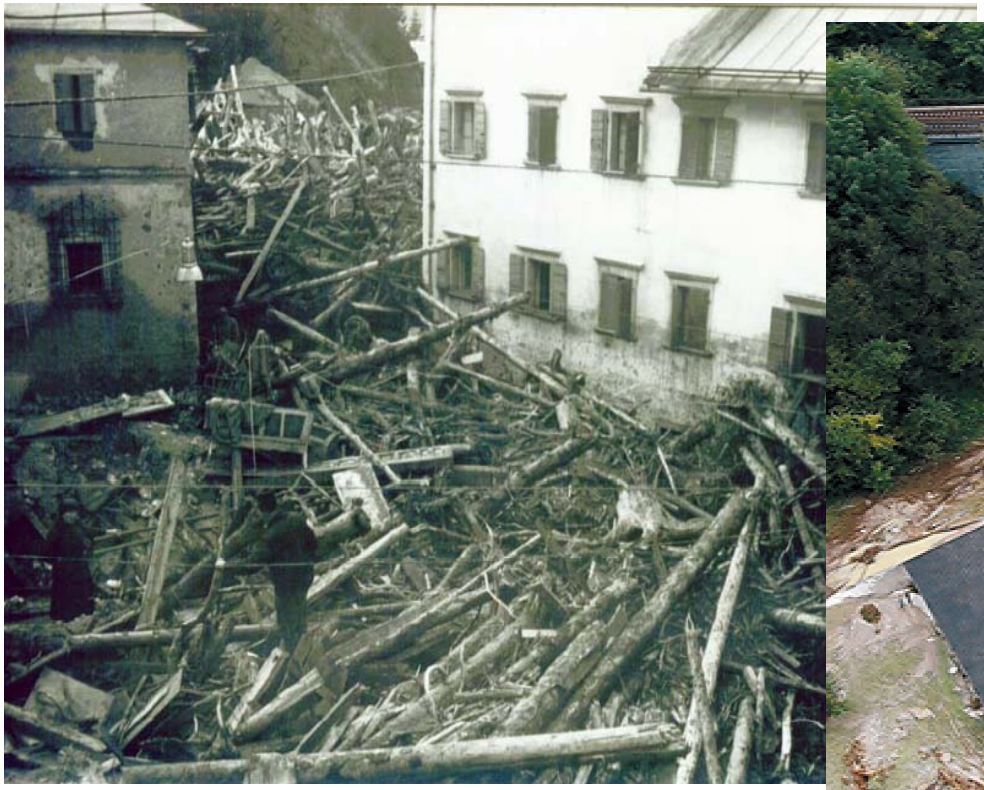
Third International Conference
WOOD IN WORLD RIVERS 2015
PADOVA, ITALY, July 6-10 2015

Wood is good but it moves!
Associated problems and research issues

Piégay H., Benacchio V., Boivin M., Lemaire P., MacVicar B., Moulin B., Ruiz-Villanueva V., Buffin-Bélanger T., Michel K., Stoffel M., Tougne L.



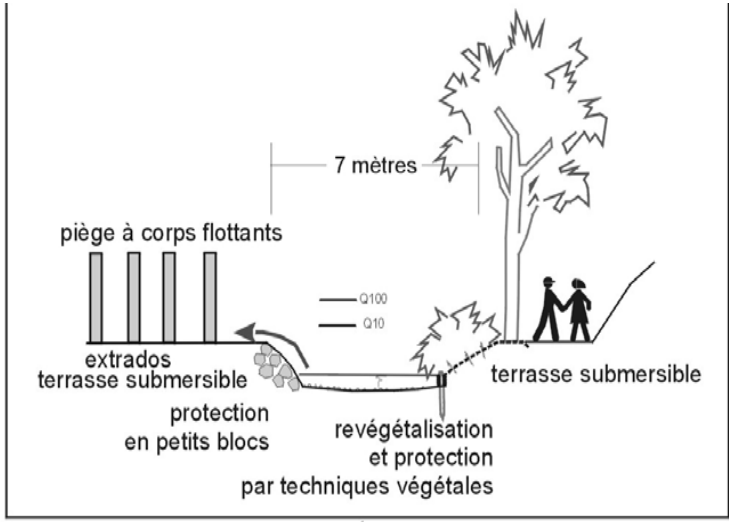
F. Comiti, pers. com.

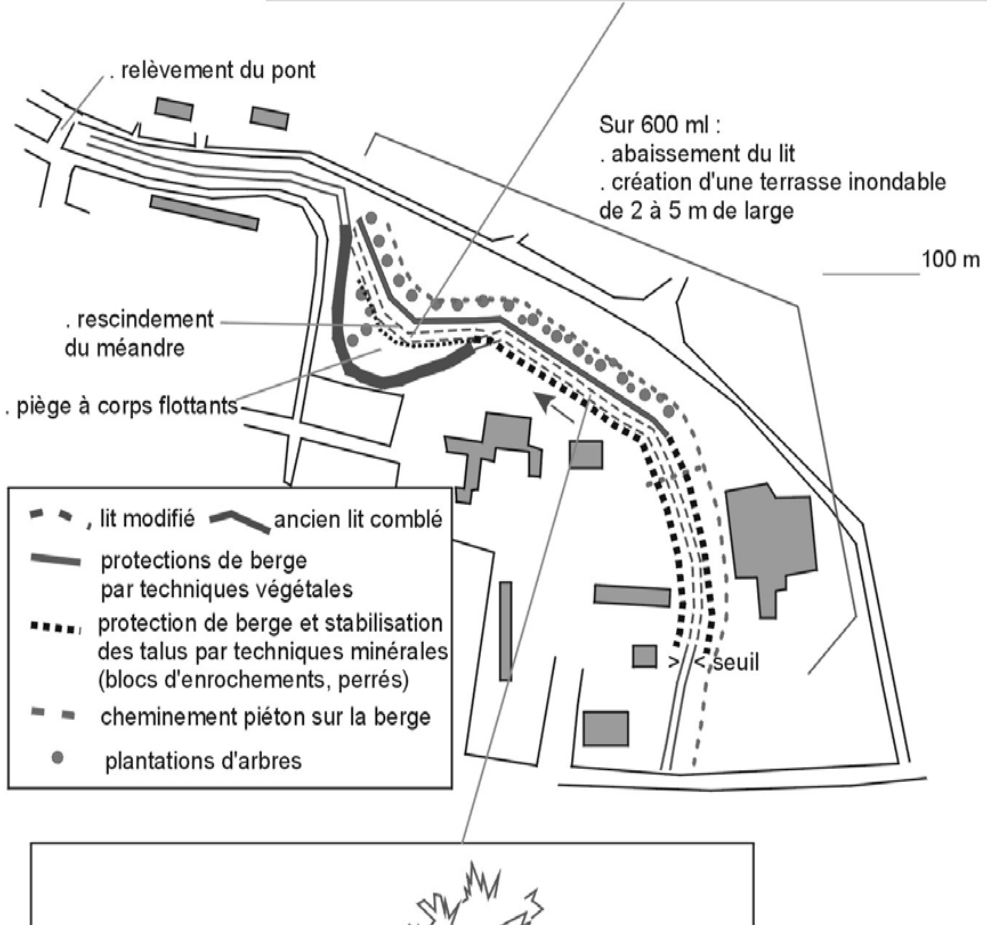
G.R. Bezzola, pers. com.

A. Rimböck, pers. com.

http://www.wwa-ke.bayern.de/fluesse_seen/massnahmen/bodensee_treibholz/index.htm

R.G. Bezzola
Com. perso.





Gérer les flux de bois et leur intérêt piscicole amont tout en valorisant les milieux riverains

M. Boyer, Concept Cours d'eau

. relèv

. rescinder
du méand

. piège à corps f

, lit mod

protect
par tec

protect
des tal
(blocs

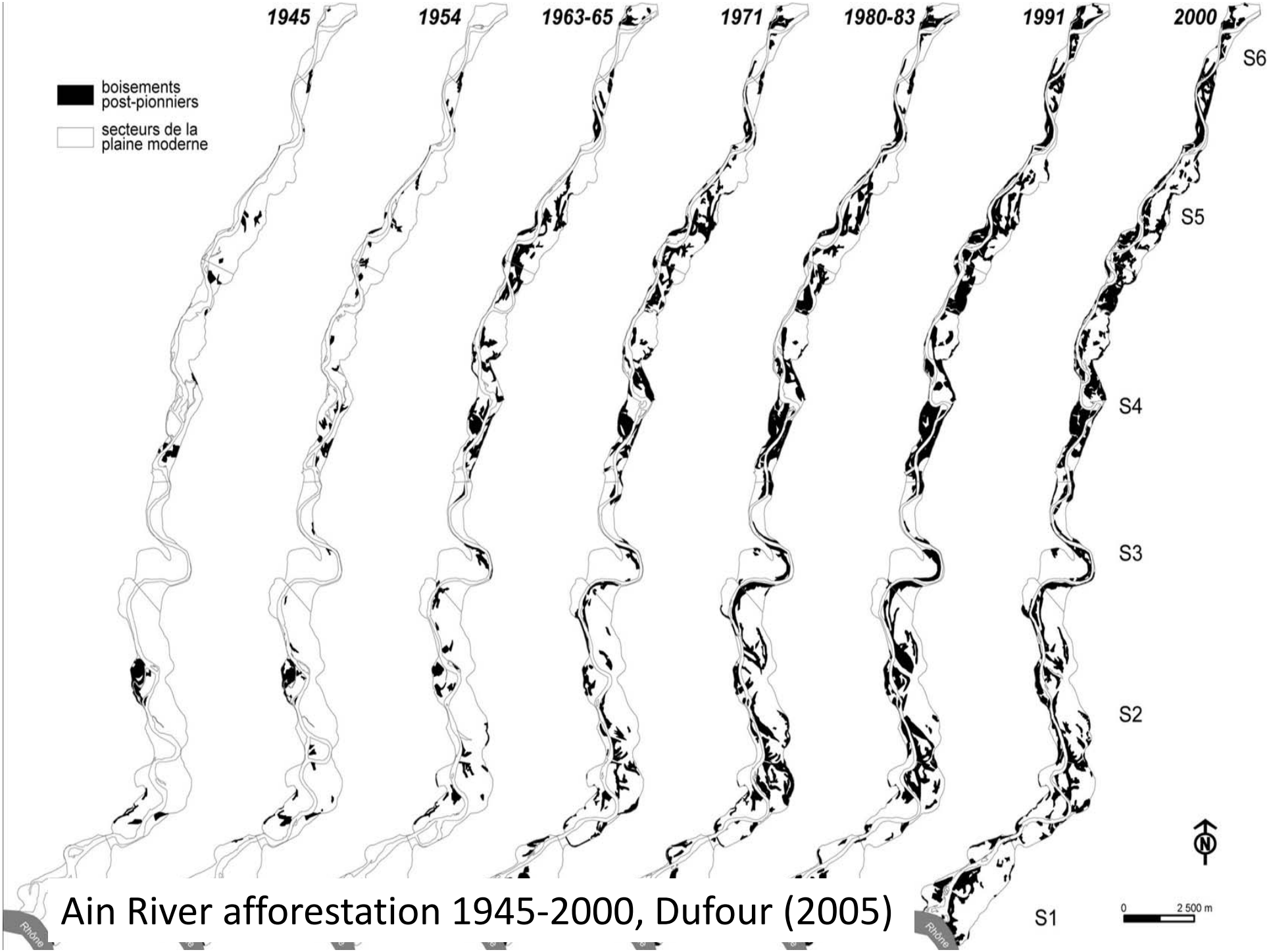
chemir

planta

Carmel river, Californie, USA, 2003 (Photo by D. Smith)

1894

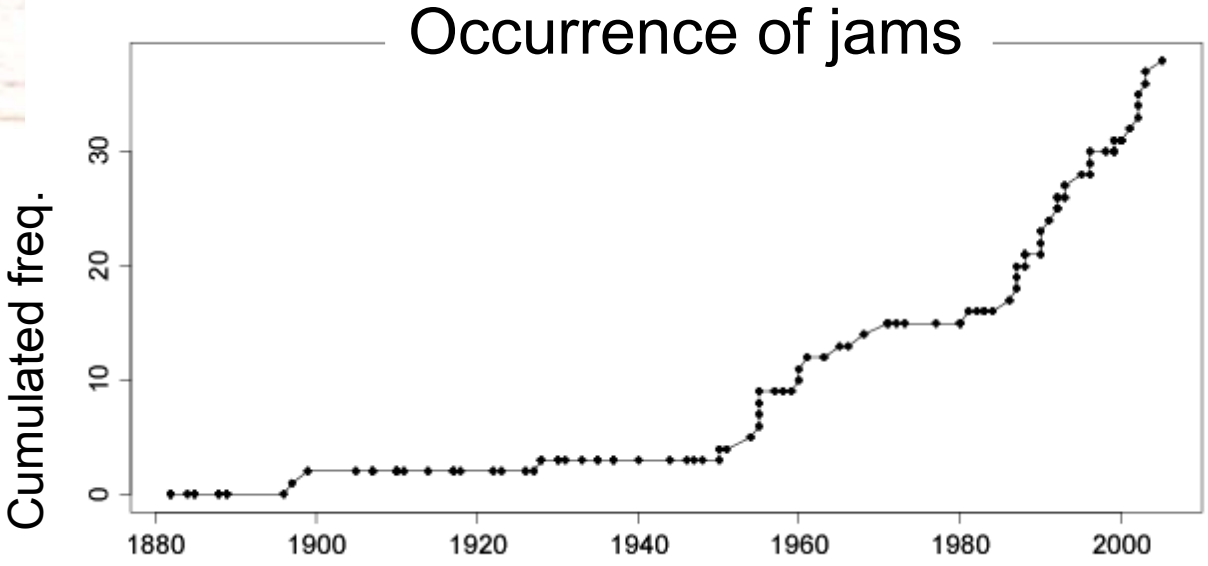
1996



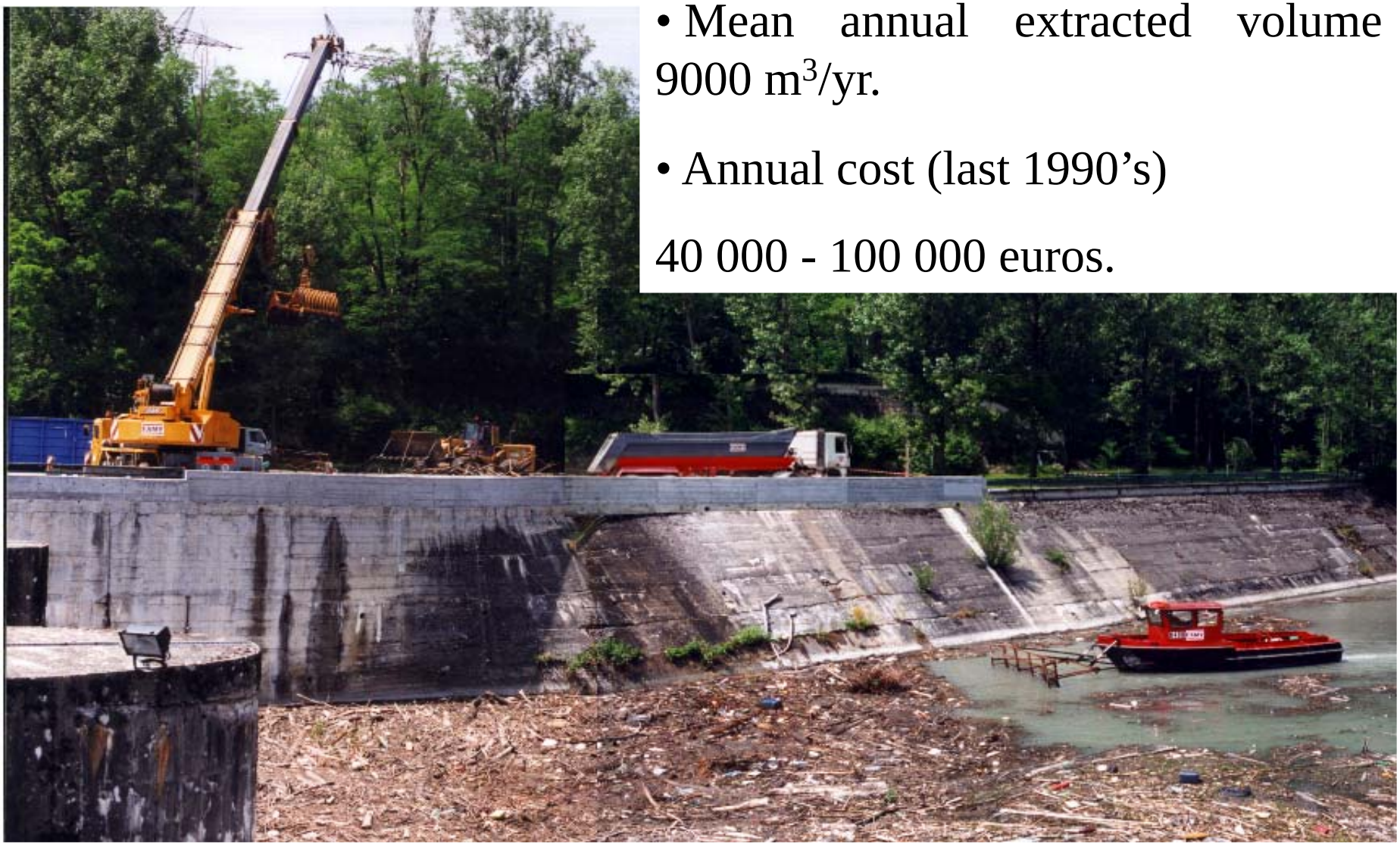
Ain River afforestation 1945-2000, Dufour (2005)


Ain, River

Daily regional newspapers
1879/ 2005
110 Floods studied
(from Y. Lelay, 2007)



Génissiat on the Rhône (France) :

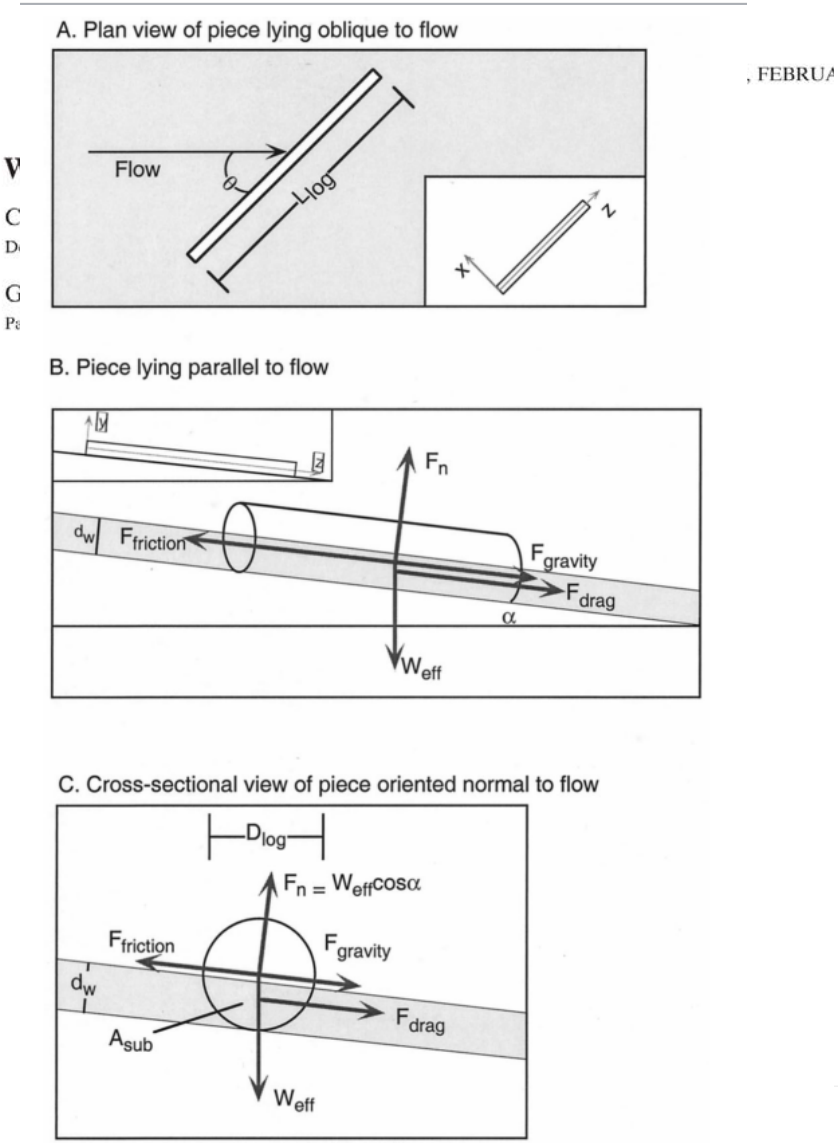


• Mean annual extracted volume 9000 m^3/yr.

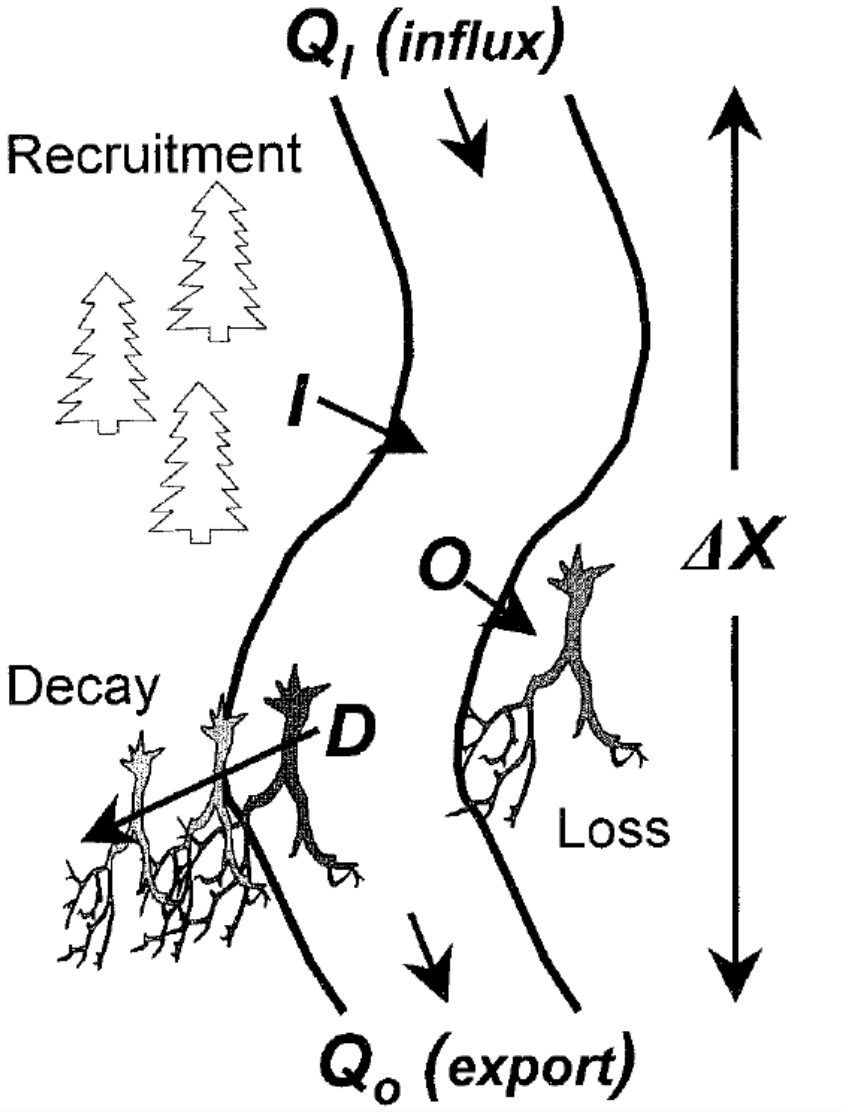
• Annual cost (last 1990's)

40 000 - 100 000 euros.

Wood moves!

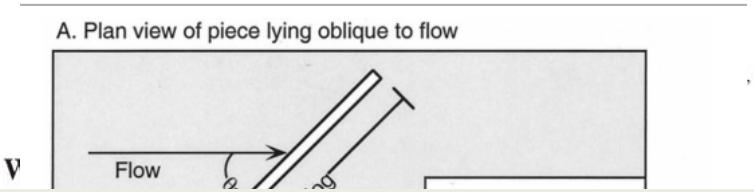


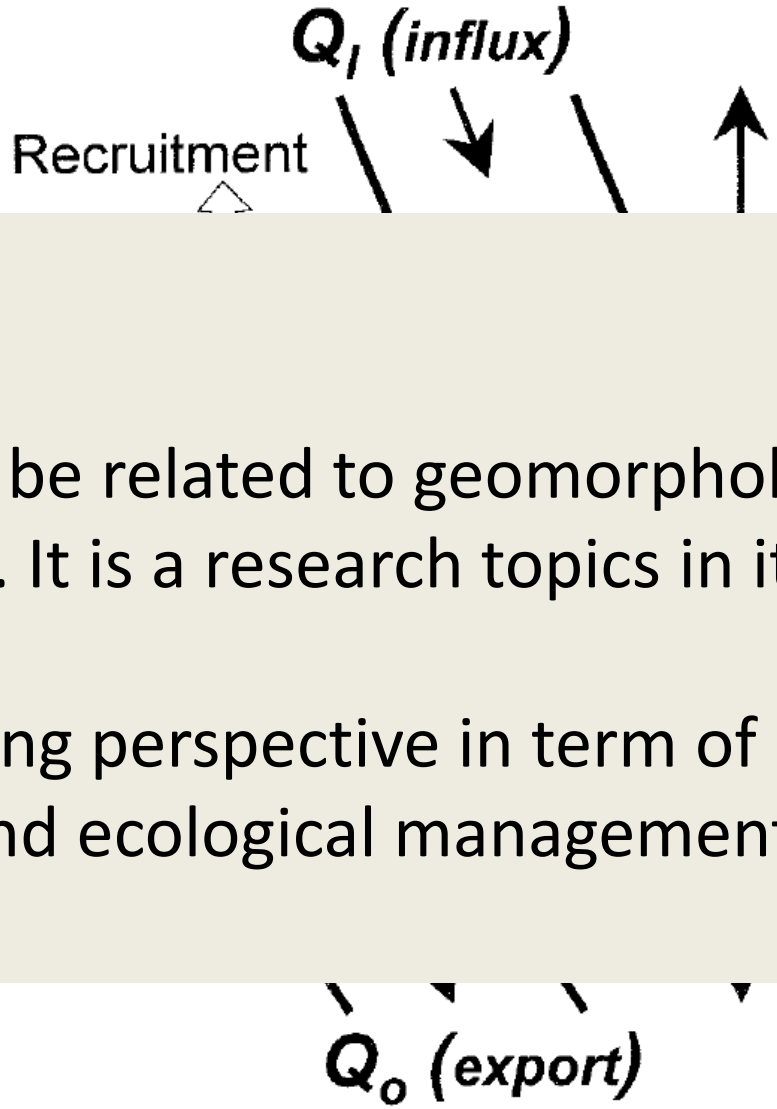
Braudrick and Grant, 2000



Martin & Benda, 2001

Wood moves!

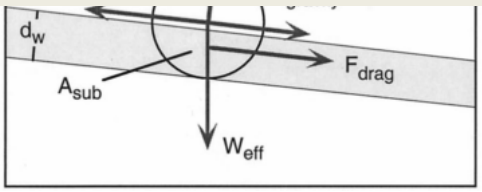




2006 – Stirling :

Wood study does not need to be related to geomorphology or to ecology to be of interest. It is a research topics in itself

Wood budgeting is a challenging perspective in term of knowledge, but also for risk and ecological management



Braudrick and Grant, 2000

Martin & Benda, 2001

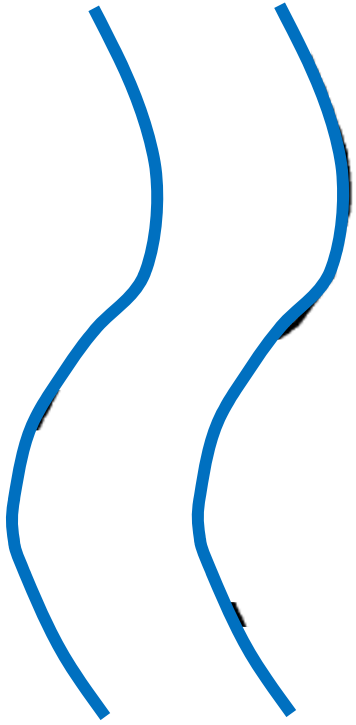
Open questions

How can we evaluate wood budgeting and wood flux in basins?

=> Understand time series of all parameters

Video, Photo

Photo
+ Field monitoring



Tagging / Tracking
Monitoring
(radiotransmitters,
RFID, GPS,)

Modelling

Dating
Experimenting

Video, Photo,
Field monitoring
(obs. windows)

Each issue is a research question in itself
Integration and modelling are challenging

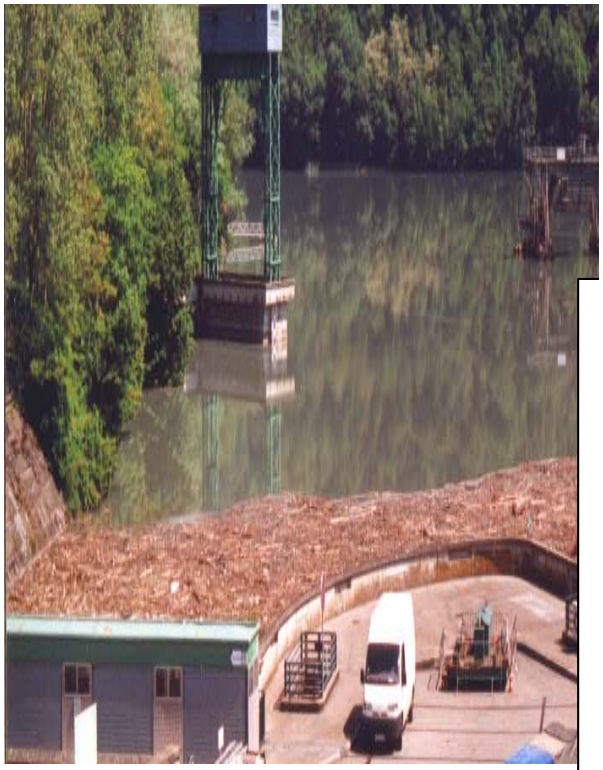
Martin & Benda, 2001

Qo – Basin delivery

$$V = 7.41\,Qr - 3459 \qquad (r^2 = 0.71; p < 0.0001)$$

Moulin & Piégay, 2004

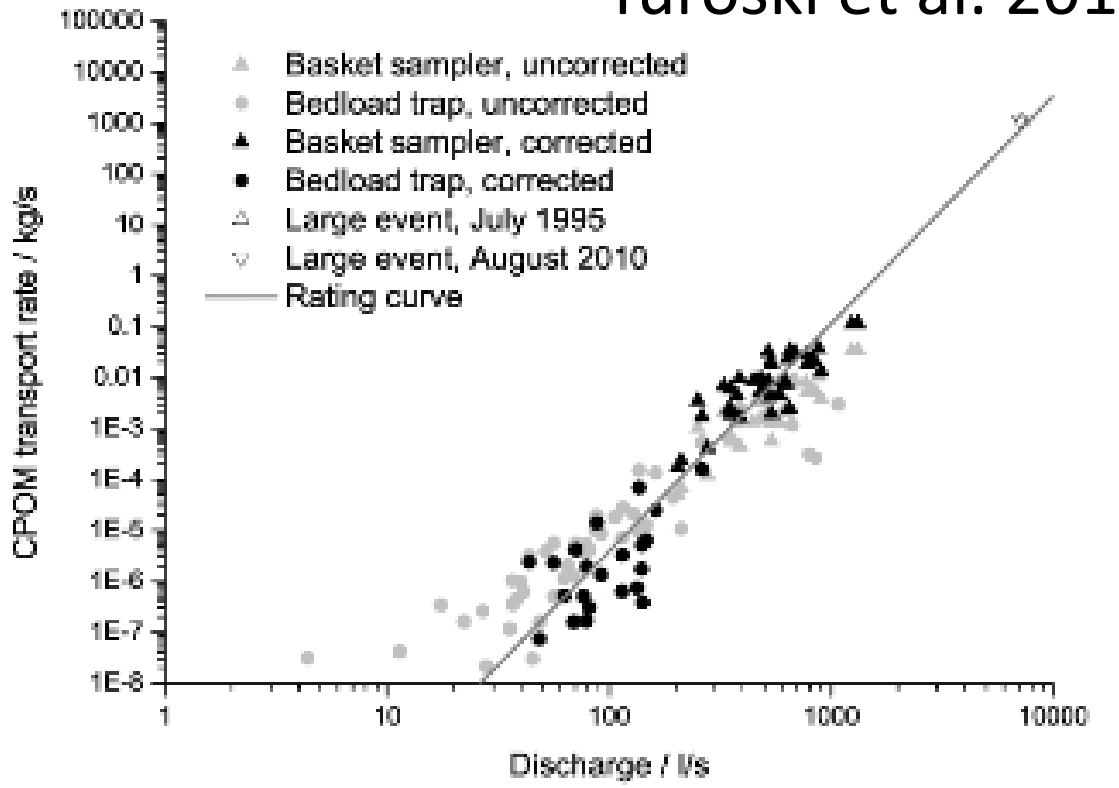
Qo – Basin delivery



$$V = 7.41$$

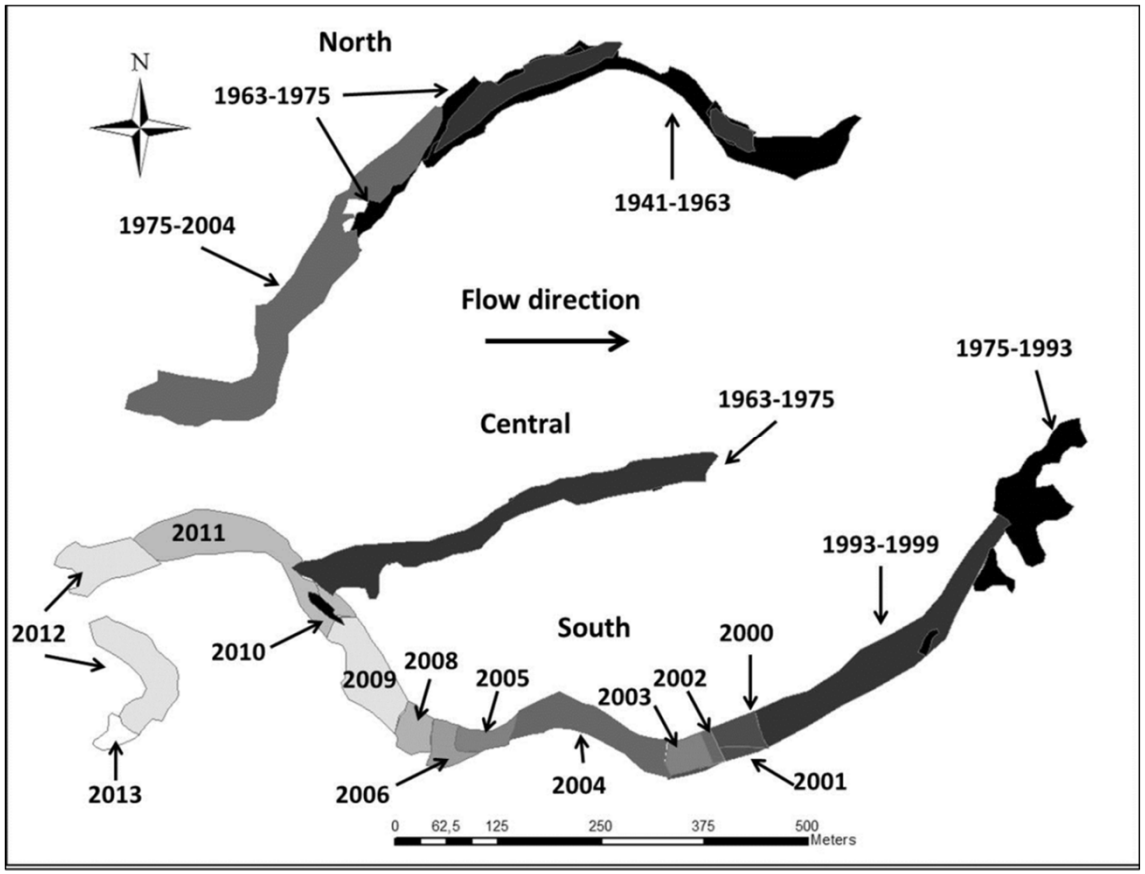
Moulin & Piégay, 2004

Turoski et al. 2013



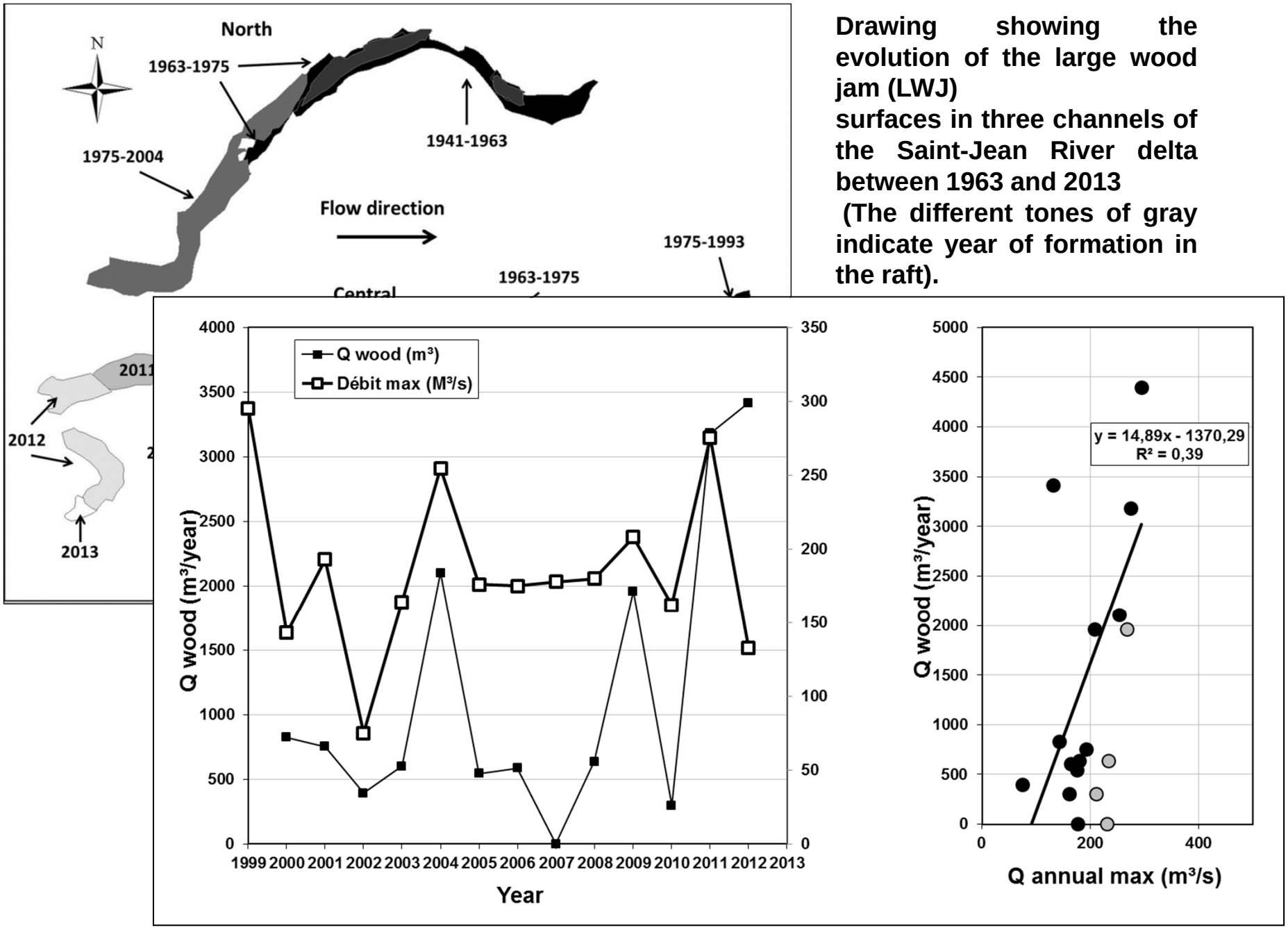
Embâcle Chenal nord,
Rivière St-Jean

Photo : Maxime Boivin



Drawing showing the evolution of the large wood jam (LWJ) surfaces in three channels of the Saint-Jean River delta between 1963 and 2013 (The different tones of gray indicate year of formation in the raft).

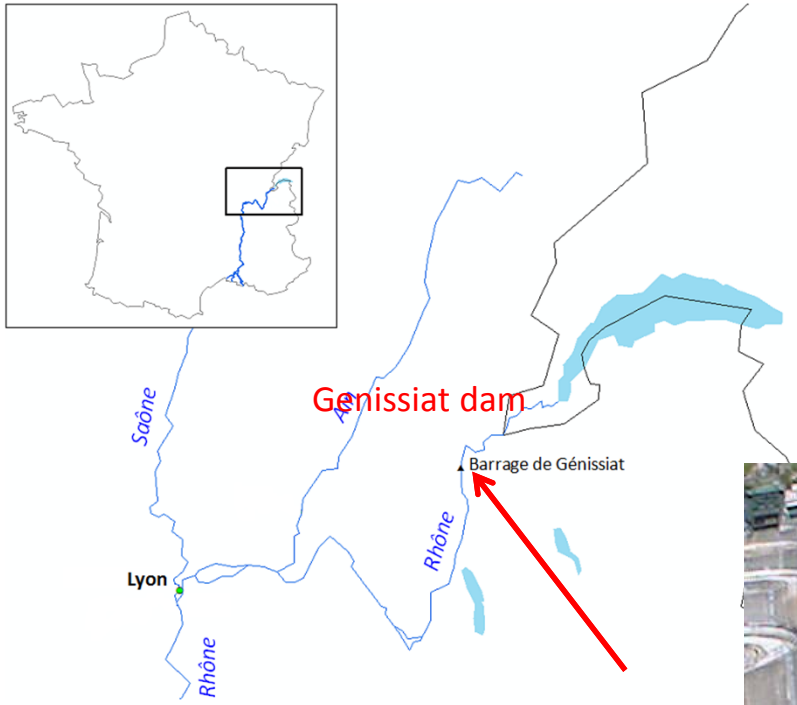
Boivin et al., 2015



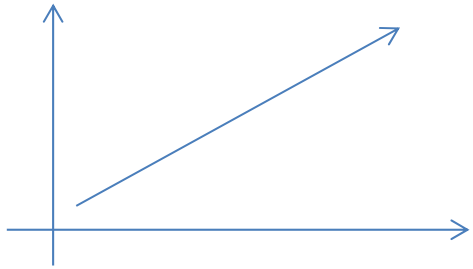
Drawing showing the evolution of the large wood jam (LWJ) surfaces in three channels of the Saint-Jean River delta between 1963 and 2013 (The different tones of gray indicate year of formation in the raft).

Boivin et al., 2015

Wood raft

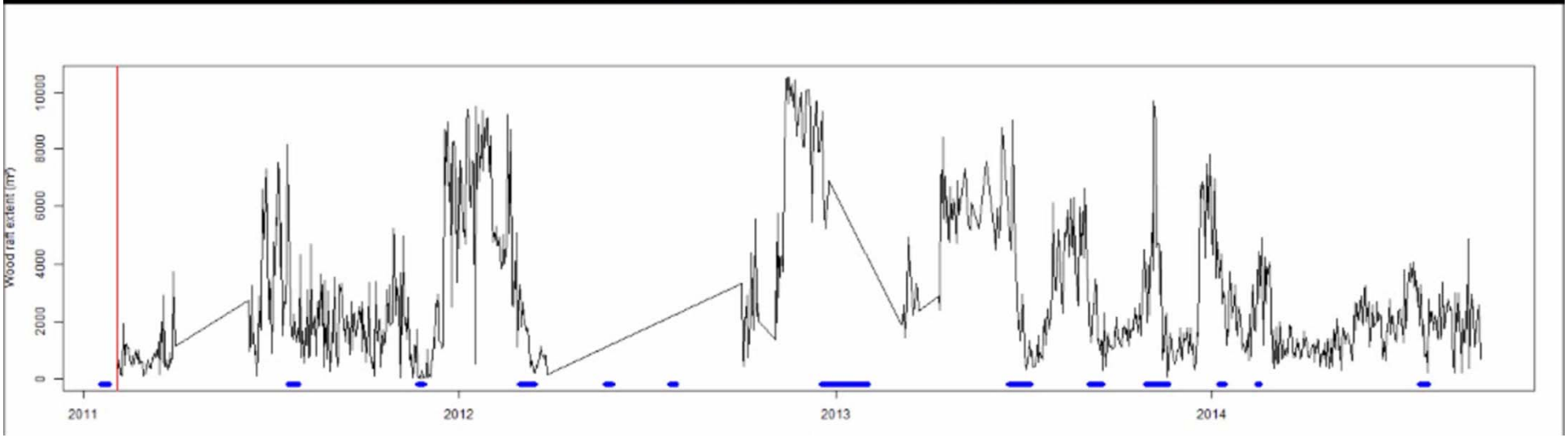


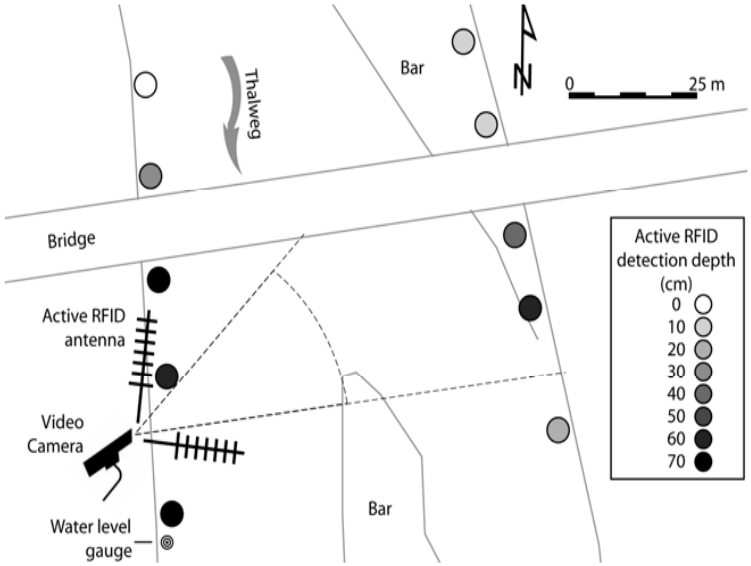
Wood mass or volume (t, m3)

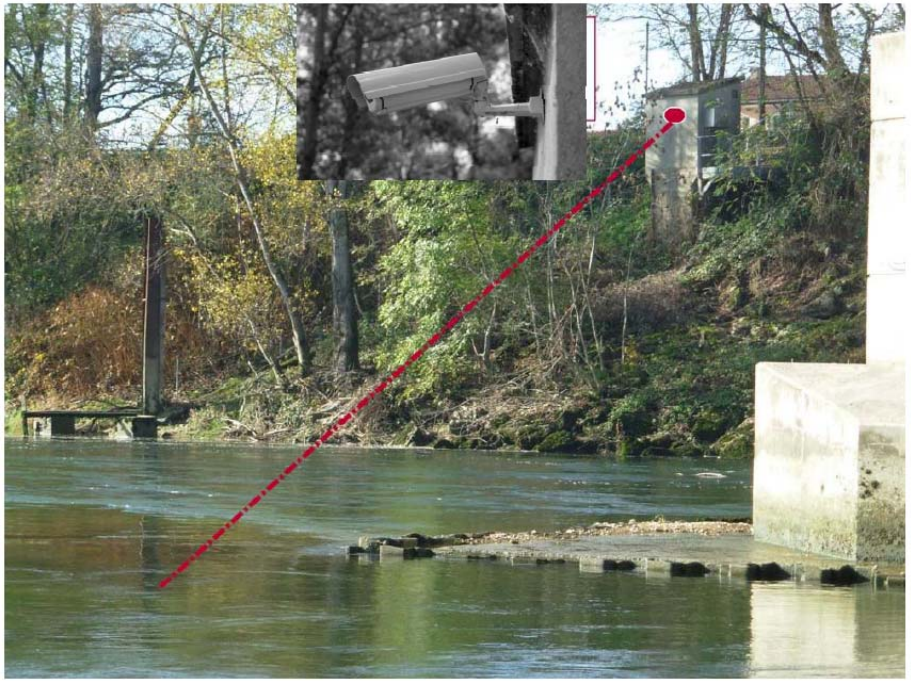


Wood raft area (m2)

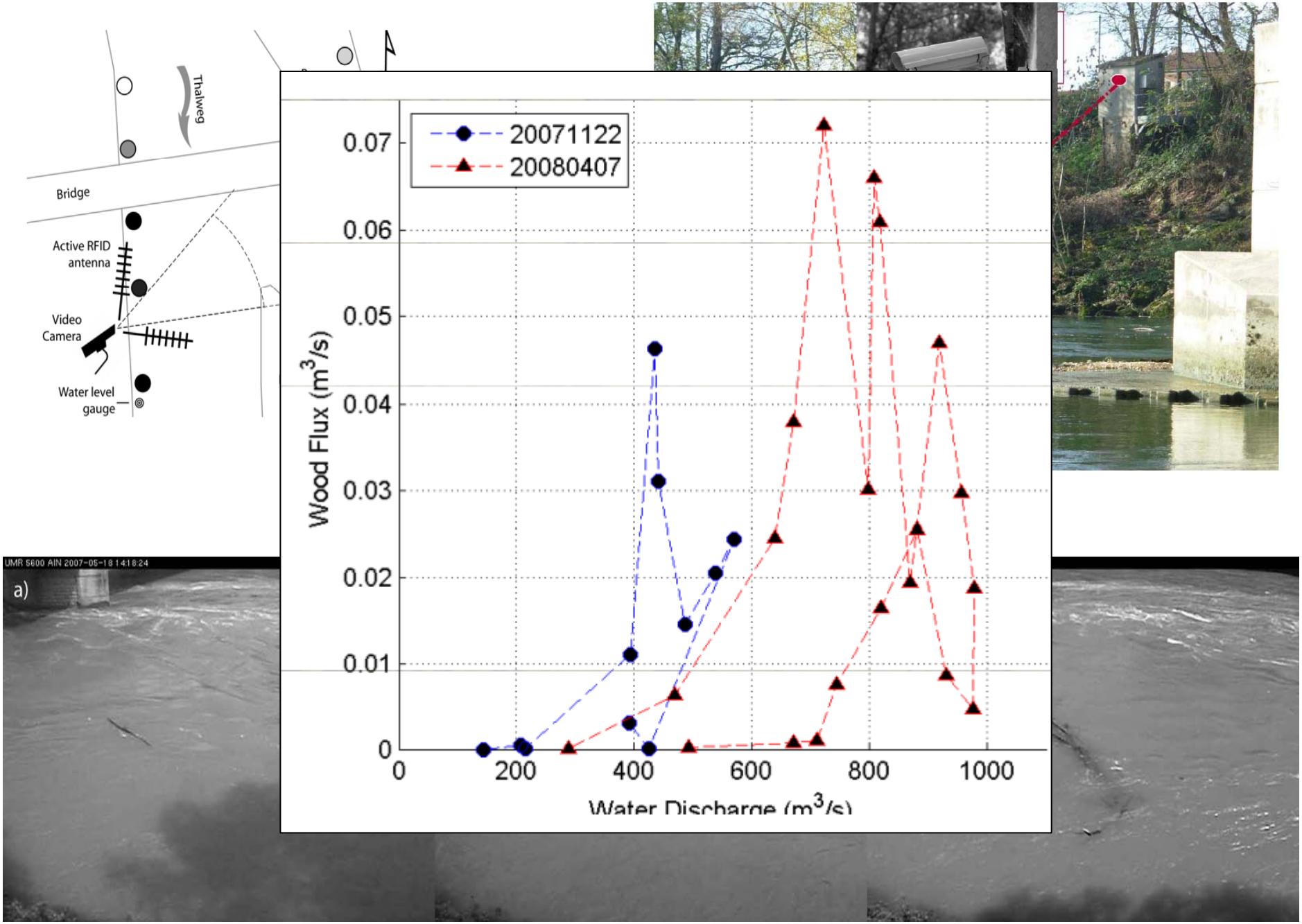
Benacchio et al.
Poster WWR 3

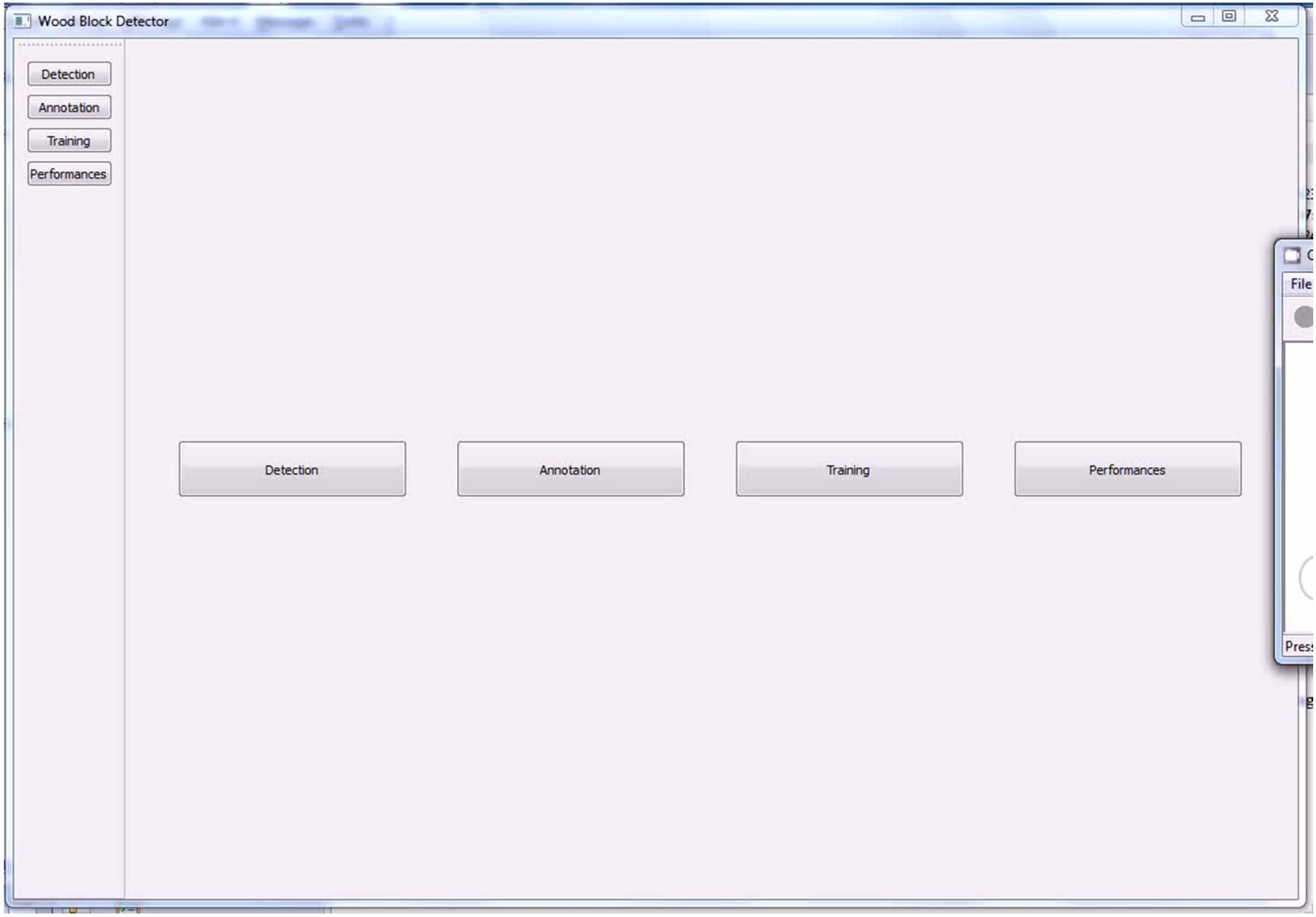



Thalweg
Bar
N
0
25 m
Bridge
Active RFID antenna
Video Camera
Water level gauge
Bar
Active RFID detection depth (cm)
0
10
20
30
40
50
60
70




UMR 5600 AIN 2007-05-18 14:18:24
a)
UMR 5600 AIN 2007-05-18 13:20:39
b)
UMR 5600 AIN 2007-05-18 12:37:57
c)


Thalweg
Bridge
Active RFID antenna
Video Camera
Water level gauge
20071122
20080407
Wood Flux (m3/s)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0
200
400
600
800
1000
Water Discharge (m3/s)
UMR 5600 AIN 2007-05-18 14:18:24
a)



P. Lemaire et al., in prep.

Drôme - Réserve Naturelle des Ramières, à Allex

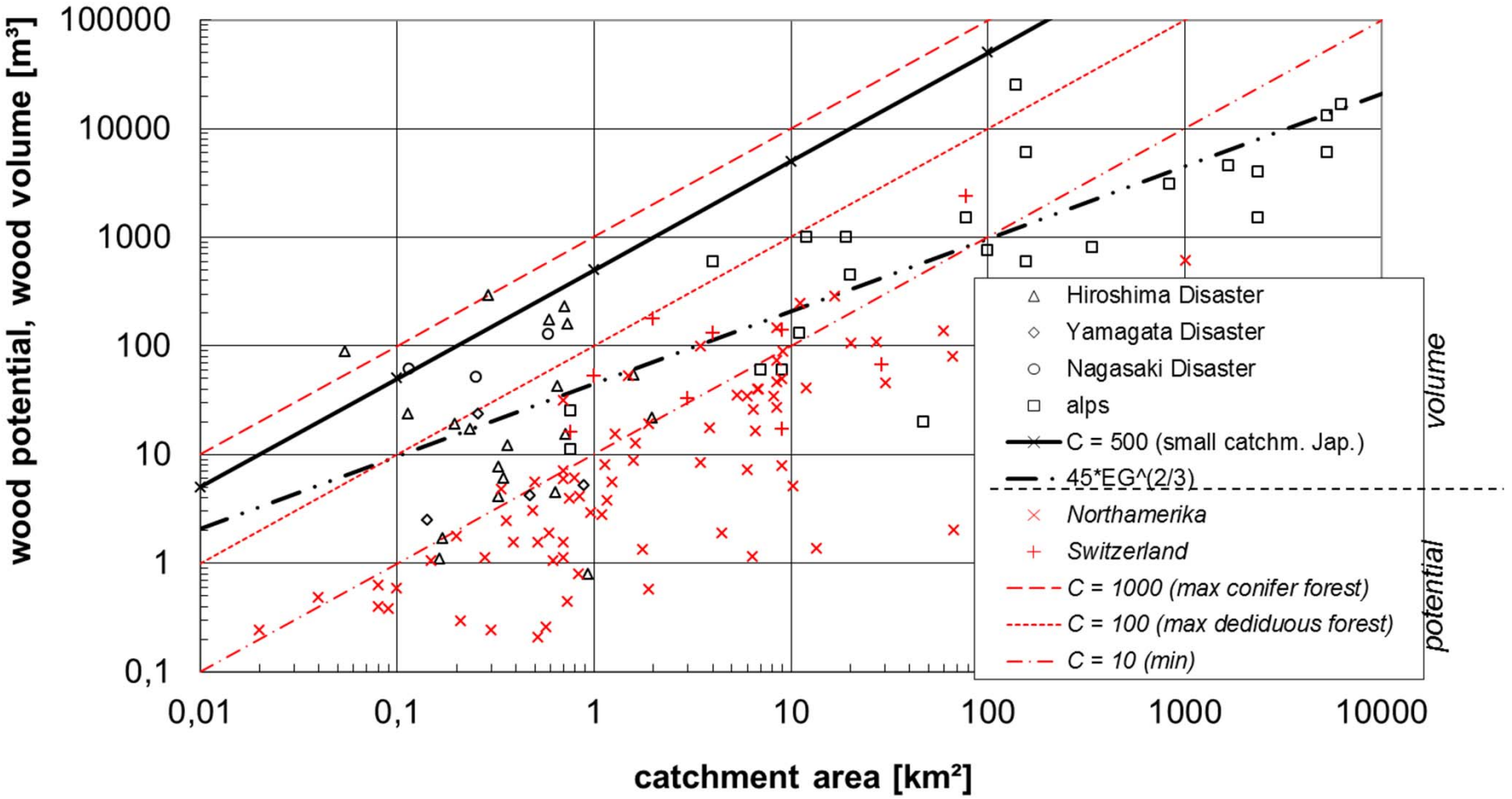
1 – Chenal Principal

2 – Chenal secondaire:

passage en crue

Date: 16/05/2015 de 12h30 à 13h

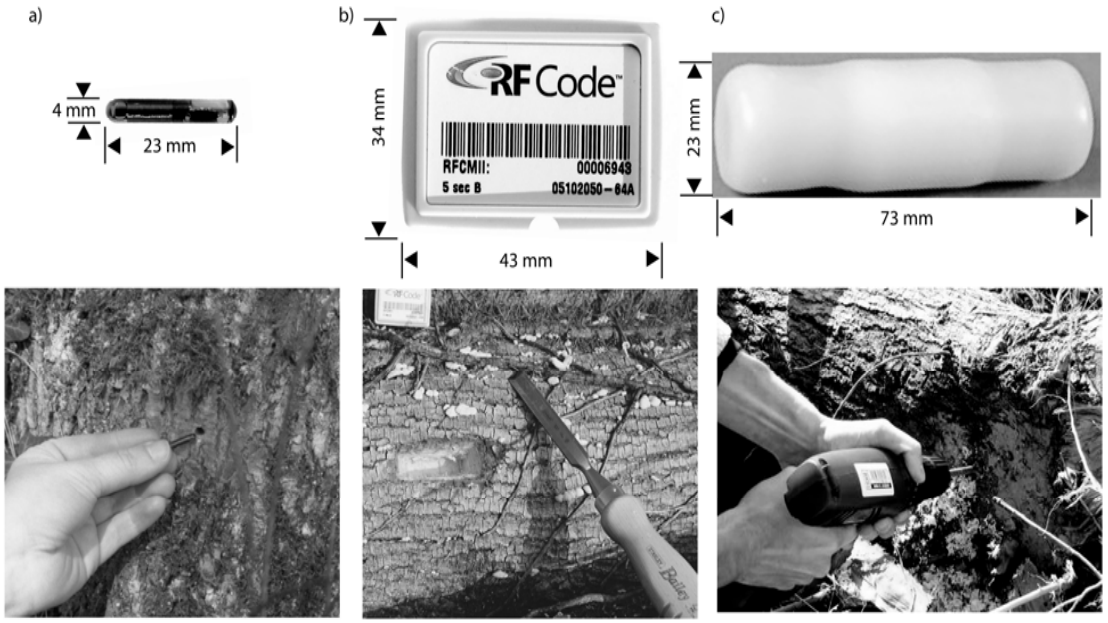
M. Boivin, Pers. Com.



Wood volume resp potential for different catchment areas: assessments and formula results

OptiMeth project conducted by the international research society INTERPRAEVENT (comp. Rimböck et al (2013))

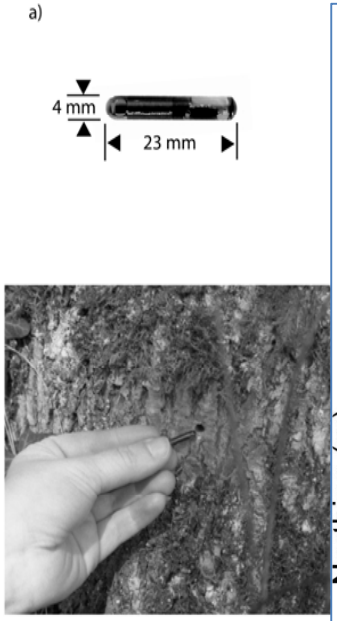
ΔX, I, O



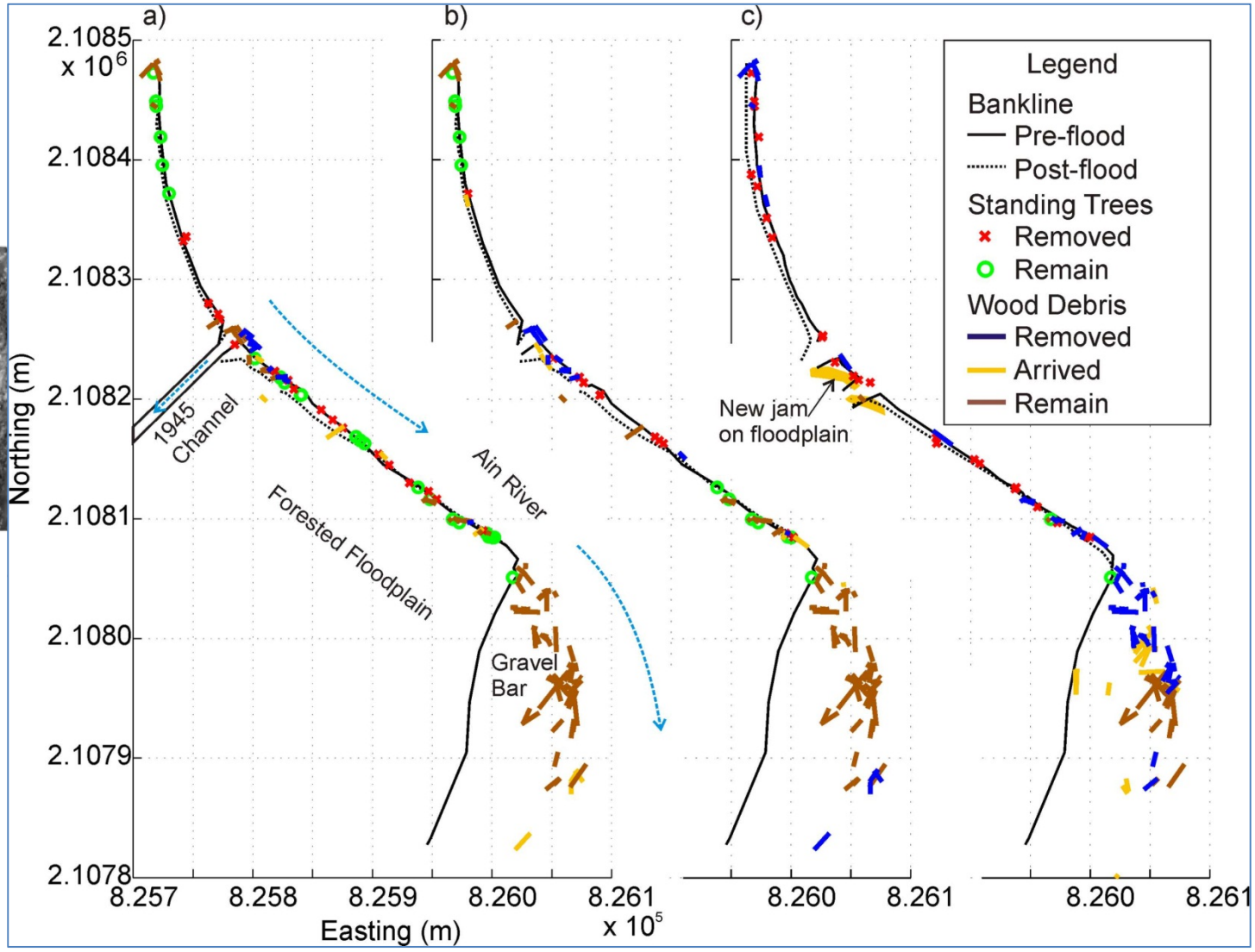
MacVicar et al., 2009, ESPL

ΔX, I, O

Locations of tagged trees and the locations of fallen trees found after they had been mobilised via bank erosion on the Ain River, France between March 2007 and March 2008.



MacVicar et al.,



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Published online 1 March 2011 in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/esp.2135

Distribution and characterization of in-channel large wood in relation to geomorphic patterns on a low-gradient river

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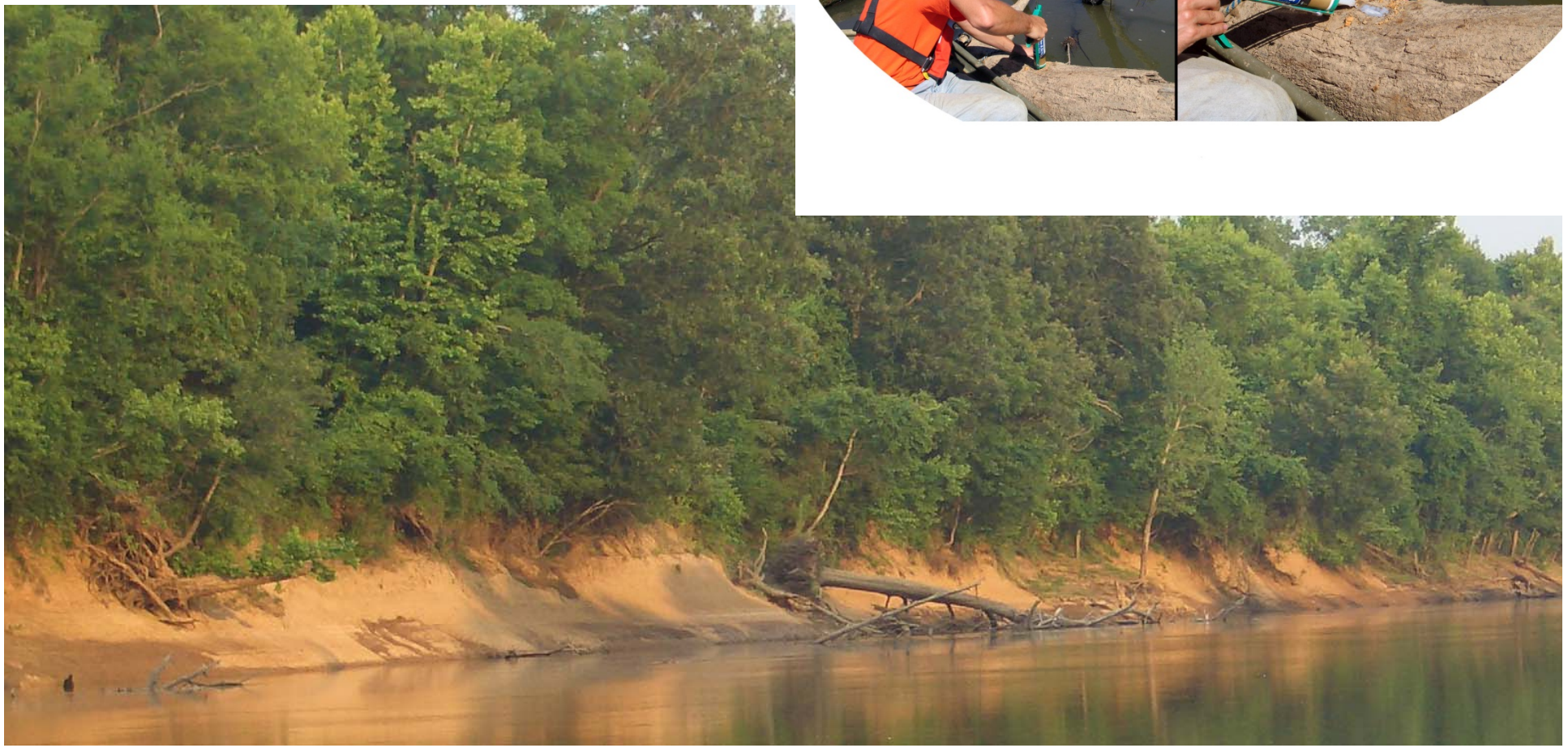
[2] US Geological Survey, 12205 Sunrise Valley Dr., Reston, VA 20192, USA

Received 30 August 2010; Revised 5 January 2011; Accepted 10 January 2011

* Correspondence to: E. R. Schenk, US Geological Survey, 12205 Sunrise Valley Dr., Reston, VA 20192, USA. E-mail: eschenk@usgs.gov



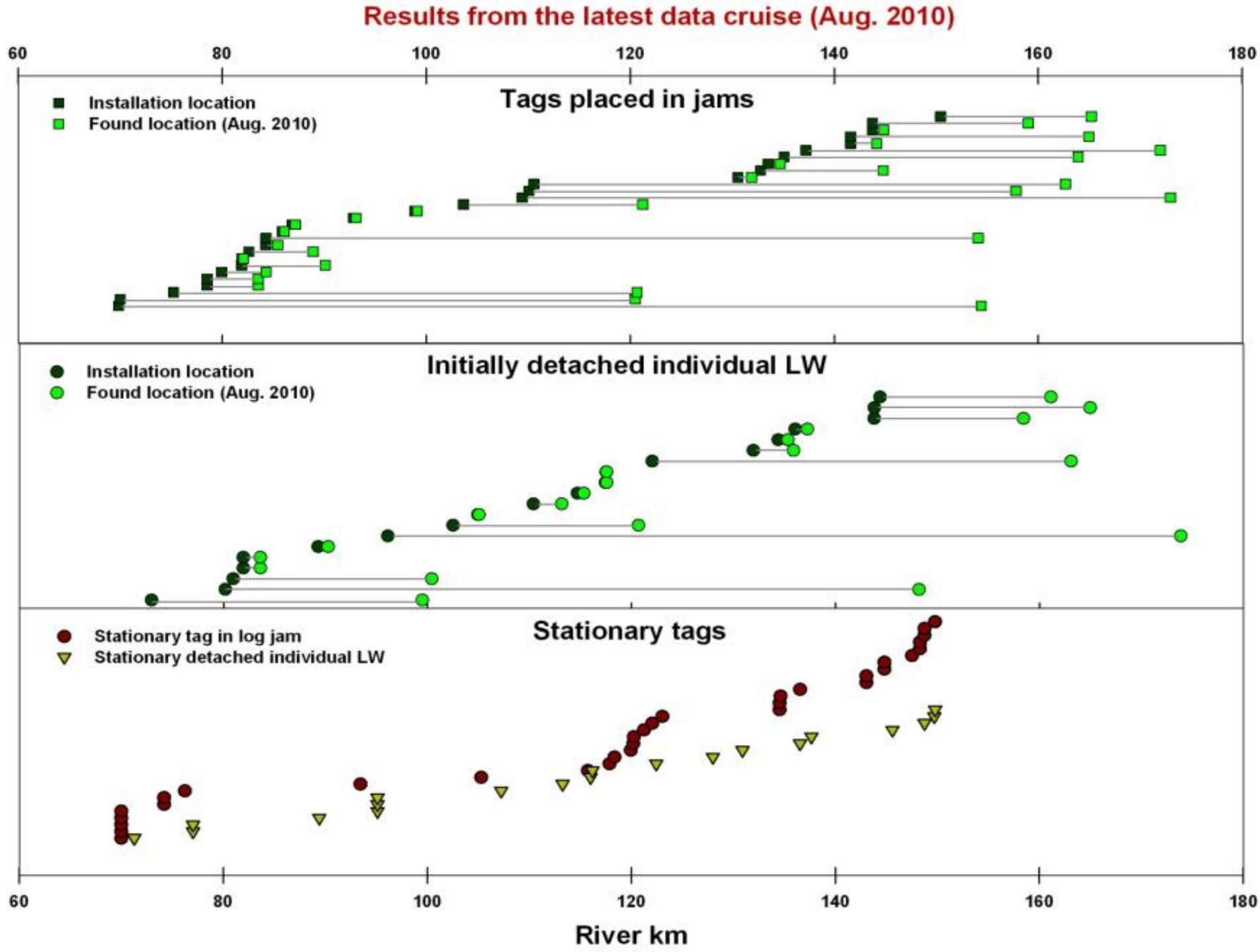

Results from the latest data cruise (Aug. 2010)
60
80
100
120
140
160
180
Tags placed in jams
Installation location
Found location (Aug. 2010)
Initially detached individual LW
Installation location
Found location (Aug. 2010)
Stationary tags
Stationary tag in log jam
Stationary detached individual LW
River km

Table III. The percentage of tags that moved and their distance (x) by initial bank placement.

	n	Percent transport	x (river km)	SE	x10 (river km)
Water	61	80	20.6	3.4	70.2
Lower	29	59	7.7	4.9	38.7
Mid	51	9	6.3	3.7	17.3
High	28	31	2.5	5.0	4.4

Note: Tags that were installed in LW at or near the water line are indicated by 'water', tags installed on the bank are indicated by the third section that they were located (e.g. 'lower' indicates the lower third of the bank). Standard error (SE) is provided for the mean distance traveled. The top 10% of distances by initial bank position (x_{10}) shows how far some of the wood moved during the study.

Moulin et al.
ESPL, 2011

Table III. The percentage of tags that moved and their distance (x) by initial bank placement.

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High	28	31			

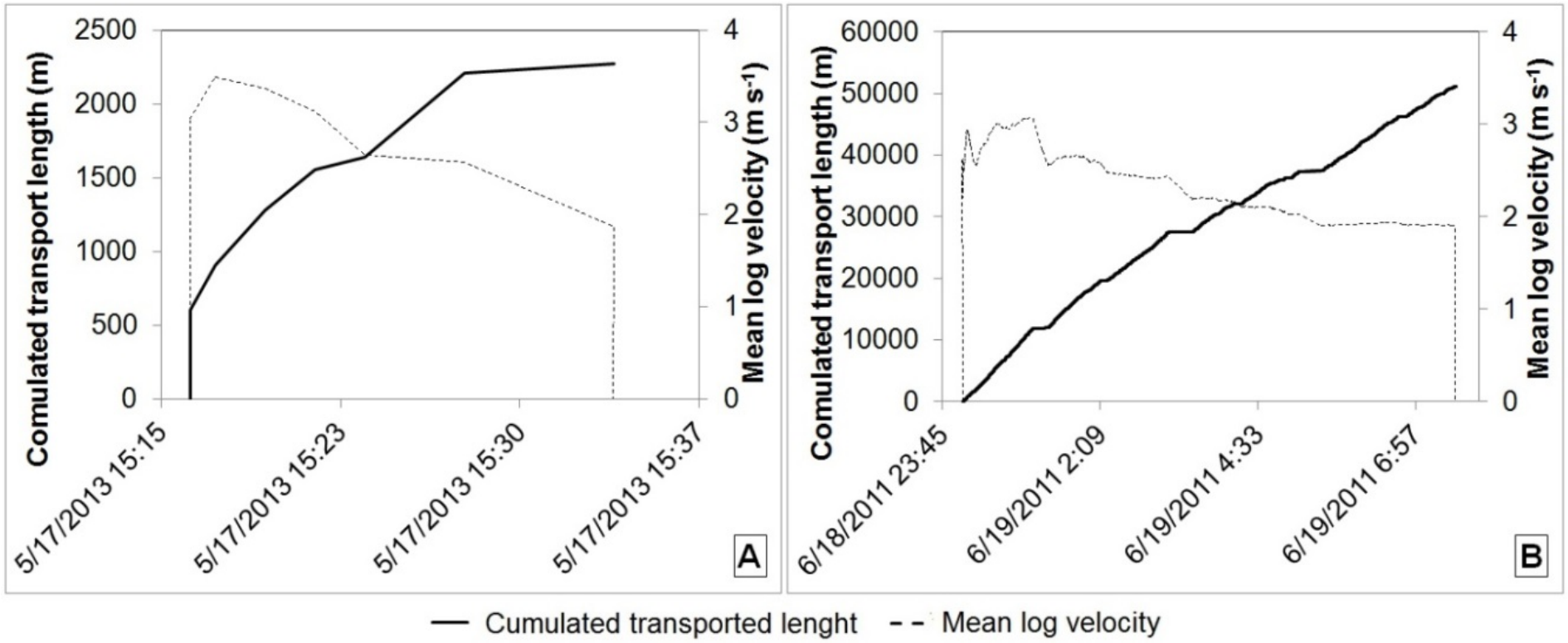
Note: Tags that were inst
indicated by 'water', tags
third section that they we
third of the bank). Standar
traveled. The top 10% of
how far some of the wood

Table IV. Distance tagged LW moved versus root presence (entire rootwad, partial roots, or no roots), and whether soil was present in the rootwad [Correction added on 5 September 2013, after first online publication: the misaligned entries in rows two and three of this table are corrected].

Root Present	n	Soil present	x (river km)	SE	x_{10}
Entire	12	Yes	0.0	0.0	0.1
	4	No	1.3	1.3	n/a
Partial	14	Yes	1.3	1.3	0.0
	43	No	13.2	3.6	47.2
None	100	n/a	14.0	2.3	46.7

Note: The mean distance (x) traveled by each category is presented as is the standard error (SE), and the top 10% of distances (x_{10}).

Moulin et al.
ESPL, 2011



Cumulated transported distance and mean velocity of log with GPS_P1 (A) and GPS_T3 (B) of Piave and Tagliamento River, respectively.

Real time Short Message Service (SMS) over GSM communications network (i.e. time, position, batteries lifetime)

Lenzi M.A., Picco L., Moretto J., Ravazzolo D. (2015, SedAlp Report)

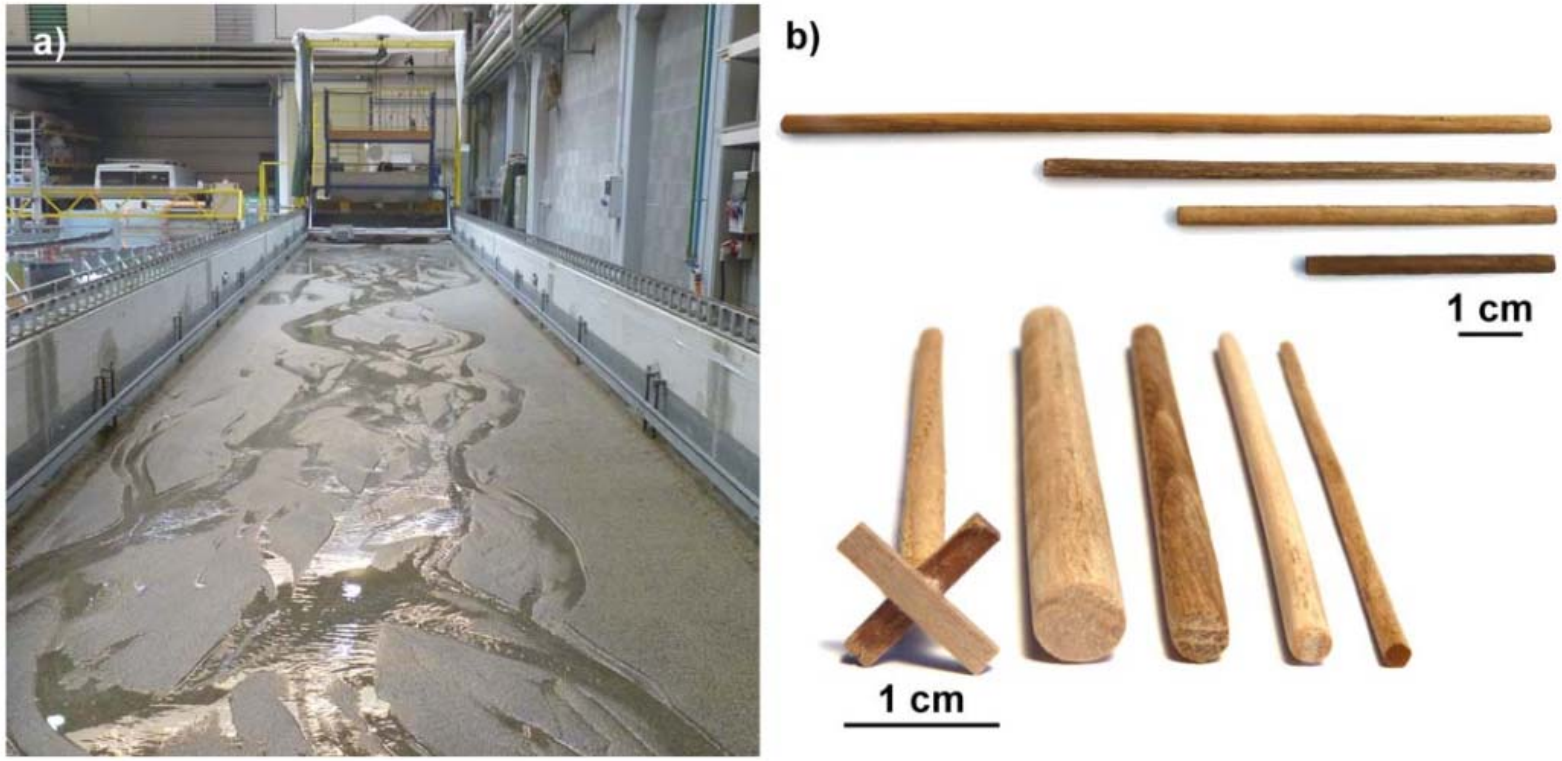


Figure 1. (a) View of the laboratory flume. Flow is toward the camera; (b) size range of the dowels used for flume simulations.

Welber et al. 2013 WRR

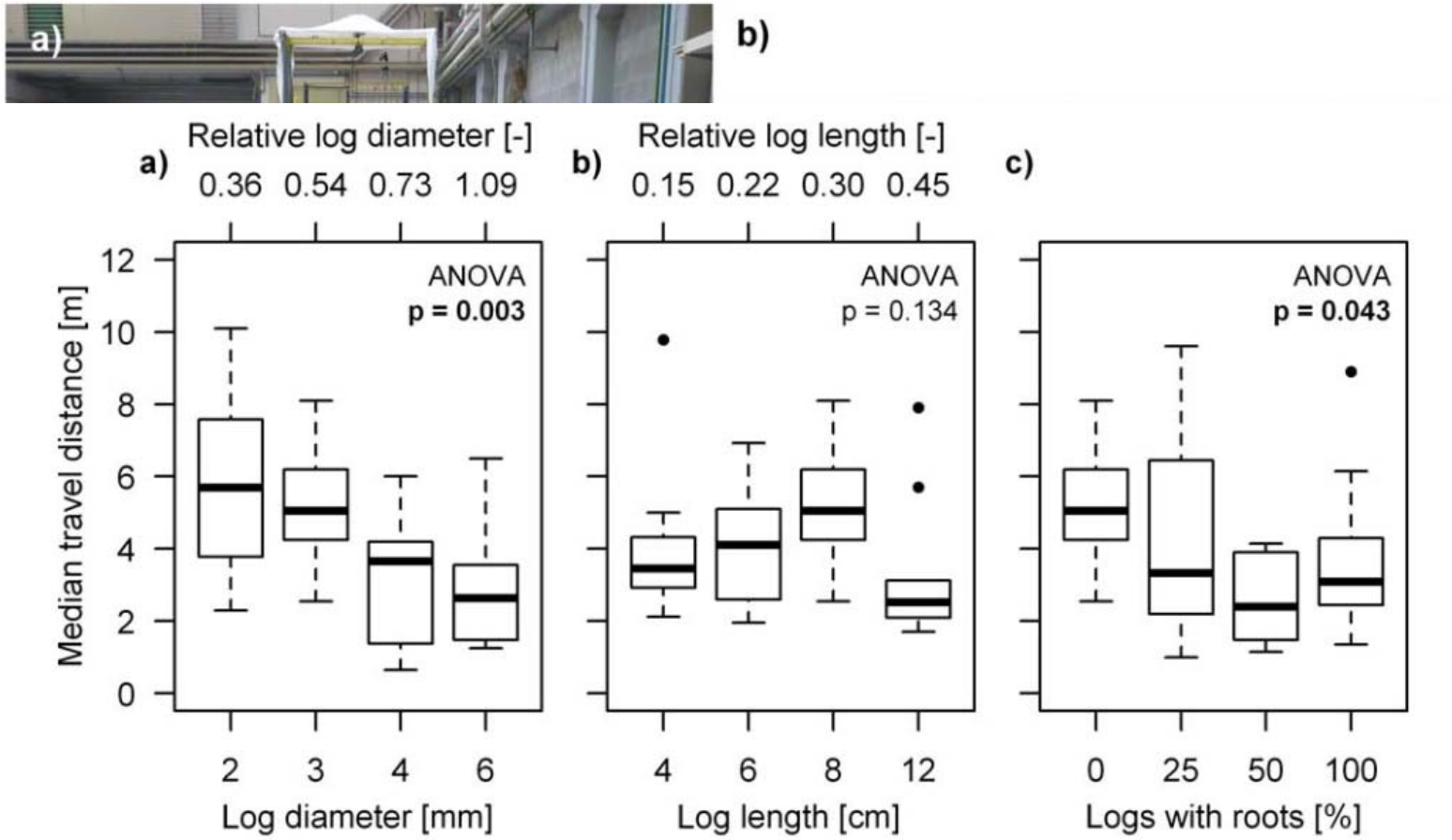


Figure 5. Median travel distance of log cohorts with different values of (a) log diameter; (b) log length; and (c) percentage of logs with roots. Data for sets of 10 runs are presented as box plots with dots indicating outliers; whiskers extend to the minimum and maximum values. Significant ANOVA *p* values are shown in bold.

Welber et al. 2013 WRR

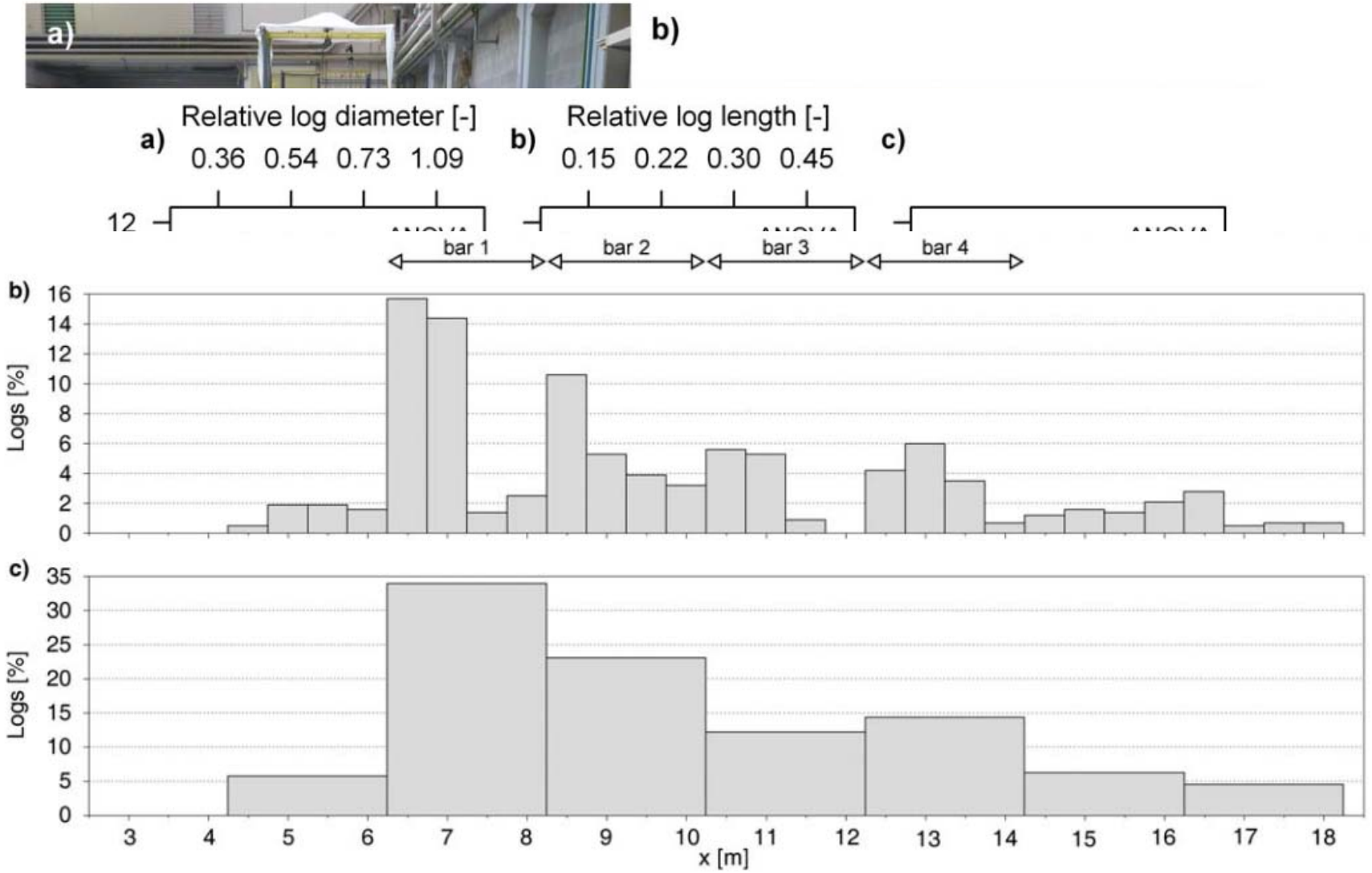
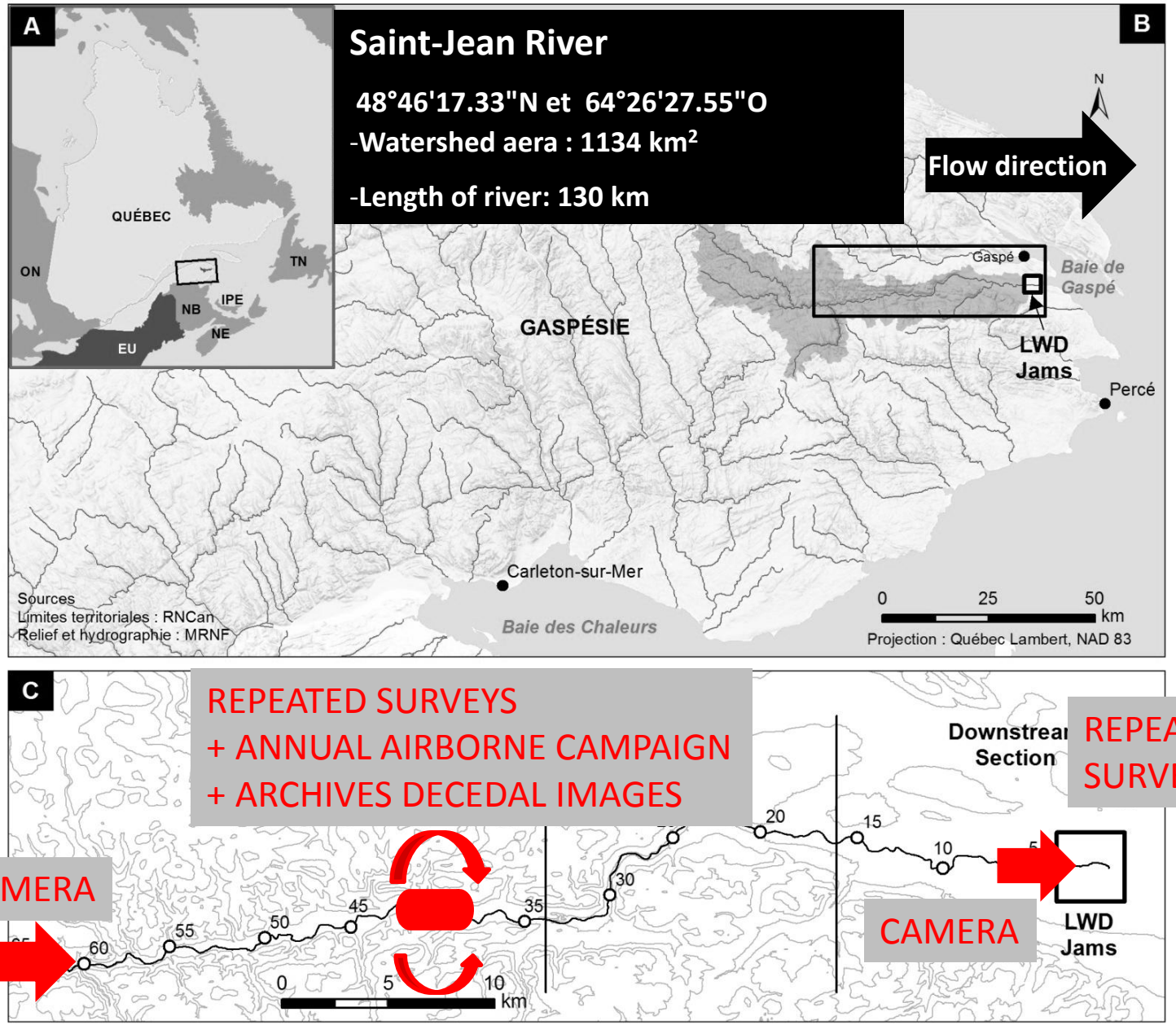
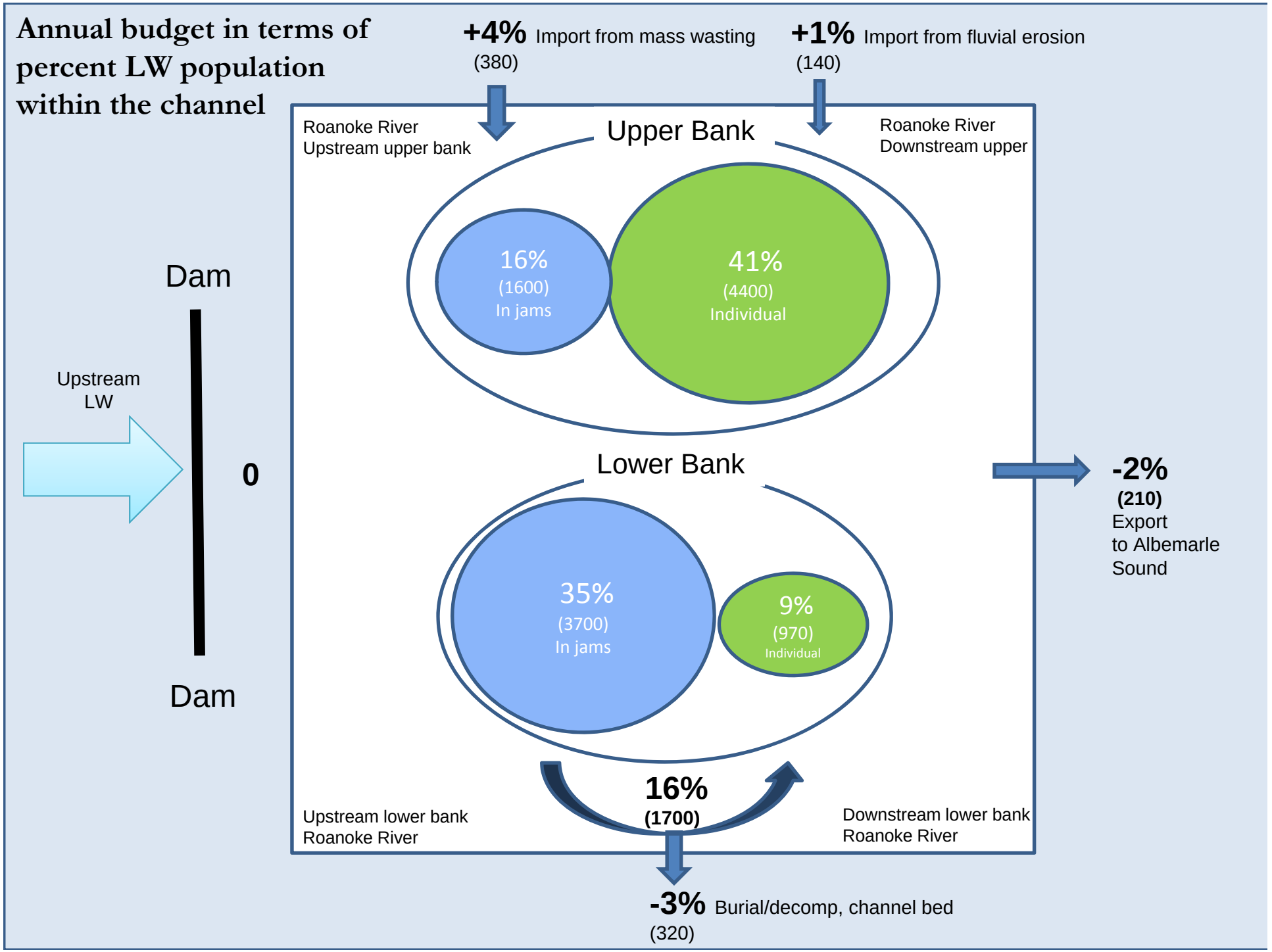


Figure 9. (a) Map of wood deposition across the network; (b) downstream distribution of wood aggregated over 1/4 of bar wavelength; and (c) downstream distribution of wood aggregated over one bar wavelength.

Welber et al. 2013 WRR

Wood budgeting, St-Jean River, Gaspé, Québec




Annual budget in terms of percent LW population within the channel
+4% Import from mass wasting
(380)
+1% Import from fluvial erosion
(140)
Roanoke River
Upstream upper bank
Upper Bank
Roanoke River
Downstream upper
16%
(1600)
In jams
41%
(4400)
Individual
Dam
Upstream
LW
0
Lower Bank
-2%
(210)
Export
to Albemarle
Sound
35%
(3700)
In jams
9%
(970)
Individual
Dam
16%
(1700)
Upstream lower bank
Roanoke River
Downstream lower bank
Roanoke River
-3% Burial/decomp, channel bed
(320)

Two-dimensional numerical modeling of wood transport

Virginia Ruiz-Villanueva, Ernest Bladé, Martí Sánchez-Juny,
Belén Marti-Cardona, Andrés Díez-Herrero and José María Bodoque

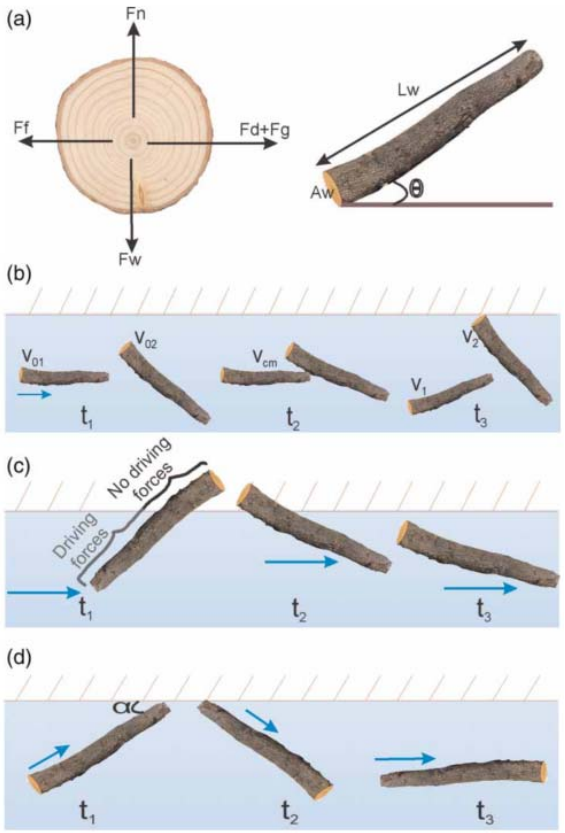


Figure 1 | (a) Schematic and body-force diagram of the force balance components acti on a cylindrical piece of wood. (b) One piece of wood is moving in the flov direction and meets another piece; they collide and after the collision they continue moving at different velocities. (c) Part of the log is out of the river (c area) then driving forces are re-calculated. (d) Log hits the bank (wall) and slides or bounces off depending on the incidence angle α. Different time ste are represented as t_1, t_2 and t_3.

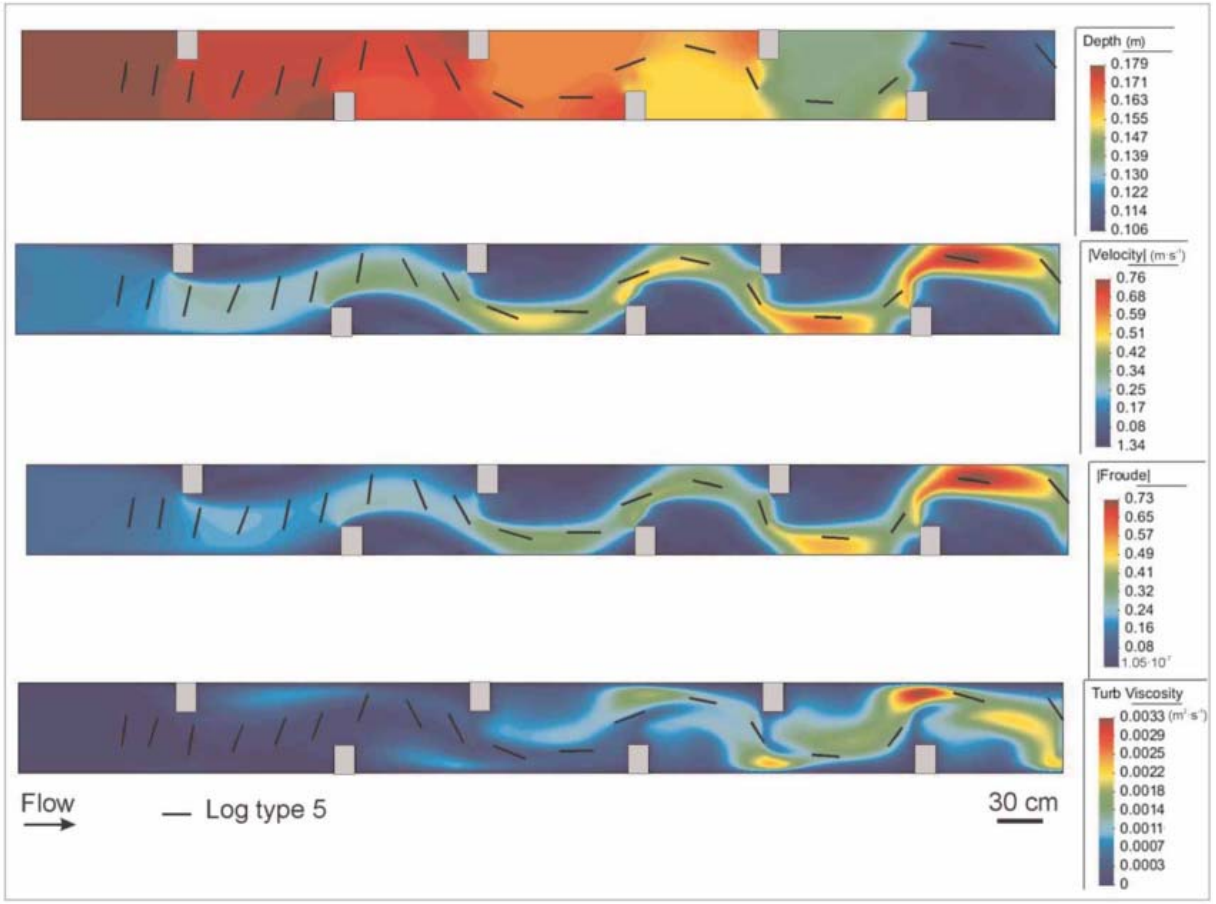
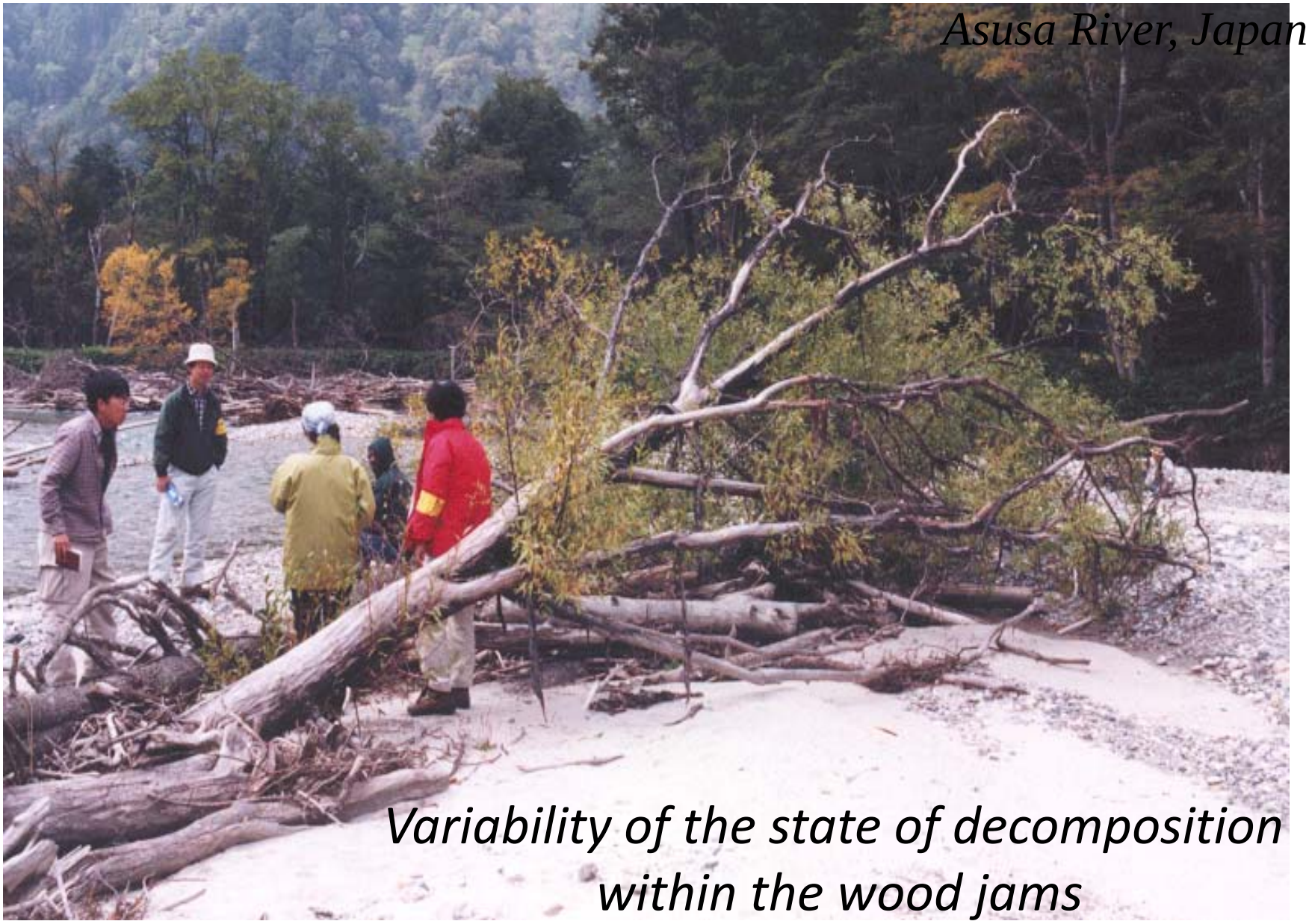


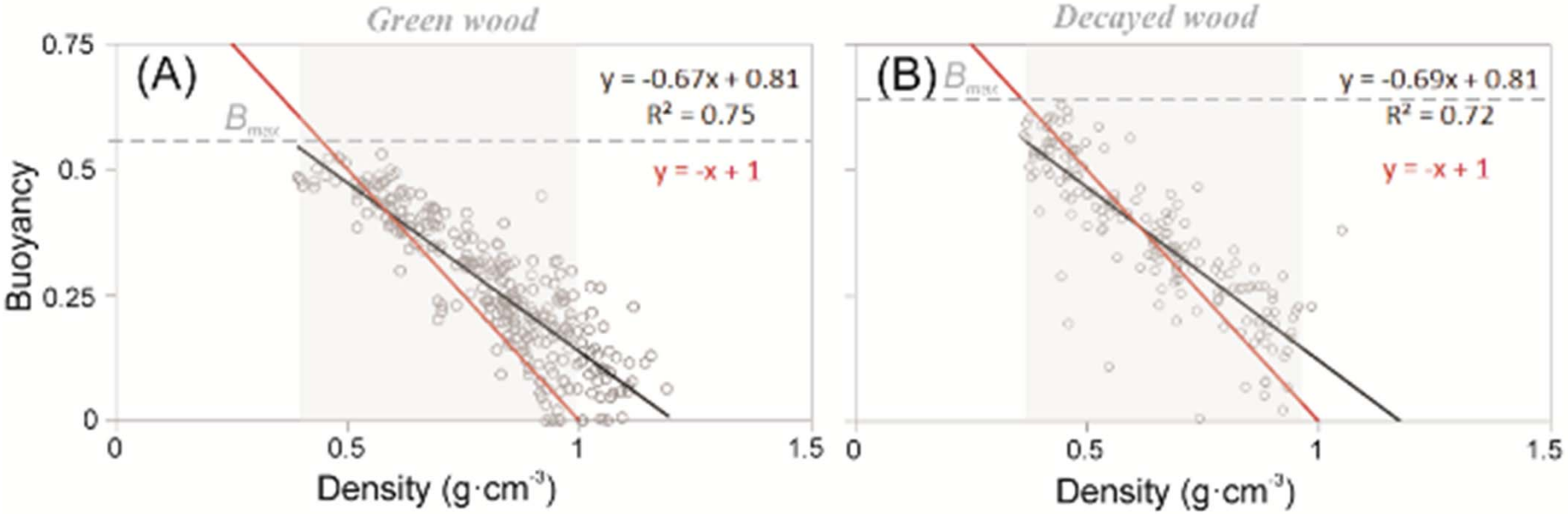
Figure 7 | Model outputs for geometry 1: water depth, flow velocity (module), Froude number and turbulent viscosity are shown together with log tra left to right.

Decay

Strand line (wood deposited during the 1994 flood)

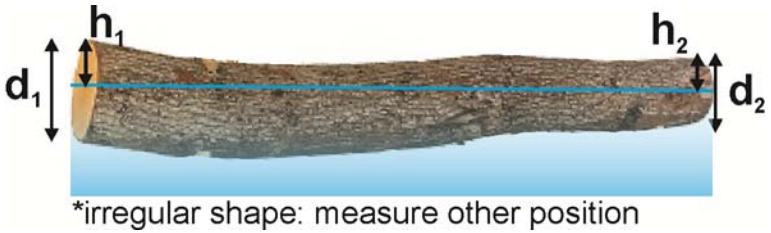
Middle Loire River near Nevers France (sept. 2000)


Asusa River, Japan
Variability of the state of decomposition
within the wood jams



Relationship between wood density (g.cm-3) and wood buoyancy for green (A) and decayed wood (B). Bmax is the maximum value of buoyancy.

Grey shaded area highlights the density range between 0.45 and 0.95 g.cm-3. Red line is the linear relationship defined by the Arquimedes principle.



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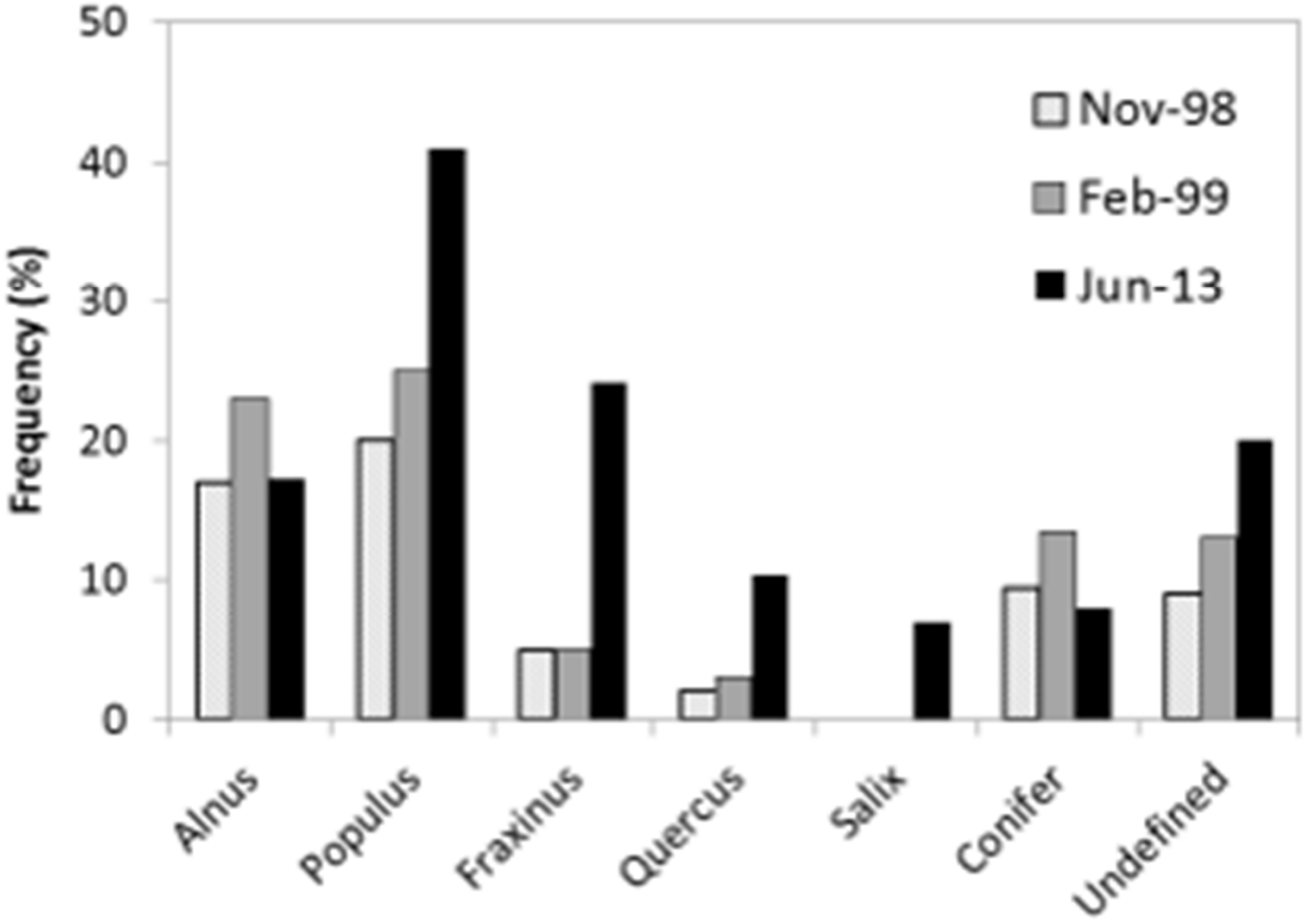

Distribution of the pieces extracted from Génissiat according to their taxonomic genus during different surveys.

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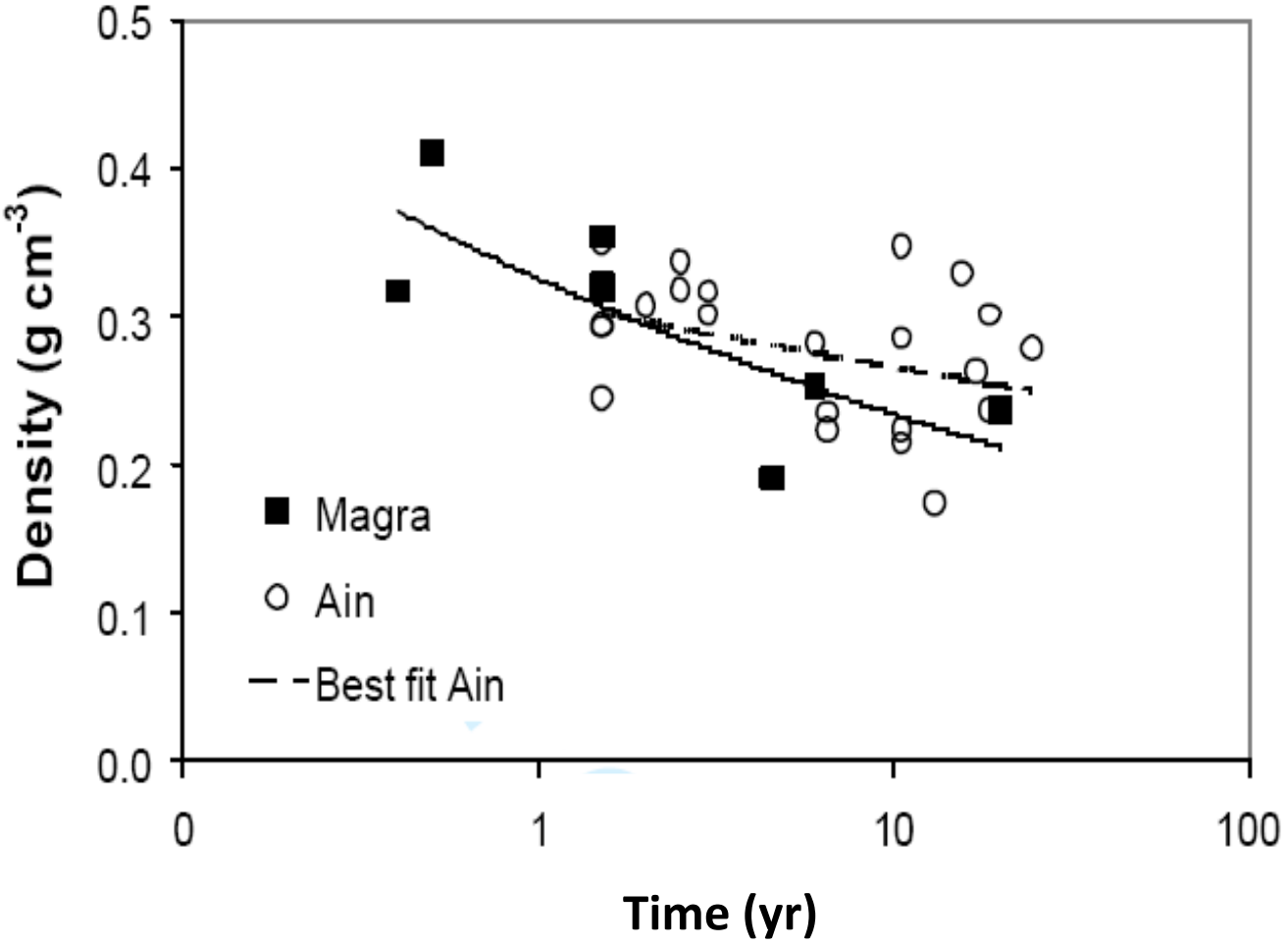
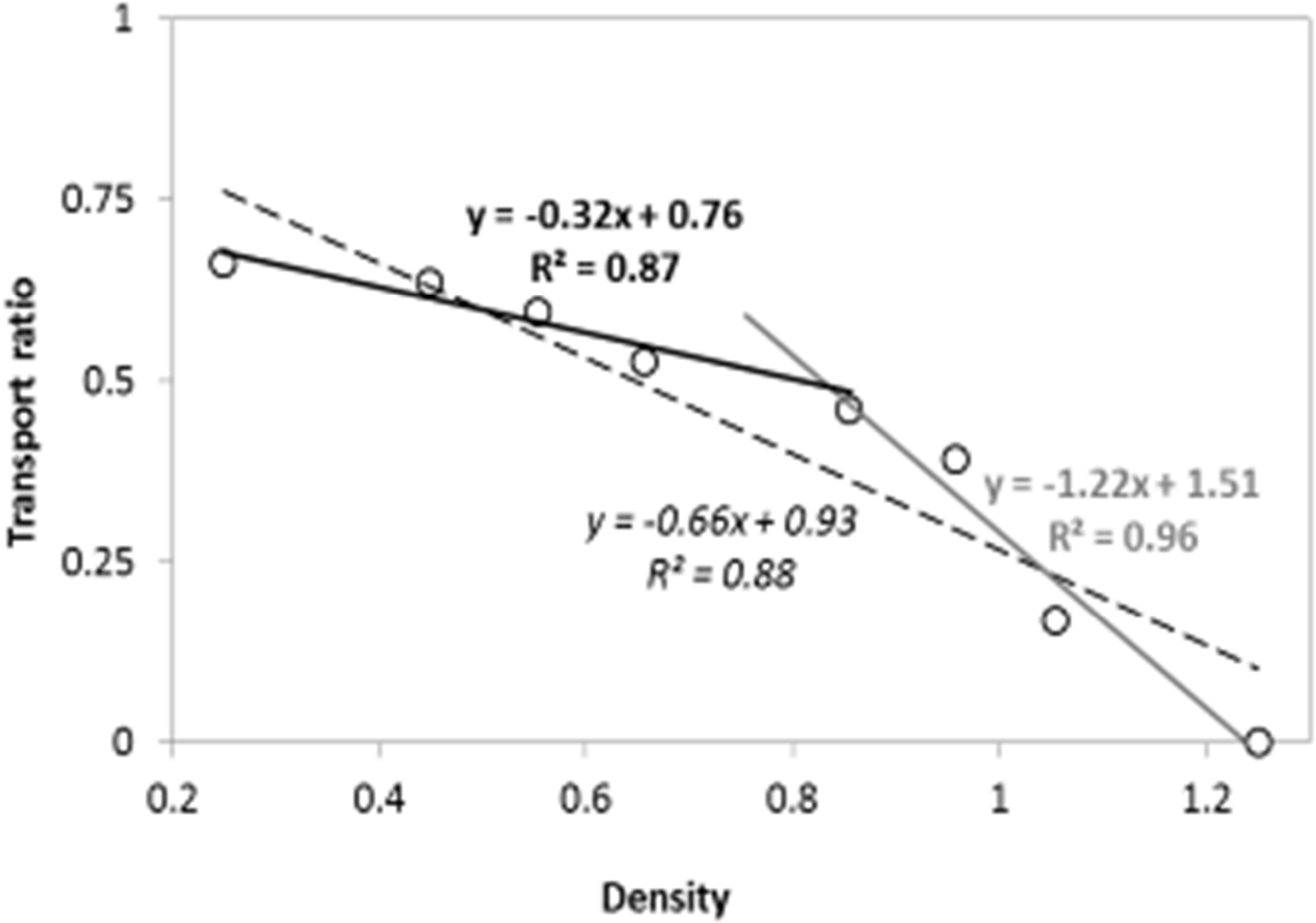


Wood density versus residence time for the Ain and Magra rivers based on years elapsed since tree death (14C data).

MacVicar et al. 2009



Relationship between wood density and transport ratio. Result from numerical modelling.

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Conclusions

- Let’s continue to ride the horse… there is a lot to do
- New technologies should provide original knowledge in this domain
- Explore space and time and controls… model… manage