Beaver – concept and action plan.

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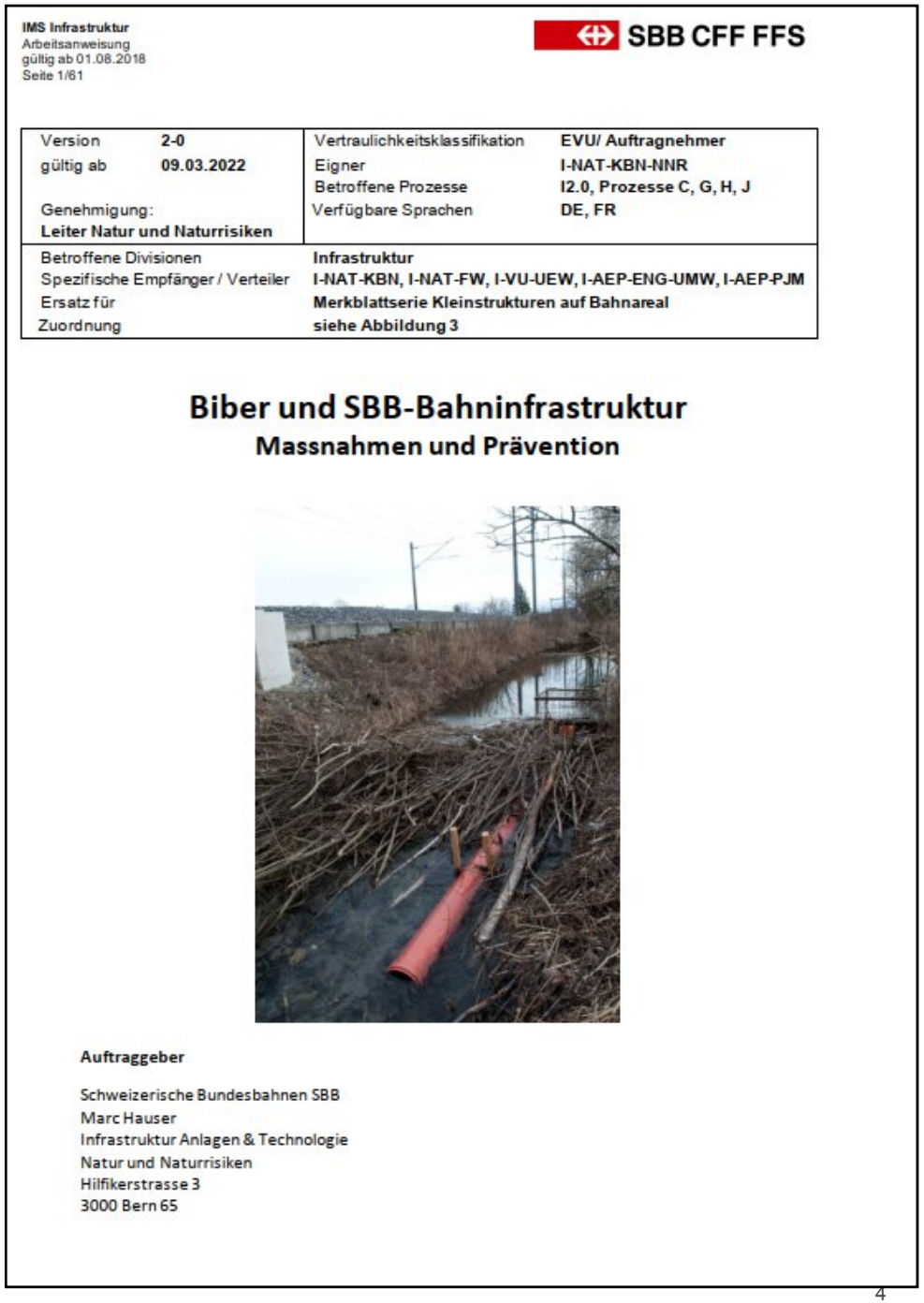
Background

Construction of dams by beavers and burrowing (also of badgers and foxes) can cause problems on the track and railway embankment.

Objective after an incident in 2013:

- To find a sustainable way of dealing with the beaver (no shooting - the next beaver is sure to come)
- Mandate to the National Beaver Consultancy at info fauna to
  - identify conflicts (felling of trees, burrowing, dam construction)
  - analysis of actual and potential conflict zones
  - develop a beaver action plan and preventive measures



IMS Infrastruktur
Arbeitsanweisung
gültig ab 01.08.2018
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Version	2-0	Vertraulichkeitsklassifikation	EVU/ Auftragnehmer
gültig ab	09.03.2022	Eigner	I-NAT-KBN-NNR
		Betroffene Prozesse	I2.0, Prozesse C, G, H, J
Genehmigung:		Verfügbare Sprachen	DE, FR
Leiter Natur und Naturrisiken			
Betroffene Divisionen		Infrastruktur	
Spezifische Empfänger / Verteiler		I-NAT-KBN, I-NAT-FW, I-VU-UEW, I-AEP-ENG-UMW, I-AEP-PJM	
Ersatz für		Merkblattserie Kleinstrukturen auf Bahnareal	
Zuordnung		siehe Abbildung 3	

Biber und SBB-Bahninfrastruktur
Massnahmen und Prävention

Auftraggeber

Schweizerische Bundesbahnen SBB
Marc Hauser
Infrastruktur Anlagen & Technologie
Natur und Naturrisiken
Hilfikerstrasse 3
3000 Bern 65

GIS analysis to identify potential conflict sites

Sensitive sites regarding <u>burrowing</u>:

- Parallel rivers at 15 m from the railway embankment (excluding of culverted rivers).
- Focus on dams with a slope gradient > 30 degrees.

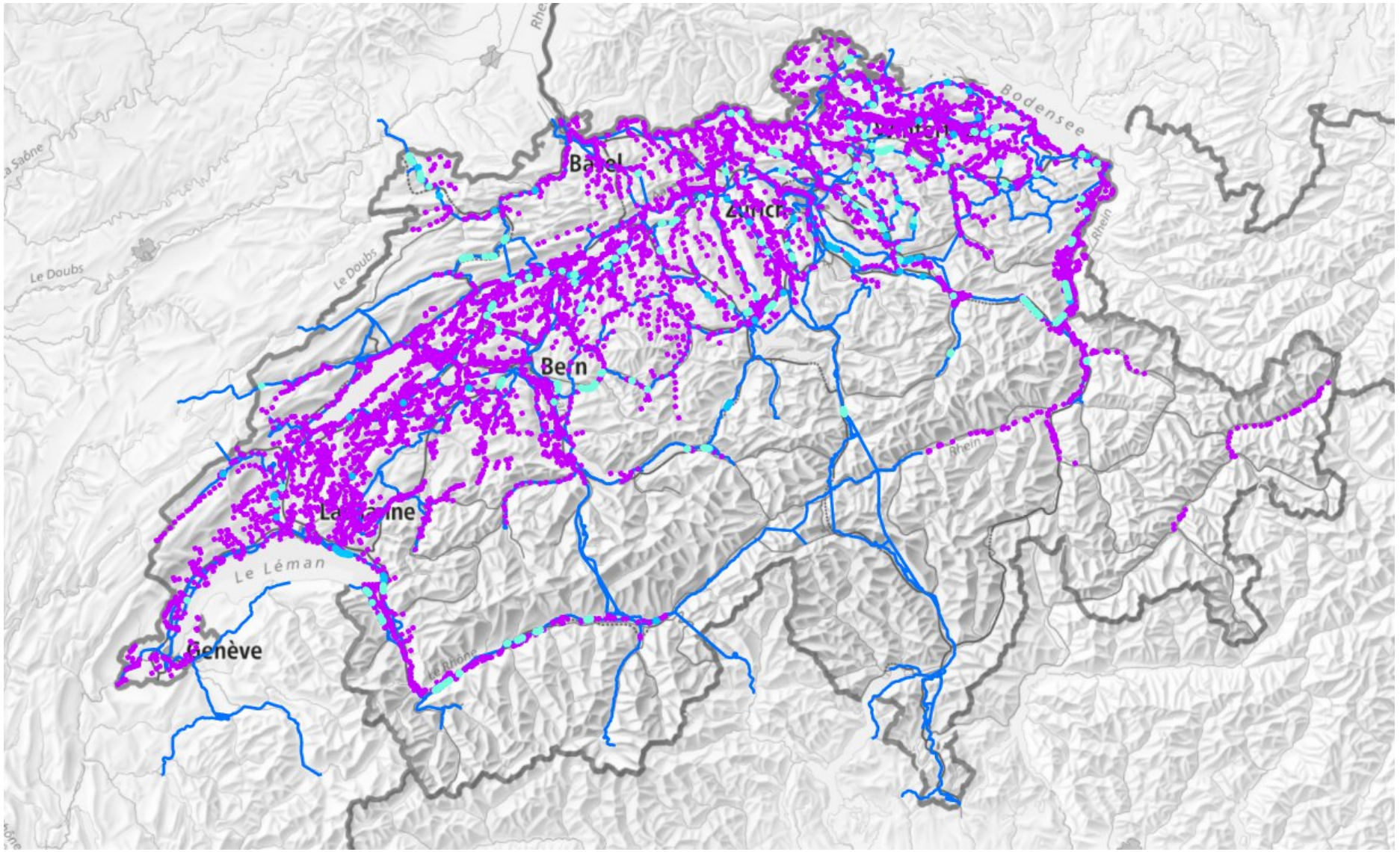
Sensitive sites regarding <u>dam construction</u>:

- Sections, where streams run parallel to the railway and where the upper edge of the track sleeper is less than 4 meters above the water level (2.5 safety distance and 1.5 m dam-height.
- Narrow culverts under railway embankments which can be plugged.

➢ On the entire SBB rail network, 284 sites along 120 streams can be classified as sensitive either to beaver burrowing or damming activities.

➢ Information on slope gradient is not available for all railway embankments

Beaver presence and potential conflict sites along SBB railway tracks



Beaver presence in 2022

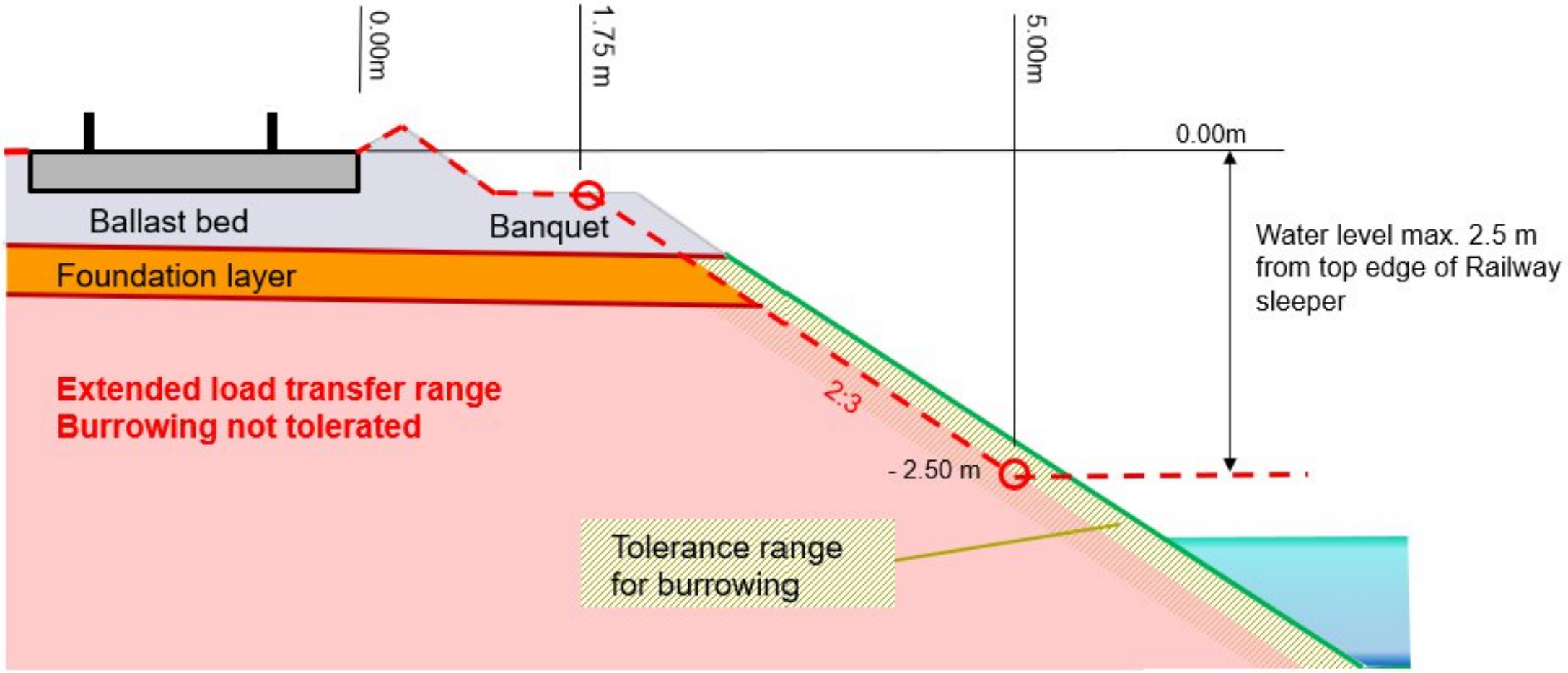
Potential conflict sites with beavers

No beaver present yet
in the Canton of Ticino (boarder to Italy)

Current situation

- 45 known sites with beavers and 27 with badgers.
- Not all cases are known or reported centrally.

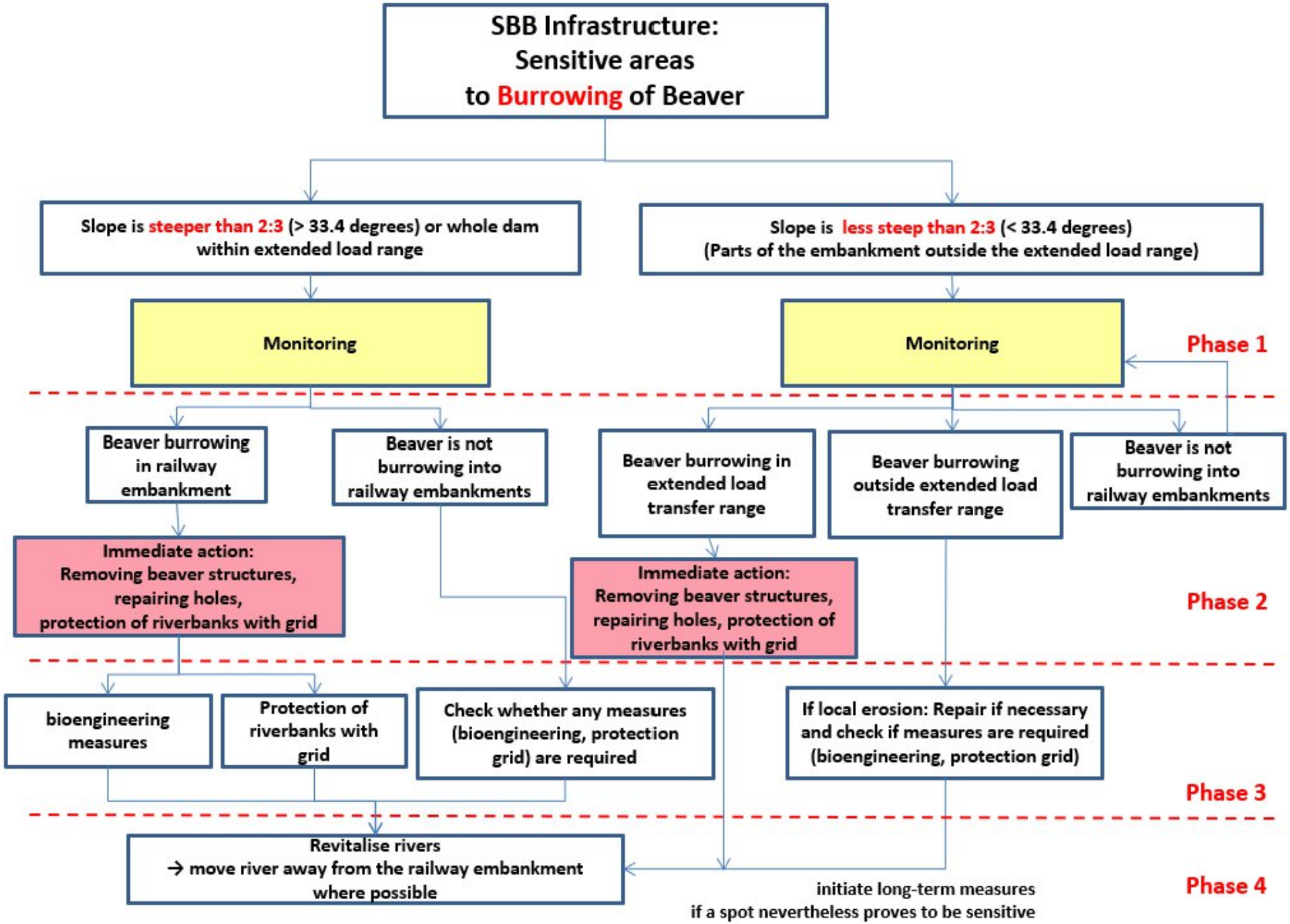
Limit values for animal structures: standard dam



Schematic showing the sphere of influence of beaver activities such as burrowing and construction of dams on the railway embankment infrastructure. There must be no beaver structures in the red area. The water level of waters dammed by beavers must not extend closer than 2.5 m to the upper edge of the sleeper.

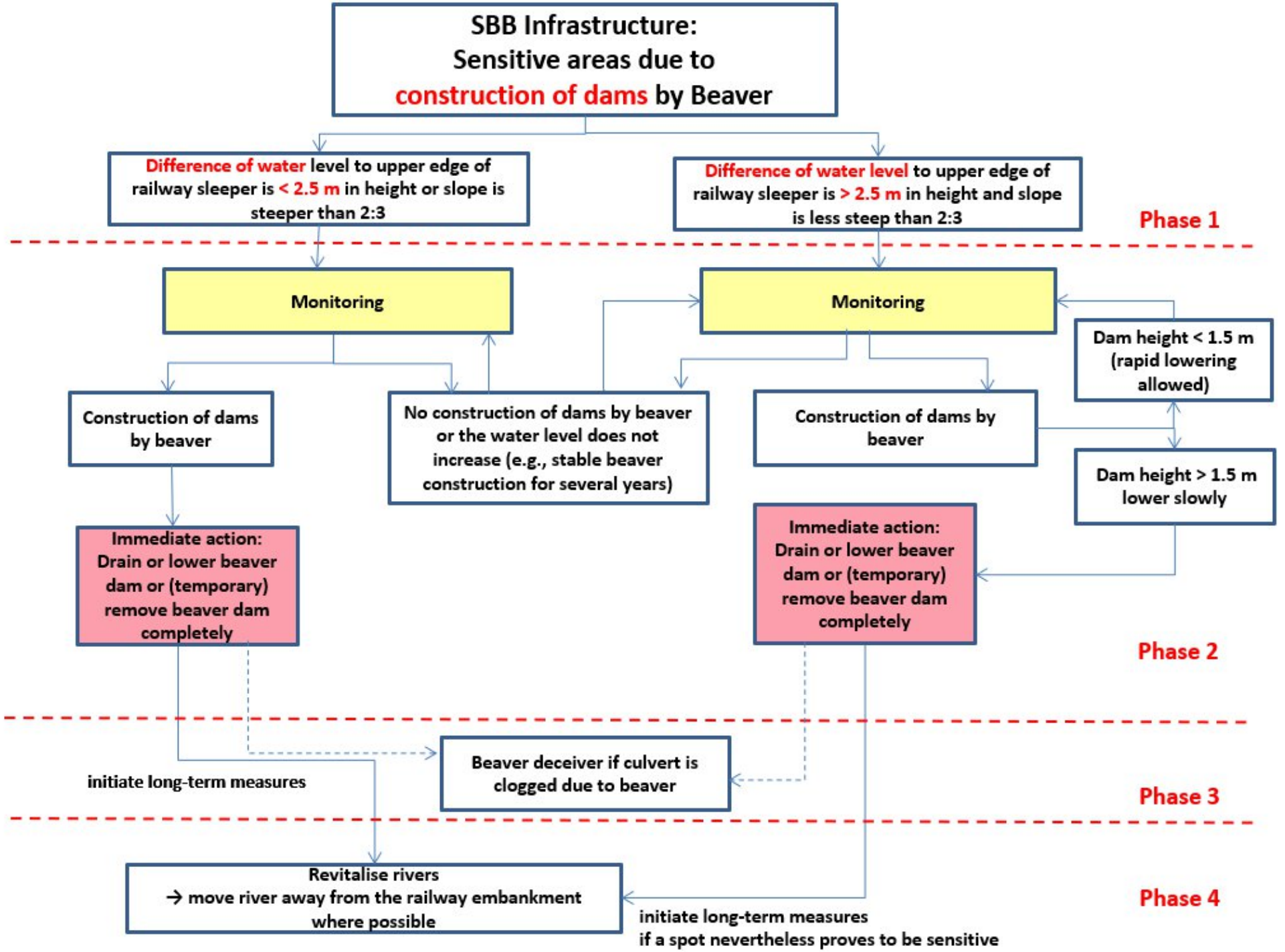
Prevention and measures

- Two different flow charts for burrowing or construction of dams, as different measures are required.


SBB Infrastructure:
Sensitive areas
to Burrowing of Beaver
Slope is steeper than 2:3 (> 33.4 degrees) or whole dam within extended load range
Slope is less steep than 2:3 (< 33.4 degrees)
(Parts of the embankment outside the extended load range)
Monitoring
Monitoring
Phase 1
Beaver burrowing in railway embankment
Beaver is not burrowing into railway embankments
Beaver burrowing in extended load transfer range
Beaver burrowing outside extended load transfer range
Beaver is not burrowing into railway embankments
Cantonal authorisation required!
Immediate action:
Removing beaver structures, repairing holes, protection of riverbanks with grid
Immediate action:
Removing beaver structures, repairing holes, protection of riverbanks with grid
Phase 2
bioengineering measures
Protection of riverbanks with grid
Check whether any measures (bioengineering, protection grid) are required
If local erosion: Repair if necessary and check if measures are required (bioengineering, protection grid)
Phase 3
Revitalise rivers
→ move river away from the railway embankment where possible
initiate long-term measures
if a spot nevertheless proves to be sensitive
Phase 4

SBB Infrastructure: Sensitive areas due to construction of dams by Beaver

Cantonal authorisation required!



Special case of stable earthworks and stable water level

If a stable earthwork is located next to a body of water with a water level that has been stable for several years and there is no risk of breaking of the beaver dam, then a difference of the water level to the upper edge of the railway sleeper of < 2.5 m is tolerable (seasonal variation included). The characteristics of the earthwork shall be checked. Monitoring is important.

Measures

Factsheet on technical measures for animal damage in earthworks

- Gitter auf die Böschung auflegen und 20 cm überdecken (optimale Lösung)
- Gitter senkrecht eingraben (in Etappen)

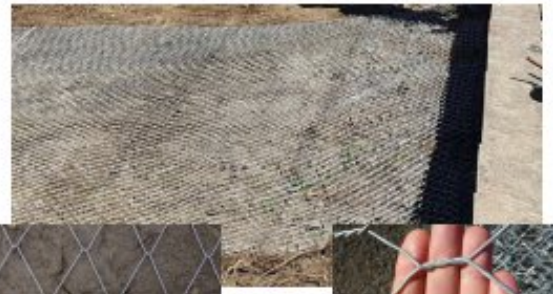
Fotos: Senkrechter Einbau von Grabschutzgittern. Wenn luftdicht abgeschlossen (vollständig im Erdreich), dann kein verzinktes Material nötig. (Quelle: Christof Angst, BFS.

Massnahmen beim Biber (eidg. geschützte Tierart):

- Massnahmen auf der Bach zugewandten Böschung ausführen.
- K196 Bewehrungsmatten (10x10 cm), wenn unter Wasserlinie und bei senkrechtem eingraben. Falls Bisamratten, dann zusätzlich ein Netz von 5x5 cm.

Massnahmen beim Dachs (jagdbare Tierart):

- Bahndamm durch Auffüllen der Hohlräume stabilisieren.
- Rückschnitt der Vegetation / Hecken prüfen (Absprache mit kant. Fachstelle, da Hecken gemäss Art. 18 Natur- und Heimatschutz geschützt sind).
- Gitter sind allenfalls beidseitig der Bahnböschung einzugraben.
- Betonitmatten einlegen, wenn Entwässerung kein Problem ist (ermöglicht kein Durchgraben mehr).
- Einzelfallweise das Schadenausmass prüfen und sich auf Basis einer Kosten-Nutzen-Analyse für eine technische Massnahme entscheiden. Andernfalls das Tier durch die kantonale Jagdverwaltung abschiessen lassen und den Standort überwachen.



Fotos: Diagonalgeflecht resp. Steinschlagnetz auf die Böschung auflegen und mit ca. 20 cm Erdmaterial überschütten. Maschenweite 65 mm bei Biber und Dachsen sowie 50 mm bei Bisamratten. (Quelle Fotos: Christof Angst, BFS und SBB Infrastruktur).

Vorgängig eine Meldung an kantonale Jagdverwaltung

- Alle Hohlräume der Biber- oder Dachsbaue im erweiterten Lastabtragbereich mit Sickerbeton gemäss FB 400-0060 zufüllen (Sondierung mittels Videokamera)
- Drainage-Rohre in Biberdamm einlegen
- « Beaver Deceiver » vor Durchlass
- Durchlass vergrössern
- Kunstbau an geeigneter Stelle ausserhalb Bahndamm errichten
- Revitalisierung, falls obengenannte Massnahmen keine Wirkung zeigen

Foto links: « Beaver Deceiver », Pilot in Oberstammheim (Quelle: Christof Angst, BFS). Foto rechts: Kunstbau aus Holz, der an einem lokal geeigneten Standort ausserhalb des Bahndammes erstellt werden soll. (Quelle: Martin Schmid, Jagdinspektorat Kt. Bern)

Kosten pro Laufmeter (Erfahrungen aus Deutschland)

• Senkrechtes Eingraben von Gittern	**CHF 50 - 120**
• Auflegen von Gittern	**CHF 50 - 120**

Erfahrung SBB: Auflegen von 3 m breiten Gittern beidseitig der Bahn (Ausführung, inkl. Sicherheit) **CHF 50 - 60 pro m²**

Kosten

• Auffüllen von Tierbauen (SBB)	**CHF 15'000 - 30'000 pro Einsatz**
• Drainagerohr einlegen (BFS)	**CHF 400 - 800**
• Beaver Deceiver errichten (SBB)	**CHF 65'000 - 70'000**
• Durchlass vergrössern (BFS)	**CHF 15'000 pro m²**
• Kunstbau erstellen (BFS)	**CHF 10'000 - 25'000 pro Bau**

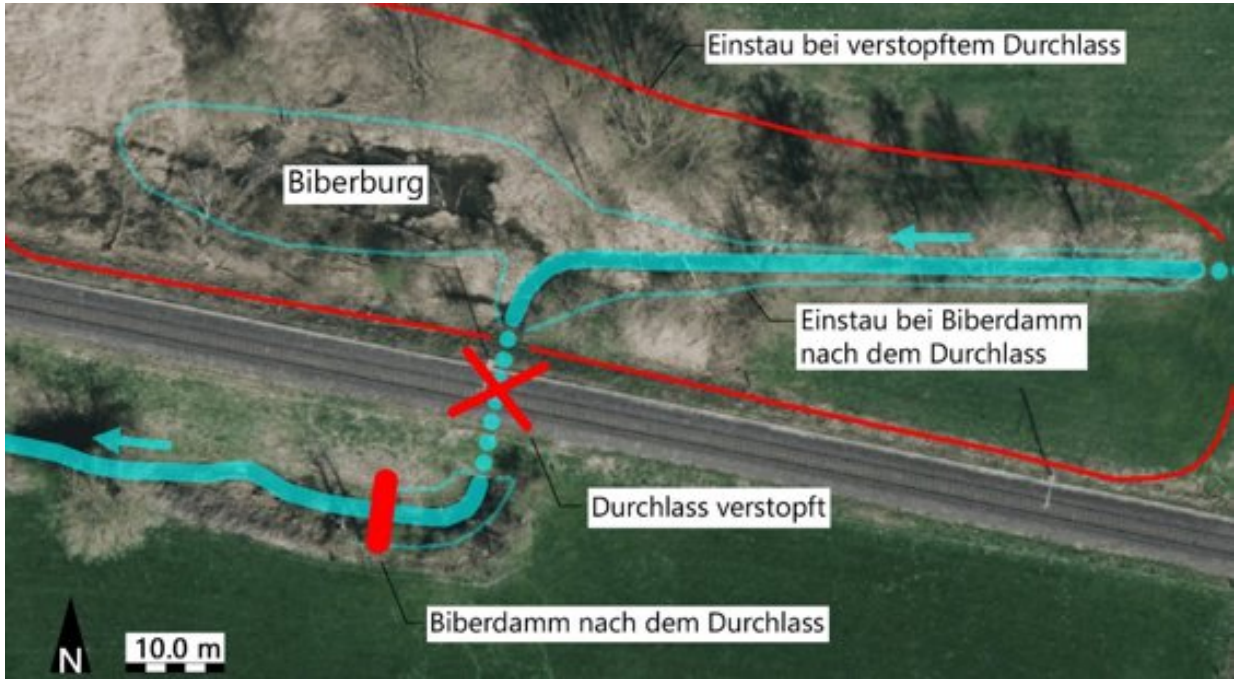
Badger

- Vionnaz: Installation of protection grids. Cost of CHF 0.2 millions

Vionnaz 2020

Beaver Deceiver Oberstammheim

April 2016: The culvert was completely clogged by beavers. This, combined with heavy rainfall, led to massive damming in front of the railway embankment. Water had to be slowly pumped out by the fire brigade to prevent the embankment from draining away. As an immediate measure, a special barrier grid made of reinforcing mats was installed (not acceptable from a fisheries law point of view).



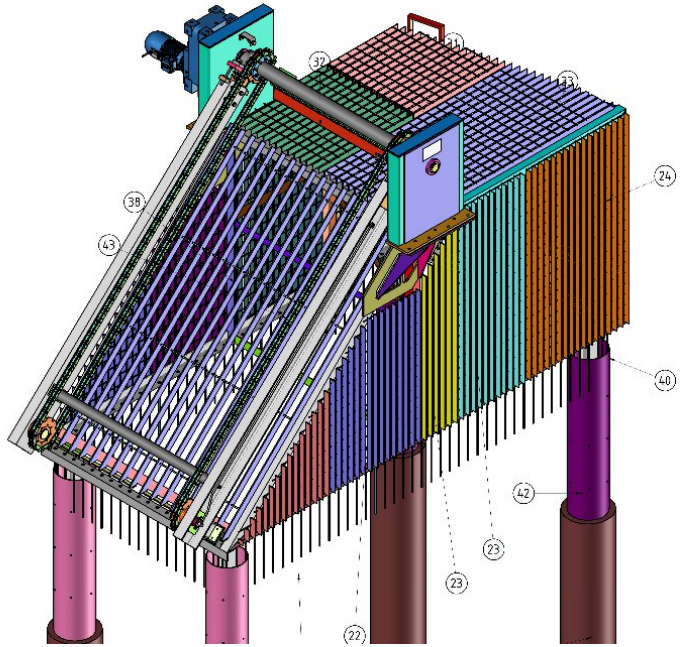
Beaver Deceiver as a solution

Comparing the variants showed that a beaver deceiver has by far the best cost-benefit ratio and is effective. The variant was then defined and approved in consultation with the cantonal specialist departments.

On the one hand, the beaver deceiver must be adapted to the beavers, but also to the drainage (flood safety, bed load, driftwood) and the fish migration.

Planning costs:
Preliminary study with variants: approx. 20,000.- Euros
Project planning, submission and implementation: around 25,000.- Euros

Construction costs:
Material and production costs: approx. 40,000.- Euros
Construction costs: approx. 20,000.- Euros
Automatic rake cleaning (not carried out): approx. 40,000.- Euros



Conclusion

- There is no standard monitoring of earth structures, as long as there are no known problems.
- In most cases, no data are available on the construction of earth structures.
- Track inspectors primarily check the track and not the embankment
- Damage caused by beavers and badgers is not the main problem. More damage due to weather conditions (heavy rainfall) and increase of traffic. Financial resources for monitoring are used where the main problems are.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Thank you, danke,
merci & grazie.