

# Mechanisms of vegetation removal by floods on bars of a heavily managed gravel bed river: Isère River, France

Camille Jourdain<sup>1\*</sup>, Philippe Belleudy<sup>1</sup>, Michal Tal<sup>2</sup>, Jean-René Malavoi<sup>3</sup>

general assembly 2016

## Context and questions

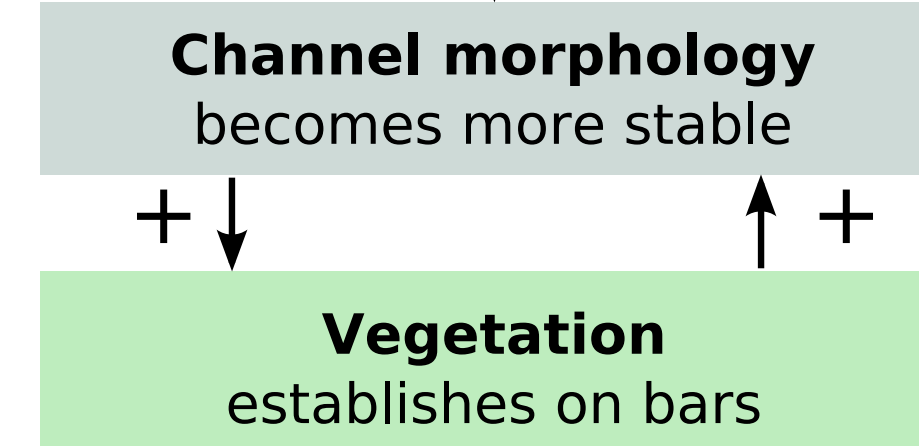
The morphology of river beds is maintained by their **hydrological and sediment regimes**. It is also highly impacted by **vegetation**, which has a stabilizing impact on channel morphology.

**River training (dam, dykes)** alters sediment supply and hydrological regime

Vegetation encroachment is common in managed rivers, and presents problems of :

- increased flood risks
- biodiversity loss
- costs of mechanical clearing

In this context, we are investigating whether artificial floods can be used to limit vegetation establishment on managed rivers.

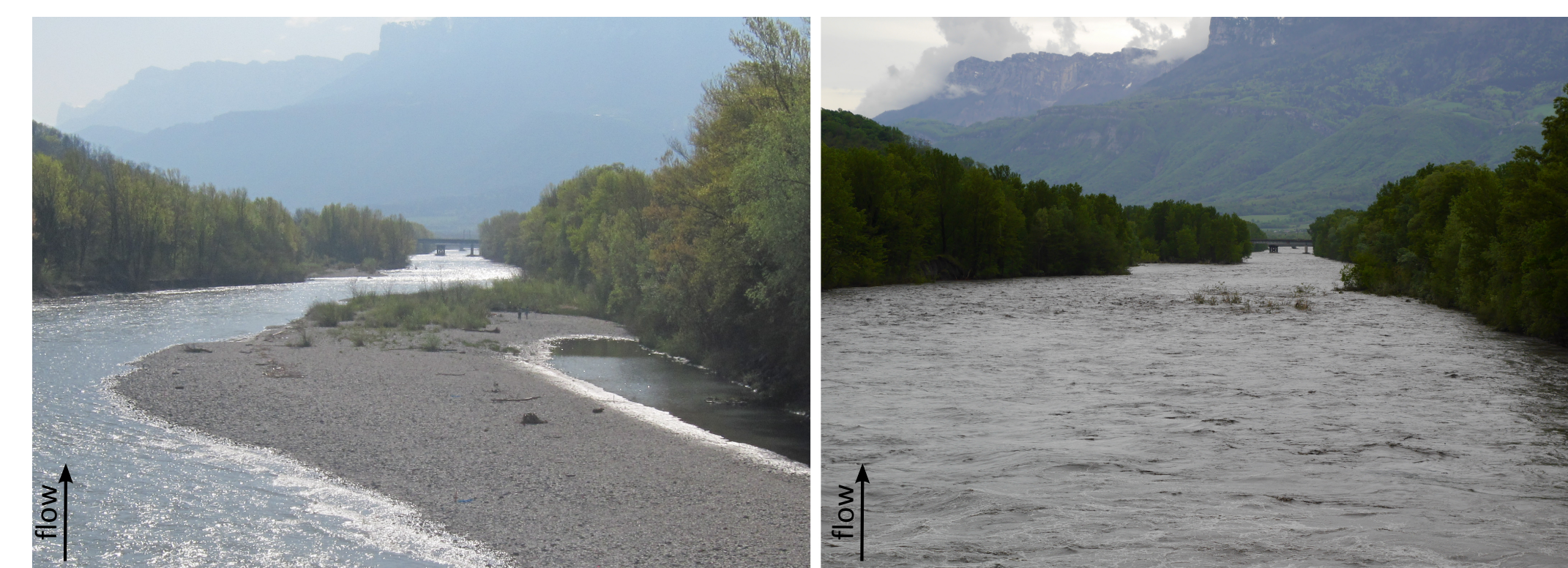
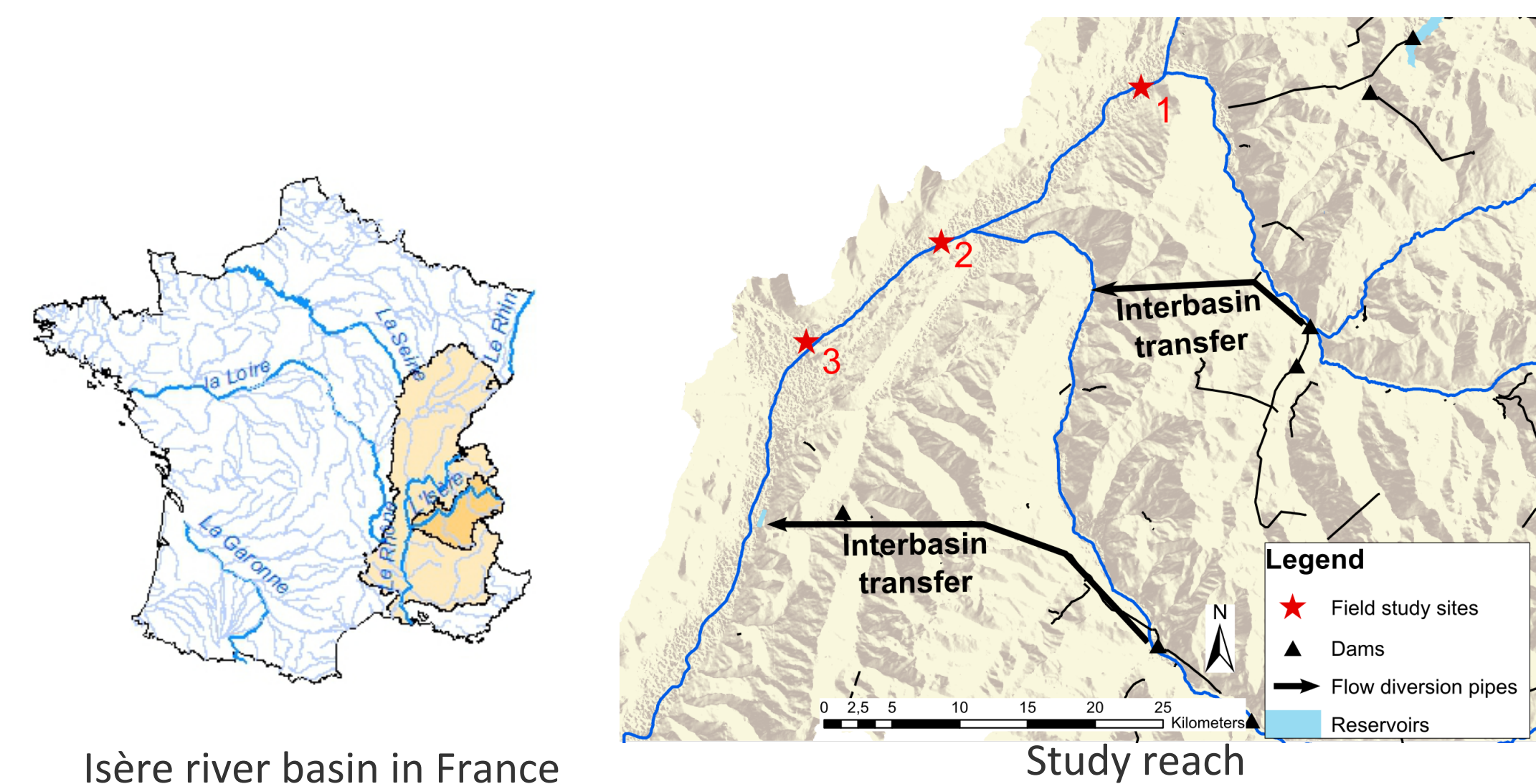


### Research questions :

- What are the **mechanisms of vegetation removal** from river bars by floods?
- Can we relate these mechanisms to specific conditions of **bed mobility**?
- **Which floods** are able to remove vegetation from bars on the Isere River?

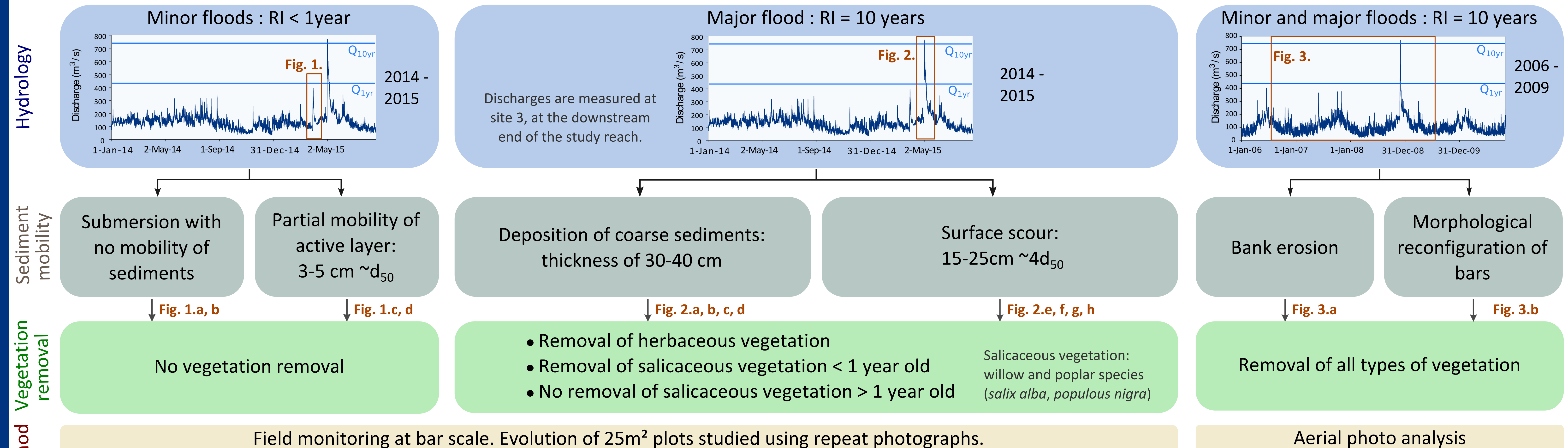
## Study Site : Isere River, French Alps

The **Isère River** is a formerly braided Alpine gravel bed river. It has been heavily impacted by **dyking, sediment extractions, and hydroelectricity**. Three field sites are being monitored.

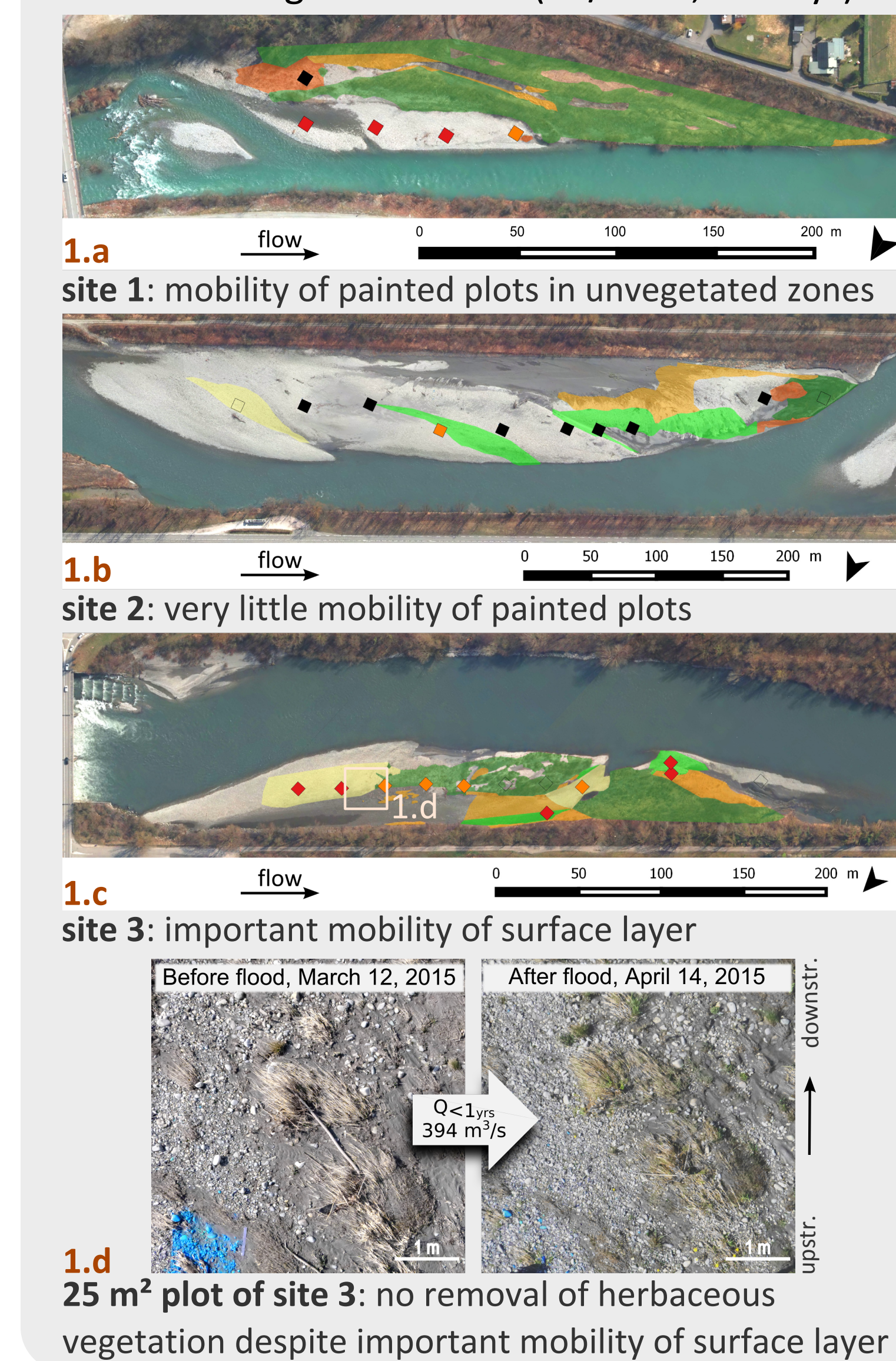


View of the Isère River at low and high flow (site 3)

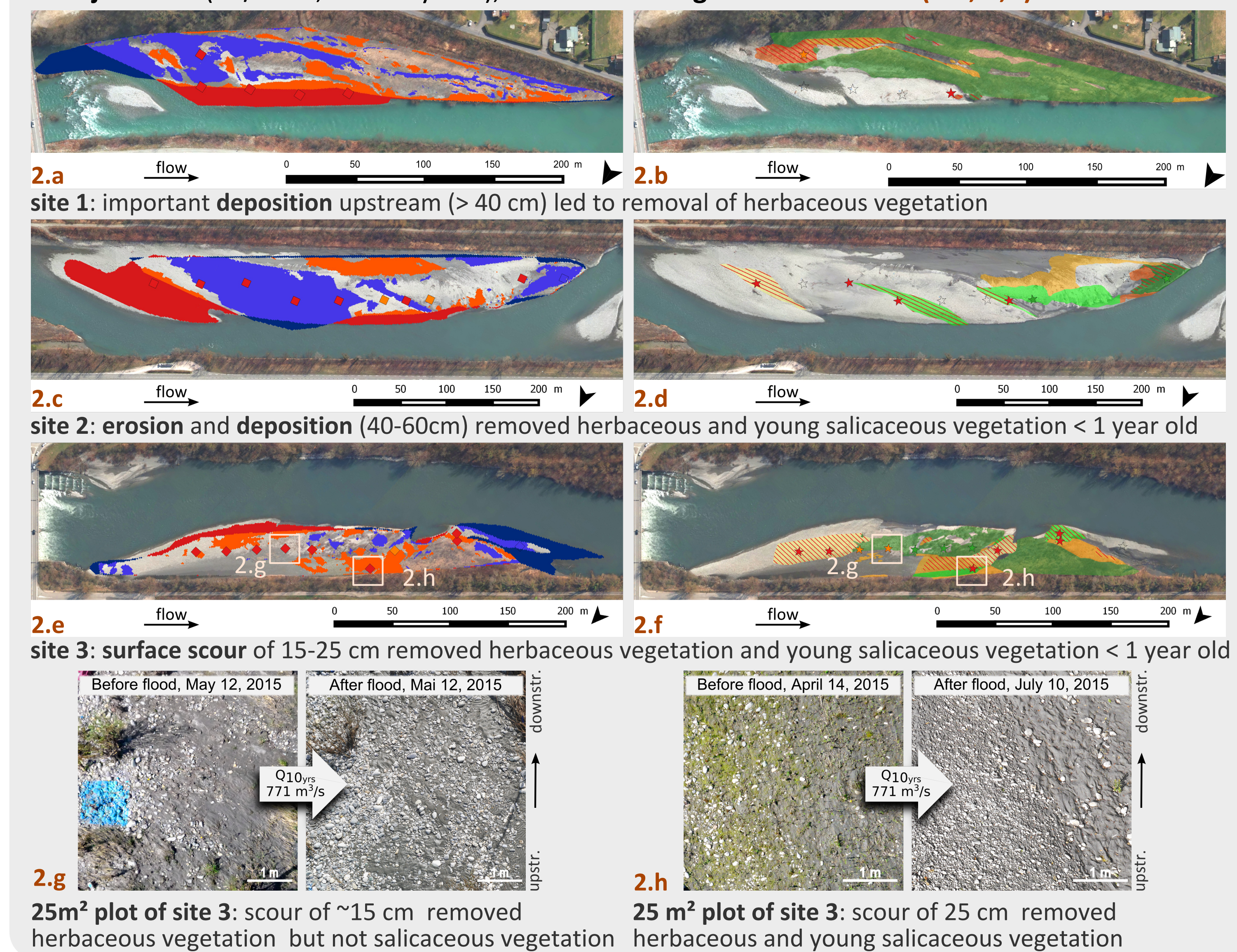
## Observed impacts of floods on bed mobility and vegetation



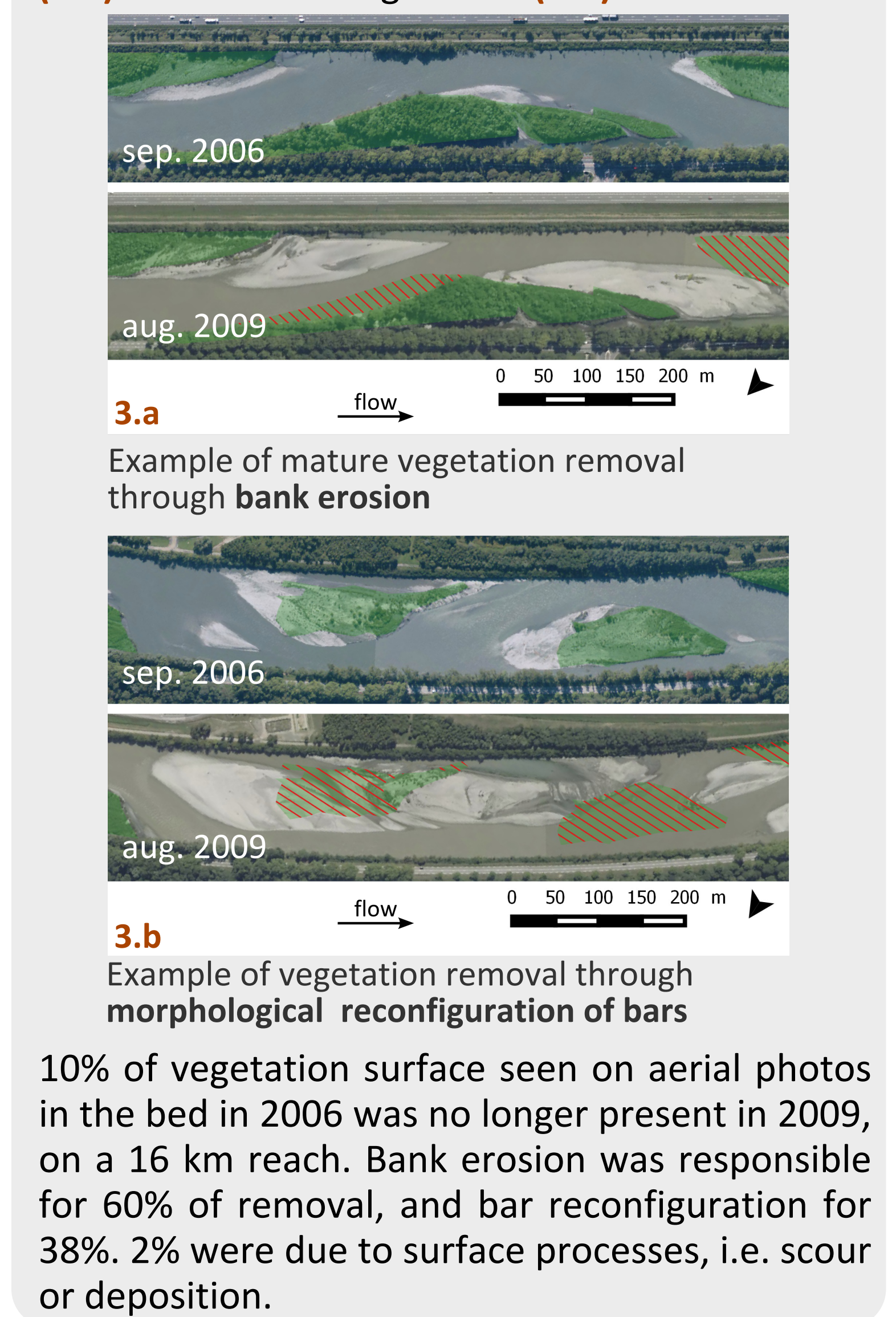
**Fig. 1. Mobility of painted plots and no vegetation removal during minor flood (03/2015, RI < 1yr)**



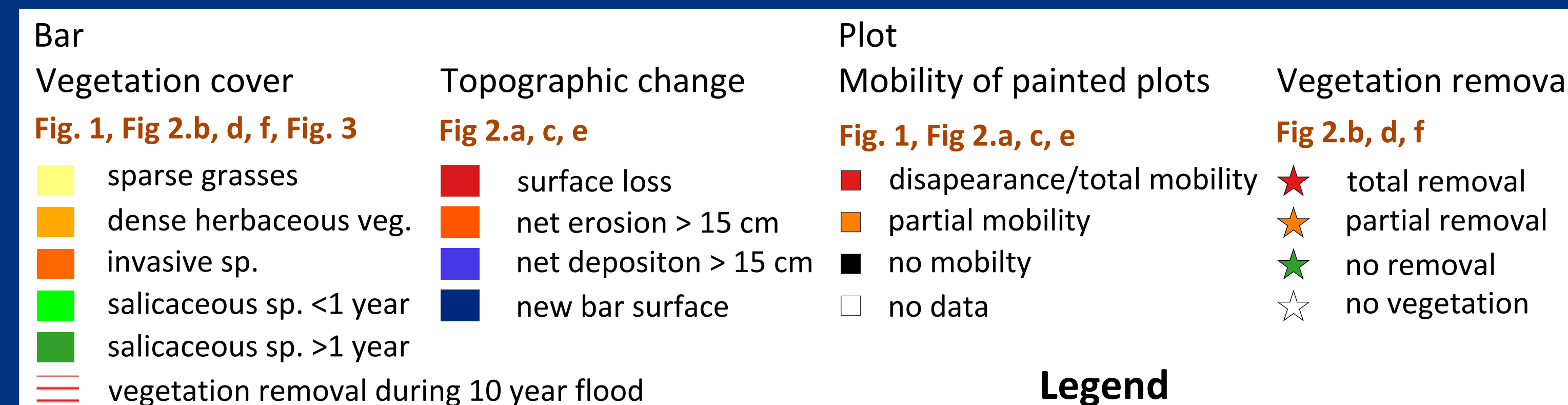
**Fig. 2. Bar mobility observed through painted plots and net topographic change (2.a, c, e) following a major flood (05/2015, RI = 10 years), and induced vegetation removal (2.b, d, f)**



**Fig. 3. Vegetation removal through bank erosion (3.a) and bar reconfiguration (3.b)**



10% of vegetation surface seen on aerial photos in the bed in 2006 was no longer present in 2009, on a 16 km reach. Bank erosion was responsible for 60% of removal, and bar reconfiguration for 38%. 2% were due to surface processes, i.e. scour or deposition.



## Take home

- ✓ **Partial mobility** of the active layer is **not sufficient** to remove vegetation from bars.
- ✓ **Surface Scour** (15-25 cm) and **deposition** (> 40 cm) are able to **remove pioneer vegetation**.
- ✓ **Mature vegetation** is most efficiently removed by **bank erosion** and **complex bar reconfiguration**.
- ✓ On the Isère river, only **major flood events** induce enough bed mobility to remove vegetation from river bars.

<sup>1</sup> Univ. Grenoble Alpes, LTHE, F-38000 Grenoble, France  
<sup>2</sup> Aix-Marseille Université, CEREGE UMR 7330, 13545 Aix-en-Provence, France  
<sup>3</sup> Electricité de France, Lyon, France  
\*corresponding author: camille.jourdain@ujf-grenoble.fr