Interdisciplinary seminar with international experts:

Dam Removal goes Alps 2021

When: 4 to 7 May 2021, each from 2 to 5 p.m.

What: Online seminar series, free admission

DAM REMOVAL EUROPE

WWF

WORLD FISH MIGRATION FOUNDATION

ERN EUROPEAN RIVERS NETWORK

aqua viva

BUND Naturschutz in Bayern e.V.

LANDES FISCHEREI VERBAND BAYERN

Bayerischer Kanu-Verband e. V.

Part 1: What is on stake? Why do we need dam removal?

2:00 p.m. Start with an emotional videoclip on Alpine rivers

Welcome from the organizers

2:15 p.m. Keynote speech:
Klement Tockner (General Director of the Senckenberg Society): "Importance and threats to river ecosystems - with a focus on Europe and the Alpine Space"

2:45 p.m. Showcase Austria:
Gerhard Egger (WWF Austria): Removal of the "Hornbachsperre" Showcase from the Lech River in Tyrol (Austria)

3:10 p.m. *Short break*

3:20 p.m. Breakout in four parallel sessions

S11: Overview on dams in Europe
Moderator: Theresa Schiller (WWF Germany)

Extent of river fragmentation in Europe: Results and recommendations from the AMBER Project *(Carlos Garcia de Leaniz, Swansea University, UK)*

Status of dams and barriers in Bavarian rivers *(Stefan Ossyssek, WWF Germany)*

S12: Critical status of European rivers
Moderator: Bettina Urbanek (WWF Austria)

Opportunities for dam removal under the EU Biodiversity Strategy *(Claire Baffert, WWF EPO, Belgium)*

A pan-Alpine overview on the status of rivers *(Pablo Rauch, BOKU, Austria)*

S13: Effects of barriers on fish populations
Moderator: Armin Peter (EAWAG)

Effects of barriers on fish and outcome of barrier removal in Switzerland *(Armin Peter, EAWAG aquatic research, Austria)*

Scientific program to understand the mechanisms of restoration of the Selune River (France) following the removal of two large dams *(Laura Soissons, INRAE, France)*

S14: Decline of land ecosystems
Moderator: Wolfgang Hug (WWF Germany)

Decline of gravel banks and related species (Myricaria) due to river degradation *(Gregory Egger, KIT, Germany)*

Modelling the impact of dams and exotic vegetation in New Zealand braided rivers *(Guglielmo Stecca, NIWA, New Zealand)*

4:30 p.m. Short feedback from each session; wrap up and closing words by organizers

5:00 p.m. End of first seminar day

Abstracts of keynote speakers and presenters available from page 7

Part 2: How to push Dam Removal forward?

2:00 p.m. Start with a video clip on the biggest weir removal in the UK planned in the Lake District as adaption measure to climate change and safety

Welcome from the organizers

2:15 p.m. Keynote speech:
Teppo Sakkinen, Political Advisor to the Finish Environmental Ministry: "Government programme to restore migratory fish populations in Finland"

2:45 p.m. Showcase Switzerland:
Christian Hossli (Aqua Viva): Removal of a small powerplant in Schöftland (Switzerland)

3:10 p.m. *Short break*

3:20 p.m. Breakout in four parallel sessions

S21: Approaches to prioritize dam removal
Moderator: Christian Hossli (Aqua Viva)

Swiss methodology for identification and prioritization of obsolete dams *(Christian Hossli, Aqua Viva & Cathy Hutchings, WWF Switzerland)*

Prioritization concept in North Rhine-Westphalia, Germany *(Andreas Müller, Chromgruen)*

S22: Highlighting negative effects of dams
Moderator: Carlos Garcia de Leaniz (UK)

Did the publication of the AMBER map change opinions and push removals? *(Carlos Garcia de Leaniz, Swansea University, UK)*

Significance of river continuity to fish population *(Philipp Sicher, SFV, Switzerland)*

S23: Pointing to the chances
Moderator: Sampsa Vilhunen (WWF Finland)

Managing dam removal in Slovenia *(Leon Kebe, WWF Adria)*

Finnish campaign for dam removal *(Sampsa Vilhunen, WWF Finland)*

S24: Innovative communication strategies
Moderator: Sigrun Lange (WWF Germany)

Free flowing Salzach: The power of images and visions *(Christine Margraf, BUND Naturschutz, Germany)*

Lessons learned from the World Fish Migration Day *(Pao Fernandez, WFMF, Netherlands)*

4:30 p.m. Short feedback from each session; wrap up and closing words by organizers

5:00 p.m. End of second seminar day

Abstracts of keynote speakers and presenters available from page 7

Part 3: Benefits of Dam Removal to Nature and People

2:00 p.m. Start with a short videoclip about the first dam removal in Europe in June 1998: The Saint Etienne de Vigan dam (12 m) at Allier River (a Loire tributary), France

Welcome from the organizers

2:15 p.m. Keynote speech:
Beth Lambert, Director of Division of Ecological Restoration at the Massachusetts Department of Fish and Game (USA): "The economic effects of ecological restoration and dam removal in Massachusetts"

2:45 p.m. Showcase Bavaria:
Johannes Schnell (Bavarian Fishery Association): Removal of three small hydropower plants along the Mitternacher Ohe, Germany

3:10 p.m. *Short break*

3:20 p.m. Breakout in four parallel sessions

S31: Ecological benefits of dam removal
Moderator: Stefan Ossyssek (WWF Germany)

Removal and reconstruction of a weir at the Ammer river *(Bernhard Müller, Water Management Office Weilheim, Germany)*

Ecological benefits of dam removal in Denmark *(Niels Jepsen or Kim Aarestrup, DTU Aqua, Denmark)*

S32: Economic benefits of dam removal
Moderator: Wouter Helmer (Rewilding Europe)

Dam Removal – Exploring Investable Projects *(Wouter Helmer, Rewilding Europe)*

Assessing the economic rationale of small-scale dam removal *(Antti Iho, Luke, Finland)*

Lessons learned from the removal of the Krebsbach Dam, Germany *(Ercan Ayboga, Environmentalist, Germany)*

S33: Social benefits of dam removal
Moderator: Ruedi Boesiger (WWF Switzerland)

Dismanteling of a longitudinal dam right in the middle of Zurich *(Christian Hossli, Aqua Viva, and Cathy Hutchings, WWF Switzerland)*

The Altenau Story, one of the most remarkable river restorations in Germany *(Ulrich Eichelmann, Riverwatch)*

S34: Removals in the view of climate change *Moderator: Pao Fernandez (WFMF)*

Global warming induced fish die-off in the Rhein 2018 and mitigation measures taken *(Samuel Gründler, Swiss Fishery Association)*

Methan production in large and small reservoirs in Bavaria and Rhineland-Palatinate *(Andreas Lorke, University Koblenz-Landau)*

4:30 p.m. Short feedback from each session; wrap up and closing words by organizers

5:00 p.m. End of third seminar day

Abstracts of keynote speakers and presenters available from page 7

Part 4: Political Frameworks and Financing

2:00 p.m. **The biggest dam removal in Europa, happening right now at the Selune River in France! Live reporting from the removal of La Roche-qui-Boit dam by Roberto Epple, European Rivers Network**

Welcome from the organizers

2:25 p.m. Keynote speech:
Christophe Poupard, Director for Water Planning, Agence de l'Eau Seine-Normandie: "Selune, the biggest dam removal in Europe"

2:55 p.m. Showcase Lithuania:
Karolina Gurjazkaitė: Dam removal in a country, where dam removal used to be impossible (Lithuania)

3:20 p.m. *Short break*

3:30 p.m. Breakout in four parallel sessions

S41: Exemplary political frameworks
Moderator: Tobias Schäfer (WWF Germany)

A truthful bidding mechanism for micro-hydro-power plant removals *(Iho Atti, Luke, Finland)*

Restoring the Snake River through dam removal *(David Moryc, American Rivers)*

Comparing dam removal policies in Europe - a short overview (*speakers from different European countries requested*)

S42: Financing dam removal
Moderator: Eva Hernandez (LER Initiative, WWF)

Crowd funding for dam removal *(Carmen Arufe, WWF Netherlands)*

Subsidising the removal of smaller dams in Northern France *(Stéphane Jourdan (Water Agency Artoise- Picardie)*

S43: Expiring concessions as new chances
Moderator: Ruedi Bösiger (WWF Switzerland)

How removing "eternal rights" of water use might lead to dam removals
(Ruedi Bösiger, WWF Switzerland)

Dam removal at the Duero River in Spain
(Carlos Marcos Primo, NAIAD Coordinator)

Selune example: Why the concession was not prolonged *(Roberto Epple, ERN, France)*

S44: Legal cases and law enforcement
Moderator: Stefan Schmidt (BKV, Germany)

Weir today, gone tomorrow? An approach to understanding and managing historic weirs in England
(Steve Dean, Environmental Agency, UK)

Removal of a small weir in the Windach *(Markus Brandtner, Water Management Agency Weilheim, Germany)*

4:40 p.m. Short feedback from each session; wrap up and closing words by organizers

5:15 p.m. End of the seminar series

Abstracts of keynote speakers and presenters available from page 7

Registration

Join the online seminar! Let´s learn from and be inspired by dam removal experiences from all over Europe and beyond! Discuss the ecological, economic and social benefits of dam removal, and network with relevant actors dedicated to the subject. We encourage practitioners ranging from authorities, planning offices, nature conservation organisations and science to recreational users, tourism experts and politicians to take partizipate in the event. And of course, everybody interested in free-flowing rivers is more than welcome to join.

Registration is free of charge. The number of participants is unlimited.

https://dam-removal-goes-alps.de/

Bražuolė weir, Lithuania
© Karolina Gurjazkaitė

Hornbach water barrage Tyrol, Austria
© Toni Vorauer

Le Vezin Dam at Selune River, Normandie, France
© Roberto Epple

Cayaking paradise: Soca River, Slovenia
© Sigrun Lange

Strech of free flowing Isar River, Bavaria, Germany
© Karl Seidl

Tagliamento, King of Alpine Rivers, Italy
© Sigrun Lange

Keynote speakers

Klement Tockner, Senckenberg Society of Nature Research & Goethe University, Frankfurt/Main, Germany

Email: klement.tockner@senckenberg.de

Importance of and threats to river ecosystems – with a focus on Europe and the Alpine space

In their natural state, rivers are among the most complex, dynamic, and diverse ecosystems – its biodiversity equates to the outstanding diversity typical for tropical rainforests and coral reefs. At the same time, rivers and streams are among the most threatened ecosystems globally. Consequently, the protection of the (few) remaining free-flowing rivers must have utmost priority, thereby creating a continental network of reference systems. In addition, we need to restore large sections of rivers and streams, in the Alps and in Europe, in order to meet the ambitious goals of the EU Water Framework Directive and the EU Biodiversity Strategy 2030. Rivers form the natural and cultural backbones of our landscapes – hence, their protection and restoration serve nature and people alike.

Teppo Sakkinen, Political Advisor to the Finish Government

Email: teppo.sakkinen@tem.fi

Government programme to restore migratory fish in Finland

- Quick overview on migratory fish and hydropower or other obstacles in Finland;
- Policies of the current and former governments of Finland on restoring migratory fish
  # National Fishway Strategy in 2014
  # Governmental ”Spearhead Project” in 2015-2019
  # „National Migratory Fish Programme Nousu” in 2019
  (covers dam removal/restoration but also fishways etc)
- Showcase of recent dam removal cases in Finland (Hiitolanjoki, Saramojoki etc) and the role of the government in the projects;
- Some thoughts on the future of river restoration in Finland.

Beth Lambert, Division of Ecological Restoration of Massachusetts Department of Fish and Game

Email: Beth.Lambert@state.ma.us

The economic impacts of dam removal and river restoration in the US and Massachusetts

River restoration brings many benefits to communities, including improved public safety, resilience to climate change, and a ripple effect on the economy. Agencies and non-governmental organizations across the United States have carried out a variety of studies to document the economic benefits of river restoration and dam removal. In the state of Massachusetts, the state's Division of Ecological Restoration has modeled jobs creation and other economic benefits of dam removal. This presentation will summarize the results of economic studies from across the US, share the results of studies in Massachusetts, and discuss how the Division of Ecological Restoration uses economic information to promote dam removal to decision-makers and others..

Christophe Poupard, Agence de l'Eau Seine-Normandie

Email: POUPARD.Christophe@aesn.fr

Removal of two major dams on the Selune River, emptying into the bay of Mont-Saint-Michel

The "Vezins" and "La Roche qui boit" dams are hydroelectric plants, operated by the French electric utility company EDF since 1946. They impact respectively 19km and 4km of the River Sélune's flow, leading to sediment accumulation as well as loss of fish and other freshwater species. Furthermore, this case is important for international tourism and biodiversity because the river runs into the Bay of Mont-Saint-Michel (a UNESCO World Heritage Site).

While until now the obstacles removed on French rivers have been relatively low, in November 2017 the French government confirmed its choice to remove the 36 metre-high Vezins and the 16 metre-high "La Roche qui boit" dams. Since the beginning of this project, a multi-disciplinary scientific expertise has been engaged to conduct an environmental and social impact assessment. It is coordinated by INRAE, the National Research Institute for Agriculture, Food and Environment, and supported and financed by Seine-Normandie Water Agency. The decision to dismantle the dams was preceded by local consultations and dialogue with stakeholders at local, water basin, and regional levels.

Dismantling two dams targets rehabilitating sediment flow and facilitating the Atlantic salmon run by creating new spawning areas. It represents one of the largest dam removal projects in Europe and a considerable step towards the restoration of river valleys in the Seine-Normandie river basin. It has environmental, ecological and socio-economic impacts on both, landscape and territory as a whole. It concerns not only river dynamics and its microenvironment and habitats, but also the local touristic and economic activities, leisure activities, the restoration of the river banks and the perceptions, values and representation of cultural landscapes. In this sense, the project goes far beyond dam demolition.

Session inputs

Part 1: What is on stake? Why do we need dam removal?

S 1.1: Overview on dams in Europe

Carlos Garcia de Leaniz, Swansea University (UK):
Extent of river fragmentation in Europe: Results and recommendations from the AMBER Project

Email: c.garciadeleaniz@swansea.ac.uk

With only one third of its rivers having 'good ecological status' Europe has probably more heavily modified rivers than anywhere else in the world, as well as a long legacy of fragmentation. The results of the AMBER project indicate that there at least 1.2 million instream barriers in Europe (mean density = 0.74 barriers/km), 68% of which are low-head (<2m) structures such as culverts, ramps and fords. The distribution of barriers largely mirrors the distribution of other anthropic pressures in Europe's rivers. Barrier density can be predicted by agricultural pressure, road density, extent of surface water, and elevation. Although few or no river in Europe is completely free of barriers, relatively unfragmented rivers are still found in the Balkans, Scandinavia, the Baltic states, and parts of southern Europe. These require urgent protection from new dam developments. Most barriers to free-flow are small structures that are difficult to detect and are poorly mapped. Loss of connectivity depends mostly on the number and location of barriers, not on their height. The new EU Biodiversity Strategy aims to reconnect at least 25,000 km of Europe's rivers by 2030. To achieve this, a two-pronged approach is needed: (1) halt current rates of fragmentation; this may require a critical reappraisal of building new dams against the alternative of enhancing the efficiency of existing ones, and other alternative sources of energy and water storage; and (2) remove obsolete barriers using an optimised approach that maximises connectivity gains and reduces costs and social conflict.

Stefan Ossyssek, WWF Germany:
Status of dams and barriers in Bavarian rivers

Email: Stefan.Ossyssek@wwf.de

With around 100.000 km of rivers and streams Bavaria is very rich in running waters. At the same time c. 56.000 cross barriers hamper these watercourses in flowing freely. Detailed data collected by the Bavarian Environment Agency show that from these structures, among which are weirs, dams, ramps, drops, culverts and pipes, only c. 11 % are passable upstream for all relevant fish of the respective waters. Moreover, c. 5.900 of these barriers are delipidated and at c. 4.200 weirs hydroelectric electricity is generated. The results suggest that there is a great demand for longitudinal river restoration, which is recognized within the River Basin Management Plans for the third WFD cycle by suggesting 15.000 measures for creating fish pass ability. It will be crucial to find cost effective ways to implement these measures, and also generate maximal ecological gain. Barrier removal can be the silver bullet to cover these needs.

S 1.2: Critical status of European rivers

Claire Baffert, EPO WWF (Belgium): **Opportunities for dam removal under the EU Biodiversity Strategy**

Email: cbaffert@wwf.eu

This presentation will describe the opportunities provided at EU level for dam removal. It will outline how the target set by the EU biodiversity for restoring 25,000 km of free-flowing rivers can provide a legal and financial boost to put dam removal on the agenda as a cost-effective option for river restoration. It will also make the link with the third cycle of River Basin Management Plans and show the necessity to use these tools to plan for dam removal projects. Based on a WWF advocacy report, it will also present possible criteria for identifying candidates for removal.

Pablo Rauch, University of Natural Resources and Life Sciences Vienna (Austria): **Pan-Alpine overview on the status of Rivers**

Email: pablo.rauch@boku.ac.at

All large valleys along the Alpine ridge are densely populated areas, making usable space a scarce and highly sought-after resource. The rivers flowing through these valleys have suffered major deteriorations since the beginning of the 20th century due to intensified land-use, flood protection measures and increased exploitation of the hydropower potential. In contrast to most other European river systems, Alpine rivers are more severely impacted by hydro-morphological stressors than water-quality issues. In many cases, these ecosystems are exposed to a multitude of stressors. Thus, integrative management approaches that incorporate innovative and courageous ideas are needed to substantially act against the decline of freshwater biodiversity in the Alps.

S 1.3: Effects of barriers on fish populations

Armin Peter, EAWAG (Switzerland): **Effects of barriers on fish and outcome of barrier removal in Switzerland**

Email: apeter@fishconsulting.ch

Swiss rivers and streams are highly fragmented by artificial barriers. These barriers affect fish populations. Movements and migration are ecologically very important for the fitness of the fish. Habitat fragmentation of rivers is a great threat to biodiversity and fish species which highly depend on movement and migration. The effect of barriers on fish will be highlighted and the outcome of barrier removal is generally discussed and explained with case studies.

Laura Soissons, INRAE (France): **Scientific program to understand the mechanisms of restoration of the Selune River (France) following the removal of two large dams**

Email: laura.soissons@inrae.fr

By disrupting ecological connectivity and causing fragmentation in river systems, dams impose significant changes to hydrological regimes, water temperature and biological and bio-chemical fluxes. This is the case on the Selune River, one of the four coastal rivers that ends in the Bay of Mont

Saint-Michel in Normandy, France. Two large dams (36 and 16m high) and many other secondary obstacles hinder free water flow and migrations of diadromous fish species. Their dismantling was the subject of many political, ecological and societal debates and finally started in 2019. The largest dam has now been completely removed. A breach at the bottom of the second dam will be done by summer 2021. After a century of lockdown, the upper 60 km of the Selune River, representing about 1000 km of flowing habitats if one considers the numerous tributaries of the river, will be reconnected to the ocean. To understand the mechanisms of restoration of the Selune River, a scientific program was initiated in 2012 and will continue until 2027. This unique and multi-disciplinary program aims at characterising the physical, chemical, biological and societal processes involved in the ecological restoration of the river and its valley. The scales of study are multiple, cascading from landscapes to chemical elements. The objective of this program is to produce a full experience feedback on the restoration of river connectivity. So far, scientists have worked on understanding how the river works with dams. Current research also focuses on anticipating the changes that may occur following dam removal. From 2022, research will focus on understanding how the aquatic and riparian ecosystems will evolve without dams. By comparing these different phases, it will be possible to characterize the effects of the removal of dams and to identify the societal and ecological costs and benefits associated with the return of a free-flowing fluvial ecosystem.

S 1.4: Decline of land ecosystems and sediment management

Gregory Egger, KIT (Germany): **Decline of gravel banks and related species (Myricaria) due to river degradation**

Email: gregory.egger@kit.edu

Braided rivers, also called „wild river landscapes“, are characterized by extensive gravel areas and high morpho- and hydrodynamics. They are one of the characteristic ecosystems of the Alps. The habitats are characterized by stresses such as flooding, disturbance and drought. Accordingly, the wild river landscapes of the Alps represent a „hot spot“ of a specific flora and fauna. Wild river landscapes and with them the characteristic species are highly endangered in the whole Alpine arc. Especially in the Central and Northern Alps of the Eastern Alps they are now almost completely extinct. The causes can be summarized in four factors. 1) Quantitative extinction of riparian habitats in the last 150 years in the Alpine region, especially in the Eastern Alps and most particularly in the Central and Northern Alps. 2) Degradation of remaining riparian habitats due to bedload deficit, absence of morphodynamics and hydrodynamics and over-fertilization 3) Fragmentation and below minimum habitat sizes 4) Reintroduction succeeds in very few cases. The current state is not „5 to 12“ but long past 12 and the process of extinction is irreversible. Only „big solutions“ can at least lead to a trend reversal.

Guglielmo Stecca, NIWA (New Zealand): **Modelling the impact of dams and exotic vegetation in New Zealand braided rivers**

Email: Gu.Stecca@niwa.co.nz

River planform results from the complex interaction between flow, sediment transport and vegetation, and can evolve following a change in these controls. Disentangling this complex causation path as a preliminary measure to devising restoration measures is not straightforward. We propose a modelling approach that can be used as tool for analysis of observed trajectories and to forecast future behaviours in dam- and vegetation- impacted braided rivers. We focus two iconic braided river cases in New Zealand’s South Island: the Lower Waitaki River and the Waimakariri river. The Waitaki is impacted by the combined effects of exotic

vegetation and a hydropower scheme that has altered the flow regime. As the Waitaki River is unable to clear vegetation efficiently, vegetation encroachment has promoted a shift towards a single-thread morphology. In contrast, the more active Waimakariri River, despite having been subjected to similar vegetation, retains a largely unvegetated channel due to its ability to naturally clear vegetation.

A two-dimensional physics-based numerical model capable of accounting for the evolution of morphology and vegetation in braided reaches is constructed and applied to the two rivers. Calibration and validation of the vegetation parameter settings, which is critical to obtaining realistic planform styles, is carried out in applications to the two test cases by selecting the parameter values that allow the model to predict vegetation encroachment in the Waitaki and efficient vegetation clearing in the Waimakariri. The model responds sensibly to changes in parameters, showing that more aggressive vegetation types cause a sharper reduction of braiding. Finally, the calibrated model is applied to reconstruct planform changes in the Lower Waitaki under a reconstructed natural flow regime, showing that the river would have still suffered from vegetation encroachment due to its naturally steady hydrology.

Part 2: How to push dam removal forward?

S 2.1: Approaches to prioritize dam removal

Cathy Hutchings, WWF Switzerland & Christian Hossli, Aqua Viva: **Swiss methodology for identification and prioritization of obsolete dams**

Email: cathy.hutchings@wwf.ch & christian.hossli@aquaviva.ch

Switzerland: Small country, big in dams. Unfortunately, in Switzerland there are around 100‘000 barriers in our rivers which are higher than 0.5 metres. If you add all the smaller ones, you end up with several hundred thousand. On average, there is a barrier every 650 metres in Swiss rivers. So if you want to start removing dams in Switzerland, you are first and foremost confronted with the question: Where do we start? To tackle that huge challenge, a clever methodology to identify the most promising barriers is required. Which means those barriers, where the ecosystem benefits the most while still being relatively easy to remove. Over the last 3 years we were working on that tool and we are looking forward to present you the actual result of those efforts. In this session we will show the theory behind this half-automatic tool as well as the practical application of it.

Andreas Müller, Chromgruen:
Prioritization concept in Nordrhein-Westfalen (Germany)

Email: am@chromgruen.de

GIS-based determination of habitat gains achievabale by dismantling of transverse structures: In the German state of North Rhine-Westphalia there are tens of thousands of artificial structures impairing ecological continuity. As a basis for prioritizing their dismantling, North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection (LANUV) developed a GIS-based process, which was implemented by a consortium of chromgruen, Umweltbüro Essen and DIE GEWÄSSER-EXPERTEN! The prioritization procedure combines two components:

- Lengths of contiguous flow sections achievable by removing pre-defined „obstacles to continuity“ (artificial structures that restrict the passage of organisms and sediment) are determined. This results in ‚habitat gains‘ as the sums of continuous stretches of water located above and below the obstacles to continuity.

- Ecologically significant attributes are assigned to the hydraulic structures under consideration and evaluated according to a standardized, transparent scheme.

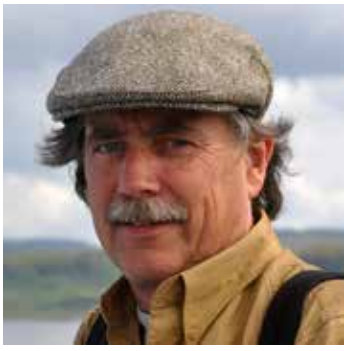
From these components an index value is calculated and assigned to each artificial structure. In order to overcome problems of accuracy, structures are classified in five priority classes (A to E). Results are published as object reports for each structure and in maps. As the method was implemented in a geo database it will be integrated into the state river database in order to allow for regular updates of priorities.

S 2.2: Highlighting negative effects of dams

Carlos Garcia de Leaniz, Swansea University (UK):
Did the publication of the AMBER map change opinions or push removals?

Email: c.garciadeleaniz@swansea.ac.uk

The biggest problem in restoring river connectivity is not what we don't know, but what we don't know we don't know (the unknown unknowns). In this sense, the AMBER project helped to shine light on the extent of river fragmentation in Europe. Thus, river continuity conditions were unknown for 61% of rivers in 2018 (EEA, 2018). Now we can estimate there are over 1.2 million barriers. These results have helped put the need to restore rivers in the policy agenda and helped to define the target of the new EU Biodiversity Agenda which aims to make at least 25,000 km of rivers free-flowing by 2030. We estimate that there are at least ~150,000 obsolete barriers that can be removed and are developing methods to prioritize their removal in the most effective and economic possible way, one that brings about the greatest gains in connectivity with the minimum possible cost. Our project produced 3 EU policy briefs, over 30 peer-reviewed publications, and featured in more than 50 news and media articles, reaching over 50 million people. It resulted in the cancelation of one big dam, the retrofitting and lowering of another dam, and the removal of 26 smaller structures. Above all, AMBER has shown the power of good applied science, common sense and reason.



Philipp Sicher, Schweizerischer Fischereiverband (Switzerland):
Significance of river continuity to fish population

Email: p.sicher@skf-cscp.ch

Fish are migrating! For many fish species, migration is essential for reproduction. The use of water for energy production or other purposes destroys precisely this continuity at uncountable rivers and thus endangers the fish population. The urgently needed restoration of free fish migration, especially the removal of dams, usually involves high costs that are not always well understood by the public. Using scientific and political instruments, this presentation illustrates how acceptance for the implementation of such projects can be improved in the political arena and in the development of public understanding. The importance of public relations is central. Which instruments can be used to communicate the problem to the public? Biodiversity and species diversity are two keywords that currently are highly valued by the public. The loss of biodiversity in water systems, especially the loss of well-known and popular fish species such as salmon or eel, encourages the people to actively do something about it ... the removal of barriers to migration, dams, are elements to actively contribute to support on a regional level. As a practical example, the implementation of a project in Switzerland is presented from public relations through communication to their planning and finally their realisation on the river.

S 2.3: Pointing to the chances

Léon Kebe, WWF Adria:
Managing dam removal in Slovenia

Email: lkebe@wwfadria.org

The presentation will be about the development of dam removal in Slovenia, from the initial idea to the development of serious strategies and eventual actual removals. Lessons learned and good practices will be illustrated as well as the support and encouragement from the dam removal community.

Sampsa Vilhunen, WWF Finland:
Finnish campaign for dam removal

Email: sampsa.vilhunen@wwf.fi

Over 70 % of Finnish citizens think, that hydropower dams insignificant for energy production should be removed in order to restore migratory fish stocks. The current Finnish governmental programme has dam removal explicitly as its concrete targets. The objective of more free flowing rivers now makes even active hydropower to retreat. How did all this come about, and is it repeatable in other countries?

S 2.4: Innovative communication strategies

Christine Margraf, BUND Naturschutz (Germany):
Free flowing Salzach: The power of images and visions

Email: christine.margraf@bund-naturschutz.de

Like almost all pre-Alpine rivers, the Salzach (border Bavaria-Austria) has been straightened and river banks obstructed over the last 150 years. For decades there is a controverse dispute over the construction of hydropower plants. The nature-conservationists not only argued against this damming with facts, but also used scientific concepts to promote a “natural flow” and renaturation. It is shown with facts, that and how the vision of a near-natural river landscape with a free flowing Salzach can be achieved. In order to awaken the desire for it, this is also visualized with pictures. In Austria, the “Salzachauen Nature Park” project was started in 2014 by the state of Salzburg. At the presentation of the project, nature conservation officer Astrid Rössler said: „This is a huge potential for building a cathedral for the future.“ The importance of powerful images and memorable image associations in the mind is the theme of the workshop. Even if the case of the Salzach is not concerning the removal of a dam, so the visualization of visions is at least as important for awakening a desire for rivers without transverse structures.

Pao Fernandez, World Fish Migration Foundation:
Connecting fish, rivers and people. Lessons learned from the World Fish Migration Day

Email: pao@fishmigration.org

We live in the Communication and Technology Era, however, the public knows so little about the important efforts being carried out in every part of the world to improve and restore their rivers and migratory fish populations. World Fish Migration Day is breaking this isolation, putting together thousands of organizations, connecting people and helping share positive experiences to inspire others to take action. We need you too! Join us!

Part 3: Benefits of dam removal to nature and people

S 3.1: Ecological benefits of dam removal

Bernhard Müller, Water Management Office Weilheim:

Removal and reconstruction of a weir at the Ammer river

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Das Grundwehr III wurde 1923 im Zuge der Ammerkorrektion errichtet. Der Lauf der Ammer unterhalb von Weilheim bis zum Ammersee wurde dabei von 25 km auf rund 13 km verkürzt. Ziel war es, eine Vorflut für die landwirtschaftlichen Entwässerungen im Ammermoos zu schaffen. Im Rahmen der Wiederherstellung der Durchgängigkeit der Ammer wurde das fast einhundert Jahre alte, nicht mehr standsichere Grundwehr abgebrochen und durch eine naturnahe Sohlgleite in Steinschütt-Bauweise mit Neigung 1:50 ersetzt. Der Freistaat Bayern hat sich gegen eine Wehrsanierung und gegen eine Nutzung der Wasserkraft zugunsten eines möglichst naturnahen Bauwerks entschieden.

Zum Ochsenbach-Altwasser wurde ein Rauhgerinne-Beckenpass sowie für die Beschickung mit Ammerwasser ein Wellstahldurchlass durch den Deich errichtet Das Ochsenbach-Altwasser ist somit wieder von ober- und unterstrom durchgängig an die Ammer angebunden. Zum Auwald hin wurde das Ufer als weiches Ufer gestaltet. Die eigendynamische Entwicklung und eine Flutung des Auwalds bei kleinen Hochwasserabflüssen sind nun wieder möglich. Vielfältige Lebensräume wurden so wieder vernetzt, in Längs- wie auch in Querrichtung. Der Hochwasserschutzdeich auf der gegenüberliegenden Seite wurde an die neue, im Gleitenbereich höhere, Wasserspiegellage angepasst. Um die Sozialfunktion des Gewässers angemessen zu stärken, wurden Ein- und Ausstiege sowie eine Niedrigwasserrinne für Kanuten angelegt. Für Radreisende (Ammer-Amper-Radweg) wurde eine Rastmöglichkeit mit Infotafel geschaffen. Die Umgestaltung des Grundwehres III in eine Sohlgleite war mit Baukosten in Höhe von 2,15 Mio. Euro die bisher größte ökologische Maßnahme an der Ammer. Die Durchgängigkeit der Ammer wird seit 2001 verfolgt. Bis zur Umgestaltung des Grundwehres III wurden in dieses Projekt über 6 Mio. Euro vom Freistaat Bayern investiert. Aus Sicht des Artenschutzes ist der betrachtete Teil des Ammersystems mit der gefundenen Artenausstattung in seiner Gesamtheit ohne Zweifel von außerordentlicher hoher Bedeutung, nicht nur auf landes- und bundesweitem Niveau, sondern auch innerhalb des gesamten Nordalpenraumes.

S 3.2: Economic benefits of dam removal

Wouter Helmer, Rewilding Europe:
Dam Removal – Exploring Investable Projects

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Dam removal is one of the most effective ways for river restoration and the rewilding of river catchment areas. All over Europe thousands of dams serve no function anymore, while still having negative impacts on nature and people. In many cases removal of these obsolete dams is cheaper than their maintenance. This means that there is a basis for scalable (financial) models on dam removal that serve both ecological and socio-economic goals. Dam Removal Europe is currently exploring these models and those partnerships that are needed to make them a succes. This presentation will give a short overview of the type of models we're thinking of and will end with a call to nominate investable pilot projects for these models.

Antti Iho, Natural Resources Institute Finland (Luke):
A tool assessing the economic rationale of small-scale dam removal

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Dam removal processes are hard to initiate and toxic to carry out. Small-scale plant owners are often family businesses. They do not necessarily have the skills to evaluate how changes in environmental regulation would affect their businesses. Fish-passages are expensive to design and construct and they decrease the revenue stream. How do these changes affect the economic profile of the facility? On the other hand, the parties wanting to remove the dams and restore the rivers often fail to see the economic value of the plants. Small but steady revenue streams might be valuable in the long-run. I present an easy-to-use support tool for dam removal negotiations. It is being used in dam removal processes in Finland. It helps identifying facilities that are not economically viable to co-exist with fish passages; and it helps narrowing down the compensation requests in the negotiations.

Ercan Ayboga, Germany: **Lessons learned from the removal of the Krebsbach Dam in Germany**

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In 2007 the Krebsbach Dam, located in Thueringa/Germany, was removed as the second dam in Germany. The 18m high dam was built for industrial water supply in 1962. In the 80s, the purpose ceased to exist. Then in the 90ies, security and structural obsolescence problems emerged. As comprehensive rehabilitaion measures were necessary and no new purposes could be developed, the operator, the Thueringer Fernwasserversorgung, decided to remove it. Estimated rehabilitation and operation costs have been too high (cost-benefit analysis). The unique aspect of this dam removal project is the designed meandering channel for the small creek in the 700 m long impoundment area. This was justified with the risk of floods in downstream areas after the removal. The sedimentation was low, not much contaminated and thus not a serious issue. Totally 1,2 Million Euro have been spent for this removal, which is relatively high and justified with the aim to develop an example for future removal projects. 14 years after the removal no extreme flood happened and the preshaped channel has been stabilized. But the biodiversity in the whole river channel remains below the expectation. What does the option of preshaping the former impoundment mean for further dam removal projects, particularly in areas with flood concerns and dense populations?

S 3.3: Social benefits of dam removal

Cathy Hutchings, WWF Switzerland & Christian Hossli, Aqua Viva: **Dismanteling a longitudinal dam in the middle of Zurich**

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Usually dam removals take place in rather remote areas without a lot of humans or human infrastructure around them (because this normally makes removing more complicated). But not in this case: this removal took place in the heart of Zurich, right next to the central station – probably one of the most vivid spaces in Switzerland. Two years after the removal we look back at how the site has developed and what the citizens of Zurich think of it.

Ulrich Eichelmann, Riverwatch: **The Altenau Story: One of Germany´s most remarkable river stories**

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The Altenau is a 28km long stream in North-Rhine Westfalia, south of Paderborn. And she is “my river”. I grew up next to it and to a large extend “in it”. I caught trout with my bare hands and – I must confess – sometimes even graylings in April. I watched kingfishers and dippers, built treehouses in the willows etc. The story of the Altenau begins with a huge flood in July 1964. After this flood, the river was regulated, straightened and several flood retention basins were built. People were happy and didn´t think much about the environment. Safety first. A very normal “German river story” so far. But then they built a retention dam about 5km upstream of my hometown and in contrast to others of that kind, it was constructed with a permanent reservoir lake. To attract tourist, that was the idea. The problem was that they build it on karstic ground, so the water just disappeared. And suddenly – for the first time in history – the Altenau did not reach our little village any longer. Geese and ducks were wading in a dry riverbed, people were shocked and had no idea, what the hell was going on. The shock was big and even the people who didn´t care about nature, fish, or whether the river was regulated or not, came together and thought about it. And that´s where the great story begins.

S 3.4: Dam removal in the view of climate change

Samuel Gründler, Swiss Fishery Association: **Global warming induced fish die-off in the Rhein 2018 and mitigation measures taken**

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Based on the experiences of 2003 fish kill due to warm water, the local fisheries organisation developed an emergency plan for cold water fish in the river Rhine. In 2018 actions were needed due to another extreme summer conditions with water temperatures up to 28°C. In these man made cold water zones thousands of graylings survived those few weeks of deadly conditions in the main river.

Andreas Lorke, University Koblenz-Landau:
Methan production in large and small reservoirs in the states of Bavaria and Rheinland-Pfalz

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Inland waters are a significant yet poorly constrained source of the potent greenhouse gas methane (CH_4). Manmade reservoirs have been found to be particularly strong emitters globally, with river impoundments in the temperate zone being among the global hotspots of CH_4 emissions from aquatic systems. We present and analyze extensive measurements of CH_4 production and emission rates in impoundments located in the Rhine and Danube River basins in Germany. By comparing fluxes and drivers of CH_4 emissions from these systems with those from streams, lakes and large reservoirs across different climatic zones, we explore the reasons for the relatively high emissions. High deposition rates of fine sediment, shallow water depth and high summer temperature are among the main drivers, while trophic state appears to be an important mediator. Moreover, high CH_4 emissions rates are mainly maintained by ebullition, i.e. by bubble-mediated transport to the atmosphere, which bypasses aerobic CH_4 oxidation at the sediment-water interface or in the water column. Sediment management appears to be key to potential mitigation efforts aiming at a reduction of greenhouse gas emissions from river impoundments.

Part 4: Political frameworks and financing

S 4.1: Exemplary political frameworks

Antti Iho, Natural Resources Institute Finland (Luke): **A bidding mechanism for micro-hydropower plant removals**

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There are myriads of small-scale hydropower plants which are too small to reconcile electricity generation with environmental regulations. Governments should help such plants cease production and restore the rivers. However, government resources in terms of money and time are limited. Also, we don't know how valuable the plants are for their owners. How to find the low-hanging fruits, and of these the tastiest ones? Together with WWF Finland and the Ministry of Agriculture, we are planning a reverse auction mechanism to locate and remove the cheapest and the most harmful dams. We call plant owners to submit bids indicating the compensation for which they let the authorities remove the dam and restore the river. The auction will be a scoring auction with compensation requests weighted with obtained ecological benefits. The auction mechanism and the pilot program for Southern Savonia are presented.

David Moryc, American Rivers: **A Vision to save the beating heart of the Pacific Northwest: Restoring the Snake River through dam removal**

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The Snake River flowing out of the Sawtooth Mountains in the Pacific Northwest of the United State is Columbia River's largest and most important tributary which once hosted up to six million wild salmon and steelhead. This river served as the backbone of the ecology, economy and culture of the Pacific Northwest. The construction of the four lower Snake River dams created significant impediments for migrating fish and changed river conditions to the point where the numbers of salmon and steelhead have plummeted by roughly 90%. Today Snake River salmon and steelhead are on the brink of collapse, listed as Endangered Species, which has

shock waves through the region's web of life and the people who depend on them for their cultures and livelihoods. Over the last three decades, efforts to recover imperiled Snake River native fish, including previous efforts to strike an agreement to remove the Lower Snake River dams, have been unsuccessful. The status quo is supported by powerful economic interests that have stood in opposition to removing the dams. However, changes in economic conditions over the past decade, most importantly in the energy sector, has opened the door for regional decisionmaker willingness to engage on the issue.

For the first time, decisionmakers in the region are talking about making strategic investments that would reimagine the region's energy future, improve aging infrastructure, support a growing agricultural economy and meet the nation's obligations to the region's tribal nations. One member of the US Congress, a conservative Republican has proposed a $34 Billion plan to remove the dams and address the other stakeholders that rely on the benefits the river current rly provides including transportation, agriculture, and energy. We will explore the importance of the Columbia and Snake River Basins and the national campaign to remove the dams and find lasting solutions for the region.

S 4.2: Financing dam removal

Carmen Arufe, WWF Netherlands: **Crowd funding for dam removal: It's not all about the money!**

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This fairly recent online tool is indeed a great way of financing individual projects or causes. But that's not the only point. In fact it may be the least important goal. Crowdfunding is a time, effort and cost effective action that yields countless benefits in many different ways. It spreads our message above and beyond our wildest expectations. It provides us with valuable contacts with companies, foundations and big donors. It refreshes the connection with our members, subscribers, volunteers and followers and adds new data leads coming from traffic on the platforms. Crowdfunding is about reaching out, creating bonds and boosting social action. It gives us the chance to promote social awareness and show people how they can really change things quickly when working together. How they can see the immediate effects of being a crowd.

S 4.3: Expiring concessions as new opportunities

Ruedi Bösiger, WWF Switzerland: **How removing "eternal rights" of water use might lead to dam removals**

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With its decision on the residual water remediation of the Hammer power plant, the Federal Supreme Court has finally ended the old "eternal right" regarding water usage for hydropower in Switzerland. The Federal Supreme Court ruled that formerly awarded "perpetual concessions and eternal water rights" were unconstitutional. Based on this decision WWF Switzerland therefore calls on all relevant stakeholders to replace existing conjugal rights. The plants must be brought into a legally compliant state and must be relicensed as soon as possible. This means that from now on all regulations of environmental and water protection law in Switzerland is applicable for those ancient "rights". These plants equipped with ancient rights must be operated in compliance with the law as soon as possible, but by 2025 at the latest. Therefore, WWF started off a process to ensure all relevant stakeholders on national and county level know about the decisions of the court , to create a national and regional "overview" of power plants with marital rights, to priorities regions with high numbers of martial rights and to assess powerplants with martial rights in prioritized regions, to enforce the legal compliance process and to detect the low hanging fruits for removal among the obsolete plants.

Carlos Marcos Primo, River Duero Basin Authority, Spain:
Demolition of the Yecla Dam in Spain

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One of the actions implemented as part of the LIFE CIPRÍBER Project has been the complete removal of one of the largest transverse barriers impeding the passage of fish in the project area: the Yecla de Yeltes dam. The Yecla de Yeltes dam was constructed in 1958 across the Huebra River, a tributary of the Yeltes River, to regulate annual water supply to the municipality of Vitigudino. However, construction of new infrastructures and water supply pipes in the second half of the 20th century definitively resolved the supply of water to villages in the region, and the dam gradually fell into disuse. According to the law, once a concession expires, the concession holder has to remove the established infrastructure. Following removal of the Yecla dam and construction of fish ladders around obstacles, longitudinal connectivity was restored to 95% of the length of the Huebra River, permitting the passage of its migratory fish species, protecting an important part of the river's historical heritage and ensuring that use of the river was compatible with the local economy.

S 4.4: Legal cases and law enforcement

Steve Dean, Environment Agency, UK:
Weir today, gone tomorrow? An approach to understanding and managing historic weirs in England

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The Environment Act (1996) requires the EA to avoid (wherever possible) impacting upon the historic environment and, where this is not possible, to mitigate any impacts we might have. Our work, while centred on responding to climate change via large-scale flood risk management schemes, nevertheless incorporates smaller schemes such as wetland creation, Natural Flood Management and the promotion of fish passage. Our regionally-based archaeologists are able to advise on the management of archaeological risk of any EA scheme. Using case studies, I will outline our knowledge-based approach to understanding the historic significance of weirs and how this is applied in the promotion of fish passage along a watercourse. Moving on we will briefly address the heritage designations which can be ascribed to weirs and how they inform our work. I will also emphasise that some 'modern' weirs may encase earlier structures and could be accompanied by other features which survive as buried archaeological remains. Such weirs may not be designated but could be identified on a County Historic Environment Record and so may be a material consideration in the planning process. Finally I hope that this presentation will highlight the historic potential that some weirs can have, that delegates will be able to share their experiences in this regard and that this might inform the future of the sustainable management of fish passage.

Markus Brandtner, Water Managing Acency Weilheim, Germany: **Removal of an already broken weir evaluated under non-ecological aspects**

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In 2015 one of the many transverse structures along the mid-sized river Windach broke during a flood. The river's waterbody structure as well as its connection to the water meadows come very close to its WFD-reference structure. The weir owner decided not to rebuild the transverse structu-

re out of economic reasons. This issue is remarkable because the mid-sized river significantly fails to reach the „good ecological status“ due to the missing ecological passability at its weirs. From an ecological point of view all issues including legal water und environmental regulations strongly support the complete removal of the weir.

Bavaria´s Water Management Administration, which is bound to achieve a good ecological status until 2027, was offered the opportunity to stop conveying the water and recharge a 1.2 km long part of river Windach. As soon as 2015 our local office decided to buy the bank right to convey up to 600 l/s from the river in order to produce electric power. As a consequence not only the weir's fragments had to be bought but also the dried out turbine`s channel. From now on many different issues appeared on the project`s agenda. The first question was how to deal with the red-listed mussels, which were found in a remarkable number in the channel. Sewage disposal and losses in value for all the houses situated close to the channel were another two. An additional point was the old mill, which is a listed building and a cultural heritage site, and therefore the question if a listed watermill can be left without water or even without a channel came up. Considering so many questions not linked to ecological reasons and effecting mostly cultural and economic matters, the key issue “Ecological Status of River Windach” had necessarily to be subordinated to matters concerning the reshaping of the mill-channel.

Dam removal showcases

Christian Ihrenberger, Gebietsbauleitung Wildbachverbauung Reutte
Toni Vorauer and Gerhard Egger, WWF Austria

Austria: Removal of a torrent control at River Hornbach in the Natura-2000-site Lech-Valley (Tyrol)

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River Lech in Tirol is a braided river system with multiple channels, gravel bars and floodplain forests. The still near-natural river Lech is distinctive for the whole valley, which is nowadays protected as Natura 2000 site and nature park. Nevertheless, river regulation works in the 20th century and building of torrent control dams in major tributaries caused substantial changes of the ecosystem. A lack of sediments in combination with increased flow-velocity of the river caused a severe riverbed degradation (drop by 3m in some parts). As a consequence, levels of groundwater and frequency of floods declined, with negative impacts on ecosystems and water management. For that reason, a large river restoration project (LIFE Wildflusslandschaft Tiroler Lech) has been started in 2001, including the removal of torrent control dams and the removal of bank protection. Within a view years, three dams have been partly removed, releasing 150.000 m³ of bed-load, which had been trapped in the centuries before.

While artificial barriers are built quickly, removal is time-consuming. Dams at the Hornbach had to be removed in several steps to make sure, that sediments trapped for centuries, are not released too fast. That is why it took almost 20 years before the final steps can be taken. This year the first of two remaining dams can be removed completely. The Hornbach will finally become a free-flowing stream again. Meanwhile gravel released from the removed sediment traps already reached river Lech and contributes to sediment balance. Restoration work is not limited to the tributaries. Meanwhile, a second LIFE project started (Dynamic River System Lech, 2016-2021). Within this project further bank-protections are removed to restore connected floodplains and natural river dynamic. Overall, the Lech in Tirol is one of the outstanding wild rivers left in the Alps.

Christian Hossli, Aqua Viva

Switzerland: Dam removal in Schöftland (removal of a small powerplant)

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The powerplant in Schöftland was a so called "water vortex powerplant". This is a special type of powerplant in which a lot people had very high expectations. Unfortunately, most of those promises couldn't be fulfilled, so it had to be removed again. We followed the removal live and will now have a look at the situation two years after the removal.

Johannes Schnell, Bavarian Fishery Association

Bavaria: We must clear the way, dam removal at Mitternacher Ohe

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Since 2013, Bavaria's Mitternacher Ohe is once again flowing freely and unhindered along its total length of around 17 km. With the removal of the Mitternach-Mühle hydropower plant by the Bavarian Fisheries Association (Landesfischereiverband Bayern), the last of what used to be three transverse structures disappeared. As a result, brook trout, huchen, lampreys and river pearl mussels can once again migrate freely. This project returned high-quality floodplain landscapes to the river, aligned with the conservation goals of the European NATURA 2000 biotope network. The loss of electrical power due to the decommissioning of the three hydropower plants is roughly equivalent to the output of a mid-range car. The complete passability of the river and the habitat improvement at the Mitternacher Ohe outweigh the lost contribution to climate protection and energy transition ecologically many times over.

Karolina Gurjazkaitė, Lithuanian Fund for Nature

Lithuania: Bražuolė: The first dam removal in Lithuania

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July 2020 was marked by a historic moment in Lithuania's environmentalism. That month the first artificial barrier was removed in Lithuania to restore river connectivity of the Bražuolė river. The presentation will outline the process of the river restoration, from the point of decision-making to the day of the barrier removal. The removal of Bražuolė weir has demonstrated that obsolete barriers can be easily demolished and deliver promising results regarding improved water and habitat quality. Removal of such barriers can contribute to achieving national and international environmental targets. The presenter will address the future of the barrier removal in Lithuania. This will be discussed in the context governmental authorities' plans for restoring Lithuania's rivers, also covering the challenges posed by public perception towards such removals.