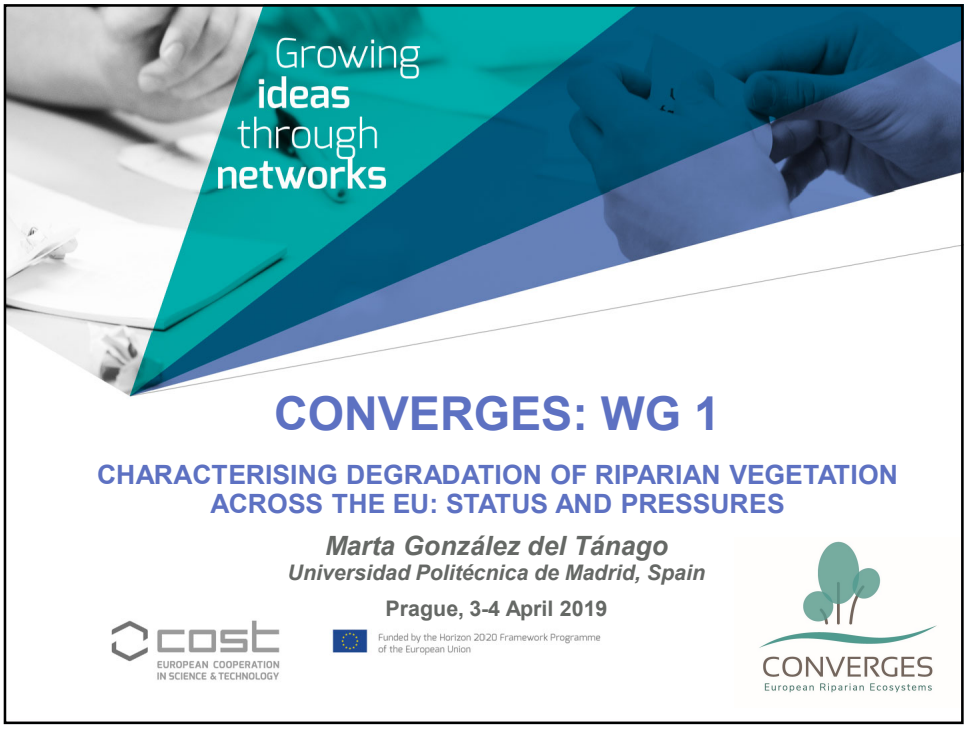

CONVERGES: WG 1

CHARACTERISING DEGRADATION OF RIPARIAN VEGETATION ACROSS THE EU: STATUS AND PRESSURES

Marta González del Tánago
Universidad Politécnica de Madrid, Spain

Prague, 3-4 April 2019

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Funded by the Horizon 2020 Framework Programme of the European Union

CONVERGES European Riparian Ecosystems

CONTENT

- Summary of Madrid meeting (10-11 July, 2018): *Monitoring and Assessment of Riparian Vegetation in European countries*
- European Riparian Vegetation Status Assessment: An overview
- Proposal of Spatial scales, Vegetation units and Indicators for a multi-scale Riparian Vegetation Status Protocol
- Relationships between pressures and Riparian status
- Plans for the next months

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PROGRAMME

I: CONCEPTS AND DEFINITIONS

1. Riparian zones-Riparian vegetation: Concepts and definitions (*SIMON DUFOUR, University of Rennes)*

II: FORMS AND FUNCTIONS

1. Riparian vegetation: Knowledge conversion for understanding river functioning and status (*FRANCISCA AGUIAR*, University of Lisboa)
2. Phytosociological characterization of European Riparian vegetation (*DEJAN MANDZUKOVSKI,* Department for Forest Management Planning, Macedonian)
3. Functional characterization of Spanish Riparian vegetation (*DIEGO GARCÍA DE JALÓN,* UPM, Madrid)

III: CHARACTERIZATION ACROSS EUROPEAN COUNTRIES

1. Riparian vegetation in Denmark (*TENNA RIIS*, Aarhus University, Denmark)
2. Riparian vegetation in UK (*ROBERTO MARTÍNEZ, Scottish Environment Protection Agency)*
3. Riparian vegetation in Spain (*VANESA MARTÍNEZ*-FERNÁNDEZ, UPM, Universidad Politécnica de Madrid)
4. Riparian vegetation in Portugal *(PATRICIA RODRÍGUEZ, University of Lisboa)*
5. Riparian vegetation in Hungary *(TINNEA KISS, Dept. of Physical Geography and Geoinformatics, Hungary)*
6. Riparian vegetation in France *(SIMON DUFOUR, University of Rennes)*
7. Riparian vegetation in Italy (*NICOLA LAPORTA*, *Dept of Sustainable Agroecosyst. and Bioresources, Trento*)

IV: NEW APPROACHES OF CHARACTERIZATION AND ASSESSMENT

1. A hierarchical hydro-morphological framework for developing multi-scale riparian vegetation characterization and assessment *(MARTA GONZÁLEZ DEL TÁNAGO, UPM Madrid)*
2. Panel Discussion on following topics: Ecosystem services provided by Riparian vegetation and Relationships between pressures and status (Francisca Aguiar, Simon Dufour, Marta González del Tánago)
3. CONCLUSIONS AND FUTURE WORK

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MONITORING AND ASSESSMENT OF RIPARIAN VEGETATION IN EUROPEAN COUNTRIES
WG 1 Workshop, Madrid (Spain), 10-11 July, 2018

5 Main topics identified along the Madrid meeting:

1. PHYTOSOCIOLOGICAL APPROACH (Presented by *Dejan Mandzukovski*)
2. DEFINITION / DELINEATION ISSUES (Presented by *Simon Dufour*)
3. EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT
4. RELATIONSHIPS BETWEEN PRESSURES AND STATUS
5. ECOSYSTEM SERVICES REVIEW (Presented by *Tenna Riis*)

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European Riparian Ecosystems

EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

- Oral presentations evidenced a **wide array of RV assessment** approaches across EU countries
- **RV** monitoring is usually **included in the appraisal of Hydromorphological conditions** of rivers**,** following the rules of the Water Framework Directive (WFD)
- **Different RV data sets:** At **national scale**, hydromorphological data must exist and be **available** at the respective River Basin Management Plans (RBMP´s)

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EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

Different RV assessment data and indexes across EU countries

DENMARK (From *Tenna Riis* presentation:

- Dominance of low-energy rivers, frequently channelized
- High intensity land use (agriculture)

- National Monitoring (2004-2009) of Plant communities
  - 515 riparian sites
  - Characterization and floristic quality
  - Strong Influence of channel size and form on plant diversity

- No current monitoring of riparian areas

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EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

Different RV assessment data and indexes across EU countries

SCOTLAND (From *Roberto Martínez* presentation):

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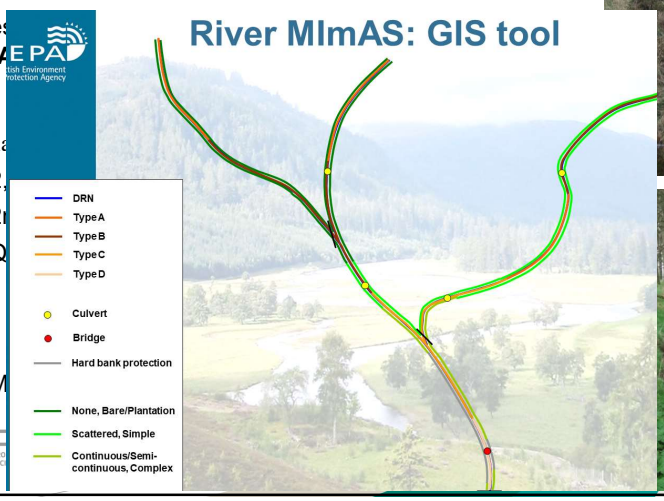

EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

Different RV assessment data and indexes across EU countries

SPAIN (From *Vanesa Martínez-Fernández* presentation):

- RV currently **monitored at national scale** within the respective Hydromorphological assessments following the WFD requirements
- **QBR Index** applied and data available at the respective RBMP´s
  - 4390 River water bodies covering the full river network,
  - Study area as the potential área with riparian vegetation
  - Assessment of Vegetation **Cover,** Vegetation **Structure**, Vegetation **Quality** and River channel alterations following the QBR index protocol
  - Riparian Quality **assessment based on QBR "reference" values** for each river type (based on the Spanish river typology, 32 types), for very good, good, fair, poor and very poor status

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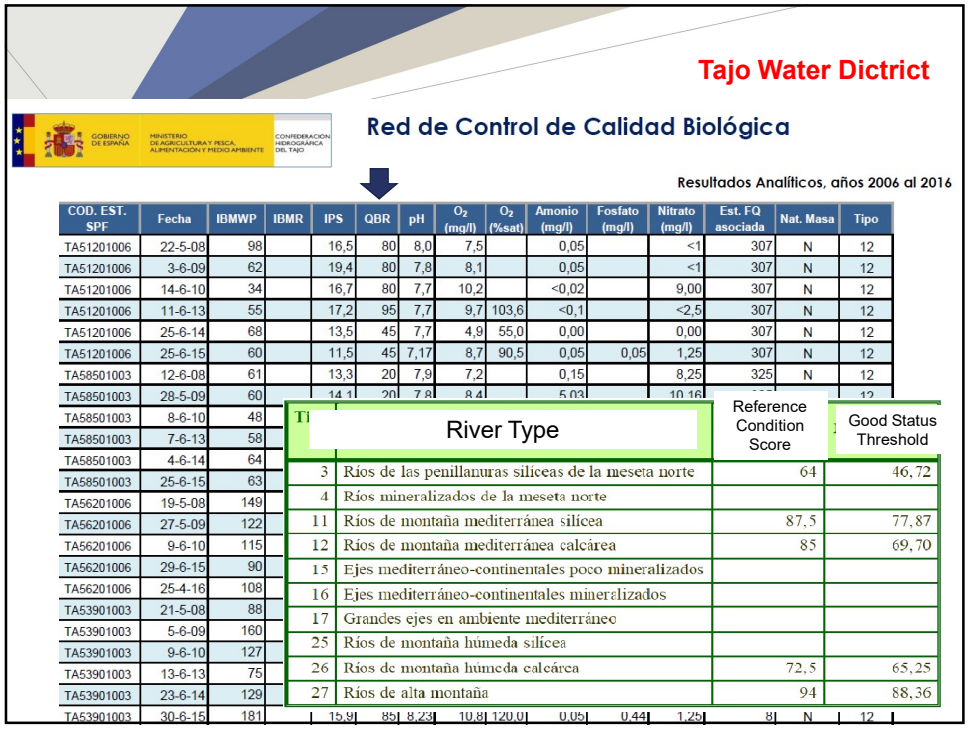

COD. EST. SPF	Fecha	IBMWP	IBMR	IPS	QBR	pH	O_2 (mg/l)	O_2 (%sat)	Amonio (mg/l)	Fosfato (mg/l)	Nitrato (mg/l)	Est. FQ asociada	Nat. Masa	Tipo
TA51201006	22-5-08	98		16,5	80	8,0	7,5		0,05		<1	307	N	12
TA51201006	3-6-09	62		19,4	80	7,8	8,1		0,05		<1	307	N	12
TA51201006	14-6-10	34		16,7	80	7,7	10,2		<0,02		9,00	307	N	12
TA51201006	11-6-13	55		17,2	95	7,7	9,7	103,6	<0,1		<2,5	307	N	12
TA51201006	25-6-14	68		13,5	45	7,7	4,9	55,0	0,00		0,00	307	N	12
TA51201006	25-6-15	60		11,5	45	7,17	8,7	90,5	0,05	0,05	1,25	307	N	12
TA58501003	12-6-08	61		13,3	20	7,9	7,2		0,15		8,25	325	N	12
TA58501003	28-5-09	60		14,1	20	7,8	8,4		5,03		10,16			12
TA58501003	8-6-10	48												
TA58501003	7-6-13	58												
TA58501003	4-6-14	64												
TA58501003	25-6-15	63												
TA56201006	19-5-08	149												
TA56201006	27-5-09	122												
TA56201006	9-6-10	115												
TA56201006	29-6-15	90												
TA56201006	25-4-16	108												
TA53901003	21-5-08	88												
TA53901003	5-6-09	160												
TA53901003	9-6-10	127												
TA53901003	13-6-13	75												
TA53901003	23-6-14	129												
TA53901003	30-6-15	181		15,9	85	8,23	10,8	120,0	0,05	0,44	1,25	8	N	12

River Type		Reference Condition Score	Good Status Threshold
3	Ríos de las penillanuras silíceas de la meseta norte	64	46,72
4	Ríos mineralizados de la meseta norte		
11	Ríos de montaña mediterránea silícea	87,5	77,87
12	Ríos de montaña mediterránea calcárea	85	69,70
15	Ejes mediterráneo-continentales poco mineralizados		
16	Ejes mediterráneo-continentales mineralizados		
17	Grandes ejes en ambiente mediterráneo		
25	Ríos de montaña húmeda silícea		
26	Ríos de montaña húmeda calcárea	72,5	65,25
27	Ríos de alta montaña	94	88,36

EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

Different RV assessment data and indexes across EU countries

PORTUGAL (From *Patricia Rodríguez* presentation):

- **Three main data bases** of Riparian Vegetation using different approaches:
  - Habitat Directive Monitoring: Cartography of different habitat types (62 sites)
  - European Vegetation Survey: 700 releves with phytosociological approach
  - WFD Monitoring: **National Scale** Survey adapting **RHS protocol** (5 vegetation types, 4 vegetation structure, 3 tree-density clases)
- Development of new indexes: Riparian Vegetation Integrity (RVI)
- Additional RV survey in 2004-2005 (*Aguiar et al., 2012*) on 175 sampling sites of the **National network Reference river sites**
  - Species composition, abundance
  - 28 plant traits on growth, productivity, reproduction, phenology and the autoecology

EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

Different RV assessment data and indexes across EU countries

HUNGARY (From *Timea Kiss et al.* presentation):

- **Hydromorphological characterization** of rivers within the WFD:
  - **Good status** of riparian ecosystems according to their **buffer function**:
    - Width of active floodplain: 300-500 m if forests, 500-800 m if meadows
    - Status of floodplain: agricultural área < 30%
  - **No characterization of forests** (plantation vs. Riparian forest)
  - No evaluation of invasive species

- Strong evidence of the influence of RV and invasive species increasing flood hazard

EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

Different RV assessment data and indexes across EU countries

FRANCE (From *Simon Dufour* presentation):

- **Four main data bases** of Riparian Vegetation using different approaches:
  - WFD monitoring at national scale by two protocols
    - **SYRAH** based on existing maps: RV structure, Longitudinal continuity, Artificial structures, Land use
    - **CARHYCE** based on field surveys: RV structure, width, RV type, dominant strata, Longitudinal continuity
  - Natura 2000
  - European Vegetation Survey
  - Local monitoring (e.g. National reserves)

EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

Different RV assessment data and indexes across EU countries

ITALY (From *Nicola La Porta* presentation):

- National Forest Inventory
- Regional guidelines for monitoring Hydromorphological conditions of rivers
- **Different approaches for RV** characterization across Italian basins
- Index of Fluvial Functionality (IFF) using riparian vegetation structure

- **MQI** (Morphological Quality Index, *Rinaldi et al., 2013*) proposed as the standard Hydromorphological assesment protocol:
  - Indicators of Functionality, Artificiality and Channel adjustments
  - **Functionality: 2 RV** of 12 indicators: Width and Linear extensión of vegetation potentially connected to channel processes)
  - **Artificiality: 1 RV** of 11 indicators: Intensity of vegetation cuts during the last 20 years)
  - In practice, RV scores do not influence the MQI results determining the hydromorphological status of rivers

EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT

Remarks:

- Monitoring **Riparian "condition"** at national scale is **mandatory** by the WFD, as a third element of hydromorphological conditions of rivers.
- **Riparian "vegetation"** is **not explicitely considered** by the WFD
- **Different protocols** used to monitor RV, most of them representing **qualitative appraisals of "forms"** (Width, Cover, Structure…).
- **Not enough quantitative data** on species composition, diversity and functionality to do proper **characterization and assessment**
- Need **multi-scale approach** to **relate** intensity of **pressures and impacts** with RV **status**

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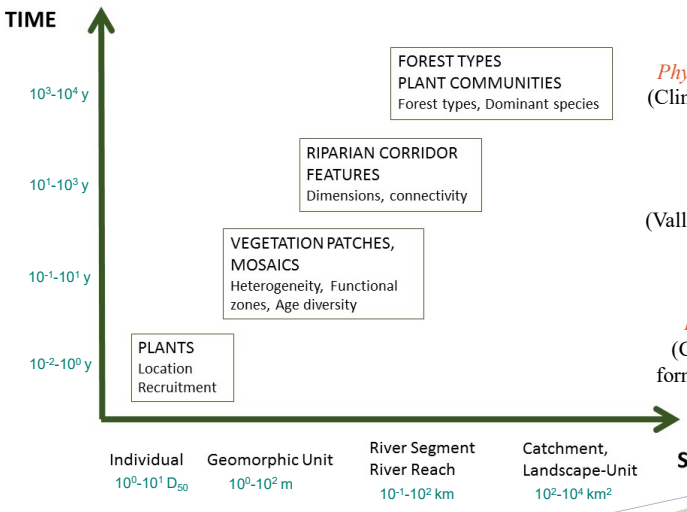
PROPOSAL OF SCALES, VEGETATION UNITS AND INDICATORS



Phytosociological approach
(Clima, Geology, Topography)

GIS based approach
(Valley features, Channel size, Land cover)

Field-work approach
(Channel pattern & land forms, Flooding, Land use)

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TOWARDS A MULTI-SCALE RV CHARACTERIZATION

What **attributes** of RV should be used for RV **characterization**?

At **what spatial scale** would be **feasible the assessment** of each attribute?

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TOWARDS A MULTI-SCALE RV CHARACTERIZATION

What **attributes** of RV should be used for RV **characterization**?

At **what spatial scale** would be **feasible the assessment** of each attribute?

Catchment, Landscape Unit

Corridor features:
- Vegetation types,
- Associations,
- Dominant species

River segment

Corridor features:
- Continuity,
- Width, Coverage
- Species composition
- Functional zones,

River reach

River reach

RV patch features:
- Size, Form,
- Age diversity
- Pioneer recruitment

TOWARDS A MULTI-SCALE RV CHARACTERIZATION

SPATIAL UNIT	VEGETATION UNITS	INDICATORS	PRESSURES / IMPACTS
REGION:	BIOMES	Plant Biogeographical Regions,	Climate change
	VEGETATION ZONES	Vegetation types, Classes	Large scale Land Cover changes
CATCHMENT/ LANDSCAPE UNITS	RIPARIAN VEGETATION TYPES	Riparian/Floodplain Vegetation types	Land Cover/Use changes (Afforestation, Agriculture, Grazing)
	PLANT ASSOCIATIONS	Dominant species	Soil erosion
			Groundwater depletion
RIVER SEGMENT	RIPARIAN PLANT COMMUNITIES	Corridor features: • Dimensions • Coverage • Longitudinal continuity /	Flow regulation by dams and reservoirs Grounwater abstraction Lateral barriers, Channelization Works
	FUNCTIONAL ZONES (Dominant hydrogeomorphic processes)	Functional zones: • Average width • Dominant species, coverage	Valley floor/Floodplain occupation Gravel mining
RIVER REACH	VEGETATION MOSAICS, PATCHES	Vegetation patches: • Location (distance and elevation) • Species composition, coverage, • Age classes	Channel adjustments Channelization works, Channel revetments
RIPARIAN AND FLOODPLAIN GEOMORPHIC UNITS		% invasive or exotic species	Dredging, Bank elevations
	VEGETATED BAR, ISLAND	Pioneer recruitment (área, location)	Foodplain/riparian occupation
		% Dead trees (Potential large Wood supply)	Fillings, excavations
			Comercial vegetation management
CHANNEL GEOMORPHIC UNIT	AQUATIC VEGETATION	Aquatic vegetation morphotypes	Water eutrophication, pollution
	COMMUNITIES, POPULATIONS	Coverage and distribution	Siltation
	LARGE WOOD ELEMENT	Abundance of large Woody debris	Wood removal
RIVER ELEMENT		Location, Size, orientation	

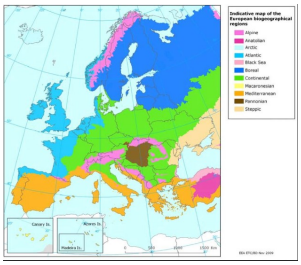
TOWARDS A COMMON EUROPEAN RV ASSESSMENT PROTOCOL

TOWARDS A COMMON EUROPEAN RV ASSESSMENT PROTOCOL

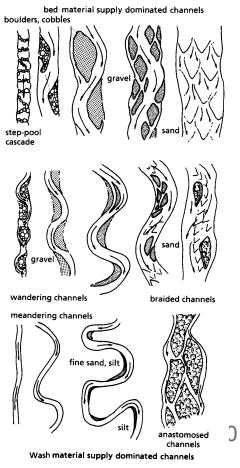
- Assessments need **comparisons between current** status and **"reference"** status

- RV **reference** status should be defined **according to river typologies**:

a) Biogeographical Regions



b) Channel Morphological Types

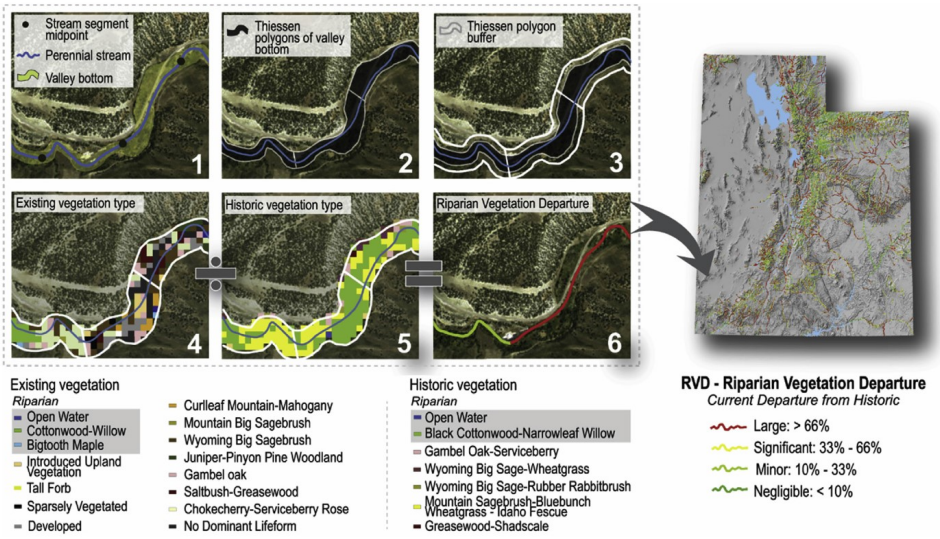


- RV assessments based on **scoring protocols** to **evaluate the differences** with reference conditions

TOWARDS A COMMON EUROPEAN RV ASSESSMENT PROTOCOL

ANTECEDENTS

Macfarlane *et al*. 2017. Riparian vegetation as an indicator of riparian condition: Detecting departures from historic condition across the North American West. *Journal of Environmental Management* 202: 447-460.



TOWARDS A COMMON EUROPEAN RIPARIAN VEGETATION CHARACTERIZATION AND ASSESSMENT PROTOCOL

WHAT WE NEED:

- Select **spatial scales** to be considered at European level
- Define **attributes and metrics** to measure
- Establish **RV reference types** according to biogeographic and hydromorphologic typologies
- Define **score systems** to assess differences between current status and “reference” (historic conditions, target status, predicted trajectories …)

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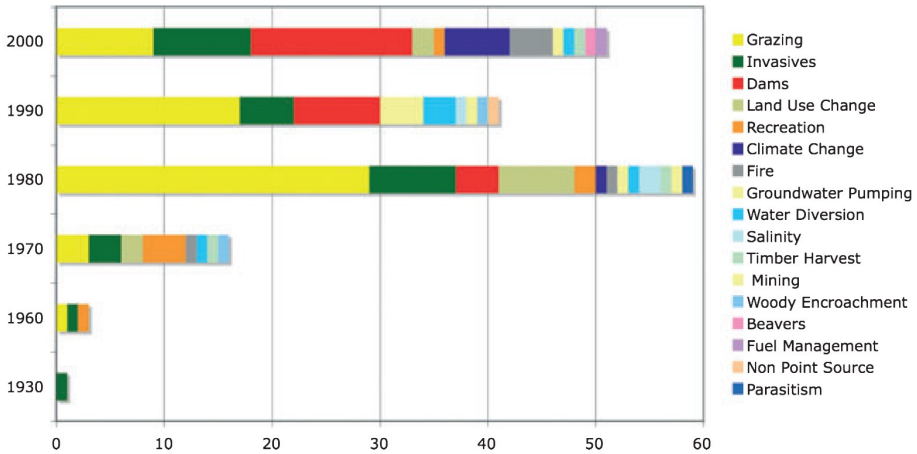
RELATIONSHIPS BETWEEN PRESSURES AND RV STATUS

RELATIONSHIPS BETWEEN PRESSURES AND RV STATUS

IDENTIFY POTENTIAL PRESSURES AND IMPACTS ON RIPARIAN SYSTEMS

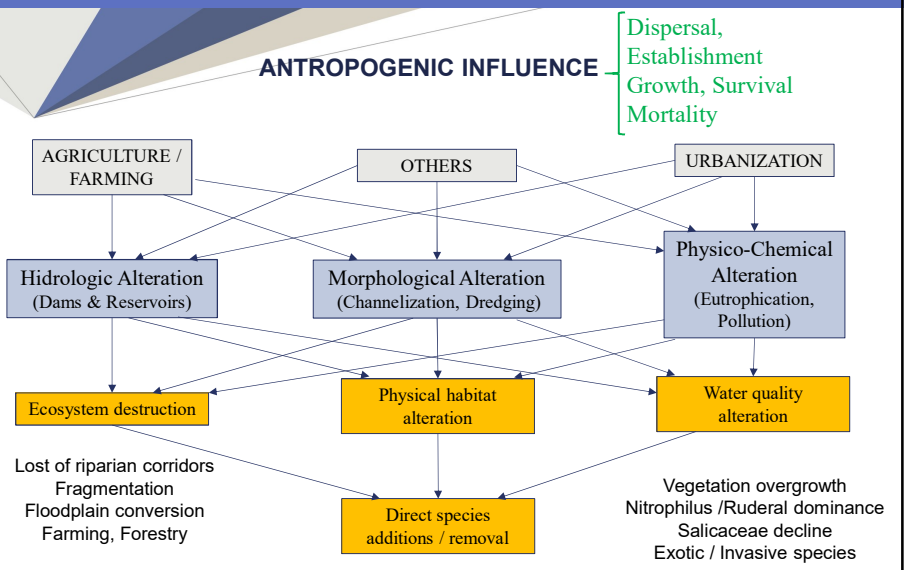
ANTECEDENTS

Poff *et al.*, 2011. Threats to Riparian Ecosystems in Western North America: An analysis of existing literatura. *Journal of the American Water Resources Association* 47.6: 1241-1254.



Temporal Distribution of Research Papers Addressing the Primary Threats to Riparian Ecosystems

RELATIONSHIPS BETWEEN PRESSURES AND RV STATUS



- Intensity of Pressures changes in time
- RV responses may be delayed from the pressures and impacts

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TOWARDS A COMMON EUROPEAN RIPARIAN VEGETATION CHARACTERIZATION AND ASSESSMENT PROTOCOL

KNOWLEDGE TRANSFER TO MANAGERS:

HISTORIC CONDITIONS → Pressures, Impacts → PRESENT CONDITIONS → Management Options → FUTURE CONDITIONS

- **Explain current status** according to trajectories from **the past**, under identified pressures and impacts **at different spatial and temporal scales**
- **Predict future adjustments** or trajectories to define **proper management options** and restoration measures
- **Improving** current **RV characterization and assessment** is strongly **needed**

CONVERGES
European Riparian Ecosystems

PLANS FOR THE NEXT MONTHS ...

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Rennes, February 2018

WG 1 OBJECTIVES (From Proposal):

1. To **assess** Riparian Vegetation (RV) at EU scale
2. To **synthesize** current knowledge of RV
3. To define a **protocol** to assess RV status and pressures
4. To design conceptual process-based diagrams **visualizing RV pressures and status**

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CONVERGES European Riparian Ecosystems

Rennes, February 2018

TASKS

T1.1 1-11 Define a protocol to assess RV status and pressures
T1.2 12-30 Assess RV status
T1.3 12-30 Assess RV pressures
T1.4 12-30 Assess RV impacts

MILESTONES

M1.1 4-8 STSMs to define the assessment protocol (n = 3)
M1.2 15-17 Assessment for each country/region
M1.3 20 Workshop for cross comparison of status and pressures (including a field trip)
M1.4 24 Process-based diagram about pressure/status relationships
M1.5 24 Training School for ECIs and end users about RV and related ecosystem services
M1.6 30 Workshop for final results presentation
M1.7 34 Submission of review paper(s)

DELIVERABLES

D1.1 10 Guidance to implement the protocol for the status/pressures assessment
D1.2 14 Report about ecosystem services provided RV
D1.3 24 Graphic description of relationships between pressures and status
D1.4 32 Report about riparian status, pressures and changes in EU
D1.5 36 Review paper

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- **EUROPEAN RIPARIAN VEGETATION STATUS ASSESSMENT**
- **RELATIONSHIPS BETWEEN PRESSURES AND RIPARIAN STATUS**

What we have:

- Riparian Vegetation Data included in Hydromorphological Assessment Protocols
- Data based on qualitative appraisal of Vegetation Structure, Cover, Width
- Insuficient width of monitoring área
- No data of Species composition, Diversity and Functionality at national scale

What we should have:

- Common Protocol for Characterization at different spatial scales
- Riparian Vegetation Reference Typologies, based on Biogeographical regions and Hidromorphological River types
- Common Protocol for Assessing Riparian Vegetation status

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