ALPINE WATER –
COMMON GOOD OR SOURCE OF CONFLICTS?

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ALPINE WATER – COMMON GOOD OR SOURCE OF CONFLICTS?

Changing environmental and climatic conditions as well as growing demand is likely to lead to conflicts in water use and water management in the Alps. This ForumAlpinum will identify hot spots of water use and management in the Alps, will analyse target conflicts, assess their relevance in a regional, national or international context, and discuss possible solutions.

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The EU Habitats Directive demands monitoring and managing its Annex species and habitats. In this session, we will discuss this subject area for Alpine rivers. The special focus will be on key species and their habitat types 3220, 3230, 3240 “Alpine rivers” and 7240* and 91E0. Within the last EU Habitats Directive, Article 17 Reporting, the conservation status of these habitats ranged from unfavourable to inadequate to bad. Therefore, examples of management and reintroduction of key species will be part of this workshop alongside methods of monitoring. This workshop is also part of the 16th International Alpine Workshop, an annual meeting of scientists, practitioners and advanced students working in Alpine rivers (see www.fh-erfurt.de/la/tagliamento).

CONCLUSIONS
Norbert Müller & Helmut Kudrnovsky

With the Water Framework, Bird, and Habitats Directives, the European Union has established three important instruments for the conservation, sustainable and wise use, and restoration of its Alpine water ecosystems. In the implementation process of these directives, the EU demands the preservation and restoration of a favourable conservation status, as well as monitoring and managing their Annex species and habitats. For Alpine rivers, a special focus within the Habitats Directive is on key species and their habitat types of “Alpine rivers” with herbaceous vegetation (3220), false tamarisk (3230), rosemary willow (3240), dwarf bulrush communities at sand and silt rich sites (7240*), and softwood alluvial forests (91E0*).

Natural river dynamics are the key requirements for a favourable conservation status of these habitats. Rivers and riverine landscapes are ecosystems significantly shaped by recurrent natural disturbances. These dynamic processes initiate a complex mosaic of habitats that is home to a remarkably high diversity of aquatic, amphibious and terrestrial organisms linked to these aquatic systems.

What are and will be increasing or upcoming conflicts in water use in the Alps (and beyond) related to socio-economic or climate change?

River ecosystems are connected on large spatial scales, have varied drivers, strong, and often conflicting, societal interests, and interacting management processes. Nowadays Alpine rivers with near-natural morphology and dynamics, along with their natural riparian vegetation, have become rare and are highly endangered.

The key components of hydro-morphological pressure are changes in hydrological regime / runoff, interruption of river and habitat continuity, disconnection from adjacent wetlands / floodplains, and changes in erosion and sediment transport.

Climate change may change spatial and temporal patterns of precipitation in and around the Alps, with a possible increase in the demand for water for irrigation. Abandoning the use of fossil and nuclear energy calls for a greater use of renewable energy like hydropower.

Within our annual workshop1 at the Forum Alpinum, we discussed current main challenges in implementing the EU Environmental Directives, followed by a week-long excursion to two main references ecosystems for

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1 https://www.fh-erfurt.de/lgf/la/lehrende/prof-dr-norbert-mueller/tagliamento/
Mapping of hydrological and water-driven hotspots in the Alps

the Alpine rivers in Austria – the Tyrolean river Lech and the river Isel, including their tributaries.

Although enormous efforts were made in the last ten years within two Life projects at the Tyrolean Lech, it is uncertain if a favourable conservation status in the river course, which is impacted by hydroelectric power plants, will be achieved. At the river Isel and its tributaries, there is ongoing great pressure to use these ecosystem or parts thereof for hydroelectric power plants.

What are needed actions and available tools to face or mitigate such conflicts?

At European Union level, the Habitats Directive and the Water Framework Directive establish legal frameworks and set out action plans to maintain or restore a favourable conservation status of Alpine rivers and associated habitats and species of community interest.

An intensified and entangled implementation of both these directives helps raising awareness of Alpine rivers as lifelines for humans as well as for species and habitats of European interest and finding a sustainable and balanced way to ensure all social and ecological functionalities of such ecosystems.

Only strict conservation and restoration actions will save these two river reference ecosystems, Lech and Isel and tributaries, and will meet the requirements of the EU Environmental Directives.

According to the Interpretation Manual of the European Union, habitat 3230, “Alpine rivers and their ligneous vegetation with Myricaria germanica” is described as: communities of low shrubby pioneers invading the herbaceous formations on gravel deposits rich in fine silt, of mountain and northern boreal streams with an Alpine, summer-high, flow regime. Myricaria germanica and Salix spp. are characteristic (Salici-Myricarietum; Fig. 17).

Next to the river system of Isar / Rissbach, the Tyrolean Lech is one of two hotspots for this specific habitat type in the northern parts of the Eastern Alps. Additionally, both river sections are part of Natura 2000, the Europe-wide network of protected areas (Tiroler Lech – SiteCode: AT3309000; Karwendel mit Isar – SiteCode: DE8433301, Karwendel – SiteCode: AT3304000) and challenge conflicts of landscape use like hydropower plants or gravel mining.

Fig. 17: Myricaria germanica – species distribution in Tyrol. Graphics: © Naturpark Tiroler Lech 2016
In recent years, the author visited the Tyrolean part of the river Lech several times. Based upon the comparison of historic and current documents (e.g. aerial photos, landscapes pictures and results of habitat mapping over the years), recent observations of trends, e.g. in spatial distribution or population characteristics, will be presented and discussed with the audience.

Reintroduction of *Myricaria germanica* in Italy – an overview

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*Myricaria germanica* (L.) Desv (German tamarisk), a pioneer shrub of natural Alpine and pre-Alpine rivers, is declining in Europe as a result of human disturbance, which has reduced the spontaneous river dynamics, the input of sediments and the river corridor width. Since all the Italian rivers are subject to some form of human disturbance, conservation of *M. germanica* should be ensured by river restoration, active management of riparian habitats or reintroductions. The reintroduction of *M. germanica* has recently been the subject of projects of national and international interest. *M. germanica* can reproduce easily by cuttings or seeds, but translocations have a variable success rate. Some reintroduction projects have also been performed in Italy. For example, the Emilia-Romagna region coordinated the Life project *Taro-Requalification of Taro fluvial habitats vital to avifauna* (LIFE 98NAT/IT/5138) in which thousands of new *M. germanica* plants, grown in nurseries, were produced and planted. The plant nursery of the Veneto region produced hundreds of plants of *M. germanica* in the last 20 years. In South Tyrol a wide range of river enhancement programmes have been carried out since 1999. In many river sites, the Office for Mountain Basins of the Civil Protection Agency of the Autonomous Province of Bozen/Bolzano has planted thousands of rooted cuttings of *M. germanica*, which have generated some new vital populations. We confirm that *M. germanica* is a good indicator of natural riverine conditions. Therefore a successful reintroduction of *M. germanica* can be used to assess the environmental success of a river enhancement work.

30 years monitoring and managing *Typha minima* at the Tyrolean river Lech – a key species of Alpine rivers

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*Typha minima* Funck ex Hoppe (Dwarf Bulrush; Fig. 18) is the outstanding key species for braided rivers of the Alps and their foreland. Within the European Habitats Directive, the species is assigned to the priority habitat 7240*, Alpine pioneer formations of *Carrion bicoloris-atrofusca*. This habitat is defined as Alpine, peri-Alpine and northern British communities colonizing neutral to slightly acid gravelly, sandy, stony, sometimes somewhat argilous or peaty substrates colonizing neutral to slightly acid gravelly, sandy, stony, or on alluvial sands of pure, cold, slow-flowing rivers and cold backwaters. Recent mapping guidelines for this habitat distinguish between four pioneer formations in the alpine zone and one pioneer formation in the subalpine to montane zone, including *Typha minima*. Due to river regulation and the construction of power plants, the species, and its habitat has declined rapidly in the 20th century in the Alps and it is today extinct or highly endangered in most European countries. At the river Lech a last large *Typha minima* population was discovered in 1988 in a gravel pit in Tyrol, next to the Bavarian border. After traditional conservation actions in the first years, a species action programme started in 2003. This programme is including ex situ and in situ cultivation of the species, the management of the last isolated populations and trials for the reintroduction of the species by seeds and young plants to create new populations during river restoration. Within a wider scientific collaboration some research was done on population biology and genetics. In this contribution, we will present a) results from monitoring the actions mentioned above, b) conclusions for the reintroduction of plant species during river restoration, and c) recommendations on monitoring and managing of dynamic habitats of Alpine rivers within the EU Habitats Directive.
Monitoring *Bryodemella tuberculata* – a key species of the habitats 3220, 3230 and 3240 Alpine rivers

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In Central Europe, the grasshopper *Bryodemella tuberculata* is restricted to sparsely vegetated gravel bars of rivers and streams of the Bavarian and Tyrolian Alps. These populations have probably been isolated from Northern and Eastern European populations for several thousand years. The species is classified as threatened by extinction in the Red Lists of Bavaria and Germany. Many local populations became extinct during the first half of the 20th century along the headwater streams of the Iller, the Lech in Bavaria, or the Inn in Switzerland. The local populations at the Isar downstream of Bad Tölz disappeared during the second half of the 20th century. Today the Tyrolian Lech and the Isar upstream of the Sylvenstein reservoir harbour the two most important meta-populations in Central Europe. Smaller populations can be found at the headwaters of the Ammer and Loisach catchments, as well as along streams feeding lakes Heiterwang and Plansee.

*B. tuberculata* is a key species of several habitat types protected by the EU Habitats Directive. It occurs in—and is restricted to—the habitat types: Alpine rivers and the herbaceous vegetation along their banks (3220), Alpine rivers and their ligneous vegetation with *Myricaria germanica* (3230), and Alpine rivers and their ligneous vegetation with *Salix elaeagnos* (3240). The long-term persistence of *B. tuberculata* is characterized by metapopulation dynamics. Local populations may become extinct by flooding or succession, but can be recolonized or colonized from neighbouring local populations. Population dynamics of the single local populations are therefore often not correlated or even show opposing trends. Monitoring single local populations (like single gravel bars), or a monitoring scheme using permanent observation plots, will not lead to significant results. Therefore, monitoring of the population viability, or the conservation status, requires monitoring of entire meta-populations. A simple and fast field method can be carried out using groups of 4–8 people.
and counting individuals visually during the period of maximum abundance. Results from several small and large meta-populations reveal that population sizes remain stable along some river reaches, while others are characterized by decreasing populations or even local extinction.

A standardized selection of species and habitats for protection measures

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European directives and international programmes provide a framework for a sustainable and effective improvement of habitats and the conservation of endangered species. Nature protection measures are thus an integrated component of restoration projects. Nevertheless, action plans often lack a scientific rationale as well as a multidimensional approach, since managers must operate within time and budget constraints. This circumstance calls for simple but efficient mechanisms, which bridge the gap between science and practice by translating scientific knowledge to management policy. The authors developed a standardized method for the evidence-based selection of target species within the framework of the river restoration project LIFE Lech – Dynamic river system Lech. The species of the protected area Tiroler Lech were evaluated on multimetric scales. The index score of the species generates the priority ranking for measures. The standardized selection method was tested on already finalized LIFE projects to examine its applicability and to identify deviations between the standardized approach and the status quo. The standardized selection method is a first step towards a science based Decision Support System (DSS) for LIFE projects.