

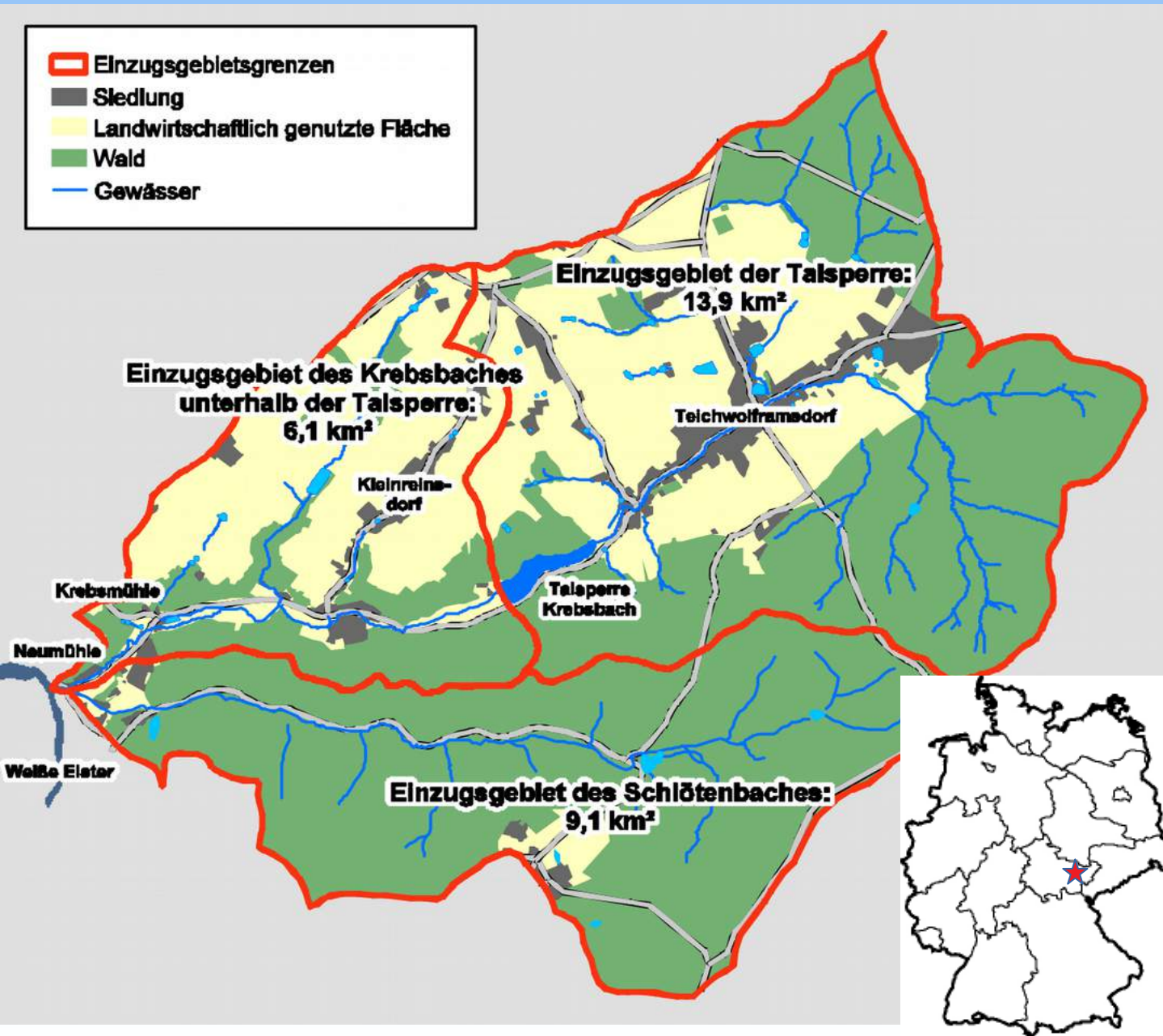
Lessons learned from the removal of the Krebsbach Dam in Germany



Dam Removal Goes Alps 2021, 06.05.2021
Ercan Ayboga

Introduction

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Situated in low mountain range (300 m altitude)

Rock embankment Dam

18,8 m high

Impoundment length: 700 m

Basin: 14,1 km²

Average flow: 0,089 m³/s

Reservoir capacity: 0,5 mio. m³

Krebsbach Dam constructed in 1964 for Uran processing.

Early problems: leak water and other structural deficiencies.

--> Sheet pilings driven in 1969

Purpose in 1985 abandoned.

Remained use: Flood protection and hobby fishing.

After 1990 stability problems continued and bottom outlet and spillway too small designed for big floods.

Estimated rehabilitation and operation costs were too high (cost-benefit analysis) and no new purpose could be developed.

Decision by operator “Thüringer Fernwasserversorgung” (public owned) for removal in 1997!

2001: Construction of new spillway due of stability reasons
--> decrease of water level

No experience in Germany --> Pilot character!

According to plan approval procedure hearing
in 2003 : 53 objections by stakeholders
--> Main concern: abolition of flood protection

EIA and “accompanying landscape
conservation plan” approved in 2005.

Removal costs: 1,2 Mio. € (planning costs 250.000 €) --> expansive!

Consider: At same time the last large German dam Leibis-Lichte
(100 m high, 500 Mio. €) has been constructed by same operator.
--> Krebsbach Dam Removal a kind of “compensation“?



Removal started in March 2007

Main Steps:

Sediment trap built directly downstream of dam.

Fishes and mussels relocated to other waters.

Emptying of reservoir

Widening of bottom outlet to a temporary floodway

Removal started at left side with a slide



Excavated material reused at left flank within impoundment

Sheet pilings pulled (20 m)

Removal of all operation equipment

Location of bottom outlet = location for passage of channel
= Construction of a bridge
over channel

Creation of a meandering
trapezoid profile in the valley

Biological compensation
measures





Situation after emptying reservoir, before the removal

Flood compensation measures in downstream stretches



Average height of sedimentation in reservoir: 30-35 cm

Limited contamination --> some upstream industrial agriculture

Conclusion of analysis: no special measure necessary, sediment can be released without intervention

Planning: Majority of sediments will be bounded by vegetation and sediment pool

Uniqueness of Krebsbach Dam Removal Project:

Preshaped channel (as meander) in the former impoundment!

Length: 1,4 km (length of impoundment: 700 m)

Without meander the creek would flow mainly on the right side of the impoundment

Reasons:

1) Raising flood concern in downstream stretches.

Existing buildings built after dam construction (60s - 80s).

2) Creation of a valuable wetland landscape through vegetation measures

--> Capacity to hold a 10 years flood (HQ10)!

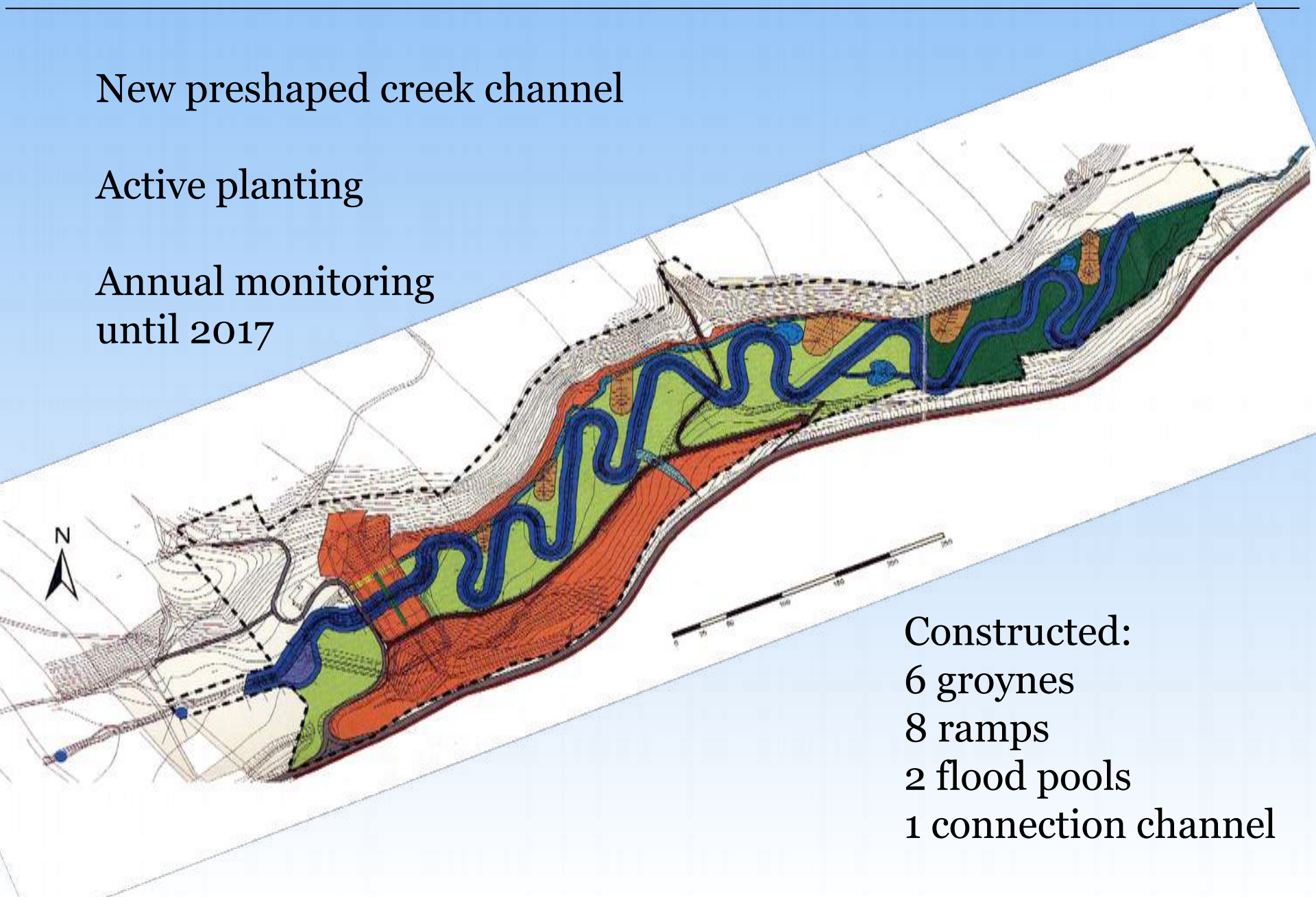
Impoundment consideration

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New preshaped creek channel

Active planting

Annual monitoring
until 2017



Constructed:
6 groynes
8 ramps
2 flood pools
1 connection channel

Impoundment consideration

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April 2008 – first spring after removal



Development after removal

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April 2008 – 1st image after
dam removal



Development after removal

July 2008

Vegetation grows quickly



Development after removal

October 2009 - Vegetation grows, but not in the planned way.





2010 Bio-Monitoring at five location
in the Krebsbach creek

- 1) More nettles (nitrate in the ground)
and Willows/Sallows than expected.
- 2) 22 species of Macrozoobenthos
determined (affected by waste water):
Small crab, odonata, mayfly, caddisfly
and other new flies
→ improved biocenosis



Findings on Krebsbach Dam Removal

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Repopulation of fishes started after 2007 from Weiße Elster and tributaries; except trout

Fishes have returned slowly
→ In 2010: 6 fish species

- Stone Loach (Bachschmerle), Eel and Stickleback (Stichling)
- Less abundance: Perch (Flussbarsch), Prussian Garo (Giebel)
- Only Downstream: Brown trout - 3 times more (2009) and river goby (Gründling)



March 2019 – View from upper left point
into former impoundment



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March 2019
A straight part and a following
ramp

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Creek in upper part of the former impoundment – surrounded by forest



Channel stretch in the upper part, partly disturbed by the flood in 2013

Findings on Krebsbach Dam Removal

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Sediment Pool – downstream of former dam location



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Flood Pool



Monitoring in 2017:

Due to two barriers further downstream and to low water quality the biocenosis improved lately; and this by:

- 1) Fish passage installation at upper downstream barrier (other one half passable)
- 2) Construction of a waste water treatment upstream
- 3) Two floods in 2011 and 2013

Predicted decrease of water quality in downstream stretches has not happened. Rather the self-cleaning capacity has upvalued the river classification!

Own observations in 2019:

- Although revegetation has not developed in the planned way, a certain valuable habitat has been created.
- Less nettles than in the first years after removal → less nitrate in the ground

Limited ecological development because of:

- 1) Trapezoid channel in the former impoundment
→ monotonous/uniform and not enough flat water areas
- 2) no natural substrate (alluvial clay instead of sand-gravel mix).
Upstream industrial agriculture - > no supply of sand+gravel
→ big package of gravel could have been deposited at upstream point
- 3) Downstream barriers (although fish passage). Consideration of whole stream is important.

Discussion and Conclusion:

Pre-shaped impoundment (particularly meander) was not necessary to improve the habitat in the impoundment and the whole creek after dam removal.

With much less money (+time) almost same ecological results could have been achieved. Even more dynamic creek!?

Protection from floods is very limited (MQ10), for big floods no benefit – other solutions could have been discussed for the few buildings in risk.

Observed: German unflexibility!

Only in case of increasing flood risk in downstream stretches (in old industrial areas) the Krebsbach case could be interesting.

2nd German Dam Removal Project

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2nd German Dam Removal Project

Untere Herbringhauser Dam , Wuppertal

2nd German Dam Removal Project

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- Constructed in 1922 by Wuppertal Municipality
- For drinking water – 18 m high
- Abandoned in beginning of 90s
- Serious security problems
- Removed without EIA in a short time!
→ „imminent danger“
- Slopes/Hangs have been maintained partly due to monument character



2nd German Dam Removal Project

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The river channel in the former impoundment has several small cross rows of stones → due to high slope and recreation reasons

200 m downstream is the Wupper River → no flood consideration



Since 90s in Germany several hundred weirs have been removed

However, recently positive development in Thuringia!

Only in Thuringia 5 more dams planned or discussed for removal:
The four dams Roth 1 (9,5 m high), Noßbach (11 m), Wechmar (11,7 m) and Haina (7 m) will be removed soon by Thüringer Fernwasserversorgung (TFW). Haina in 2021!
The dam Engerda (11,25 m) is discussed in detail for removal.
All are obsolete dams with no new purpose! Maintenance and rehabilitation costs are main drivers.

In next years around 30 more problematic dams could be considered for removal by FV and private operators.