UNIVERSITAT POLITÈCNICA DE VALÈNCIA

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Can a riparian vegetation model be spatially validated?

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INTRODUCTION

- **RVDM (Riparian Vegetation Dynamic Model)** → riparian vegetation prediction in **natural** semiarid systems (García-Arias and Francés, 2016)

- Objective → versatility of the model in a riparian environment under **flow regulation** (changes in seasonality of natural floods and droughts impacts, characteristic of semiarid environments)

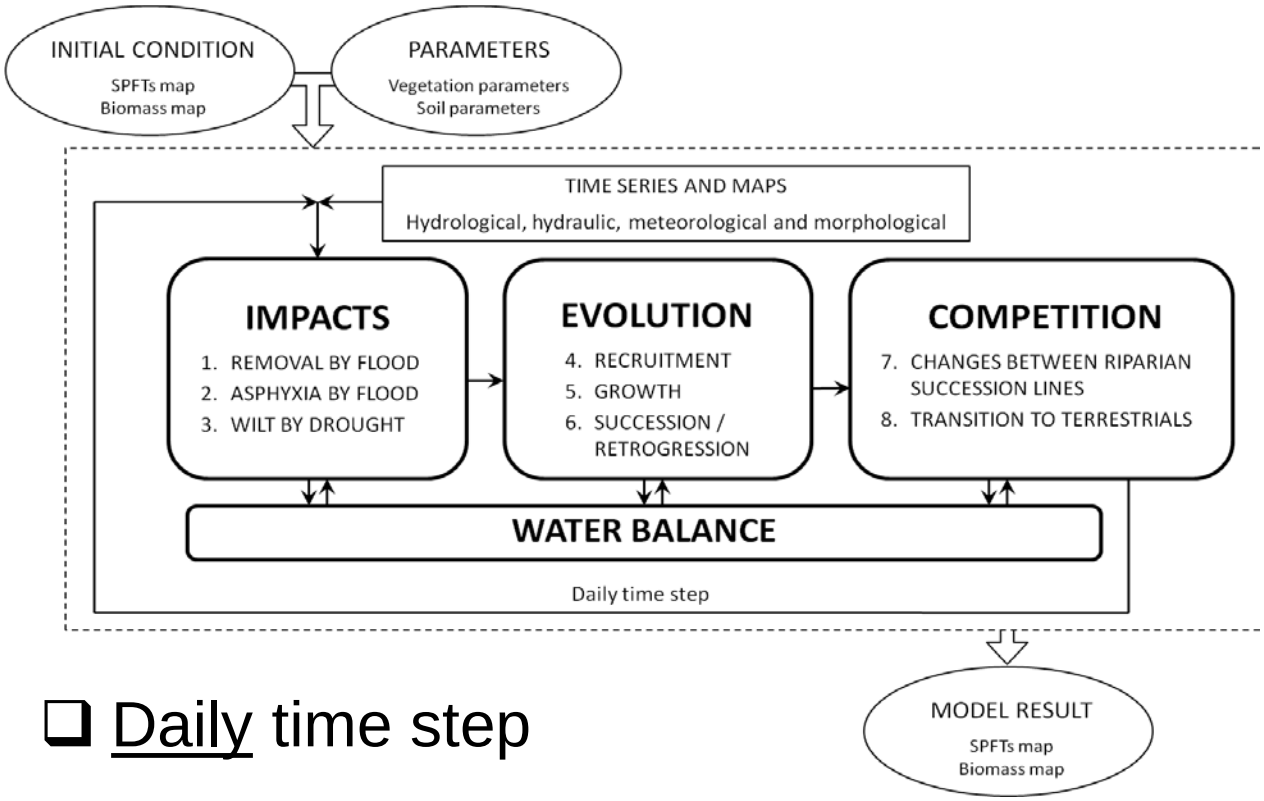
- Main conclusion → the spatial **robustness** of the model

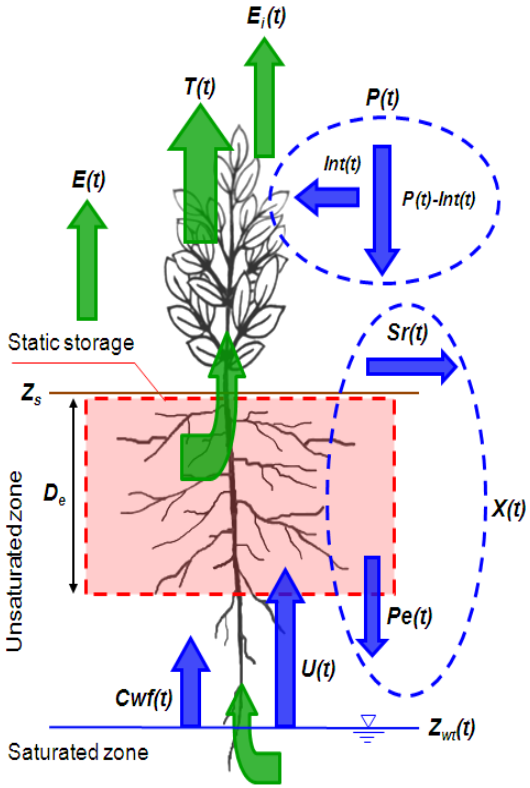
  RVDM is capable to predict plant behaviour under different hydrological regimes in different river systems

RVDM (García-Arias and Francés, 2016)

Ecohydrology 9 (3): 438–459
DOI: 10.1002/eco.1648

- Modular structure
- Distributed in small cells → distance to water table





- Daily time step

RVDM (García-Arias and Francés, 2016)

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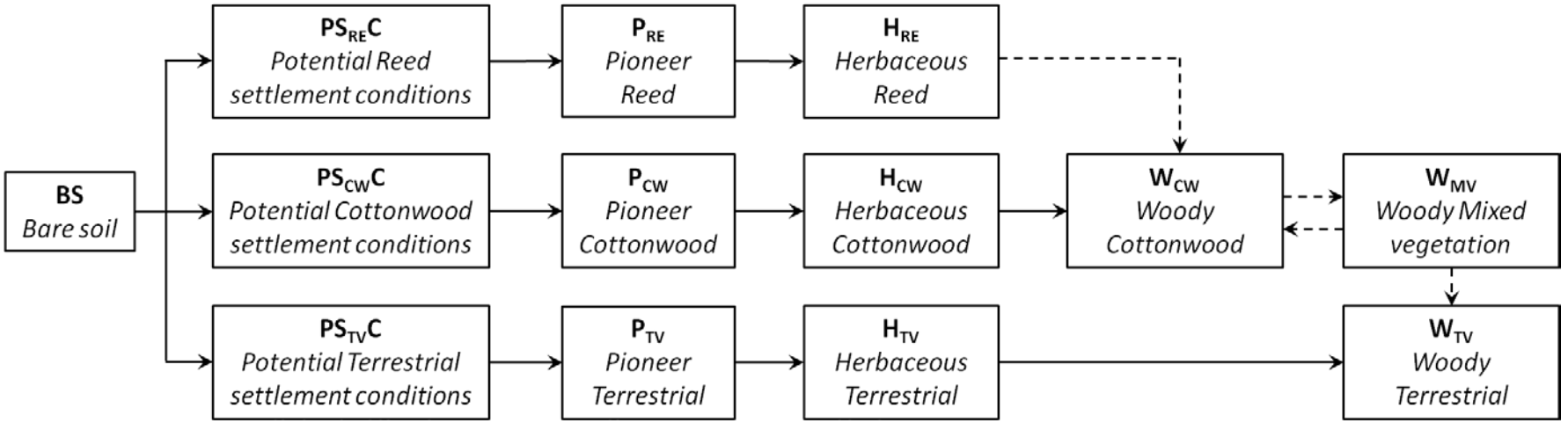
❑ SPFT → Main state variable of RVDM

- ❑ 2 Riparian succession lines: **Reed (RE)** and **Cottonwood (CW)**
- ❑ 1 **Terrestrial (TV)** → zonal vegetation



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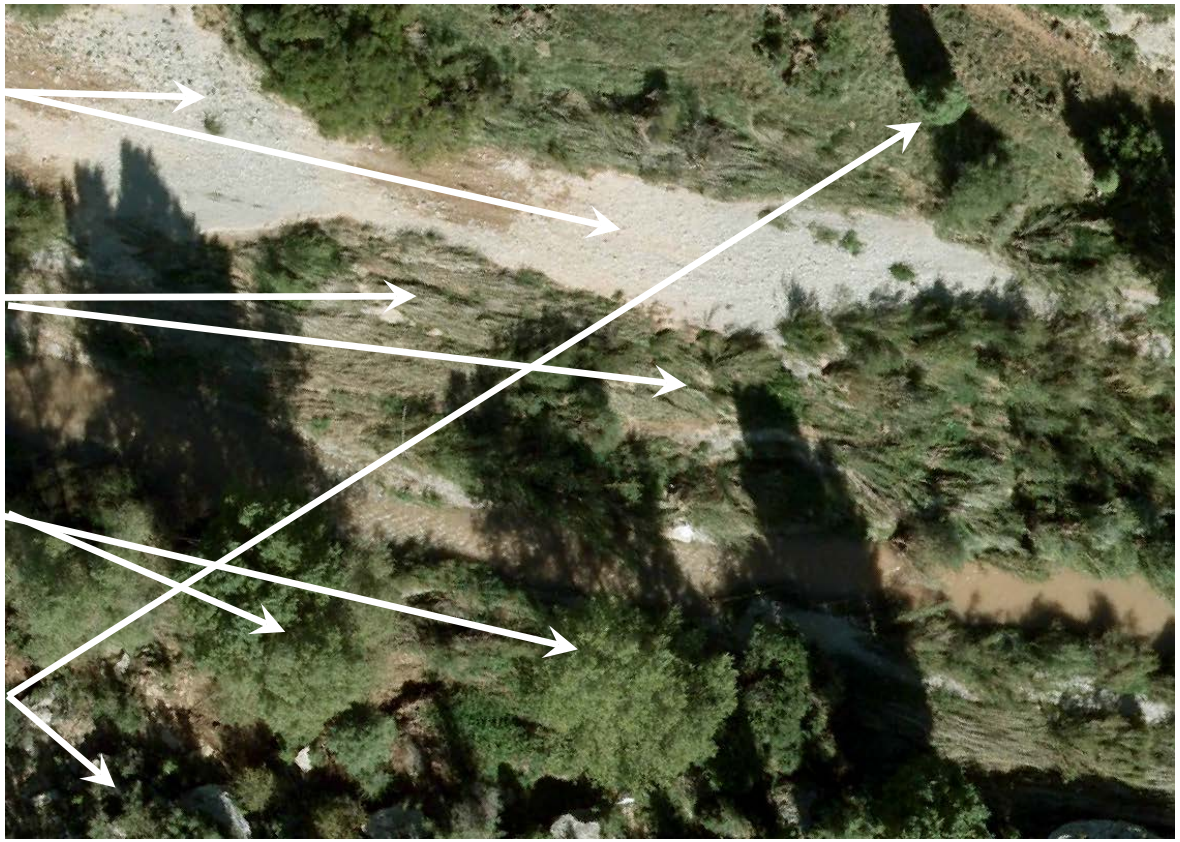

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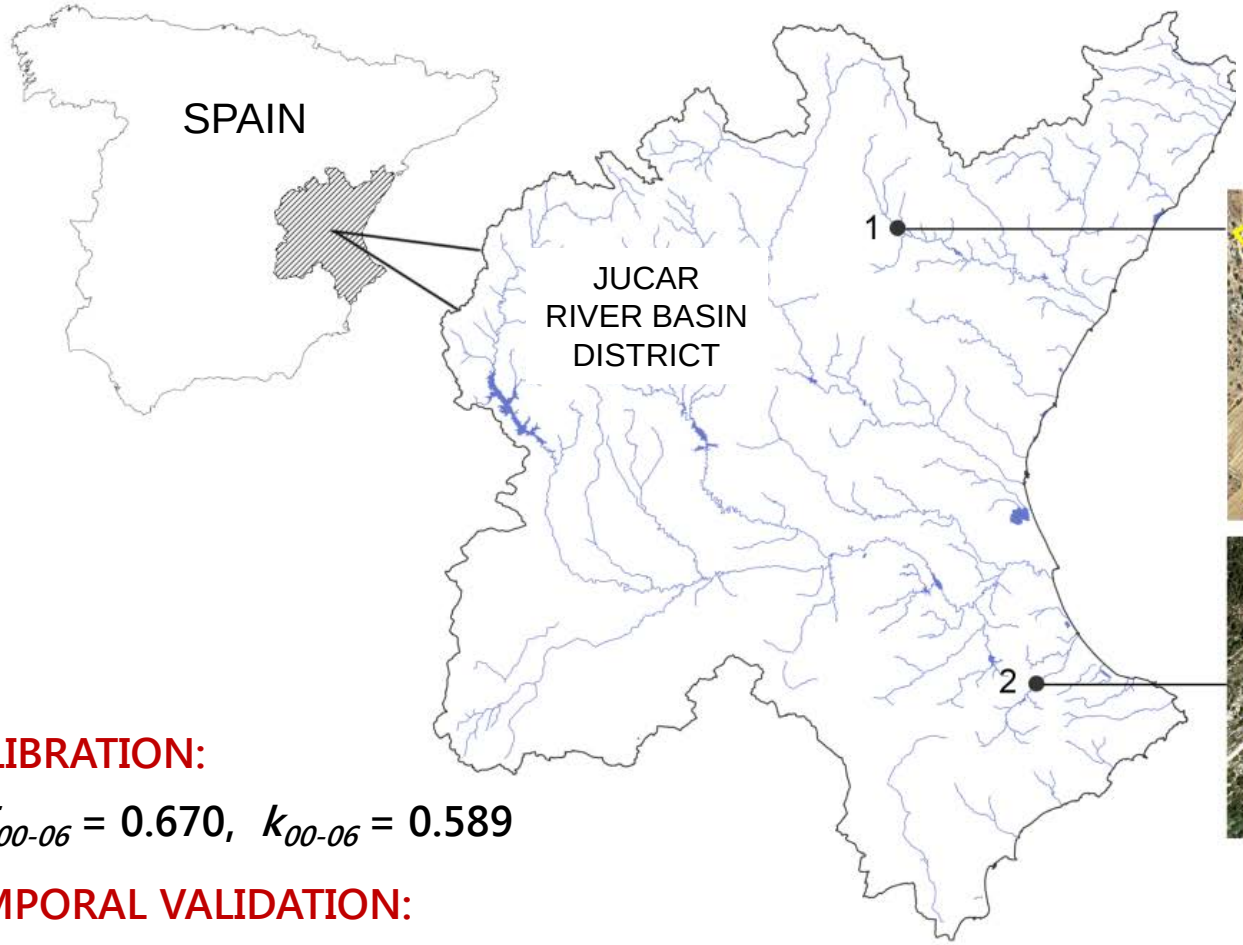


RVDM **CALIBRATION**
STUDY SITE: Terde reach, Mijares River

SPATIAL VALIDATION
STUDY SITE: Lorcha reach, Serpis River

CALIBRATION:

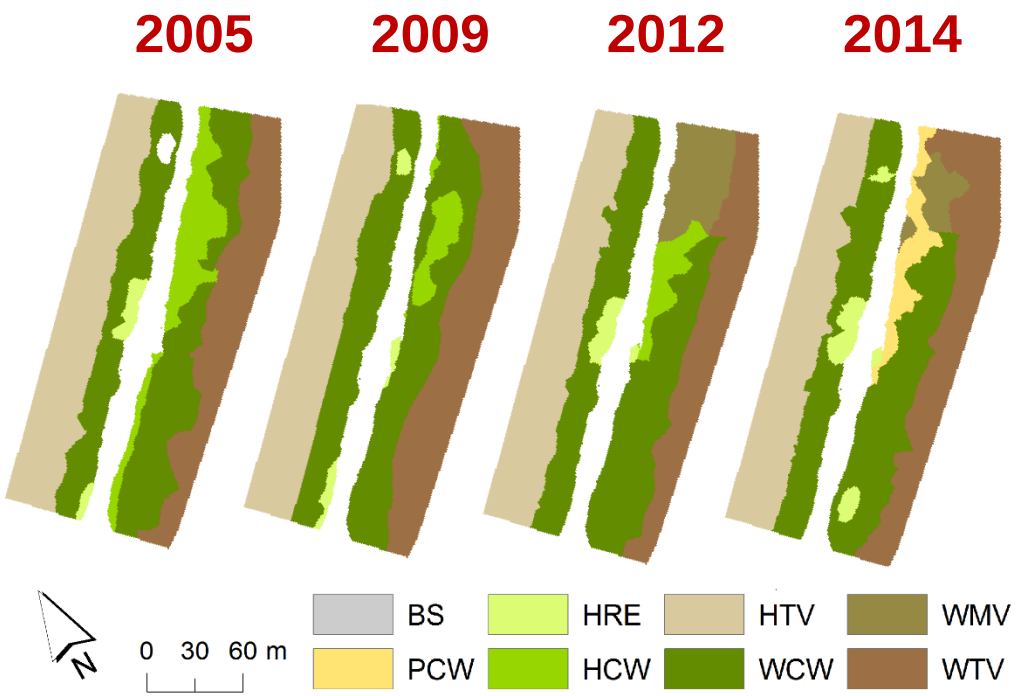
$CCI_{00\text{-}06}$ = 0.670, $k_{00\text{-}06}$ = 0.589

TEMPORAL VALIDATION:

$CCI_{06\text{-}09}$ = 0.639, $k_{06\text{-}09}$ = 0.545

SPATIAL VALIDATION

- Case study → **Lorcha reach, Serpis River, Spain**
  - Semiarid climate
  - Regulated flow
  - Vegetation maps:



SPATIAL VALIDATION

- **RESULTS:** Period Sep2005 - **Nov2009** (1771 days of simulation)
  - ***CCI*** = **0.67**, ***kappa*** = **0.58**

	BS-PSC	HRE	HCW	HTV	WCW	WMV	WTV
BS-PSC	**0**	0	0	0	0	0	0
HRE	39	**233**	32	0	136	1	0
HCW	28	0	**942**	0	0	76	0
HTV	0	0	0	**7371**	163	12	0
WCW	38	477	**1726**	385	**3656**	**4019**	141
WMV	0	0	0	0	0	**0**	0
WTV	0	0	19	0	0	**1677**	**5650**

SPATIAL VALIDATION

❑ **RESULTS:** Period Sep2005 - **Nov2009** (1771 days of simulation)

➢ *CCI* = 0.67, *kappa* = 0.58

➢ ***Phases:***

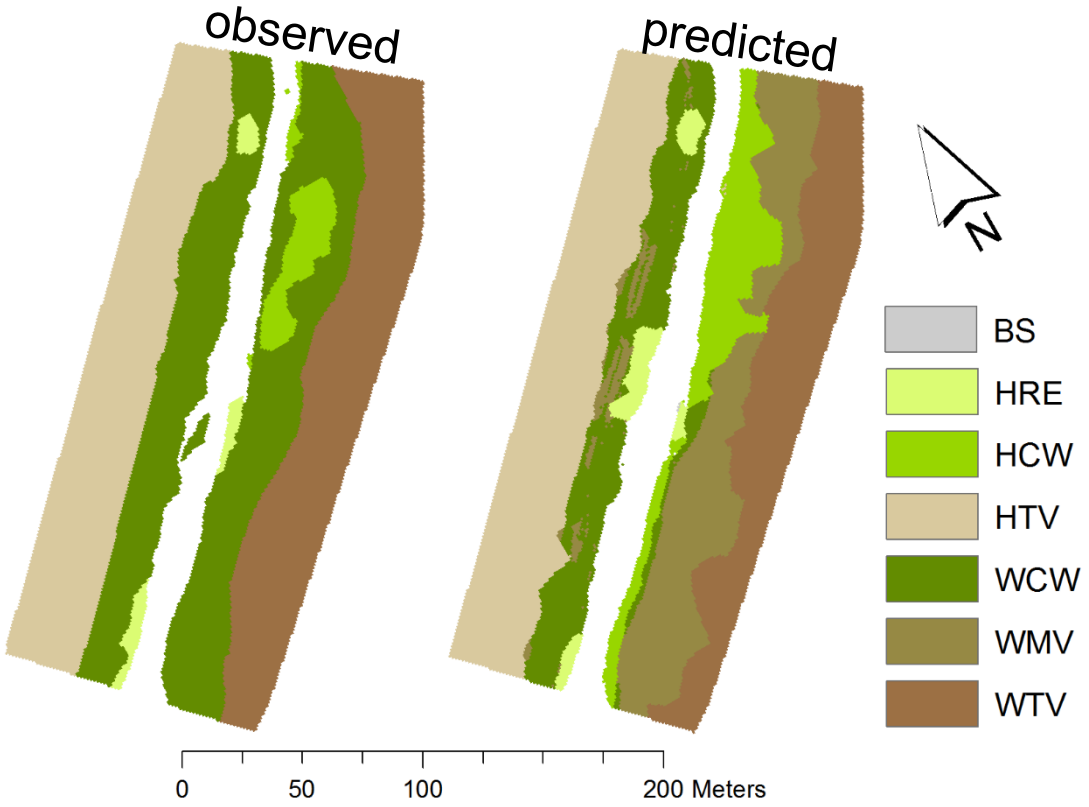
CCI = **0.88**, ***kappa*** = **0.76**

	BS-PSC	H	W
BS-PSC	**0**	0	0
H	67	**8578**	388
W	38	2607	**15143**

➢ ***Lines:***

CCI = **0.73**, ***kappa*** = **0.56**

	RE	CW	MIX	TV
RE	**233**	204	4	0
CW	477	**6390**	4095	526
MIX	0	0	**0**	0
TV	0	182	1689	**13021**



SPATIAL VALIDATION

- **RESULTS:** Period Sep2005 - **Jun2012** (2734 days of simulation)
  - ***CCI*** = **0.60**, ***kappa*** = **0.52**

	HRE	HCW	HTV	WCW	WMV	WTV
HRE	**368**	3	29	4	106	0
HCW	13	**1019**	12	7	84	0
HTV	0	0	**7482**	0	78	0
WCW	329	**774**	300	**1087**	**6819**	651
WMV	0	932	29	0	**1292**	182
WTV	0	0	0	0	**263**	**4958**

SPATIAL VALIDATION

- **RESULTS:** Period Sep2005 – **Jun2012** (2734 days of simulation)
  - *CCI* = 0.60, *kappa* = 0.52

- ***Phases:***

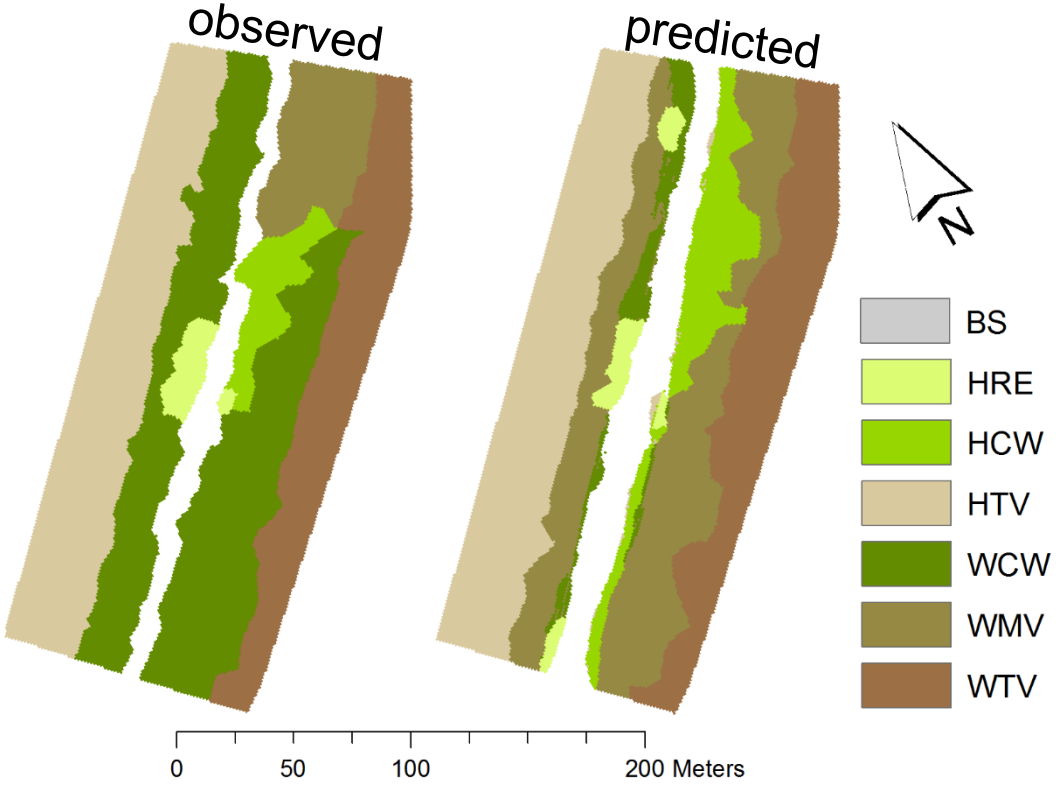
  CCI = **0.90**, ***kappa*** = **0.79**

	BS-PSC	H	W
BS-PSC	**0**	0	0
H	0	**8926**	279
W	0	2364	**15252**

- ***Lines:***

  CCI = **0.63**, ***kappa*** = **0.45**

	RE	CW	MIX	TV
RE	**368**	7	29	106
CW	342	**2887**	963	6903
MIX	0	0	**12440**	341
TV	0	932	211	**1292**



SPATIAL VALIDATION

- **RESULTS:** Period Sep2005 - **Jul2014** (3469 days of simulation)
  - ***CCI*** = **0.62**, ***kappa*** = **0.53**

	BS-PSC	PCW	HRE	HCW	HTV	WCW	WMV	WTV
BS-PSC	**0**	0	0	0	0	0	0	0
PCW	**55**	**0**	23	**1344**	4	58	21	0
HRE	31	0	**422**	13	40	65	357	0
HCW	0	0	0	**0**	0	0	0	0
HTV	0	0	0	0	**7260**	9	65	0
WCW	29	0	204	**895**	513	**3112**	**4390**	665
WMV	1	0	0	432	0	0	**574**	8
WTV	0	0	0	24	0	2	**1087**	**5118**

SPATIAL VALIDATION

- **RESULTS:** Period Sep2005 – **Jul2014** (3469 days of simulation)
  - *CCI* = 0.62, *kappa* = 0.53

- ***Phases:***

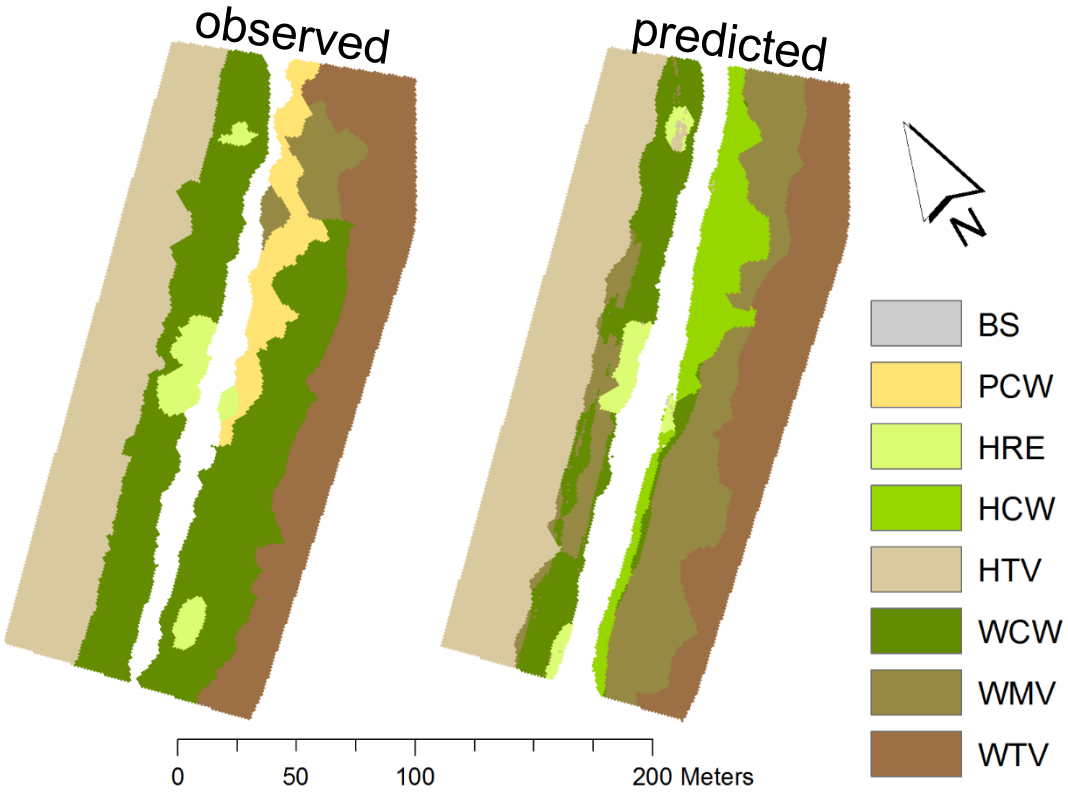
  CCI = **0.85**, ***kappa*** = **0.69**

	BS-PSC	P	H	W
BS-PSC	**0**	0	0	0
P	55	**0**	1371	79
H	31	0	**7735**	496
W	30	0	2068	**14956**

- ***Lines:***

  CCI = **0.70**, ***kappa*** = **0.54**

	RE	CW	MIX	TV
RE	**422**	106	40	360
CW	227	**5490**	1182	4414
MIX	0	35	**12378**	1152
TV	0	433	8	**574**



DISCUSSION

TERDE REACH
(Mijares River)

CALIBRATION

Period 2000-2006	*CCI*	*kappa*
SPFTs	0.67	0.59
Phases	0.76	0.48
Lines	0.72	0.60

TEMPORAL VALIDATION

Period 2006-2009	*CCI*	*kappa*
SPFTs	0.64	0.55
Phases	0.77	0.45
Lines	0.67	0.54

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LORCHA REACH
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TAKE HOME IDEAS

- **RVDM (Riparian Vegetation Dynamic Model)** → riparian vegetation prediction in **natural** and **hydrologically altered** semiarid systems

  - **versatility** → predicts vegetation dynamics under **modified seasonality of natural driver variables**

  - **robustness** → predict riparian communities distribution with **similar accuracy under different hydrological regimes in different river systems**

- What about **other river systems different from semiarid**? … **IN PROCESS**

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Thank you for your attention

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