

# CLIMATE CHANGE IMPACTS ON ALPINE RIVERS: ANGLERS' PERSPECTIVE

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# COMMON PERCEPTION OF A PRISTINE ALPINE RIVER





# ANGLERS' PERSPECTIVE OF ALPINE RIVERS

## Flyfishing





# ANGLERS' PERSPECTIVE OF ALPINE RIVERS

Game fishing - i.e. fishing for salmonid species



# ALPINE RIVER AS A FISH HABITAT

- ▶ Main habitat for salmonid fish species
  - ▶ Crucial factor: cold, fast running water & high oxygen levels

- ▶ Typical salmonid species:

Brown trout



Lake trout



Grayling



Huchen - Danube salmon





# IMPORTANCE OF ALPINE RIVERS FOR ANGLING

- ▶ Fly-fishing based tourism
  - ▶ Higher revenue from day fishing licenses
    - ▶ Average fly fishing license: €70.00 and higher
    - ▶ Average coarse angling day license: €20.00
  - ▶ Dependent:
    - ▶ Fisheries
    - ▶ Tackle dealers
    - ▶ Hotels, room-renters etc.



- ▶ ***“An assessment of the importance of recreational sport fishing in the upper Soča basin, Slovenia”*** by Caroline Sullivan - Centre for Ecology and Hydrology, Wallingford UK 2003, Barbara Podpečan-Jesenšek, Dušan Jesenšek, Anka Zuza - Tolmin Angling Club
- ▶ Main conclusion: angling tourists come to the Upper Soča because of preserved natural river and number of interesting fish.

marble trout



# EXPECTED EFFECT OF CLIMATE CHANGE IN ALPINE REGIONS

- ▶ Uneven distribution of rain water
  - ▶ Summer, spring: droughts
    - ▶ Frequent low water levels
    - ▶ Increase in water abstraction due to drought
    - ▶ **92%** expected increase of water-based habitats use due to tourism in years 2010-2050 (Assessing tourism's global environmental impact 1900-2050 Stefan Gössling & Paul Peeters, Journal of Sustainable Tourism, Volume 23, 2015)
  - ▶ Autumn, winter: floods = danger to human life and property
- ▶ Known effects on fish
  - ▶ Droughts: less water, warmer water temperatures: stress due to low oxygen level
  - ▶ Floods: fish and other fauna is crushed by sediment or simply flushed away



# CLIMATE CHANGE EFFECTS ON ALPINE RIVERS

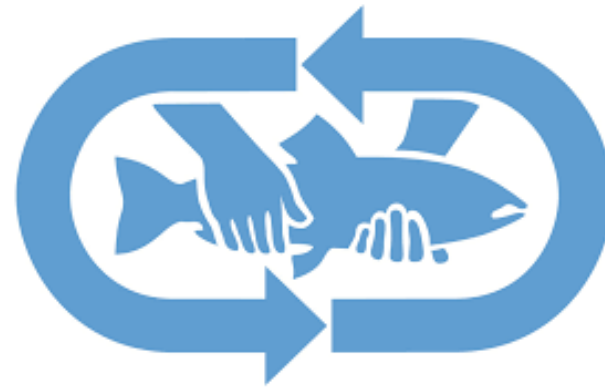
- ▶ Regulations and channelization of rivers and streams in Alpine regions
  - ▶ Logical urgent priority: protection of life and property
    - ▶ Widening and straightening of rivers
    - ▶ Drastic removal of riparian vegetation
  - ▶ Side effect: loss of habitat for salmonid fish species
    - ▶ Loss of cover and food sources for fish
- ▶ Frequent fragmented responsibility of river management
  - ▶ Various ministries and bureaus with conflicting views
  - ▶ Inclusion of angling representatives





# WATER TEMPERATURES AND EFFECTS ON FISH

- ▶ Brown trout, rainbow trout: 18-20°C stress, **23-25 °C mortality**
- ▶ Huchen/Danube salmon: 18-20°C stress, **22 °C mortality**
- ▶ Grayling 15-18 °C stress, **mortality above 25 °C**
- ▶ “Catch & release“ practice is considered **lethal** in water temperatures **above 18 °C**
- ▶ Increased water temperature is detrimental to the ability of salmonid species to survive climate change.



# CLIMATE CHANGE EFFECTS ON FISH

- ▶ Clear evidence of gradual increase in water temperature in Alpine rivers in past years
- ▶ High water temperature: increase in fish diseases
  - ▶ proliferative darkening syndrome - “blackening” of brown trout in most cases lethal to fish
- ▶ 2018 case of the upper Rhine at Schaffhausen Switzerland: high grayling mortality due to **water temperature 27.6 °C !**





# EXPECTED EFFECTS OF CLIMATE CHANGE ON ANGLING

- ▶ Clear link between protected salmonid fish habitats & flyfishing tourism
  - ▶ significant habitat reduction = loss of important revenue for anglers and local tourism
- ▶ Cyprinid species likely to inhabit left-over areas (atypical habitat for cyprinids)
- ▶ Question: Can angling tourists adapt to the loss of salmonid species and revert to cyprinid species?
  - ▶ Only time will tell
  - ▶ Growing pressure on ever decreasing salmonid population



# POSSIBLE MITIGATION MEASURES

- ▶ By anglers:
  - ▶ Stocking of juvenile fish
    - ▶ Rainbow trout: less susceptible to temperature increases as domestic brown trout
  - ▶ Further angling restrictions
- ▶ Serious limiting factor: habitat loss renders actions by anglers almost useless & expensive as stocked fish have no means to survive in changed habitat.
- ▶ More influence of anglers and environmental NGO's in river management planning
- ▶ Keeping rivers cool - restoring riparian growth



Keeping Rivers Cool:  
A Guidance Manual

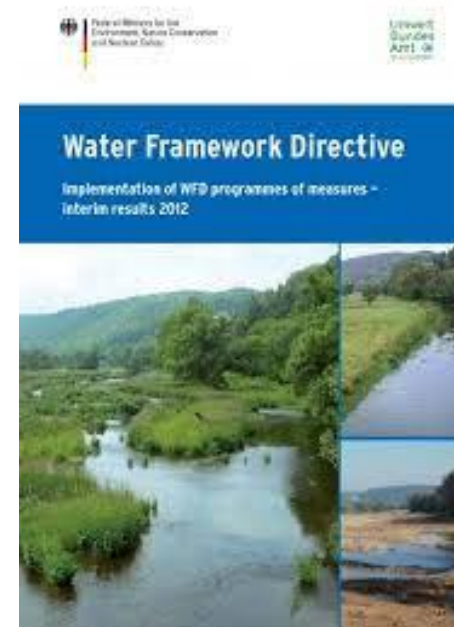
Creating riparian shade for  
climate change adaptation

February 2016



# CONCLUSIONS

- ▶ Alpine rivers and angling:
  - ▶ Delicate and specific fish habitat
  - ▶ Serious challenges expected due to climate change
  - ▶ Habitat protection: crucial for future survival of salmonid fish species & crucial for established angling tourism
  - ▶ Spatial planning & river management activities should be measured and should incorporate habitat protection as its inseparable part.
  - ▶ Implementation of Water Framework Directive



# LET RIVERS STAY RIVERS



Thank you!