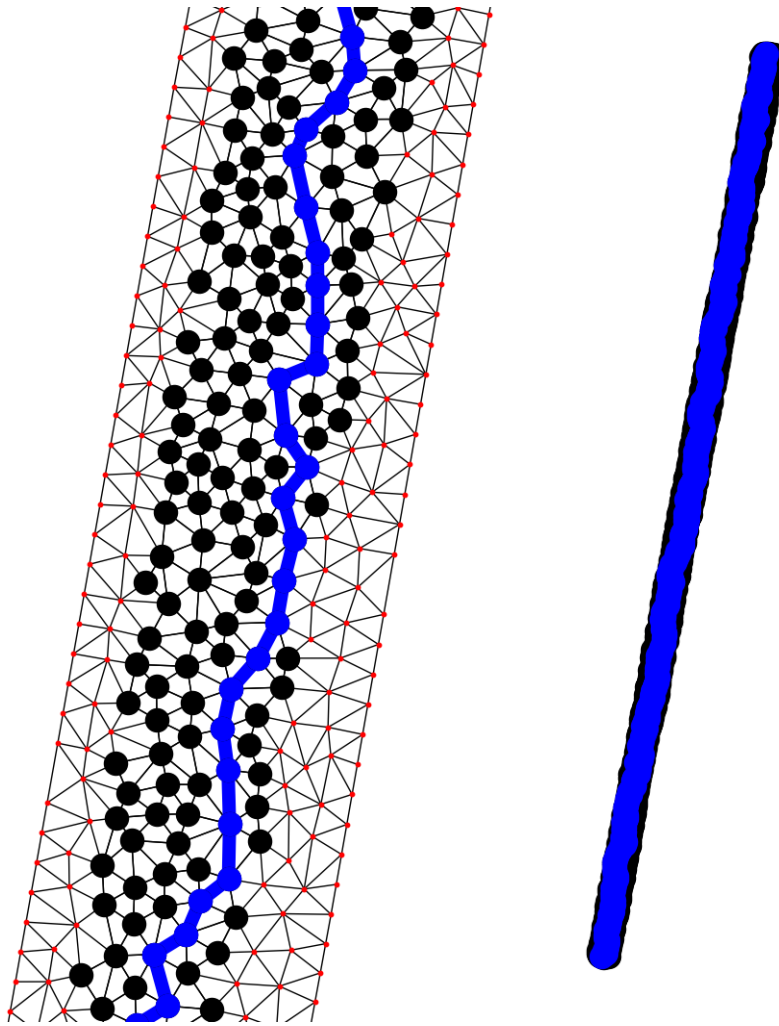
1. In the first option, the outflow is changed so that the patency depth for a desired water depth (for example, 20 centimeters) is guaranteed.
2. In the second option, the patency depth is reduced (for example 8 centimeters) to see from which water depth with the same outflow the patency is given.

### 3 Results

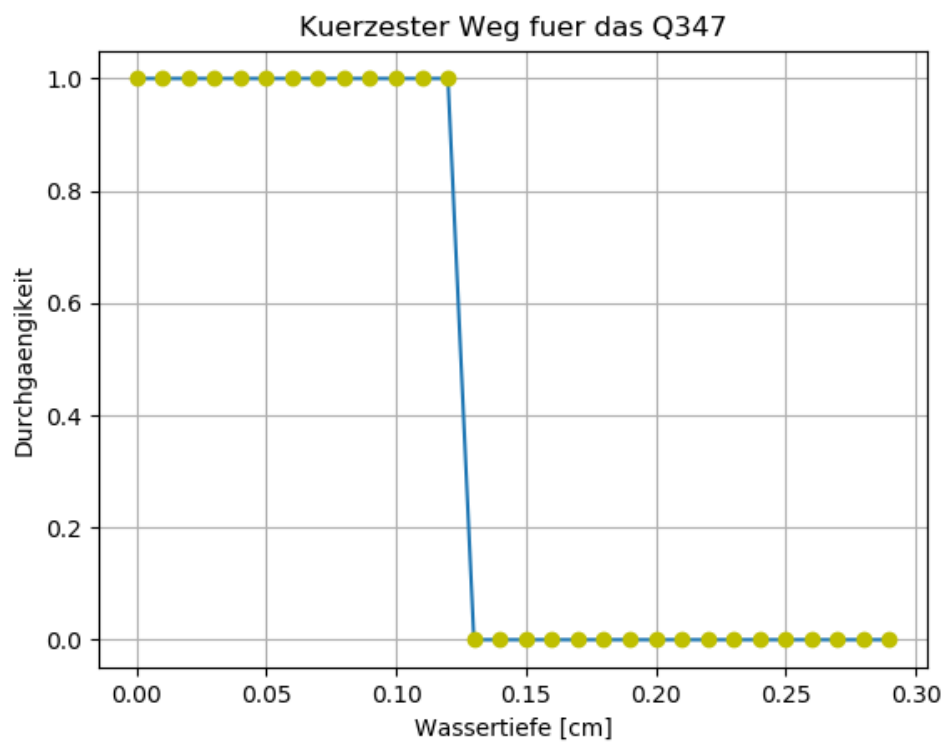


For fish that need 20 centimeters of water to pass to the river, the continuity would not be given with a Q347 of 0.75m/s.





For fish that only need 8 centimeters of water to pass to the river, the continuity would be given with a Q347 of 0.75m/s.



## 4 Literature

Angelone, S., Fäh, R., Peter, A., Scheidegger, C., Schleiss, A. (2012): Flussrevitalisierungen: eine Übersicht. In: Merkblatt-Sammlung Wasserbau und Ökologie. BAFU, Bern. Flussrevitalisierungen: eine Übersicht.

Landesanstalt für Umweltschutz Baden-Württemberg (LfU) (Hrsg.): Leitfadenreihe Durchgängigkeit für Tiere in Fliessgewässern. In: Schriftenreihe Oberirdische Gewässer der LfU (2005).

[http://www.ig-dreisam.de/info/lfu/durchgaengigkeit\\_tiere\\_1.pdf](http://www.ig-dreisam.de/info/lfu/durchgaengigkeit_tiere_1.pdf)

### Weitere Literatur:

Naef, F., Margreth, M., Florianic, M. (2015): Festlegung von Restwassermengen: Q347, eine entscheidende, aber schwer zu fassende Grösse. Wasser, Energie, Luft. 107. Jahrgang, Heft 4.

Woolsey, S., C. Weber, T. Gonser, E. Hoehn, M. Hostmann, B. Junker, C. Roulier, S. Schweizer, S. Tiegs, K. Tockner & A. Peter. (2005): Handbuch für die Erfolgskontrolle bei Fliessgewässerrevitalisierungen. Publikation des Rhone-Thur Projektes. Eawag, WSL, LCH-EPFL, VAW-ETHZ. 112 pp.