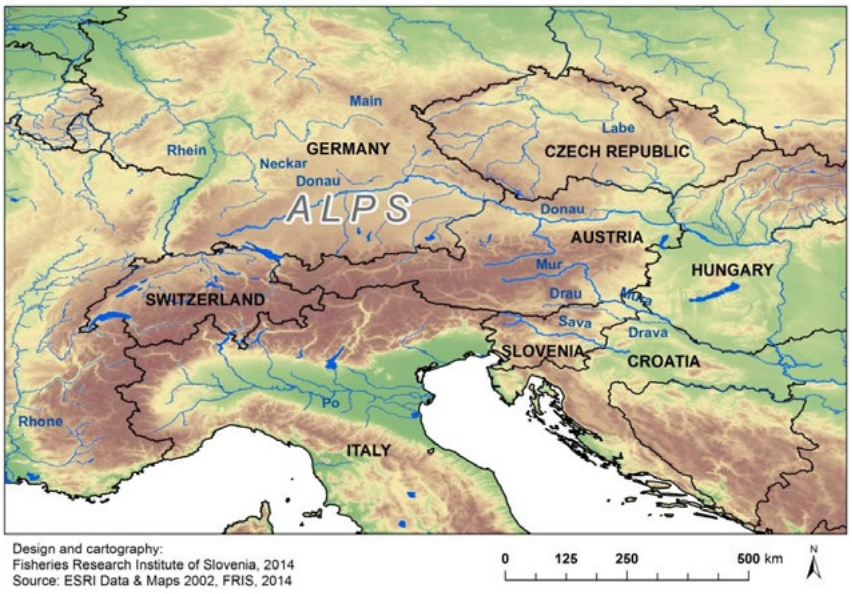
EAA
European Anglers
Alliance

ALPINE RIVERS ARE ENDANGERED

In the long history of human intervention on aquatic environment there are now only a few untouched areas left in the world. The mountainous regions of Europe have been occupied for thousands of years and thus have a long history of human effects on watercourses (Wohl, 2006), where alpine rivers are no exception. In Europe there are numerous streams and rivers in the mountainous regions of the alpine and subalpine space. According to the study “Save the Alpine Rivers!”, carried out by WWF, only one of ten rivers in the alpine region of Europe remains in its natural state.

Picture 1: *Soča river, Slovenia. Photo: FRIS.*



Picture 2: *Alpine region of Europe.*

ALPINE RIVERS ARE FISH HABITATS

Mountanious rivers and streams of alpine region show distinctive hydromorphologic characteristics resulting in diversity of fish habitats. Most common fish species that inhabit alpine and subalpine streams and rivers are salmonid and other fish species, such as brown trout (Salmo trutta), bullhead (Cottus gobio), Danube salmon (Hucho hucho), grayling (Thymallus thymallus) and marble trout (Salmo marmoratus). European alpine watercourses are a part of two different river basins. Most of the streams and rivers of alpine space are a part of the Danube river basin; in these watercourses, the common salmonid species are the brown trout and Danube salmon. Other part of Alpine watercourses belongs to the Adriatic river basin; in these waters, the dominant salmonid fish species is the marble trout.

Picture 3: Brown trout (Salmo trutta fario). Photo: FRIS.

Picture 4: Marble trout (Salmo marmoratus). Photo: Krištof Istinič.

Picture 5: Grayling (Thymallus thymallus). Photo: FRIS.

Picture 6: Danube salmon (Hucho hucho). Photo: FRIS.

Picture 7: Bullhead (Cottus gobio). Photo: FRIS.

The physical environment, inhabited by the fish, depends mainly on geological, morphological and hydrological processes (Cowx in Welcomme, 1998).

In a natural state, rivers and streams provide the existence of a large variability in substrate type, flow depth and velocity, thermal regime, nutrient availability (Wohl, 200) that support the existence of different types of micro and macro habitats the fish species need to spawn, hatch, grow, feed, hide, overwinter and also provides the existence of longitudinal conectivity, that enables the fish to migrate between habitats. In a natural river, morphology consists of alteration between different types of water flow – riffles, laminar current and pools. These caharacteristics enable the existence of fish habitats (Pictures 8 – 11).

Picture 8: *Natural morphology of Učja river. Photo: Matevž Jus.*

Picture 9: *Natural pools of Radovna river, Slovenia. Photo: Matevž Jus.*

Picture 10: *Natural riffles of Učja river. Photo: Matevž Jus.*

Picture 11: *Nadiža river, Slovenia. Photo: FRIS.*

To complete their life – cycle, fish species require different habitats with suitable microhabitat conditions for each specific life stage (eggs, larvae, juveniles, adults). Suitable microhabitat depends on complex interactions between water temperature, water depth and velocity, dissolved oxygen, substrate composition, vegetation cover and the presence of suitable structures that provide hiding places.

Watercourses in alpine regions have distinctive characteristics. High flow velocities often induce lateral erosion and sediment (gravel) transport, which becomes particularly evident in times of increased water and sediment flow in heavy percipitation, when flooding often occurs.
European legislation that applies to the ecological and chemical status of surface and ground waters is the Water Framework Directive (2000/60/EC). One of the main purposes of the Water Framework Directive is sustainable water use resulting also in protection of aquatic ecosystems and wetlands. The Directive requires a step-wise achievement of good ecological status on surface and ground water resources by 2015.

THREATS TO FISH HABITATS IN ALPINE RIVERS

In practice, water management is usually not in line with the objectives of the Water Framework Directive. Various actions of water management, such as remediation and maintenance of water infrastructure are continuously carried out to ensure flood protection, elimination of flood consequences, protection of water infrastructure, and ensuring the function of water infrastructure objects. These interventions are most often made on behalf of the increased channel flow and sediment transport management. Consequently, the hydromorphology of the river bed and banks is changed. Because of their specific characteristics, alpine rivers are also under water use pressure. Due to the hydropower and other water use, many water abstractions are required. Problems deriving from water use and implementation of environmental flows are already recognised in many EU member states. The change of natural hydromorphology of watercourses impacts the composition and quantity of sediment, physico-chemical and biological properties of water, changes of flow velocities and depth, riparian vegetation cover and other essential fish habitat structures. All these changes result in the significant negative changes in fish habitats. Cumulative negative effects reflect in the change of fish assemblage, spatial distribution of fish species, fish population densities and in the age structure of fish populations.

Picture 12: *The channelised section of Ribnica river. The stream is widened, the banks stabilized. Photo: FRIS.*

Water management interventions for improvenment of watercourses, in many locations in alpine rivers and torrents are needed to guide floods and mudflows safely without hazards for people and infrastructure.

Direct interventions inside the alpine rivers and in torrents inhabited by fish have many negative effects on fish populations. Most common interventions are concrete works that include river regulations and channelising, stabilization of the riverbed or river banks with concrete and stones/rocks, placing the transverse water obstacles inside the riverbed (dams, dam checks dams, bottom weirs) and removal of riparian vegetation.

Inappropriate water management activities have immediate negative effects caused during the construction works. Such activities also cause significant long term negative effects on fish habitats and populations (listed in Table 1).

Table 1: Some of the most common negative effects resulting from bad planning of alpine watercourse management.

WATER MANAGEMENT ACTIVITY	IMMEDIATE NEGATIVE EFFECT	LONG TERM NEGATIVE EFFECT
Concrete works in the river bed area (e.g. revetment of banks and channel bottom)	Water contamination resulting from: concrete waste-waters Increased water turbidity Increased fish mortality	Destruction of fish habitats Destruction of fish spawning sites Impoverishment of fish species and communities diversity as a consequence of habitat homogeneity
River bed channelization (stream widening or straightening)	Increased water turbidity	Changes in water level, water discharge Increase of water temperature (changes in temperature regime) and reduction in dissolved oxygen levels Reduction of habitat diversity or destruction of fish habitats Reduction or destruction of fish spawning sites Reduction of fish cover area Impoverishment of fish species and communities diversitiy as a consequence of habitat homogeneity
Water obstructions (e.g. dams, weirs and check dams used for sediment control)	Increased water turbidity Destruction of natural riverbanks	Reduced or blocked river connectivity for the fish Reduced accessibility of the spawning sites for the fish Modifications in sediment transport resulting in downstream water sediment change Impoverishment of fish species and communities diversitiy as a consequence of habitat homogeneity
Removal of riparian vegetation	Reduced shading of a stream Loss of fish covers	Increase of water temperature (changes in temperature regime) and reduction in dissolved oxygen levels Increased riverbanks erosion Impoverishment of fish species and communities diversity as a consequence of habitat homogeneity
Water abstractions (e.g. for small hydropower plants, artificial production of snow, irrigation)	Low water level or dried-up streams Hydropeaking	Increase of water temperature (changes in temperature regime) and reduction in dissolved oxygen levels Reduction of fish cover area Reduction of habitat diversity or destruction of fish habitats Reduced or blocked river connectivity for the fish Impoverishment of fish species and communities diversity as a consequence of habitat homogeneity Reduced accessibility of the spawning sites for the fish or destruction of spawning sites

1. Regulations and channelization

An example of bad practice in managing alpine watercourses are widening and straightening the river bed and channelizing it with concrete (Picture 12). With the implementation of inappropriate regulations, diverse fish habitats of natural rivers have been lost. Complex and dynamic aquatic habitats are severely reduced by stream channelisation resulting in uniform bottom and riverbanks (Pictures 13 - 15).

Picture 13: *Example of widening and straightening the riverbed with the concrete stabilization of river banks. Photo: FRIS.*

Picture 14

Picture 14 and 15: *Examples of stream regulations in the alpine region, inappropriate for fish. The riverbed was widened and straightened, river banks revetment was made with concrete and rocks, riparian vegetation was removed. Photos: FRIS.*

Impacts of regulations and watercourse channelizations on fish habitats and populations are severe. With the loss of natural hydromorphology the complexity and diversity of fish habitats is severely reduced or lost, which can lead to destruction of spawning sites as well as rest and feeding fish habitats. The channelization often includes removal of riparian vegetation, that shades the stream and prevents overheating of water. Nevertheless, removal of riparian vegetation always results in fish covers loss. Cumulative effects of changes in hydromorphology of the river bed and banks lead to impoverishment of fish assemblage and fish populations.

2. Transverse water obstructions

One of the common transverse objects built on alpine rivers are check dams. Check dams are commonly used to prevent erosion of river bed, for sediment control, or reduction of hydraulic gradient. However, the additional protection of river banks is only needed in the reach of check dam.

The downstream transport of sediment (gravel) usually stops at the check dam in combination with a retention basin. Consequently, the downstream gravel quantity is reduced.
Fish that spawn in alpine rivers are mostly lithophyllic spawners and require gravel for spawning substrate. With the reduction of gravel transport fish spawning area is reduced.
Check dams also reduce and block fish migration. Hence, the accessibility of spawning sites and river connectivity is reduced.
Other transverse objects with the same negative effects on aquatic habitats are also low bottom weirs and dams.

Picture 16

Pictures 16 and 17: *Transverse water obstacles block the river connectivity for fish and impact the amount of sediment downstream. Photo: FRIS.*

Picture 18

Pictures 18 and 19: *Examples of check dams, that disable fish migration. The pictures also shows bank river channelization and bank stabilization with rocks and concrete. Photo: FRIS.*

3. Water abstractions

Due to different types of water use, considering the mode and quantity of water abstraction from surface streams, the biggest threat for the fish and their habitats in the alpine and subalpine space are hydropower plants, artificial production of snow, irrigation systems, etc..
Water abstractions resulting from water use impacts instream fish populations. Due to the low water levels or dried-up streams river connectivity for the fish is reduced or blocked.
Water abstractions result in discharge reduction and in higher water temperature and consequently effects sustainability of natural stream dynamics and fish populations and their habitats. We can also recognise some specific negative effects, deriving from hydropower plant operation, such as hydropeaking. However, water use must always be identified as cumulative effect, affecting the environment.

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Picture 20

Pictures 20 and 21: *An example of extremely bad practice of water use. Downstream of the water abstraction location the river bed is completely dry (left). Photo: FRIS.*

Picture 22

Pictures 22 and 23: *Examples of bad practice of water use. Examples show the water abstractions for small hydropower plants on weirs. Downstream of the weirs, only the minimum discharge is left in the bed. Photo: FRIS.*

CONCLUSIONS:

To ensure water management practice, that does not degrade water habitats and enables the existence of functional fish habitats and longitudinal connectivity of watercourses, the cooperation between water management and fisheries experts is necessary.

It's understandable that certain water management interventions in the watercourses are necessary for the flood protection and for ensuring safety for people and infrastructure. Negative water management effects on fish habitats cannot always be avoided.

However, it can be severely reduced with the close to nature planning and implementation methods and with the use of natural materials.

Resulting from past inappropriate water management practice, a lot of river restoration projects across Europe are in progress with the same goal: to rehabilitate deteriorated river sections and restore water habitats.

Although river restoration is a step towards better future, we believe that the priority must always be preservation of natural rivers.

Preserve, so we won't have to restore in the future!

WHAT WE WANT:

- Consideration of the Water Framework Directive in coherence with the Habitats Directive
- Updated hydromorphological pressures and impacts analysis
- Clear delineation of water bodies with catchment size between 10 and 100 km2 to ensure that significant impacts are not being overlooked
- Defined No-Go areas where hydrological and morphological alteration is forbidden
- Ensured fisheries and nature conservation expert and public participation in water management issues
- Prohibiting bad practice in water management
- Implementing an effective inspection control of concrete works and water use
- Effective management of transverse water obstructions in terms of assuring longitudinal river connectivity for freshwater organisms.
- Strategic planning and close to nature implementation of water interventions.
- Close to nature rehabilitation of inappropriately regulated sections of watercourses.

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