Gathering reliable fish data in large scale research facilities on German Federal Waterways

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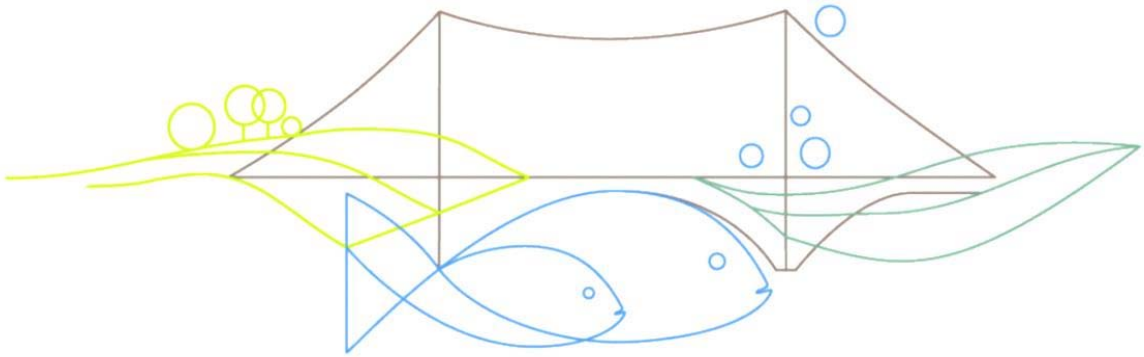

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1) Gathering reliable fish data at pilot sites

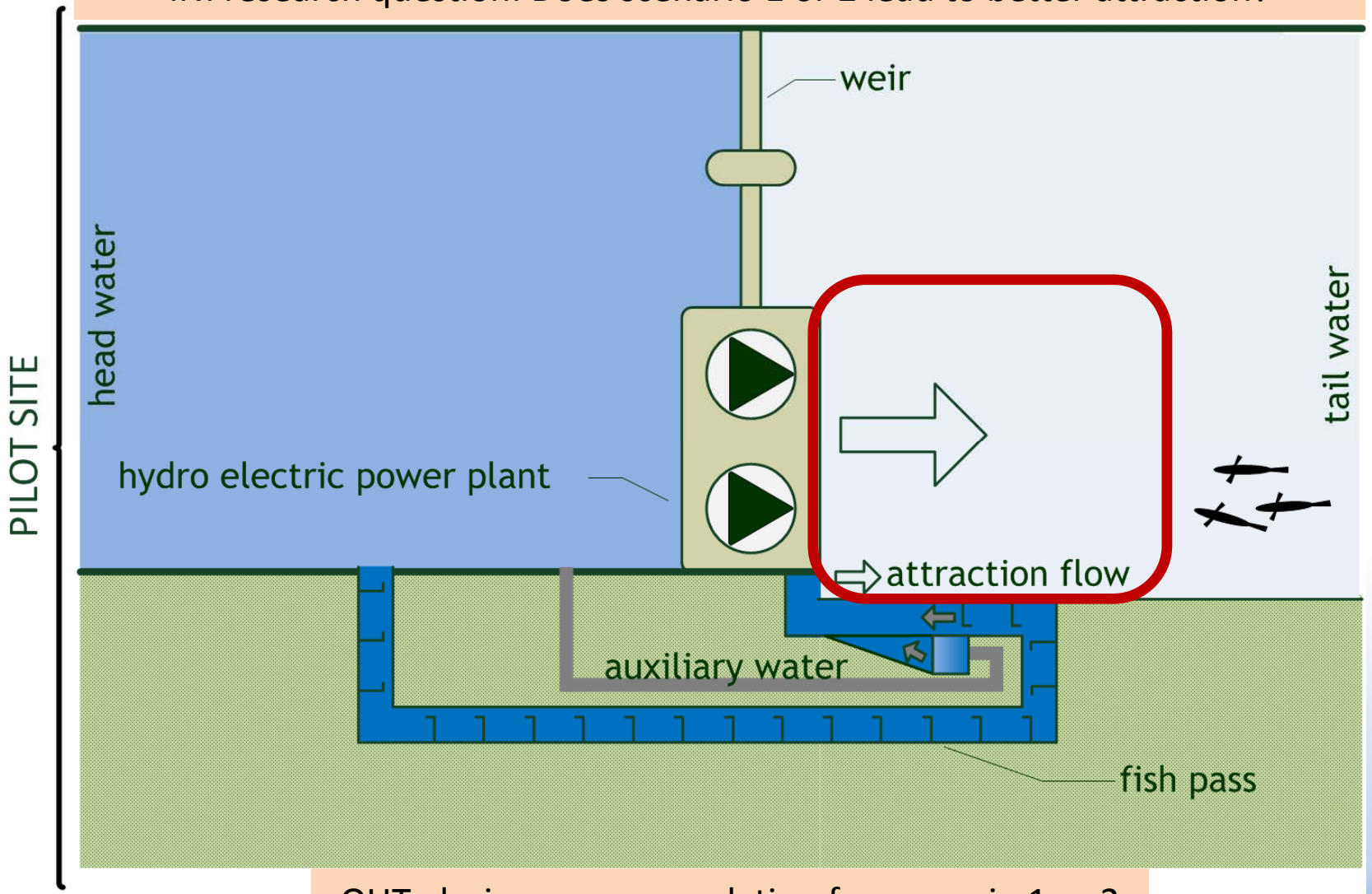
- Aims
- Challenges
- Options
- Solutions

2) Transferring results from pilot sites to ‚real life' sites

- Challenges
- Solutions

Gathering reliable fish data at pilot sites

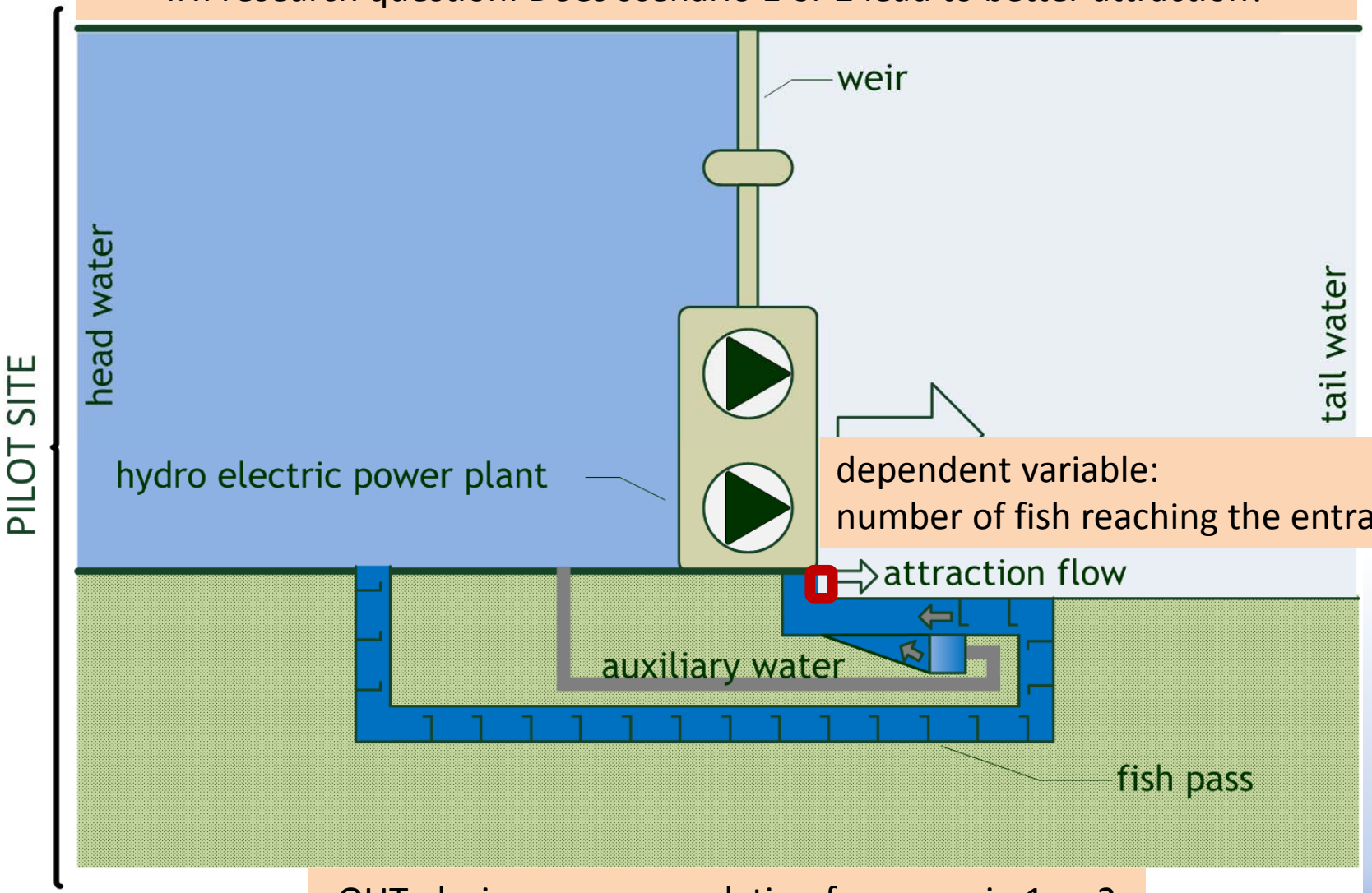
IN: research question: Does scenario 1 or 2 lead to better attraction?



OUT: design recommendation for scenario 1 or 2

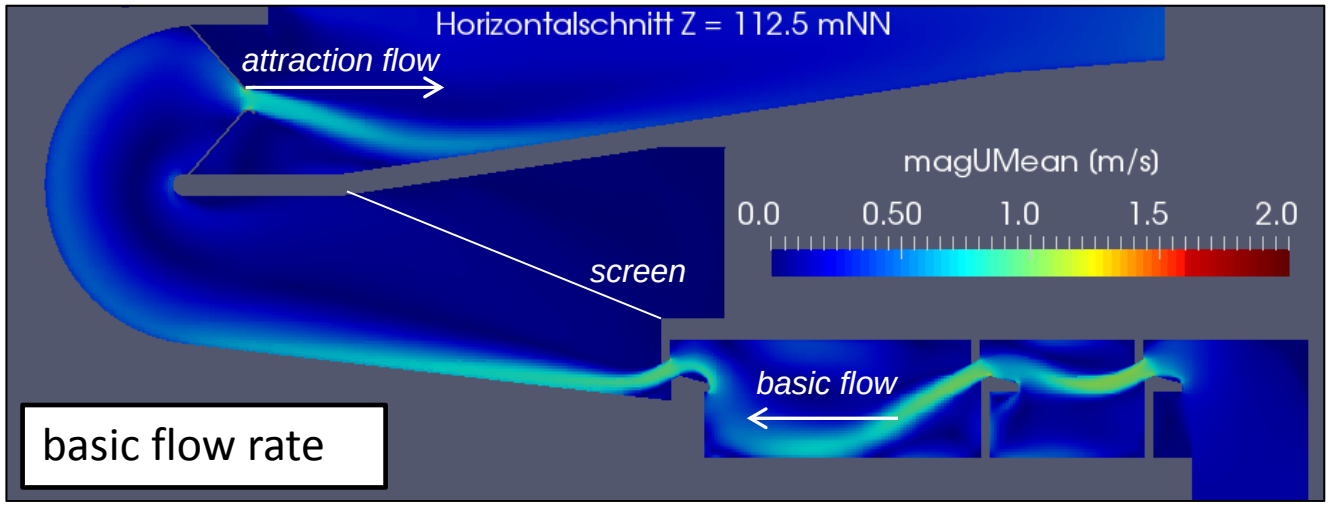
Gathering reliable fish data at pilot sites

IN: research question: Does scenario 1 or 2 lead to better attraction?

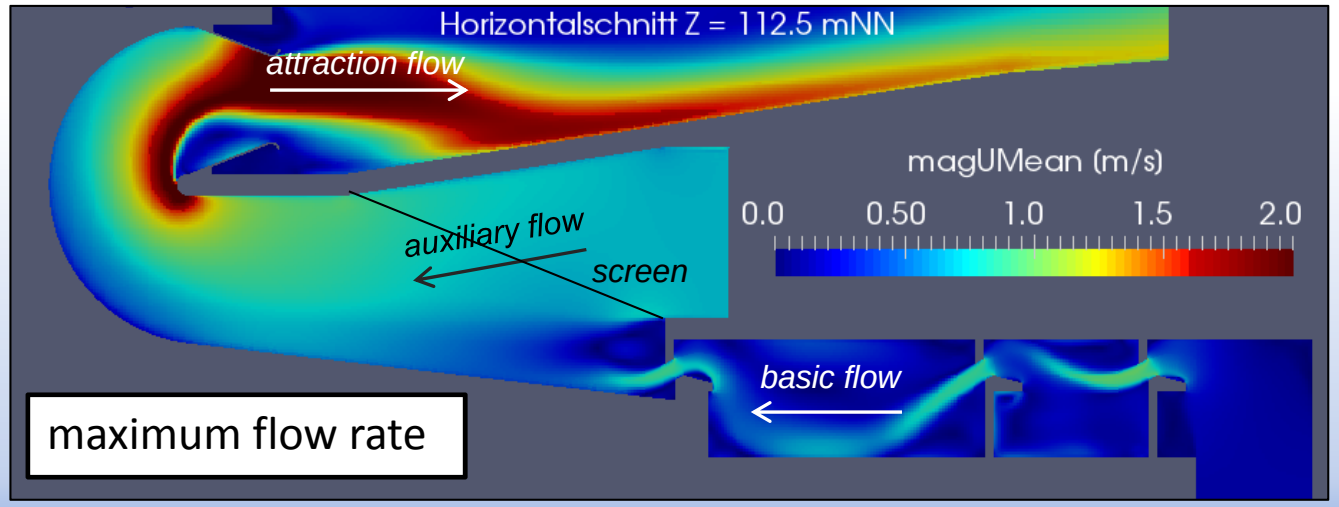


OUT: design recommendation for scenario 1 or 2

Challenge: variable entrance dimensions



flow rate: min. 0.7 m³/s
max. 6.0 m³/s
width: min. 0.45 m
max. 1.70 m
depth: ~ 2.00 m



Gathering reliable fish data at pilot sites

Challenge: best scenario has to attract all fish species and sizes

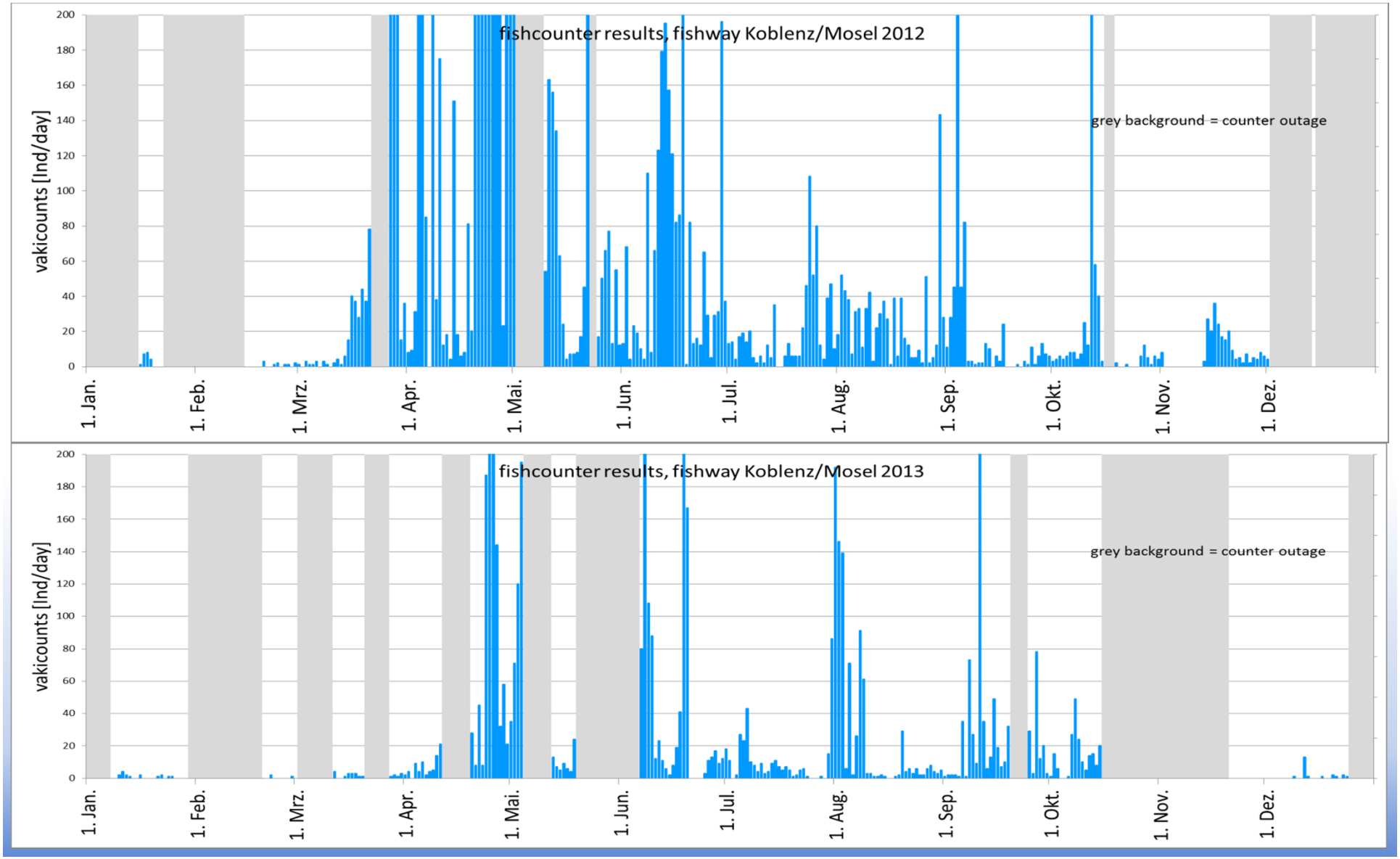
We need detailed information on

- number of fish
- species (around 30 at each site)
- sizes (length: ~ 0.03 to 3.00 m)

Pictures: © Bernd Stemmer, www.fischfauna-online.de

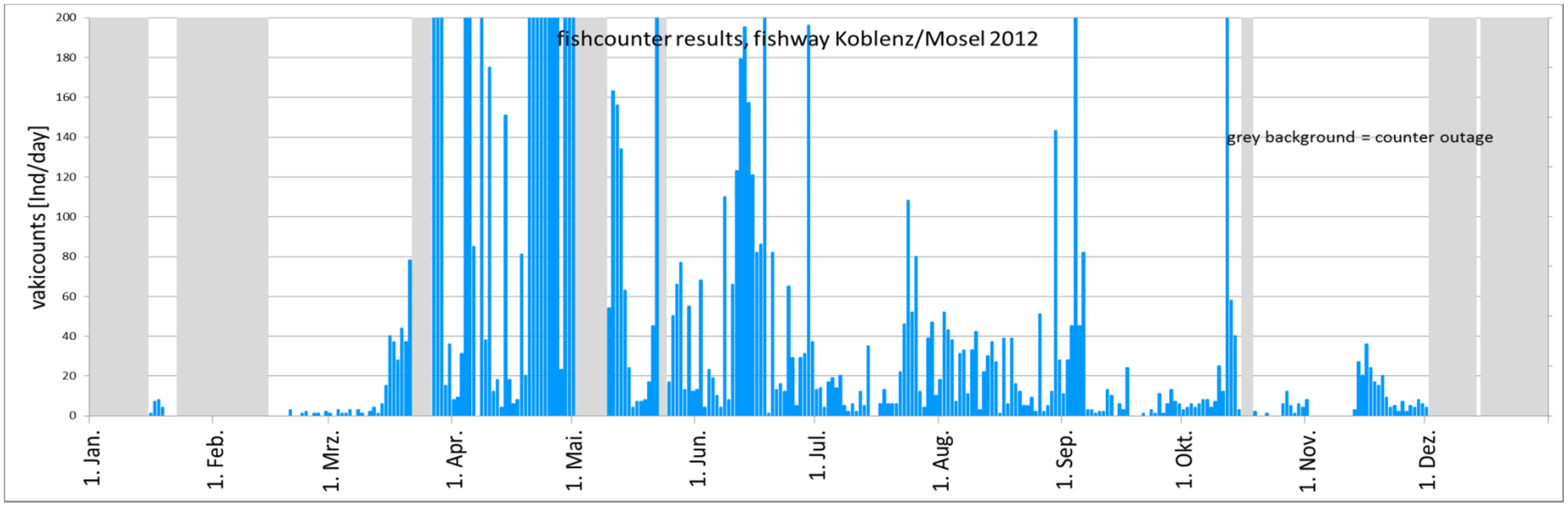
Gathering reliable fish data at pilot sites

Challenge: experimental approach = blocked design with daily change of scenarios



Gathering reliable fish data at pilot sites

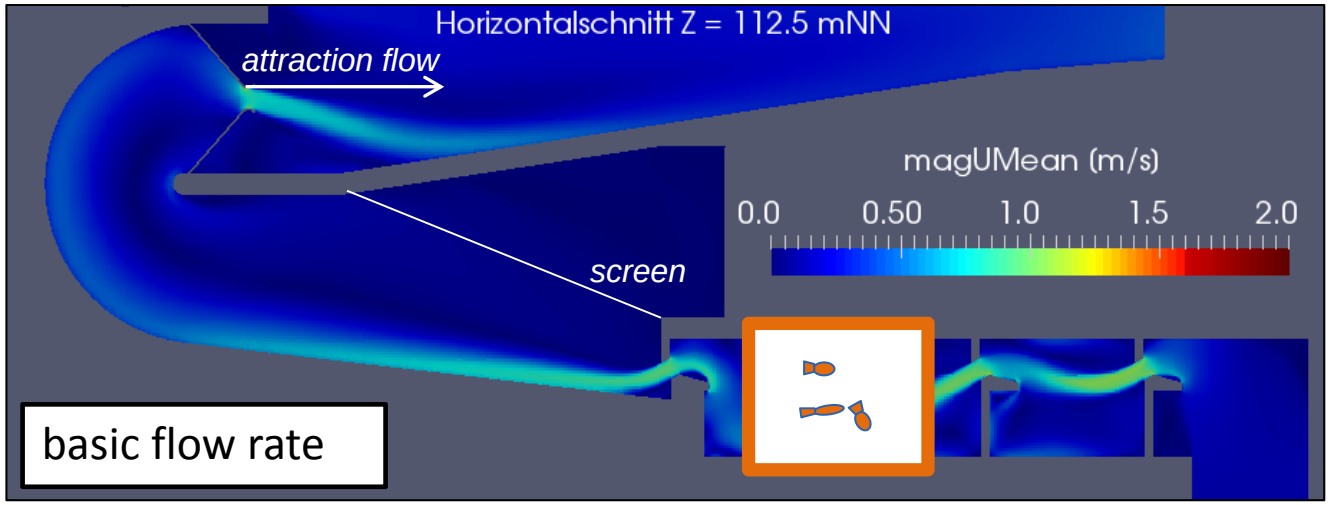
Challenge: experimental approach = blocked design with daily change of scenarios



Natural variability:

- variations between years: weather, discharge, good/bad reproduction, …
- variations between months: migration of different species, weather, discharge, …
- [variations between two days: flood events, turbine/weir operation, …]

Options?



flow rate: min. 0.7 m³/s
max. 6.0 m³/s
width: min. 0.45 m
max. 1.70 m
depth: ~ 2.00 m

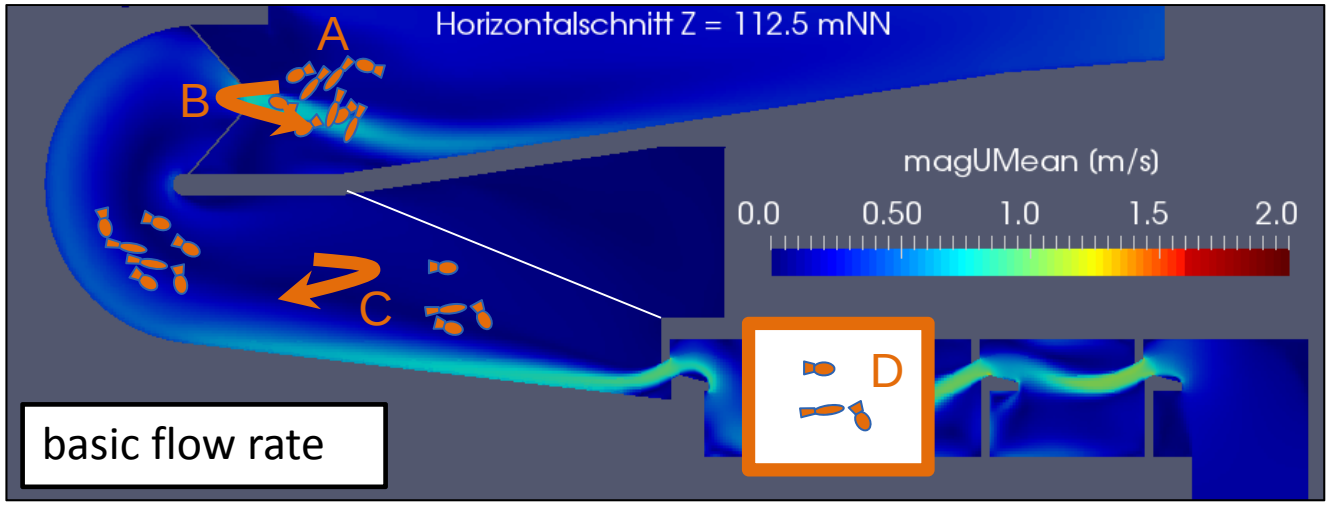
At the entrance:

- fish counter, fyke: alters hydraulic signal, forces fish to change swimming horizon
- cameras, IR, etc.: range of ~ 0.5 m (turbidity), no counts of fish passing in the middle of the entrance (depends on scenario); IR: insufficient information about species
- sonar: difficult because of turbulence from hpp
- pit tags: large effort (wild fish, all species), daily change of scenarios

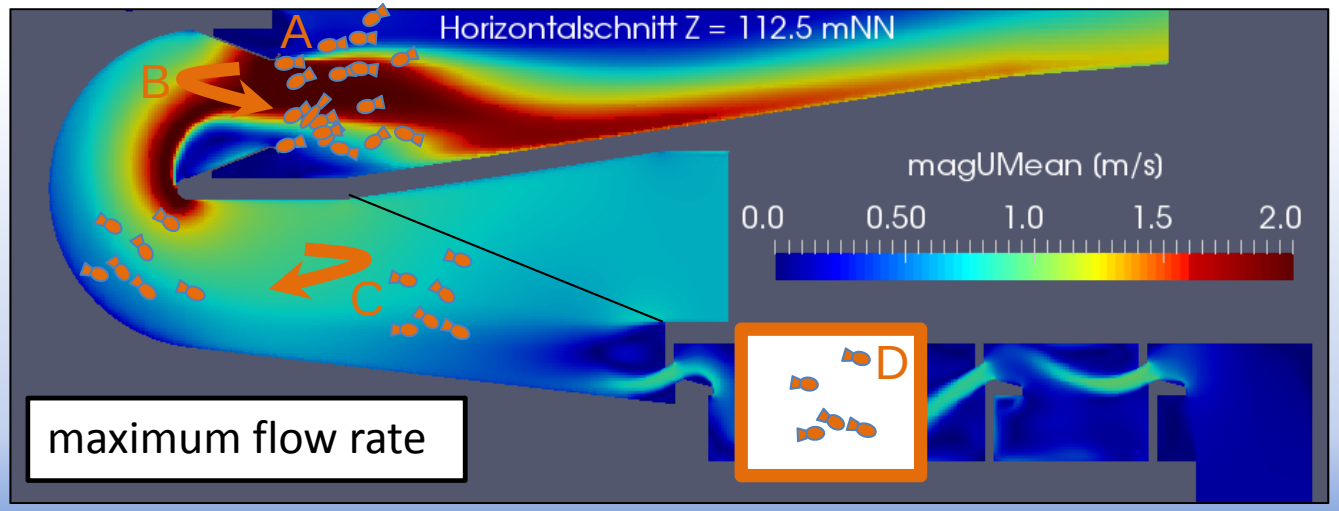
→ best possible option: fish counter upstream of entrance pool

Gathering reliable fish data at pilot sites

New challenges…

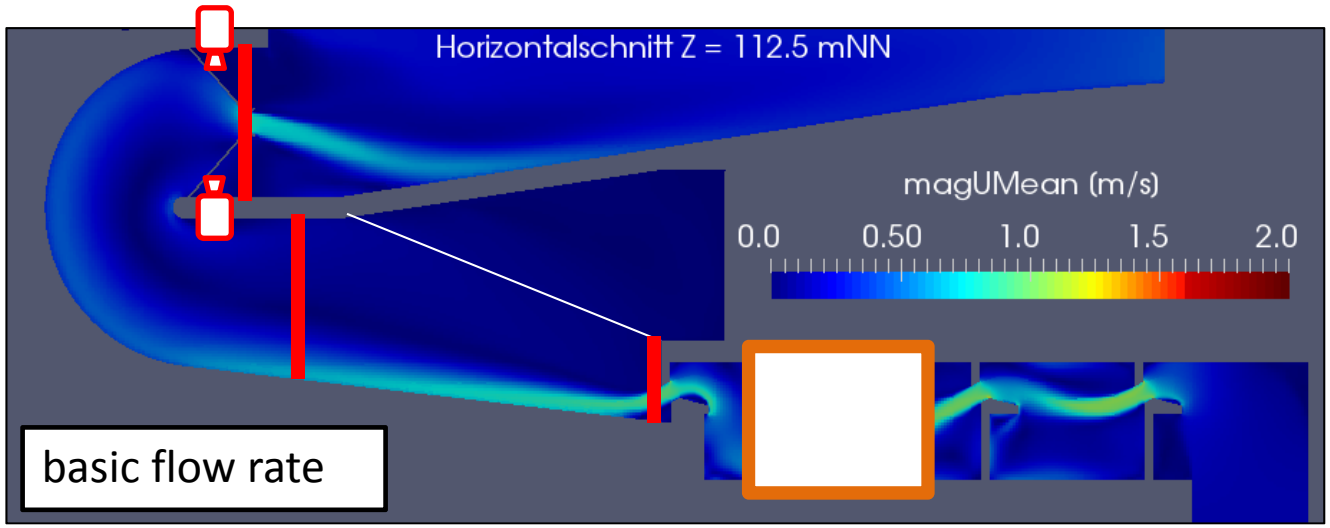


We want to count A
but we are counting:
A - B - C = D



…and not only A, but also B and C might not be independent from the tested scenario!

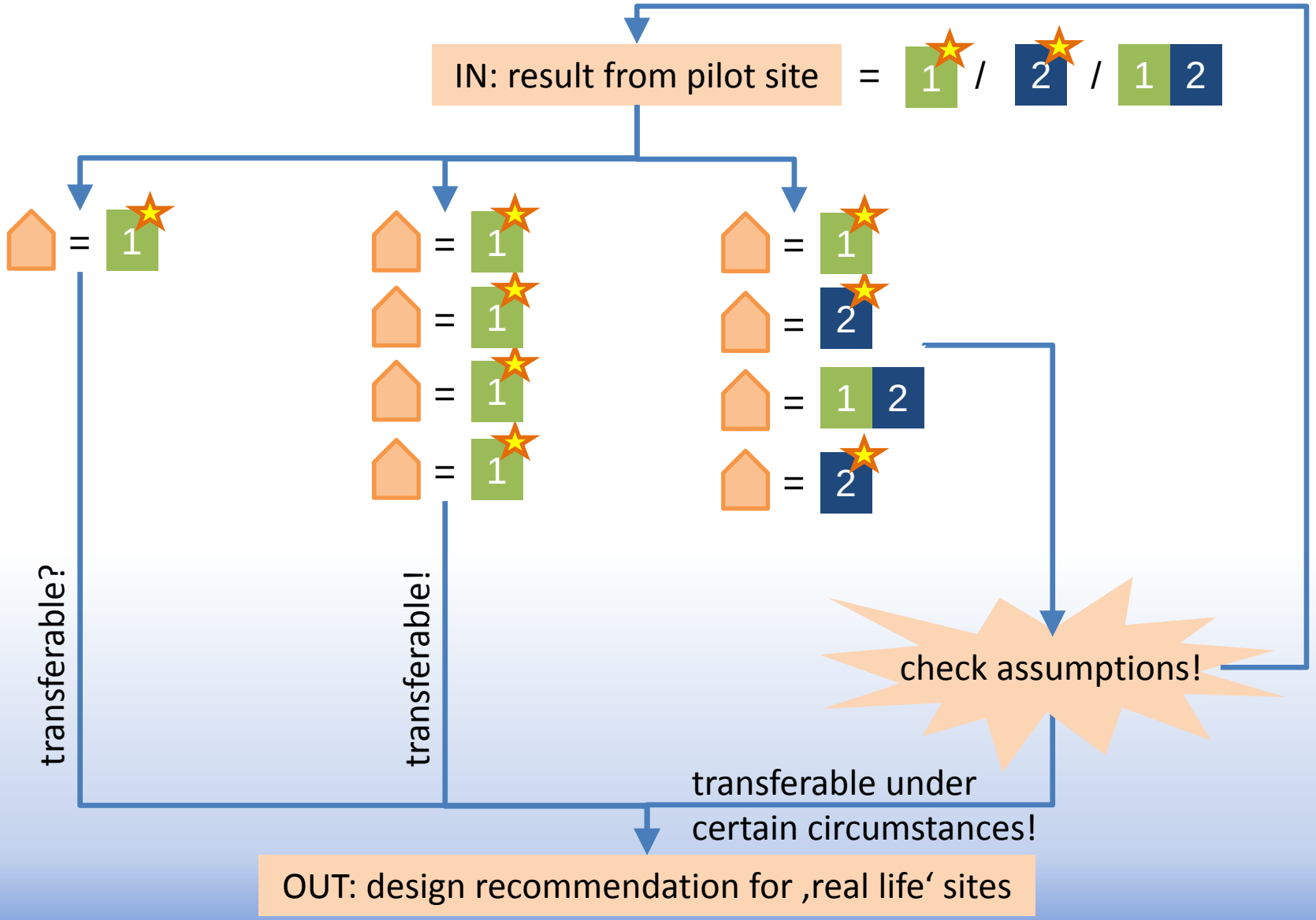
Solutions:



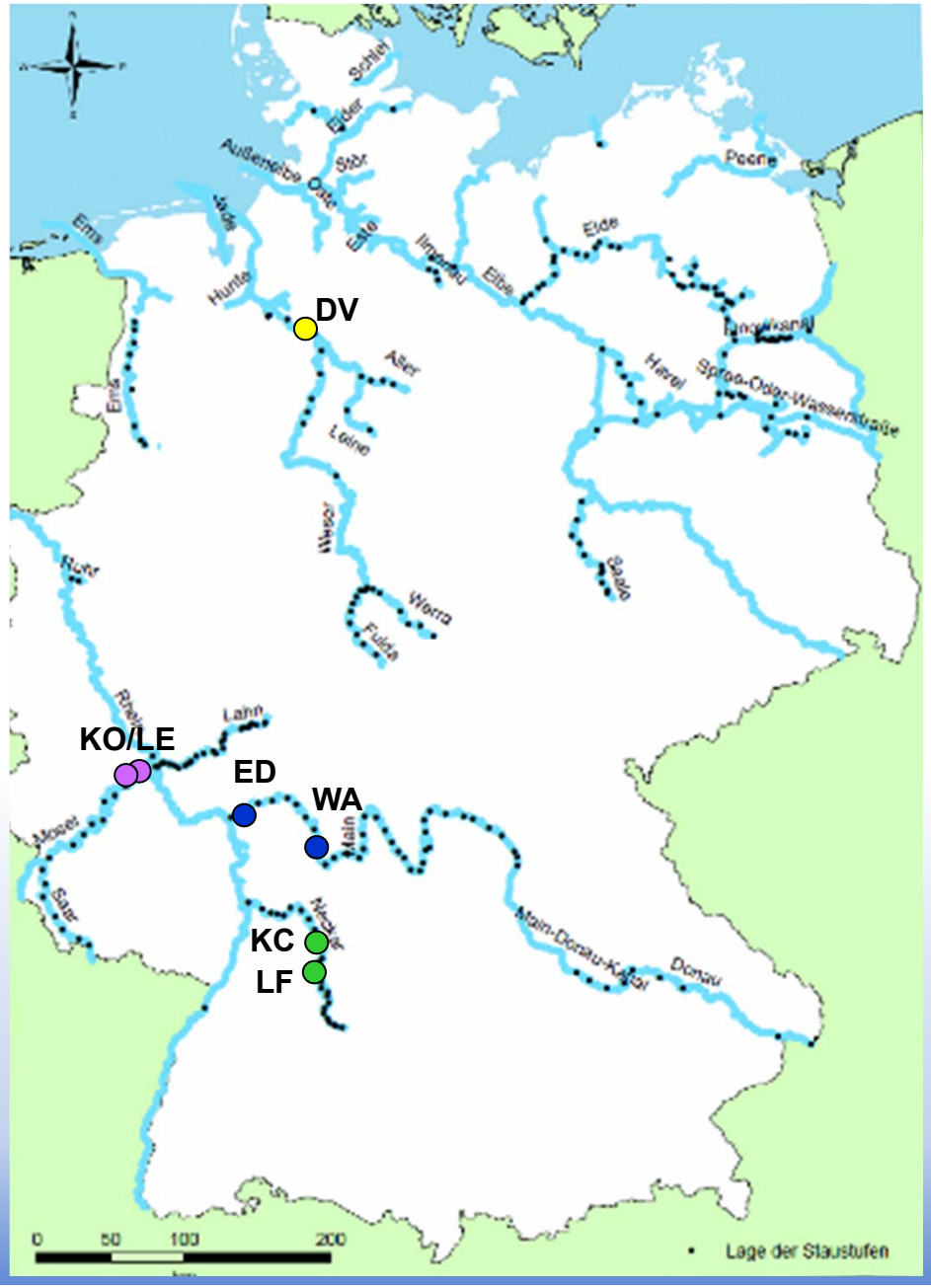
1 optimize passability (see previous talk)
2 quantify fish turning back by pit tags (HDX)
3 install video system at entrance (& maybe ARIS sonar)

→ quantification of counting error (for different scenarios)

Transferring results from pilot sites to ‘real life’ sites



Transferring results from pilot sites to ‘real life’ sites



Solution: more than one pilot site

- 7 pilot sites representing common layouts in German Federal Waterways
- 1 built, 6 in planning

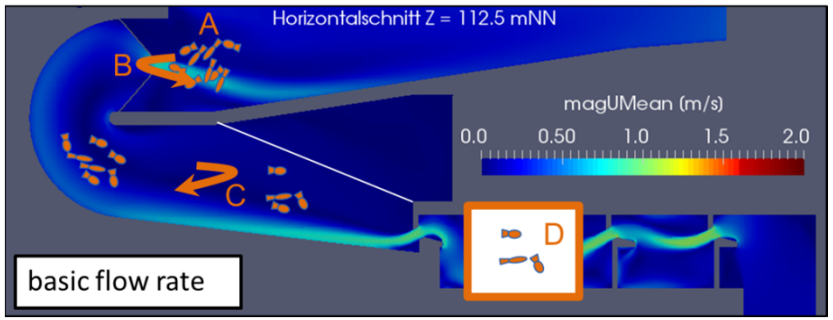
Transferring results from pilot sites to ‘real life’ sites

Solution: duplicate experiments at different pilot sites

		ED	WA	KB	LE	KC	LF	DV
Basic research	Question B1	X						X
	Question B2	X						
	Question B3	X						X
	Question B4			X				
	Question B5	X	X	X	X	X	X	X
Attraction	Question A1	X						X
	Question A2	X	X	X		X	X	X
	Question A3	X	X	X	X	X	X	X
	Question A4	X	X			X		X
	Question A5	X	X		X			X
Passability	Question P1	X						
	Question P2	X						
	Question P3	X		X				
	Question P4	X		X	X	X	X	X
	Question P5	X	X	X	X	X	X	X
Downstream passage	Question D1	X						X

Summary

1) Gathering reliable fish data at pilot sites



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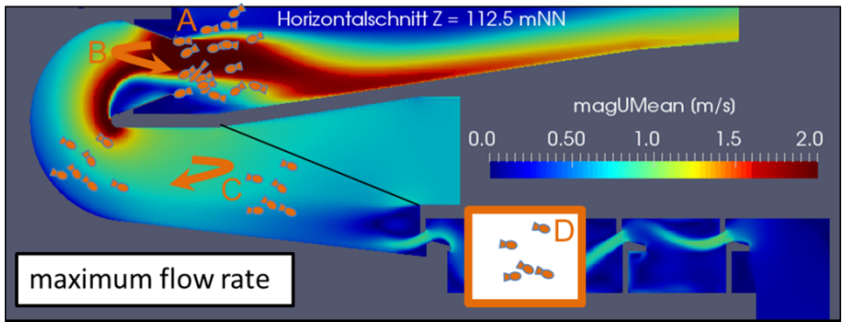
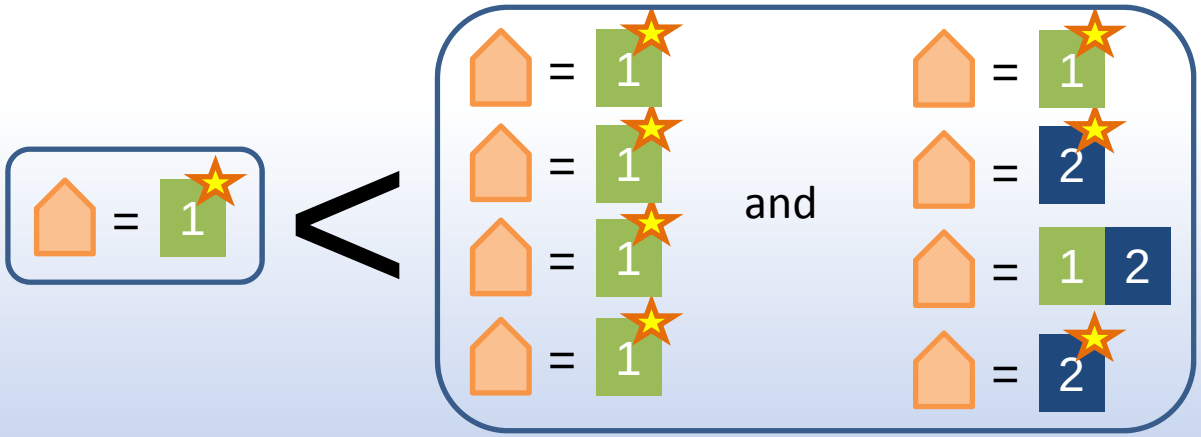


solution: optimize passability
quantify counting error (with several methods, for each scenario)

2) Transferring results from pilot sites to ‚real life' sites

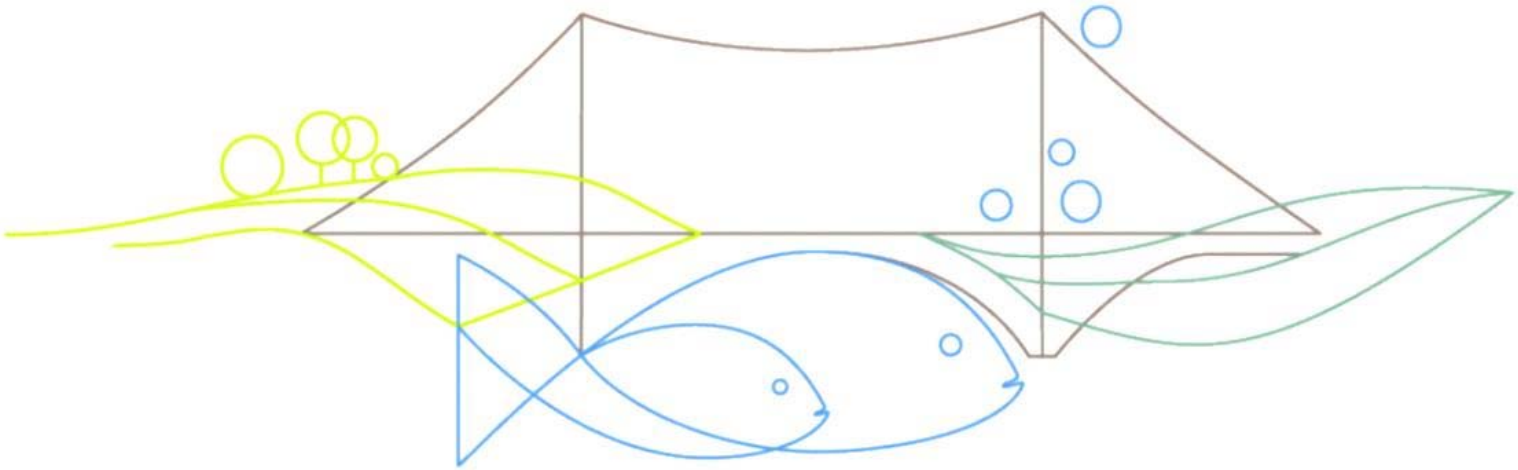


solution:

duplicate experiments at several pilot sites to transfer results with more certainty

<u>Are you encountering similar challenges? Are there other approaches/solutions?</u>

Thank you for your attention



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