



EFC WPMMW

Working Group Forests and Water: a Case Study on the Management of Forests in Catchments of Drinking Water Reservoirs

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MISSION OF THE „FORESTS AND WATER“ WORKING GROUP

- a) Better understanding the forest and water relationship in headwater catchments
- b) Environmental services in headwater catchments
- c) Participatory watershed management
- d) Citizen science and active citizenship
- e) Environmental education for sustainability in changing world
- f) Demonstration projects and training courses

Outcomes: Springer Book published in 2017

Josef Krečák • Martin Haigh • Thomas Hofer
Eero Kubin • Catrin Promper (Eds)

Ecosystem Services of Headwater Catchments

The book aims to address the evaluation of environmental impacts and services identified in headwaters of different eco-zones of the world. This volume contains 24 papers selected from contributions to recent meetings of the European Forestry Commission Working Party on the Management of Mountain Watersheds, which is managed by FAO (Food and Agriculture Organization of the United Nations). The Working Party - its biennial sessions and inter-session activities - focuses on the continuous exchange of knowledge and experience between professionals in Europe and other regions of the world confronted with similar issues.

The contributions have been updated and peer-reviewed, and the interdisciplinary team of authors includes experts from the specialised areas of geography, hydrology, chemistry, biology, forestry, ecology and socio-economy. The participatory management of headwater catchments in Europe, Africa, America and Asia have been the central theme of the articles, divided into four sections: (I) Headwater Environment and Natural Resources; (II) Enhancing Ecosystemal Services in Headwaters; (III) Environmental Services in the Changing World; and (IV) New Challenges for Environmental Education and Active Citizenship. The practical applications shown in the book deal with the multi-resourced concept.

The book will be useful to environmentalists, engineers, watershed planners and policymakers.

307 p.

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CAPITAL PUBLISHING COMPANY
www.capital-publishing.com



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Ecosystem Services
of Headwater Catchments

Josef Krečák • Martin Haigh • Thomas Hofer
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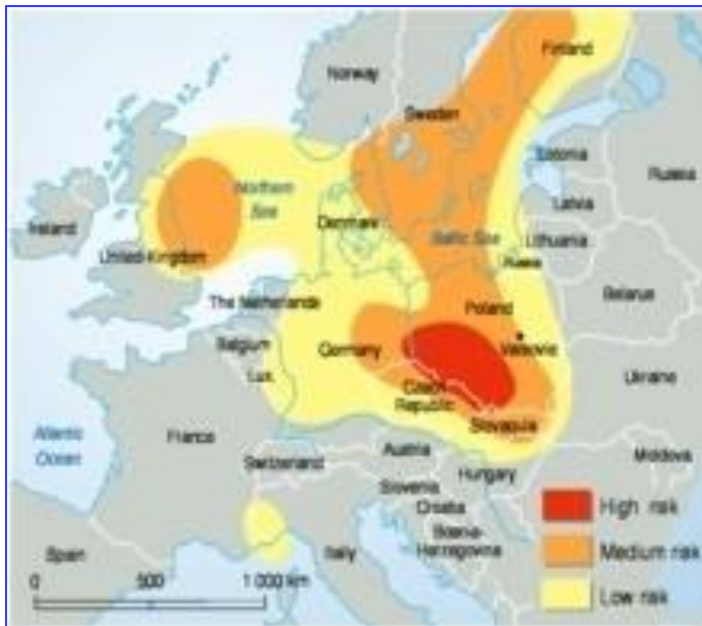
Edited by
Josef Krečák
Martin Haigh
Thomas Hofer
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Catrin Promper

Ecosystem Services of Headwater Catchments

CASE STUDY: FORESTRY IN CATCHMENTS OF DRINKING WATER RESERVOIRS AFFECTED BY ACID ATMOSPHERIC DEPOSITION

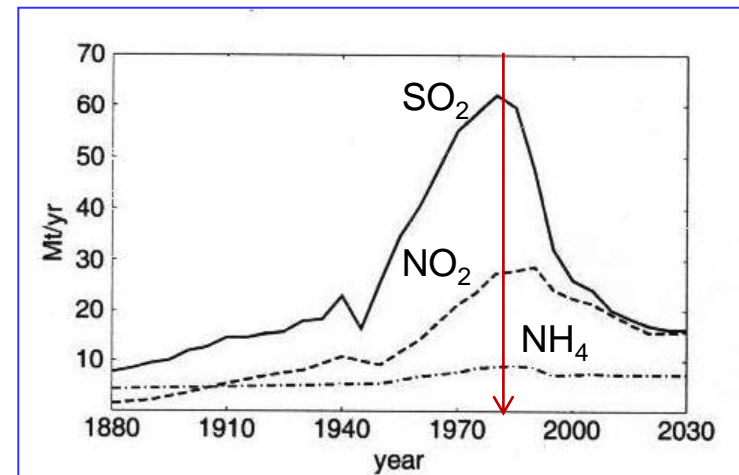
The European „Black Triangel“

Risk of acidification in Europe



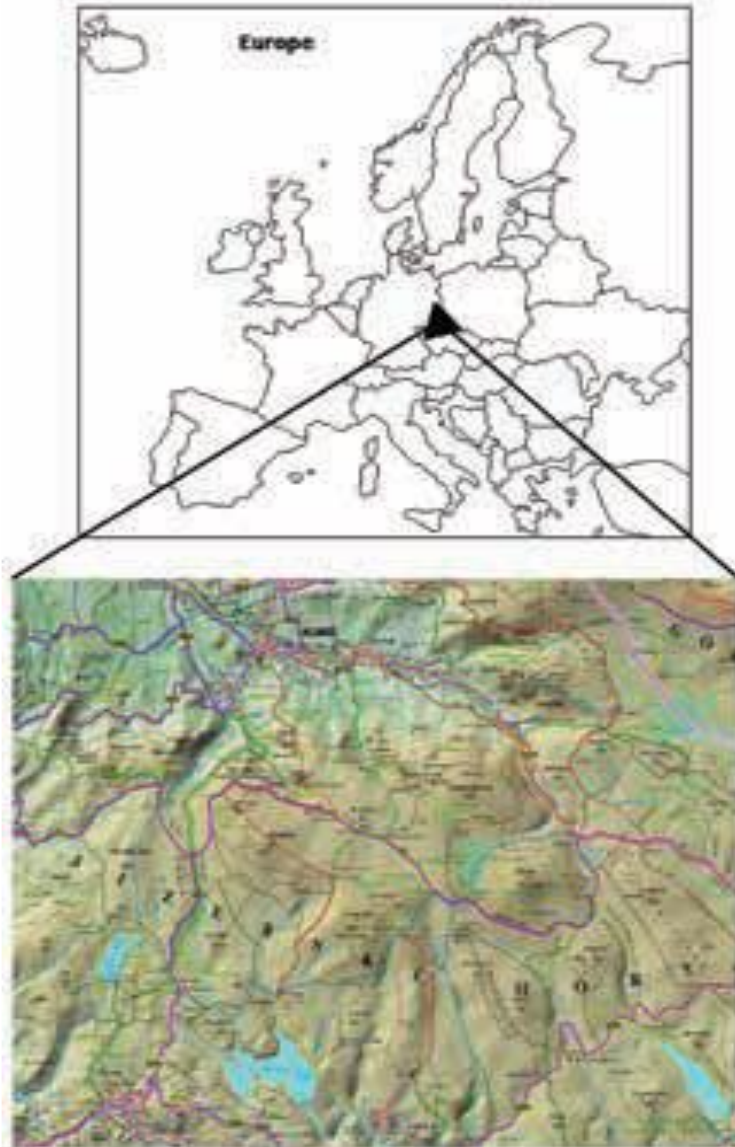
UNEP (2005)

European emissions prognoses



Schöpp *et al.* (2003)

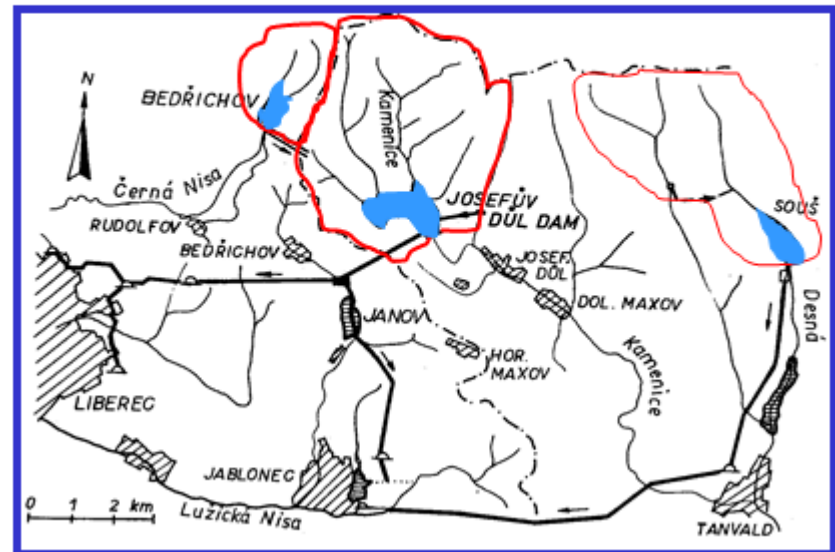
THE JIZERA MTS. (CZECH REPUBLIC)



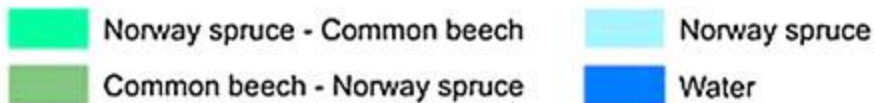
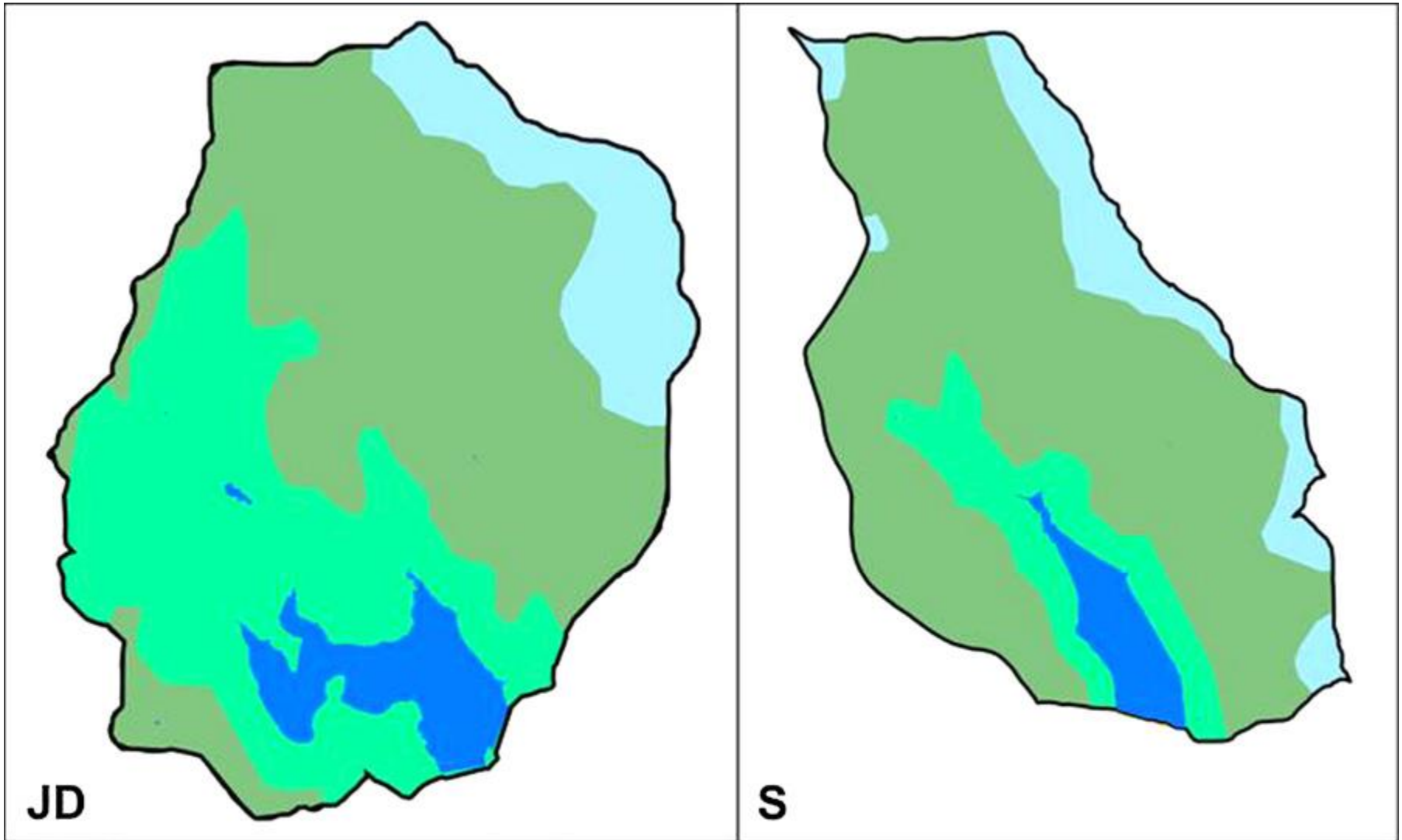
In the 1980s and 1990s:

- Low pH values
- High contents of Al^{3+}
- Fishless streams and reservoirs

System of Drinking Water Supply in the Jizera Mts.



CLIMAX FOREST ZONES IN FOCUSED CATCHMENTS



CHANGING PRIORITIES IN WATERSHED MANAGEMENT

1. 1900 – 1970: Flood control

- a) Building retention dams after the catastrophic floods in 1897
- b) Reforestation

2. Since 1970: Drinking water supply

- a) Retention dams changing to water supply systems

3. Since 1980, particularly, control of water quality

- a) Reduction of the acid atmospheric deposition
- b) Participatory watershed management

PROBLEMS

1. Commercial forestry:

- a) Converting native forests - Common beech (*Fagus sylvatica*), Common silver fir (*Abies alba*), and Norway spruce (*Picea abies*) – to spruce plantations, during the 19th century.
- b) Clear-cut and heavy mechanisation, used in the 1980s and 1990s.

2. Extreme acid atmospheric deposition (emissions of Sulphur and Nitrogen) culminating in the late 1980s.

3. Expected climate change impacts (2071-2100):

Water yield reduced: 10 – 40 %.

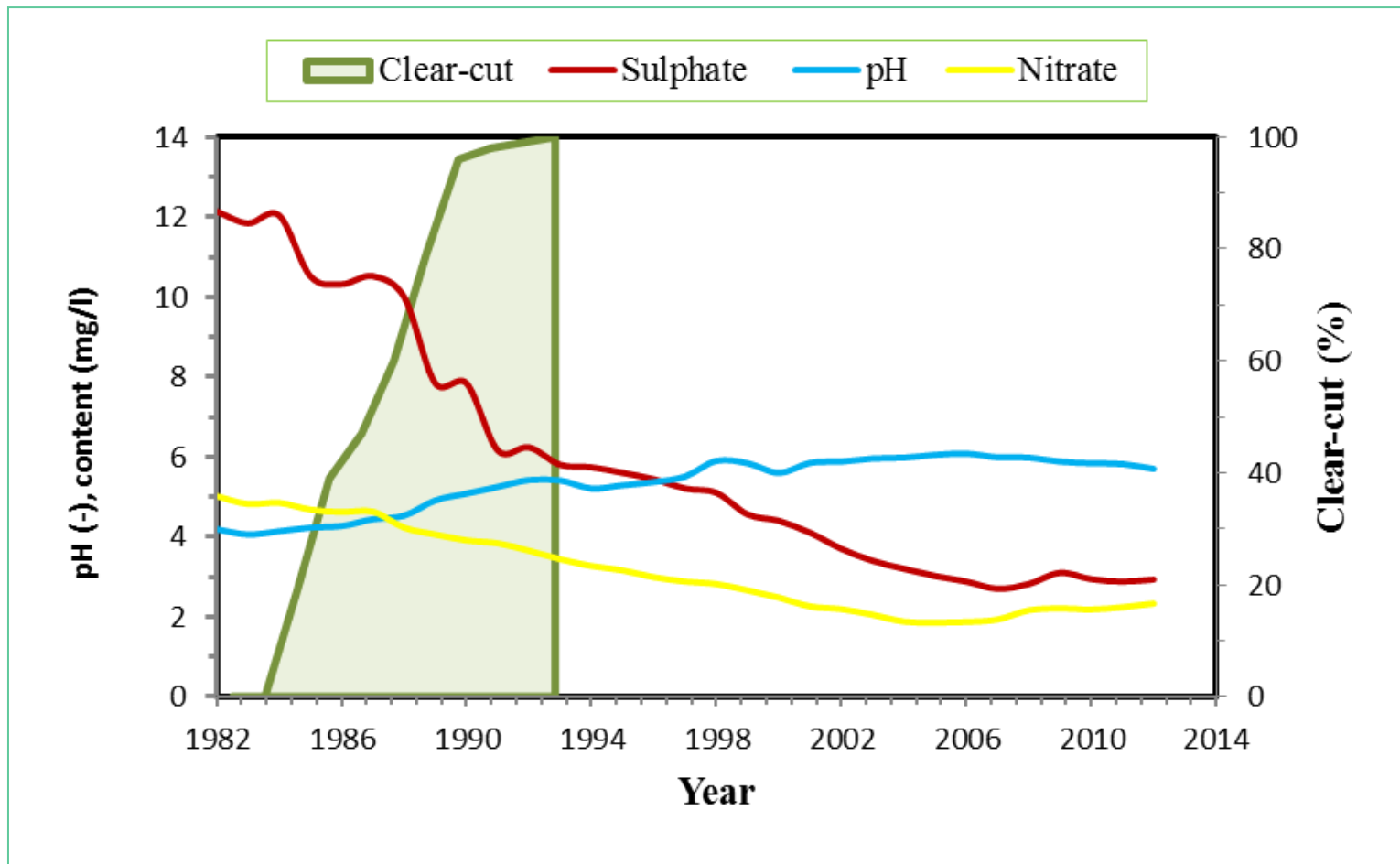
More intensive extreme events: rainstorms, flash-floods, and draughts.

Seasonal runoff changes: drop (20 – 90 %) in the summer,
increase (30 – 50 %) in the winter.

Snow cover reduced: 30 %.

Spruce stands endangered: 50 %.

IMPACT OF SPRUCE CANOPY REDUCTION ON STREAMFLOW CHEMISTRY



MODIFICATION OF FOREST STANDS IN FOCUSED WATERSHEDS

To support water resources recharge, to reduce the acid atmospheric load and to mitigate flood genesis:

- Regulating the acid deposition in elevations > 900 m,
- Increasing water yield at slopes $< 25^\circ$,
- Controlling runoff genesis and soil erosion at slopes $> 25^\circ$,
- Support of riparian buffer zones (width of ca 30 m) to protect the drainage network.

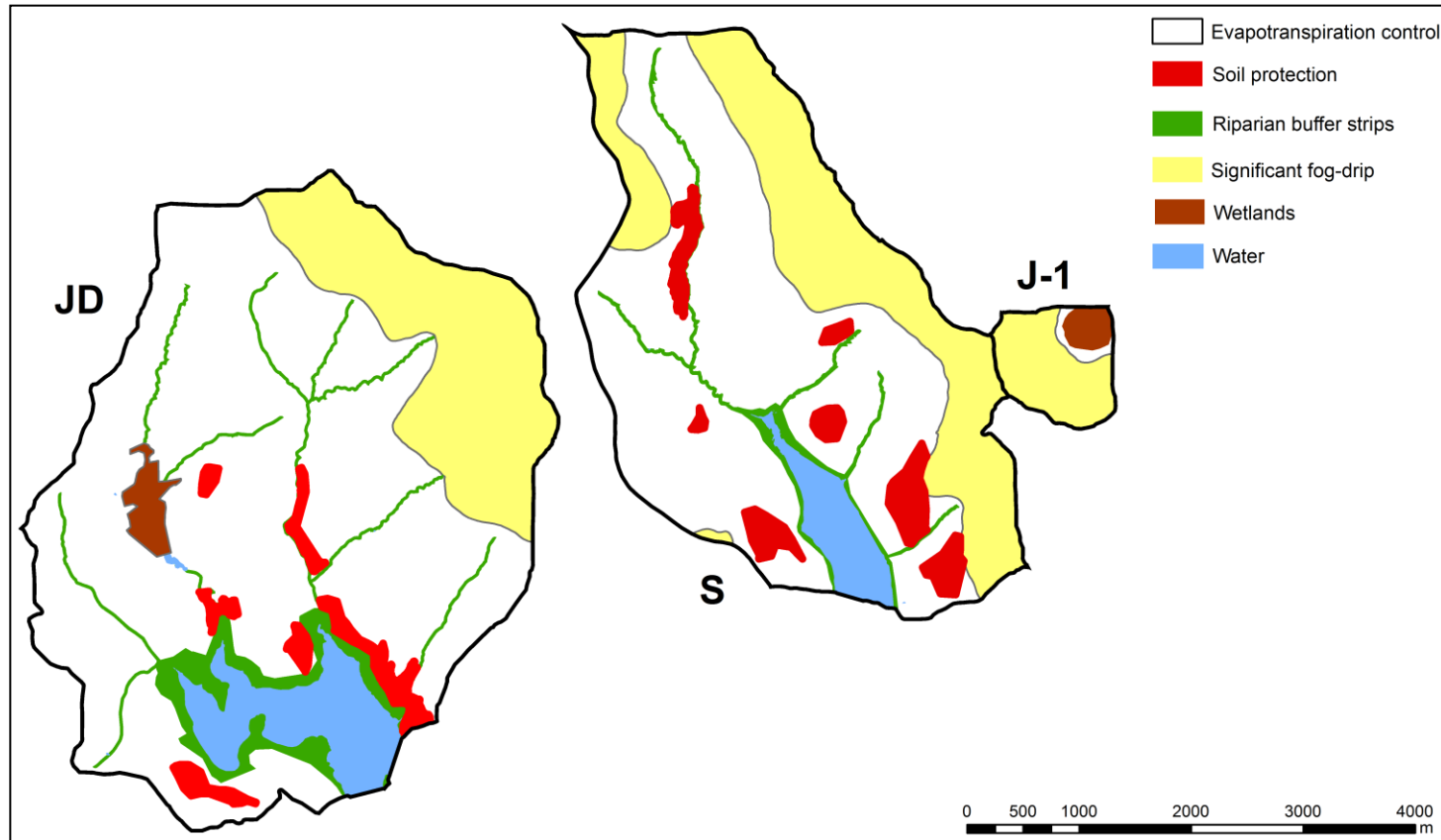
STRUCTURED FORESTRY PRACTICES FOR DRINKING WATER SUPPLY

- Identification of stakeholders and roundtable debate.
- Core participants: managers in sectors of water, forestry, nature conservation, municipalities, and recreation business.
- The aim: to identify optimum forestry practices in watersheds of Josefův Důl (JD) and Souš (S) to support the water resources recharge (quantity and quality), according to the *Water Act 254/2001 Coll.*

Criteria C	Weights w	Rating				Performance values			
		A ₁	A ₂	A ₃	A ₄	a ₁	a ₂	a ₃	a ₄
C ₁ . Water quality	30	5	4	2	1	150	120	60	30
C ₂ . Water yield	10	2	2	3	3	20	20	30	30
C ₃ . Flood prevention	20	4	3	2	1	80	60	40	20
C ₄ . Biodiversity	20	4	3	2	1	80	60	40	20
C ₅ . Timber yield	10	2	2	4	5	20	20	40	50
C ₆ . Recreation	10	3	3	2	2	30	30	20	20
Totals	100					380	310	230	150

STRUCTURED FORESTRY ZONATION

- 1) Riparian buffer strips
- 2) Zones of soil protection
- 3) Evapotranspiration control
- 4) Areas of significant fog drip
- 5) Wetlands.



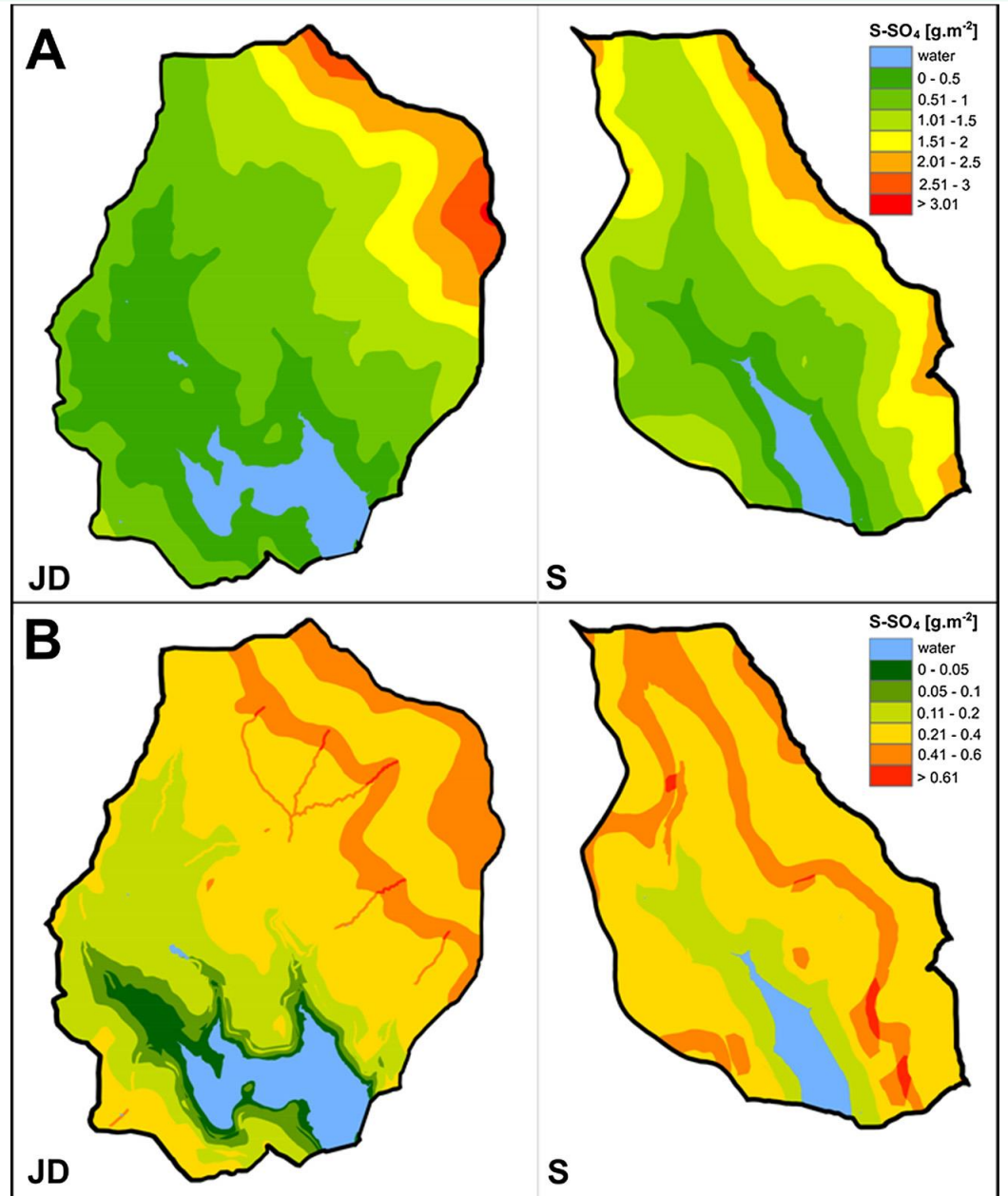
ANNUAL DEPOSITION OF SULPHUR

Scenario A:

Even aged mature spruce forest stands

Scenario B:

Structured forestry with beech stands in riparian and soil protection zones; spruce stands with reduced crown closure to 0.5 at the slopes below 30%, and, grass cover in elevations above 900 m



A scenic landscape photograph showing a wide, calm lake in the middle ground, with misty mountains in the background. The foreground is dominated by the dark, silhouetted trunks and branches of evergreen trees, which frame the view. The sky is overcast and grey. The overall mood is serene and quiet.

... thank you