Interreg CENTRAL EUROPE

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BOOK OF ABSTRACTS

Enhancing biodiversity & interconnectivity by ecological restoration

Version 1

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Interreg CENTRAL EUROPE
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- Hof county branch of Friends of the Earth Germany (Germany),
- DOPPS – BirdLife Slovenia (Slovenia),
- Ametyst, NGO (Czech Republic),
- Federacja Zielonych "GAJA", NGO (Poland),
- WWF Italy (Italy),
- Thayatal National Park (Austria),
- University of Vienna (Austria),
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- Slovenian National Institute of Biology (Slovenia)
- Institute of Marine and Environmental Sciences of the University of Szczecin (Poland)
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PROGRAM

Scientific Conference - Enhancing biodiversity & interconnectivity by ecological restoration

05.12.2025

Version 4

11 2025

9:00-9:10 ***Welcome and opening remarks*** *- Jörg Schmiedel, BUND*

9:10-9:20 **Presentation of the Joint Practitioners' Guides** *- Jakub Skorupski, GF"GAIA", University of Szczecin, Polish Society for Conservation Genetics LUTREOLA*

ReCo project in action! Six Pilot Regions along European Green Belt

9:20-9:35 **Stream substrate restoration to improve freshwater pearl mussel habitats** *- Rebecca Hoess, Technical University of Munich (TUM)*

9:35-9:50 **Conservation of *Narcissus poeticus* in mountain hay meadows of Jesenice** *- Metod Rogelj, Institute of Republic of Slovenia Nature Conservation*

9:50-10:05 **Biodiversity Monitoring at the Green Belt: A Nationwide Insect Survey of Habitat Connectivity and Biodiversity** *- Vincent Babl, BUND*

10:05-10:20 **Coastal wetland habitats restoration in Škocjanski zatok Nature Reserve: the case of land subsidence** *- Danijel Ivajnšič, Faculty of Arts and Faculty of Natural Sciences and Mathematics, University of Maribor*

10:20-10:35 **Safeguarding ecosystem functions under climate stress in freshwater mussel habitats in the Aš region** *- Ondrej Spisar*

10:35-10:45 **Discussion**

Coffee Break

Connectivity of Natura 2000 Habitats or Species Migration along the European Green Belt

10:55-11:10 ***Computational Historical Ecology*** - *Malte Rehbein, University of Passau*

11:10-11:25 ***Harmonizing transport infrastructure conflicts with landscape connectivity through a strategically planned ecological network*** - *Ivo Dostál, Transport Research Centre (CDV)*

11:25-11:40 ***Earth Observation Data and Methods in Support of the Nature Restoration Regulation: Results of the RestorEO Project*** - *Manuela Hirschmugl, University of Graz & Joanneum Research*

11:40-11:55 ***Advancing Ecological Connectivity through Passive Forest Restoration*** – Cornelia Amon, *Katharina Lapin, Austrian Research Centre for Forests (BFW)*

11:55-12:10 ***Drivers of peatland conservation status in Austria*** - *Elias Kapitany, University of Vienna*

Coffee Break

12:20-12:35 ***Hydrological restoration of wetlands and streams in headwater areas (LIFE for MIRES, Sumava National Park)*** - *Ivana Bufkova, Sumava National Park*

12:35-12:50 ***Initiatives to restore important marine species recognized as habitat builders in the northern Adriatic Sea: experiences from Slovenia*** - *Lovrenc Lipej, National Institute of Biology, Marine Biology Station, Piran, Slovenia*

12:50-13:05 ***Ecological restoration best practices: the case study of the LIFE FORESTALL project*** - *Alessandro Meggiato, Marco Baldin, CORILA - Consortium for coordination of research activities concerning the Venice lagoon system*

13:05-13:20 ***The LIFE Drylands project: Restoration of dry-acidic continental grasslands and heathlands in Natura 2000 sites of the western Po Plain*** - *Silvia Assini, Department of Earth and Environmental Sciences, University of Pavia*

13:20-13:35 ***Restoring biodiversity along the Italian EGB: forgotten bunkers, abandoned meadows & disappearing ponds*** - *Davide Scridel, Rete Italiana European Green Belt Association*

Lunch Break

Development of National Stategies following the EU Nature Restoration Law

14:25-14:30 ***Introduction*** – *Thomas Wrbka, University of Vienna*

14:30-14:40 ***National Strategy for Austria*** – *Martin Wildenberg, BMLUK*

14:40-14:50 ***National Strategy for Czech Republic*** - *Barbora Chmelová, WWF Czechia*

14:50-15:00 ***National Strategy for Germany*** - *Juliana Schlaberg, BfN*

15:00-15:10 ***National Strategy for Italy*** – *Laura Facioni, MASE (Environmental Ministry)*

15:10-15:20 ***National Strategy for Poland*** - *Marta Zimny, Ministry of Climate and Environment*

15:20-15:40 **Discussion**

15:40-15:50 ***Wrap-up and closing remarks*** - *Jörg Schmiedel, BUND & Jakub Skorupski, GF"GAIA", University of Szczecin, Polish Society for Conservation Genetics LUTREOLA*

Ecological restoration and biodiversity conservation stand at the forefront of Europe's environmental priorities, particularly in times of accelerating climate change and increasing pressures on natural habitats. The ReCo Scientific Conference on Enhancing Biodiversity & Interconnectivity by Ecological Restoration, held on 5 December 2025, brings together researchers, practitioners, and policymakers committed to strengthening ecological networks and advancing restoration science across the European Green Belt (EGB), a unique corridor of transboundary nature that stretches across the continent (www.europeangreenbelt.org). This Book of Abstracts showcases the scientific contributions presented at the conference and reflects the breadth and depth of current research efforts.

Organized within the ReCo - Restoring Degraded Ecosystems along the Green Belt to Improve and Enhance Biodiversity and Ecological Connectivity project, and co-hosted by leading Central European research institutions, the conference provides a cross-disciplinary platform for sharing knowledge, developing new partnerships, and aligning restoration practice with policy needs. As emphasized in the conference invitation, biodiversity restoration requires both scientific excellence and policy relevance, as well as the cross-border collaboration that is essential for ecological connectivity across political boundaries.

The abstracts collected in this volume represent a diverse portfolio of restoration initiatives across terrestrial, freshwater, coastal, and marine environments. They highlight innovative approaches to reconnecting fragmented habitats, enhancing climate resilience, and restoring ecological functions in degraded landscapes - from hydrological restoration of wetlands, forest connectivity and stepping-stone networks, and peatland conservation modelling, to grassland and heathland recovery, stream substrate restoration, and biodiversity monitoring on a national scale. Several contributions illuminate the importance of Natura 2000 sites, the effectiveness of nature-based solutions, and the role of long-term monitoring and advanced technologies such as GIS-based prioritization, remote sensing, DNA metabarcoding, and machine learning in guiding restoration decisions.

Importantly, many of the presented case studies address the challenges of a changing climate, ranging from altered hydrology and increased disturbance regimes to emerging ecological risks, demonstrating how restoration science must adapt to dynamic environmental conditions. They also showcase the cultural and historical dimensions of restoration, including the transformation of former military or anthropogenic landscapes into biodiversity-rich habitats. The inclusion of methodologies such as Computational Historical Ecology underlines the growing relevance of interdisciplinary research in understanding long-term ecological change and guiding present-day management decisions.

Together, the contributions in this Book of Abstracts exemplify the shared commitment of the scientific community to improving ecological connectivity along the European Green Belt and beyond. They offer valuable insights for practitioners, managers, researchers, and policymakers working to safeguard biodiversity and strengthen ecosystem resilience across Europe's varied landscapes.

We hope that this collection serves not only as a record of the research presented at the ReCo Scientific Conference, but also as a catalyst for continued cooperation, innovation, and knowledge exchange in the field of ecological restoration.

Jakub Skorupski, PhD, Eng. (Chair)
Green Federation "GAIA" & University of Szczecin &
Polish Society for Conservation Genetics LUTREOLA

ABSTRACTS

Presentation of the Joint Practitioners' Guides

Jakub Skorupski

Green Federation "GAIA" & University of Szczecin & Polish Society for Conservation Genetics LUTREOLA

Ecological restoration and species conservation along the Central European section of the European Green Belt are addressed in two Joint Practitioners' Guides prepared within the Interreg ReCo project. The Guides synthesize methods, results and lessons from six Joint Pilot Actions and are intended as operational tools for practitioners and decision-makers involved in restoration and connectivity planning. In the first Guide, Ecological restoration for habitat development, integrated approaches to the restoration of wetlands, peatlands, alpine meadows, karst dry grasslands and coastal brackish wetlands are compiled on the basis of four pilot regions in Germany, Czech Republic, Slovenia and Italy. Restoration techniques are systematized with emphasis on hydrological measures, management of ecological succession in meadows and dry grasslands, connectivity interventions at the landscape scale, as well as the use of innovative tools such as amphibious machinery, remote-controlled mowers and AR/VR applications. Monitoring schemes for vegetation, fauna, hydrology and community-based observations are described and linked to adaptive management. Key lessons are formulated around the integration of scientific and traditional knowledge, prioritisation of hydrology, phased implementation, climate-adaptation co-benefits and the need for early policy integration. The second Guide, Restoration to promote NATURA 2000 (priority) species, is based on two species-focused pilots – European bison in the Ińsko Lakeland (Poland) and European wildcat in the transboundary Thayatal–Podyjí national parks (Austria/Czech Republic). The application of reintroduction and translocation protocols, high-resolution GPS/VHF telemetry, habitat management tailored to focal species, conflict-mitigation measures, genetic monitoring and transboundary coordination mechanisms is presented. Particular attention is given to the role of science- and technology-driven management, to connectivity at population and landscape scales, and to social acceptance enabled by structured stakeholder engagement and communication. Across both Guides, restoration and conservation are framed as community-based, evidence-driven processes that generate leverage effects beyond the initial pilots. The potential of the compiled methods and lessons to inform regional and EU-level strategies, funding schemes and replication in other Green Belt regions is highlighted.

ReCo project in action! Pilot Regions along European Green Belt

Stream substrate restoration to improve freshwater pearl mussel habitats

Rebecca Hoess[1], Wolfgang Degelmann [2]

[1]Aquatic Systems Biology Unit, TUM School of Life Sciences, Technical University of Munich

[2]Bund Naturschutz, Kreisgruppe Hof

Functional and oxygenated stream beds provide essential habitats for endangered freshwater taxa, such as freshwater mussels, fishes, and aquatic insect larvae. Colmation - clogging of interstitial spaces by fine sediments - can impede oxygen exchange between open water and hyporheic zone with particularly detrimental effects on juvenile freshwater pearl mussels (Margaritifera margaritifera). Substrate raking is regularly employed as a stream bed restoration technique to remove fine sediments and improve oxygenation, but the long-term success of such interventions is strongly influenced by catchment-scale land use intensity, as indicated by previous studies in Germany and Sweden.

As part of the ReCo project, substratum raking was carried out using a walking excavator in two degraded reaches of a former pearl mussel stream in Upper Franconia, Germany. Pre- and post-restoration monitoring assessed fine sediment content and substrate conditions, with comparisons made to an untreated reference site. The treated sections showed significant improvements in stream bed quality and oxygenation immediately after restoration, which persisted for several months. After half a year, substrate quality declined at several sites due to continued sediment inputs.

Substratum raking can therefore be a valuable tool to improve stream bed quality of a short time, e.g. to enable egg and larval development of gravel spawning salmonids. To achieve a longer-lasting improvement of substrate oxygenation, restoration measures require catchment-scale management and target fine sediment inputs from intensive catchment land use. Reducing upstream sediment sources is essential for sustaining substrate quality and promoting the recruitment success of endangered freshwater mussels, thereby supporting biodiversity and the ecosystem services they provide.

Biodiversity Monitoring at the Green Belt: A Nationwide Insect Survey of Habitat Connectivity and Biodiversity

Vincent Babl

BUND (Bund für Umwelt und Naturschutz Deutschland / Friends of the Earth Germany)

The German Green Belt, a former inner-German border zone, forms a unique ecological corridor of outstanding conservation value, with a length of almost 1400 km. Within the research project (2024–2027), we are conducting the first standardized, nationwide survey of insect diversity along this landscape. Using 100 Malaise traps across 19 habitat types and selected special sites, monthly samples will be collected between April and August 2025. State of the art DNA metabarcoding will generate comprehensive species lists for later analysis.

Complementary datasets from adjacent protected areas, monitoring programs, and published surveys will be integrated to provide a broader biodiversity baseline. Analyses will focus on (i) the current status of insect diversity, (ii) evidence of climate-driven range shifts, and (iii) the role of the Green Belt as both a biotope network and a north–south climate corridor.

The results will support targeted management and long-term monitoring while contributing to the justification of the site's Outstanding Universal Value (OUV) for the planned UNESCO World Heritage nomination. This project will give new insights into biodiversity in different qualities of biological corridors and delivers practical recommendations for conserving one of Europe's most significant ecological networks.

Coastal wetland habitats restoration in Škocjanski zatok Nature Reserve: the case of land subsidence

Danijel Ivajnšič [1], Daša Donša [2], Veno Jaša Grujić [3], Nataša Pipenbaher [4], Mitja Kaligarič [4], Borut Mozeti [5], Bojana Lipej [5].

[1] *(University of Maribor, Faculty of Natural Sciences and Mathematics, Faculty of Arts)*

[2] *(University of Maribor, Faculty of Natural Sciences and Mathematics and Agricultural Institute of Slovenia)*

[3] *(University of Maribor, Faculty of Natural Sciences and Mathematics and Faculty of Education)*

[4] *(University of Maribor, Faculty of Natural Sciences and Mathematics)*

[5] *(DOPPS - BirdLife Slovenia, Škocjanski zatok Nature Reserve)"*

In midlatitude coastal wetland environments, new terrain for target habitat development for conservation purposes must be planned carefully. In the Škocjanski zatok Nature Reserve (Slovenia) thus mudflats and islets were created along a micro-altitudinal gradient, which resulted, through the primary succession process, in the development of three target habitat types (mudflats not covered by seawater at low tide, Mediterranean glasswort swards and Mediterranean saltmarsh scrubs, including the transitional forms between them). Since this new terrestrial area was created only with the surrounding mud material, the ongoing erosion and subsidence processes caused a gradual submergence of these valuable structures. In 10 years, the restored habitat types, along several seashore bird breeding grounds, thus practically disappeared. We documented this process via habitat mapping (in 2011, 2014, 2022 and 2025) and elevation points measuring in three-time frames (2011, 2014 and 2022). We combined high vertical resolution GNSS measurements and LIDAR remote sensing technology and developed a land subsidence model. According to the studies by Ivajnšič et al. (2014, 2016), we then evaluated the needed land-up movement for each target islet and mudflat and the amount of used mud material (in m3) by considering different mean sea level scenarios. Result, after implementation (in 2024), show a gradual return of al tree target Natura 2000 habitats.

Safeguarding Ecosystem Functions Under Climate Stress in Freshwater Mussel Habitats

Ondřej Spisar

BIVALVIA s.r.o.

Over the past 30 years, various methodologies have been developed to support and reinforce populations of the freshwater pearl mussel (Margaritifera margaritifera), alongside targeted efforts to restore and revitalize their habitats. These include the captive rearing of juvenile mussels, stream restoration, improving of trophic resources, and the identification of key ecological risks. The effectiveness of these measures is evidenced by several successfully restored mussel populations across Europe, including in the Aš region in the western Czech Republic.

However, since approximately 2015, there has been a recurrent increase in environmental challenges attributed to global climate change. These changes are manifested both as large-scale disturbances across entire catchments and as gradual yet critical shifts in spring areas — often with severe consequences for freshwater biodiversity. A particularly concerning outcome has been the rise in indirect effects, such as unexpected interspecific interactions, which emerge during periods of increased ecological stress.

Addressing these complex and evolving threats requires integrated, interdisciplinary and in case of the Aš region also international Czech -Bavarian cooperation. The dynamic nature of these climate-driven challenges presents new demands on species action plans, highlighting the need for adaptive conservation planning, cross-sectoral engagement, and continuous ecological monitoring to maintain and enhance ecosystem resilience.

Connectivity of Natura 2000 Habitats or Species Migration along the European Green Belt

Computational Historical Ecology

Malte Rehbein[1], **Wolfgang Göderle**[1,2]

[1] *University of Passau*

[2] *University of Graz*

Historical records are vital for understanding long-term ecological developments — from identifying continuities and disruptions in climate, biodiversity, and land use, to reconstructing environmental baselines. These sources also offer crucial insight into the role of human activity, shaped by political and economic decisions of the past, in driving ecological change.

Computational Historical Ecology (CHE) is a research programme and international network initiated at the University of Passau [1]. It aims to bridge _Historical Ecology_ (the study of interactions between people and their environments over time) and _Computational History_ (the study of the past using data-driven and algorithmic methods), by leveraging advances in artificial intelligence to unlock the vast, underutilised ecological knowledge embedded in historical ""archives of societies"".

CHE promotes interdisciplinary collaboration between historians, ecologists, and computer scientists to scale up access to mass historical ecological data and integrate it into contemporary research. Central to this effort is the use of machine learning, computer vision, and natural language processing to extract structured data from complex historical sources — such as manuscripts, maps, drawings, and photography — at unprecedented scale.

This talk introduces the CHE framework and presents three representative case studies:

1. Biodiversity reconstruction: Mining 19th-century handwritten faunistic records to trace historical biodiversity patterns across Bavaria (published: [2-4]).

2. Hydrometric reconstruction: Extracting 19th-century river water levels from hand-drawn line charts along the Danube river (unpublished).

3. Landscape transformation: Detecting hedgerow systems and land use change through a fusion of historical maps and early to mid-20th-century aerial photography (work in progress).

Together, these cases demonstrate how CHE opens new avenues for high-resolution historical analysis of ecological change. The talk concludes by outlining the vision for expanding CHE as a global, open research infrastructure for historical ecology.

[1] https://che.hypotheses.org/

[2] Rehbein, M. „From Historical Archives to Algorithms: Reconstructing Biodiversity Patterns in 19th Century Bavaria“. Diversity 17, 5 (2025): 315. https://doi.org/10.3390/d17050315.

[3] Rehbein, M. et al. „Quantitative and Qualitative Data on Historical Vertebrate Distributions in Bavaria 1845“. Scientific Data 12, 1 (28. März 2025): 525. https://doi.org/10.1038/s41597-025-04846-8.

[4] Haider, T., T. Perschl, M. Rehbein. „Quantification of biodiversity from historical survey text with LLM-based best-worst-scaling“. In Proceedings of the 1st workshop on ecology, environment, and natural language processing (nlp4ecology2025) https://aclanthology.org/2025.nlp4ecology-1.13/. "

Harmonizing transport infrastructure conflicts with landscape connectivity through a strategically planned ecological network

Ivo Dostál

Transport Research Centre (CDV)

The presentation will introduce the concept of the nationwide Czech ecological network "Habitat of selected specially protected species of large mammals", which has become in recent years (introduced 2017; legally bound 2019) the basis for the identification of areas needed for the preservation of landscape connectivity. This tool is used both for landscape planning and in the design of transport networks to address bottlenecks where spatial conflict occurs.

Earth Observation Data and Methods in Support of the Nature Restoration Regulation: Results of the RestorEO Project

Manuela Hirschmugl, Florian Lippl, Petra Miletich, Hanns Kirchmeir, Larissa Posch, Stefan Schindler, David Paternoster

University of Graz & Joanneum Research

The final regulation on nature restoration (2024/1991) came into force on August 18, 2024, leaving the authorities with new reporting duties. The RestorEO project's aim is to support the authorities with objective, accurate, transparent and wall-to-wall data derived from Earth Observation (EO) for three important ecosystems in Austria: grasslands, forests and wetlands. We evaluated the use of EO data and methods for monitoring the success of restoration measures based of the indicators listed in the regulation. This talk will give an overview on the project results and achievable accuracies, but also show limitations and improvement potential. We also highlight the potential of AI methods for monitoring and point out future research directions.

Advancing Ecological Connectivity through Passive Forest Restoration

Katharina Lapin, Cornelia Amon

Department of Forest Biodiversity & Nature Conservation, Austrian Research Centre for Forests (BFW)

Ecological connectivity is a key principle for restoring biodiversity and supporting climate adaptation in forest ecosystems. Launched in 2021, the Austrian Stepping Stone Program seeks to strengthen forest connectivity by designating over 500 biodiversity-rich sites—each ranging from 0.5 to 25 hectares—as conservation zones exempt from active forest management. This nationwide initiative combines scientific methods, stakeholder engagement, and systematic monitoring to enhance the quality and success of ecological restoration. A GIS-based prioritization framework guides site selection by evaluating four core criteria: Protect Value, Connect Value, Species Value, and Habitat Value. This ensures that stepping stones are strategically located for maximum ecological benefit. Priority areas typically feature high levels of deadwood, mature habitat trees, rare or endangered species, and ecologically valuable habitats such as wetlands or dry woodlands. To encourage participation, the program offers landowners financial compensation of up to €5,040 per hectare over 20 years. Extensive biodiversity surveys cover plant life, fungi, saproxylic beetles, forest birds, bats, and soil organisms. Early results reveal notable differences in forest structure and aboveground biomass, with stands centered on habitat trees exhibiting 75% more biomass than those focused on rare species or ecosystems. Ongoing monitoring supports evaluation and forms the foundation for adaptive management strategies.

Drivers of peatland conservation status in Austria

Elias Kapitany[1], Stefan Forstner[2], Thomas Wrbka[1], Stefan Dullinger[1]

[1]*University of Vienna*

[2]*Austrian Research Centre for Forests (BFW)*

Context

Wetlands belong to the most threatened ecosystems in central Europe, with drainage, agricultural intensification and climate change being the most important threats. To protect and restore wetlands different measures are needed depending on the type of wetland at hand. In this context, the differentiation between fens (i.e., groundwater fed peatlands) and bogs (rainwater fed peatlands) is important since their hydrology strongly influences their management needs and susceptibility to external pressures. The implementation of protected areas is the most common approach in nature conservation to preserve natural and semi-natural habitats, yet how exactly the effectivity of protected areas differs when it comes to the conservation of bogs and fens remains unclear.

Objectives

In this study we aim to analyze the effect of different protected area types and especially time since implementation on the conservation status of Austrian wetlands. We furthermore analyze the effects of abiotic factors (such as temperature, precipitation and topography) and human interventions (such as drainage, atmospheric nitrogen deposition and agricultural management) on wetland conservation status in Austria. We aim to identify the effects that each of these variables has on the conservation status of peatlands and how these effects might interact. Most importantly, we try to identify how these effects differ between fens and bogs.

Methods

To assess the current conservation status of wetlands we will work with the newly compiled Austrian catalogue of peatlands published by the Austrian Environment Agency. Most environmental and anthropogenic variables used as predictors were compiled in the project “Moist - Erfassung degradierter Moorflächen Österreichs und Beurteilung ihrer Eignung zur Regeneration”, funded by the Austrian Ministry for Agriculture and Forestry. We will use different linear models to identify the relation between conservation status of wetlands and the above-mentioned variables.

Hydrological restoration of wetlands and streams in headwater areas (LIFE for MIRES, Sumava National Park)

Ivana Bufkova, Tomáš Doležal, Eliška Václavíková

Sumava National Park, Czech Republic

Šumava situated on the Green Belt along the border of the Czech Republic, Germany and Austria is one of the most important wetland area in Central Europe. Characteristic feature of this headwater area is namely a high proportion of springs and mires. The region, however, has been subject to significant landscape drainage in the past. Since 1990s, comprehensive programme of hydrological restoration has been started here. The programme was aimed at restoration of near natural hydrological conditions and processes in the landscape and the rehabilitation of major natural water macrostructures such as wetlands, watercourses and springs. Third phase of restoration efforts, represented by the large transboundary project LIFE for MIRES (2018 - 2024), was finished last year.

Within this LIFE project, 2182 ha of wetlands have been restored both on the Czech and Bavarian side of the border. 212 km of drainage ditches were closed and 35 km of mountain streams together with 28 springs were restored. Restorations were carried out according to three basic concepts: i) micro-catchment concept (whole hydrological units were addressed), ii) target water level concept (water table was returning to near-natural levels) and iii) concept of one-off functional measures (restoration was aimed on releasing damaged ecosystems out of degradation trajectory and initiate their spontaneous recovery).

The presentation shows restoration methods for different habitats and situations including specific technologies developed for drained springs or strongly eroded streams on slopes. Monitoring of the restoration success using variables as water table, water chemistry, runoff, vegetation and microclimate and recorded response of the ecosystems to the measures implemented are presented.

The LIFE project also had a strong focus on raising public awareness of the importance of wetlands and their role in the landscape and mitigation of climate change. Some outputs like collaboration with volunteers, educational programme for schools, published books and art or educational films will be mentioned.

Initiatives to restore important marine species recognized as habitat builders in the northern Adriatic Sea: experiences from Slovenia

Lovrenc Lipej, Valentina Pitacco, Martina Orlando Bonaca

National Institute of Biology, Marine Biology Station, Piran, Slovenia

The coastal zone provides valuable living and non-living resources (Holligan, 1995) and is considered as the area with the highest biological diversity and productivity. Coastal ecosystems are important also from the food security point of view, since they provide food sources and fish nurseries. Notable habitat builders include the Mediterranean stony coral (Cladocora caespitosa), canopy-forming species of the complex Cystoseira sensu lato and the noble pen shell (Pinna nobilis). These organisms contribute to the formation of important habitat types such as coral beds and brown algal forests. Nowadays, these habitat types are subjects to many harmful impacts due to anthropogenic activities, including eutrophication, coastal fisheries, and pollution, which, combined with climate induced changes, affect the health of algal forests and coral beds, leading to their shrinkage and slow disappearance. The decline of the Noble pen shell in the Mediterranean is primarily attributed to the newly discovered pathogens Haplosporidium pinnae and Pinna nobilis Picornavirus (PnPV), but climate change and anthropogenic impacts such as anchoring can also have a detrimental effect on the recovery of the species.

To attenuate and reduce such impacts, our research has focused on cultivating and restoring these species to facilitate their repopulation. Successful laboratory cultivation has been achieved for all three species. For Cystoseira s.l., initial efforts involved the outplanting of cultivated thalli into the coastal sea on structures protected from grazing by herbivorous fish, aiming to establish sustainable populations. For P. nobilis efforts have focused on collecting juveniles using larval collectors and maintaining them under controlled conditions until they are large enough for safe transplantation.

Ecological restoration best practices: the case study of the LIFE FORESTALL project

Alessandro Meggiato[1], Marco Baldin[2]

[1]*CORILA - Consortium for coordination of research activities concerning the Venice lagoon system*

[2]*WWF Italy Foundation*

The case study of the LIFE FORESTALL project contributes to sharing scientific knowledge and practical experiences in ecological restoration that align with the scope of the upcoming Scientific Conference of the Interreg project ReCo on "Enhancing biodiversity & interconnectivity by ecological restoration".

The project area is the WWF Oasis of Valle Averto (southern lagoon of Venice); the area is within two Natura 2000 sites and a site included in the list of wetlands of international importance according to the Ramsar Convention.

The project activities have redeveloped an environment of extraordinary naturalistic interest, both for the vegetation and for the sedentary and migratory birdlife.

Anthropic pressures and climate changes have put the specific biodiversity of this environment at risk and active protection actions were necessary to preserve it.

LIFE FORESTALL has implemented the restoring and size increase of the habitats "7210* Calcareous fens with Cladium mariscus and species of the Caricion davallianae" and "91E0* Alluvial forests with Alnus glutinosa and Fraxinus excelsior" considered as priority by the 92/43/EEC Habitats Directive. A total of over 43,000 seedlings were planted. Hydraulic interventions were carried out to guarantee optimal conditions for the resting and feeding of birds during the winter and the migratory period and to encourage the natural expansion of the project habitats. One action of the project involved the creation of floating rafts for the nesting of terns, waders and other species of community interest hosted in the project area.

The containment of invasive alien species has also been implemented: Robinia pseudoacacia, Baccharis halimifolia and the "Wels catfish" ((Siluris glanis). The positive impact of the project on both ecosystem functions and human activities, that determine the use of cultural ecosystem services, was highlighted, thus maintaining the sustainability of the same provided by the Oasis.

The LIFE Drylands project: Restoration of dry-acidic continental grasslands and heathlands in Natura 2000 sites of the western Po Plain

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Open dry habitats, protected in Europe under the Habitat Directive (92/43/EEC), are becoming increasingly rare and threatened across the continent. In the Po Plain, their situation is particularly critical: intense human activity and a lack of proper management have led to habitat fragmentation and, in many cases, their disappearance. These habitats are especially valuable because they (1) represent a high phytogeographical significance, being at the southern limit of their European distribution, (2) host communities rich in terricolous lichens, which at low altitudes are now exclusive to these environments, and (3) provide several important ecosystem services that benefit human populations. The “LIFE18 NAT/IT/000803 LIFE DRYLANDS” project was launched with the aim of restoring habitats classified as 2330 ("Inland dunes with open Corynephorus and Agrostis grasslands"), 4030 ("European dry heaths"), and 6210 ("Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)"), specifically the acidophilous subtype. These efforts focus on eight Natura 2000 sites in the western Po Plain. The overarching goals of the project are to restore these habitats to improve their conservation status, establish core areas, and develop ecological corridors to reduce fragmentation and enhance connectivity. To achieve these objectives, the project employed several key strategies: (1) structural restoration of the target habitats through methods such as mowing and herb removal, cutting back native woody species (preserving larger specimens that can serve as refuges for ecotone species), sod cutting, and topsoil inversion; (2) reduction of invasive woody species via cutting and stump removal; (3) enhancement of the floristic composition by planting typical habitat herbaceous species; and (4) creation of new habitat patches using appropriate propagation materials—such as surface sands rich in seeds of typical species for H2330, harvested seeds for H6210, and cuttings of Calluna for H4030. Overall, approximately 21 hectares of open dry habitats have been restored.

Restoring biodiversity along the Italian EGB: forgotten bunkers, abandoned meadows & disappearing ponds

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Rete Italiana European Green Belt Association

Between November 2022 and October 2024, the project Restoring Biodiversity Along the Italian Green Belt was implemented in the Julian Prealps Nature Park (Lusevera Municipality, Italy) to enhance biodiversity and revalue forgotten Cold War landscapes. Formerly seen as symbols of conflict or neglect, abandoned meadows, military bunkers, and degraded ponds were transformed into valuable habitats supporting rare and threatened wildlife.

The project targeted three main ecological challenges. First, two disused Cold War bunkers were restored to create suitable roosting sites for bats, a group of species suffering from habitat loss and population decline across Europe. Bat-friendly entrances and internal structures were installed, and their use by bats was monitored using bat detectors and camera traps throughout the project period.

Second, five heavily silted and overgrown ponds were rehabilitated. Manual removal of invasive vegetation, algal blooms, and excess sediment aimed to improve breeding conditions for threatened amphibians and provide new foraging sites for bats. The ecological outcomes were assessed by tracking changes in vegetation structure, water quality, and faunal presence.

Third, shrub encroachment was addressed in an abandoned military shooting range, now classified as a sub-Mediterranean Scorzonetalia villosae Natura 2000 dry grassland. Here, selective removal of trees and invasive shrubs was conducted to halt the decline of open alpine grassland habitats. Biodiversity responses were monitored through field surveys and drone-based habitat mapping.

In addition to ecological restoration, the project promoted local awareness of European Green Belt (EGB) values and supported stakeholder engagement and capacity building to strengthen sustainable local economies. By reimagining post-conflict landscapes as refuges for biodiversity, this project contributed to the broader EGB mission of connecting nature, culture, and people across former European division lines.