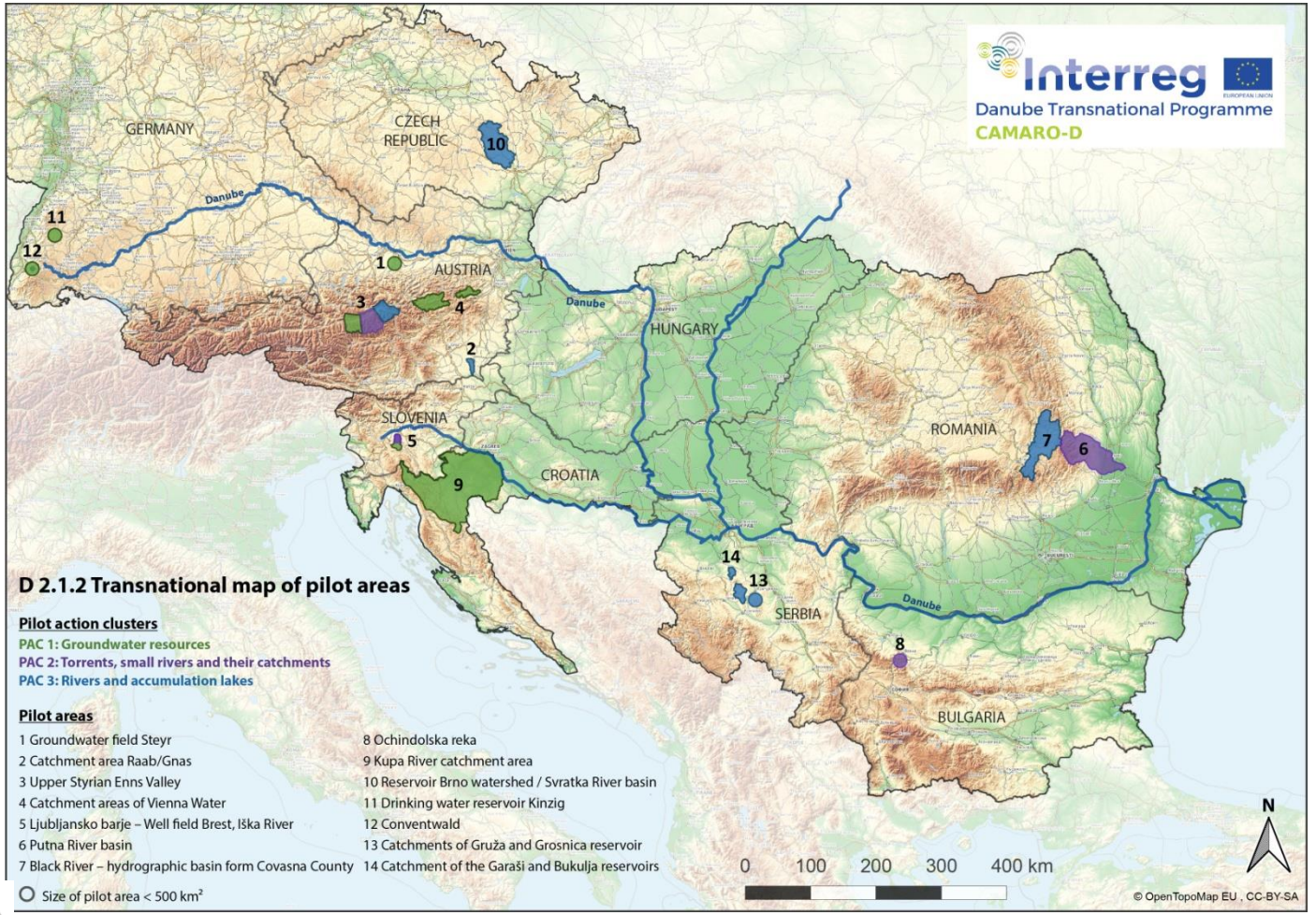
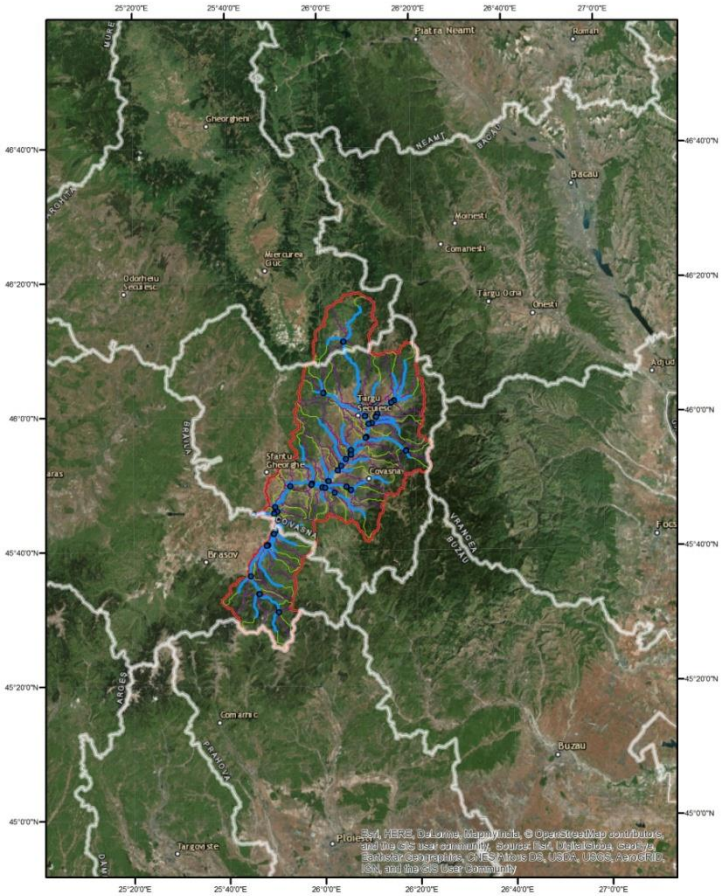
Pilot study site of Black river hydrographic basin
– results and measures –

Florian Bodescu

Programme co-funded by the European Union (ERDF, IPA)

CAMARO-D PILOT SITES





Interreg
Danube Transnational Programme
CAMARO-D

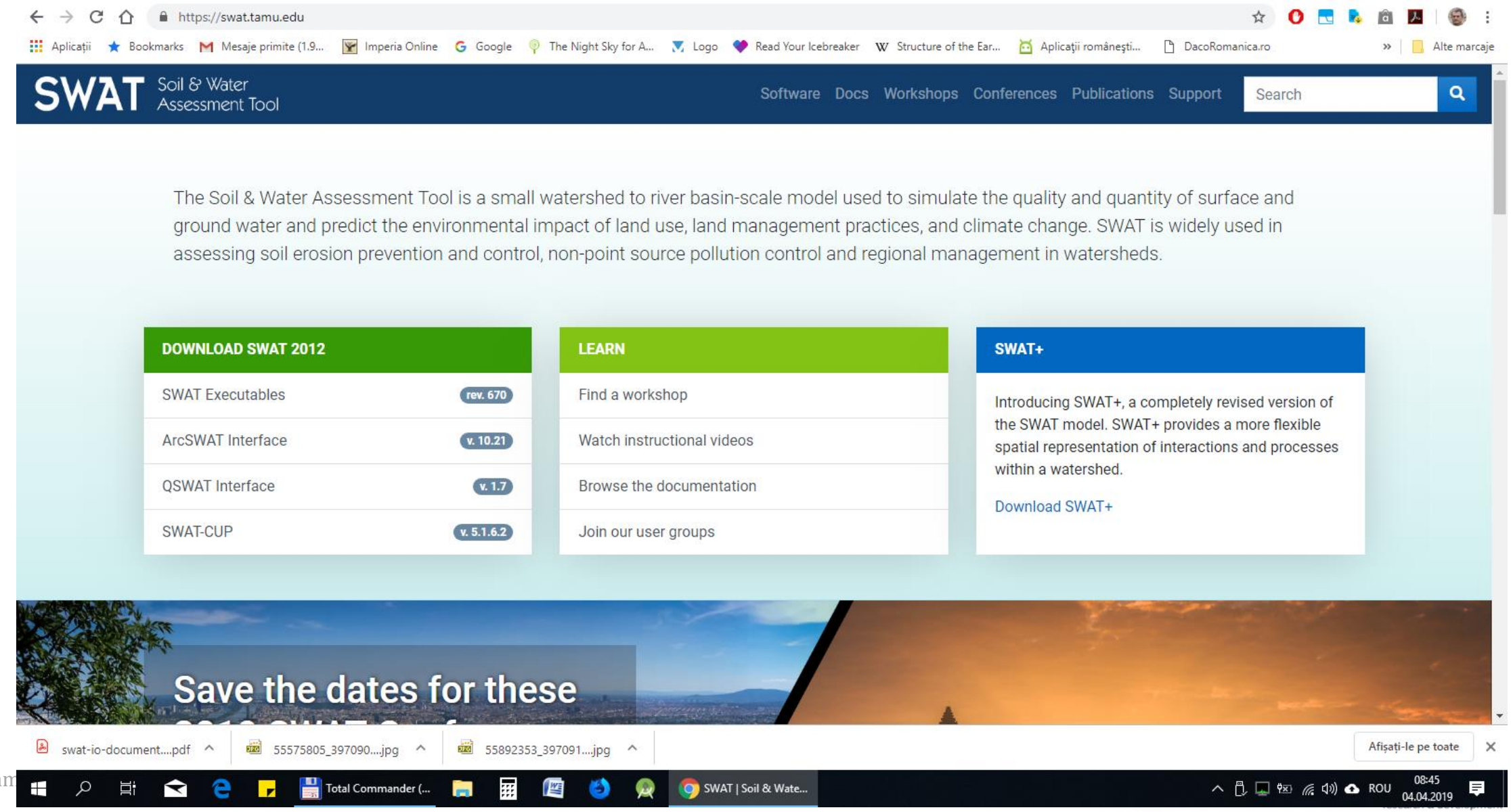
METEO ROMANIA

AIM

APELE ROMÂNE

HERMAN OTTÓ INTÉZET NONPROFIT KFT.

Software used for simulations



QUESTIONS

- Regional to local influences:
  - Climate change will have an negative impact on human wellbeing in the Black river hydrological basin?
  - What is the effectiveness of counter measures on climate change negative impact?
- Local to regional influences:
  - Socio-economical systems sustainable development and beaver conservation measures can be applied in the same space?
  - What is the effectiveness of human-beaver conflicts mitigation measures?

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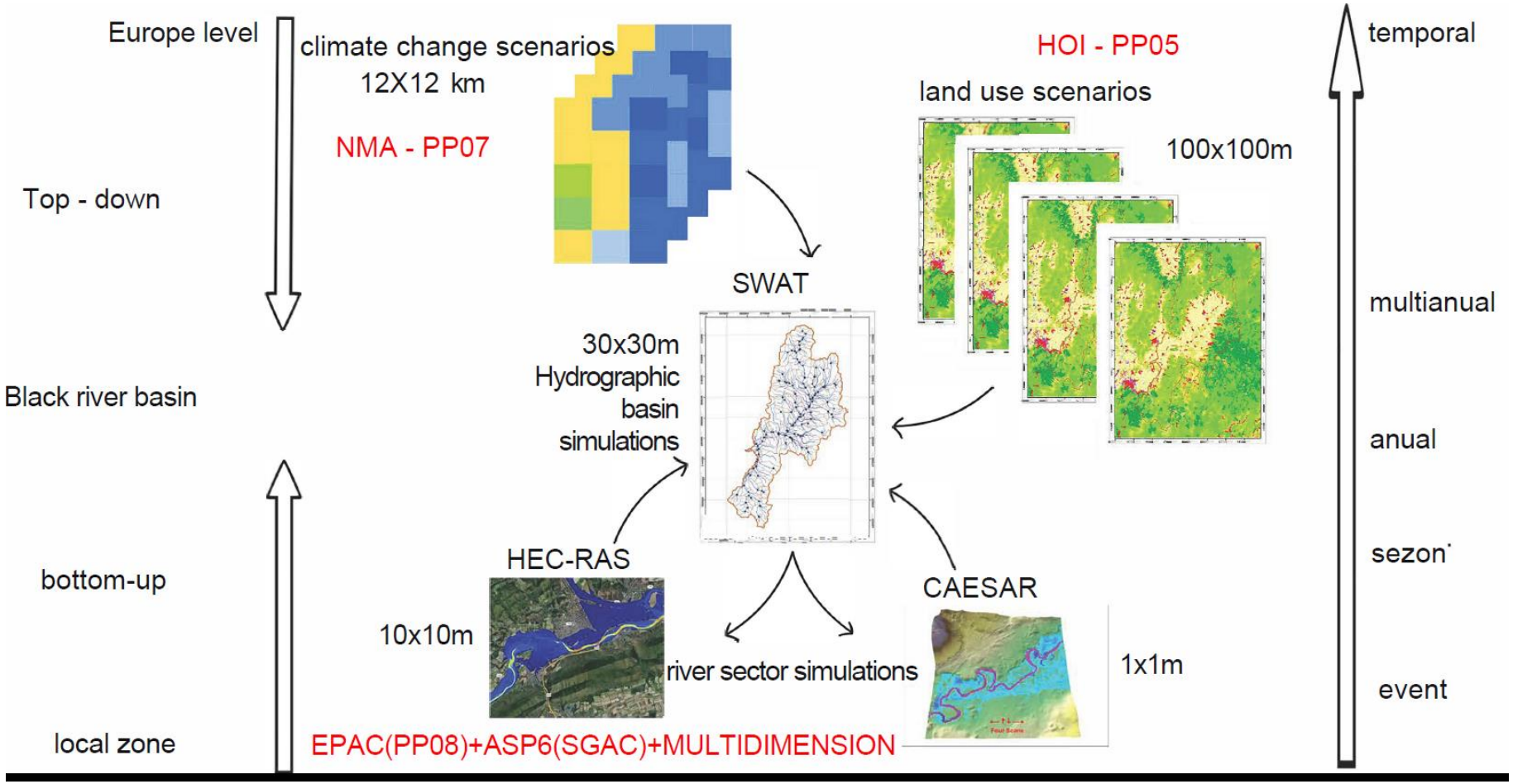
METHODOLOGICAL APPROACH

- Top – down approach
  - Climatic change scenarios
- Bottom - up approach
  - Land use scenarios
  - Beaver habitat conditions and dispersion



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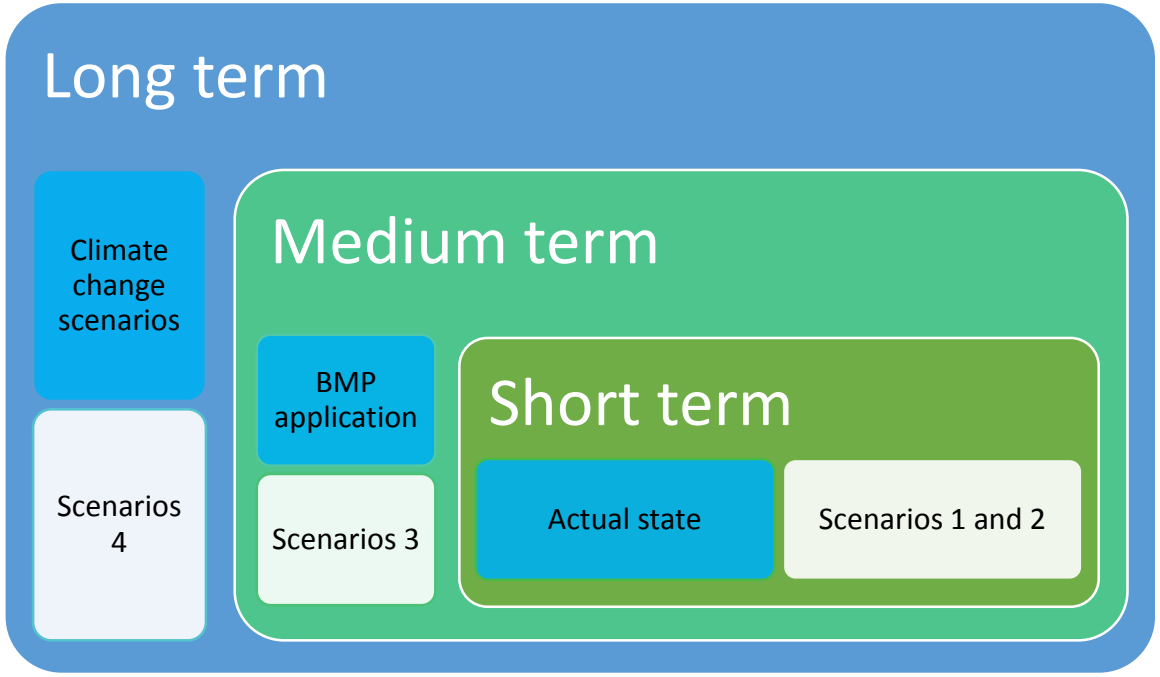
Eco-hydrological models scenarios



1. **Scenarios class 1**

1.1. Reference temporal scale: 2000-2013

1.2. Characterization of ecosystems functioning on reference period

1.3. Calibration and validation models based on actual monitoring data on water quantity and quality parameters

2. **Scenarios class 2**

2.1. Testing short term changes: 2015-2018

2.2. Characterization of actual response on water quantity and quality of calibrated model

2.3. Short term changes comparative analysis between scenarios 1 and 2

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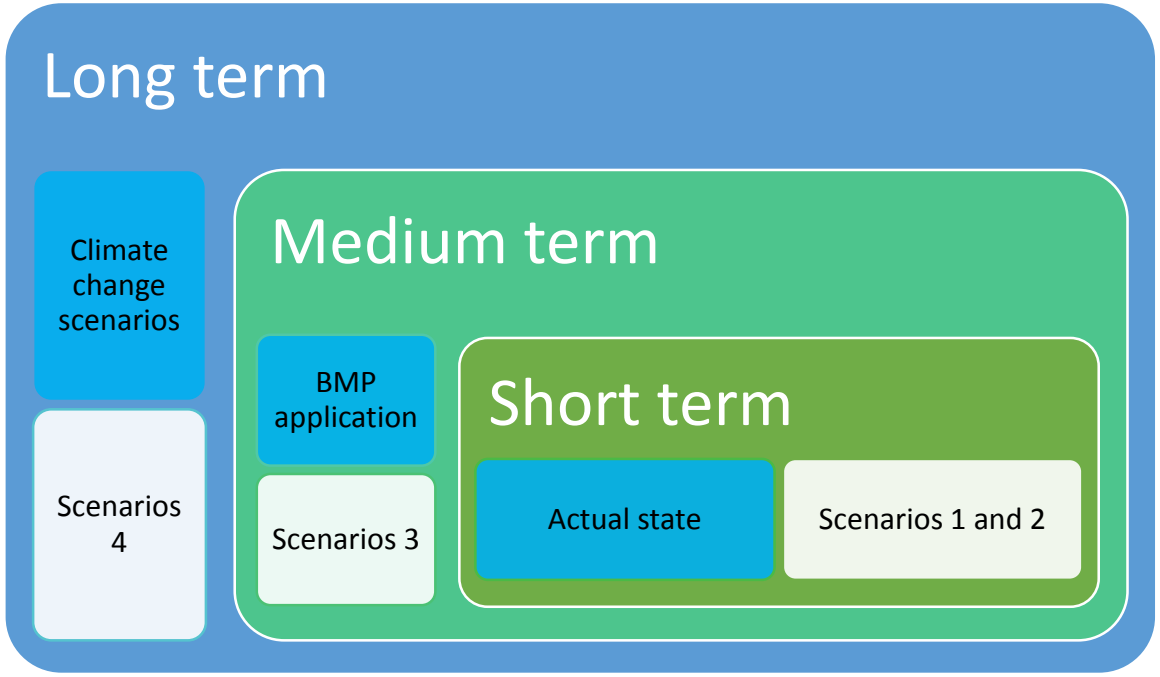
Eco-hydrological models scenarios



3. **Scenarios class 3**

3.1. Medium term land use change: 2025-2028

3.2. Implementation of BMP for improvement in water quantity and quality and also habitat conservation

4. **Scenarios class 4**

4.1. Long term climate change: 2041-2043, 2065-2068

4.2. Analysis of climate change scenarios at catchment scale

4.3. Cumulative effects of climate and land use change in a Black river hydrographic basin

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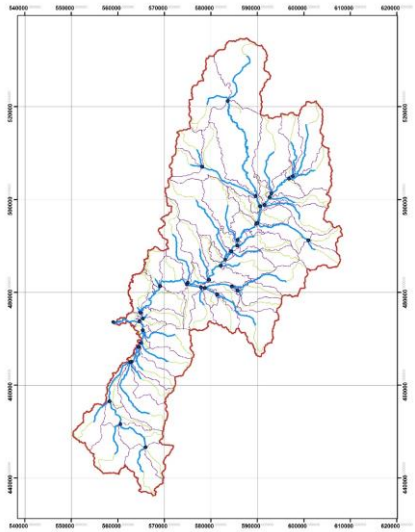
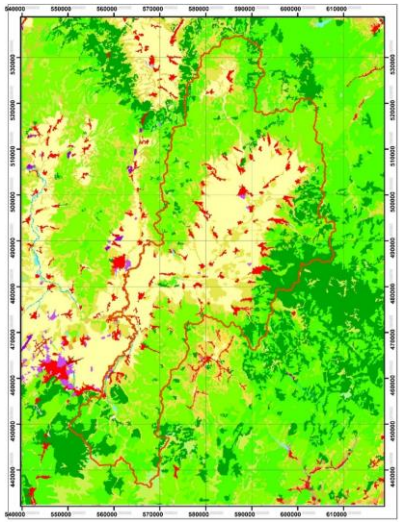
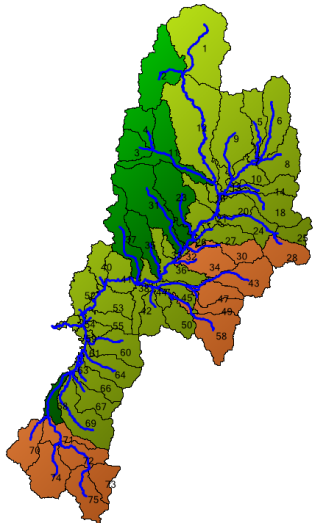
Scenarios 1

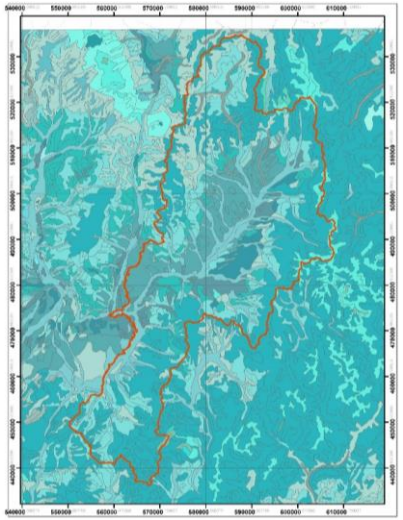
- 75 sub-catchments
- 16 land use types
- 12 soil types

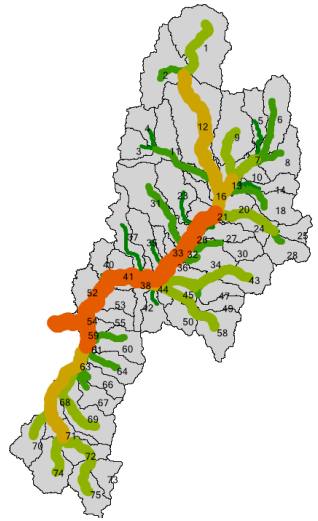






Precipitation amount
Green – low
Red - high





Surface water amount
Green – low
Red - high

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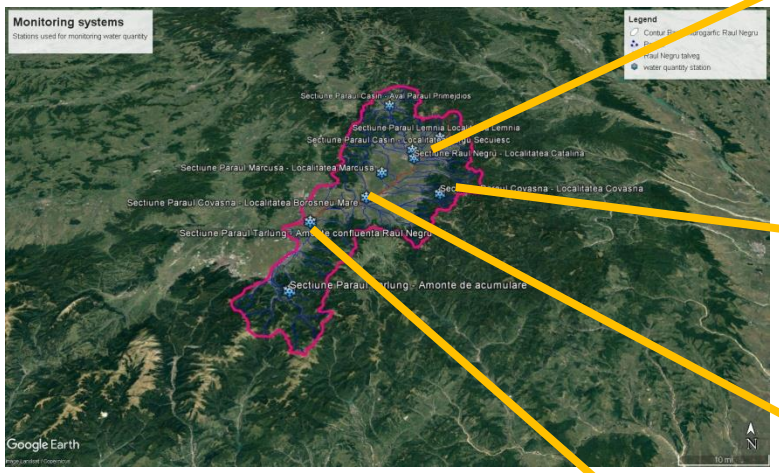
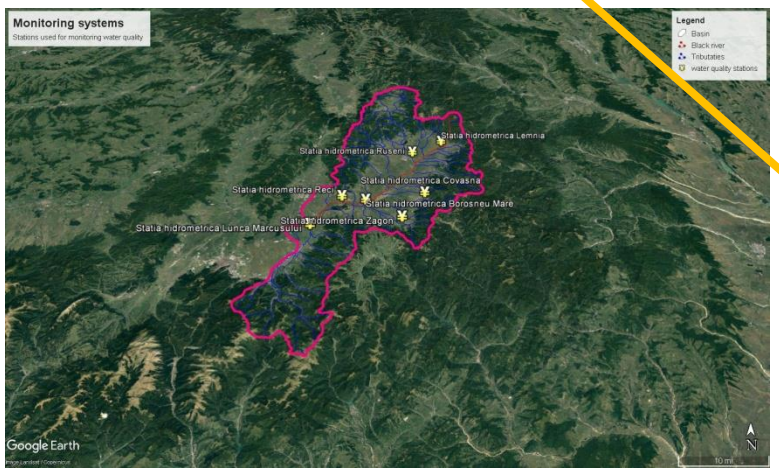
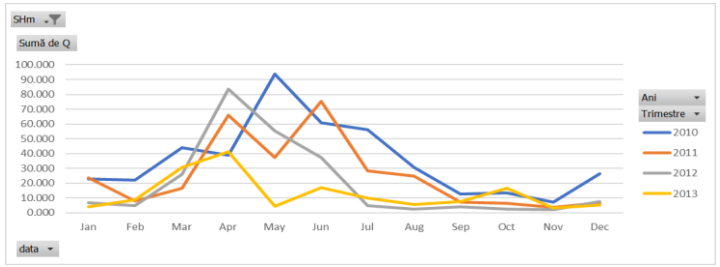
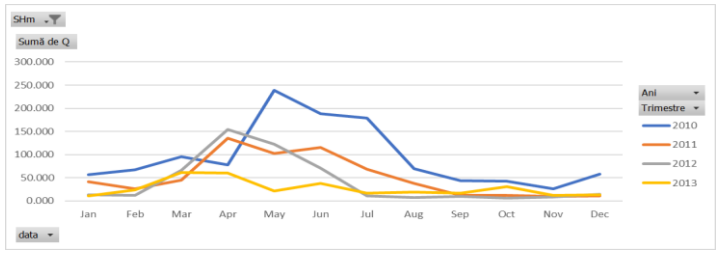
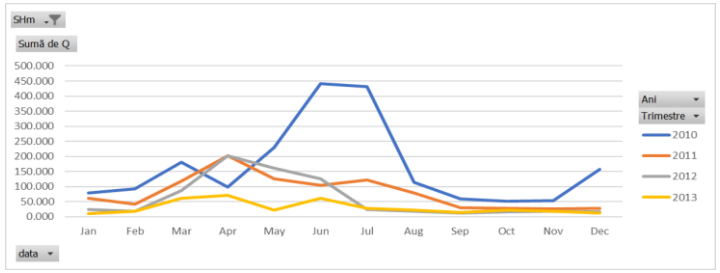
Monitoring systems

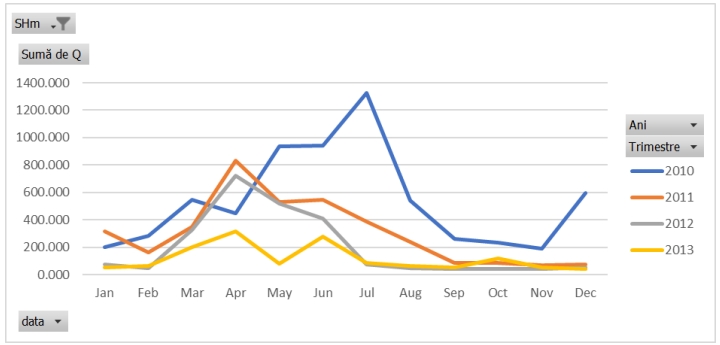












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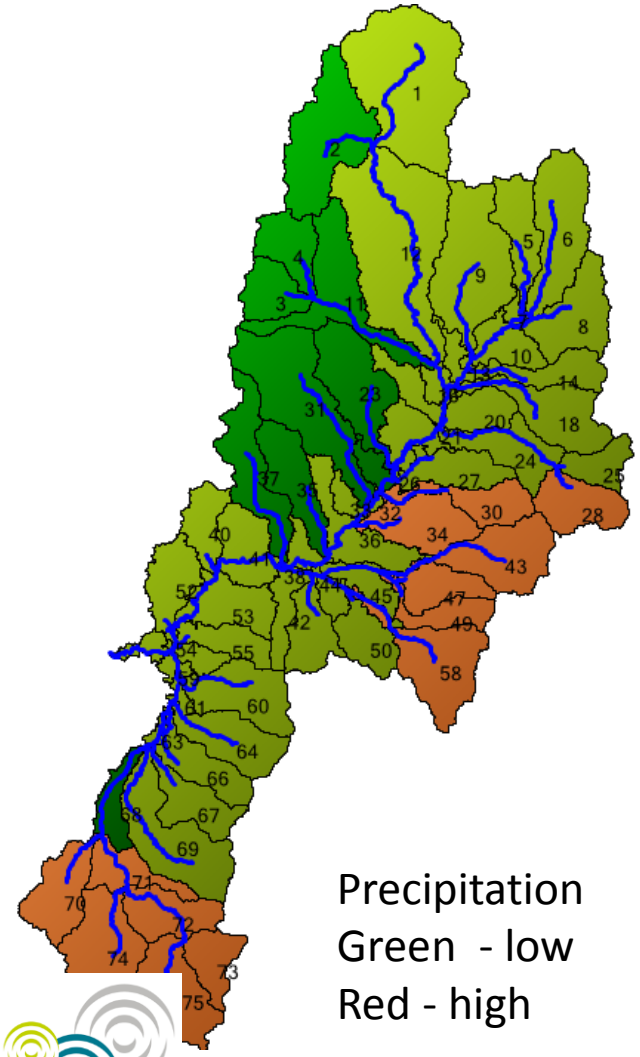
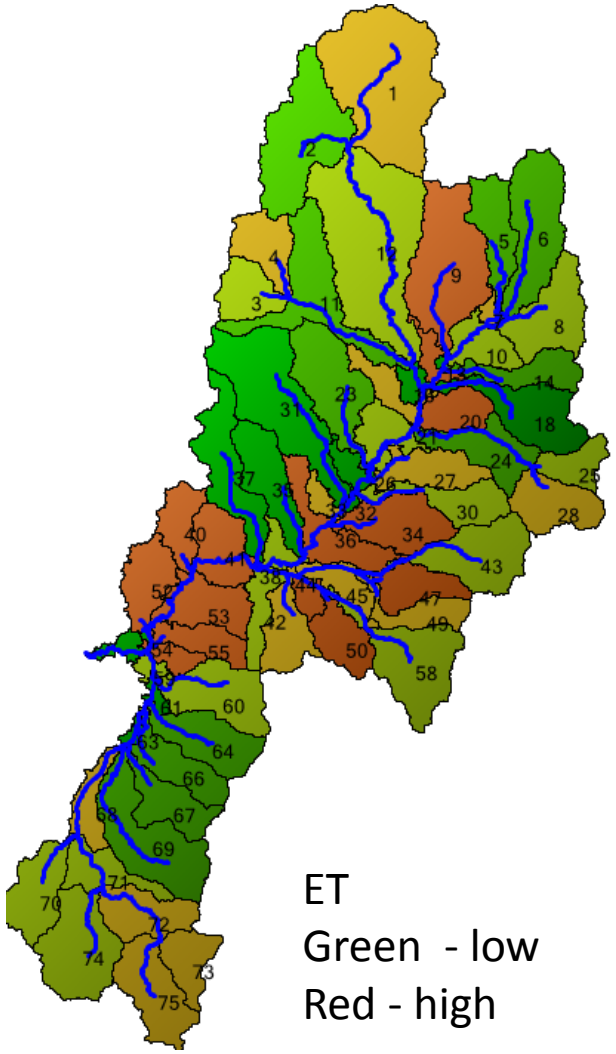
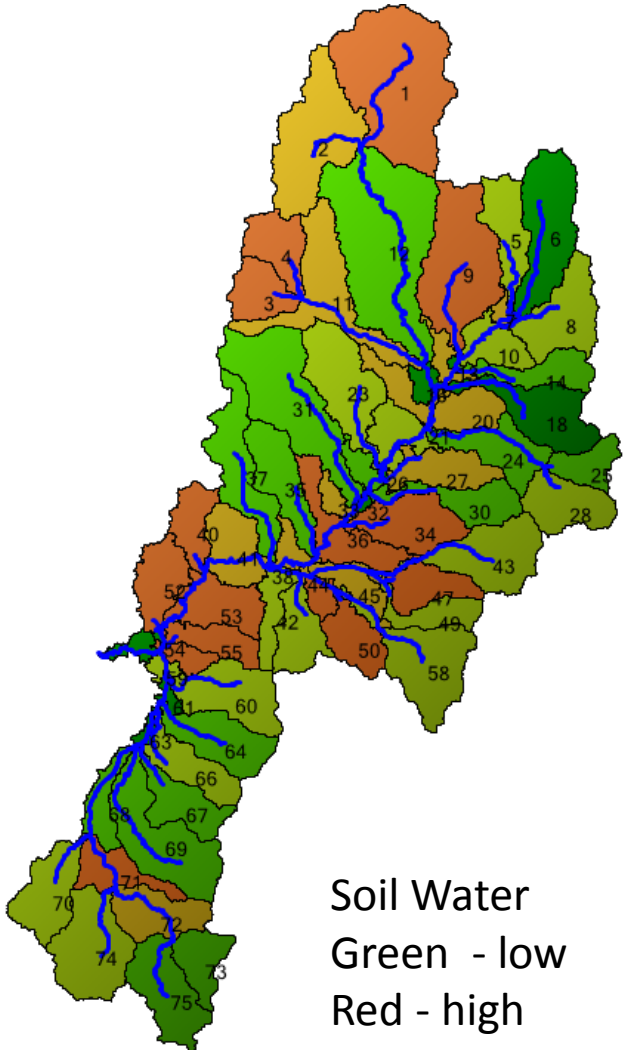
Surface water quantity (S1)



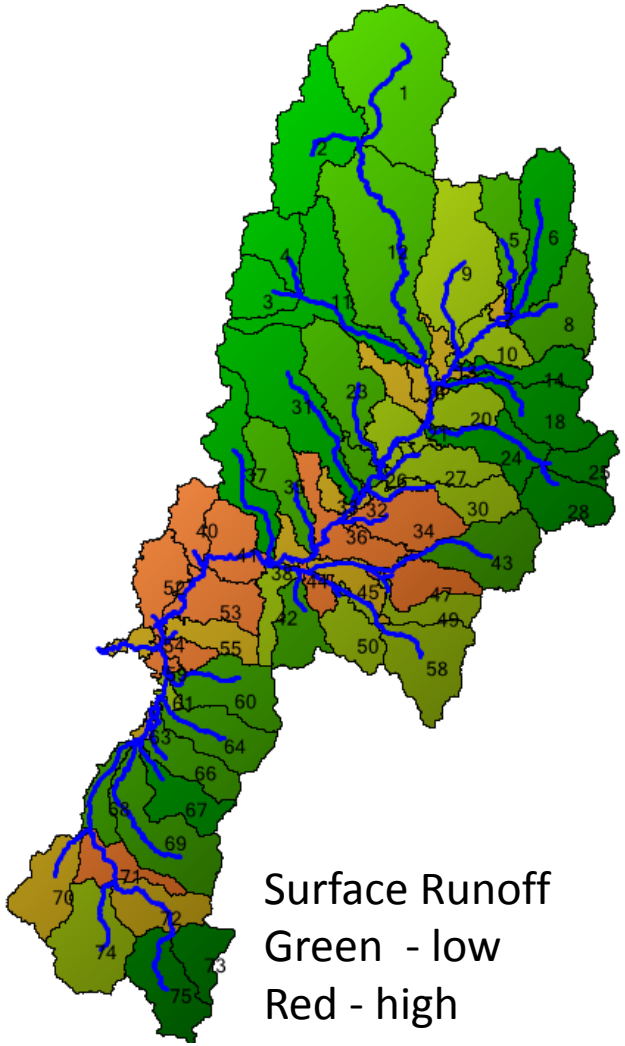
Precipitation
Green - low
Red - high



ET
Green - low
Red - high



Soil Water
Green - low
Red - high



Surface Runoff
Green - low
Red - high

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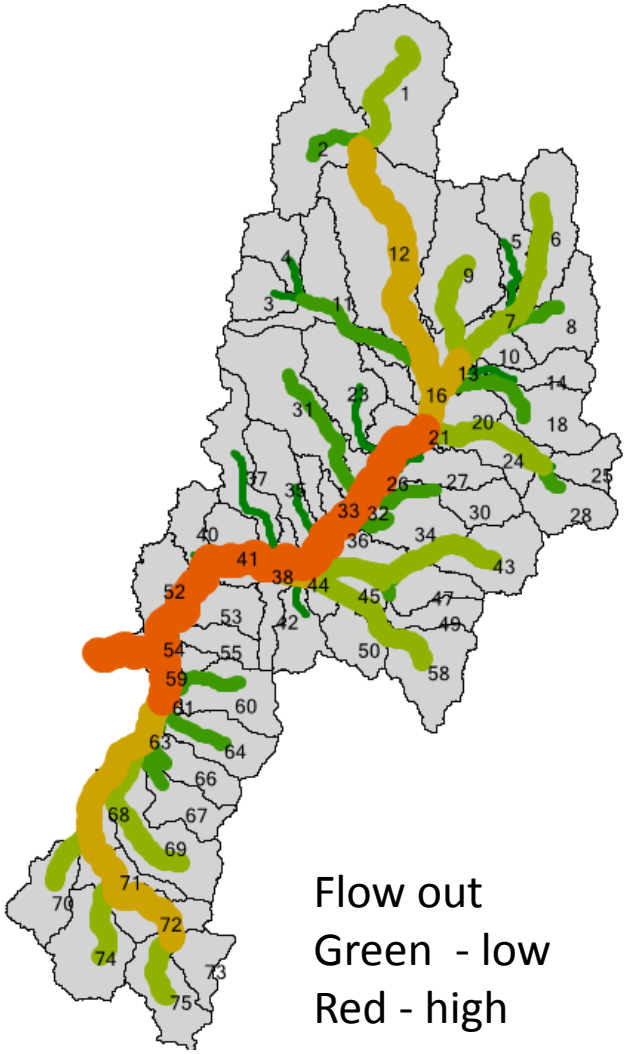
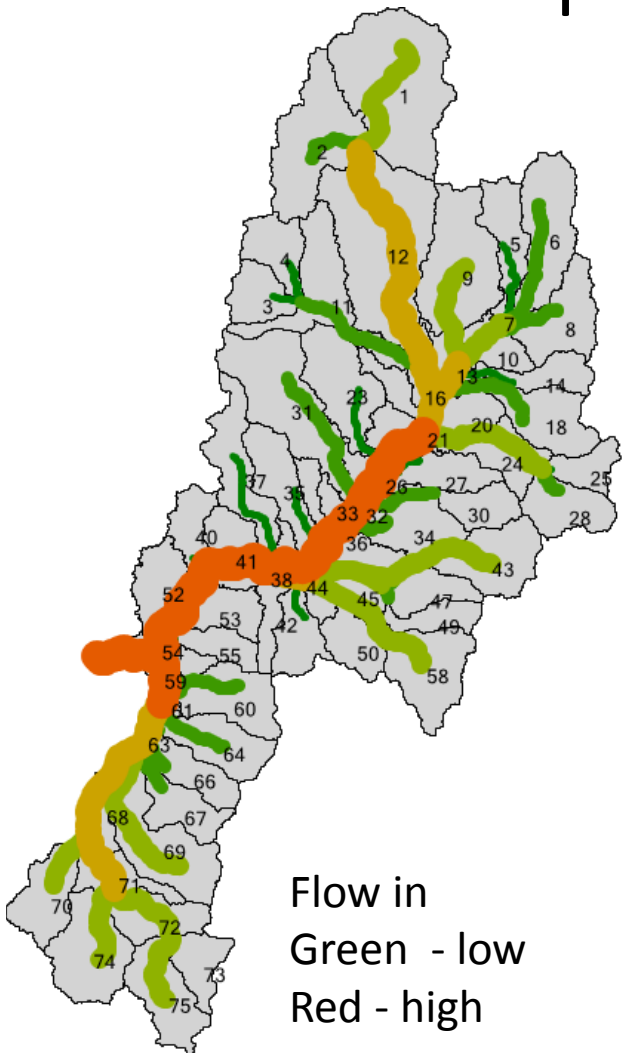
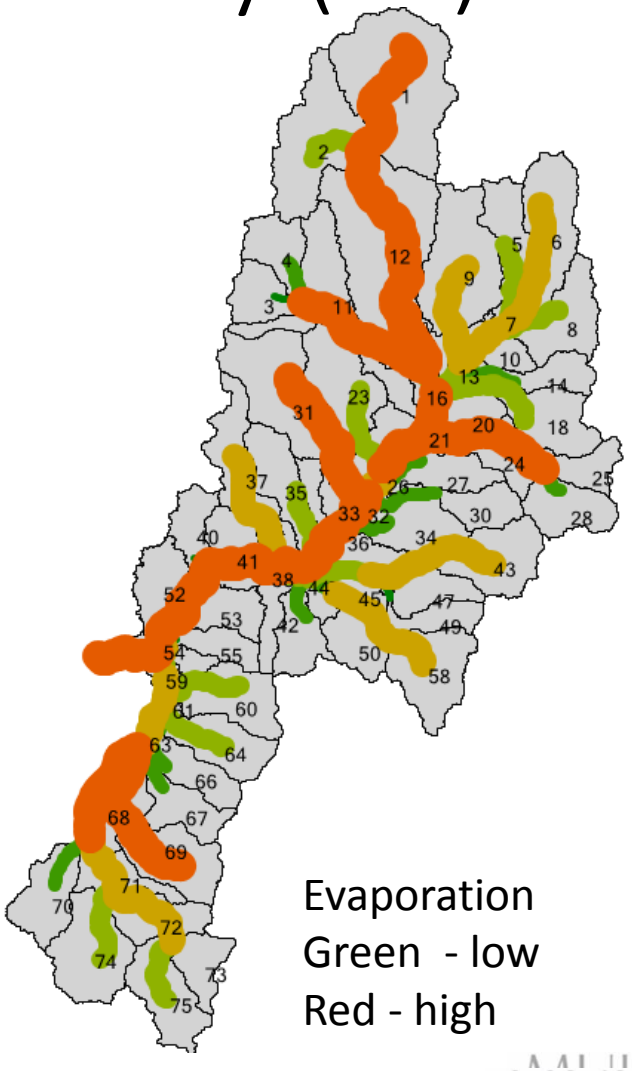
Surface water quantity (S1)



Flow out
Green - low
Red - high



Flow in
Green - low
Red - high



Evaporation
Green - low
Red - high

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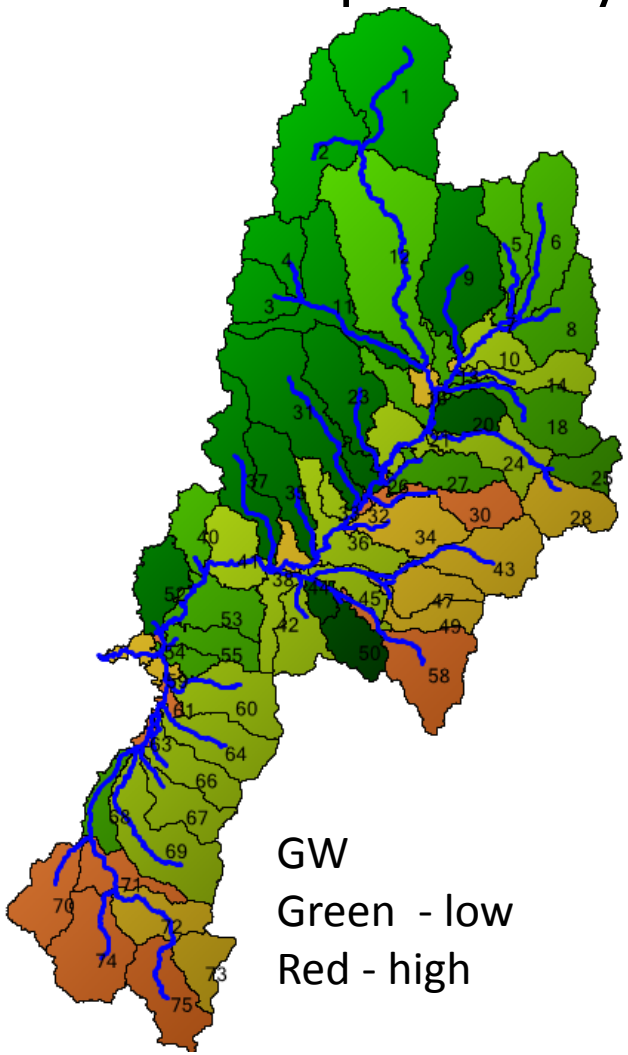
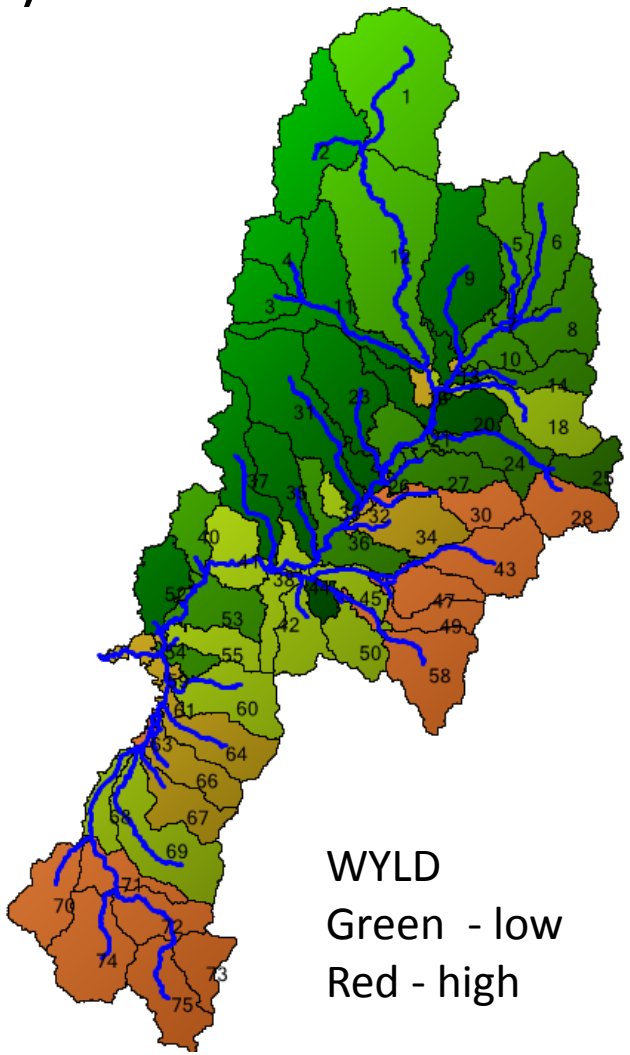
Water quantity (S1)



GW
Green - low
Red - high



WYLD
Green - low
Red - high

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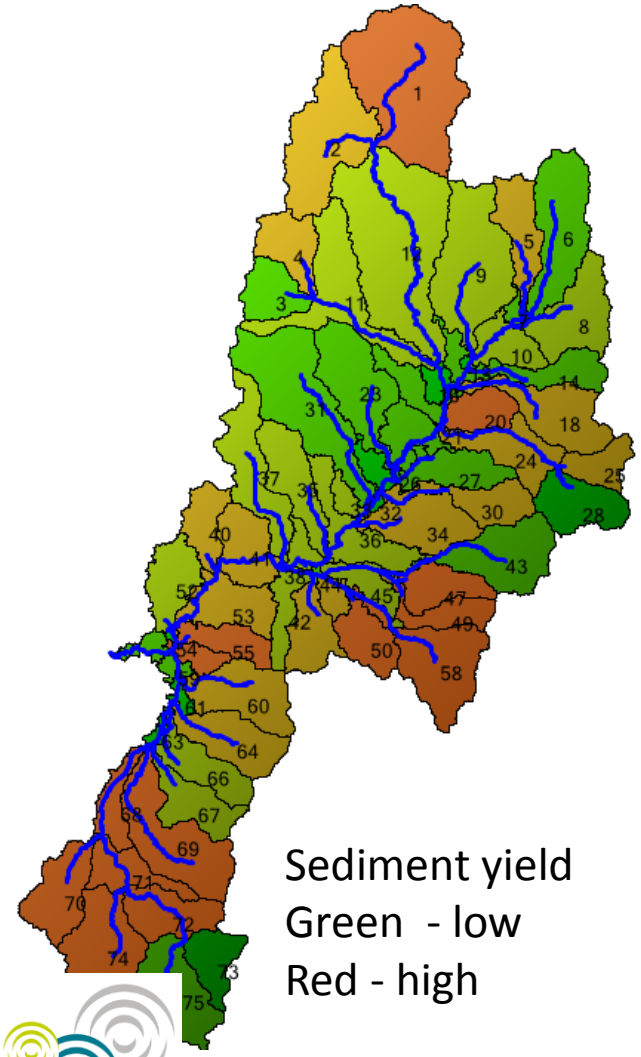
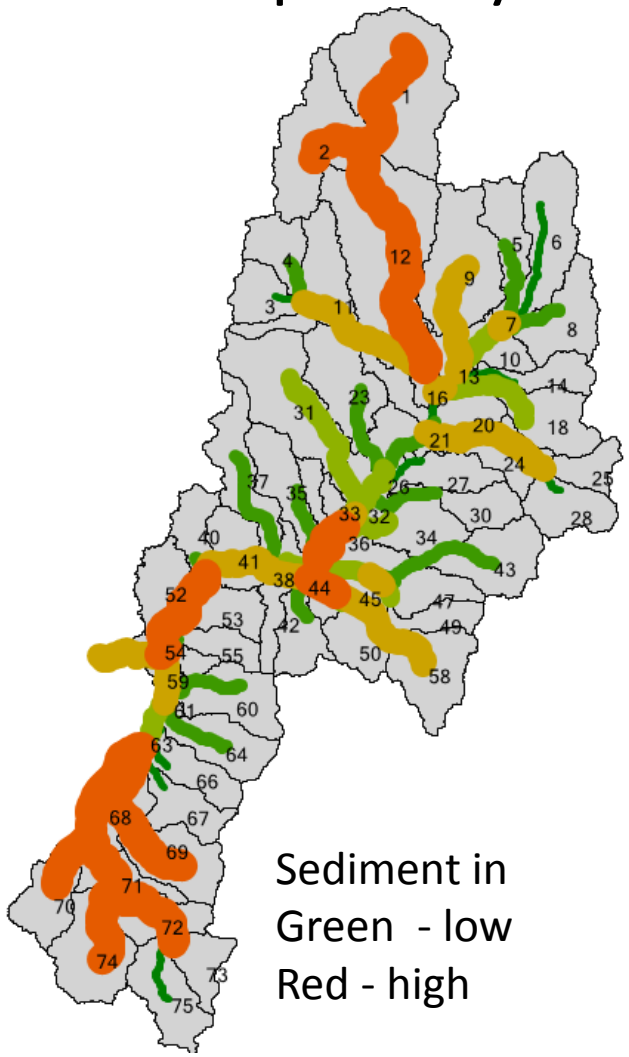
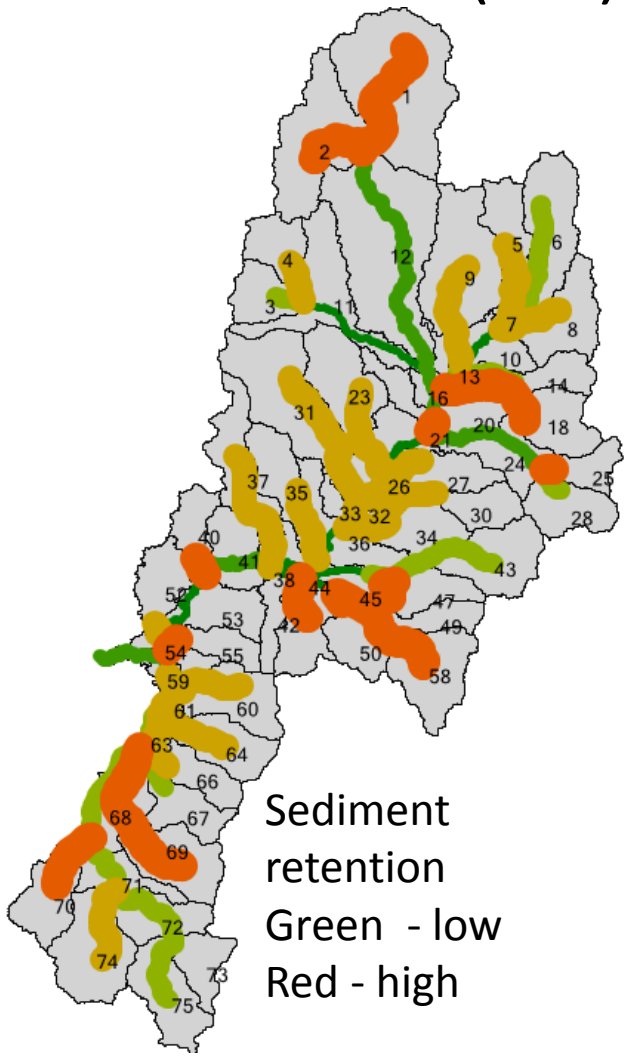
Water quality – sediments (S1)



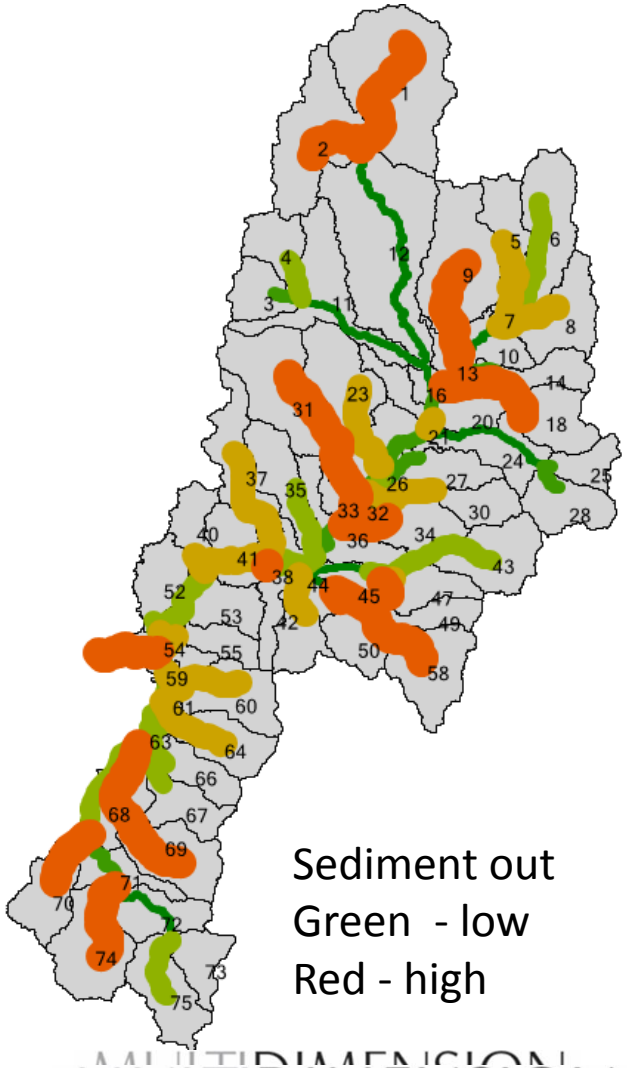
Sediment yield
Green - low
Red - high



Sediment in
Green - low
Red - high



Sediment retention
Green - low
Red - high



Sediment out
Green - low
Red - high

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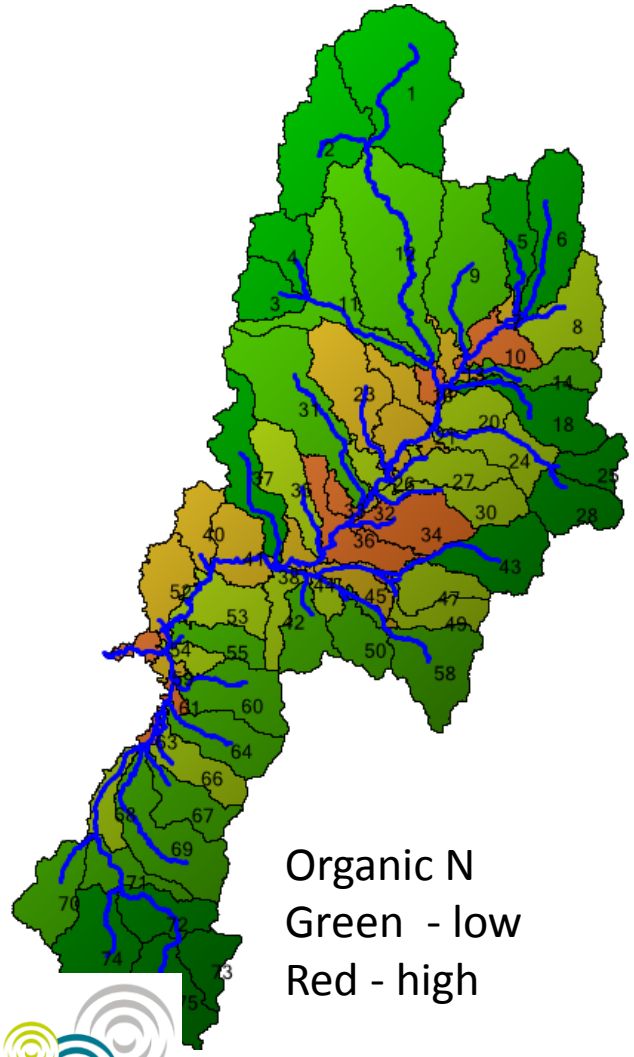
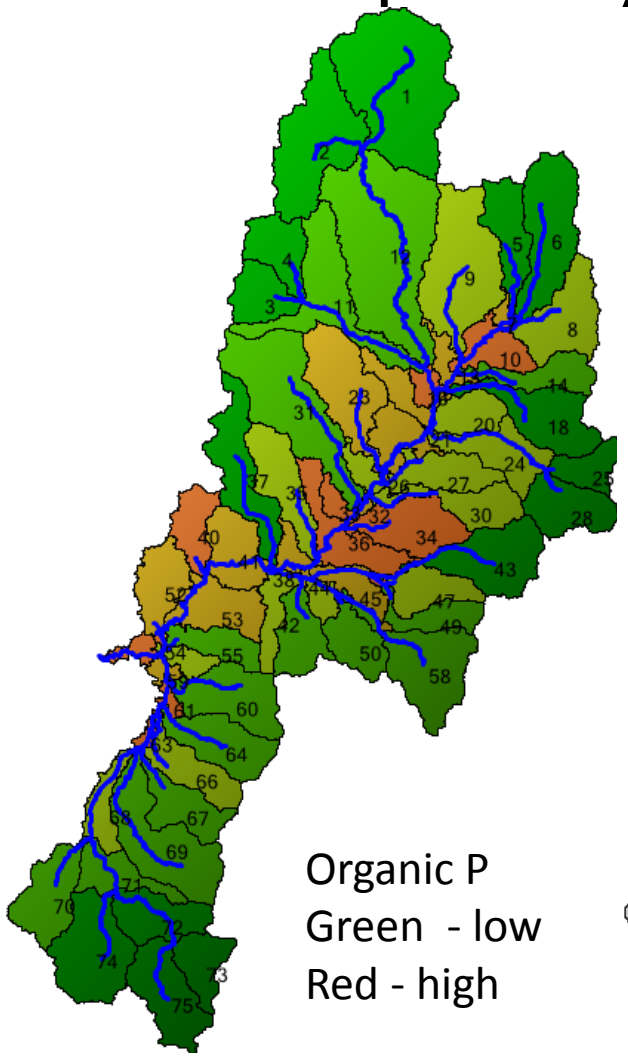
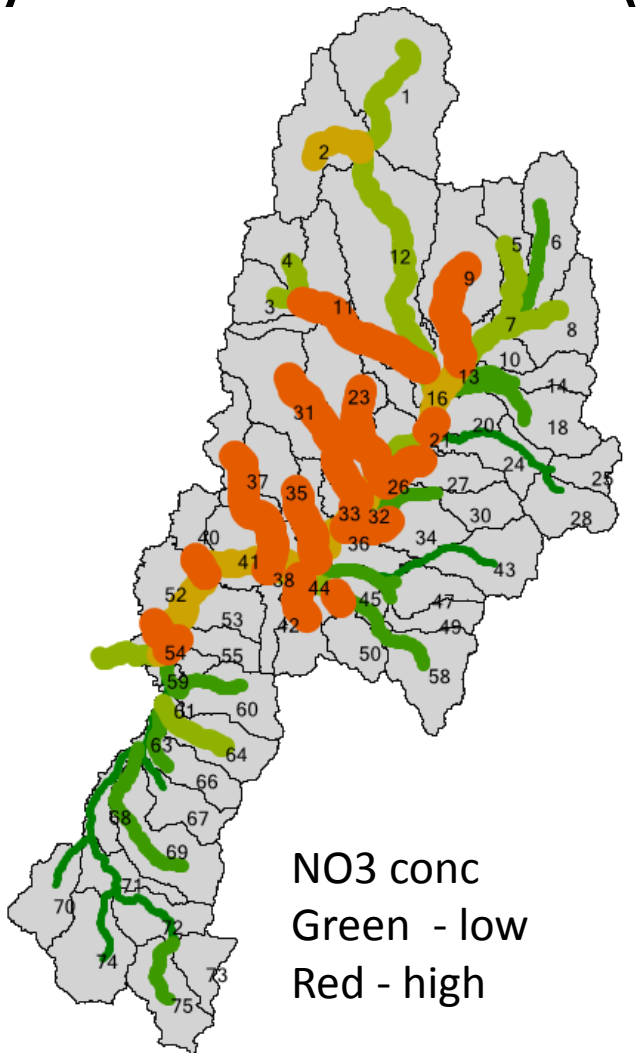
Water quality - nutrients (S1)



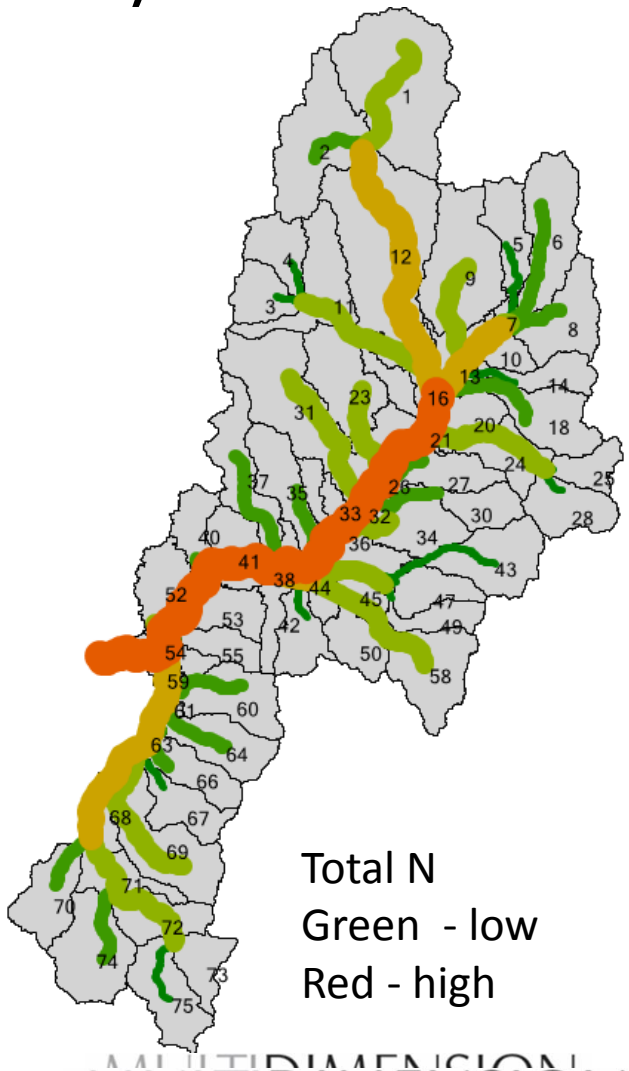
Organic N
Green - low
Red - high



Organic P
Green - low
Red - high



NO3 conc
Green - low
Red - high



Total N
Green - low
Red - high

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Scenario development

Best Management Practices:

- **Restoration of wetlands (water retention, peak flow reduction)**
- **Permanent grassland (improved sil properties on slopes)**
- **Riparian strips (forested buffer strips)**
- **Grassland buffers (additional to forested buffer strips)**

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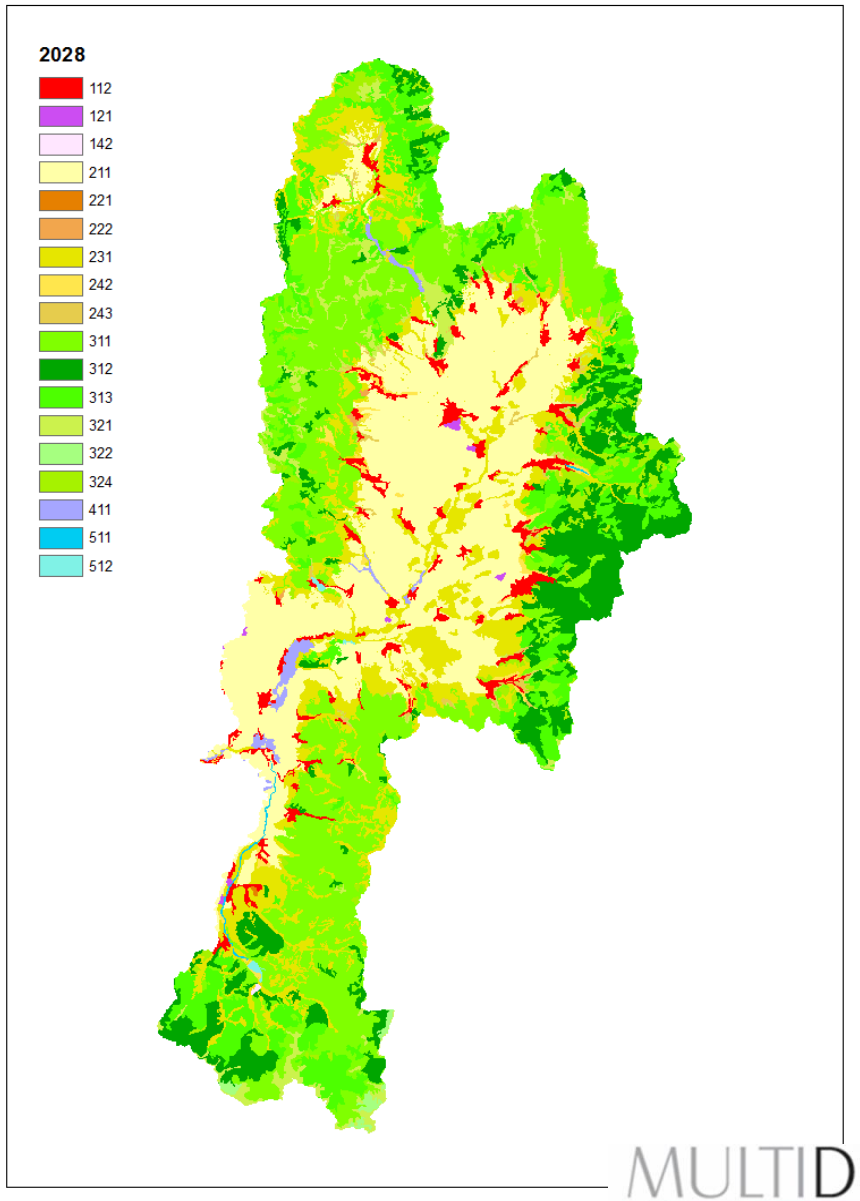
Stage 1 (from present to 2028):

- Re-establishment of wetlands (1608 ha)
- Transforming arable lands of steep slopes (>11°) to grasslands (2517 ha)
- Establishment of riparian forest strips (50m from midstream) in parts of the river (from source to Sânzieni, 334 ha)



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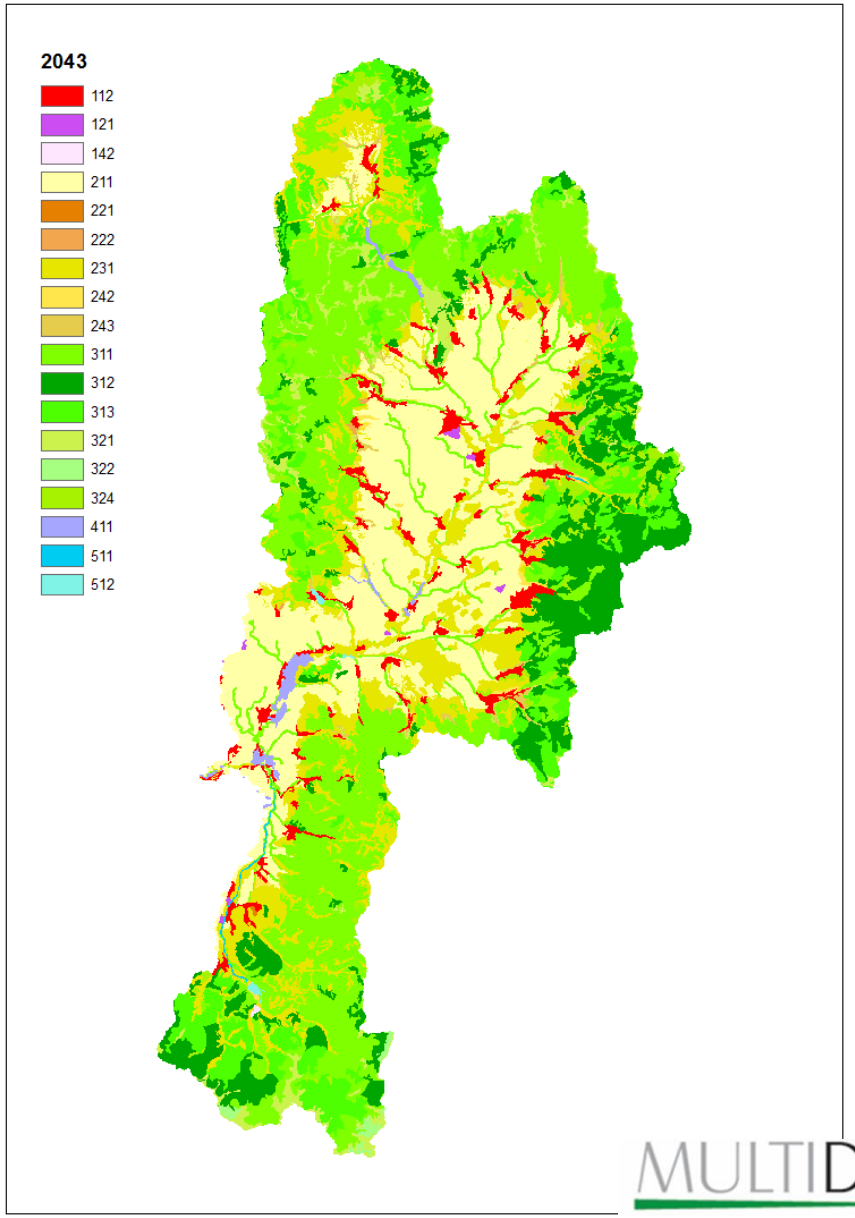
Stage 2 (2028 - 2043):

- Continued establishment of riparian forest strips (50m from midstream) extended to the whole of the river (6031 ha)



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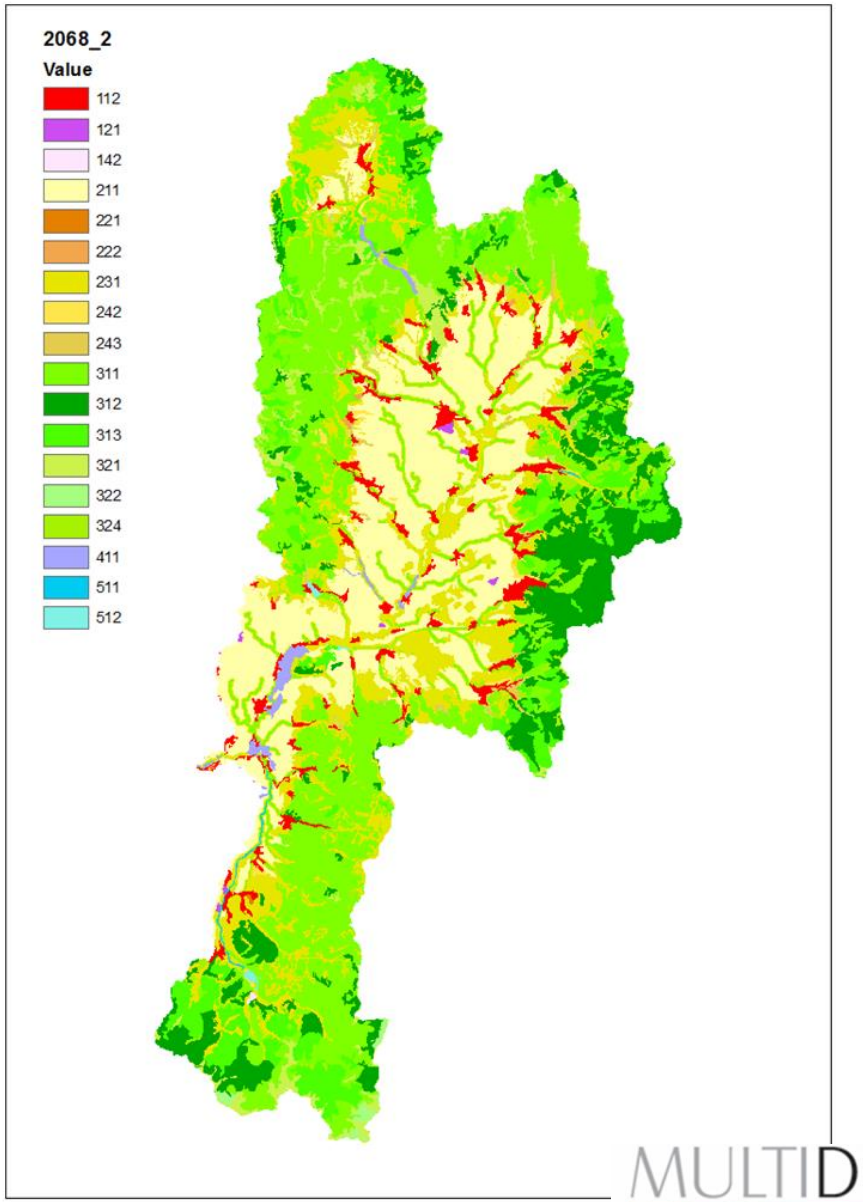
Stage 3 (2043 - 2068):

- Establishment of grassland buffers (additional 100m outside of riparian forests, 5939 ha)



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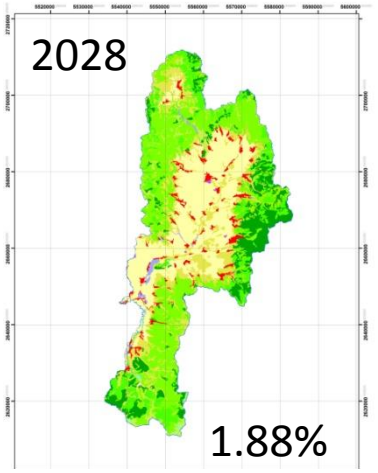
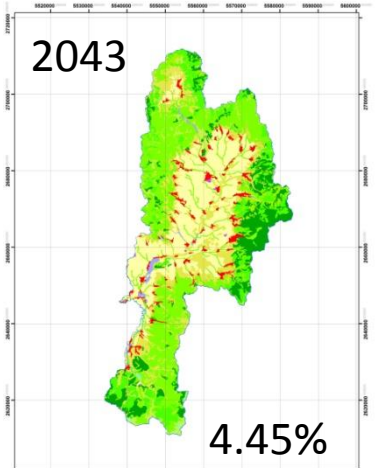
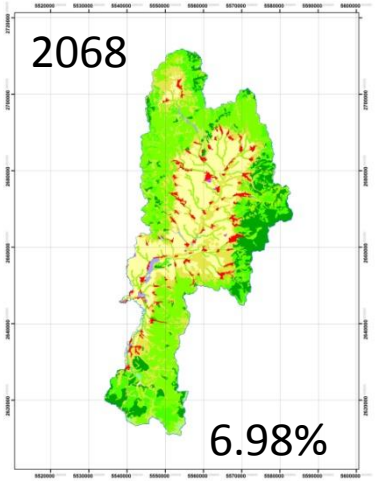
Input data for scenarios 3

- **PP05 - HOI** - selection of BMP and induced land use changes to improve water quality and habitat conservation

CLC code	2012	2028	2043	2068	CLC description
112	3.51%	0.00%	0.00%	0.00%	Discontinuous urban
121	0.12%	0.00%	0.00%	0.00%	Industrial and comercial
142	0.02%	0.00%	0.00%	0.00%	Sport and leisure facilities
211	26.79%	-1.23%	-3.58%	-5.98%	Non-irrigated arable land
221	0.02%	0.00%	0.00%	0.00%	Vineyards
222	0.07%	0.00%	0.00%	0.00%	Fruit trees and berry plantations
231	13.46%	0.41%	0.41%	2.94%	Pastures
242	0.94%	-0.16%	-0.38%	-0.51%	Complex cultivation patterns
243	1.23%	-0.49%	-0.49%	-0.49%	Land principally occupied by agriculture, with significant areas of natural vegetation
311	26.77%	0.03%	2.60%	2.60%	Broad-leaved forest
312	10.91%	0.10%	0.10%	0.10%	Coniferous forest
313	10.59%	0.00%	0.00%	0.00%	Mixed forest
321	2.65%	0.62%	0.62%	0.62%	Natural grassland
322	0.28%	0.01%	0.01%	0.01%	Moors and heatland
324	2.41%	0.02%	0.02%	0.02%	Transitional wood-shrub
411	0.00%	0.68%	0.68%	0.68%	Inland marshes
511	0.14%	0.00%	0.00%	0.00%	Water courses
512	0.09%	0.00%	0.00%	0.00%	Water bodies



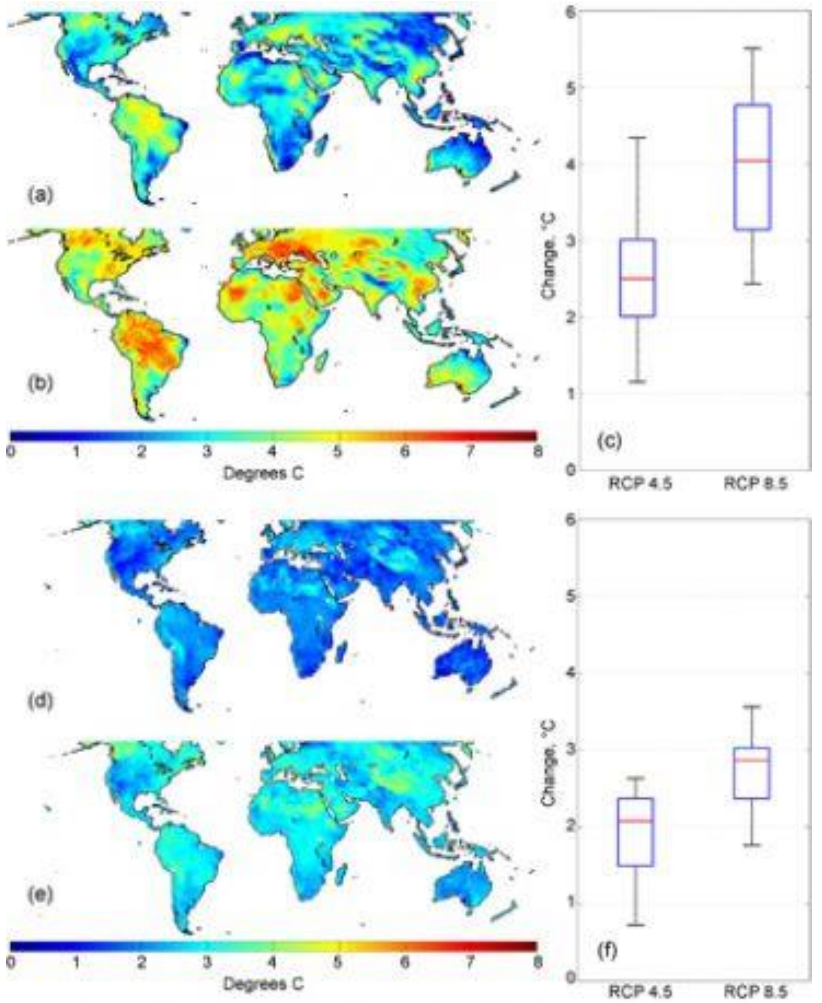




MULTIDIMENSION research & development

Input data for scenarios class 4

- **PP08 - NMA** - climatic change scenarios selection and extraction 12x12 km resolution
  - EURO-CORDEX hist 1970-2006
  - EURO-CORDEX RPC45 2006-2100
  - EURO-CORDEX RPC85 2006-2100



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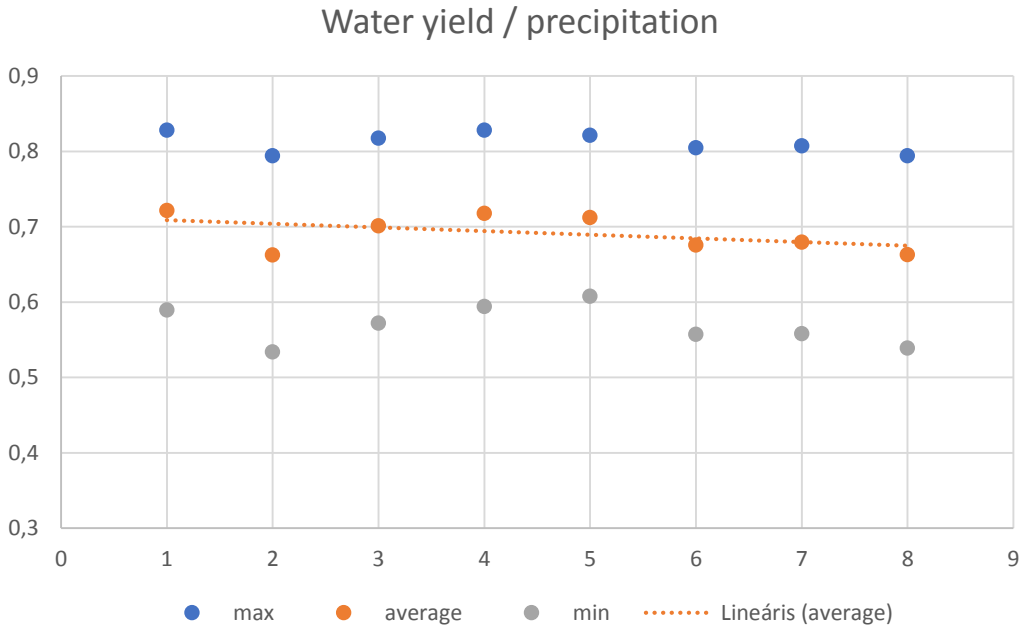
Results

ES	Water availability						
LU	2018	2028_rpc45	2028_rpc85	2046_rpc45	2046_rpc85	2068_rpc45	2068_rpc85
LU2018	5	5	4	3	2	2	1
LU2028	6	6	5	4	3	3	2
LU2046	7	7	6	5	4	4	3
LU2068	8	8	7	6	5	5	4

ES	Soil erosion						
LU	2018	2028_rpc45	2028_rpc85	2046_rpc45	2046_rpc85	2068_rpc45	2068_rpc85
LU2018	5	5	4	3	2	2	1
LU2028	6	6	5	4	3	3	2
LU2046	7	7	6	5	4	4	3
LU2068	8	8	7	6	5	5	4



~5% of water availability decrease in 50 years

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Local assessment of beaver management plan

- SWOT analysis:
  - O1. Maintaining a viable population with favorable conservation status for ROSCI0374 and ROSCI0111
  - O2. Maintaining components of unmanaged water resource management infrastructure for local social and economic protection
  - O3. Control of dispersion in critical areas through authorized bodies for the relocation of individuals
  - O4. Testing of the methods of protection of the infrastructure elements by technical measures (anti-lawn nets, target arbors fences, electric fences for crops)

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SWOT analysis

	Strengths	Weakness	Opportunities	Threats
O1. Maintaining a viable population with favorable conservation status for ROSCI0374 and ROSCI0111	• Classification of riparian habitats according to the risk of conflicts occurring • Involvement of INCDS critical conservative interest areas ROSCI0111 and ROSCI0374	• Harmonization of legislation; • Actualizarea măsurilor de management	• Periodic reassessment of population; • Identifying habitats that can be re-populated in INCDS	• Damage to crops, 98%, small amounts • Flooding of land • Damage to roads, bridges, dikes
O2. Maintaining components of unmanaged water resource management infrastructure for local social and economic protection	• Active management for elements of infrastructure • Identification of the elements of critical infrastructure	• Investments additional cost	• Testing of technical methods in experimental system • Identify areas with potential conflict risk SGA	• Beaver dams (blockages in the bed) • The nests in the dykes
O3. Control of dispersion in critical areas through authorized bodies for the relocation of individuals	• Immediate relocation for conflict prevention	• Harmonization of legislation	• Authorization of APM-SGA-INCDS direct cooperation	• Juvenile dispersal upstream
O4. Testing of the methods of protection of the infrastructure elements by technical measures (anti-lawn nets, target ences, electric fences for crops)	• Good results can be replicated	• Additional cost	• Testing of technical methods in experimental system by CAMARO-D • Identification of areas with potential conflict risk SGA-INCDS	• Socio-economic conflicts

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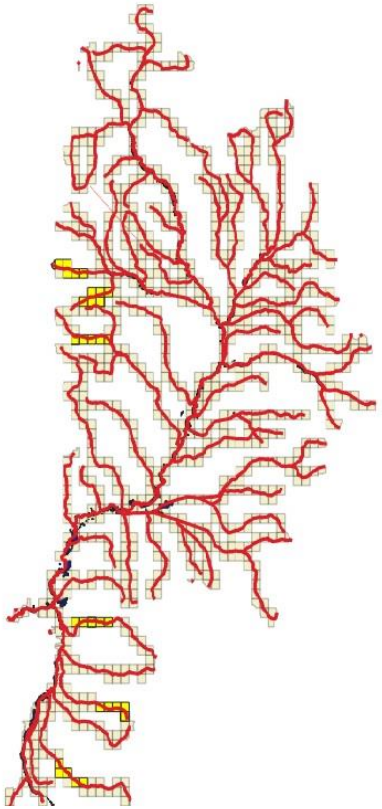
Beaver habitat assessment



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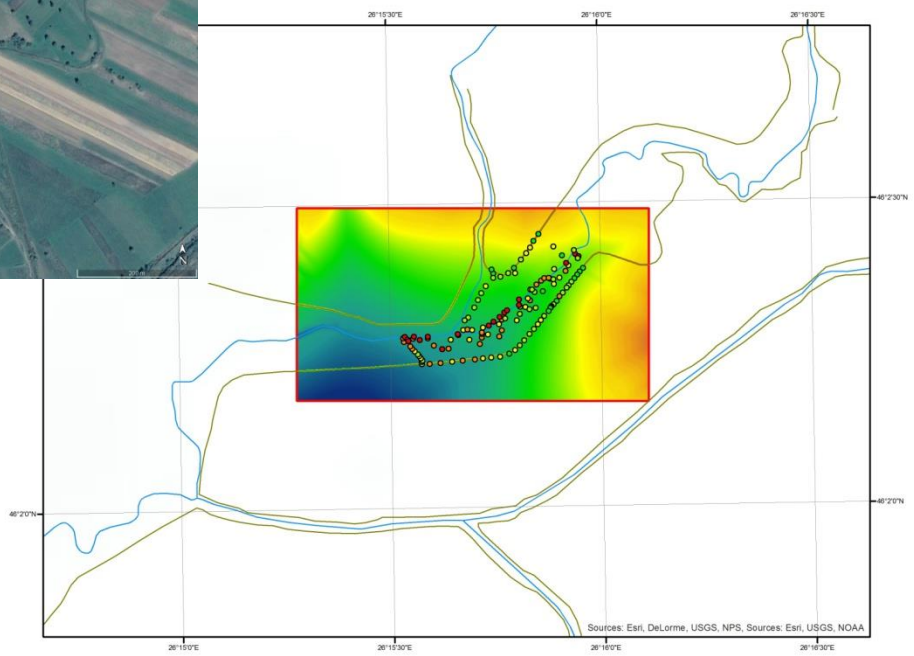
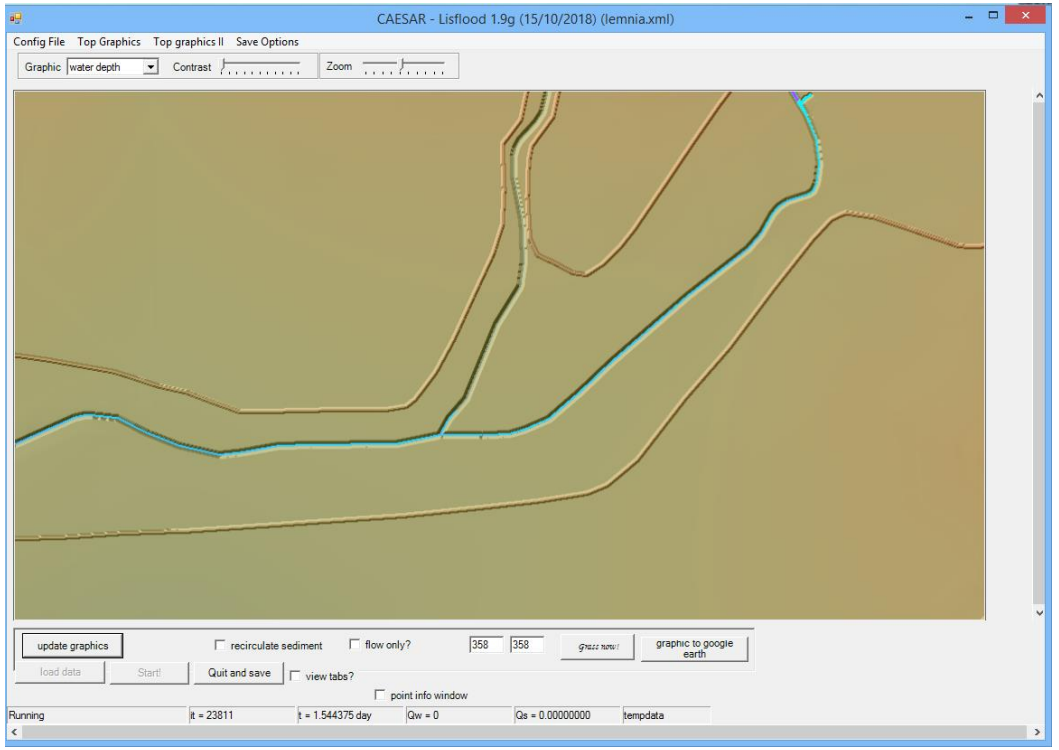
Lemnia local habitat assessment





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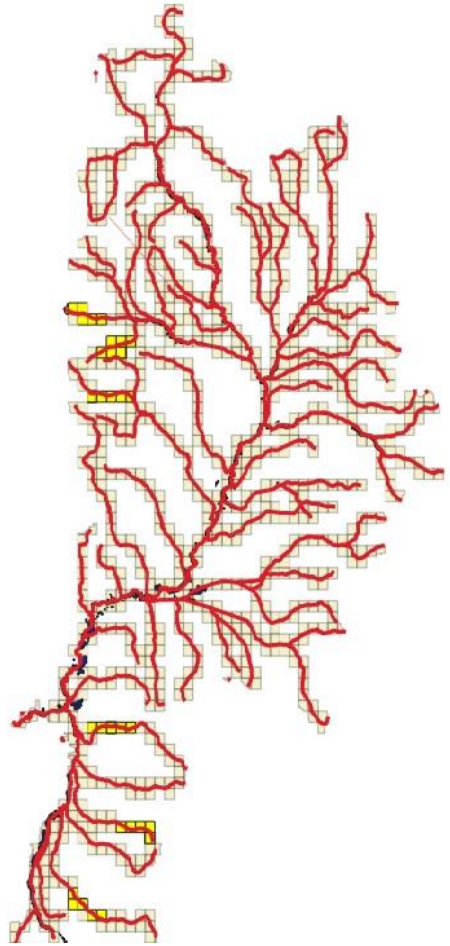
Castor fiber influences

Ecosystem services	Influences
Surface water availability	• Water retention at local level
Sub-surface water availability	• Water sub-surface lateral flow at local level
Water quality	• Sediment trap function of beaver dam • Nutrient retention
Biodiversity maintenance	• Community interest species conservation • Trees and shrubs thickening



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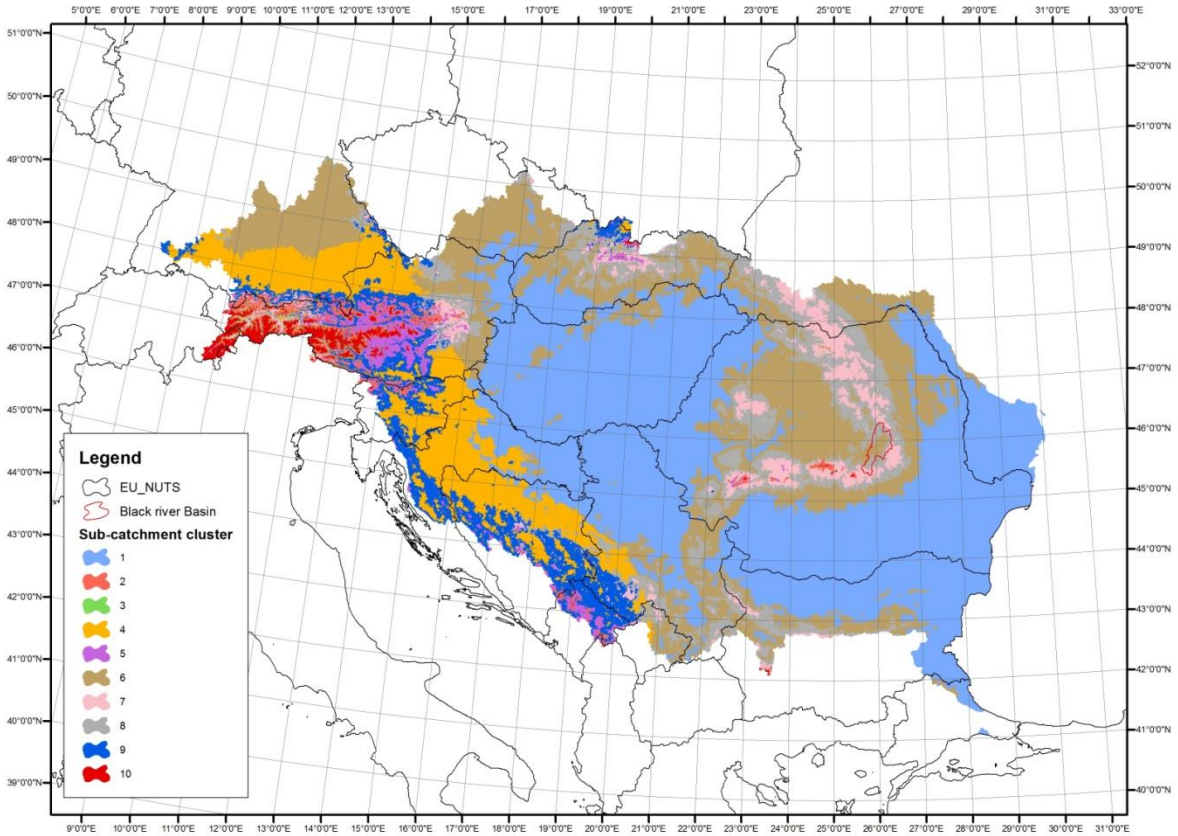
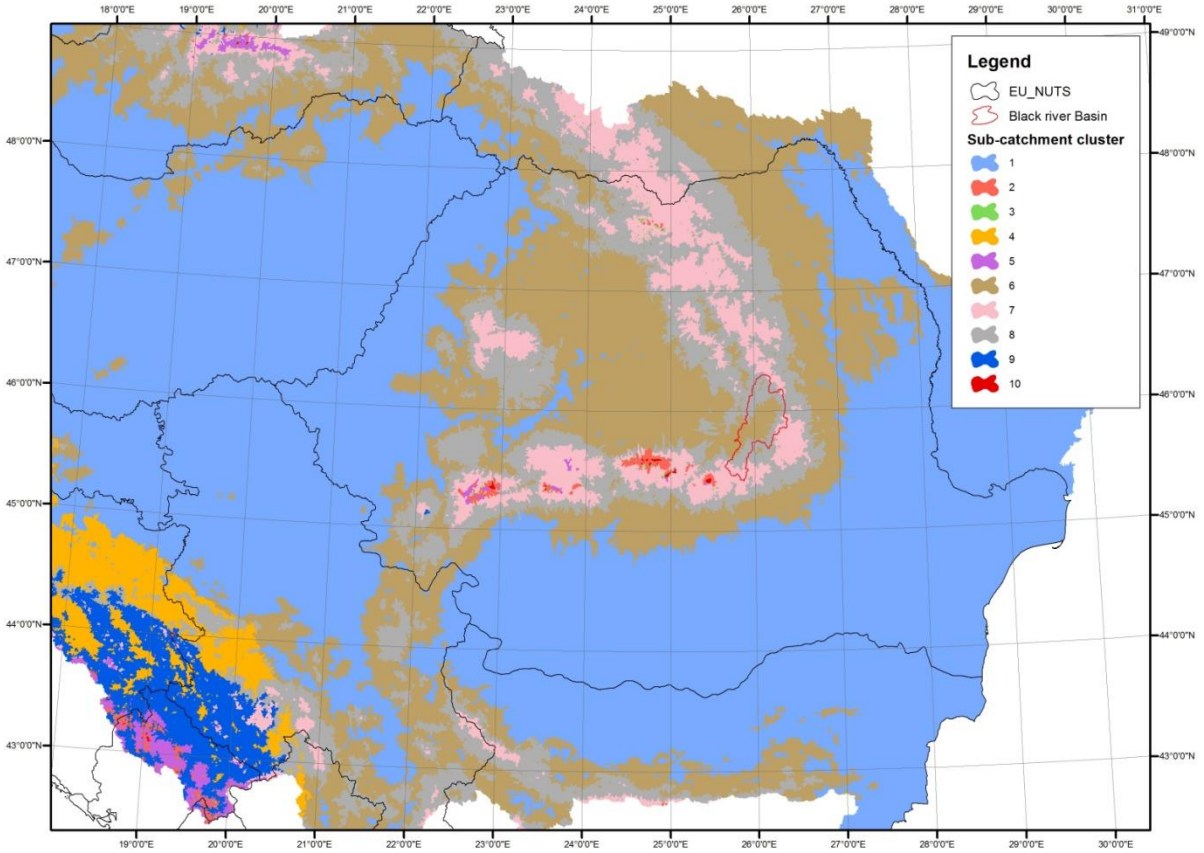
Clusters groups of Danube sub-catchments





using JRC CCM21

22% plains (cluster 6) and 9% hills (cluster 8) sub-catchments of Black River

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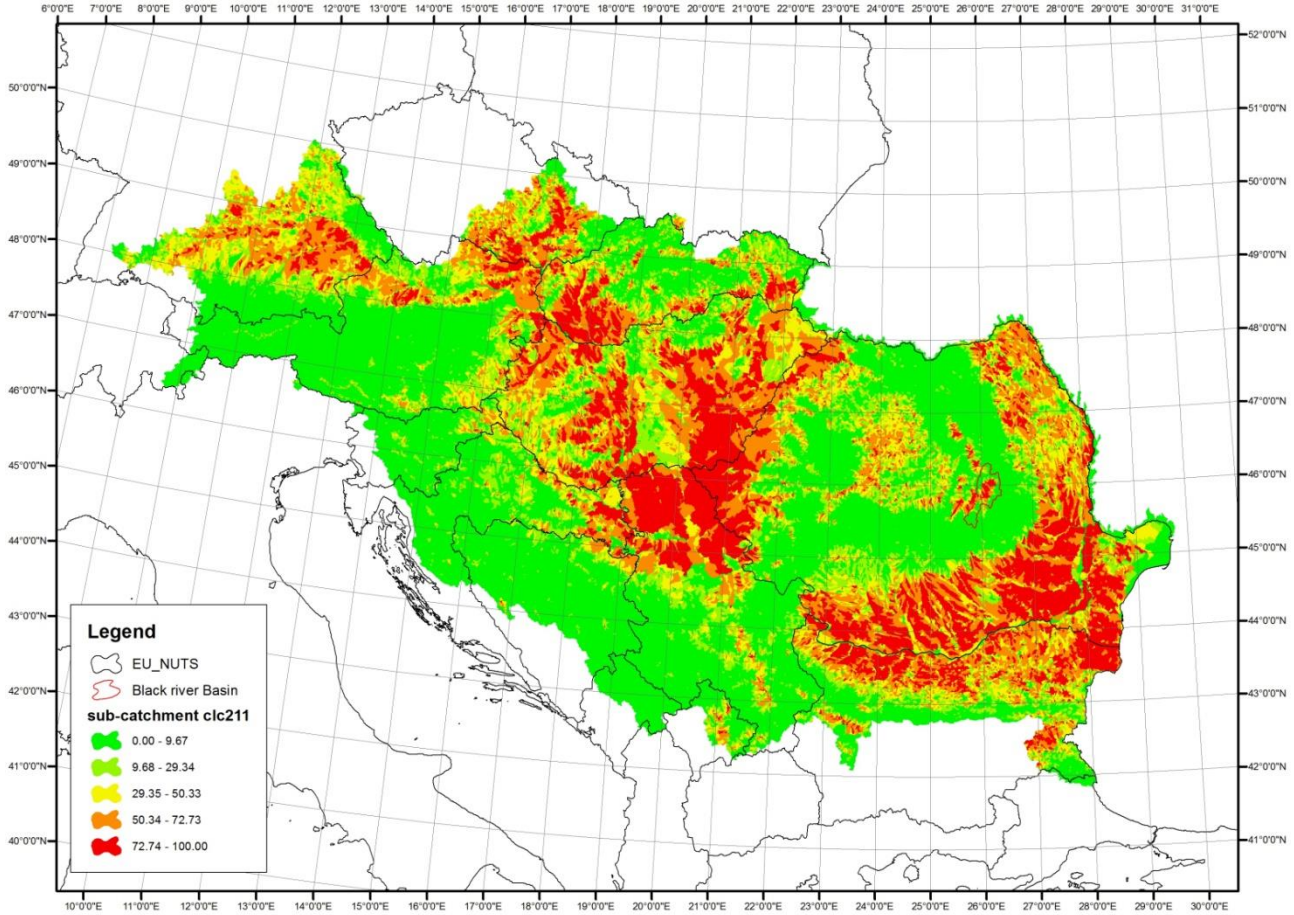
BMPs from HOI extrapolation



- If we are extending the BMPs to Danube floodplain we will obtain 42% from the surface of Danube basin can benefit from the same BMPs like Black river basin

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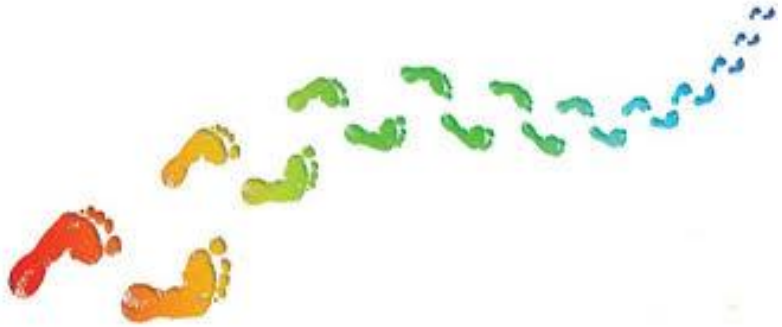

Many thanks for your attention!

- Florian Bodescu
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