



Global warming induced fish die-off in the Rhein 2018 and mitigation measures taken

Benefits of Dam Removal to Nature and People 06.05.2021



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Contents

- The grayling population on River Rhine
- Heat wave 2018 and mitigations measures taken
- What do we know?

River Rhein: Lake Constance to Schaffhausen

Home of a grayling population
of national and international importance



free flowing
damed

Until 2003 and maybe 2018:

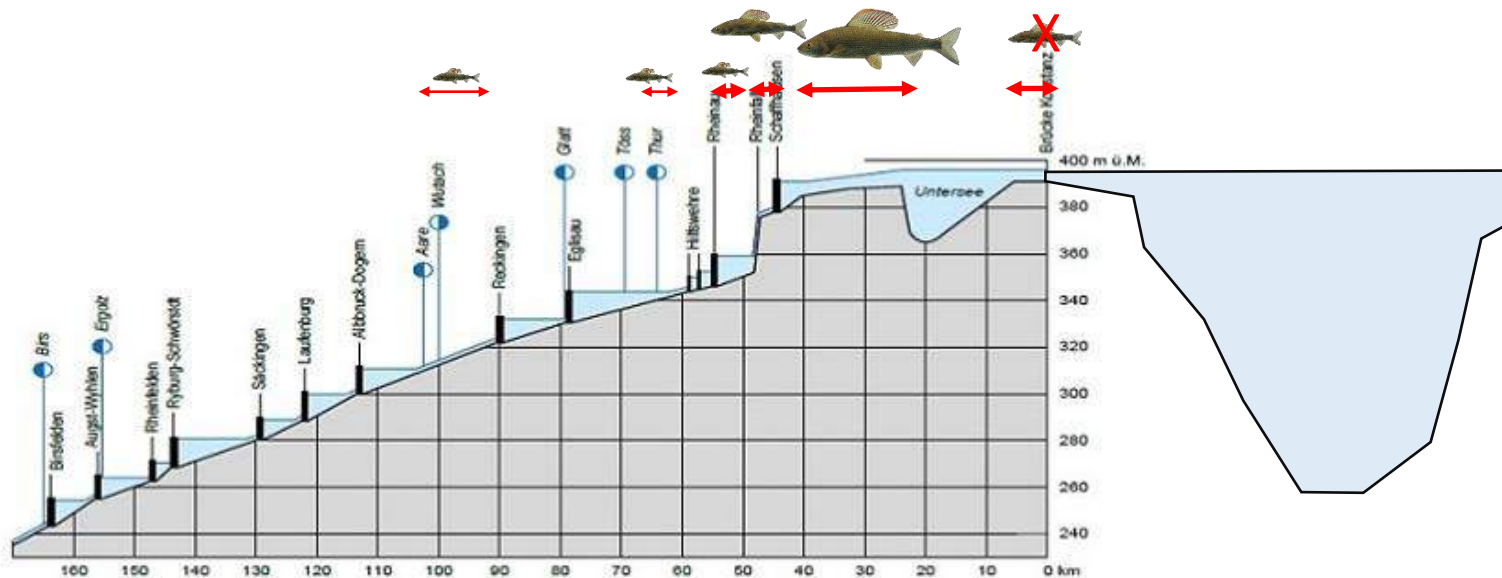
- One of the largest and most productive grayling stock in central Europe
- Fast growth
- Early maturity





The grayling in the River Rhine

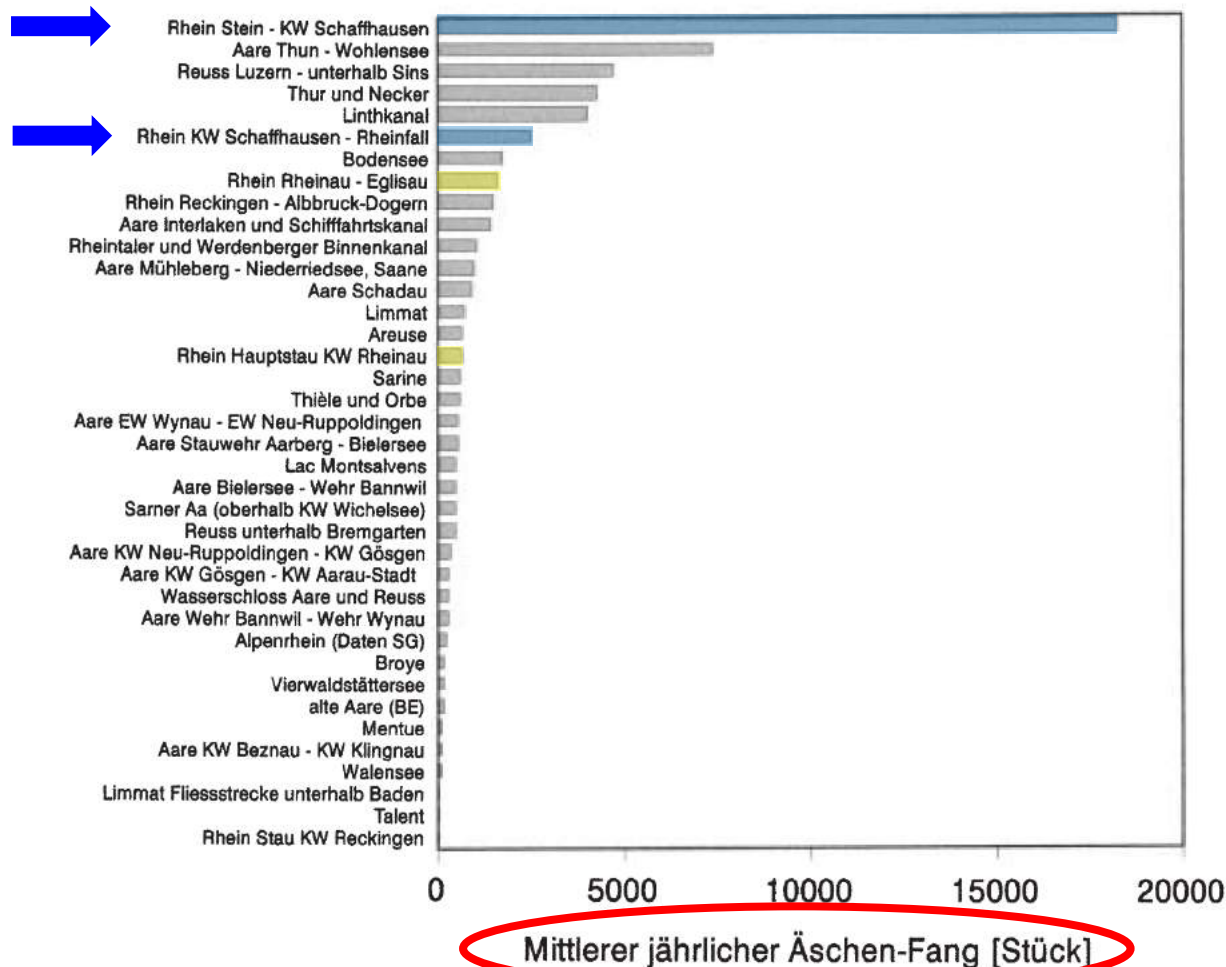
The grayling stock depends on free flowing rivers!





Graylingpopulations in Switzerland

Äschenpopulationen von nationaler Bedeutung (BAFU, 2002) ←



Average annual catch



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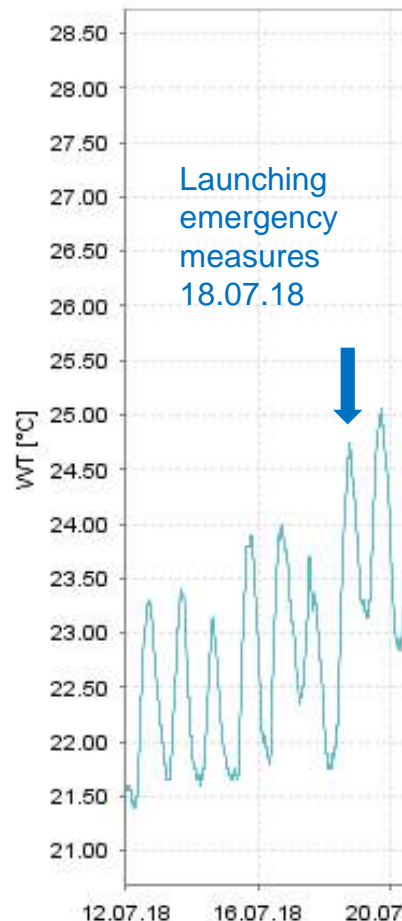
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Chronology of heat wave 2018

(based on the experiences
of heat wave in summer 2003)



Chronology River Rhein



Letzter Wert vom 20.08.18 09:00 2

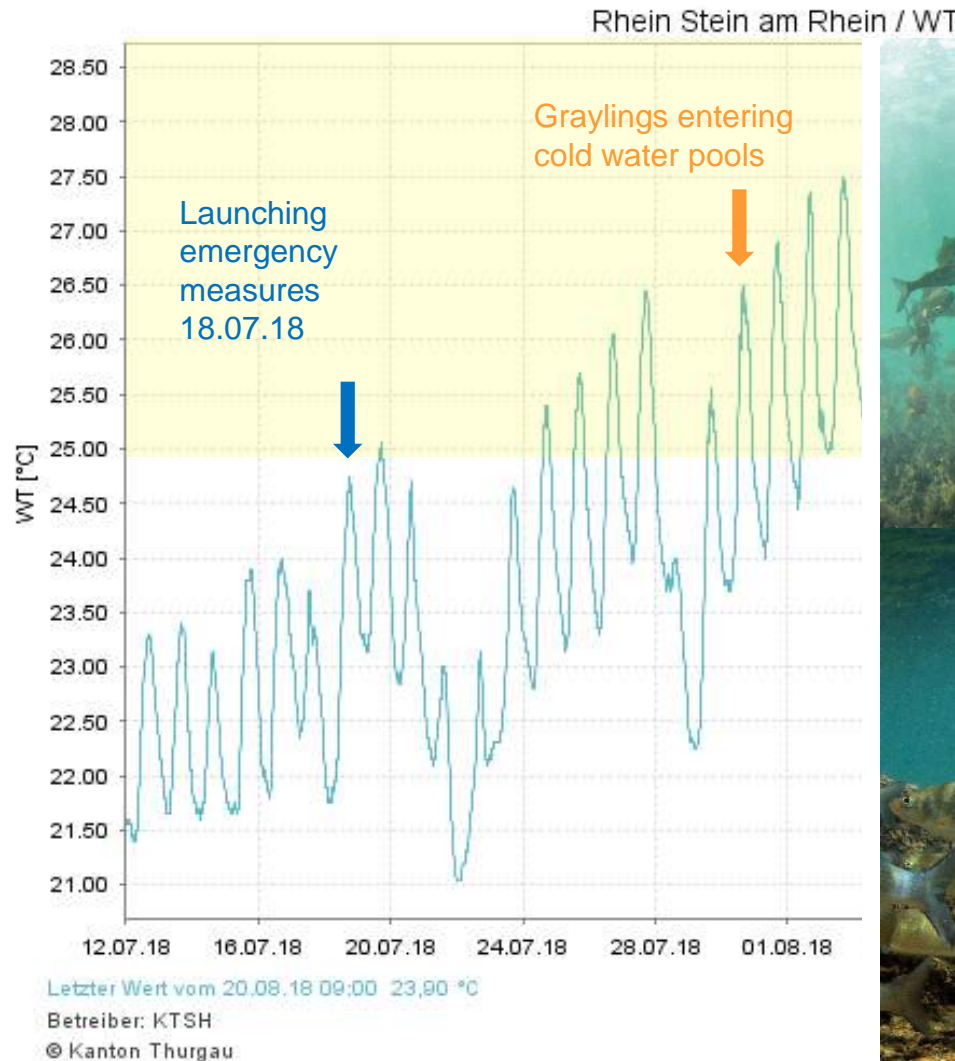
Betreiber: KTSH

© Kanton Thurgau



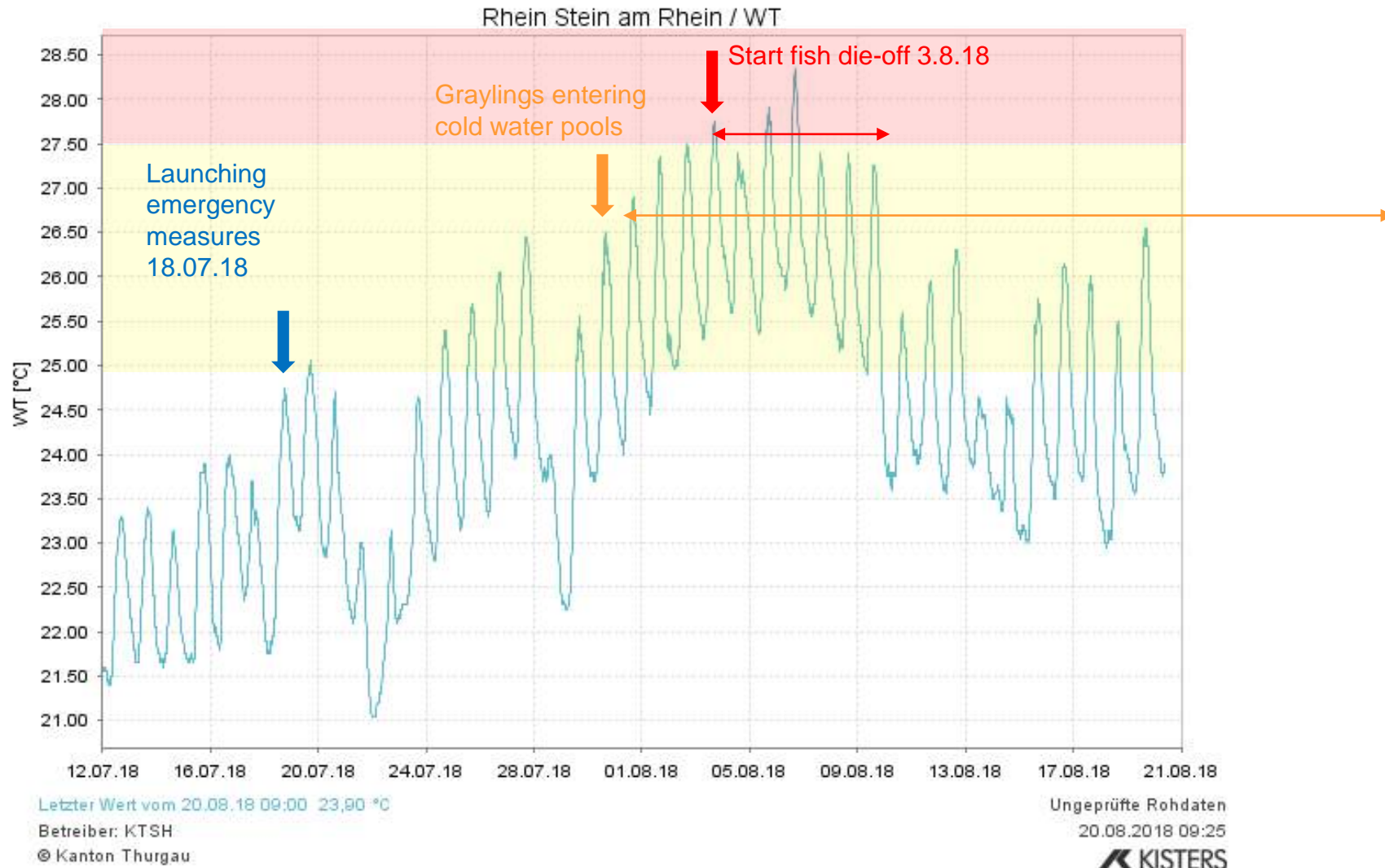


Chronology River Rhein





Chronology River Rhein









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The fishes choice on heat waves

Option for fish	Possible?	Experiences based on 2003	
Stay on your spot	Yes	Unlikly at water temperatures up to 28°C	
Migration to the lake	If possible	Probably, if cold and oxygenated water available. Migration back to the main river at high risk due to predation.	
Main river, looking for cold inlets	If available	Yes, but entering those mainly shallow spots with little shelter only short before die-off. High risk of predation, additional stress ect.	
Migration to tributaries	If possible	Yes, but strong species selection	



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Fish die-off





Fish die-off





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Fish die-off





Fish die-off



Heat wave:

2003

2018

Disposed fish

> 40'000 fish \approx 17 tons

> 10'000 fish \approx 3 tons

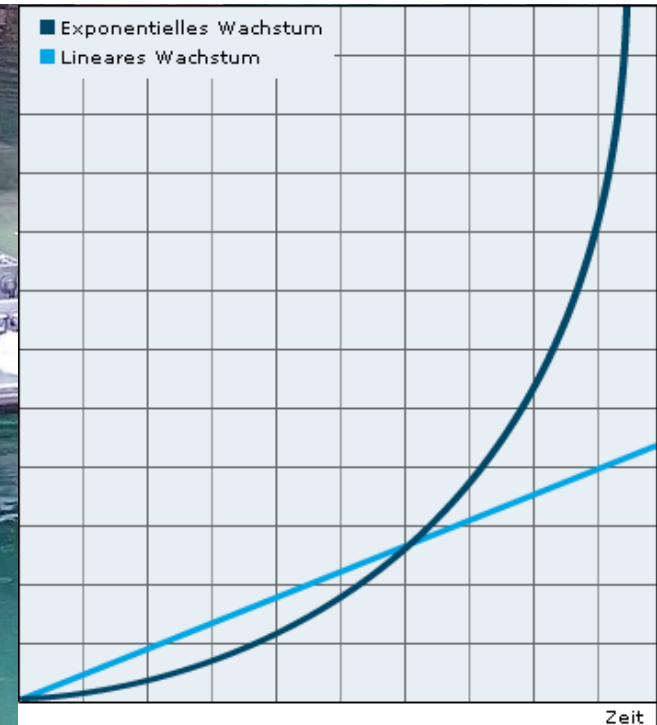
Fish composition:

> 95% grayling, mostly 2+

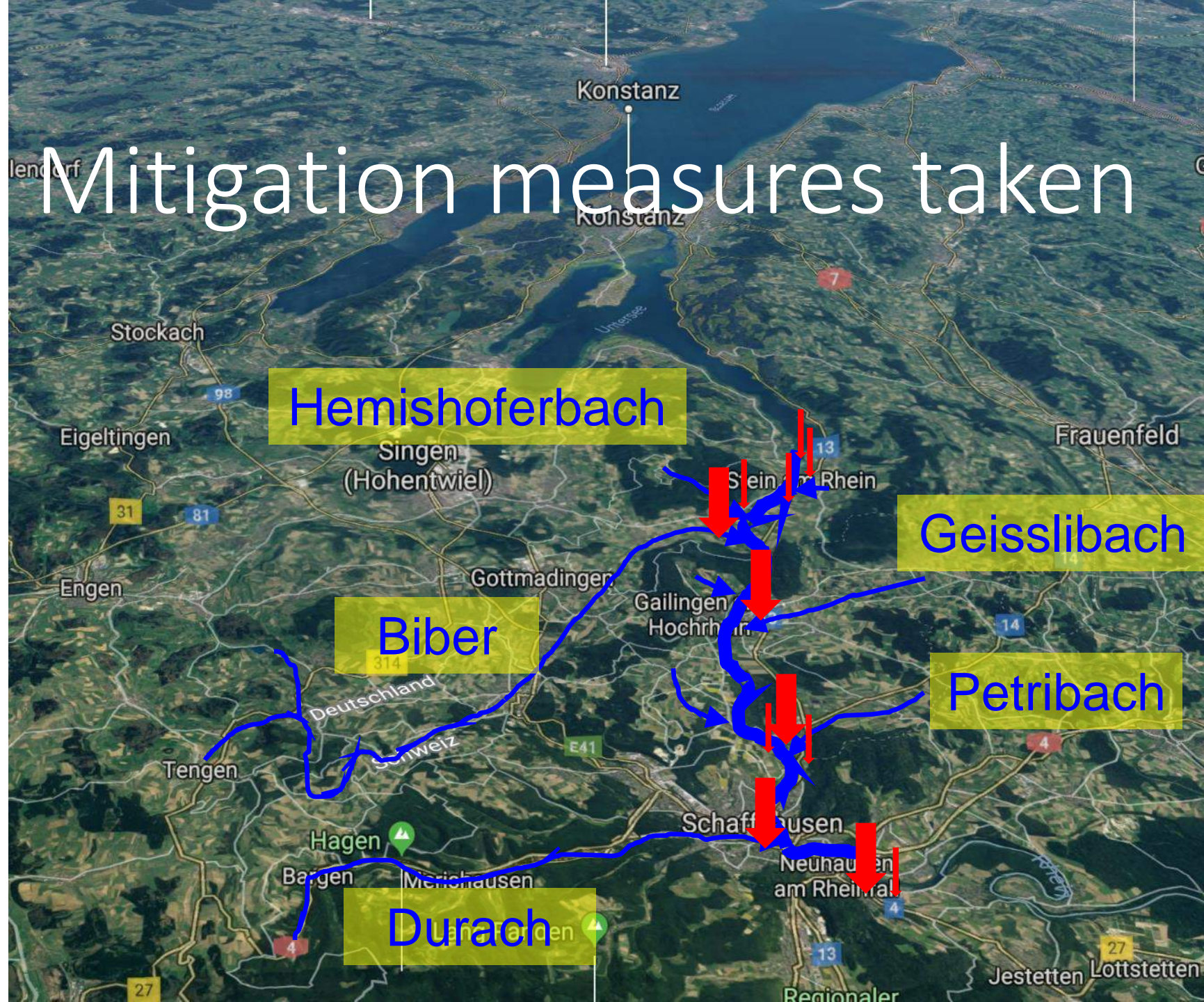
> 90% grayling, all age cohorts



Protecting fish - Basic concept for stock restoration



Mitigation measures taken





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Create publicity and awareness

Erholungszone für Fische

Der Rhein ist gegenwärtig für viele Fischarten zu warm.
Aber hier können sich die Fische erholen, weil sich in diesem Bereich kalte
Grundwasseraufstösse befinden.

**Bitte hier nicht baden
und tauchen!**



Danke für Ihre Rücksichtnahme



Bild: Michel Roggo



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Stream «Durach»





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Stream «Durach»



Patrick Vogel
fotografie

Stream «Durach»





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Artificial shelter on Stream «Geisslibach»





Measures at Stream «Biber»



Improving migration route



Measures at Stream «Biber»





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Measures at Stream «Biber»



Oxygenation

Measures at Stream «Biber»



Free migration
even at low
runoffs

Ca. 1200m

Video Monitoring

Ca. 400m

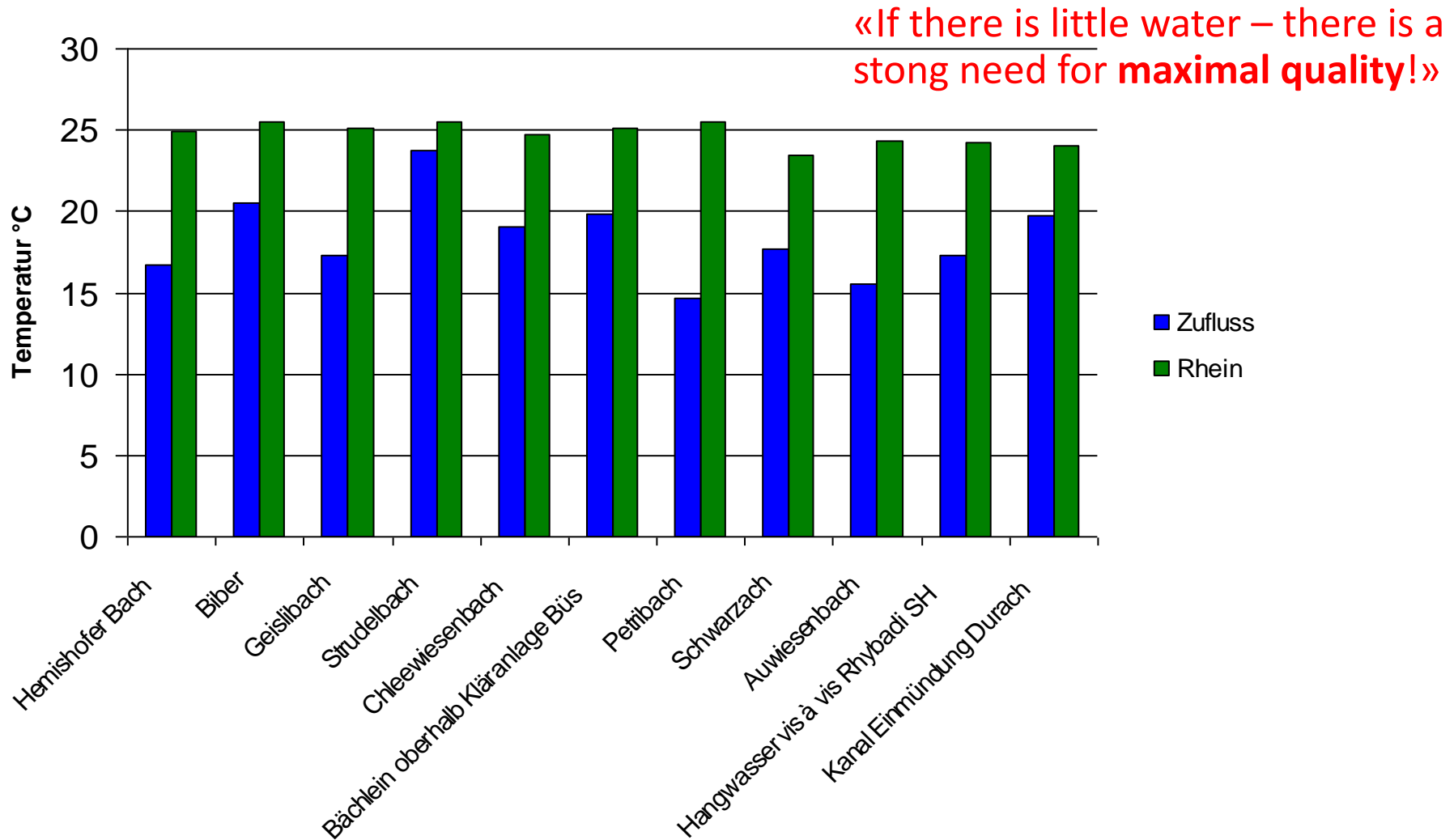
Water oxygenated

Free migration is worthless with poor water quality!



The importance of small streams

Wassertemperaturmessung am 20.08.2003





Don't forget the small(!) streams





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Don't forget the small(!) streams





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Don't forget the small(!) streams





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Don't forget the small(!) streams





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Evacuation – very last option



Petrus Vogel



Measures to improve fish survival

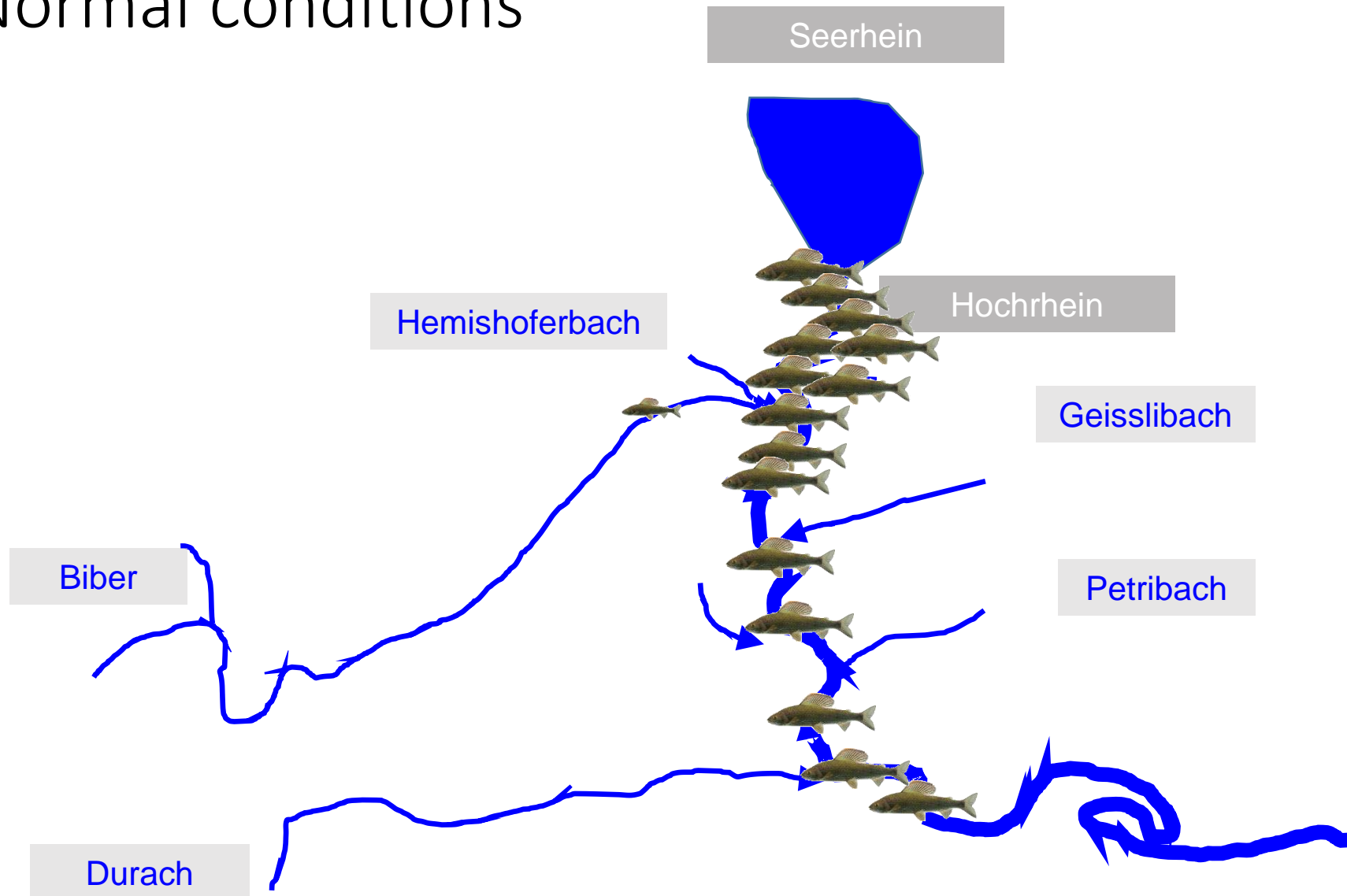
Measure	Aim	What to do?
Accumulate knowhow	Improving management	Taking measurement (temperature, oxygen saturation, rethink existing paths, documation
Publicity	Increase public awarness	Offensive communication! Media and infoboxes on the water
Guard sensitive areas	Reduce stress	Marking spots an block access to publicity (no swimming, diving, boating etc.) Additional manmade shadding to reduce predation / stress
Create artificial cold water areas	Optimal use of cold water	Avoid fast mixing of cold and warm water, man made large «holding pools» on inlets.
Improve migration routes	Allow access to tributaries	Short term: digging channels – i.e. during low water conditions / Long term: dam removals + improvement of water quality
Evacuation of warm water	Hope for survival	Relocate fish of spots with no or very little survival chance – the very, very last option



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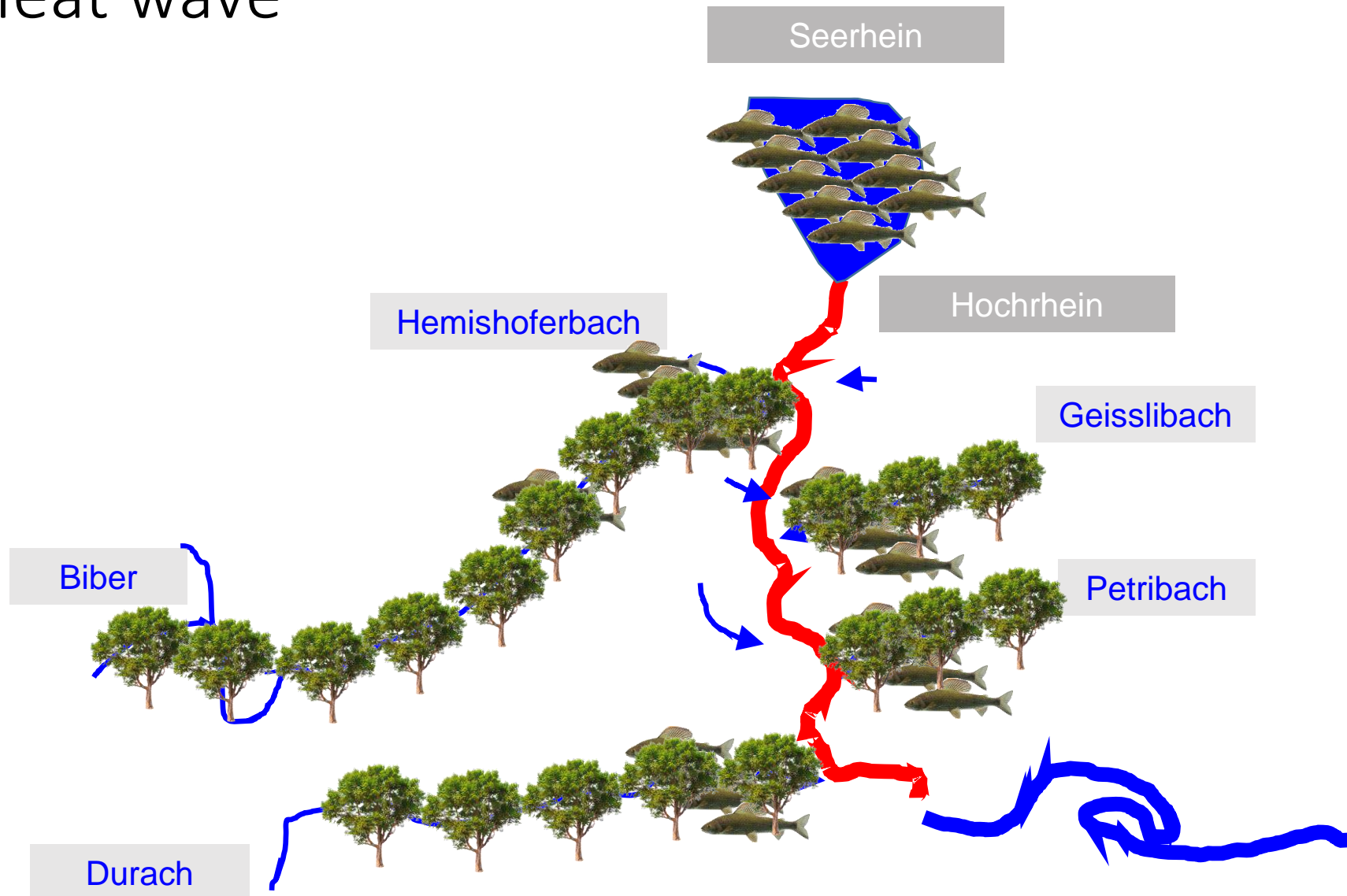
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Normal conditions





Heat wave

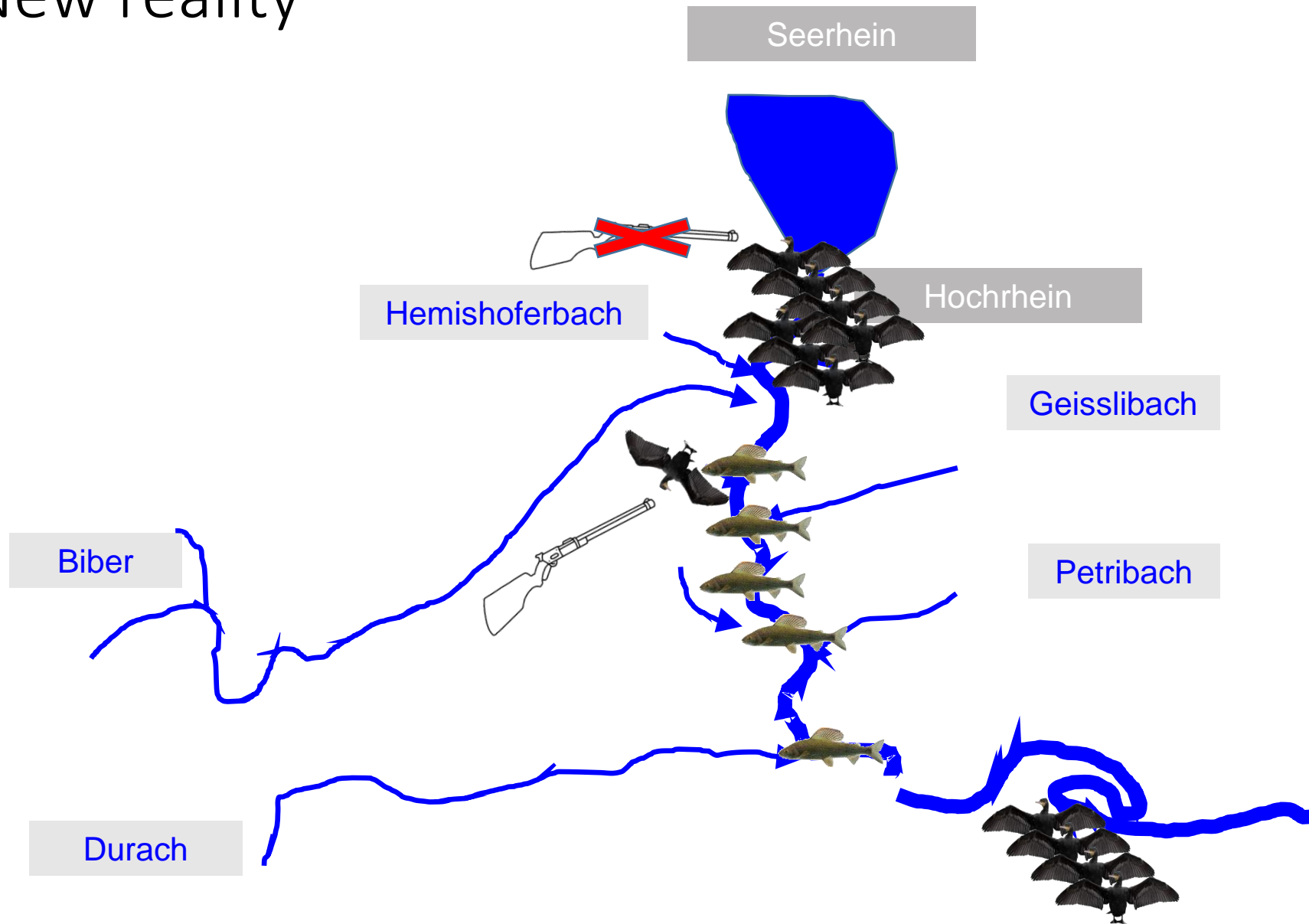




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New reality





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Conclusion

- Short term survival higher than 2003
- Long term survival and successful spawning unknown (bottle neck?)
- Importance of maximum protection to allow for recovery (predation)

Did we make difference???

Definitely in the people's mind, maybe even in the fish stock...



Grayling in cold spot



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Thank you for your attention!



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