10th INTERNATIONAL BEAVER SYMPOSIUM SCOTLAND 2025

Book of Abstracts

10th International Beaver Symposium
17th-19th September 2025
Inverness, Scotland

Symposium partners:

NatureScot NàdarAlba
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

UHI | INVERNESS

Symposium supporter:

Cairngorms National Park
Pàirc Nàiseanta a' Mhonaidh Ruaidh

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Contents

Introduction

The 10th International Beaver Symposium is being held at the University of the Highlands and Islands, Inverness. It will be the first in the UK, and the largest one to date, with 150 delegates anticipated from about 20 different countries across Europe and North America.

A substantial number of abstracts were submitted for the event, with a total co-authorship of over 550 beaver specialists. The abstracts for the posters, speed talks and oral talks are presented in this volume.

Partners

NatureScot NàdarAlba
Scotland's Nature Agency
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UHI | INVERNESS

Supporter

We are grateful for the support of the Cairngorms National Park Authority, in particular for their contribution to the Cairngorms excursion day.

Cairngorms National Park
Pàirc Nàiseanta a' Mhonaidh Ruaidh

Technical partner

We are also grateful to the Royal Zoological Society of Scotland for hosting delegates at the Highland Wildlife Park during the Cairngorms excursion day.

RZSS
THE WILDLIFE CONSERVATION CHARITY

Organising Team

- Martin Gaywood – University of the Highlands & Islands/NatureScot
- Roo Campbell – NatureScot
- Bernd Hänfling – University of the Highlands & Islands
- James Macarthur – University of the Highlands & Islands
- Monika Maleszka-Ritchie – University of the Highlands & Islands
- Gosia Pattison – University of the Highlands & Islands
- Paul Robertson – NatureScot

Scientific Committee

- Martin Gaywood – University of the Highlands & Islands/NatureScot, Scotland
- Roo Campbell – NatureScot, Scotland
- Glynnis Hood – University of Alberta, Canada
- Georgeta Ionescu – National Institute for Research and Development in Forestry, Romania
- Petri Nummi – University of Helsinki, Finland
- Helen Taylor – Royal Zoological Society of Scotland
- Nigel Willby – University of Stirling, Scotland

Conference Programme

Day 1

Wednesday 17th September

Conference day, UHI House, Inverness

Time	Title	Presenters and Chairs	Presentation
08:00	Registration and poster installation. Coffee/tea	-	-
08:45	Welcome presentations	Chair: Martin Gaywood	-
-	Martin Gaywood, UHI Inverness/NatureScot	-	-
-	Chris O'Neill, Chief Executive, UHI Inverness	-	-
-	Colin Galbraith, Chair, NatureScot	-	-
-	Glynnis Hood, University of Alberta	-	-

Time	Title	Presenters and Chairs	Presentation
-	**Session 1: Population status**	**Chair: Glynnis Hood**	-
09:30	Population and distribution of Eurasian beavers	Duncan Halley	F
09:45	The genetic legacy of the first successful reintroduction of a mammal to Britain: Founder events and attempted genetic rescue in Scotland's beaver population	Helen Taylor	F
10:00	Long term local and regional colonization patterns of European beavers in France	Laura Plichard	F
10:15	Genetic situation of the Beaver in France, Belgium and Luxembourg: Lessons for the species conservation?	Johan Michaux	S
10:18	First insights into the origin and distribution of the newly established beaver populations in Bulgaria via eDNA	Maria Kachamakova	S
10:21	Twin Cities Beaver Project: Population and distribution in the Mississippi National River and Recreational Area	Bridgette Timm	S

Time	Title	Presenters and Chairs	Presentation
10:24	Q&A for speed talks	-	-
10:35	Coffee/tea	-	-

Time	Title	Presenters and Chairs	Presentation
-	**Session 2: Behaviour, physiology, disease and long-term patterns**	**Chair: Roo Campbell**	-
11:15	Building like beavers: Stigmergic robotics for landscape design	Jordan Kennedy	F
11:30	A perpetual state of flux? Twenty years of vegetation dynamics in beaver wetlands and what they tell us	Nigel Willby	F
11:45	Harnessing machine learning for long-term monitoring of beaver dams in satellite imagery	Harris Sloan	F
12:00	Short and long-term effects of repeated capture and handling on territorial movement behaviour in Eurasian beavers	Rasmus Mohr Mortensen	F
12:15	Seasonal and daily variation in body temperature and heart rate of the Eurasian beaver	Martin Mayer	F
12:30	Are beavers a zoonotic risk? Assessing pathogens in Eurasian beavers (Castor fiber) and beaver wetlands	Lovisa Hökby	S
12:33	Disease prevalence in wild beavers (Castor fiber) in Britain	Romain Pizzi	S
12:36	20 years of rewilding: Beavers increase biodiversity at the landscape	Callum Dunleavy	S
12:39	What we learned from 20 years with beavers: An emotional, ecological and social testimony	Sophie Ramsay	S
12:42	Q&A for speed talks	-	-
12:55	Lunch and Posters	-	-

Time	Title	Presenters and Chairs	Presentation
-	**Session 3: Interspecific interactions and biodiversity impacts**	**Chair: Bernd Hänfling**	-
14:10	Beavers and wolves: Renewing an old relationship (key study from Central Europe)	Aleš Vorel	F
14:25	Interactions between Eurasian beaver (Castor fiber) and other riparian mammal species, along Olt river	Georgeta Ionescu	F
14:40	Moving right along: Wildlife use of beaver dams	Glynnis Hood	F
14:55	Beaver-felled trees as ecological hotspots for riparian mammals and birds	Adrian Zwolicki	F
15:10	A home for the many? Beaver lodges as hotspots for bird and mammal diversity	Hanna Kavli Lodberg-Holm	S
15:13	Interaction between the Eurasian beaver (Castor fiber) and the brown bear (Ursus arctos) in the marshy zone of the Prejmer Forest Protected Area (ROSCI0170), Romania	Ramon Jurj	S
15:16	How do wolves and humans shape beaver spatial behaviour and ecosystem impacts in Białowieża Primeval Forest?	Tom A. Diserens	S
15:19	Spatio-temporal trends in vertebrate biodiversity following a beaver (Castor fiber) reintroduction in Cheshire, UK	Lucia Galvez-Bravo	S
15:22	Evaluating biodiversity impacts of beavers on invertebrate and vertebrate communities using environmental DNA	Tom Spencer	S
15:25	Are beavers making a mess of scenic landscapes? Beaver reintroductions and contested landscape aesthetics.	Flurina Wartmann	S
15:28	Q&A for speed talks	-	-
15:40	Coffee/tea	-	-

Time	Title	Presenters and Chairs	Presentation
-	**Session 4: Biodiversity and ecosystem effects, coexistence**	**Chair: Nigel Willby**	-
16:10	Beavers (Castor spp.) as a tool to enhance biodiversity across multiple taxa	Wenfei Liao	F
16:25	Transforming landscapes through rewilding: Beavers enhance biodiversity and ecosystem function	Alan Law	F
16:40	Monitoring beaver impacts on habitats and species to inform delivery of mitigation	Jonathan Willet	F
16:55	A national scale floodplain model revealing channel gradient as a key determinant of beaver dam occurrence and inundation potential can anticipate land-use based opportunities and conflicts for river restoration	Matthew Dennis	S
16:58	Managing beavers at the watershed level: Combining riparian habitat connectivity, potential beaver population, beaver recovery zones and intuitive GIS/GPS field data collection	Kurt Menke	S
17:01	Incorporating human-beaver conflict potential into urban beaver restoration models	Martha Denton	S
17:04	Beaver burrowing activity along the River Isla in Scotland	Roo Campbell	S
17:07	Developing a new mapping tool to assess beaver impacts: The Beaver Impact Assessment Toolkit (BIAT)	Heather White	S
17:10	Q&A for speed talks	-	-

Time	Title	Presenters and Chairs	Presentation
17:30	Poster session + Evening reception + Musical performance by Mhairi Hall at UHI House	-	-
20:00	End + Free time	-	-

F Full presentation S Speed presentation

Day 2

Thursday 18th September

Excursion day, Cairngorms National Park

08:00-08:30
Meet at UHI House, Inverness
Pick up packed lunches, board coaches

08:30-17:45
Delegates taken to three sites in the Cairngorms National Park where there will be opportunities to see and discuss beaver reintroduction projects and wider nature restoration work. This will include a visit to the Highland Wildlife Park where a range of species conservation breeding programmes are underway in support of nature restoration projects

17:45-19:00
Delegates taken to Drumossie Hotel, Inverness – Free time

19:00-23:00
Conference dinner and ceilidh at Drumossie Hotel, Inverness

23:00
Transport available to Inverness city centre + Free time

Day 3

Friday 19th September

Conference day, UHI House, Inverness

Time	Title	Presenters and Chairs	Presentation
08:15	Coffee/tea	-	-

Time	Title	Presenters and Chairs	Presentation
-	**Session 5: Ecosystem services**	**Chair: Richard Brazier**	-
09:00	Beaver-driven wildfire resistance: Generalizability, mechanisms, and predictability	Emily Fairfax	F
09:15	Mapping beaver contributions to ecosystem services priorities across sectors and scales	Collin VanBuren	F
09:30	Pond-ering carbon: The storage of sediment and carbon by beavers	Emily Simpson	F
09:45	Under pressure: Quantifying the hydraulic stability of beaver dams	Cherie Westbrook	F
10:00	Busy beaver capture carbon? The role of beaver-engineered wetlands in enhancing soil carbon sequestration	Annegret Larsen	F
10:15	Beavers banking on carbon: Drivers of carbon storage across annual and decadal scales in a Swiss beaver wetland	Annegret Larsen	S
10:18	Beaver wetlands mediate diffuse water pollution in agriculturally dominated catchments	Gareth Bradbury	S
10:21	The influence of the age and geomorphic type of beaver ponds on stream water chemistry	Joanna Wąs	S
10:24	Leveraging hyperspectral data to model carbon storage in North American beaver (Castor canadensis) influenced watersheds of the Laurentian Forest Province	Bob Boucher	S
10:27	Assessing the spatial dependence of aboveground biomass in relation to beaver dam disturbance in a montane fen	Nichole-Lynn Stoll	S
10:30	Q&A for speed talks	-	-

Time	Title	Presenters and Chairs	Presentation
10:40	Coffee/tea	-	-

Time	Title	Presenters and Chairs	Presentation
-	**Session 6: Beaver-fish interactions and coexistence**	**Chair: Helen Taylor**	-
11:15	Influences of beavers (Castor fiber) on the spawning dynamics of trout (Salmo trutta) in the North German lowlands – Part 1: Evaluation of spawning dynamics based on abiotic factors and habitat conditions	Felix Krause	F
11:30	Influences of beavers (Castor fiber) on the spawning dynamics of trout (Salmo trutta) in the North German lowlands - Part 2: Migratory behaviour of sea trout (Salmo trutta trutta) at beaver dams	Torsten Ode	F
11:45	The impact of reintroduced Eurasian beaver (Castor fiber) dams on the upstream movement of brown trout (Salmo trutta) in upland areas of Great Britain	Robert Needham	F
12:00	Behaviour of fishes at beaver dams - Investigations with PIT tags	Thomas Kreienbuhl	F
12:15	Catchment-scale eDNA sampling reveals effects of beaver recolonization on the distribution of migratory fish	James Macarthur	F
12:30	Keeping The Netherland dry, part 2	Vilmar Dijkstra	S
12:33	A dam good network: Creating the International Beaver Knowledge Hub	Elze Polman	S
12:36	A mitigation resource for the engineering community	Elly Andison	S
12:39	Working with Beavers in Alberta, Canada: beneficial management practices for beaver coexistence	Holly Kinas	S
12:42	Stakeholder engagement and knowledge sharing in England	Jake Chant	S
12:45	Q&A for speed talks	-	-

Time	Title	Presenters and Chairs	Presentation
12:55	Lunch and Posters	-	-

Time	Title	Presenters and Chairs	Presentation
-	**Session 7: Changing populations and coexistence**	**Chair: Georgeta Ionescu**	-
14:00	Arctic Beaver Observation Network and the future of lowland tundra ecosystems	Ken D. Tape	F
14:15	Impacts of North American beaver (Castor canadensis) range expansion in the Inuvialuit Settlement Region	Helen Wheeler	F
14:30	Modelling habitat suitability and carrying capacity for European beaver (Castor fiber) in a highly modified lowland landscape	Ronald de Jong	F
14:45	Survival of wild beavers (Castor fiber) translocated for human-wildlife conflict mitigation in Britain	Roisin Campbell-Palmer	F
15:00	Methodological insights into non-invasive and invasive sampling for population genetics of reintroduced Castor fiber	Elena Ciocirlan	S
15:03	“Gnawing concerns are not going away” - a media analysis of beaver reintroductions to the Scottish Cairngorms National Park	Barnaby Fogg	S
15:06	Local people’s attitudes towards beavers in the Western Carpathians - what drives peaceful relations?	Joanna Wąs	S
15:09	Beavers over concrete! Creating space for nonhuman others	Lukas Tobias Knoflach	S
15:12	Lawyers, guns and money: Helping beavers with sticks and carrots?	Jakob Shockey	S
15:15	Q&A for speed talks	-	-
15:30	Coffee/tea	-	-

Time	Title	Presenters and Chairs	Presentation
-	**Session 8**	**Chair: Martin Gaywood**	-
16:00	Where next for the International Beaver Symposium? Discussion session	Martin Gaywood	-
16:20	Student prize giving	Glynnis Hood	-
16:30	Closing remarks	Bernd Hänfling	-
16:35	End	-	-

F Full presentation S Speed presentation

List of Presenters

List of Presenters

A list of presenters and their presentations are provided below, divided as follows:

- oral presentations
- speed talk presentations
- poster presentations

Names are given in first name alphabetic order. A small number of presenters are giving more than one presentation.

Email addresses are provided unless the individuals concerned did not give permission. Note that those presenters marked with an asterisk* are not the first authors in the relevant abstract.

Oral presentations

Adrian Zwolicki
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- University of Gdańsk
- Poland
- Beaver-felled trees as ecological hotspots for riparian mammals and birds

Alan Law
alan.law1@stir.ac.uk
- University of Stirling
- Scotland
- Transforming landscapes through rewilding: Beavers enhance biodiversity and ecosystem function

Aleš Vorel
vorel@fzp.czu.cz
- CZU Czech University of Life Sciences Prague
- Czech Republic
- Beavers and wolves: Renewing an old relationship (key study from Central Europe)

Annegret Larsen
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- Wageningen University and Research
- Netherlands
- Busy beaver capture carbon? The role of beaver-engineered wetlands in enhancing soil carbon sequestration

Cherie Westbrook
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- University of Saskatchewan
- Canada
- Under pressure: Quantifying the hydraulic stability of beaver dams

Collin VanBuren
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- Virginia Museum of Natural History
- USA
- Mapping beaver contributions to ecosystem services priorities across sectors and scales

Duncan Halley
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- Norwegian Institute for Nature Research
- Norway
- Population and distribution of Eurasian beavers

Emily Fairfax
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- University of Minnesota
- USA
- Beaver-driven wildfire resistance: Generalizability, mechanisms, and predictability

Emily Simpson
emily.simpson@stir.ac.uk
- University of Stirling
- Scotland
- Pond-ering carbon: The storage of sediment and carbon by beavers

Felix Krause
biogeografische-erfassungen@hotmail.com
- University of Applied Sciences Neubrandenburg
- Germany
- Influences of beavers (Castor fiber) on the spawning dynamics of trout (Salmo trutta) in the North German lowlands – Part 1: Evaluation of spawning dynamics based on abiotic factors and habitat conditions

Georgeta Ionescu
titi@icaswildlife.ro
- National Institute for Research and Development in Forestry “Marin Drăcea
- Romania
- Interactions between Eurasian beaver (Castor fiber) and other riparian mammal species, along Olt river

Glynnis A. Hood
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- University of Alberta
- Canada
- Moving right along: Wildlife use of beaver dams

Harris Sloan
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- University of Montana
- USA
- Harnessing machine learning for long-term monitoring of beaver dams in satellite imagery

Helen Taylor
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- Royal Zoological Society of Scotland
- Scotland
- The genetic legacy of the first successful reintroduction of a mammal to Britain: Founder events and attempted genetic rescue in Scotland's beaver population

Helen Wheeler
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- Anglia Ruskin University
- England
- Impacts of North American beaver (Castor canadensis) range expansion in the Inuvialuit Settlement Region

James Macarthur
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- University of the Highlands and Islands
- Scotland
- Catchment-scale eDNA sampling reveals effects of beaver recolonization on the distribution of migratory fish

Jonathan Willet
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- Cairngorms National Park Authority
- Scotland
- Monitoring beaver impacts on habitats and species to inform delivery of mitigation

Jordan Kennedy
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- Harvard University Graduate School of Design
- USA
- Building like beavers: Stigmergic robotics for landscape design

Ken D. Tape
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- University of Alaska Fairbanks
- USA
- Arctic Beaver Observation Network and the future of lowland tundra ecosystems

Laura Plichard
- Institut National de Recherche pour l'Agriculture, l'alimentation et l'Environnement (INRAE)
- France
- Long term local and regional colonization patterns of European beavers in France

Martin Mayer
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- University of Inland Norway
- Norway
- Seasonal and daily variation in body temperature and heart rate of the Eurasian beaver

Nigel Willby
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- University of Stirling
- Scotland
- A perpetual state of flux? Twenty years of vegetation dynamics in beaver wetlands and what they tell us

Rasmus Mohr Mortensen
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- Aarhus University
- Denmark
- Short and long-term effects of repeated capture and handling on territorial movement behaviour in Eurasian beavers

Robert Needham
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- University of Southampton/Beaver Trust
- England
- The impact of reintroduced Eurasian beaver (Castor fiber) dams on the upstream movement of brown trout (Salmo trutta) in upland areas of Great Britain

Roisin Campbell-Palmer
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- Beaver Trust
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- Survival of wild beavers (Castor fiber) translocated for human-wildlife conflict mitigation in Britain

***Ronald de Jong**
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- Altenburg & Wymenga Ecological Research LLC
- Netherlands
- Modelling habitat suitability and carrying capacity for European beaver (Castor fiber) in a highly modified lowland landscape

Thomas Kreienbuhl
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- Switzerland
- Behaviour of fishes at beaver dams - Investigations with PIT tags

Torsten Ode
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- Natura et Cultura - office for environmental planning and environmental education
- Germany
- Influences of beavers (Castor fiber) on the spawning dynamics of trout (Salmo trutta) in the North German lowlands - Part 2: Migratory behaviour of sea trout (Salmo trutta trutta) at beaver dams

Wenfei Liao
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- Finland
- Beavers (Castor spp.) as a tool to enhance biodiversity across multiple taxa

Speed talk presentations

*Annegret Larsen
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- Netherlands
- Beavers influence dissolved organic carbon water content by altering stream hydrology and aquatic primary producers abundance

Barnaby Fogg
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- “Gnawing concerns are not going away” - a media analysis of beaver reintroductions to the Scottish Cairngorms National Park

*Bob Boucher
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- Superior Bio Conservancy
- Canada
- Leveraging hyperspectral data to model carbon storage in North American beaver (Castor canadensis) influenced watersheds of the Laurentian Forest Province

Bridgette Timm
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- University of Minnesota
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- Twin Cities Beaver Project: Population and distribution in the Mississippi National River and Recreational Area

Callum Dunleavy
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- 20 years of rewilding: Beavers increase biodiversity at the landscape

*Elena Ciocirlan
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- Institute for Research and Development in Forestry Marin Dracea + Transilvania University
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- Methodological insights into non-invasive and invasive sampling for population genetics of reintroduced Castor fiber

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- A mitigation resource for the engineering community

***Elze Polman**
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- Dutch Mammal Society
- Netherlands
- A dam good network: Creating the International Beaver Knowledge Hub

Flurina Wartmann
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- Scotland
- Are beavers making a mess of scenic landscapes? Beaver reintroductions and contested landscape aesthetics.

Gareth Bradbury
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- England
- Beaver wetlands mediate diffuse water pollution in agriculturally dominated catchments

Hanna Kavli Lodberg-Holm
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- A home for the many? Beaver lodges as hotspots for bird and mammal diversity

Heather White
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- Developing a new mapping tool to assess beaver impacts: The Beaver Impact Assessment Toolkit (BIAT)

Holly Kinas
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- Working with Beavers in Alberta, Canada: beneficial management practices for beaver coexistence

Jake Chant
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- Stakeholder engagement and knowledge sharing in England

Jakob Shockey
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- Lawyers, guns and money: Helping beavers with sticks and carrots?

Joanna Wąs
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- Local people's attitudes towards beavers in the Western Carpathians - what drives peaceful relations?

Joanna Wąs
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- The influence of the age and geomorphic type of beaver ponds on stream water chemistry

Johan Michaux
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- Liège university - GECOLAB
- Belgium
- Genetic situation of the Beaver in France, Belgium and Luxembourg: Lessons for the species conservation?

Kurt Menke
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- Managing beavers at the watershed level: Combining riparian habitat connectivity, potential beaver population, beaver recovery zones and intuitive GIS/GPS field data collection

Lovisa Hökby
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- Are beavers a zoonotic risk? Assessing pathogens in Eurasian beavers (Castor fiber) and beaver wetlands

Lucia Galvez-Bravo
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- England
- Spatio-temporal trends in vertebrate biodiversity following a beaver (Castor fiber) reintroduction in Cheshire, UK

Lukas Tobias Knoflach
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- Beavers over concrete! Creating space for nonhuman others

Maria Kachamakova
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- Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences
- Bulgaria
- First insights into the origin and distribution of the newly established beaver populations in Bulgaria via eDNA

Martha Denton
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- USA
- Incorporating human-beaver conflict potential into urban beaver restoration models

Matthew Dennis
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- University of Helsinki
- Finland
- A national scale floodplain model revealing channel gradient as a key determinant of beaver dam occurrence and inundation potential can anticipate land-use based opportunities and conflicts for river restoration

Nichole-Lynn Stoll
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- University of Saskatchewan
- Canada
- Assessing the spatial dependence of aboveground biomass in relation to beaver dam disturbance in a montane fen

Ramon Jurj
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- National Institute for Research and Development in Forestry “Marin Drăcea”
- Romania
- Interaction between the eurasian beaver (Castor fiber) and the brown bear (Ursus arctos) in the marshy zone of the Prejmer Forest Protected Area (ROSCI0170), Romania

Romain Pizzi
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- Disease prevalence in wild beavers (Castor fiber) in Britain

Roo Campbell
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- Scotland
- Beaver burrowing activity along the River Isla in Scotland

Sophie Ramsay
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- What we learned from 20 years with beavers: An emotional, ecological and social testimony

Tom A. Diserens
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- Polish Academy of Sciences
- Poland
- How do wolves and humans shape beaver spatial behaviour and ecosystem impacts in Białowieża Primeval Forest?

Tom Spencer
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- University of Hull
- England
- Evaluating biodiversity impacts of beavers on invertebrate and vertebrate communities using environmental DNA

Vilmar Dijkstra
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- Dutch Mammal Society
- Netherlands
- Keeping The Netherland dry, part 2

Poster presentations

Alan Puttock
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- England
- Making space for water: Nature-based solutions with beavers

Alex Adams
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- University of Stirling
- Scotland
- Birds, bats, beavers, and bioacoustics: Listening to biodiversity in beaver-engineered wetlands

Alexa Whipple
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- Methow Okanogan Beaver Project
- USA
- It's complex: Modernizing beaver management and policy requires managing for complexity, creativity, connectivity and collaboration

Alice Turner
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- University of Stirling
- Scotland
- How do beavers respond to anthropogenic pressures?

Alyssa Connaughton
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- University of Minnesota
- USA
- Beavers and phenology: A case study in the Kenai National Wildlife Refuge, Alaska

***Annegret Larsen**
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- Wageningen University and Research
- Netherlands
- Beavers banking on carbon: Drivers of carbon storage across annual and decadal scales in a Swiss beaver wetland

Annett Schumacher
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- Arbeitskreis Biberschutz Sachsen-Anhalt
- Germany
- Utilisation of wildlife rescue hills by Eurasian beaver (Castor fiber) with regard to its management in floodplains

Basile Marteau
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- University of Helsinki
- Finland
- The role of beaver floods, vernal pools and aquatic invertebrates in supporting waterfowl breeding success

Ben Morris
ben@beavertrust.org
- Beaver Trust
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- Beavers on the down-low: Monitoring and managing beavers and their effects on floodplain habitats

Brigitte Komposch
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- Austria
- A new method for large-scale population estimation of the Eurasian beaver (Castor fiber)

Britt van Zelst
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- Netherlands
- Beavers in your backyard: Social-ecological dynamics of beavers in anthropogenic landscapes

Cath Bashforth
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- England
- Cropton Beaver Enclosure, North Yorkshire – The results of 5 years of hydrological and biodiversity monitoring of an enclosed population of Eurasian beavers (Castor fiber)

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- Water quality monitoring using citizen science on beaver river reaches in Switzerland

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- Beaver mimicry for drought and fire resilience: Accelerating implementation through science and policy collaboration

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- Modelling future beaver distribution in Flanders

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- A technical guide for protective measures for river banks, dikes and dams against beavers (Castor fiber) and other burrowing animals

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- Approach to diagnostic imaging and complementary post-mortem examinations as part of the Eurasian beaver (Castor fiber) NatureScot monitoring scheme

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- Extreme modifications caused by beavers in high-altitude riparian habitats in the Ciuc lowland area, eastern Transylvania

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- Benthic macroinvertebrate communities and food webs of beaver-impounded streams in the eastern Canadian Arctic

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- Variation of opinions on beaver reintroduction across the US and EU

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- Beaver-inspired solutions for stream restoration and climate resilience in America's Great Plains

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- Beavers, burrows and dikes; Understanding beaver behaviour in fluctuating lowland water systems with telemetry

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- Exploring fish colonization of newly constructed beaver (Castor spp.) channels, in Hatchmere, Cheshire, UK

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- Beaver foraging patterns related to moose density and habitat composition in a boreal landscape

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- Improving multi-stakeholder recording of - and access to - Eurasian beaver (Castor fiber) records in Britain, to enhance and inform beaver conservation activities

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- The lived experience of rewilding: Exploring perspectives on coexistence with the European beaver (Castor fiber) in the Netherlands

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- Winds of change - Do we truly need to introduce population control?

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- Perceptions of Eurasian beavers (Castor fiber) living wild in Wales: Results of a nationwide public survey

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- Learning to live with reintroduced species: Beaver Management Groups are an adaptive process

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- A boost in biodiversity through the dam-building activity of beavers on the Swiss Plateau

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- A boost in biodiversity through Beaver Dam Analogs (BDAs) on the Swiss Plateau

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- Beavers are boosting biodiversity - what has happened since the 6th IBS?

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- Monitor the evolution of the European beaver (Castor fiber) distribution in France: Methods, tools and results

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The Abstracts

The abstracts are listed in order of the lead author's surname. Note that in a few cases one of the co-authors, rather than the lead author, will be presenting at the symposium.

The Abstracts

Title:

Birds, bats, beavers, and bioacoustics: listening to biodiversity in beaver-engineered wetlands.

Author name(s):

Alex Adams[1], Alan Law[1], Elisa Fuentes-Montemayor[1], Aileen Mill[2], Nigel Willby[1]

Organisation name(s):

[1]University of Stirling, [2]Newcastle University

Abstract:

Beavers returned to Scotland over 20 years ago and have been exerting their "ecosystem engineering" influence ever since, increasing habitat heterogeneity and boosting biodiversity. However, the challenges of long-term, continuous monitoring mean that knowledge of species' seasonal use of beaver-modified habitat is limited, and there remain gaps in our understanding due to the difficulty of detecting certain species. This study used acoustic techniques to investigate the effects of beaver engineering on biodiversity in ponds and surrounding terrestrial habitat. Autonomous recording units were deployed at 5 beaver-created ponds and 5 non-beaver influenced ponds in eastern Scotland for 12 months. The recordings were then analysed using automatic classification software to detect and identify bird and bat species. Species richness at beaver and non-beaver ponds was similar, with 7 bat species/groups detected at both, and no significant difference in the composition of the bat communities recorded at each of the two types of pond. In total, 109 bird species were recorded, 93.6% of which were present at both pond types. Only Acanthis cabaret, Plectrophenax nivalis, and Podiceps cristatus were unique to beaver ponds, while *Larus canus, L. fuscus*, Oenanthe *oenanthe*, and Passer *domesticus* were only detected at non-beaver ponds. However, although there is overlap, the bird community compositions surrounding the two pond types differed significantly. These results indicate that beaver-engineered wetlands can, in many respects, provide similar resources to comparable un-engineered freshwater habitats, but that alongside non-beaver ponds, they have a complementary effect on biodiversity at a landscape scale.

Title:

Evaluating beaver translocation methods and measures of success in North America and Europe.

Author name(s):

Molly Alves[1,2], Julie Young[1], Emily Fairfax[3]

Organisation name(s):

[1]Utah State University, [2]California Department of Fish and Wildlife, [3]University of Minnesota

Abstract:

Beavers were harvested to near extinction across their entire range in the northern hemisphere of the globe. Recognizing their value as an ecosystem engineer and keystone species, capable of restoring hydrologic processes and protecting landscapes from wildfire and flooding has encouraged their natural and facilitated return and protection. We surveyed beaver translocators across the globe and the methodologies they used in their programs and how that translates to various definitions of success. We hope this research will enable us to provide recommendations for best management practices for translocation on a regional scale for standardization of monitoring across geographically similar beaver translocation programs. The results of this research are already contributing to improved methods and geographic expansion of the new California Beaver Restoration Program.

Title:

A mitigation resource for the engineering community in the UK.

Author name(s):

Elly Andison[1], Krzysztof Dabrowski[1], Atkins Realis[2]

Organisation name(s):

[1]Environment Agency, [2]Atkins Realis

Abstract:

There are many techniques for responding to the activity of beavers. A huge amount of expertise and knowledge exists in the beaver community across the globe and various guides and documents are available to support practitioners. However, detailed information for engineers, on the design, build, inspection, and maintenance of assets, is spread across various documents, presentations and posters. The Environment Agency, a regulator, advisor and operator in the water environment, is working with Atkins Realis and others to collate information that will support the engineering community to develop best practice ways of working across the life cycle of an infrastructure asset with beavers in mind. The resource aims to be a 'go to' location in Britain, complementing materials online here and abroad. The objective is to build on existing knowledge of beaver experts and engineers, creating a resource that guides decision making, promoting engineered solutions when they are needed, that are appropriate proportionate and effective. Beaver activities and their contribution to flood risk reduction could, over time, reduce the density and scale of flood risk assets. There are also significant challenges, and our objective is to equip infrastructure engineers, now, with the information they need to work alongside another very capable engineering species, whilst continuing to respect and enhance our river systems.

Title:

Seizing the opportunity: Transitioning from damage-centred management to integrating beavers into Swiss conservation programs for maximizing ecosystem services.

Author name(s):

Christof Angst[1], Cécile Auberson[1]

Organisation name(s):

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Abstract:

Since its reintroduction and increasingly conspicuous presence in various landscapes, the beaver has evolved from being classified as a “threatened and nationally protected species” to being regarded as a “conflictual animal, requiring management.” A growing body of scientific evidence supports the ecological advantages of beavers, including their positive contributions to biodiversity enhancement, improvements in water quantity and quality or carbon sequestration. This accumulating knowledge provides a robust foundation to advocate for a paradigm shift - one where beavers are seen not merely as destructive rodents but as key agents in the restoration of riverine and riparian habitats. In Switzerland, this shift is underway, exemplified by the establishment of a federal program that allocates funding for the creation of beaver-managed reserves, where forests can be shaped and flooded by beavers. However, challenges remain in promoting broader societal acceptance of the beaver’s role, particularly in agricultural landscapes and urban areas. While several strategies are being explored, more work is needed to facilitate a wider understanding of the beaver’s ecological impact. Moreover, the potential for leveraging beaver activities for large-scale river restoration has yet to be fully realized. As research progresses and societal attitudes evolve, it is imperative to continue developing tools that allow for the effective integration of beavers into habitat restoration initiatives, ensuring that the benefits of their presence are maximized across diverse ecosystems. This ongoing transition holds significant promise for a peaceful coexistence with beaver, one in which both can thrive in a balanced and sustainable environment. To be continued.

Title:

Water quality monitoring using citizen science on beaver river reaches in Switzerland.

Author name(s):

Cécile Auberson[1], Christof Angst[1], Kaspar Berger[2], Natalie Ceperley[2], Raphael d'Epagnier[2], Christopher Robinson[3], Bettina Schaefli[2], Joshua Larsen[4], and Annegret Larsen[5]

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Abstract:

This study assessed the impact of beaver systems on nitrate and dissolved organic carbon (DOC) concentrations in Swiss low-order streams, focusing on spatial and seasonal variability. Water samples were taken in a citizen science project with volunteers during the national beaver monitoring. Here, we describe how, and how-not to involve volunteers into field monitoring including water sampling. For example, volunteers experienced challenges managing multiple tasks, including water sampling. Additionally, logistical difficulties arose in the shipment of cooled water samples to the analytical laboratories. Nitrate and DOC contents were measured upstream and downstream of 164 beaver systems across Switzerland during winter and summer 2022. Despite considerable variability, the data revealed a trend: nitrate concentrations generally decreased, while DOC levels increased, with the most pronounced increase occurring in summer. We also found that no single characteristic of beaver systems, such as dam size, slope, or water volume, explained the extent of nitrate removal or DOC gain. However, land-use analysis of areas surrounding the beaver dams showed that the proportion of wetlands in buffer zones influenced nutrient changes. Wetlands, which create anaerobic conditions and support dense vegetation, reduced nitrate levels and increased DOC concentrations due to enhanced ecosystem productivity. The findings suggest that beaver systems improve water quality mainly by creating wetlands through damming and raising water levels, rather than by specific physical features. In landscapes with low river gradients and wide floodplains, beavers enhance water quality by promoting wetland development, which reduces nitrate and increases DOC concentrations.

Title:

Population size estimation of the Eurasian Beaver using GPS telemetry in nature park Kopački Rit, the largest inland Danube delta.

Author name(s):

Marko Augustinović[1], Monika Petković[1], Vedran Slijepčević[2], Duško Ćirović[3]

Organisation name(s):

[1]Oikon Ltd. – Institute of Applied Ecology, [2]Karlovac University of Applied Sciences, [3]Faculty of Biology, University of Belgrade

Abstract:

Kopački Rit is a floodplain where the Drava meets the Danube. It is a valuable natural area, internationally recognized but now threatened by human interventions, such as altering the Danube's course, climate change, lower water levels in the Danube and the Drava, and soil sedimentation and elevation. Furthermore, in recent years the floods that are a defining feature of this area have failed to occur, endangering many species, especially birds. As part of the Naturavita project, one objective is to prepare a study on the revitalization of water ecosystems in the floodplain area of Kopački Rit Nature Park. Research covered various plant and animal species, focusing particularly on beavers. The goal was to estimate the local beaver population using telemetry data, and to understand beaver behaviour during the multi-month flood season. Beavers were captured using nets and cage traps, and six individuals were equipped with GPS devices attached to their fur by glue. Data collected via telemetry were analyzed with two approaches, yielding estimates of 61 to 83 beaver families or about 216 to 430 individual beavers which indicates a dense population. Unfortunately, during the study period, the usual flood season did not occur, and we were unable to determine what happens to beavers during high water and flooding. This leaves an opportunity for a future project and further research.

Title:

Perceptions of Eurasian beavers (*Castor fiber*) living wild in Wales: Results of a nationwide public survey.

Author name(s):

Roger E Auster[1], Kirsty Frith[1], Stewart Barr[1], Richard Brazier[1]

Organisation name(s):

[1]University of Exeter

Abstract:

North Wales Wildlife Trust (NWWT) are working towards re-establishing beavers in Wales. Beavers are not yet legally considered 'resident', and there are no licensed wild beaver populations. There are, however, a small number of beaver enclosures and reports of small populations of beavers living wild in some areas. Welsh Government announced in 2024 that it '*supports moving towards the managed reintroduction of European beavers*'. Prior to this, NWWT commissioned the University of Exeter to independently undertake a nationwide survey of attitudes to beavers living wild in Wales. Public surveys provide a useful overview of attitudes where a possible release location encompasses a large area, and this survey was an opportunity for an overview of resident views throughout Wales. Surveys nonetheless have limitations and should not be relied upon in isolation within social feasibility work. As such, this is one piece of evidence within a wider body of engagement work being led by NWWT. This poster presents a subset of results (n = 3783) and key analytical recommendations made in response to the findings. The results were reflective of prior surveys undertaken in Britain, indicating broad public support but with observable polarisation in viewpoints. Continuing to consider the future of beavers in Wales as a binary 'yes or no' decision risks escalating existing social tensions, regardless of which way the decision lands. We hence recommend there is active effort to incorporate multiple, diverse perspectives through a collaborative decision-making process, towards a strategic approach and management framework for beavers in Wales.

Title:

Learning to live with reintroduced species: Beaver Management Groups are an adaptive process.

Author name(s):

Roger E Auster[1], Alan Puttock[1], Stewart Barr[1], Richard Brazier[1]

Organisation name(s):

[1]University of Exeter

Abstract:

In February 2025, UK Government expressed support for wild beaver reintroduction in England. Where beavers are reintroduced or where they naturally disperse into new catchments, the people living there today may not be familiar with the species or how to live with them, yet will need to learn to live alongside beavers in a process of 'renewed coexistence'. Within national approaches to beaver reintroduction and management, Beaver Management Groups (BMGs) play a role in engaging with local communities' stakeholders, familiarising them with beavers, and facilitating coexistence. Prior to the announcement, Natural England commissioned the University of Exeter to capture lessons from the governance of two existing BMGs operating in the catchments of the River Otter and River Tamar, in south-west England. The findings sought to inform BMGs being established elsewhere are available in Restoration Ecology and the associated Natural England report. The findings demonstrated that BMGs are an adaptive process, and not fixed structures. They consist of three stages and are influenced by the national policy context and resource availability. BMGs may play a front-line role as beavers are reintroduced and disperse into new catchments but are resource intensive. As beavers and management options become more familiar, the role or remit of BMGs could be scaled back over time and integrated within existing management structures, bodies, or organisations. There will need to be flexibility in policy to enable adaptability and facilitate coexistence in the longer term.

Title:

Ghosts of beavers past - insights from sedimentary ancient DNA.

Author name(s):

D. Nevé Baker[1,2], Darren Larsen[3], Paula Noble[4], Beth Shapiro[5,6], Emily Fairfax[1]

Organisation name(s):

[1]University of Minnesota, [2]Smithsonian National Zoo and Conservation Biology Institute, [3]Occidental College, [4]University of Nevada Reno, [5]Colossal Biosciences, [6]University of California Santa Cruz

Abstract:

Prior to near extirpation by the fur trade, beavers were abundant across North America: felling trees, damming creeks, and digging canals in nearly every ecosystem across the continent for at least seven million years. Today, beaver reintroduction is a promising strategy for ecological restoration, yet little is known about how beavers were spatially and temporally distributed in the past, and how their engineering may have helped shape our landscapes. Here we present an overview of our efforts to characterize the last ten thousand years of North American beaver dynamics and vegetation response using ancient DNA isolated from lake sediments (sedaDNA). In the first phase of this project, focused on Grand Teton National Park, Wyoming, we demonstrate that sedaDNA is an effective and sensitive tool for documenting fine-scale patterns of beaver presence over time. Furthermore, our results indicate complex interactions between climate, beavers, and plant communities and at least five thousand years of continuous presence of this ecosystem engineer at the watershed scale. We also present initial results of ongoing efforts to expand the geographic scope of this research to other regions - including California and the Alaskan Arctic - testing the hypothesis that historical beaver presence is locally dynamic, controlled by regional climate, and modulates the local ecological community and impact of wildfire and other disturbances. Assessing these different regions together, we can infer larger-scale patterns of beaver engineering and landscape response throughout the Holocene and apply these insights to help maximize the long-term success of ongoing restoration efforts.

Title:

Cropton Beaver Enclosure, North Yorkshire – the results of 5 years of hydrological and biodiversity monitoring of an enclosed population of Eurasian beavers.

Author name(s):

Cath Bashforth[1], Nicholas Gibbons, Alan Puttock[2], Mark Smith[3], Megan Klaar[3], Tom Spencer[4], Ambroise Baker[5]

Organisation name(s):

Forestry England[1], University of Exeter[2], University of Leeds[3], University of Hull[4], Teesside University[5]

Abstract:

In April 2019, two beavers were released into a 10ha enclosure in Cropton Forest, North Yorkshire as a 5-year trial licensed by Natural England. The main aims of the project were to assess the impact of the beavers on the movement of water through the site and their interaction with man-made wooden structures put in as part of a DEFRA funded 'Slowing the Flow project'. Beavers' impact on water quality and biodiversity was also studied throughout the trial. The research was done in partnership with several academic institutes and volunteer species specialists. Results of the hydrological monitoring research showed that, in combination with pre-existing infrastructure at the site, beavers are increasing water storage, attenuating downstream flow regimes and trapping large volumes of sediment. Wildlife monitoring also had positive results. Spawn counts were conducted to estimate amphibian populations. Before the arrival of beavers, six clumps of spawn were recorded. By year 5, the number of spawn clumps had become too numerous to count, and their distribution had expanded across the site. Additionally, bat monitoring included bat box checks, site transects and static acoustic monitors. Results showed an increase in bat activity which can be directly linked to beaver activity. Next, Longworth trapping of small mammals was undertaken across the site and there was an increase in numbers and species. We also used trail cameras to monitor otter activity and identified an increased number of clips each year. Finally, damselfly and dragonflies, monitored by volunteers, increased in numbers and species throughout the five years of the trial.

Title:

Beaver wetlands mediate diffuse water pollution in agriculturally dominated catchments.

Author name(s):

Gareth Bradbury[1], Alan Puttock[1], Gemma Coxon[2], Stewart Clarke[3], Richard E Brazier[1]

Organisation name(s):

[1]University of Exeter, [2]University of Bristol, [3]National Trust

Abstract:

After an absence of 400 years, Eurasian beavers (*Castor fiber*) are returning to landscapes across Britain, through increasing reintroduction and subsequent natural recolonisation. These landscapes are predominantly agriculture-dominated and often suffer from nutrient pollution diffusely entering watercourses from fields. Beaver wetlands, created by damming of smaller tributaries, have the potential to improve river water quality through the settling of solids and uptake and cycling of excess nutrients. By contrast there are periodic releases of solids and nutrients from these wetlands due to storm flows, burrow and canal excavations, dam breaches and nutrient inputs from beavers themselves or the diverse biota their wetlands support. The balance of processes determines potential water treatment effects which is reflected by great variation in results between previously published studies. To examine the drivers of variation of beaver wetland effects on the transfer of sediments and nutrients in catchments, we undertook pond sonar surveys and water and sediment sampling at three beaver reintroduction sites in south-west England over two years. Sediment and nutrient storage in beaver ponds was controlled principally by hydrology and secondly by the relative position of ponds in the beaver dam cascade. These cascades reduced suspended solids and nutrients where inflow concentrations were high and acted as slight sources where inflow concentrations were low. The source-sink dynamics and drivers of storage and cycling identified in these studies help resolve variation in results between previously published studies and adds confidence to their overall positive impacts.

Title:

Monitoring the evolution of the European beaver (*Castor fiber*) distribution in France: methods, tools and results.

Author name(s):

Yoann Bressan[1], Paul Hurel[1,2], Ophélie Petit[3], Margaux Joulain[3]

Organisation name(s):

[1]French biodiversity agency – Research direction, [2]French biodiversity agency – Regional direction Centre-Val de Loire, [3]French biodiversity agency – Information systems direction

Abstract:

Since 1987 the French biodiversity agency is in charge of the monitoring of the European beaver distribution at the national scale. A standardised national protocol has therefore been developed to detect the presence and the absence of the species on rivers. It is implemented on the field by the members of a professional network, the Beaver Network, coordinated by the agency. All these persons are trained specifically. Until 2020, the Beaver Network was mostly composed by agents of the agency. Facing the increase of the beaver population and the territories to cover, it was decided to open the network to partners: NGOs, river and land managers, local authorities, hunters and fishermen…but the same standardised national protocol is still used by all members! In order to synthesise all the data collected on the field, a dedicated application is under development to replace the actual "old-school" way of data centralisation (i.e. papers on the field with a centralised entry into a database). This application allows a direct entry on the field (or on a computer in office) by the members, but also an import of data coming from other databases. These methods and tools, completed with historical data, allow us to monitor the increase of the distribution of the European beaver along the rivers in France since the beginning of the 20th century, when the species was on the threshold of extinction. And the development of the new application is also an occasion to complete our knowledge with presence opportunistic data.

Title:

Beaver burrowing activity along the River Isla in Scotland.

Author name(s):

Roo Campbell[1], Ann-Marie MacMaster[1], Kieren Jones[1], Jenny Bryce[1]

Organisation name(s):

[1]NatureScot

Abstract:

Beaver burrowing is a recognised risk to agriculture and other land-uses that are adjacent to watercourses, particularly where the land use is protected by embankments in close proximity to the river. In Scotland, licences for removal of beavers have been granted partly or wholly due to the risk of burrowing causing serious damage. Beavers were first reported living wild in Tayside from around 2006 and it is likely from a very early stage they were resident in the River Isla, a tributary of the Tay. Working with a contractor within the Scottish Government's CivTech programme, we explored the use of side-scanning sonar for burrow detection. In Feb-Mar 2024 we ran a sonar and LiDAR survey alongside a foot survey over 22 km of the River Isla to compare survey methods and examine the environmental factors that are linked to burrow locations to better identify burrowing likelihood and risk. The foot survey detected 21 intact, 156 collapsed, and 17 potential burrows alongside nine lodges. Burrows tended to be aggregated in some areas. Sonar and LiDAR survey recorded 51 burrows, some of which were the same as recorded during the foot survey. Four of the five burrows identified from LiDAR were detected on foot whereas only a third of sonar detections were also identified by foot. Between all methods, an estimated 235 unique burrows and lodges were identified, an overall mean of 10.6 per km riverbank. The effectiveness of the methods is discussed and environmental factors affecting burrow distribution explored.

Title:

Survival of wild beavers (*Castor fiber*) translocated for human-wildlife conflict mitigation in Britain.

Author name(s):

Roisin Campbell-Palmer[1], Daniel Arah[1], Sheelagh MacAllister[1], Rob Needham[1], Veselina Alva[2], Gary Curran[2], Fiona Howie[3], Claire Howe[4], Roo Campbell[5], Romain Pizzi[1, 2]

Organisation name(s):

[1]Beaver Trust, [2]Five Sisters Zoo, [3]Scotland's Rural College, [4]Natural England, [5]NatureScot

Abstract:

Wild free-living beavers (*Castor fiber*) were trapped under license by the relevant statutory bodies in Britain from 2019 until the end of 2024 as an alternative to lethal control in human-wildlife conflict situations. Kaplan-Meier cumulative probability of survival analysis with right-censoring of data was performed. Adult beavers had a 91.4% probability of survival to one year after translocation (95% *CI* = 86.3% to 96.5%, *n*=117), Overall, across all age groups including very young kits beavers had an 87.1% probability of survival to one year post translocation (95% *CI* = 82.7% to 91.5%, *n*=227). No fatalities were recorded during any trapping events using Bavarian style traps. The median time to death was 44 days (*95% CI* = 30 to 99 days). Translocated beavers underwent detailed veterinary health examination under anaesthesia and disease screening as required by the relevant statutory bodies, and a period of quarantine while awaiting screening results. As far as was practically possible, entire families were trapped and relocated. Captive beaver welfare was assessed with 24-hour CCTV monitoring and veterinary oversight. Beavers in Britain currently translocated by this method for human-wildlife conflict mitigation have welfare safeguards in place and high survival rates when released.

Title:

Beavers influence dissolved organic carbon water content by altering stream hydrology and aquatic primary producers abundance.

Author name(s):

Leonardo Capitani[1,2], Christof Angst[3], Matthew Dennis[4], Lukas Hallberg[5], Annegret Larsen[6], Joshua R. Larsen[5], Silvan Minnig[3], Valentin Moser[1,2], Francesco Pomati[2], Anita Risch[1]

Organisation name(s):

[1]WSL Swiss Federal Institute for Forest, Snow and Landscape Research, [2]EAWAG Swiss Federal Institute of Water Science and Technology,[3]Swiss Federal Office for the Environment, Biberfachstelle/Info Fauna, [4]MCGIS, The University of Manchester, [5]University of Birmingham, [6]Wageningen University

Abstract:

Dissolved organic carbon (DOC) is important in many aquatic processes such as bacterial activity and primary production. Moreover the control of DOC has been recognized as an important parameter in drinking water monitoring and distribution systems. Beaver damming activity may influence the DOC content in the water by altering the lateral and longitudinal stream connectivity favouring new habitat for primary producers. However, to what extent beavers influence the DOC content in the water and which mechanisms are the main drivers of such potential alterations remain to be clarified. In this study, we used the most comprehensive data set compiled for Switzerland (176 sites), to assess how beaver engineering activity alters stream hydrology and primary producers abundance to influence net changes in DOC water content. We found that, from winter to summer, beaver ponds act as sources by adding on average 0.13 mg/L DOC. During winter the average net DOC content is expected to decrease by 0.05 mg/L. The observed changes are influenced by water residence time (+3%), macrophytes (+6%), phytoplankton abundance (+7%) and the DOC content upstream (-11%). Beaver dam height (+15%) and the number of dams observed at each site (+6%) positively influence water residence time. Given these results, we conclude that beaver engineering activity influences DOC content by increasing aquatic primary producers abundance and altering stream hydrology. These results allow us to quantify and predict how and when beaver presence influences stream biogeochemistry with notable consequences on ecosystem functioning and water quality.

Title:

Stakeholder engagement and knowledge sharing in England.

Author name(s):

Jake Chant[1], Elly Andison[2]

Organisation name(s):

[1]Natural England, [2]Environment Agency

Abstract:

Wild beaver populations are found across the South of England. The populations originated from enclosure escapees and unlawful wild releases. In February 2025, the Government announced that Natural England (the Governments Adviser on the Natural Environment) could license applications for beaver wild release that fulfil key criteria. Stakeholders across England have differing views, some excited at the wetland creating abilities of beavers, others concerned about impacts that beaver burrowing and damming may have on farmland and infrastructure. There is a need to upskill stakeholders on beaver ecology, behaviour and management. In this presentation we introduce the innovative networks that Natural England and the Environment Agency (regulator, operator and advisor with a significant role for rivers and wetlands) have set up that enable active knowledge sharing. The National Beaver Management Forum seeks to maximise the opportunities and address the challenges of wild beaver populations in England. The forum is supported by two sub-groups. The Infrastructure Sub-group focuses on the infrastructure sector. It aims to learn, adapt and embed best practice ways of working alongside beavers throughout the life cycle of assets, from design and build through to operational management, maintenance and inspection. The Practitioner Sub-group enables those managing wild beaver populations in England to share significant advances in beaver management, creating a community that can facilitate beaver and human coexistence. The proactive creation of these networks aims to put England in the best possible place to manage negative impacts and benefit from the return of beavers.

Title:

Nature's urban allies: The benefits of beavers in cityscapes.

Author name(s):

Sandra M. Clinton[1], Diego Riveros-Iregui, Luke Pangle, Elizabeth Sudduth, Sarah H. Ledford

Organisation name(s):

[1]University of North Carolina

Abstract:

Beaver populations are increasing in number across North America and they are now commonly found in urban streams and rivers. The potential for human-beaver conflict is high in these environments as people are often concerned about beaver related impacts such as flooding and tree damage. Urban beaver ponds and wetlands however, can bring multiple ecosystem services to urban areas that should be considered when deciding how best to manage these populations. We have been studying urban beaver ponds and wetlands in the Piedmont region of the southeastern United States (Chapel Hill, NC, Charlotte, NC, and Atlanta, GA) since 2020 to develop and test a conceptual model relating and comparing the physical features of urban beaver and stormwater ponds to their observable impacts on streamflow attenuation and water quality. We have also collected data related to algal biomass and macroinvertebrate abundance and diversity. Our data demonstrate that beaver ponds and wetlands are an important habitat in urban watersheds that increase hydrological residence time and retain total suspended solids, dissolved total phosphorus and nitrate. Beaver ponds and wetlands also increase biodiversity at the watershed scale by creating lentic habitat for macroinvertebrates (as well as birds and otters) that would not otherwise occur at these sites. Overall beaver activities offer numerous ecosystem services that enhance urban areas, and their populations should be preserved wherever possible.

Title:

Beavers and phenology: A case study in the Kenai National Wildlife Refuge, Alaska.

Author name(s):

Alyssa Connaughton[1,2], Emily Fairfax[1,2]

Organisation name(s):

[1]Department of Geography, Environment, and Society, University of Minnesota, [2]Saint Anthony Falls Laboratory, University of Minnesota

Abstract:

Beavers are powerful ecosystem engineers that have the ability to help mitigate impacts of climate change by storing water, creating areas of fire refugia, and forming biodiverse heterogenetic landscapes that support a variety of wildlife. Quantifying vegetation health in and around beaver influenced areas can be done by using remote sensing indices like the Normalized Differential Vegetation Index (NDVI). Ecosystems in northern latitudes are particularly vulnerable to climate change, as these regions are warming at twice the global average rate. With a warming climate, comes issues such as different timing in vegetation growing seasons leading to a shift in phenology. Studies have shown that the timing of vegetation greening and browning has shifted over the past 30 years in Alaska. Shifts in phenology lead to negative ecological impacts such as changing in food source availability for herbivores and pollinators. It is known that beaver modified ecosystems store water and promote healthy vegetation, but there is a gap in the literature in regards the timing of vegetation green up and down in beaver modified ecosystems to non-beaver modified ecosystems. This study seeks to establish the most recent beaver distribution and compare phenology of beaver modified to non-beaver modified ecosystems in the Kenai National Wildlife Refuge, Alaska to test whether beaver ecosystem engineering can offset any portion climate-change induced shifts in phenology.

Title:

A national scale floodplain model revealing channel gradient as a key determinant of beaver dam occurrence and inundation potential can anticipate land-use based opportunities and conflicts for river restoration.

Author name(s):

Matthew Dennis[1 2], Christof Angst[3], JoshuaLarsen[4], Emmanuel Rey[3], Annegret Larsen[5]

Organisation(s):

[1]Complex Landscapes Group, HELSUS, University of Helsinki, [2]Dept. of Geography, The University of Manchester, [3]Info fauna – Biberfachstelle, Switzerland, [4]School of Geography, Earth and Environmental Sciences, University of Birmingham, [5]Wageningen University

Abstract:

The recent expansion of the Eurasian beaver (*Castor fiber*) brings with it opportunities for nature restoration, the provision of river ecosystem services and the return of naturally functioning floodplains. It also has the potential for conflict with existing human land-use through dam induced floodplain inundation and wetland development. To maximise restoration benefits and minimise conflict, modelling approaches are needed that can predict the likelihood of dam building and include scenarios for subsequent floodplain inundation. This study describes the first national-scale comprehensive assessment of the drivers of beaver dam occurrence and beaver floodplain inundation potential. This revealed that channel gradient was the overriding driver of both dam occurrence and potential land-use impact. Although widely considered to be a key constraint, channel width exhibited considerably lower explanatory power. The delineation of areas reflecting overall opportunities and conflict reveals that the reintroduction of *Castor fiber* into Switzerland implies a net benefit from a landscape restoration perspective, though outcomes scaled closely with catchment position. Given the rapidly expanding population range and popularity of continuing beaver reintroductions, this approach could help maximise landscape restoration goals whilst minimising undesirable land-use conflicts that may harm conservation efforts, incorporating human-beaver conflict potential into urban beaver restoration models

Title:

Incorporating human-beaver conflict potential into urban beaver restoration models.

Author name(s):

Martha Denton[1], Jessie Moravek[1], Emily Fairfax[1]

Organisation name(s):

[1]University of Minnesota

Abstract:

Beaver reintroduction has historically been concentrated in rural areas and public lands to avoid human-beaver conflict that can result from tree felling and flooding. However, there is a growing interest in reintroducing beavers into urban areas to integrate the ecosystem services they provide into sustainable landscape architecture designs. Beaver engineering facilitates groundwater recharge and flood mitigation, important ecosystem services in urban contexts with high degrees of impermeability. To model potential urban beaver restoration, the GIS-based Beaver Restoration Assessment Tool (BRAT) was run on the Mississippi River-Twin Cities watershed. This HUC-8 watershed includes the Minneapolis-Saint Paul metro area in the United States, a conurbation with a population of 3.7 million people. BRAT integrates data characterizing hydrography, vegetation, and land use to quantify the historical and existing dam-building capacity of streams in the watershed. The model was run twice: once considering land use resulting in possible human conflict and once excluding this data layer. Land use data inputs to the BRAT model do not currently account for community attitudes toward beaver presence. These results were used to establish documentation for how to manually adjust human-beaver conflict values within urban watersheds in a spatially explicit way. Ground-truthed urban beaver colony observations within the watershed of interest indicate that beavers are present, but currently construct primarily ephemeral dams, reducing access to potential beaver-related ecosystem services. When reintroduction is properly managed, restoration ecologists can leverage beavers to improve urban ecosystem functions, in Minneapolis and beyond.

Title:

Keeping The Netherland dry, part 2.

Author name(s):

Vilmar Dijkstra[1]

Organisation name(s):

[1]Dutch Mammal Society

Abstract:

The Netherlands is vulnerable to flooding, and with the growing beaver population, the challenge of preventing beavers from digging into our dykes during high water levels is increasing. Together with other organizations, we started a project in 2021 to prevent beavers from digging into our dykes. In this project, three types of high-water refuges were developed: a ground hill in the floodplain, a refuge against the dyke, and a floating device. Almost 18,000 kilometres of dykes are maintained by the national water authority and 21 regional water authorities. We created guidelines for them on the steps to take to implement high water refuges in the field. This presentation will provide an update from the 2022 presentation in Romania, including design drawings and monitoring plans.

Title:

Beavers, burrows and dikes; understanding beaver behaviour in fluctuating lowland water systems with telemetry.

Author name(s):

Lidewij Disbergen[1]

Organisation name(s):

[1]Dutch Mammal Society

Abstract:

The Dutch Mammal Society in cooperation with Waterboards and University of Applied Sciences Van Hall Larenstein, is conducting a study to better understand the biology of beavers in relation to water security. In the Netherlands the beaver population is growing. Dutch waterboards see great risks in water security as beavers are burrowing in dikes, especially during extreme high water situations in the main rivers in the Netherlands. During high water the existing burrows or lodges are overflown and beavers will search for dry places. In these situations the only places that remain above the water level are the dikes. In the past there have been a number of high risk situations due to beavers burrowing in infrastructure. In order to minimize these risks, pro-active measures are needed. For a better understanding of which measures can and should be taken, more knowledge is needed to understand and predict beaver behaviour. In our study we are combining different methods to study beaver behaviour. Telemetry (both VHF/GPS and innovative methods like automatic radio telemetry) will be used to provide better insights into the locations were beavers go and burrow during high water situations. In combination with fieldwork and data analysis/literature research we aim to answer questions such as: how far do beavers move out of their regular territory during high water situations? What physical factors (e.g. temperature) influence beaver behaviour and the occurrence of burrowing? What social factors (e.g. presence of other beaver territories) play a role?

Title:

How do wolves and humans shape beaver spatial behaviour and ecosystem impacts in Białowieża Primeval Forest?

Author name(s):

Tom A. Diserens[1], Marcin Brzeziński[2], Marcin Churski[1], Andrzej Zalewski[1], Dries P.J. Kuijper[1]

Organisation name(s):

[1]Mammal Research Institute, Polish Academy of Sciences, [2]Faculty of Biology, University of Warsaw

Abstract:

The recent return of beavers to Białowieża Forest presents us with the rare opportunity to study how beavers and large carnivores interact in a well-preserved temperate system with low human impact. Although this woodland comprises extensive tracts of old-growth forest, up till the 1990s beavers had been rare here for centuries. Over the talk, I will discuss our aim to study three aspects of beaver impacts on the forest. We plan to quantify i) the area of forest beavers have opened up via flooding, ii) how large carnivore presence shapes beaver spatial behaviour, and iii) how large carnivores indirectly shape the beaver's impacts on tree communities along watercourses. Our preliminary results show beavers have opened up hundreds of hectares tree-stands in the forest's river valleys. Meanwhile, our camera trapping shows that the forest's two large carnivore species, the wolf and lynx, visit beaver foraging trails often. In accordance with the landscape of fear concept, we will test whether large carnivore presence curtails the distances beavers travel inland to forage, and reduces beaver occurrence in parts of the forest with highest large carnivore activity. Finally, we will assess whether any large carnivore induced changes in beaver foraging patterns lead to corresponding changes in riparian tree community structure and composition. In recent years the landscape of fear has been a hot topic in ecology, and the present study aims to extend this framework to the beaver, helping us to better understand the ecological effects of the ongoing wolf and beaver recolonisations of Europe.

Title:

Twenty years of rewilding: beavers increase biodiversity at the landscape scale.

Author name(s):

Callum Dunleavy[1], Nigel Wilby[1], Garth Foster[2], Alan Law[1]

Organisation name(s):

[1]University of Stirling, [2]Aquatic Coleoptera Conservation Trust

Abstract:

Trophic rewilding, through the reintroduction of keystone species such as the beaver, offers a solution to the biodiversity crisis through reinstating lost ecological processes. However, many studies focus only on short-term effects (<5 years) leaving a need for long-term studies to inform future policy and practice. Here we report on the long term (decadal scale) changes in freshwater biodiversity that followed the release of beavers into an agricultural landscape in 2002 when shallow, straightened streams were transformed into an interconnected series of ponds and wetlands of varying age and complexity. Freshwater macroinvertebrate samples were collected seasonally in 2010/11 (n = 109) and 2021/22 (n = 203) by semi-quantitative net sampling from 4 dominant habitat types; upstream and downstream of beaver dams, unmodified stream reaches and, where available, from vegetated areas within ponds. From 2011/12 to 2021/22, effort-standardised macroinvertebrate species richness (gamma diversity) increased by ~22%, from 110 to 134 species with richness increasing across all habitat types and significant differences being observed in species composition among habitats, which contributed to increased gamma diversity. Beaver-created habitat types were highly heterogeneous both within and among samples, and across sampling periods. These results demonstrate that beaver driven rewilding has a significant effect on macroinvertebrate biodiversity which is both sustained and increasingly positive over time. With freshwater biodiversity in global decline, our findings highlight the value of beavers, as a nature-based solution, to support long-term restoration of freshwater biodiversity, but this can only be realized if beavers are given suitable space and time.

Title:

Behavioral assessment of Eurasian beavers (*Castor fiber*) in trap use for scientific research.

Author name(s):

Robert Egri[1], Cezar Spătaru[1], George Sarbu[1],Ion Simion[1], Alexandru Gridan[1], Claudiu Pasca[1], Ilie Popescu1, Daniel Visan[1], Gabriel Militaru[1], Ileana Ionescu[1], Flaviu Vodă[1], Lucian Toiu[1]

Organisation name(s):

[1]National Forestry Institute for Research and Development in Forestry "Marin Dracea", Romania

Abstract:

The use of traps in wildlife research requires careful evaluation of their impact on animal behavior. The Eurasian beaver (*Castor fiber*), a species reintroduced in several European regions, shows cautious and exploratory behaviors in its habitat. This study examines the beavers' behavioral responses to traps used for scientific capture. The study took place from March 10 to March 28, 2025, in Covasna, Brașov, and Harghita counties, Romania, along the Olt and Râul Negru river basins. Beavers were monitored using motion-sensor camera traps near strategically placed Bailey traps. Data collected included pre-capture behavior (hesitation, investigation), the capture moment, and post-release behavior. Weight, age category, environmental context, and genetic samples (saliva, fur) were recorded. Five teams, each with two experts, deployed two traps per team, beginning at noon time to identify optimal beaver pathways. Traps were set during daylight, with most captures occurring between 19:30 and 22:00. Castoreum from a road-killed beaver, dissolved in ethyl alcohol, was used as an attractant. Most beavers exhibited active investigative behavior toward the traps, followed by voluntary entry. Older beavers hesitated more frequently, and a small percentage did not enter the traps after detecting the attractant.

Title:

Rivers of the dammed: the impacts of beavers on methane emissions.

Author name(s):

Sarah Fairbrother[1], Joshua Larsen[2], Vincent Gauci[3], Stewart Clarke[4], Annegret Larsen[5]

Organisation name(s):

[1 2 3]University of Birmingham, [4]The National Trust, [5]Wageningen University

Abstract:

The beaver's ability to create valuable wetland habitat, amongst other benefits, has led to widespread reintroduction programmes across Europe and more recently in the UK. While there is evidence of their role in carbon sequestration through dam building, the role of beavers in the generation of biodiversity benefits, improvement of local water quality and attenuation of flow and carbon sequestration at a local level has been well-documented and aids our understanding their full impact on terrestrial and aquatic carbon cycling less well-developed. Beavers increase lateral connectivity in the landscape through their damming activity with the aquatic-terrestrial interface becoming an increasingly important zone in biogeochemical cycling. However, the effect of this evolving interface has not been properly examined. My project explores the impact of beavers on the structure and function of the landscape and the effect that those changes have on carbon fluxes in aquatic and terrestrial ecosystems through the measurement of methane fluxes from tree stems, soil and water bodies. This research will improve our understanding of the role that beavers play in carbon sequestration and release, and support land management decisions whilst also contributing to wider understanding of the mechanisms and scales by which methane sinks and sources occur in temperate wetlands.

Title:

Beaver-driven wildfire resistance: generalizability, mechanisms, and predictability.

Author name(s):

Emily Fairfax[1], Andrew Arlt[1], Martha Denton[1], Joe Miller[1], Jessie Moravek[1]

Organisation name(s):

[1]University of Minnesota

Abstract:

Beaver-engineered river corridors have been previously shown to mitigate wildfire damage in a variety of environmental settings, ranging from the arid American West to the Boreal Shield of Ontario, Canada. As land managers and policy makers consider ways to include beaver ecosystem engineering and beaver mimicry into their wildfire mitigation plans, understanding what specific aspects of these landscapes results in wildfire resistance is increasingly important. It is also necessary for characterizing the generalizability and predictability of this ecosystem service that beavers provide. To help close this information gap, we identified recent wildfires across North America that had varying configurations of beaver dams and/or beaver dam analogs within their burn perimeters. Using a combination of high-resolution satellite imagery available via Google Earth Pro, ESRI basemaps, and PlanetScope, we manually mapped all beaver dams and/or dam analogs within the fire perimeters. Then, using satellite-derived burn severity (dNBR, differential normalized burn ratio), we determined the level of vegetation burning within beaver influenced areas as well as in areas without beavers. We also used satellite-derived vegetation greenness (NDVI, normalized difference vegetation index) to evaluate ecosystem health in years prior to fire events in places where drought stress was a contributing factor to wildfire conditions. From these data, we demonstrate that beaver-driven wildfire resilience is a highly generalizable phenomenon and that it is – to an extent – predictable from either antecedent drought resistance or physics-based wildfire modelling that has been parameterized to reflect how beaver engineering alters fuel structure and moisture.

Title:

Beaver mimicry for drought and fire resilience: accelerating implementation through science and policy collaboration.

Author name(s):

Emily Fairfax[1], Alex Funk[2], Alicia Marrs[3]

Organisation name(s):

[1]University of Minnesota, [2]Theodore Roosevelt Conservation Partnership, [3]National Wildlife Federation

Abstract:

Beaver mimicry is a form of beaver-based restoration that includes the construction of human-built beaver dams or Beaver Dam Analogs (BDAs). In the United States, beaver mimicry is increasingly being sought out as a strategy for improving drought and fire resistance in places where beaver populations are limited. Creating these linkages between beaver restoration and natural disaster mitigation can unlock funding that can quickly accelerate adoption of these practices. However, scientific data on the efficacy of BDAs for building climate resilience is difficult to find. This is due in part to a communication disconnect between the scientific research community and land managers, including federal and state agencies. Academic scientists tend to only share their research findings via peer-reviewed publications, and that publication process can take many months to years to complete after the actual research activities have concluded. Federal and state land management agencies need scientific backing for their restoration work, particularly when working to link beaver mimicry and management with longstanding agency priorities such as wildfire mitigation. However, agency leadership do not have established pathways to access that information in the interim between the conclusion of research activities and the publication of results. Here we present a case study for accelerating beaver-based restoration by partnering scientists with policy-connected non-profit organizations and engaging in targeted outreach presentations to decision makers. We detail this process from idea conceptualization, through funding acquisition, presentation organization and delivery, feedback from participants, and beaver management outcomes at the state and federal level.

Title:

Methodological insights into non-invasive and invasive sampling for population genetics of reintroduced *Castor fiber*.

Author name(s):

Ancuta Fedorca[1], Pasca Claudiu[1], Elena Ciocirlan[1 2], George Sirbu[1], Adina Gontea[1 2], Bianca Birza[1], Iulia Baciu[1 2], Mihai Fedorca[1 2]

Organisation name(s):

[1]National Institute for Research and Development in Forestry Marin Dracea, [2]Transilvania University

Abstract:

The Eurasian beaver (*Castor fiber*) was reintroduced to Romania between 1998 and 2003 after a prolonged period of extirpation. To assess the genetic status, diversity, and structure of the population two decades post-reintroduction, we analysed 250 biological samples collected from multiple river basins across the species' current Romanian range. Sample types included tissue, hair, and saliva; the latter was obtained both through live-capture sampling and non-invasively from young branches, enabling a comparative evaluation of DNA integrity under varying environmental exposure. Genomic DNA was extracted using two distinct protocols: the automated Hamilton Omega system and the manual Isohelix extraction kit, facilitating a comparative analysis of yield and quality across different sample types and processing methods. Genotyping was performed using 14 highly polymorphic microsatellite loci, organized into two optimized multiplex PCR panels. The analysis revealed high levels of genetic diversity, indicative of a demographically viable population. However, a significant genetic substructure was detected among geographic regions, suggesting restricted gene flow and potential population differentiation. These findings reflect both the spatial expansion patterns following reintroduction and possible landscape-level barriers to dispersal. The study further highlights the limitation of non-invasive sampling for beavers and highlights the importance of continued genetic monitoring to inform adaptive management and conservation planning in Romania.

Title:

“Gnawing concerns are not going away” - a media analysis of beaver reintroductions to the Scottish Cairngorms National Park.

Author name(s):

Barnaby Fogg[1], Flurina Wartmann[1]

Organisation name(s):

[1]University of Aberdeen

Abstract:

The Scottish Government adopted a policy of active expansion of Eurasian beaver (*Castor fiber*) populations across Scotland in 2022, following 20 years of unlicensed and licensed releases after extirpation in the 16th century. The Cairngorms National Park Authority (CNPA) have been leading a consortium to reintroduce beavers to the National Park in the Scottish Highlands, and began with the Upper Spey catchment in 2023. The commencement of the engagement and consultation process led to substantial opposition and conflict with local farmers and crofters, prompting significant local and national media coverage. The scope and intensity of the debate continued to expand following the first release of beavers in December 2023, with farmers raising broader issues with the National Park’s actions, ethos and authority. Using reflexive thematic analysis, we assembled and analysed a corpus of 86 news media articles to uncover underlying narratives and identities driving the conflict between the CNPA and farmers. We identified themes of belonging, pressure from authorities, collaboration and conflict surrounding the beaver reintroduction. These are intensified by local tensions reflecting the area’s unique cultural identity following the forced evictions of the 18th century Highland Clearances. The media analysis highlighted the complexity of stakeholder relationships within the National Park, especially those surrounding reintroductions of keystone species such as beavers. Our research sheds light on the power of news media in both narrating and in turn influencing public attitudes towards reintroduction efforts. These insights can provide guidance for future stakeholder and media engagement for beaver reintroductions and management.

Title:

Flooding impacts reproduction of a semi-aquatic species, the Eurasian beaver.

Author name(s):

Marte Stensby Fountain[1], Christian Andrè Robstad[1], Hanna Kavli Lodberg-Holm[1], Rasmus Mohr Mortensen[1,2], Norith Eckbo[1], Frank Rosell[1]

Organisation name(s):

[1]Faculty of Technology, University of South-Eastern Norway, [2]Department of Ecoscience – Wildlife Ecology, Aarhus University

Abstract:

Climate change is affecting the hydrological cycle and alters flow patterns including the timing and frequency of floods. Similar changes can occur when rivers are regulated for hydropower use which can negatively impact many terrestrial mammals during the reproductive period. However, little is known about the effect flooding has on the offspring of semiaquatic mammals, such as the keystone species beaver (*Castor spp.*). Using demographic data of Eurasian beaver (*C. fiber*) spanning two decades, from three rivers differently affected by hydropower regulation, we investigated the effects of increased water level on successful reproduction and beaver kit survival. Time periods were chosen to fit the different stages in the kits' development. Increased water level during summer, when the kits emerge from the lodge, had a negative effect on successful reproduction. During spring and autumn, increased water level did not negatively affect beaver kit survival. Our results indicate that flood peak timing may be more important than flood peak magnitude on successful reproduction and offspring survival in a semiaquatic mammal.

Title:

Spatio-temporal trends in vertebrate biodiversity following a beaver (*Castor fiber*) reintroduction in Cheshire (UK).

Author name(s):

Lucia Galvez-Bravo[1], Lynsey R. Harper[1,2], Holly Broadhurst[3], Elin Smith[3], Jake Jackman[3], Maria Loftus[1] Stefano Mariani[1], Lori Lawson-Handley[4,5], Allan McDevitt[3,6]

Organisation name(s):

[1]School of Biological & Environmental Sciences, Liverpool John Moores University, [2]Natural England,[3]School of Science, Engineering and Environment, University of Salford, [4]Department of Biological and Marine Sciences, University of Hull, [5]Centre for Ecology and Hydrology, [6]Marine and Freshwater Research Centre, Atlantic Technological University

Abstract:

Beaver (*Castor fiber*) reintroductions via fenced enclosures have proliferated in the UK in the past 5 years. The potential environmental benefits mediated by beaver engineering activities are well understood, but there are some uncertainties about how beavers may affect vertebrate biodiversity in fenced areas after being absent from UK landscapes for over 500 years. Environmental DNA (eDNA) metabarcoding enables non-invasive, cost-effective, high-resolution vertebrate surveys, and is an ideal approach to monitor beaver reintroduction effects on vertebrate communities. We used eDNA metabarcoding with seasonal sampling to examine vertebrate species richness and community composition pre- and post-fence construction as well as pre- and post-beaver reintroduction. Sampling included a distance gradient downstream from the beaver enclosure, an upstream site and control areas. Data were collected pre-beaver reintroduction and seasonally for two years post-reintroduction. Fencing did not appear to influence vertebrate diversity, and no major differences were found in alpha diversity between reintroduction and control areas for most vertebrate groups. New species were recorded after beaver reintroduction and changes in community composition were observed for some vertebrate groups. These results provide critical baseline data for long-term assessment of the benefits of beaver reintroduction on vertebrates in enclosures and the time required for these benefits to offset any potential negative effects.

Title:

Benthic macroinvertebrate communities and food webs of beaver-impounded streams in the eastern Canadian Arctic.

Author name(s):

Katelyn Gao[1], Mathilde Lapointe St-Pierre[2], Jordan Musetta-Lambert[3], Michael Power[1]

Organisation name(s):

[1]University of Waterloo, [2]Nunavik Research Centre, [3]Environment and Climate Change Canada

Abstract:

As circumpolar warming facilitates the shrubification of Arctic and sub-Arctic landscapes, the distribution of beavers (*Castor canadensis*) in Canada has been expanding northward, raising concern among Inuit communities. Beavers are widely known as ecosystem engineers and while their impact in boreal ecosystems is well-documented, their influence in the tundra is still being investigated. In freshwater streams, beaver dams accumulate sediment and detritus, disrupt nutrient flow, and alter hydrological connectivity. In Arctic and sub-Arctic regions, changes in physical habitat and water quality can impact fish populations that use small streams for breeding and juvenile rearing. Between 2023 and 2024, 20 beaver-impounded streams were sampled along western Ungava Bay near the northern villages of Kuujjuaq and Tasiujaq, Quebec. Samples were used to assess differences in water quality, benthic macroinvertebrate communities, and trophic structure as characterised by stable isotopes (from primary producers to fish), with comparisons made between downstream and upstream habitats proximate to dams above (Tasiujaq) and below (Kuujjuaq) the tree line. The hypotheses tested concerned changes in food web complexity (e.g., food chain length, resource base width) caused by dams and the extent of which the availability of trees amplifies dam impacts. Given the ongoing tundra colonisation by beavers and the importance of Arctic streams as habitats for fish, it is important to characterise stream food webs in response to dams. This research will help determine whether beaver-transformed tundra streams will continue to support healthy fish populations and characterise the risks beavers may pose to Inuit food security in Nunavik.

Title:

Towards a national strategy on the European beaver (*Castor fiber*) in France (monitoring, studies and cohabitation).

Author name(s):

Paul Hurel[1,2], Yoann Bressan[1], Thomas Ruys[3], Rémi Luglia[4]

Organisation name(s):

[1]French Biodiversity Agency – Research direction, [2]French Biodiversity Agency – Regional direction Centre-Val de Loire, [3]French Society for the Study and Protection of Mammals, [4]National Society for the Protection of Nature

Abstract:

The European beaver is now considered to be in a favourable conservation status in France. The species has been protected since 1968, and several reintroductions have enabled beavers to be observed in different parts of the country. Today, the beaver's presence in our territories is an integral part of many social issues, including the restoration of ecological continuity, flood and fire risk prevention, carbon sequestration and wetland preservation, as well as the place given to wildlife. It is also a remarkable opportunity to work on human/non-human relations and on the cohabitation between this building species and the human species, but also on approaches to the management of natural areas, such as free evolution, low-tech restoration and naturalness. This species is thus at the crossroads of the objectives of several European directives, such as the Habitats, Fauna and Flora Directive, the Water Framework Directive and the European Nature Restoration Regulation. As a result of these various challenges, it became necessary to build a national strategy for France to bring together the various initiatives concerning this species in four axes:

1. Organise the stakeholder community and supporting actions
2. Develop and disseminate knowledge about the European beaver
3. Integrate the beaver into the management/restoration of socio-ecosystems
4. Improve beaver-human cohabitation

The French Office for Biodiversity, the French Society for the Study and Protection of Mammals and the National Society for the Protection of Nature are currently co-drafting a national beaver strategy which we will present at the 10th International Beaver Symposium.

Title:

Exploring fish colonization of newly constructed beaver (*Castor spp.*) channels, in Hatchmere, Cheshire, UK.

Author name(s):

Alvaro Lopez Garcia[1], Lucia Galvez-Bravo[1]

Organisation name(s):

[1]School of Biological and Environmental Sciences, Liverpool John Moores University, UK

Abstract:

The Eurasian beaver (*Castor fiber*) was a natural inhabitant of UK rivers and wetlands until it's extinction in the 11th century. In recent years, the reintroduction of this species has been recognised as key process to achieve ecological restoration, as it often leads to increased biodiversity and habitats becoming more heterogeneous. Beavers modify the landscape through the construction of dams and the excavation of ditches and channels. These unique features can potentially benefit aquatic ecosystems by enhancing habitat availability and increase access to adequate spawning grounds for freshwater fish. However, in some cases dams can also restrict the upward movement of fish during migratory periods as well as contribute to increased siltation. This study aimed to investigate the impact of beavers on freshwater fish communities in Hatchmere Nature Reserve (Cheshire) by comparing areas significantly modified by beaver activity to areas where beavers are absent. In Summer 2025, fish were sampled using fyke nets and electrofishing techniques, estimating their abundance and diversity in both beaver-created channels and equivalent nearby ditches outside the beaver enclosure. Water chemistry and environmental parameters in the beaver and control areas were also recorded. Findings from this investigation can be used as a guideline to help predict the expected impact beavers will have on fish species in other UK reintroductions. Finally, this study can significantly contribute to assessing the feasibility of beaver reintroduction in specific locations.

Title:

Approach to diagnostic imaging and complementary post-mortem examinations as part of the Eurasian beaver (*Castor fiber*) NatureScot monitoring scheme.

Author name(s):

Gidona Goodman[1], Adrian W. Philbey[1], Tobias Schwarz[1]

Organisation name(s):

[1]Royal (Dick) School of Veterinary Studies and the Roslin Institute, University of Edinburgh

Abstract:

Sixteen beaver cadavers were submitted over a two-year period to the Royal (Dick) School of Veterinary Studies. They are part of an ongoing NatureScot initiative to assess the welfare of beavers shot under licence and to collate information on the health status of beavers in Scotland. The work was carried out in collaboration amongst three specialist departments within the veterinary school, Easter Bush Pathology, the Diagnostic Imaging Service and the Conservation Medicine Group. Outcomes were presented in a report to NatureScot which highlighted that the majority of animals died due to suspected or confirmed traumatic injuries, either gunshot injuries or road traffic accidents. Post-mortem evidence, diagnostic imaging findings and information provided with the carcasses corroborated these findings. The level of autolysis prohibited histological or microbiological examination of the carcasses. The condition of the carcasses led to an adaptation of the diagnostic imaging protocols with carcasses computed tomography (CT) scanned and radiographed whilst frozen. The aim of establishing a diagnostic imaging protocol is to enable veterinarians in general practice to radiograph beavers if required either for welfare or clinical assessments. In beavers with gunshot injuries metallic shrapnel debris was seen in the neck and head area and associated with bone trauma. CT provided more detailed information including the trajectory of the gunshot confirming the effectiveness of the kill with injury to vital organs such as the brain stem.

Title:

Winds of change - Do we truly need to introduce population control?

Author name(s):

Niels Hahn[1], Stephan Frei[2], Simone Foltyn[2]

Organisation name(s):

[1]WILCON - Wildlife Consulting, Beaver Manager on behalf of Nature Protection and Landscape Preservation Division, Stuttgart Regional Council, Germany, [2]Lower Nature Conservation Authority, District Office Ostalbkreis, Germany

Abstract:

Amid strict legal protection, growing debate, and increasing human-beaver conflicts, a key question arises: Are existing tools such as advice, prevention, and case-by-case interventions still sufficient, or do high-conflict areas require new approaches, including beaver population control? In Baden-Württemberg (Southwest Germany), this discussion is currently highly emotional, shaped by differing perspectives, local impact, and site-specific conditions. So far, no lethal removals have been necessary in the Stuttgart administrative district. Conflicts have been resolved using established instruments of non-lethal beaver management. However, robust data on the actual effort and effectiveness of this management are often lacking or not evaluated in relation to the ecological benefits of beaver activity. To support a more objective discussion, we analyzed one year of beaver management in two municipalities in the Ostalbkreis district (main land use: agriculture and forestry), where beaver populations in local aquatic systems are assumed to be near carrying capacity. We examined beaver presence, the number and severity of conflict cases, management effort, and resolution success using current tools. Our findings show that in most territories, little or no management is required. Overall, the current approach is proportionate and effective, though some aspects could be improved. We conclude that under current conditions, population control through culling is not justified. The pragmatic beaver management approach using non-lethal tools to mitigate conflicts has proven effective and transferable. Results of our study offer potential to depolarize similar debates in other human-shaped landscapes.

Title:

Beavers banking on carbon: drivers of carbon storage across annual and decadal scales in a Swiss beaver wetland.

Author name(s):

Lukas Hallberg[1], Joshua Larsen[1], Annegret Larsen[2], Raphael d'Epagnier[3], Sarah Thurnheer[4], Natalie Ceperley[3], Bettina Schaefli[3], Matthew Dennis[5]

Organisation name(s):

[1]University of Birmingham, [2]Wageningen University, [3]University of Bern, [4]Swiss Federal Institute for Forest, Snow and Landscape Research, [5]University of Manchester

Abstract:

Riparian zones are critical links between terrestrial and aquatic ecosystems, controlling the biogeochemical fluxes and thus the fate of carbon (C) in stream networks. The re-introduction of beavers across Europe provides opportunities to leverage their riparian ecosystem engineering and improve water quality and C sequestration. The construction of beaver dams gives rise to wetlands integrated in river networks, which support high capacities for deposition, storage and processing of C. However, our current understanding of both short- and long-term C storage, as well as the underlying drivers remains limited in beaver wetlands. The aim of this study was to quantify a comprehensive annual C budget, which included monitoring of fluvial, gaseous, sediment and biomass C together with hydrology in a beaver wetland on the Swiss plateau. Using modelled sediment deposition and sediment C pyrolysis analysis we further investigated the long-term fate of C. On the annual scale, the system was a net C sink, primarily explained by large reductions in dissolved inorganic carbon (DIC) loads. The water balance further showed that DIC loads were mainly removed via subsurface storage. Carbon dioxide (CO2) fluxes from non-flooded sediments were the dominant source of C from the wetland. However, the limited release of CO2 from water surfaces showed that only a negligible fraction of DIC was released via this pathway. Across decades, a large fraction of deposited C in sediments were shown to be stable, suggesting a potential for C sequestration in beaver wetlands that greatly exceeds the C storage capacities of running waters.

Title:

Population and distribution of Eurasian beavers (*Castor fiber*).

Author name(s):

Duncan Halley[1]

Organisation name(s):

[1]Norwegian Institute for Nature Research

Abstract:

Formerly one of the most widespread Eurasian mammals, overhunting had by 1925 reduced Eurasian beaver populations to c. 1200 animals in scattered refugia from France to Mongolia. A century later reintroductions and natural spread, especially in the last 30 years, have restored the species to much of its original range. Population has more than tripled since the first modern estimate in 1998; the minimum estimate (March 2025) is now c. 1.6 million. Range expansion 2015-2025 has been especially rapid, with large extensions in western and southern Europe, southern Russia, and west and central Siberia. Very recent spread to multiple river systems in Iberia and Italy appear to be the result of unofficial releases. Beavers are now re-established in all countries of their former European range except for the Balkans south of Serbia and Bulgaria. The range is now continuous from the Loire estuary in western France to NW Mongolia, with scattered populations east to the Amur/Heilongjiang watershed near Vladivostok, and south to the Guadalquivir in southern Spain and Volturno in southern Italy. Populations are now mature in much of European Russia, Ukraine, Belarus, the Baltic States, Poland, Sweden and Norway. There is also significant population of North American beaver in Finland and north-west Russia. Consolidation of the scattered Eurasian beaver range in western and central Europe and Great Britain, rapid range extension in Iberia, Italy, and Great Britain, and substantial increases in population throughout Europe west and south of Poland are likely features of the next phase of population development.

Title:

BIBOB – Cross-border beaver dam management in the context of climate change.

Author name(s):

Torsten Heyer[1], Aleš Vorel[2], Tomáš Dostál[3], Cordula Jost[4], Lukáš Poledník[5]

Organisation name(s):

[1]TUD Dresden University of Technology, [2]CZU Czech University of Life Sciences Prague, [3]CTU Czech Technical University Prague, [4]Landscape Conservation Association Saxon Switzerland-Eastern Ore Mountains, Germany, [5]ALKA Wildlife, o.p.s., Czech Republic

Abstract:

The resilience of landscapes and ecosystems to climate change depends largely on their ability to adapt to extreme fluctuations in water supply. Beaver activity contributes to water balance equalization, biodiversity increase, and regional climate resilience enhancement. However, negative effects (e.g. unintended flooding, burrowing in infrastructure) need to be considered as well, as they have led to an increasing critical view of beaver recolonization in many European regions. The beavers' ability to dam water in rivers significantly alters hydraulic, hydrological, and ecological conditions up and downstream of the dam locations. However, the extent to which these changes affect regional surface and groundwater conditions is often unclear. In cultural landscapes, this lack of knowledge complicates the work of environmental and water authorities when deciding whether beaver dams can be left in place or whether interventions are necessary. Therefore, the Czech-German project "BIBOB" aims to demonstrate and quantify to which extend beaver dams can contribute to mitigating environmental risks. Investigations are conducted in the mountainous border region "Saxon/Bohemian Switzerland", as one of the Central European landscapes that is extremely affected by climate change. The international project will involve a combination of field surveys (incl. remote sensing techniques) at multiple dam sites and hydronumerical modelling/simulation of surface and groundwater flows to investigate the site specific hydrological and hydraulic effects caused by the dams. The project's outcomes will provide a data-driven approach that allows an enhanced beaver dam management, including guidelines with technical recommendations and modelling approaches applicable in other regions as well.

Title:

Assessing the role of Eurasian beavers (*Castor fiber*) in the occurrence of zoonotic pathogens.

Author name(s):

Lovisa Hökby[1], Alina Anton[2], Sascha Knauf[2 3], Jonas Malmsten, Yonas Meheretu[1], Rainer G. Ulrich[4], Frauke Ecke[1 5]

Organisation name(s):

[1]Department of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences (SLU), [2]Institute of International Animal Health/ One Health, Friedrich-Loeffler-Institut (FLI), Federal Research Institute for Animal Health, [3]Professorship for One Health/International Animal Health, Faculty of Veterinary Medicine, Justus-Liebig-University, [3]Institute for Novel and Emerging Infections Diseases, Friedrich-Loeffler-Institut (FLI), Federal Research Institute for Animal Health, [4]Organismal and Evolutionary Biology Research Programme, University of Helsinki

Abstract:

As natural habitats are being increasingly degraded, zoonotic diseases are an emerging public health challenge with rodents as important reservoirs. The biggest native rodent in Eurasia, Eurasian beaver (*Castor fiber*), can carry multiple zoonotic pathogens. Yet, its role in disease ecology remains understudied. After almost extirpation followed by reintroduction, beavers are recolonizing much of their former distribution range, progressively restoring degraded habitats. By constructing dams, beavers significantly alter landscape structure, and increase wetland surfaces, habitat heterogeneity, and biodiversity. Tularemia and leptospirosis are two zoonotic diseases of regional and global significance, respectively. Tularemia is caused by the bacterium *Francisella tularensis* and leptospirosis by *Leptospira* spp. Both diseases are associated with wet environments, and beaver-induced landscape rewetting could potentially increase their occurrence. We investigated the role of beavers and beaver wetlands for pathogen prevalence by collecting spleen and liver samples from 25 beavers throughout Sweden, shot in 2024 by private hunters. In addition, we collected 62 water samples, consisting of pond, upstream, and downstream samples from 10 beaver systems during the summer and winter of 2023. Tissue and water samples were tested for the two pathogens *Leptospira* spp. and *F. tularensis* using qPCR. All samples tested negative for both pathogens. These preliminary results suggest limited involvement of beavers and their wetlands as reservoirs for the pathogens in Sweden, yet more data are needed. Once completed, our results could guide risk assessments of future rewilding programs focusing on beavers as nature-based solutions for climate change mitigation and for the ongoing biodiversity crisis.

Title:

Moving right along: Wildlife use of beaver dams.

Author name(s):

Glynnis A. Hood[1 2], Cherie Westbrook[2]

Organisation name(s):

[1]University of Alberta, [2]University of Saskatchewan

Abstract:

As unique habitat features, beaver dams provide travel corridors, loafing sites, and foraging areas for a variety of other species. To examine the role of beaver dams in the spatial and temporal distribution of wildlife over a five-year period, we installed cameras on beaver dams in the Beaver Hills Biosphere Reserve in east-central Alberta, Canada and at Sibbald Fen in Kananaskis Country, Alberta. This study includes data from over 40 camera sites, with >300 deployments representing each time a camera card was downloaded and reset. Using Timelapse Image Analyzer software, we attributed the data and also identified whether animals were on the dam, in the water, on land, or, when present, on nearby beaver lodges within view. Cameras captured well over 250,000 images that recorded >37 species of birds and 23 species of mammals. Although fewer in number, amphibians and invertebrates were also detected. Birds represented 59% of the species, while mammals comprised 36% of all species. There were distinct differences among taxa relative to use of the dam (e.g., travelling, loafing, foraging), dam morphology, and key spatial and temporal associations among taxa. Use of beaver dams by wildlife is rarely studied; however, our data suggest that dams provide an important habitat for a variety wildlife and an understudied influence on temporal and spatial interactions among species.

Title:

Modelling future beaver distribution in Flanders.

Author name(s):

Frank Huysentruyt[1], Anneleen Rutten[1], Robrecht Dockx[1]

Organisation name(s):

[1]Research Institute for Nature and Forest (INBO)

Abstract:

Beavers have reappeared in Flanders since 2000, with their numbers expanding rapidly over the past decade, posing challenges for impact management. To identify areas most vulnerable to beaver-related damage, we developed a species distribution model (SDM). Using a MaxEnt-based approach, we estimated habitat suitability and simulated potential future dispersal with the SiMRiv R-package. Our initial model, built in 2020 using 2019 distribution data, predicted beaver presence up to 2022. In 2024, we validated these predictions against observed distributions from 2020–2022, demonstrating strong overall performance (AUC = 0.825). However, the model tended to overestimate occupancy, resulting in higher negative than positive predictive power though accuracy improved with increasing occupancy probability. This overestimation aligns with the model's risk management purpose. In 2025, we sought to enhance positive predictive power by expanding the model beyond Flanders and increasing simulation iterations. Here, we present the 2027 predictions and share the model code as open-source.

Title:

Interactions between Eurasian beaver (*Castor fiber*) and other riparian mammal species, along Olt river.

Author name(s):

Georgeta Ionescu[1], Claudiu Pașca[1], Alexandru Gridan[1], George Sârbu[1], Cezar Spătaru[1], Ion Mirea[1], Ovidiu Ionescu[1,2], Marius Popa[1]

Organisation name(s):

[1]National Institute for Research and Development in Forestry "Marin Drăcea",[2]Faculty of Silviculture and Forest Engineering, Transilvania University of Brasov,

Abstract:

This study explores the interactions between the Eurasian beaver (*Castor fiber*) and other riparian mammals along a 450 km stretch of the Olt River in Romania. A total of 139 randomly selected 500 m sampling plots were surveyed, representing 15% of the study area. Observations and camera trap data revealed 22 mammal species, with beavers ranking among the most frequently documented. Their dam-building and foraging activities significantly influence riparian habitat structure, creating microhabitats (e.g., pools, flooded areas) that benefit diverse species, including otters (*Lutra lutra*), water voles (*Arvicola terrestris*), and muskrats (*Ondatra zibethicus)*. Limited dietary overlap with otters reduces direct competition, while newly exposed vegetation following beaver foraging supports small rodents and early-successional plant communities. Larger mammals, such as red foxes (*Vulpes vulpes*) and wild boar (*Sus scrofa*), also utilize beaver-modified areas for foraging and shelter. However, anthropogenic pressures—river works, overgrazing, illegal wood cutting and habitat fragmentation—threaten both beavers and the broader riparian ecosystem. The study highlights the importance of maintaining wide riparian buffers (>10–20 m) to preserve habitat complexity and minimize human–beaver conflicts. By balancing conservation objectives with local land-use needs, resource managers can promote ecological resilience across riparian corridors. Ultimately, the beaver's function as an ecosystem engineer highlights its importance for biodiversity and reinforces the need for integrative policies to protect riparian habitats.

Title:

A potential conservation conflict: Invasive fish species can gain benefit from the beavers' dam building behaviour.

Author name(s):

Erika Juhász[1,2], Zoltán Botta-Dukát[1], Borbála Kanizsay[1], Zsolt Molnár[1], Roland Csipkés[3,4]

Organisation name(s):

[1]HUN-REN Centre for Ecological Research, Institute of Ecology and Botany, Hungary, [2]HUN-REN Centre for Ecological Research, National Laboratory for Health Security, Hungary, [3]University of Debrecen, Juhász-Nagy Pál Doctoral School, [4]Bükk National Park Directorate, Hungary

Abstract:

The return of the Eurasian beaver can be considered a success story from a nature conservation point-of-view. The impacts of the reintroduced species are predominantly positive, and the processes triggered by beavers are supporting the restoration of wetland habitats. However, beaver habitats have been altered because of human land-use interests in the last few centuries, and they are also exposed to the impacts of invasive species. Previously, we highlighted a conservation conflict: beavers might exacerbate the spread of invasive woody species in floodplains where the sprouting and renewal of native species are not supported by the environmental conditions. In this new study, we examined the abundance and relative abundance of native and non-native fish species in beaver impounded and reference stream sections. Electrofishing surveys were conducted along six streams in Northern Hungary in three seasons (111 times along beaver-impounded and 44 times along reference sections). In parallel, beaver dams were monitored in the region (along stream sections with a 50-km summarized length). In total, 14,538 individual fish were captured. We registered 27 species, five of which are invasive species (Prussian carp, topmouth gudgeon, black bullhead, Chinese sleeper, and pumpkinseed). Invasive species had a significantly higher number of specimens and higher relative abundance along the impounded sections. Conservation management should be informed objectively about the ambivalent impacts of the beavers' landscape alteration. This is the only way to ensure the protection of habitats and valuable beaver impacts, while also providing appropriate responses to the conservation challenges that may arise.

Title:

Interaction between the Eurasian beaver (*Castor fiber*) and the brown bear (*Ursus arctos*) in the marshy zone of the Prejmer forest protected area (ROSCI0170), Romania.

Author name(s):

Ramon Jurj[1], Georgeta Ionescu[1], Ancuța Fedorca[1], Ovidiu Ionescu[1 2], Marius Popa1, Ion Mirea[1], Mihai Fedorca[1 2], Claudiu Pașca[1], Iulia Baciu[1 2], Alexandru Gridan[1], Flaviu Vodă[1], Cezar Spătaru[1]

Organisation name(s):

[1]National Institute for Research and Development in Forestry "Marin Drăcea" – Romania, [2]Transilvania University of Brașov

Abstract:

This study examines the interactions between the Eurasian beaver (*Castor fiber*) and the brown bear (*Ursus arctos*) in a 350-hectare marshy area within the Prejmer forest area (ROSCI0170), Romania. Over five years, motion-sensor cameras were placed around beaver lodges and dams to document patterns of habitat use, population changes, and interspecific encounters. Neither species was present twenty years ago; beavers reappeared around 2005, five years after their reintroduction along the Olt River, and grew to 16–20 individuals by 2020. Brown bears emerged between 2015 and 2020, with four adults recorded, increasing to six by 2024. Results reveal a complex relationship, featuring both detrimental and beneficial effects. Bears often damaged beaver dams and lodges, especially in spring, forcing repeated relocations of beaver families. Yet beaver dams created pathways through marshy terrain, assisting bear movement, while sustaining higher water levels that indirectly supported nearby crops, including corn, a key bear food source. Consequently, even though bears stressed the beaver population, beavers provided resources beneficial to bears. This study illustrates how two mammals can coexist, shaping their shared ecosystem through contrasting yet interlinked behaviors. Monitoring these interactions is vital for guiding future conservation strategies, highlighting both the difficulties and ecological gains of species reintroductions and range expansions. Continued research will clarify long-term population trajectories, refine management approaches, and facilitate the successful coexistence of these ecologically significant species. Acknowledging the role of keystone species like the beaver can inform habitat restoration efforts, while understanding bear foraging behavior is critical for mitigating human-wildlife conflicts.

Title:

First insights into the origin and distribution of the newly established beaver populations in Bulgaria via eDNA.

Author name(s):

Maria Kachamakova[1], Aneliya Bobeva[1], Polina Nikova[1], Simeon Borissov[1], Vladimir Todorov[1], Blagovesta Dimitrova[1], Yordan Koshev[1]

Organisation name(s):

[1]Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences

Abstract:

Thanks to successful reintroductions and natural recolonisation during recent decades, the Eurasian beaver (*Castor fiber*) is returning throughout Europe. However, its hard-to-distinguish American congener, *Castor canadensis*, has also been successfully introduced and is thriving in some parts of Europe as an invasive species. Thus, obtaining genetic information for the newly recorded populations is important to ensure appropriate management actions. Here, we present the first genetic assay of five recently established beaver populations in Northern Bulgaria using the non-invasive method of eDNA sampling. The results indisputably confirm the current presence of *Castor fiber* in the country, having gone extinct more than 150 years ago. The studied populations bear haplotypes from the refugial populations in Norway and France. We hypothesise that animals spread naturally from Romania, where reintroductions have been made using individuals derived from Bavaria, which were in turn imported from Scandinavia, France, Russia and Poland. Our research offers the first insights into the successful recolonisation by the Eurasian beaver along the Danube coast and its tributaries in Bulgaria. We map the species' current distribution in the country based on confirmed reports.

Title:

Building like beavers: Stigmergic robotics for landscape design.

Author name(s):

Jordan Kennedy[1,3], Gemrisha Anantham[1], Michelle Li[1], Justin Werfel[2], Karen Lee Bar-Sinai1

Organisation name(s):

[1]Harvard University Graduate School of Design, [2]Harvard University, [3]Beaver Institute

Abstract:

Beaver damming complexes, spanning hundreds to thousands of meters, emerge over generations as beavers continuously maintain and expand their structures. This process requires indirect coordination, as individual beavers contribute to construction efforts across space and time. Their decentralized, stigmergic approach to building makes them a compelling model for robotic multi-agent systems. While partnering with beavers is the most effective strategy for landscape restoration, some environments are too degraded or uninhabitable for them. This study integrates multi-agent simulations with landscape architectural design principles to explore the potential for robotic agents modeled after North American beaver construction behaviors in these cases. This work presents a theoretical framework for beaver logic, detailing how beavers respond to and modify their environment based on stigmergic principles. Specifically, it examines how an initiating event - such as water flow conditions - triggers trail building, with trails optimized to cover the largest area with minimal effort, forming vascular or dendritic structures. Productive trails are reinforced into canals, creating self-reinforcing hydrological networks. These emergent patterns are visualized using Python-based simulations, revealing the interplay between beaver behavior and environmental feedback. By applying this framework to pre-annotated UAV-generated orthomosaics of beaver damming complexes and agent-based simulations in Mesa, this study explores how beaver-inspired robotic systems could restore degraded landscapes where beavers cannot thrive - such as urban wetlands, deserts, agricultural lands, or even extraterrestrial environments. These findings contribute to adaptive design strategies that enhance biodiversity and geomorphic complexity, potentially facilitating future beaver recolonization.

Title:

Working with Beavers in Alberta, Canada: beneficial management practices for beaver coexistence.

Author name(s):

Holly Kinas[1], Kerri O'Shaughnessy[2], Amy McLeod[2], Norine Ambrose[2], Nilo Sinnatamby[1], Danah Duke[1]

Organisation name(s):

[1]Miistakis Institute, [2]Cows and Fish – Riparian Management Society

Abstract:

This year, Canada celebrated the 50th year of the North American beaver (*Castor canadensis*) as its national symbol. However, beavers are absent or greatly reduced in many landscapes where they once played a crucial role in maintaining healthy ecosystems. In Alberta, where we face significant drought and flood risks associated with climate change, the absence of beavers reduces our landscape resiliency. While beavers are increasingly being recognized as a nature-based climate solution, beaver activity often conflicts with human infrastructure and land-use objectives, challenging their acceptance and conservation on the landscape. Beaver management in Alberta, has typically taken a traditional approach relying heavily on lethal methods; however, in 2017 we conducted a survey of Albertans and found support for coexistence. Currently, there is a knowledge gap regarding practical coexistence strategies and the tools available to land managers. Recognizing this gap, we created a comprehensive set of Beneficial Management Practices (BMPs) to support evidence-based, humane, and effective beaver management. Drawing from scientific literature, practitioner expertise, and on-the-ground case studies, the BMPs offer practical guidance on coexistence techniques, such as flow devices (pond levellers and culvert protectors), tree protection, and other strategies. The practices and interactive decision support tool serve as a model for sustainable beaver management applicable across diverse landscapes and jurisdictions. The primary goal of this work is to conserve beavers on the landscape by promoting coexistence and reducing conflict; these BMPs aim to help land managers, municipalities, and conservation organizations make informed decisions that balance ecological benefits with human needs.

Title:

Variation of opinions on beaver reintroduction across the US and EU.

Author name(s):

Keitreice Kirksey

Organisation name(s):

University of Minnesota

Abstract:

There has been an increased momentum of public opinion on beavers. However, these opinions can differ based on a number of factors. This study investigates how opinions vary according to beaver relocation sites based in the US and in the EU, each zone being considered a different case study. This is being done by reviewing opinion news pieces as well as analyzing posts across different social media outlets. The information accrued is being classified into negative, positive, or neutral opinions. Here this research gives us better insight into how public opinion of beaver reintroduction varies in different countries.

Title:

Beavers over concrete! Creating space for nonhuman others.

Author name(s):

Lukas Tobias Knoflach[1]

Organisation name(s):

[1]University of Vienna

Abstract:

Beavers over concrete! The title of this thesis is also a rallying cry for conservation in the 21st Century. Mainstream conservation cannot create the necessary space for beavers at scale, as it lacks the financial and political muscle. Consequently, beaver-managers are largely confined to *firefighting*, trapping beavers and managers in an undesirable middle ground, rendering stakeholder perception of beavers precarious. Well-funded and competent beaver management is essential on a short- and mid-term basis. However, as conflicts with beavers for the most part emerge in damaged wetlands, a long-term solution to beaver conflicts is tied to central Europe's wetland crisis. My study of central Europe's landscape history reveals the fossil status quo, with *technocentrism* as its ideological corollary as a political and economic force in conflict with conservation and beavers. Through adopting the *castorian perspective* it becomes possible to view beavers as utopian *world-makers* whose projects significantly overlap with various *more-than-human* projects beyond conservation. I argue that beavers and beaver-managers, in order to stem the rising tide of extinction, must ally themselves with water managers, in what Latour and Schultz have called the formation of the *ecological class* as a political subject. Based on expert interviews, participant observation, *new materialist* theory and the consultation of historical, anthropological and ecological literature; I offer a framework for conservation thought and action beyond Modernist Dualisms, opening conservation to the often-marginalized social sciences. In so doing, my research contributes to debates on rewilding practices, nature-based solutions, and transdisciplinary conservation.

Title:

A new method for rapid large-scale population estimation of the Eurasian beaver (*Castor fiber*).

Author name(s):

Brigitte Komposch[1], Anna Rodenkirchen[1], Werner E. Holzinger[1]

Organisation name(s):

[1]Ökoteam - Institute for Animal Ecology and Landscape Planning

Abstract:

Reliable data on beaver populations are important for the management of the species. For large areas, complete mapping is often not feasible for cost reasons. We developed a new method for population estimation and tested this method in two federal states of Austria (Upper Austria and Carinthia). For this purpose, the entire water network within the known distribution area of the beaver in the federal state was divided into 5-km-sections. We then excluded 'non-habitable' sections on the basis of 'altitude' and 'inclination' (too high, too steep). Finally, a random sample (n=100) of the remaining 'habitable' sections, stratified by stream size, was chosen. In the field, all beaver signs were mapped in these sections and beaver territories (number, territory type) were determined. Additional habitat parameters were also recorded. The method was used for Upper Austria and Carinthia and resulted in very plausible population estimates with a significantly reduced time expenditure compared to area-wide mapping. In the example of Upper Austria, 757 5-km-sections were defined as suitable for beavers. 73 of the 100 mapped sections showed beaver signs, 102 beaver territories were documented. The extrapolation resulted in average territory lengths of approx. 1.6 km and a total population of approx. 2,200 (±440) beavers in around 735 (±120) territories.

Title:

Influences of beavers (*Castor fiber*) on the spawning dynamics of trout (*Salmo trutta*) in the North German lowlands – Evaluation of spawning dynamics based on abiotic factors and habitat conditions.

Author name(s):

Felix Krause[1], Robert Sommer[1]

Organisation name(s):

[1]University of Applied Sciences Neubrandenburg

Abstract:

As ecosystem engineers, beavers (*Castor fiber*) influence smaller watercourses particularly by building dams. Furthermore, the impact on salmonids is documented by many studies in Europe and North America. This impact can be extremely complex, ranging from positive e.g. through the creation of refugial areas, to negative, e.g. through the loss of spawning habitats. It is not yet clear how these effects of beavers, particularly in the North German lowlands, affect the overall dynamics of trout (*Salmo trutta*) stocks in the long term. To this end, the Linde, a lowland stream of Mecklenburg-Western Pomerania, was studied between 2021 and 2023. Over a distance of 11 km, beaver dams were categorized according to their passability. Moreover, spawning beds (redds) as well as spawning substrates were mapped. Some dams were found to obstruct the migration of trout. Therefore, up to 31.6 % of the medium gravel dominated stream sites were inaccessible. Additionally, the number of redds downstream of beaver dams increased by 125 % between 2021 and 2023, while the number of redds upstream of beaver dams stagnated. Furthermore, it was found that a discharge between 0.75 m^3/s (2023) and 1.3 m^3/s (2021) was sufficient in the Linde to enable the passage of potentially impassable dams. This illustrates the importance of the flow regime for river continuity. An acute threat to the trout population from beaver dams cannot be proven by this study. In this respect, it reflects mostly the current state of knowledge in the international literature.

Title:

Behaviour of fishes at beaver dams - investigations with PIT tags (part of the Swiss national beaver research project).

Author name(s):

Thomas Kreienbühl[1]

Organisation name(s):

[1]Ecqua GmbH

Abstract:

The question of fish passability at beaver dams is a recurring issue for fishermen and authorities. Therefore, beaver dams in three representative Swiss midland waters were studied, which had different channel characteristics. The study was conducted with PIT tags. Antennas above and below the beaver dams were used to redetect the marked individuals.

The results showed that brown trout (*Salmo trutta*), chub (*Squalius cephalus*) and bullhead (*Cottus gobio*) were able to cross the beaver dams upstream. The ascent was easier if the streams were connected laterally with their environment. Most ascent events took place during periods of increased discharge. During such events the difference between upstream and downstream water level at the beaver dams aligned, which facilitated the ascent. It was also observed that side channels quickly formed during rainfall, which gradually dissipated the energy of the water and thus offered the fish additional opportunities to ascend.

The comparison of two study years, one with a dry and one with a wet summer (frequent precipitation events) showed that fish migration can be reduced during dry periods. This could be particularly problematic in waters with spawning grounds for migratory fish species or in regulated waters. However, it must be borne in mind that beaver dams in dynamic waters are not static structures. They are subject to a natural life cycle and are regularly damaged or destroyed. The study concludes that negative effects on local fish populations are hardly to be expected due to beaver dams in such streams.

Title:

Busy beaver capture carbon? The role of beaver-engineered wetlands in enhancing soil carbon sequestration.

Author name(s):

Annegret Larsen[1], Lukas Hallberg[2], Tom Brouwers[1], Manou van Mierlo[1], Rodin Dukker1, Michiel in t'Zandt[1], Nick Quist[1], Christof Angst[3], Thierry Adatte[4], Carsten Mueller[5], Joshua Larsen[2]

Organisation name(s):

[1]Environmental Sciences, Wageningen University and Research, [3]info fauna – Biberfachstelle Switzerland, [2]Earth and Environmental Sciences, University of Birmingham, [4]Institute of Earth Sciences, Lausanne University, [5]Soil Science, Technical University Berlin

Abstract:

Beavers (*Castor spp.*) are influential ecosystem engineers, significantly altering river corridor hydrology, geomorphology, nutrient dynamics, and ecosystem function. Their primary mechanism of influence is dam construction, which impounds water, expands the extent of standing water bodies, and initiates a cascade of geomorphic and ecological transformations. Following a period of widespread regional extirpation, beaver populations have been recovering and expanding across Europe, necessitating a deeper understanding of their ecological impacts on river corridor dynamics and the development of management strategies that optimize benefits for both human and ecological systems. In this study, we investigate carbon cycling within several river sections at one beaver wetland in Switzerland. Our research quantifies soil carbon stocks and characterizes their composition. Field work and UAV-based remote sensing included sediment and vegetation mapping and measurements of organic and inorganic soil carbon content using Rock-Eval pyrolysis (RE6 and RE7), and density fractionation. Our results indicate that soil carbon sequestration is a major contributor to negative carbon fluxes (see abstract by Hallberg et al.). Furthermore, we demonstrate that a substantial fraction of the stored soil organic carbon is not only highly recalcitrant but also exists as mineral-associated organic matter (MAOM) – a heavier, less complex, and more stable carbon fraction with typically lower turn-over time. A controlled incubation experiment gave further insights into the microbially mediated processes driving MAOM formation and hence carbon sequestration. Our findings indicate that beaver wetlands effectively store and sequester carbon over millennial timescales, which persists also in the absence of active beaver presence.

Title:

Improving multi-stakeholder recording of - and access to - Eurasian beaver (*Castor fiber*) records in Britain, to enhance and inform beaver conservation activities.

Author name(s):

Matt Larsen-Daw[1], Claire Howe[2], Jess Thomasson[3], Ross Clifton[1]

Organisation name(s):

[1]The Mammal Society, [2]Natural England, [3]Environment Agency

Abstract:

Ahead of the recent change in legislation to allow wild beaver releases under licence in England, it was identified that the real 'on-the-ground' picture of beaver occupancy was difficult to ascertain due to unsanctioned releases, escapes from licenced enclosed populations, and a reticence from some organisations and communities to publicise local beaver populations due to fears of persecution or removal. Data available through national biodiversity records centres would often be incomplete and blurred. Furthermore, the fast-changing situation in the landscape was not always reflected by the data available.
The Mammal Society, in collaboration with Natural England and the Environment Agency, developed new functionality in its citizen science recording app, the Mammal Mapper app, to enable it to capture valuable information on beaver presence or activity. Additionally, a password-protected online portal was developed to show real-time beaver records received through this app alongside historical records and data from professional surveys on an interactive map.
This poster will outline the functionality and data flow of the app and portal, the rationale for design decisions, how it is being used, and the potential evolution of this portal and recording tool to enable a strategic and informed approach to beaver conservation.

Title:

Transforming landscapes through rewilding: beavers enhance biodiversity and ecosystem function.

Author name(s):

Alan Law[1], Nigel Willby[1], David Bryan[1], Garth N. Foster[2], Lori Lawson Handley[3,5], Wenfei Liao[4], Graham S. Sellers[3], Tom Spencer[3], Petri Nummi[4]

Organisation name(s):

[1]University of Stirling, [2]Aquatic Coleoptera Conservation Trust, [3]University of Hull, [4]University of Helsinki, [5]UK Centre for Ecology and Hydrology

Abstract:

Rewilding seeks to restore lost processes and is epitomised by the expansion of beaver populations. As ecosystem engineers, beavers are second only to humans in their capacity to change landscapes; their damming of streams creating heterogenous wetlands. Here we address what this immense transformative potential means for biodiversity and ecosystem functioning across multiple species groups at the landscape-scale. We quantified six taxonomic groups (aquatic plants, water beetles, amphibians, fish, birds and mammals) via in situ surveys and eDNA sampling of 18 wetlands, half created by beaver and half by other natural means (control wetlands), in the Evo region of southern Finland. Fifty-eight percent of species found were shared between beaver-created and control wetlands, yet each wetland type supported unique species or combinations of species, with beaver wetlands increasing the regional species pool by an average of 26%. In both wetlands, the incidence of rare or invasive species was low. Functional diversity, inferred from plant ecological preferences, was 55% higher in beaver compared to control wetlands, implying higher niche heterogeneity and increased landscape ecosystem resilience. Our work evidences how beavers change biodiversity across multiple species both within and beyond their wetlands and what this means at the landscape scale. Ecosystem engineers such as beavers are integral to reinstating the lost, dynamic ecological processes that promote heterogeneous landscapes and offer measurable gains for biodiversity that are hard to achieve through other mechanisms.

Title:

A dam good network: Creating the International Beaver Knowledge Hub.

Author name(s):

Marloes Leeflang[1], Elze Polman[1], Vilmar Dijkstra[1], Elly Andison[2], Laura Dalton[3], Elliot McCandles[4], Torsten Heyer[5], and Hanneke Kloosterboer[6]

Organisation name(s):

[1]Dutch Mammal Society, [2]Environment Agency, [3]Natural England, [4]The Beaver Trust, [5]TU Dresden, [6]STOWA

Abstract:

We are excited to announce the creation of the International Beaver Knowledge Hub - a global platform dedicated to fostering collaboration and sharing expertise on beaver coexistence. This hub will serve as a unique space where scientists, practitioners, and experts from around the world can connect, share knowledge, and work together on sustainable solutions for beaver management. By offering resources, research, case studies, and practical advice, we aim to create a thriving network that empowers individuals and communities to address the challenges and opportunities of living alongside beavers. We are currently in the process of building the hub and would like to invite you to be part of this exciting endeavour. We are seeking contributions of knowledge, insights, and experiences, whether through submitting articles, writing or reviewing content, or simply spreading the word about this valuable project. Together, we can create a comprehensive, collaborative, and impactful space that helps ensure a harmonious future for both people and beavers. Join us in making the International Beaver Knowledge Hub a go-to resource for all things related to beaver coexistence. Let's build something dam good, together!

Title:

Beavers (*Castor spp.*) as a tool to enhance biodiversity across multiple taxa.

Author name(s):

Wenfei Liao[1], Janne Sundell[1], Petri Nummi[1]

Organisation name(s):

[1]University of Helsinki

Abstract:

Beavers (*Castor spp.*) are ecosystem engineers that significantly alter their environment by creating floods and increasing habitat heterogeneity. This talk synthesizes findings on the impacts of beaver activity on biodiversity across multiple taxa, including aquatic insects as well as semiaquatic and terrestrial mammals. Our research conducted in southern Finland demonstrates that beaver-created ponds serve as biodiversity hotspots. Water beetles exhibit higher species richness and abundance in newly formed beaver ponds compared to older or non-beaver wetlands, likely due to favourable habitat features, such as low predation risk. Similarly, while small mammal abundance does not significantly differ between beaver-modified and control sites, species composition varies. Grass-eating field voles and invertebrate-eating shrews are more common in beaver sites, while forest-dependent species like wood lemmings are absent, highlighting beaver-modified habitat specialisation. Large mammals, such as the moose (*Alces alces*), also show higher activities in beaver-modified habitats than control sites, likely due to increased food availability. The increased herbivore activities in beaver sites tended to attract predators, such as the pine marten (*Martes martes*) and the red fox (*Vulpes vulpes*). At the landscape scale, beaver activity fosters ecological succession and contributes to overall species richness by creating a mosaic of successional stages, which supports diverse ecological communities. These findings suggest that beavers play a crucial role in ecosystem restoration, particularly in wetland conservation, by maintaining a dynamic and heterogeneous environment. The beavers or mimicking beaver-modified habitats can be used to facilitate the diversity of aquatic, semi-aquatic and terrestrial organisms for biodiversity conservation.

Title:

A home for the many? Beaver lodges as hotspots for bird and mammal diversity.

Author name(s):

Hanna Kavli Lodberg-Holm[1], Frank Rosell[1], Floris Meijer[1], Martin Midbøe[1]

Organisation name(s):

[1]Faculty of Technology, Natural Sciences, and Maritime Sciences, University of South-Eastern Norway.

Abstract

Biodiversity loss is a growing global concern. Keystone species and ecosystem engineers play a crucial role in maintaining and enhancing biodiversity. The Eurasian beaver (*Castor fiber*) is one such species, impacting the landscape through activities such as felling trees, digging tunnels, building dams, and constructing lodges. Numerous studies have shown that beavers increase biodiversity especially around their dams, but the relationship between beaver lodges and biodiversity is rarely studied. Therefore, we mapped the diversity of birds and mammals at active beaver lodges in south-eastern Norway. The study was carried out in three large rivers without beaver dams. We installed wildlife cameras at 18 active bank and stick lodges across two seasons (spring and fall), matched with an equal number of paired control sites across the river. Beaver lodges had higher abundance, higher species richness and Shannon Diversity Index than control sites in autumn, but the differences were less pronounced in spring. Our results showed that beaver lodges attracted numerous individuals and species of birds and mammals, most likely due to the availability of resources such as food, shelter and warm microclimates on the lodge exterior. Our data therefore supports the concept of beaver lodges as local biodiversity hotspots and illustrates the role of beavers as keystone species and ecosystem engineers beyond the impacts of dam construction. This knowledge may help to increase the diversity of both birds and mammals in habitats across the northern hemisphere.

Title:

Catchment-scale eDNA sampling reveals effects of beaver recolonization on the distribution of migratory fish.

Author name(s):

James A. Macarthur[1], Alan Law[2], Nigel Willby[2], Dasha Svobodova[1], Nathan P. Griffiths[1], Roo Campbell[3], Martin J. Gaywood[1 3], Colin W. Bean[3], Lori Lawson Handley[4], Melanie Smith[5], Shaun Leonard[6], Chris Conroy[5], Victoria L. Pritchard1 and Bernd Hänfling[1]

Organisation name(s):

[1]Institute for Biodiversity and Freshwater Conservation, University of the Highlands and Islands, [2]Biological and Environmental Sciences, University of Stirling, [3]NatureScot, [4]Lake Ecosystems Group, UK Centre for Ecology & Hydrology, [5]Atlantic Salmon Trust, [6]Wild Trout Trust

Abstract:

Reintroduction of keystone species is considered part of the solution to the current biodiversity crisis. The Eurasian beaver (*Castor fiber*) is one such species, shaping their habitat by felling trees, building dams and creating wetlands. However, while the potential benefits to aquatic biodiversity and ecological functioning have been widely promoted on a local scale, few studies have looked at the catchment-scale effects of beavers on migratory fish. Sequencing of environmental DNA (eDNA metabarcoding) from water samples is a cost-effective method to study species distributions across large geographical scales. Here, eDNA samples (n=426) were collected from 142 sites across the UK's oldest and largest established wild beaver population, located on Tayside, Scotland and analysed using a vertebrate specific metabarcoding assay. We combined presence/absence data from eDNA results with other environmental and anthropogenic variables to model the comparative effect of beaver presence on the distribution of three migratory fish species. Using generalised linear models, we found no effects of beaver presence on the distribution of Atlantic salmon or lamprey, but a positive co-occurrence with European eel at the catchment scale. These models also revealed effects of environmental and anthropogenic covariates on species distributions consistent with existing literature exemplifying the effectiveness of eDNA sampling in rivers as a basis for understanding species distributions at a catchment scale. This approach provides valuable insights into the effects of beaver translocation and offers a basis for decision making and environmental risk assessment moving forward.

Title:

Beaver and fish Interactions: Linking knowledge from studies of river ecology and *Castor canadensis* in North America and *C. fiber* in Norway.

Author name(s):

Rachel L. Malison[1]

Organisation name(s):

[1]University of Montana

Abstract:

Beavers are well known as ecosystem engineers, increasing biodiversity and supporting numerous species by building dams and impounding water in lotic systems. Despite the known benefits of beavers, concerns about beaver reintroductions and expanding populations often center around perceived negative impacts to fish populations, especially to the movement of salmonids. However, salmon and beavers have co-evolved for millennia and research shows that positive interactions generally outweigh negative interactions. Many studies cited for the negative impacts of beavers on salmonids do not actually show that the dams are impassable to fishes. Understanding the effects of beavers on fish populations requires investigating many system-dependent factors, including multiple spatial scales. Beavers are an important part of naturally functioning streams and river floodplains and they help restore floodplain connectivity in degraded systems. A review of previous studies, as well as case studies from research in Alaska and Norway, will be shared to discuss factors that can influence how beavers influence fish populations. Beavers can play an important role in helping restore the natural function of degraded streams and rivers. Reconnecting riparian and floodplain habitats benefit multiple species and improves ecosystem resiliency.

Title:

Multimedia installation about the positive impact of beaver dams.

Author name(s):

Dave Maric[1]

Organisation name(s):

[1]Bamff Wildland

Abstract:

I am currently working on a multimedia project (which will be ready by September), involving my own photography and filming of beaver habitats at Bamff Wildland, Perthshire—where I live—as well as a collaboration with Perthshire based ecologist and river restorer Duncan Pepper. The project partly draws on his presentations about the benefits of beaver dams and habitats, particularly their impact on water flow and river restoration. The installation will feature photography (from professional cameras, drones, trail cameras and thermal cameras), infographics, video (displayed on wall-mounted tablets), and the potential for sculptural elements and projected video. It is designed to be adaptable: elements can be reduced or omitted to suit different spaces. For example, in a conference setting, it could be simplified to one roller banner (featuring multiple images and graphics), plus a single mounted video tablet device - a compact, standalone solution. I live and work within Bamff Wildland (https://bamff.land) the oldest Scottish rewilding beaver habitat. Here, I document the landscape through photography, video, music, and audio recordings, monitor the habitat, and promote it online (I also created the bamff.land website). The full installation will include: Photography (large and small prints),; Video loops (on wall-mounted tablets, with projections in larger spaces); Audio (played through tablets, speakers, or headphones, depending on the venue), sourced from field recordings (trail cameras and hidden microphones). Sculptural elements from beaver habitat. For conferences, the presentation can be streamlined to a single banner and one video device.

Title:

The role of beaver floods, vernal pools and aquatic invertebrates in supporting waterfowl breeding success.

Author name(s):

Basile Marteau[1], Janne Sundell[2], Céline Arzel[3], Petri Nummi[4]

Organisation name(s):

[1]Department of Forestry, University of Helsinki, [2]Lammi Biological Station, University of Helsinki, [3]Department of Biology, University of Turku

Abstract:

In Fennoscandia, the decline of insectivorous waterbirds in recent decades is worrying and may be linked to deteriorating foraging conditions and breeding success issues. Fewer wetlands are suitable for dabbling ducks as many shallow lakes and wetlands have been drained for agriculture or forestry. Moreover, not all boreal lakes are suitable for rearing ducklings due to limited food resources; aquatic invertebrates are crucial for young ducklings. Therefore, flooded wetlands such as beaver ponds or vernal pools can be good habitats as they are generally abundant in aquatic invertebrates. In both of these habitats dying terrestrial vegetation acts as a base for high detritivore-based production. Moreover, the absence or low density of fish allows for a high abundance of aquatic and emergent invertebrates due to the absence of predation pressure. Consequently, beaver and temporary ponds may serve as critical habitats in the landscape for invertebrate-feeding species like waterfowl, particularly in low-productivity landscapes such as the boreal zone. This study aims to examine the temporal variation in waterfowl abundance in relation to aquatic and emergent invertebrate availability in different wetland types. We hypothesize that the abundance of aquatic insects is essential for supporting waterfowl during breeding seasons. In this study that we will conduct during early spring 2025, we expect beaver flood and vernal pool to show abundance of higher waterfowl as we expect them to have greater abundance in aquatic invertebrates than permanent wetlands and lakes.

Title:

Seasonal and daily variation in body temperature and heart rate of the Eurasian beaver.

Author name(s):

Martin Mayer[1,2], Boris Fuchs[1], Christian Robstad[3], Alina L. Evans[1], Jon Martin Arnemo1, Frank Rosell[3]

Organisation name(s):

[1]University of Inland Norway, [2]Aarhus University, [3]University of South-Eastern Norway

Abstract

Beavers are exposed to large seasonal variation in temperature, especially in the northern parts of their distribution, affecting food availability and mobility, e.g., via ice cover. They generally remain active throughout the year and do not hibernate. Instead, a food cache is constructed in fall that is then consumed over winter when access to resources is limited. However, little is known about beaver activity and physiology during winter, when they spend much of their time inside the lodge, as well as concerning seasonal variation in activity budgets. To address these questions, we investigated if (1) body temperature (T_b) and heart rate (HR) vary seasonally depending on climatic conditions, predicting that T_b and HR would drop during the colder months of the year, (2) T_b and HR can be used to estimate activity times of beavers, predicting that activity can be categorized by a drop in T_b and an increase in HR, and (3) T_b and HR can be used to detect the timing of parturition in female beavers. Apart from shining new light on seasonal variation in beaver activity and physiology, addressing these questions is of management relevance in the context of setting adequate hunting seasons, that do not overlap with the reproductive period and parturition. Finally, we will discuss the challenges of surgical implantation of bio-loggers.

Title:

Working with Eurasian beavers (*Castor fiber*) to deliver conservation management within a constrained landscape.

Author name(s):

Heather McCallum[1], Vicky Turnbull[1], Jane Sears[1], Yvonne Boles[1], Matt Self[1], Robert Coleman[1]

Organisation name(s):

Royal Society for the Protection of Birds (RSPB)

Abstract:

Loch of Kinnordy, Angus, Scotland, has been managed as an RSPB Nature Reserve since 1976. It is designated SSSI for its eutrophic loch and open water transition fen, along with the breeding bird assemblage and greylag goose roost. Northern lapwing (*Vanellus vanellus*), common redshank (*Tringa totanus*), spotted crake (*Porzana porzana*) and marsh harrier (*Circus aeruginosis*) regularly breed there. The reserve is home to nationally scarce plants cowbane (*Circuita virosa*) and coralroot orchid (*Corallorhiza trifida*). The loch has a small catchment with a high proportion of prime agricultural land managed for arable production. Eurasian beavers (*Castor fiber*) have been resident since 2011, and damming has occurred on the outflow since 2013, including against the sluice which is now protected by a cage and beaver flow device. We aimed to evaluate the impacts of beavers on the reserve's hydrology and species and habitats of conservation concern. Analysis of long-term hydrological monitoring revealed that water level has increased at Loch of Kinnordy despite management of beaver dams and it is no longer possible to reliably drawdown water levels in late summer to facilitate site management. The likely impact of beavers on species of conservation concern were mainly assessed as positive or neutral. However, the impact of beaver activity on the reserve's hydrology, combined with high nutrient loadings from the surrounding agricultural catchment may have facilitated invasion of the fen by *Typha latfoliata*, a nitrogen demanding negative indicator species. Additionally, the ability to flush nutrients through the system has likely been reduced.

Title:

Managing beavers at the watershed level: combining riparian habitat connectivity, potential beaver population, beaver recovery zones and intuitive GIS/GPS field data collection.

Author name(s):

Kurt Menke[1], Bob Boucher[2]

Organisation name(s):

[1]Septima, [2]Superior Bio-conservancy

Abstract:

This presentation details a series of GIS analyses which feed into a new management paradigm for beavers and wildlife in the U.S. This plan, which can be implemented anywhere, includes a mobile phone app which can tally beaver harvest and location information. The data is automatically uploaded to a central database. All the software used is open source, including the Mergin Maps field data collection platform which integrates tightly with QGIS. This eliminates software licensing costs for those wanting to adopt this plan. Most U.S. State wildlife agencies don't know the size and distribution of the beaver population. Utilizing the field data collection system for beaver, allows agencies to develop accurate population estimates along with harvest data by watershed or hunt unit. Once the trapping quota has been met, the management unit can be closed for the season. We have conducted several related analyses which rank watersheds by metrics such as riparian habitat connectivity, potential beaver population and river miles. We will show the results of these analyses with illustrative maps. These metrics, combined with the field data collection tool, allow for a data driven understanding of ecosystem health. We use these data to identify Beaver Recovery Zones (BRZ) within each watershed, which are beaver refuges where trapping is not permitted. These BRZ's serve as ecosystem health anchors whereby beavers can safely breed and disperse to nearby watersheds where trapping has occurred. This plan allows beavers to thrive as keystone species and ecological engineers.

Title:

Beavers are boosting biodiversity - what has happened since the 6th IBS?

Author name(s):

Uli Messlinger[1]

Organisation name(s):

[1]Büro für Naturschutzplanung und ökologische Studien

Abstract:

Since 2002 ten sections of creeks and small rivers in Bavaria were analysed: five sections with a strong beaver activity and five sections with a low beaver activity. Optical and acoustic mapping of all bird species, bird species suspected of breeding and number of all bird-territories on defined routes; optical mapping and net catches of damselflies and dragonflies on defined routes; every 4th year since 2002 (last round 2022). After twenty years of study, the number of species of dragonflies and damselflies as well as the number of species of birds and bird territories per area are still increasing. The impact is more pronounced on sample areas with a high impact of beaver activities, but smaller positive effects can also be shown on sample sites with both riparian strips free of agricultural use and without lateral flooding by beaver dams. Riparian strips free of agricultural use show a structural dynamic that improves the suitability for wildlife and strengthens the function as wildlife corridors - this has now been shown progressively for two decades. Areas with lateral flooding resulting from strong beaver activity bring even more benefits for birds, dragonflies and damselflies. We presume that this is due to additional water and structural diversity, the closer proximity of early and later successional stages and the corridor-like arrangement of the beaver-typical biotope elements.

Title:

Genetic situation of the Beaver in France, Belgium and Luxembourg: lessons for species Conservation?

Author name(s):

Johan Michaux[1,2], Yoann Bressan[3], L.M. Pigneur[1], L. Schley, J. Herr[5]

Organisation name(s):

[1]Liège University - GECOLAB, [2]CIRAD-ASTRE, [3]French Biodiversity Agency, [4]Administration de la nature et des forêts, Service Faune sauvage et Chasse, Luxembourg, [5]Administration de la nature et des forêts, Luxembourg.

Abstract:

After narrowly avoiding extinction in the early 20th century, the European beaver (*Castor fiber*) has recolonised nearly 19,000 km of waterways in France. While this represents a significant conservation success for the species, concerns remain about its long-term viability in the face of current threats. One critical issue is the species' recolonisation history, which subjected French beaver populations to several genetic bottlenecks, potentially increasing the risk of inbreeding depression. To assess the long-term survival prospects of French beaver populations better, genetic analyses were conducted on 359 tissue and hair samples collected by OFB agents between 2010 and 2022. These samples were compared to 46 beaver samples from Belgium and Luxembourg. Analyses used microsatellite markers, MHC (Major Histocompatibility Complex) genes, and SNP (Single Nucleotide Polymorphism) markers. The results confirmed the presence of only one species in France, the European beaver, with the dominant subspecies being *C. f. galliae*, originating from the Rhône basin. However, other subspecies are expanding into northeastern France from neighbouring countries such as Belgium and Germany, potentially bringing them into contact with the "native" subspecies. Importantly, genetic diversity levels in *C. f. galliae* populations were found to be extremely low across all genetic markers analysed. What lessons can be drawn from these findings for the long-term conservation of the European beaver in France? While the very low genetic diversity of French populations poses a significant intrinsic risk, the introduction of genetic diversity from other countries could mitigate this risk, offering a more optimistic outlook for the species' future.

Title:

A boost in biodiversity through the dam-building activity of beavers on the Swiss Plateau.

Author name(s):

Silvan Minnig[1], Timon Polli[2], Raphael Krieg[3], Beatrice Lüscher[4], Daniel Küry[3], Thomas Kreienbühl[5], Gwenaël Jacob[6]

Organisation name(s):

[1]Genossenschaft umweltbildner.ch, [2]Polli Natur und Dienste, [3]Lifescience AG, [4]Karch Kanton Bern, [5]Ecqua AG, [6]Universität Fribourg

Abstract:

Sixteen sites were sampled, each with two 100m perimeters, one with a beaver dam activity (territory) and one without (control). All sites were in forested or open land and near-natural or impaired streams. Overall, beaver dams caused a doubling of the water surface and a change in substrate. In stable conditions, beaver dams remained in place for a longer period, and a variety of habitat types in the watercourses and banks, which were usually absent in the control, (re) formed under these conditions. We also investigated the effect of beaver dams on four species groups (fish, aquatic plants, dragonflies, amphibians). Across all sites, ~2.5 times as many species were found with beaver dams, and these were also 6 times more frequently represented. During the study, five beaver dams were destroyed. If these data are integrated into the analysis, the diversity in stretches with beaver dams increased by a factor of 3 and species occurred around 13 times more frequently. In stretches without beaver dams, species diversity doubled, but only 1.5 times as many individuals were found. This effect was evident across all sites but was somewhat greater in the forest and in impaired streams than in open land and near-natural streams. If there were significant differences in the diversity of species across all impaired sites (open land and forest), these were greatest in the large beaver ponds in the forest. These results show that beavers, as aquatic engineers, make the Swiss Plateau aquatic landscape more dynamic and diverse.

Title:

A boost in biodiversity through BDAs on the Swiss Plateau.

Author name(s):

Silvan Minnig[1], Timon Polli[2], Niels Werdenberg[3], Nicole Egloff[4], Pascal Vonlanthen[5]

Organisation name(s):

[1]Genossenschaft umweltbildner.ch, [2]Polli Natur und Dienste, [3]Emch+Berger AG, [4]AquaPlus, 5Aquabios

Abstract:

The innovative and cost-effective revitalization method with Beaver Dam Analogs (BDAs) mimics the construction activity of beavers, especially dam building. BDAs allow the positive effects of natural beaver ponds on hydrology and biodiversity to be initiated in a targeted manner. Since 2021, this method was regularly used in Switzerland - especially when a stream needed to be reconnected with its surrounding bank area or when fish diversity and biodiversity in water bodies and riparian areas needed to be promoted. Comprehensive monitoring began in 2022, examining the effects of six BDAs over six years. Surveys of fish, aquatic plants and amphibians were conducted prior to construction and an index of the attractiveness and diversity of fish microhabitats was compiled. The first phase of this monitoring was completed in 2024 with the same surveys - with impressive results: The wetted area increased by 600%; The attractiveness of the microhabitats for fish increased significantly, which was confirmed by quantitative fishing; Fish abundance increased by a factor of 17; Aquatic plants spread rapidly; and Amphibians spawned for the first time within the BDA perimeter. The enrichment of the watercourse with different substrate types behind the BDAs led to an elevation of the stream bed. As a result, the surrounding area was permanently connected to the watercourse. We also present other BDA-projects implemented in Switzerland and placed them in the wider context of stream revitalization.

Title:

Dams for defence - Beavers as a nature-based solution to adapt to more severe drought and wildfire.

Author name(s):

Jessie A. Moravek[1], Valerie Cook[2], Molly Alves2, Kristen Wilson[3], Emily Fairfax[1]

Organisation name(s):

[1]Geography Department, University of Minnesota, [2]California Department of Fish and Wildlife, [3]The Nature Conservancy

Abstract:

The North American beaver (*Castor canadensis*) builds channel-spanning dams that can improve landscape-scale resilience to drought and fire. In regions prone to intensifying drought and wildfire, purposeful beaver restoration actions in strategic areas have the potential to create nature-based solutions to global change. We are identifying priority locations for beaver restoration actions in California, where beavers have been largely extirpated for decades and where drought and wildfire are intensifying. By identifying existing dam-building populations and potential new locations for dam-building, we can pinpoint areas where additional restoration or reintroductions are needed to help beavers successfully build dams. We can also quantify the potential for beavers to create ecosystem service benefits like storing surface water and creating fire resistance. We found that beaver dams have the potential to create considerable water storage and fire resistance throughout this region, and that the water and fire benefits created by beavers often overlap with the highest risk areas for drought and fire, suggesting that beavers have the potential to be an effective nature-based solution for mitigating climate-related drought and fire. We also suspect that fire in places without existing beavers reduces the potential for landscapes to support newly introduced beavers, suggesting that beaver restoration needs to happen as a prevention strategy rather than as a response to fire. Working with land managers in California, our results will help guide the reintroduction of beavers into locations where they can be successful and help mitigate the impacts of climate change.

Title:

Beavers on the down-low: Monitoring and managing Eurasian beavers (*Castor fiber*) and their effects on floodplain habitats.

Author name(s):

Ben Morris[1], Phil Buckley[2], Catherine Sanders[3]

Organisation name(s):

Beaver Trust[1], Canterbury Christ Church University[2], University of Lincoln[3]

Abstract:

Wild populations of beavers have been present in the Stour catchment in Kent for over 20 years. Recent surveys of the catchment have concluded that the beaver population in Kent is currently the largest and most well-established population in England. Stodmarsh National Nature Reserve (NNR) is a 250-hectare, fully designated, internationally important wetland area. The Great Stour runs adjacent to the reserve. Within Stodmarsh NNR, there are a variety of wetland habitats, including open lakes, wet woodlands, grazing marsh, lowland fen, ditch systems and the largest expanse of reed beds in the southeast of England. Under current habitat modelling, much of the area within Stodmarsh NNR is considered 'unsuitable habitat' for beavers. Although beaver presence has been confirmed within the reserve since 2012, little is known about their utilisation of the various habitats and the ecological effects of their activities. By undertaking repeated annual ground surveys and drone imagery surveys, both orthomosaic imagery and multispectral imagery, we have found that several beaver territories are actively covering all of the habitats within the reserve. Ongoing monitoring will look to investigate population dynamics and how beavers are affecting scrub development within the reed beds. This research is important because it will produce robust evidence that will allow for the creation, development and implementation of site and habitat management programmes that will consider the presence of beavers, with wider relevance to other similar areas and habitats in Britain.

Title:

Short and long-term effects of repeated capture and handling on territorial movement behaviour in Eurasian beavers.

Author name(s):

Rasmus Mohr Mortensen[1,2], Rory Paul Wilson[3], Frank Rosell[2]

Organisation name(s):

[1]Department of Ecoscience, Aarhus University, [2]Faculty of Technology, Natural Sciences, and Maritime Sciences, University of South-Eastern Norway, [3]Biosciences, College of Science, Swansea University

Abstract:

Studying animals repeatedly over long periods of time can yield important scientific insights. However, capture and handling events can induce intense stress responses, potentially changing individuals' behaviour to an extent that may make our conclusions ecologically unreliable. Some animals exhibit flight responses to avoid capture stressors, but territorial animals may not have the same options, because of other ecological drivers. We analysed 112 GPS movement trajectories of Eurasian beavers (33 F, 42 M) from a long-term individual-based monitoring program (the Norwegian Beaver Project, 25 years). We investigated how movement behaviour and habitat selection in beavers were affected in the short-term (nights since capture) and in the long-term (experienced capture intensity and years of monitoring) by repeated capture and handling events. We show how a territorial animals like beavers may adjust their movement behaviour to exploit their territory, temporally and spatially, in a less predictable manner to reduce potential risk from disturbances such as researchers in the field, but also that ecological drivers may make younger individuals less capable of adjusting because of energetic requirements related to their fitness potential. Understanding how wild animal populations are affected by research and other disturbances is important to improve their welfare and to ensure ecologically reliable research data.

Title:

Imprints of past and present-day processes on variability of MHC genes in beaver populations.

Author name(s):

Jan Náhlovský[1], Aleš Vorel[2], Pavel Munclinger[1]

Organisation name(s):

[1]Charles University, [2]Czech University of Life Sciences Prague

Abstract:

The Eurasian beaver (*Castor fiber*) experienced a severe population bottleneck at the end of the 19th century, leading to a dramatic reduction in genetic diversity. Subsequent conservation efforts, including translocations and reintroductions, have played a crucial role in shaping the genetic landscape of present-day populations. While much attention has been given to population structure and genetic diversity of selectively neutral loci, the impacts of these historical events on loci subject to selection remain less explored. Our study examined how past population declines, isolation, and subsequent mixing have influenced variability of immune genes in beavers. We focused on genes of the major histocompatibility complex (MHC), which play a key role in adaptive immunity. By analysing sequences from MHC class II DRB and DQA loci, we revealed how different historical periods shaped MHC variability. While signs of positive and balancing selection were detectable in pre-bottleneck times, severe genetic drift during the bottleneck drastically reduced this variation. In contrast, diversity of MHC genes of the American beaver (*C. canadensis*) population is much higher. Although translocations have contributed to increased diversity in newly established Eurasian beaver populations, we found no evidence of ongoing selection. Our findings also highlight the long-term genetic consequences of population declines and conservation-driven translocations in beavers.

Title:

The impact of reintroduced Eurasian beaver (*Castor fiber*) dams on the upstream movement of brown trout (*Salmo trutta*) in upland areas of Great Britain.

Author name(s):

Robert J. Needham[1 2], Richard W. Zabel[3], Dylan Roberts[4], Paul S. Kemp[1]

Organisation name(s):

[1]International Centre for Ecohydraulic Research (ICER), University of Southampton, [2]Beaver Trust, [3]National Marine Fisheries Service, Northwest Fisheries Science Centre, USA, [4]Game and Wildlife Conservation Trust

Abstract:

Despite numerous documented benefits to biodiversity, concerns relate to the influence of beaver habitat modifications on fisheries, particularly in relation to economically important salmonids. This study investigated the impacts of a series of beaver dams on the upstream movement of brown trout during the spawning period at a field site in Scotland in 2015 (high flows) and 2016 (low flow). The study site comprised two streams entering a common loch, one modified by a series of dams, the other unaltered. Trout were captured using electric-fishing and 701 were tagged with Passive Integrated Transponders (PIT) before release. PIT telemetry antennas were installed below and above each dam to establish successful passage of trout. There was a distinct difference in passage success between years, with high flows and larger fish being important positive predictors of upstream passage success. A combination of environmental and biotic factors influenced passage success with high flows being a significant covariate at all four dams. Migratory delay was inversely related to previous passage success, whilst motivation was also a determinant of success. Our findings indicate that given the right environmental and biotic factors, brown trout are adept at passing beaver dams, although under certain conditions, beaver dams can impede the movement of brown trout. In particular, the barrier effects of beaver dams are exacerbated under low flow conditions, which may become a greater challenge in the future due to shifting climatic conditions if periods of warmer and drier weather persist and coincide with peak migratory movements of fish.

Title:

Beaver Dam Assessment Methodology for Salmonids - BDAMS.

Author name(s):

Robert Needham[1], Shaun Leonard[2], Eva Edgeworth[3], Melanie Smith[4], Matthew Holden[5], Daniel Osmond[3] and Elliot McCandless[1]

Organisation name(s):

[1]Beaver Trust, [2]Wild Trout Trust, [3]West Country Rivers Trust, [4]Atlantic Salmon Trust, [5]Devon Wildlife Trust

Abstract:

The impact of beaver dams on migratory fish populations is a multifaceted issue, with effects being highly specific to the site and species and temporal in nature, with beaver damming perceived by some to be a further threat to salmonid populations. The complexity is elevated further due to most existing knowledge on fish passage being derived from interactions with anthropogenic structures which remain constant in size, shape and structure over time. The Beaver Dam Assessment Methodology for Salmonids (BDAMS) outlines a framework designed to enable informed decision making about the passability of beaver dams for migratory salmonids, particularly in scenarios where human intervention might be considered. BDAMS is adapted from the SNIFFER methodology and the Institute for Fisheries Management (IFM) fish pass manual in an attempt to simplify this complex issue. It is structured to guide users in evaluating whether a beaver dam is an impediment to fish passage and in determining the appropriate course of action, which may include modification to the dam. Crucially, it also advises on the legal considerations, such as the need for obtaining a licence for any mitigating activities. This methodology serves as an essential guide for environmental managers, conservationists and policymakers, providing a straightforward approach to a complex ecological challenge. It aims to foster a harmonious coexistence between the ecological benefits of beaver activities and the preservation of migratory salmonid populations, ensuring the health and sustainability of freshwater ecosystems.

Title:

Influences of beavers (*Castor fiber*) on the spawning dynamics of trout (*Salmo trutta*) in the North German lowlands - Migratory behaviour of sea trout (*Salmo trutta trutta*) at beaver dams.

Author name(s):

Torsten Ode[1], Kilian Neubert[2], Robert Sommer[3], Malte Dorow[4]

Organisation name(s):

[1]Natura et Cultura - office for environmental planning and environmental education, [2]State Angling Association Mecklenburg-Western Pomerania, [3]University of Applied Sciences Neubrandenburg, [4]State Research Centre for Agriculture and Fisheries Mecklenburg-Western Pomerania

Abstract:

Over the last ten years, a decline in sea trout spawning activity has been observed in beaver-influenced waters in the German Baltic Sea region. Since 2023, the influence of beaver dams and beaver ponds on the migratory part of the local trout population of the river Linde near Neubrandenburg has therefore been investigated. These investigations focussed on the upstream migration of spawning trout and the downstream migration of smolts. Trout are marked with Passive Integrated Transponders (PIT) and the migration movements at beaver dams are recorded using PIT antennas. Electrofishing to determine species composition and abundance in modified and control sections complements the study. So far, 950 trout have been tagged. Initial results show a delay in upstream migration at beaver dams and a reduced number of spawning individuals above the dams. In 2024, individual beaver dams completely impeded the spawning migration. The success of the downstream migration of smolts appears to be inversely related to the number of beaver dams passed. Predation and desmoltification in beaver ponds may be one reason for this. The species composition in influenced and non-influenced sections differs significantly. While the downstream migration of smolts is currently independent of flow, the upstream passage of spawning fish at beaver dams and the species distribution in influenced sections are strongly dependent on flow. In combination with colonisation by beavers, declining flow rates in the watercourses of northern Germany may therefore regulate the regional sea trout population in the future.

Title:

Extreme modifications caused by beavers in high-altitude riparian habitats in the Ciuc lowland area, eastern Transylvania.

Author name(s):

Claudiu Pașca[1], Georgeta Ionescu[1], Ileana Ionescu[1], George Sîrbu[1]

Organisation name(s):

[1]National Institute of Research and Development in Forestry ”Marin Drăcea”

Abstract:

Beavers often amaze with their extraordinary ability to modify the environment to create optimal living conditions. Unfortunately, most of the beavers' actions conflict with human interests. Evidence of this can be observed in the mountainous lowland of eastern Transylvania (central Romania), which are part of the upper basin of the Olt River. These depressions are characterized by unique living conditions. The hydrographic network has a high density, formed in the Eastern Carpathians, and is abundantly supplied with water throughout the year. However, the main feature is geomorphological in nature: all mountain streams converge in a flat area of the depression, where water speed decreases, creating favorable conditions for beaver colonization. In this context, the natural colonization of the Ciuc lowland area by beavers occurred in two phases. The first phase consisted of colonizing the main course, with 58 families identified. Subsequently, over the past decade, favorable areas along the tributaries of the Olt River were gradually occupied, with 59 families identified by 2024. Of these, 53 families (89.8%) caused damage by flooding adjacent lands. A total of 189.4 hectares of pastures, hayfields, and agricultural land were affected. The changes are extreme from an agricultural perspective, as returning the areas to their original state is very difficult; the flooded zones are invaded by hygrophilous vegetation, and the soil is affected by excessive waterlogging. To prevent such cases, management measures should be implemented during the initial colonization phase, and beaver families should be monitored to facilitate the relocation of problematic individuals.

Title:

When and how do we get to beavers being cherished and accepted as part of a functioning ecosystem?

Author name(s):

Dawn Phythian[1]

Organisation name(s):

[1]Natural England

Abstract:

The reintroduction of beavers into the wild in England, despite their presence for 20+ years, requires a structured approach to ensure human-wildlife coexistence where beavers are being cherished and accepted as part of a functioning ecosystem. Given England's land scarcity and population density, understanding how we navigate the route to this coexistence will require need for monitoring and evaluating of the wild release of beavers. This talk will detail the established licensing process for developing a comprehensive monitoring and evaluation strategy for wild beaver release, and the factors that have influenced our decisions around that, and why we need to do any of it. This strategy is crucial for navigating potential conflicts, learning from these to fostering acceptance, while aiming for a healthy population of beavers. We will examine the evaluation of specific management tools, the definition of success in beaver reintroduction, and the criteria for determining a stable wild population. The presentation will also address what we hope to learn from the monitoring and evaluation. We will investigate the scope of future works and when we might be in the position to reduce these activities, while discussing the following points: identifying success, record-keeping to claim success, using metrics to identify stable wild populations, reevaluating for continued action and efficiencies, and emphasising importance of data collection.

Title:

The North American Beaver Knowledge Network: collaboration, coordination, and synthesis to advance continental-scale beaver science and management.

Author name(s):

Jonah Piovia-Scott[1], Adam Burnett[2], Sandra Clinton[3], Jordan Kennedy[2], Jesse Burgher[1], Julianna Hallza[1], Max Lambert[4], Emily Fairfax[5]

Organisation name(s):

[1]Washington State University, [2]Beaver Institute, [3]University of North Carolina – Charlotte, [4]The Nature Conservancy, [5]University of Minnesota

Abstract:

Beaver-related restoration is gaining momentum as a nature-based climate solution in North America, but there is a need for greater collaboration and coordination amongst beaver researchers, managers, and policymakers. The recently created North American Beaver Knowledge Network will synthesize information on research, policy, and management practice, facilitate knowledge transfer between research, management, and practitioner communities, and co-produce a summary of the "state of the science" on beavers in North America. We will accomplish these goals by collating information from the scientific literature, managers and practitioners, and Tribes and First Nations to summarize key findings and identify knowledge gaps. We will then convene regional and continental workshops to develop strategies for advancing science and management. Our first step towards these broader goals was to synthesize information on the ecological impacts of beavers and beaver-related restoration (BRR) in western North America. We conducted a comprehensive literature review focused on the effects of BRR on habitat and biodiversity attributes. Using 161 sources, we assigned confidence scores for specific outcomes and identified climatic and hydrogeomorphic contexts where BRR may be most impactful at building climate resiliency. There is substantial evidence that BRR increases climate resiliency of stream and riparian ecosystems in western North America. However, these benefits are only likely to accrue under certain climatic and hydrogeomorphic conditions. We highlight the deficit of peer-reviewed literature at the spatial and temporal resolution necessary to bridge our understanding of the aspirational potential and the realized benefits of beaver-related restoration.

Title:

“Beaver fever” chill out - Low prevalence of Giardia spp. in wild Scottish beavers (*Castor fiber*).

Author name(s):

Romain Pizzi[1, 2], Fiona Howie[3], Daniel Arah[1], Sheelagh MacAllister[1], Rob Needham[1], Veselina Alva[2], Gary Curran[2], Roo Campbell[4], Roisin Campbell-Palmer[1]

Organisation name(s):

[1]Beaver Trust, [2]Five Sisters Zoo, [3]Scotland’s Rural College, [4]NatureScot

Abstract:

Giardia species protozoal parasites are an important common cause of waterborne gastroenteritis in humans. The zoonosis is often referred to as “Beaver Fever” in North America, which has resulted in human health concern queries regarding beavers in Scotland. 273 wild free-living Eurasian beavers (*Castor fiber*) trapped for translocation as part of conflict mitigation from 2019-2025, and 26 wild beavers found dead and examined post-mortem were tested for *Giardia* infection using a rapid enzyme immunoassay test for detecting soluble *Giardia* antigen in rectal faeces. A prevalence of only 1.83% was found in live beavers (95% confidence interval of 0.6 to 4.22%), and none of the positive beavers demonstrated any signs of clinical illness. Live beavers were treated and retested negative, and there was no difference in post-translocation survival. Prevalence was highest in kits at 3.53%, and lowest in adults at 0.68%, but did not demonstrate a significant statistical difference. In the dead beavers a single adult female tested positive, (3.85% (95%CI 0.097 to 19.64%). This beaver had no signs of any associated disease, having died from sepsis from a *Staphylococcus aureus* infected bite wound received from another beaver. Currently, wild free-living Eurasian beavers in Scotland do not appear likely to pose any notable *Giardia* infection risk to humans or other animals, in comparison to the high prevalence of *Giardia* found in numerous domestic animal species.

Title:

Disease prevalence in wild beavers (*Castor fiber*) in Britain.

Author name(s):

Romain Pizzi[1,2], Fiona Howie[3], Daniel Arah[1], Sheelagh MacAllister[1], Rob Needham[1], Veselina Alva[2], Gary Curran[2], Claire Howe[4], Roo Campbell[5], Roisin Campbell-Palmer[1]

Organisation name(s):

[1]Beaver Trust, [2]Five Sisters Zoo, [3]Scotland's Rural College, [4]Natural England, [5]NatureScot

Abstract:

Wild free-living beavers (*Castor fiber*) were trapped under license by the relevant statutory bodies in Britain from 2019 until the end of March 2025 for detailed veterinary health assessments under anaesthesia according to previously published disease risk analysis. Examination also included testing for possible zoonotic diseases including *Salmonella*, *Yersinia*, *Giardia*, *Cryptosporidium*, and *Leptospira* spp. Beavers had a low infectious disease prevalence overall, with the highest prevalence being for Leptospirosis. Of tested beavers, 2.2% had *Leptospira* spp. antibody titres above 1:1600, indicating likely recent infection according to World Organisation for Animal Health (WOAH) guidelines (95%*CI* = 0.8% to 4.8%, *n*=267). Of all beavers tested, 9.7% had *Leptospira* spp. antibodies detectable, indicating historic exposure and recovery (95% *CI* = 6.5% to 13.9%). No beavers tested were positive for Salmonellosis, *E. coli,* or *Mycobacterium avium paratuberculosis* (Johne's disease). Parasitology examinations found 29.1% of beavers had coccidial oocysts in their faeces on coprological flotation examination (95% *CI* = 20.6% to 39.3%), but none of these beavers had any clinical signs of any illness. Of all beavers examined, 2.8%, for any reason, required euthanasia for non-infectious disease health reasons, all of which were pre-trapping traumatic injuries (95%*CI* = 1.2% to 5.4%, *n*=286). Four of these beavers were euthanised for severe bone fractures, and two beavers because of severe wounds from barbed wire entanglement. There currently appears to be a low prevalence of significant zoonotic infectious diseases in wild British beavers.

Title:

Long term local and regional colonization patterns of European beavers in France.

Author name(s):

Laura Plichard[1], Yoann Bressan[2], Clément Callenge[2], Jérôme Belliard[1]

Organisation name(s):

[1]Institut National de Recherche pour l'Agriculture, l'alimentation et l'Environnement (INRAE), [2]Office Français de la Biodiversité (OFB)

Abstract:

Until the 19th Century, major human threats have considerably reduced beaver distribution across Europe, particularly in France. Since then, with protection laws and reintroductions, beaver progressively recolonize watersheds from its residual populations of the Rhône delta. Even though many studies showed the influences of local environmental factors on beaver presence, less is known about their effect on colonization process at local and regional scales. In this study, we examine the colonisation events in around 400 river sections (approximately 500m long) located in three different watersheds (the Loire, the Rhine, the Rhône). These initially unoccupied river sections were revisited 1 to 24 years later to check for possible beaver colonisation. We then used a top-down generalized linear model strategy to understand how the colonisation occurrence varied as a function of different variables representing the dispersal process (time between the two successive visits, distance to already occupied sections), hydrology and land use qualified at the local level of river section (100 x 500 m) and at a larger scale (2000-m radius). Dispersal characteristics showed a significant influence on river section colonization for each watershed, with a time positive influence and a distance from the nearest colonized site negative influence. We could not highlight any consistent hydrological and land use influence on beaver colonisation; this influence seemed to vary between watersheds, which underlines the need to further explore links between colonization and environmental factors for examples using Spatial Modelling on Stream Networks (SSN) to take into account spatial autocorrelation in river networks.

Title:

England’s journey to living alongside beavers.

Author name(s):

Delphine Pouget[1], Will Stinson[2]

Organisation name(s):

[1]Natural England, [2]Department for Environment, Food and Rural Affairs

Abstract:

Building upon the early perspectives of beaver reintroduction shared at the 9th international symposium, this presentation provides an update on beaver reintroduction in England, highlighting significant progress in policy and strategy. The landmark government announcement on February 28, 2025, marked a pivotal shift from enclosed releases to a nationwide commitment to wild beaver reintroduction, signalling a major stride in nature recovery efforts in England. The new policy approach is structured around three key objectives: the creation of a robust framework to allow wild releases, the formal recognition and management of existing wild beaver populations, and the development of a long-term management plan for England. This presentation will detail these objectives and their implementation, grounded in the IUCN translocation guidelines and the English Code, while also integrating valuable lessons learned from other countries and fostering extensive multi-stakeholder collaboration. It will explore the delicate balance between the ecological benefits of beavers and potential human-wildlife conflicts, acknowledging the influence of economic and political factors in achieving this milestone. Furthermore, it will emphasise that this decision is the beginning of a collaborative journey towards co-designing a sustainable vision for beavers in the English landscape. While the announcement offers considerable hope, it underscores the need for continued effort in fostering coexistence with a species absent for over four centuries returning to a modified environment with a complex mosaic of land uses and competing human and ecological needs.

Title:

Making space for water: nature-based solutions with beavers.

Author name(s):

Alan Puttock[1], Matt Holden[2], Holly Barclay[2], Richard E. Brazier[1], Peter Burgess[2]

Organisation name(s):

[1]University of Exeter, [2]Devon Wildlife Trust

Abstract:

We face intense pressures from climate extremes, land use change, declining biodiversity and increased demand for water resources. It is proposed that by working with natural processes, Nature-based Solutions (NbS) can increase resilience, providing multiple environmental and societal benefits. Beavers are ecosystem engineers. Research has shown the return of the beaver can provide multiple benefits including for biodiversity and water resource management. Building upon the River Otter Beaver Trial, The Making Space for Water Programme aims to support land managers to build a network of nature rich wetlands across Southwest England. This project led by Devon Wildlife Trust, in partnership with the University of Exeter and local landowners, works with wild beavers to deliver natural solutions to address societal challenges. Case studies will be presented discussing how we can make catchments 'beaver ready' finance projects to make space for beaver wetlands and maximise NbS benefits. It is hoped that this project can contribute towards the mainstreaming of nature-led NbS approaches.

Title:

Regulation of beaver reintroduction in England.

Author name(s):

Amy Radford

Organisation name(s):

Natural England

Abstract:

This presentation explores the role regulation has and will continue to play in the reintroduction of beavers to England. It is common for regulatory frameworks to be the subject of polarised opinions; is regulation red tape or does it enable an essential means of control? Does it reduce or improve opportunity to 'do the right thing' – opportunity for the species to recover; and does it offer protection – if so, what is it that should be protected? Beavers can now be released into the wild in England under licence and this presentation will detail the approach taken to develop the licensing criteria. It will consider the judgements made using these criteria and the potential for them to reasonably determine the suitability of beaver wild release proposals. There will be a particular focus on why key factors are considered pivotal in enabling both the establishment of healthy beaver populations, and their acceptance into the countryside as a naturalised wild mammal. The presentation will also discuss the issue of human wildlife conflict, the role of species management and the point at which practical needs and approaches meet regulatory requirements. In addition, there will be short reflection on the alternative to regulatory presence and the bigger picture for supporting the reintegration of a keystone species back into the everyday life of the English cultural, ecological and economic landscape.

Title:

What we learned from 20 years with beavers: an emotional, ecological and social testimony.

Author name(s):

Sophie Ramsay[1], Nonie Coulthard[1]

Organisation name(s):

[1]Bamff Wildland

Abstract:

Beavers came to Bamff in 2002. Since that time, they have radically altered both waterways and minds. A personal and descriptive account of living with beavers, managing land with beavers, and bearing witness to biodiversity increase and ecosystem repair at a time of critical global and local decline. This talk - intended to complement a more direct scientific account - will explore how beavers became a catalyst for a wider vision for landscape change: how they emboldened a bigger, more ambitious rewilding project, and how their impacts shaped thinking on catchments and landscapes, connectivity and community. The talk will cover work to extend riparian and river restoration into heavily managed landscapes beyond the boundaries of Bamff, detailing progress made, and barriers experienced: cultural, policy and regulatory. It will also discuss Bamff's interface with academic institutions - especially University of Stirling - hosting the wide range of research they have carried out, and how that has informed us as beaver advocates, building a scientific evidence base and telling the story of beavers as essential ecosystem engineers. It will describe the founding and design of our pioneering Wildland project, the vital work of our Steering Committee, our partner organisations and volunteers, and our shared vision for the role of beavers within an ecologically resilient Bioregion.

Title:

Leveraging hyperspectral data to model carbon storage in North American beaver (*Castor canadensis*) influenced watersheds of the Laurentian Forest Province.

Author name(s):

Max Rock[1]

Organisation name(s):

[1]Superior Bio Conservancy

Abstract:

Beavers are widely recognized for shaping wetlands, restoring biodiversity, and supporting watershed health. However, their potential to contribute to climate solutions through carbon storage remains largely overlooked. This presentation introduces a conceptual framework for estimating the carbon storage potential of beaver pond landscapes across the Laurentian Forest Province, with particular relevance to the Lake Superior watershed. Building on the Superior Bio Conservancy's work mapping beaver recovery zones, we propose an approach that links landscape characteristics to potential carbon benefits. The framework draws on ecological relationships between stream density, land cover, beaver pond formation, and the accumulation of organic material in wetland environments. Carbon storage in beaver pond systems is used as a proxy for identifying watershed scale potential for nature-based carbon sequestration. To identify areas with high ecological potential, we apply a composite score across mapped recovery zones based on the availability of wetlands, forests, and streams. Hyperspectral satellite imagery contributes additional inputs to the framework, capturing indicators such as vegetation composition, soil moisture gradients, and dissolved organic matter. These variables are combined into a weighted scoring system to estimate the relative carbon storage potential of beaver influenced landscapes across the region. This approach is designed to scale across the broader region and at a global level through machine learning models trained on ecological and hyperspectral satellite data. The framework supports data-driven restoration focused on a keystone species and offers meaningful implications for advancing climate resilience and conservation planning in the Laurentian Forest Province and beyond.

Title:

A technical guide for protective measures for river banks, dikes and dams against beavers (*Castor fiber*) and other burrowing animals.

Author name(s):

Georg Schrenk[1], Torsten Heyer[2], Michael Arndt[3], Haberhard Lauenstein[4], Andreas Pook[5], Ralf Rombach[6], Bettina Sättele[7], Franz X. Schöll[8], Annett Schumacher[9], Gerhard Schwab[10]

Organisation name(s):

[1]Geoökologische Beratung, [2]Technische Universität Dresden, [3]SECON SYSTEMS GmbH, [4]Justus-Liebig-Universität Gießen, [5]Amt für technischen Umweltschutz Kreis Viersen, [6]Bundesanstalt für Gewässerkunde, [7]Fachbüro Biberfragen, [8]Bundesanstalt für Gewässerkunde, [9]Arbeitskreis Biberschutz Sachsen-Anhalt, [10]BN-Bibermanagement Südbayern

Abstract:

Beavers, coypu and muskrats (but also rabbits, foxes, badgers and other species) are actively digging their homes in river banks, dikes and dams. These burrows can collapse and will weaken the structure of dams and dikes, causing them to break and subsequently creating huge damages due to flooding. The water management authority of Ingolstadt in Bavaria, Germany was the first organization which developed and implemented preventive measures against digging animals in the late 1980s by embedding steel wire mesh as vertical barrier for the protection of the dikes. The measures were published 1997 in a guideline for water management organizations. Since then, beavers and coypu have spread all over Europe, and the problems showed up in a much wider area in different countries. During the last decade the authors have collected all information available and finally published an updated version of the manual titled “DWA-M 608: Beaver, Muskrat, Coypu”. The new manual has 3 volumes: vol. 1, biology of beaver, coypu, muskrats (already available in englisch), vol. 2, preventive measures (english in preparation, due end of 2025), vol. 3, habitat improvements (in progress). In our poster, we present an extract of vol 2. for the interested public.

Title:

Utilisation of wildlife rescue hills by Eurasian beaver (*Castor fiber*) with regard to its management in floodplains.

Author name(s):

Annett Schumacher[1]

Organisation name(s):

[1]Arbeitskreis Biberschutz Sachsen-Anhalt

Abstract:

Wildlife rescue hills are a supportive management tool to avoid conflicts between flood protection and beaver activity in floodplains. After flood events on the Elbe and Mulde rivers in 2023 and 2024, the use of 46 elevations in the floodplains by beavers and other wildlife was investigated. Beaver lairs were found at nine sites and feeding places at four sites. On average, sites used by beavers were closer to the nearest permanent water body and closer to a used beaver den than those without beaver activity. There was no difference between utilised and unutilised sites in terms of vegetation cover. However, beavers preferred to build their lairs in places with dense vegetation (under shrubs or dead wood). European badger (*Meles meles*) and red fox (*Vulpes vulpes*) dens and wild boar (*Sus scrofa*) resting places were also found on the rescue sites, but only in one case were beaver lairs and a badger den found on the same hill. Camera traps were set up on five rescue hills during the flood events to obtain more information on utilization by wildlife and possible interaction between beavers and other mammals. At three of the sites, beavers were present during the flood event alongside other mammal species. However, no direct interactions between species were recorded. The rescue hills were not only used as resting places, but also as feeding places by mammals and birds. Supplementary information for the construction of wildlife rescue hills is derived.

Title:

Modelling habitat suitability and carrying capacity for European beaver (*Castor fiber*) in a highly modified lowland landscape.

Author name(s):

Ferdi Seljee[1], Sophie Ward[1], Ilse Sijtsma[1], Ronald de Jong[1]

Organisation name(s):

[1]Altenburg & Wymenga Ecological Research LLC

Abstract:

Beaver populations in the Netherlands are increasing and therefore territories are now also found in habitats outside of semi-natural river systems. Much of the Dutch lowlands are below sea level and are characterized by a dense and strictly regulated network of waterways that are protected by dykes. Policymakers wish to gain insight in the foreseeable population size and distribution of beavers in such landscapes so they can try and minimize human-wildlife conflicts. A spatial analysis was developed to model habitat suitability and expected carrying capacity. The analysis is applicable to highly modified water systems on a large scale and was applied to the province of Friesland in The Netherlands. Variables such as habitat density; habitat quality; and water availability based on groundwater levels, were used to develop the GIS-model. Land-use data, habitat data and remote sensing data of woody vegetation were used to determine locations of foraging habitat. For Friesland the model predicted a carrying capacity between 1395 and 2790 beaver territories, with an “average” scenario of 1860 territories, which equals an estimated 7070 individual beavers. High population densities were predicted in protected nature reserves, but also in certain agricultural and semi-urban areas. The results suggest that highly modified and densely populated landscapes can support high beaver densities. Beavers in close proximity to human-populated landscapes can result in safety implications, such as infrastructural collapse or flooding risks. With these results policymakers can anticipate risks and prepare accordingly by taking precautions in areas of high risk, thus, minimizing human-beaver conflicts.

Title:

Lawyers, guns and money: Helping beavers with sticks and carrots?

Author name(s):

Jakob Shockey[1]

Organisation name(s):

[1]Project Beaver

Abstract:

Humans fall in love with beavers, and - if this passion grows strong enough - will then start looking about for ways to help our fellow ecosystem engineers. Pretty soon, the inspired will begin, join or commence working for an applicable organization, government agency or university lab, then they learn to talk about strategies for coexisting with beavers, they link up with working groups, they attend their first beaver conference...many of us have followed a love for beavers down just such a path. We have worked to nourish a world where humans partner with beavers for the resilience of our planet, and many thousands of beavers owe their lives to the successes of this strategy. But why have so many who advocate for beavers chosen the non-regulatory, non-profit, and non-controversial approach? Is this really the most effective way to achieve more land and fresh water stewarded by beavers? This talk will explore some of the other strategies and tactics that get less air time, from paying landowners through “beaver easements” to passing laws that make a meaningful impact. We will highlight recent work from the United States to explore the efficacy of leveraging some of the most powerful human tools, like money and law, to benefit beavers.

Title:

Novel intake device for a re-usable, fish-friendly pond leveler.

Author name(s):

Jakob Shockey[1]

Organisation name(s):

[1]Project Beaver

Abstract:

Pond levelers are an amazing tool for restricting a the height of a beaver dam, but with hard-to-construct and tricky-to-maintain caged intake, the standard design has room for improvement. In this talk Jakob Shockey will present a new approach to protecting the intake of a pond leveler from beavers. This method is easier to install and maintain, re-usable and fish friendly. It is also in the early days of testing— Jakob will present on the results from piloting this device at sites throughout Oregon.

Title:

Pond-ering carbon: The storage of sediment and carbon by beavers.

Author name(s):

Emily Simpson[1], Scott Davidson[2], Amy Pickard[3], Anna Belcher[3], Alan Law[1],

Organisation name(s):

[1]University of Stirling, [2]University of Plymouth, [3]UK Centre for Ecology and Hydrology

Abstract:

Growing populations of beavers across Eurasia are leading to an increased density of beaver-created ponds in the landscape, which occur when beavers engineer a stream via woody dams. Beaver ponds (BPs) are biogeochemically unique, with high sediment accumulation, addition of organic material via foraging and remobilisation of sediment through dam maintenance. Estimates of carbon storage in BPs are, however, highly uncertain, and need to be better-constrained. This leaves the role of beaver ponds as a nature-based climate solution in question. Data were collected at Bamff, Scotland, where beavers have engineered for more than 20 years. 50 beaver-created and 5 non-beaver control ponds were sampled in 2024. Per pond, water and sediment depths were quantified and three sediment cores taken. Each core was subsampled from the top and bottom of each core. Across the site, 7,715,730 L of water and 549 tonnes of sediment were stored in BPs, containing an estimated 50 tonnes of C and 3 tonnes of N. The mean water, sediment and C per pond was 111000 L, 12 tonnes, and 1000 kgs, respectively. Sediment deposition was influenced by placement in the catchment (upstream dams had higher volumes), pond size, and position of the sample within the water column itself (top of the pond compared to the pond bed). Our results demonstrate that beaver-created ponds have a substantial potential to influence storage regimes. As nature-based solutions, these systems require further investigation into their ability to retain important nutrients within our freshwater systems, and possible balancing of GHG emissions through storage.

Title:

Harnessing machine learning for long-term monitoring of beaver dams in satellite imagery.

Author name(s):

Harris Sloan[1], Bret W. Tobalske[1]

Organisation name(s):

[1]University of Montana

Abstract:

Beaver dams are crucial ecological structures that shape hydrologic patterns, influence biodiversity, and serve as indicators of environmental change. Traditional field surveys are labor-intensive and limited in scale, necessitating automated approaches for large-scale, long-term monitoring. This study applies machine learning (ML) to detect beaver dams in more than a decade of satellite imagery. Leveraging convolutional neural networks and using time-series analyses for interpretation, we tracked spatial distribution and persistence of beaver dams in a 1000 km2 region of West Yellowstone, Montana USA. Our approach integrates multi-spectral and high-resolution datasets to distinguish beaver dams from similar features in riparian zones. We evaluate model performance against ground-truthed data and explore trends in dam proliferation and persistence. This work demonstrates the potential of ML-driven remote sensing for ecological monitoring and offers insight into how beaver engineering influences landscapes over time.

Title:

Evaluating biodiversity impacts of beavers on invertebrate and vertebrate communities using environmental DNA.

Author name(s):

Tom Spencer[1], James Gilbert[1], Cath Bashforth[3], Claire Howe[2], Lori Lawson Handley[1]

Organisation name(s):

[1]University of Hull, [2]Natural England, [3]Forestry England

Abstract:

UK reintroductions of the Eurasian beaver, *Castor fiber*, provide a key opportunity to research their impacts on biodiversity across entire ecological communities, different landscapes and spatiotemporal scales using modern and powerful monitoring tools like environmental DNA. Sampling from enclosed and wild reintroduction projects, we are investigating 1) how beavers impact the local distribution of conservation priority vertebrates and invertebrates, 2) how the composition of invertebrate and vertebrate communities shifts as beavers alter habitats, 3) how these impacts vary across space and time. Water samples have been collected from a number of locations across England, Wales and Finland with different environmental characteristics. Beaver sites are paired with a local control site which has not been influenced by beaver activity and will be sampled across several years to show change across temporal scales. Here we present an initial analysis of our biodiversity data collected from enclosed reintroduction projects and catchments supporting free-living beavers.

Title:

Assessing the spatial dependence of aboveground plant biomass in relation to beaver dam disturbance in a montane fen.

Author name(s):

Nichole-Lynn Stoll[1], Xulin Guo1, Glynnis A. Hood[1 2], Cherie J. Westbrook[1]

Organisation name(s):

[1]University of Saskatchewan, [2]University of Alberta

Abstract:

As Canada seeks to protect its extensive peatland carbon stocks and develop evidence-based conservation policies, recognizing beavers as a natural disturbance agent is essential. Beaver damming inundates peat, increases surface water storage, and raises and stabilizes the local water table. These hydrological changes drive shifts in peatland plant communities and successional pathways. Recent research also indicates that sedge shifts its phenology and increases in greenness in response to beaver damming, regardless of whether ponds are flooded or drained. Since changes in sedge phenology can affect carbon uptake, we assessed the spatial dependency of aboveground biomass on beaver damming. The aboveground biomass of a peatland in the montane zone of the Canadian Rockies was estimated by combining LiDAR derived from an unpiloted aerial vehicle acquired during the peak of the growing season with field biomass harvest data and beaver dam locations. Preliminary results indicate spatial patterning in the aboveground biomass of sedge, with higher values near flooded beaver dams. The findings from this study will provide key insights for policymakers and land managers aiming to balance peatland conservation with biodiversity and carbon sequestration goals by contributing to a better understanding of the role that beavers play in the carbon cycle.

Title:

Scaling-up monitoring of the rapidly expanding Scottish beaver population.

Author name(s):

Chris Sutherland[1], Ian Durbach[1], Roo Campbell[2]

Organisation name(s):

[1]University of St Andrews, [2]NatureScot

Abstract:

At the core of the Scotland's 2022-2045 Beaver Strategy is an emphasis on monitoring and reporting on the status of naturally expanding and translocated beaver populations. To date, high-quality fine-scale information has been generated thorough intensive ground surveys that allow for inferences to be made about abundance and distribution patterns. This intensive approach requires physical surveys to be conducted in all, or most of, the suitable habitat within the core Tayside beaver survey area and is not a sustainable and scalable solution for nationwide monitoring. A cost-effective and scalable alternative should retain the ability to detect spread and changes in population status and will facilitate monitoring and reporting of beavers at scale. We propose one such approach for scaling-up monitoring while maintaining the focus on, and ability to estimate population status metrics that can inform conservation and management. Our approach is embedded within an muti-state multi-scale occupancy modelling framework that comes with explicit recommendations for sampling design and analysis that meets the core objectives of the Beaver Strategy. We developed this approach using existing survey data which we compared to existing territory estimation approaches. We then used simulations to demonstrate the value of our approach. Finally, we provided a framework, and recommendations, for large scale monitoring of beavers.

Title:

Arctic Beaver Observation Network and the future of lowland tundra ecosystems.

Author name(s):

Ken D. Tape[1]

Organisation name(s):

[1]University of Alaska Fairbanks

Abstract:

The Arctic Beaver Observation Network is a group of research scientists, Indigenous observers, and land managers from the U.S., Canada, and Europe who are working to understand the scale and implications of beaver colonization of the Arctic. Collaboration across disciplines, and indeed across cultures, has enriched our understanding of this relatively new phenomenon. Remote sensing and modeling indicate that beavers have constructed over 10,000 ponds in the Alaska Arctic and are predicted to expand their range to the entire North Slope of Alaska by 2090 under moderate climate change scenarios (RCP 6.0). Similar trends have been observed and are expected in northern Canada. Field measurements indicate that beavers are targeting tundra streams with groundwater inputs, and that their ponds increasingly have unfrozen water in winter, which thaws permafrost and initially releases methane surrounding these streams. Biological studies are underway to examine the impact of beaver engineering on riparian plant diversity, aquatic communities, and avian communities. We anticipate that the effects of these oases will be to increase local terrestrial and aquatic biodiversity as the physical constraints of wintertime conditions are relaxed. Current and developing studies will focus research on local subsistence resources such as clean water and fish. Our growing understanding of this issue is shared among members of the Arctic Beaver Observation Network at biennial meetings and more regularly through community visits and collaborations.

Title:

The genetic legacy of the first successful reintroduction of a mammal to Britain: Founder events and attempted genetic rescue in Scotland's beaver population.

Author name(s):

Helen R. Taylor[1], Jean-Marc Costanzi[1,2], Kara L. Dicks[1], Helen V. Senn[1], Sarah Robinson[3], Gill Dowse[3], Alex D Ball[1]

Organisation name(s):

[1]Royal Zoological Society of Scotland,[2]Akershus University Hospital, [3]Scottish Wildlife Trust

Abstract:

Conservation translocations often inherently involve a risk of genetic diversity loss, and thus loss of adaptive potential, but this risk is rarely quantified or monitored through time. The reintroduction of beavers to Scotland, via the Scottish Beaver Trial in Knapdale, is an example of a translocation that took place in the absence of genetic data for the founder individuals and resulted in a small and suspected to be genetically depauperate population. In this study we use a high-density SNP panel to assess the genetic impact of that initial translocation and the effect of subsequent reinforcement translocations using animals from a different genetic source to the original founders. We demonstrate that the initial translocation did, indeed, lead to low genetic diversity and high mean kinship in the Knapdale population compared to other beaver populations. We also show that the reinforcement translocations have succeeded in increasing genetic diversity and reducing kinship in Knapdale. As yet, there is no evidence of admixture between the two genetic lineages that are now present in Knapdale and so genetic rescue has not yet occurred; future genetic monitoring will be required to assess whether this happens. Should admixture occur, the Knapdale population will harbour combinations of genetic diversity not currently seen elsewhere in Eurasian beavers, posing important considerations for the future management of this population. We consider our results in the wider context of beaver conservation throughout Britain, and advocate for more proactive genetic sampling to allow the full integration of genetic data into translocation planning generally.

Title:

Beaver-inspired solutions for stream restoration and climate resilience in America's Great Plains.

Author name(s):

Leah Thayer[1], Aaron Clausen[1]

Organisation name(s):

[1]The World Wildlife Fund US (WWFUS) Great Plains Sustainable Ranching Initiative (SRI)

Abstract:

The Northern Great Plains (NGP) is one of Earth's most threatened ecosystems, with stream corridors and seasonal wetlands serving as biodiversity hotspots. The World Wildlife Fund (WWF) is restoring degraded streams through low-tech, process-based techniques that mimic the ecosystem services of beavers (*Castor canadensis*), whose populations remain far below historical levels. Beaver mimicry is an innovative nature-based solution that replicates natural dams, slowing high-impact flows, restoring floodplains, encouraging sinuosity, and supporting vegetation—creating conditions for beaver recolonization. Since 2021, WWF has partnered with local organizations to establish a regional mesic restoration service, now widely used across the NGP. Working directly with ranchers, WWF has installed approximately 350 beaver mimicry structures on private lands, improving over 500 acres of critical habitat. This scalable approach aligns ecological restoration with climate resilience and ranching, benefiting both people and wildlife. WWF monitors restoration impacts through remote sensing and plans additional biodiversity assessments using environmental DNA. At the 10th International Beaver Symposium, WWF will share insights and strategies to expand this vital conservation work.

Title:

Twin Cities Beaver Project: Population and distribution in the Mississippi National River and Recreational Area.

Author name(s):

Bridgette Timm[1], Joesph Bump[1]

Organisation name(s):

[1]University of Minnesota

Abstract:

The Mississippi National River and Recreational Area (MNRRA) is a National Park Service unit comprising a 72-mile stretch of the Mississippi River that flows through the twin cities of Minneapolis and St. Paul, Minnesota, USA. This stretch of river and its floodplain forest is home to 70+ nesting bald eagle pairs and is within the flyway for nearly a third of North American migratory birds. Climate change, invasive species, altered hydrology, urbanization, and herbivory all influence the floodplain forest dynamics in the MNRRA. The relative impact of these factors on key stages of forest development and succession is not well understood. The ability of beavers to alter their habitat via tree felling and dam building is well known, but the potential impact of beaver herbivory on tree regeneration in the MNRRA floodplain forest is undetermined. Anecdotally, managers have noted that beaver forage heavily on the already limited number of eastern cottonwoods, an important nesting tree for bald eagles. The Twin Cities Beaver Project aims to better understand the population biology and functional role of beavers in the MNRRA, with an initial focus on beaver distribution, numbers, and forage selection. To estimate the beaver population, we conducted aerial cache surveys in 2022, 2023, 2024 and estimated family group size via remote cameras placed near the lodge. Vegetation transect surveys were conducted in 2024 to determine beaver preferred forage species and woody vegetation composition throughout areas of the park in various gradients of urban development.

Title:

How do beavers respond to anthropogenic pressures?

Author name(s):

Alice Turner[1], Alan Law[1], Sharon Kessler[1], Clare Andrews[1], Hannes Stephan[1]

Organisation name(s):

[1]The University of Stirling

Abstract:

The global biodiversity crisis necessitates effective ecosystem restoration strategies, with beaver reintroduction increasingly emerging as a proven method for enhancing landscape resilience, improving water quality, promoting vegetation regeneration and increasing biodiversity. However, the proximity of beavers to human-dominated landscapes can often lead to conflicts. This study investigates how human land use influences beaver foraging behaviour. We measured variation in length of 110 foraging trails at 11 beaver territories across the Tay and Forth regions of Scotland, in relation to surround land cover type. Findings indicate that beavers forage closer to water in agricultural areas, likely due to perceived threats, which could lead to concentrated beaver activity in places where conflict is magnified such as channels and immediate banks. It is therefore recommended that release sites should ideally be located away from agricultural areas. Additionally, beavers forage closer to water in broadleaved woodlands, reinforcing the importance of riparian habitats for resource availability. These results highlight the need to prioritise sites with existing riparian woodlands or implement planting prior to release, to mitigate conflicts. Integrating these findings into beaver management strategies will support human-beaver coexistence and enhance the success of reintroduction efforts in nature restoration initiatives.

Title:

Evaluation of ten years of European beaver management in the Czech Republic.

Author name(s):

Jitka Uhlíková[1]

Organisation name(s):

[1]Nature Conservation Agency of the Czech Republic

Abstract:

The Eurasian beaver has been returning to the Czech Republic since the late 1980s. The increased distribution of this species made it necessary to develop a Beaver Management Plan (www.zachranneprogramy.cz), which was adopted by the Ministry of the Environment at the end of 2013. An evaluation was carried out after ten years of implementation of the plan, and the results of the evaluation provided concrete information, e.g. how much money has been paid out in compensation for trees and crops, what measures have been used to resolve conflicts with beavers, or how many beavers in conflict have been legally killed. The evaluation also identified shortcomings in the five pillars of beaver management, i.e. publicity, advice support, financial support, application of preventive measures, compensation for damage and removal of nuisance beavers. In the last few years of the plan, the focus has been on obtaining data on the positive effects of beaver dams on the ecosystem services of beaver wetlands. The results of the evaluation of the management plan will be used to update the programme to minimise conflicts and maximise the benefits of beaver settlement.

Title:

Mapping beaver contributions to ecosystem services priorities across sectors and scales.

Author name(s):

Collin S. VanBuren[1], Emily Fairfax[2]

Organisation name(s):

[1]Virginia Museum of Natural History, [2]Department of Geography, Environment, and Society, University of Minnesota

Abstract:

The concept of ecosystem services is useful both for communicating interactions in socio-ecological systems and improving outcomes when used in environmental planning. Beavers have received increasing attention around the world for their contributions to wildfire mitigation, flood control, and other functions. In response, recent research has begun synthesizing and quantitatively (or monetarily) assessing these contributions to a number of ecosystem services. However, conceptualizations or prioritizations of ecosystem services often vary among stakeholder groups, including between global institutions that set conservation priorities and those of local communities whose actions directly affect conservation progress. To holistically capture beaver contributions to socio-ecological systems, we gathered 20 lists of ecosystem services (over 300 services in total) that were generated across a range of scales (global to local) and from various land uses or ecosystem types (agriculture, wetlands, etc.) that are common to regions where beavers are native to in North America and Europe. After accounting for overlap between them, we condensed the lists of services down to 36 ecosystem services, which notably is still 3–4 times more than has been included in previous assessments. We then evaluated whether beavers affected ecosystem service supply or demand with a proposed degree of confidence based on published studies. We found that beavers contribute to all/most of the services included in this list in some way, although evidence varied among the services. Through this synthesis, we identify knowledge gaps that may improve success in beaver restoration by improving connections between global conservation priorities and local communities.

Title:

The lived experience of rewilding: Exploring perspectives on coexistence with the European beaver (*Castor fiber*) in the Netherlands.

Author name(s):

Miranda van Ligten[1], Dennis Uit de Weerd[1], F. Paquita Perez Salgado[1]

Organisation name(s):

[1]Faculty of Science, Open Universiteit, The Netherlands

Abstract:

Despite positive effects of key species on nature restoration, stakeholder willingness for coexistence is not self-evident. In the Netherlands specifically, there is resistance to reintroduced beavers due to damage caused to dikes. Independent research into the reintroduction of beavers has led to the term 'renewed coexistence', in which people must learn to live with a species again. Although rewilding is practiced in many countries, little research has been done into renewed coexistence. This seems remarkable, because 'renewed coexistence', or the willingness of a society to embrace species it is no longer used to, appears key to the success of rewilding. This research focuses on how perspectives of beaver stakeholders beaver are shaped and influenced in the Netherlands regarding renewed coexistence. We use the Conservation Conflict Transformation approach, where social conflicts are analyzed in the process of reintroducing species. Within this approach, we use two concepts:

- The 'Concept of Lived Experience' which provides insight into contextual factors in someone's life and how someone has acquired scientific knowledge and experiential expertise.
- The 'Levels of Conflicts conceptual model' which maps causes of conflicts within a process of reintroducing species.

By analysing where resistance to or the willingness for coexistence come from, we hope to discover tools to stimulate a harmonious way of coexistence with returning species. We will present some results on stakeholder analysis.

Title:

Identification of enzymes from the digestive tract of the Eurasian beaver (*Castor fiber*) and their potential application in the fermentation of lignified biomass.

Author name(s):

Lieselotte Van Looveren[1], Franziska Schäfer[1], Nils Engler[1], Marlen Zschätzsch[2], Anett Werner[2]

Organisation name(s):

[1]DBFZ - German Biomass Research Centre, [2]TU Dresden - Institute of Natural Materials Technology

Abstract

Beavers possess a highly specialised digestive system capable of efficiently breaking down lignocellulose-rich materials such as bark and twigs. This project, led by the German Biomass Research Centre (DBFZ) in collaboration with the Technical University of Dresden, aims to investigate the beaver's gut microbiome and its potential applications in industrial biotechnology, particularly in biogas production. The main objectives include identifying the microorganisms responsible for lignocellulose degradation, characterising the beaver's seasonal diet, and exploring the use of these bacteria in biogas production from laboratory to industrial scales. Biogas is a key component of the future renewable energy supply. However, a significant portion of its potential remains untapped, particularly in the utilisation of lignocellulose-rich biomass residues such as manure, crop residues, and landscape maintenance materials. Enzymatic pre-treatment could enhance the breakdown of these complex structures, making them more accessible for microbial digestion in biogas plants. Despite the successful reintroduction of beavers across Europe, with an estimated population of over 35,000 in Germany alone, scientific research on their digestive system remains limited due to their protected status. A deeper investigation into the microbial communities and enzymes found in beavers could unlock new biotechnological pathways for optimising biogas production and improving the efficient use of organic waste materials.

Title:

Beavers in your backyard: Social-ecological dynamics of beavers in anthropogenic landscapes.

Author name(s):

Britt van Zelst[1,2], Koen Arts1, Sven Teurlincx[2]

Organisation name(s):

[1]Wageningen University & Research, [2]Netherlands Institute of Ecology

Abstract:

Beavers were reintroduced in the Netherlands in 1988, and the population has been expanding ever since. As natural habitats – their preferred habitat – reach carrying capacity, beavers increasingly settle in agricultural and even urban areas. In such anthropogenic environments, where conditions are highly controlled and closely tied to human interests, beaver behaviour is shaped by humans. For instance, artificial waterworks reduce the need for beavers to build dams, and beavers more often dig burrows in steep banks of human-modified waterways rather than constructing traditional lodges. These behavioural shifts may alter the extent to which beavers provide ecosystem services, such as water retention, water quality improvement and biodiversity boosts. Besides, the frequently degraded environmental conditions in anthropogenic landscapes may further influence or hinder the potential impacts of beavers. In addition, direct physical human-beaver interactions are more likely in densely populated countries like the Netherlands, which may influence public perceptions of wildlife in their living environment. Here, we study the ecological functioning of aquatic ecosystems across a gradient of human influences, assessing the effects of varying beaver activity through a field survey. Furthermore, we study how local residents perceive the presence, benefits and challenges of a recently established beaver family in their urbanized neighbourhood. This research aims to gain insight into the social-ecological role of beavers in anthropogenic landscapes. Deeper understanding of their role and the associated human dynamics will support the development of informed and sustainable coexistence strategies for the future, where living environments of both humans and beavers become increasingly intertwined.

Title:

Beaver foraging patterns related to moose density and habitat composition in a boreal landscape.

Author name(s):

Marion Verschueren[1], Wessel Veenbrink[1], Wenke Zimmermann[1], Barbara Zimmermann[1], Martin Mayer[1 2]

Organisation name(s):

[1]Department of Forestry and Wildlife Management, University of Inland Norway, [2]Department of Ecoscience, Aarhus University

Abstract:

In the boreal landscape, moose (*Alces alces*) and beavers (*Castor sp.*), which often co-occur in the same ecosystems, can have large impacts on the environment via selective browsing on woody vegetation. To better understand if beavers and moose compete for the same resources, we investigated beaver foraging patterns across a gradient of varying moose density while accounting for habitat composition. We hypothesized that exploitative competition between beavers and moose would be expressed as a change in beaver foraging patterns in areas with comparatively higher moose densities. Using line transects, we monitored available and beaver-cut woody vegetation at 17 beaver lodges. We analyzed the probability of a stem being cut by beavers in relation to the distance from the shore, the tree species, and the tree size in areas with various moose densities estimated from summer pellet counts. We found that the predicted proportion of cut stems was generally higher in areas of comparatively lower moose density. This was especially the case for small cut stems, birch trees and stems close to the shore, but a similar trend could be seen for large stems, willow trees and stems further from the shore. These findings indicate that moose affect beaver foraging patterns, thereby potentially mediating their effects on other wildlife.

Title:

Beavers and wolves: renewing an old relationship (key study from Central Europe).

Author name(s):

Aleš Vorel[1], Oldřich Vojtěch[1], Oldřich Vojtěch sen.[2], Jan Mokrý[2], Jan Horníček[1], Matouš Oukropec[1], Jana Korbelová[1], Lukáš Žák[1], Micol Genazzi[1]

Organisation name(s):

[1]CZU Czech University of Life Sciences Prague, [2]Šumava National Park Administration, Vimperk, Czech Republic

Abstract:

Following the establishment of a stable beaver population in central Europe, we are now documenting the re-establishment of the grey wolf (*Canis lupus*) population. It is well known that wolves are the domain predators of beavers, although they are opportunistic carnivores that proportionally select prevailing prey items. We aimed to answer the question of whether and to what extent beavers can change their behaviour when faced with a high risk of predation by wolves. We formulated three main groups of questions: (i) what are the changes in foraging patterns, (ii) how do beavers change their territoriality, (iii) can they change their circadian patterns? One of the best documented interactions of these renewing species can be found in the Bohemian Forest ecosystem, a mountainous massif on the Czech-Bavarian border. Here, a saturated beaver population (almost 140 beaver families) and a dense wolf population (six wolf packs with permanent reproduction) have been established. Using field techniques and remote telemetry of both species, we are able to document how strongly beavers respond to potential and direct risks of predation by wolves. In addition to the regular occurrence of beaver deaths with evidence of wolf kills, beavers are the third most important prey species in the study area. We also found remarkable changes in beaver feeding, territorial and circadian patterns. The wolves also show a significant tendency to prey on beavers, with some individuals specialising in beaver predation. It can be concluded that wolves should be considered an important natural ecological factor in areas where they are re-establishing, even in central Europe.

Title:

Risk assessment for European beaver (*Castor fiber*) burrowing in anthropogenic landscapes: Implications for infrastructure and water management.

Author name(s):

Sophie Ward[1], Ferdi Seljee[1], Ilse Sijtsma[1], Ronald de Jong[1]

Organisation name(s):

[1]Altenburg & Wymenga Ecological Research LLC

Abstract:

As beaver populations in highly anthropogenic landscapes increase, human-wildlife conflicts arise more frequently. In Dutch lowland areas the burrowing activities of beavers in relation to dikes and infrastructure may pose significant safety risks. Burrows are therefore a major concern for water authorities and railway managers, among others. With approximately twenty thousand combined kilometres of dikes and railways to oversee, managers must identify and prioritise the most vulnerable sections to effectively mitigate risks. We developed a risk assessment tool based on habitat suitability modelling and quantification of burrowing risk. In this model, habitat suitability is determined through a spatial analysis of land-use data, habitat data and remote sensing data of woody vegetation. The risk is calculated by multiplying the probability of burrowing with the effect of damages caused by burrowing. The probability is determined based on variables related to railway tracks and dikes, such as proximity to water and suitable habitat, the dimensions of the railway and dike foundations and the presence or absence of bank fortifications. For dikes, the difference in water levels on either side is also relevant. The effect of burrowing damage is defined based on safety implications and economic consequences. A spatial risk analysis identified high-risk areas which were verified through field surveys. During the surveys, several beaver territories were indeed discovered. Hence, risk assessments can be applied in landscape-based management strategies, for example, to identify and prioritise locations where burrowing-resistant fortifications should be implemented.

Title:

Are beavers making a mess of scenic landscapes? Beaver reintroductions and contested landscape aesthetics.

Author name(s):

Flurina Wartmann[1], Karen Jones[2]

Organisation name(s):

[1]University of Aberdeen, [2]University of Kent

Abstract:

As part of the Scottish beaver strategy, beavers have been released and translocated to various sites across Scotland, including both Scottish National Parks. The reintroduction of beavers to the Loch Lomond and the Trossachs as well as the Cairngorms National Park marks an important step for species recovery after an absence of hundreds of years that contributes to the national park nature strategies. However, the results of this often-called 'ecosystem-engineering' can also create aesthetical challenges for some, with tangled mixtures of deadwood, coppiced trees, dams, and stagnating water ponds creating a 'messy' landscape. Backlash against such beaver-landscapes is evidenced by horrified reactions to the beaver-inspired aesthetics of landscape gardening with the 'Beaver Garden' exhibited at the Chelsea Royal Horticultural Show in 2022, but still remains underexplored in terms of how policies for the conservation of national scenic landscapes and species recovery may be integrated when it comes to landscape aesthetics. In this presentation we therefore explore the contention of a necessity from global and national policies for national park management to engage in biodiversity conservation and recovery with its stated goals of preservation through the example of species recovery of beavers, and the potential contention between scenic preservation and appreciation linked to Victorian landscape ideals that have been transported across the centuries via touristic landscape appreciation, and contemporary contested aesthetics of scenic preservation of ecologically degraded landscapes versus ecological recovery and slightly 'messy' looking landscapes.

Title:

Local people's attitudes towards beavers in the Western Carpathians - what drives peaceful relations?

Author name(s):

Joanna Wąs[1], Danuta Piróg[2], Adam Solecki[3], Elżbieta Gorczyca[3], Małgorzata Kijowska-Strugała[1]

Organisation name(s):

[1]Polish Academy of Sciences, [2]University of the National Education Commission, [3]Jagiellonian University

Abstract:

The Eurasian beaver (*Castor fiber*) was extirpated across most of its range at the beginning of the 20th century. Recently due to reintroductions and legal protections, the species has appeared in the areas where it has not been observed for generations. As rapid population recovery has increased human-beaver interactions, understanding public attitudes towards this reintroduced species is crucial to the success of this rewilding effort. This study investigated factors that influenced attitudes towards beavers among local communities of the Polish Western Carpathians, where beavers now thrive after their reintroduction initiated in the 1980s. 360 structured interviews were conducted in person across three catchments that cover the original beaver release area and selected territories where it appeared subsequently in 2000s and 2020s. Analyses of damage reports provided a wider regional background for the identified issues. The most impactful factors that influenced public attitudes toward beavers determined using an ordinal regression model, were related to direct experience, knowledge, location, financial situation and mental characteristics. Several social problems associated with the spontaneous spread of reintroduced wildlife were identified. Negative perceptions were strongly influenced by regional variations in tolerance to beaver-related damage, unpreparedness for challenges associated with beaver presence, and a lack of understanding of the purpose of reintroduction efforts.

Title:

The influence of the age and geomorphic type of beaver ponds on stream water chemistry.

Author name(s):

Joanna Wąs[1], Joanna Siwek[2], Małgorzata Kijowska-Strugała[1], Elżbieta Gorczyca[2]

Organisation name(s):

[1]Polish Academy of Science, [2]Jagiellonian University

Abstract:

As the Eurasian beaver (*Castor fiber*) populations recover, the species is becoming an important ecological factor in regions where it has been absent for centuries. Although the effects of beaver dams on stream water chemistry have been studied extensively, general conclusions are often limited by site-specific conditions such as beaver ponds diversity. The aim of this study was to determine the influence of the age and geomorphic type of beaver ponds on changes in physico-chemical water parameters within and below the ponds. Nine beaver-inhabited streams were studied across the Western Carpathians (Poland, Slovakia). Samples were collected above, within and below beaver pond sequences during four seasons in 2022-2023. The age of the ponds varied from <2 years to >10 years. Ponds were classified into two geomorphic categories: overflowing river banks or confined to the river channel. Greater decreases in NO_3- and Ca_2+ concentrations were observed in overflowing beaver ponds and greater decreases in pH were observed downstream of such ponds compared to in-channel beaver ponds. In addition, greater decreases in dissolved oxygen, SO_4^{2-} and pH were observed at study sites occupied by beavers for longer periods of time. However, decreases in NO_3- and SO_4^{2-} were present mostly during the spring-summer period. The study shows that the development of extensive beaver ponds and their persistence over time may be crucial for sustaining water purification processes, as a result of decomposition, aerobic/anaerobic oxidation and CaCO3 precipitation.

Title:

Cultural ecosystem services of beaver-modified landscapes.

Author name(s):

Stephanie Webb[1], Alan Law[2], David G. Anderson[3], Flurina Wartmann[1]

Organisation name(s):

[1]University of Aberdeen, [2]University of Stirling, [3]University of Aberdeen

Abstract:

Rewilding projects are proliferating across Europe, with beaver translocations contributing to such rewilding efforts. As stipulated in Scotland's Beaver Strategy 2022-2045, beaver expansion is declared as a goal, with several translocations across Scotland already complete. However, the expansion of beavers into anthropogenic landscapes causes changes in the services that beavers offer the ecosystem. Most research on beaver-modified landscapes focusses on ecological ecosystem services, such as regulating (e.g. water quality) and supporting (e.g. biodiversity improvements) services. Less recognition has been given to cultural services and disservices such as impacts on aesthetics, although these are likely directly linked to acceptance or rejection of beaver presence. For example, do people think beaver-modified landscapes are '*beautiful*' or '*ugly*'? To address this research gap, we collected data in the form of in-situ visitor questionnaires (n = 166) within six beaver landscapes in Scotland and England to identify the cultural services and disservices. Results yielded an overwhelmingly positive response to beaver-modified landscapes. We found that these landscapes provided a range of cultural ecosystem services such as recreational and wildlife watching opportunities. Many visitors thought these landscapes were beautiful and often commented on their wild and natural aesthetics. We found that beaver-modified landscapes impressed many visitors and made them feel hopeful we could restore nature. Overall, the project aims to advance out understanding of human perceptions of beaver-modified landscapes and explore the more holistic and culturally informed approaches to beaver conservation and management.

Title:

Under pressure: Quantifying the hydraulic stability of beaver dams.

Author name(s):

Cherie J. Westbrook[1], Prakash Sapkota[1]

Organisation name(s):

[1]University of Saskatchewan

Abstract:

Beavers are increasingly recognized as effective nature-based solutions for watershed management because their dams can enhance flood resilience, improve water quality, sequester carbon, create diverse wildlife habitats, and interrupt wildfire spread. However, the growing implementation of beaver reintroduction and beaver-based restoration across Europe and North America is occurring without sufficient understanding of dam failures, which poses significant risks. Beaver dam failures can trigger sudden outburst floods with potentially destructive consequences for downstream communities and infrastructure. This study quantifies the relationship between hydraulic force loading and the structural integrity of beaver dams under variable discharge. Conceptualizing beaver dams as akin to human-built earthen dams, field data were used to estimate hydraulic forces at four beaver dams in Canada's montane region between May and October 2024. Water levels were measured upstream and downstream of the dams to calculate horizontal and uplift pressures. Upstream water levels in combination with wind speed/direction were used to determine wave pressures acting on dams. Sediment wedge thickness was measured to estimate silt pressure. A combination of 3D modelling, sediment bulk density, and cut stick measurements were used to estimate dam weight, the primary resisting force. Results show that hydraulic pressures rarely exceeded dam weight; however, one dam experienced significant structural changes during two hydrological events due to elevated hydraulic pressures. A 38 mm rainstorm caused ~30% structural change and an upstream dam failure further extended the dam breach. These findings provide an initial assessment of beaver dam stability under hydrological stress, informing risk assessment for beaver-based restoration.

Title:

Impacts of North American beaver (*Castor canadensis*) range expansion in the Inuvialuit Settlement Region.

Author name(s):

Helen C Wheeler[1], Callum Pearce[1], Georgia Hole[1], Ben deVries[2], Yannan Wang[2], Kevin Arey[3], Katherine Bennett[4], Joseph Culp[5], Lennie Emaghok[3], Max Kotokak Sr[3], Jordan Musetta-Lambert[6], Philip Marsh[5], Herb Nakimayak[7], Melanie Rohse[1], Kirt Ruben[8], Oliver Sonnentag[4], Joshua Teddy[3], Nicola Walshe[9]

Organisation name(s):

[1]Anglia Ruskin University, [2]University of Guelph [3]Imaryuk Monitoring Program, Canada, [4]University of Montreal, [5]Wilfrid Laurier University, [6]Environment and Climate Change Canada, [7]Inuvialuit Fisheries Joint Management Committee, Canada, [8]Inuvialuit Joint Secretariat, Canada, [9]University College London

Abstract:

Beavers are expanding their range in regions of arctic North America. This has created local community concerns, which led to the establishment of a socio-ecological research program to understand how beaver occupancy is changing and the impacts of those changes on ecosystems and people. We will show results of the three-year research program coproduced between Inuit experts and UK and Canadian researchers as part of the Canada Inuit Nunangat UK program. Using dendrochronological methods to age beaver cut stems and remote sensing methods to detect abrupt changes in surface water we have been assessing the past establishment and occupancy of beaver colonies. Our results show good agreement in estimates of past beaver occupancy between these two methods suggesting they can be effective in estimating past occupancy. We will also discuss changes in invertebrate communities and methyl methane production associated with beaver occupancy. Interviews with community members highlighted impacts of beavers on travel routes, fish habitat and concerns of community members for water quality that affected human behaviour. We will show a Storymap which illustrates these concerns. An investigation into the history of beavers in the region also highlighted the role of past introductions of beavers in the region in shaping current perceptions of their impacts. Finally, we will discuss the importance of coproduction and our way of working in close association between Inuvialuit and outside science partners in developing and delivering this research.

Title:

It’s complex: Modernizing beaver management and policy requires managing for complexity, creativity, connectivity and collaboration.

Author name(s):

Alexa Whipple[1]

Organisation name(s):

[1]Methow Okanogan Beaver Project

Abstract:

Management of beavers in most jurisdictions of the USA is currently antiquated and two-pronged, 1) unlimited harvest for 5 months, and 2) un- or under-regulated nuisance removal year-round. Even in states where the ecological value of beaver activity is recognized and pursued with public funding, few states have established enforceable protections for our keystone species or their climate resilience habitat benefits. In WA State, we have an established, state-sanctioned program for the relocation of beavers in conflict with people but no state beaver coexistence program or regulatory pathway for beaver prioritization or protection, even temporary, for their benefits to endangered species or to restore ecological and climate resilience. MOBP and partners are working to change beaver management in WA with a “web of complexity” approach: bottom up, top down, center out. We are working with each of the distinct and siloed programs of our state wildlife management agency to establish beaver-related pilot programs, permitting, training and workshops with inner agency champions. We are collaborating with diverse state and federal agencies, Tribes, NGO’s, private lands partners, and legislators to recognize, adopt, and now mainstream the many strategies to support and enhance beaver managed habitat while accommodating and protecting human priorities. This presentation offers a dynamic and concurrent tale of creativity, connectivity, complexity, collaboration and commitment from the beaver complex to the Capitol and every foundational touchstone in between. We are connecting beavers and people to “make the [*Castor*] revolution… irresistible”!

Title:

Mitigation of the effects of beaver dams on sea trout: A Scottish case study.

Author name(s):

Alan-Kettle White[1], Roo Campbell[2], Jenny Bryce[2]

Organisation name(s):

[1]Argyll Fisheries Trust, [2]NatureScot

Abstract:

Reflecting the conservation status of migratory fish in Scotland (principally Atlantic salmon *Salmo salmo* and sea trout, *Salmo trutta*), there is need to ensure that the reintroduced Eurasian beaver (*Castor fiber*) is not having an adverse effect on these populations. Independent monitoring of the Scottish Beaver Trial in Knapdale by the Argyll Fisheries Trust recorded baseline data on sea trout numbers and spawning activity, prior to damming activity on the Loch Coille Bharr Burn in 2009 and 2010. Beavers have been damming this burn for the last 4-5 years (per comm Heart of Argyll) and have created an extensive beaver wetland behind a series of dams. Dam notching and deepening of a by-pass channel was carried out under licence from NatureScot in 2024 in response to concerns about the impact of beaver activity on sea trout passage and habitat. Observers surveyed 1.448 km of burn for river habitat and the effect of the notching on sea trout movement was monitored by electrofishing and redd counts. Comparison with historical data from two sites indicates the density of juvenile trout may be lower than previously recorded, with 52.9% of the habitat transformed from riverine to lacustrine. However, redd counts indicate that spawning was partially successful in 2024 following dam notching, with the highest redd counts in the upper reaches where gravel and pebble substrate remain. Sea trout populations will continue to monitored and beaver mitigation approaches further investigated at this location.

Title:

Developing a new mapping tool to assess beaver impacts: The Beaver Impact Assessment Toolkit (BIAT).

Author name(s):

Heather White[1], Daveron Smith[1], Laura Dalton[1]

Organisation name(s):

[1]Natural England

Abstract:

As ecosystem engineers, the reintroduction of European Beaver (*Castor fiber*) provides an opportunity for the natural recovery of degraded ecosystems in England. Despite their ecological advantages, beaver activity poses a risk of conflict. As of February 2025, wild release of beavers is allowed under licence from Natural England. Understanding the potential impact beavers might have on the surrounding environment is pertinent to supporting decisions around licensing wild releases, avoiding conflict, and ensuring the welfare of the beavers released. A toolkit, hosted on ArcGIS Online, entitled the Beaver Impact Assessment Toolkit (BIAT), has been developed at a national scale to support practitioners with wild release application decisions. The BIAT brings together data on the potential for beaver foraging and damming activity, and an array of considerations derived from an expert review of the interactions between beavers and the natural and human environment. The toolkit allows practitioners to define regions of interest for wild releases and outputs a summary of considerations and potential beaver activity within the area. In doing so, the toolkit provides initial steer on considerations that may need further thought before releasing beavers in an area, but should be used alongside expert opinion, local knowledge, and supplementary data. A demonstration of the BIAT, including its functionalities and uses will be provided. We are currently developing an external version of the toolkit, which we hope will support the broader community, including NGOs, wildlife organisations, ecologists, and local authorities, in making informed and collaborative decisions about beaver releases and management.

Title:

A perpetual state of flux? Twenty years of vegetation dynamics in beaver wetlands and what they tell us.

Author name(s):

Nigel Willby[1], Alan Law[1]

Organisation name(s):

[1]University of Stirling

Abstract:

Ecological studies tend to be short term, accommodating long term change by treating space as a proxy for time. How effectively the past represents a guide to the future, especially in modern landscapes undergoing rapid global environmental change is now however, increasingly being questioned, and makes even less sense with a major ecosystem engineer in the mix. We sought to understand wetland dynamics during engineering by beavers (*Castor fiber*) based on fine-scale sampling (~300 fixed quadrats per visit) of several wetlands (a drained fen, and a small lake), and their sub-habitats, each surveyed on six occasions over a 21-year period. Sites were located on an agricultural estate in Perthshire (Bamff Wildland) where beavers were introduced in 2002. In all wetlands the most rapid changes occurred in the initial decade, with a pronounced diversification of vegetation, increase in fine scale heterogeneity and shift towards high light, high moisture, nitrophilous species. In the following decade both richness and heterogeneity remained similarly high but overall change in composition was smaller as the focal areas and types of beaver activity shifted. Nevertheless, no sites suggested a return towards their original baseline and sites continued to change unpredictably at the quadrat level associated with local effects such as grazing and tree fall. Beavers engineer wetlands via large and fine scale effects that are evidenced at different rates and whose importance shifts over time. Long term studies in different landscapes are essential to track these and demonstrate how wetland creation by beavers differs uniquely from humans.

Title:

Monitoring beaver impacts on habitats and species to inform delivery of mitigation in the Cairngorms National Park.

Author name(s):

Jonathan Willet[1]

Organisation name(s):

[1]Cairngorms National Park Authority

Abstract:

The Cairngorms National Park (CNP) Authority successfully applied for a licence to release beavers into the upper Spey catchment in late 2023. Beavers were first released on 18th December 2023. Since then, there have been nine more releases in the area, with three more release years to go. The released beavers will form the nucleus of a self-sustaining wild population that will, in time, increase in number and expand in range. The CNP has many protected sites and associated species (e.g. Atlantic salmon, freshwater pearl mussel, bryophyte and lichen-rich habitats on aspen) that are found in or close to where beavers are or will be active. These sites may be impacted by beavers in ways that are unacceptable to their designations. The monitoring of these sites was a stipulation of the release licence, and a monitoring programme has been developed to address these requirements. Some non-protected species, but that are nationally important, were included in non-statutory species monitoring protocol. A Mitigation Plan was produced in tandem with the Monitoring Plans. A protocol for identifying the impact of beavers on landscape is also being developed and field tested by Park Authority staff. This is thought to be a first in the UK. This monitoring is in tandem with regular stakeholder meetings to discuss monitoring and determine what, if any, additional survey or mitigation action is required. The determination of impacts that are deemed acceptable or unacceptable, in relation to protected species and sites and other important species, will be informed by robust data. This will allow mitigation actions to be targeted and this, allied with a rapid response, will seek to minimise unacceptable impacts.

Title:

Woodland creation in the presence of beaver (*Castor fiber*).

Author name(s):

Kelsey Wilson[1], Jenny Bryce[2], Roisin Campbell-Palmer[3]

Organisation name(s):

Rannoch Ecology[1], NatureScot[2], Beaver Trust[3]

Abstract:

Scotland has ambitious targets for woodland expansion and a strategy vision for beaver restoration to suitable areas (*Castor fiber*). This study aimed to provide recommendations for creating woodlands that are resilient in the presence of beavers. It comprised: a review of existing international literature; a questionnaire survey of European woodland managers and assessments of the nature and extent of beaver impacts in Scottish woodland creation sites. No specific guidance was found, but insights from research papers were collated to inform recommendations. Questionnaire responses suggest European woodland managers consider beaver-induced flooding more impactful than beaver browsing. Beaver impacts were recorded in three out of the 14 woodland creation schemes surveyed with the Forth and Tay catchments in Scotland. On average, beaver browsing affected 38% (12 – 54%) of trees in the riparian zone (within 50 m of the watercourse) and 4.4% (0.1 – 13%) of all trees in the woodland scheme. Evidence of flooding from beaver damming activity was recorded at one site. Recommendations to create beaver-resilient woodlands include consideration of: objectives for areas prone to beaver-induced flooding; the extent to which beavers are excluded and the approach to managing herbivore impacts, establishment techniques, scheme design, species choice and stocking density, together with landscape scale and connectivity. We propose the current or future presence of beaver should not discourage the promotion of woodland creation and expansion and note that effective deer management is likely to be key to establishing new woodlands where beavers are present.

Title:

Monitoring the impacts of beaver (*Castor fiber*) modification on riparian GHG (CO_2 and CH_4) emissions after release into an enclosed site in Cheshire, UK.

Author name(s):

Richard Young1, Mike Longden[1,2], Maria Nolan[1], Ryan Hoskin[1], Stephanie Evers[1], Lucia Galvez-Bravo[1]

Organisation name(s):

[1]Liverpool John Moores University, [2]Lancashire Wildlife Trust

Abstract:

With increasing beaver populations in the UK, it is important to understand the impact of this ecosystem engineer on the landscape from which they have long been absent. By raising water tables, changing rates of respiration and trapping organic matter, beaver will likely change the rates of greenhouse gas (GHG) fluxes, especially in riparian zones. The aim of this study was to monitor seasonal GHG fluxes in riparian zones and wetland margins following beaver reintroduction to a 4 ha enclosure at Hatchmere, Cheshire. Both terrestrial and aquatic flux measurements from different riparian habitats and paired controls were taken using a Los Gatos Research gas analyser. Three-minute terrestrial fluxes were taken using a sealed chamber and a soil collar inserted into the ground, aquatic fluxes were taken in pond/wetland margins using a handheld chamber. Four replicate measures were taken across three riparian habitat types (wet woodland, wetland margins and stream margins) and paired control, as well as physiochemical data using a YSI probe and water samples for nutrient and DOC analysis. Monitoring started shortly before beaver release in October 2020 and continued seasonally until Spring 2023. Emissions factors have been derived for each habitat type, with preliminary analysis suggesting that while CO_2 and CH_4 emissions typically follow seasonal trends, the creation of more wet-woodland habitat by beaver may be changing the overall emissions profile of the site. Further analysis will explore these initial findings, helping to better understand of the impact of beaver colonisation on GHG flux and guide further research.

Title:

Beaver-felled trees as ecological hotspots for riparian mammals and birds.

Author name(s):

Adrian Zwolicki[1], Marta Lech[1], Agata Weydmann-Zwolicka[2]

Organisation name(s):

[1]Department of Vertebrate Ecology and Zoology, University of Gdańsk,
[2]Laboratory of Plankton Biology, University of Gdańsk

Abstract:

Beavers (*Castor spp.*) are renowned ecosystem engineers whose dam-building and wetland creation shape biodiversity. However, the terrestrial role of beaver-felled trees remains poorly understood. In this study, we investigated the use of freshly felled trees by mammals and birds in beaver-modified riparian forests. Using camera traps over two consecutive autumn-winter seasons (2021–2023), we monitored 33 beaver-felled trees across multiple territories and tree species. We recorded 51 species, of which 44 (86%) interacted with the logs. Small mammals and mesocarnivores were the most frequent visitors. Most interactions (68.4%) involved active use such as movement, perching, foraging, or scent-marking. Species composition significantly differed between logs classified as utilized versus non-utilized, and utilization varied with tree identity and animal behaviour. Martens, mice (*Apodemus spp.*), red foxes, and birds like Eurasian wrens and great tits showed strong preferences for felled logs. In contrast, large herbivores and some mustelids avoided them. Logs served as travel corridors for mammals, elevated perches for birds, and substrates for communication and foraging. Diel activity patterns revealed temporal niche partitioning: diurnal birds and nocturnal mammals used the same logs at different times. These findings highlight the ecological significance of beaver-felled trees in shaping terrestrial wildlife communities. In managed forests, where deadwood is often limited, beaver activity may restore structural heterogeneity and offer valuable microhabitats. Conservation of beaver-modified riparian habitats may therefore contribute to broader biodiversity goals.

10th INTERNATIONAL BEAVER SYMPOSIUM SCOTLAND 2025

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