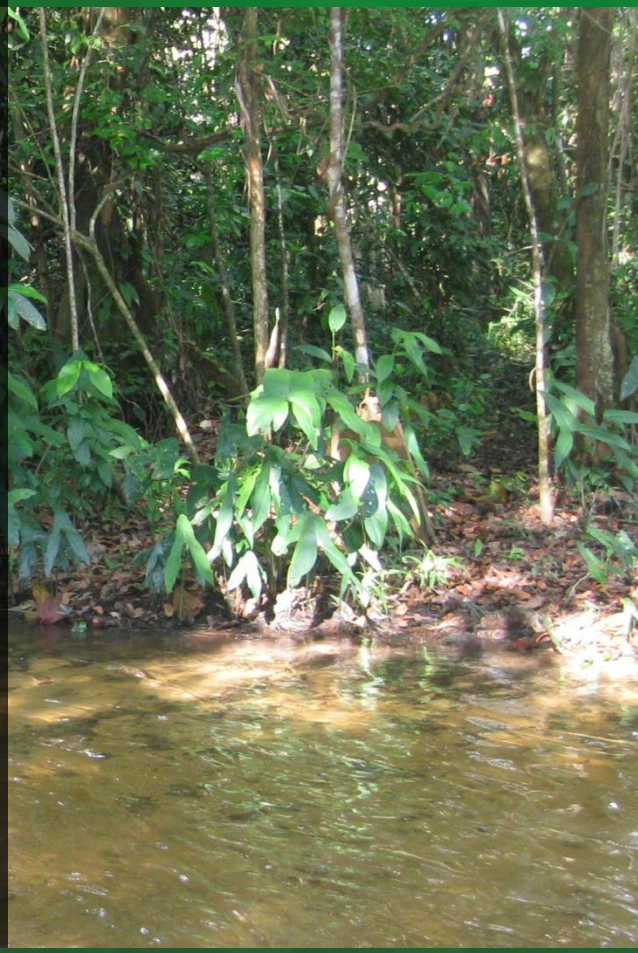
SWAT 2014 Conference

Hydrobiogeochemical fluxes and its relation to land use changes at small catchments in the Marapanim River Basin, Pará state, Brazil



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Embrapa 40 ANOS

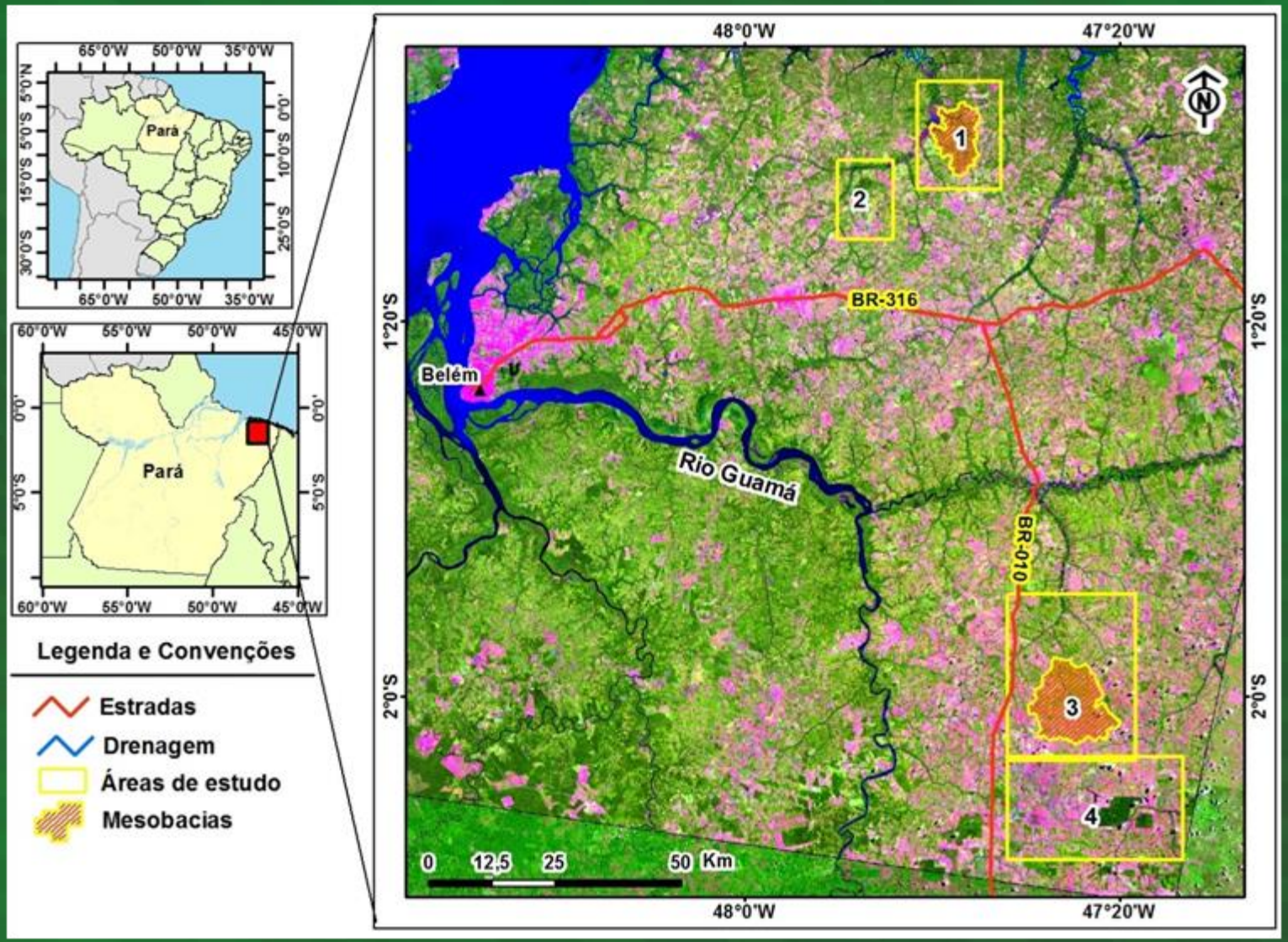
"Nordeste Paraense" - the oldest Brazilian Eastern Amazonian agriculture settled area

Widespready slash-and-burn agriculture along one hundred years

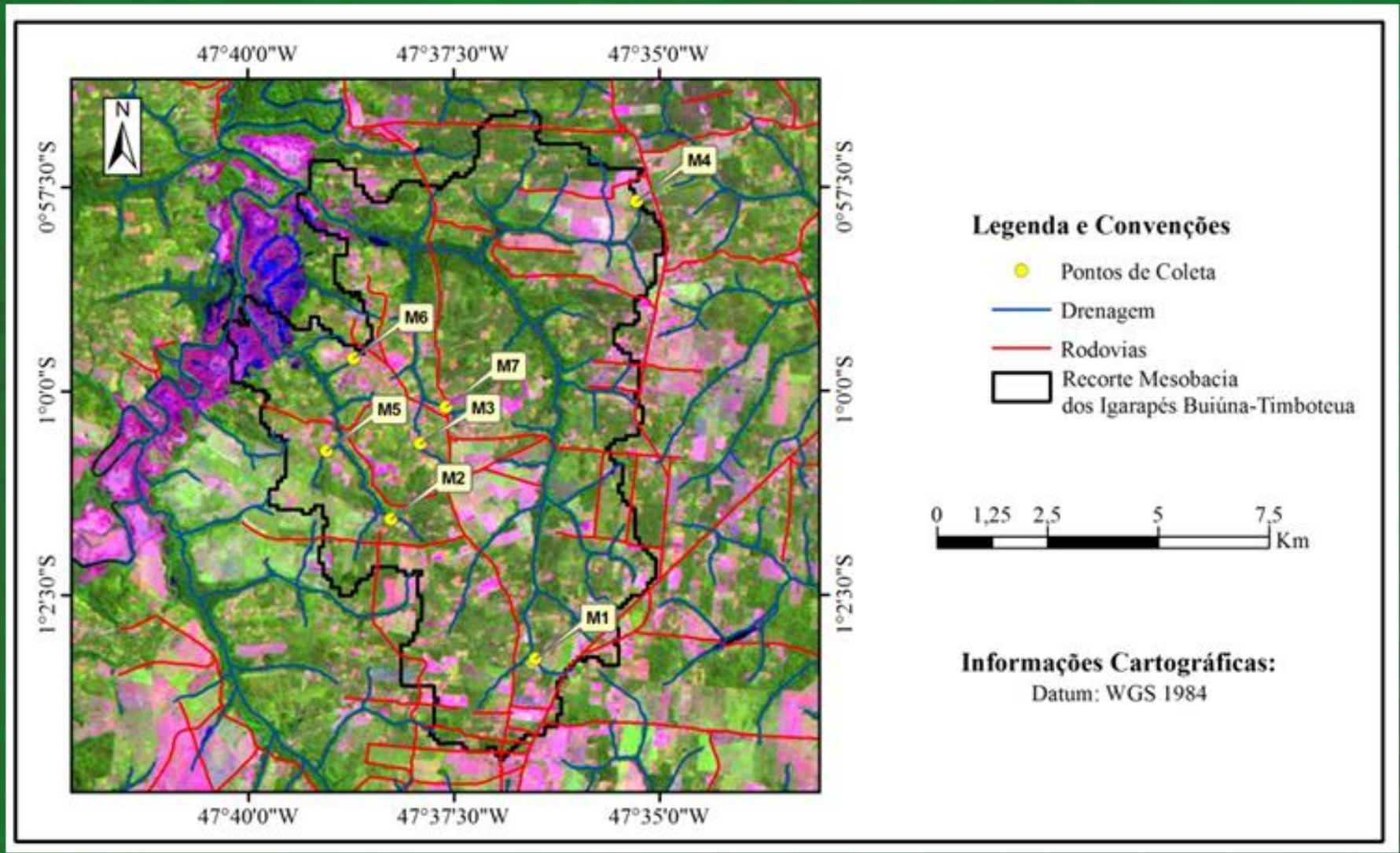
OBJECTIVE

Evaluate streamwater hydrogeochemistry and its relation to land use change in small catchments as a contribution to river basin management in the region called "Nordeste Paraense" .

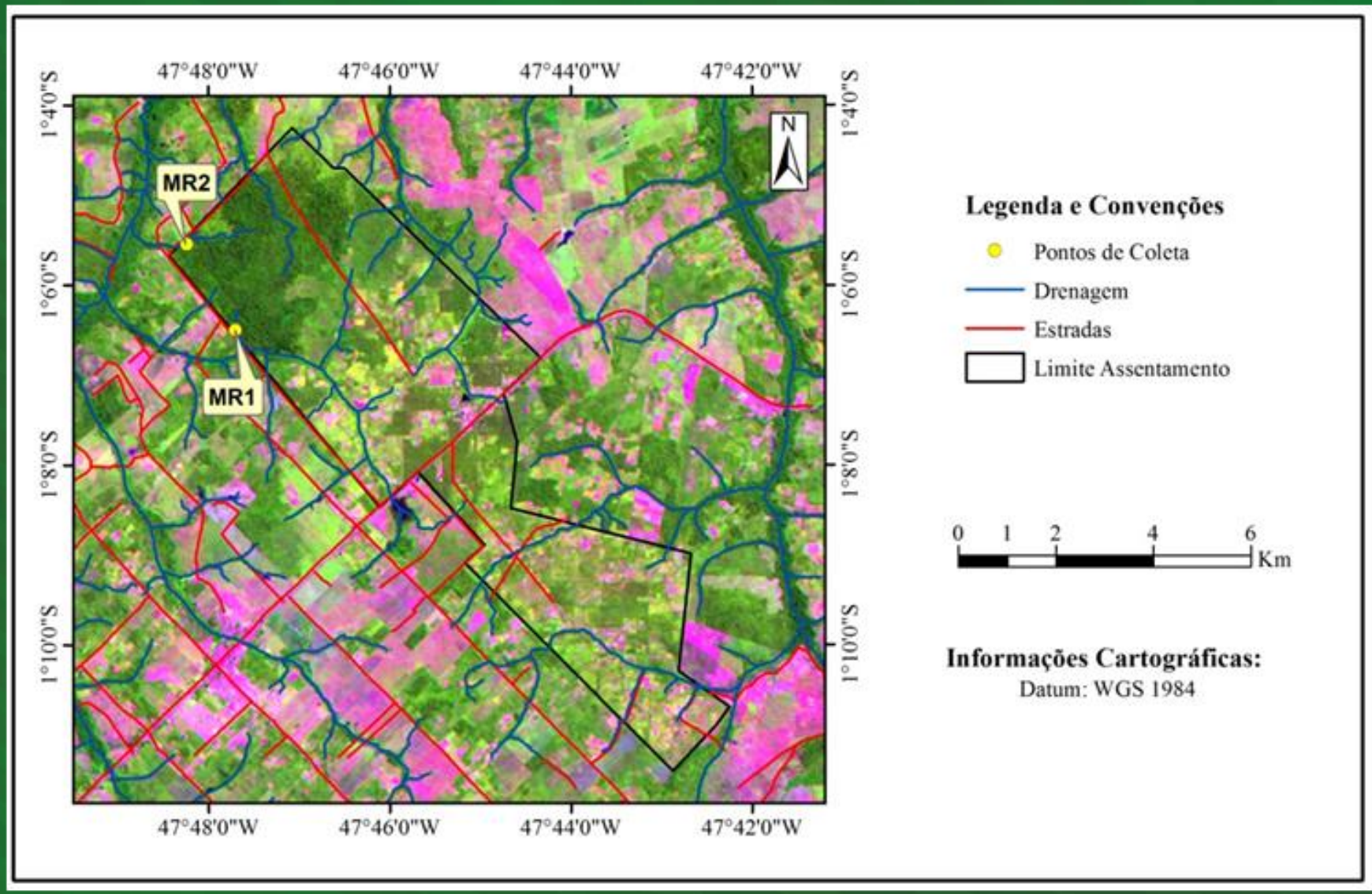
Location of our studied areas (1 and 2)

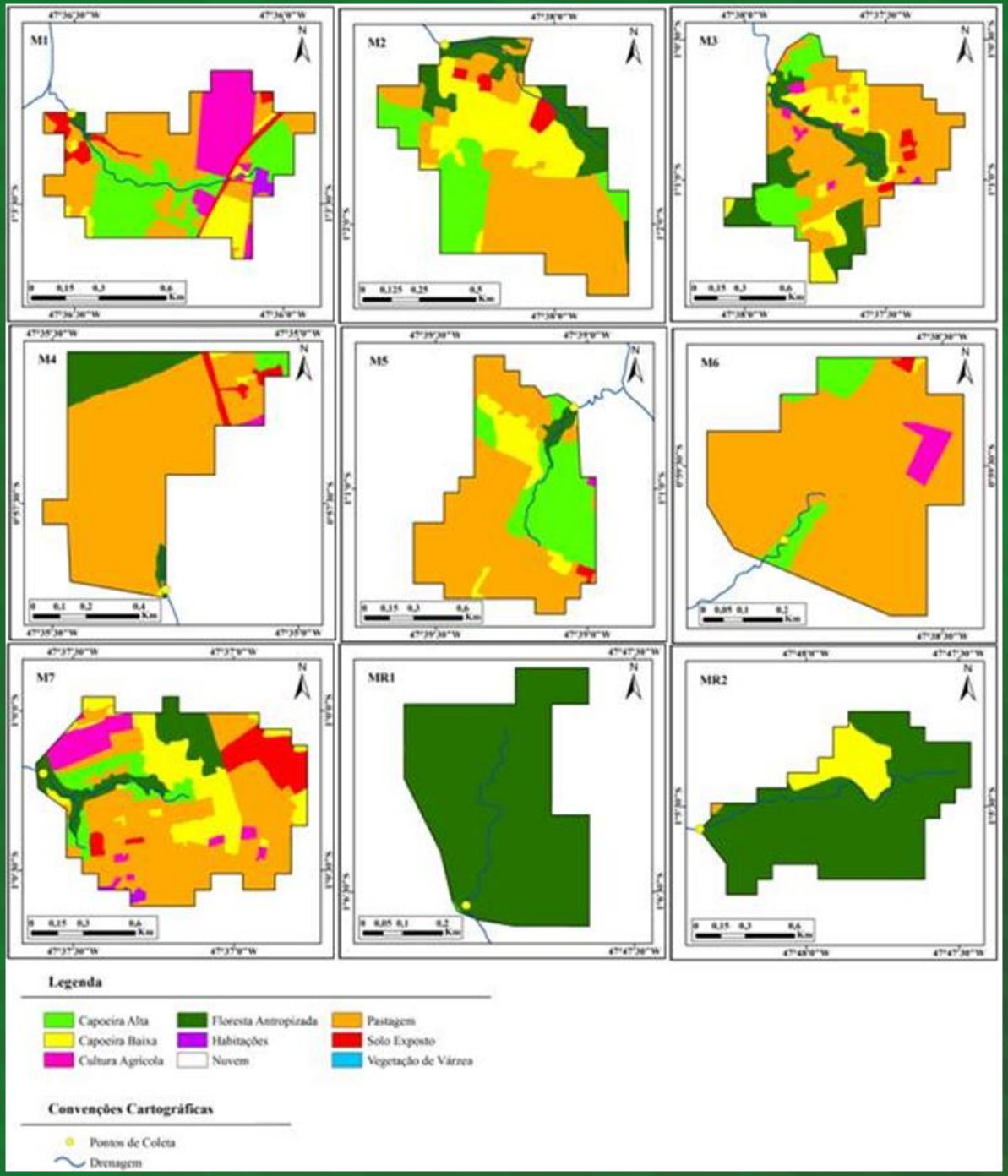


Seven agriculture catchments in Area 1



Two forested catchments in Area 2





Land use classes:

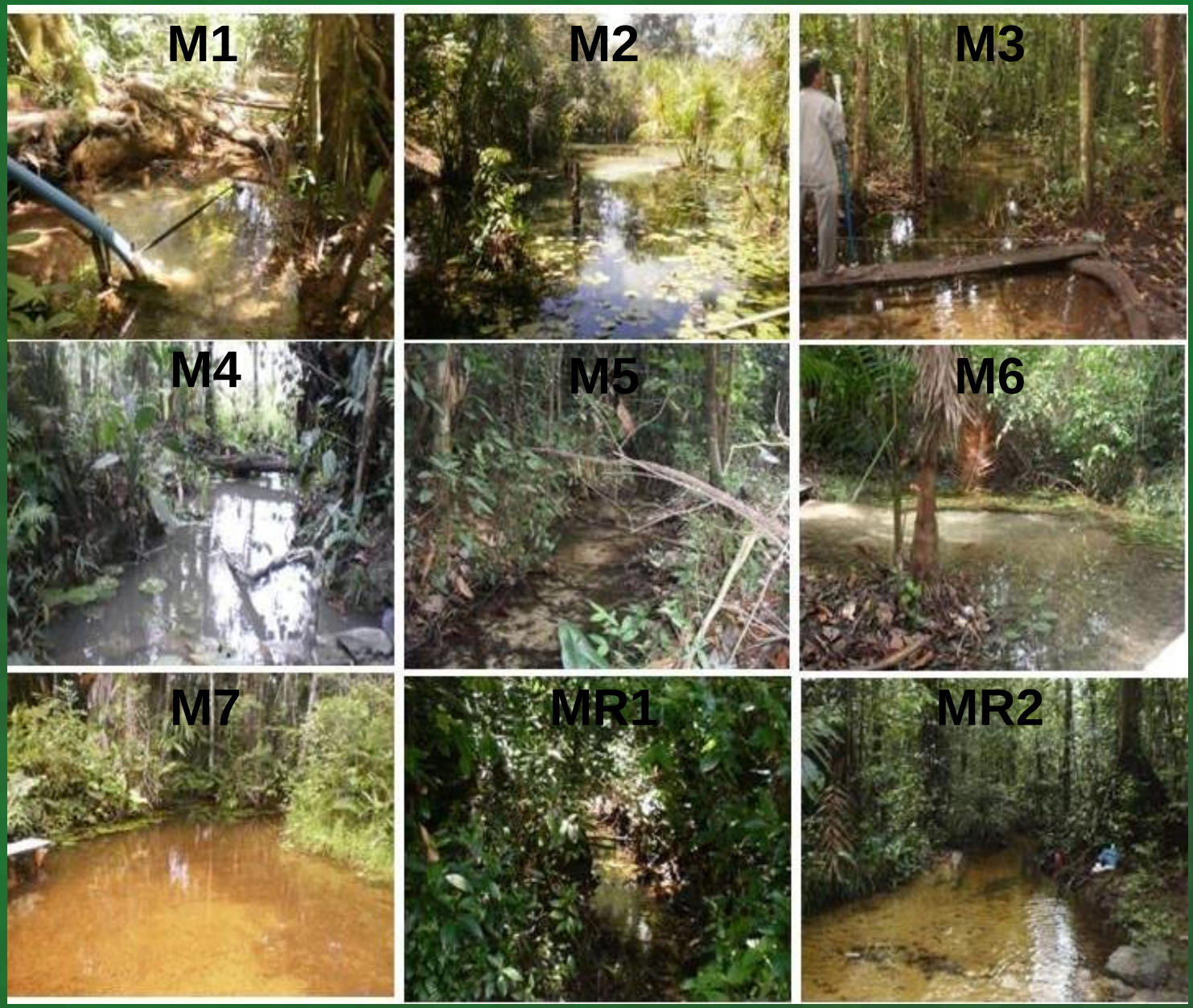
- Forest
- Fallow vegetation (old and young)
- Crops
- Exposed soil
- Pasture
- Housing

20 to 140 ha small catchments

Land use	Catchment								
	M1	M2	M3	M4	M5	M6	M7	MR1	MR2
% Forest	1,01	13,99	21,54	12,76	2,55	0,00	11,84	**99,89**	**86,62**
% Pasture	35,90	44,64	49,99	**81,58**	60,59	**88,3**	47,42	0,00	0,01
% Old 2nd Vegetation	28,56	17,21	9,57	1,76	26,50	7,59	6,89	0,10	0,00
% Young 2nd Vegetation	8,28	21,76	15,03	0,69	9,51	0,22	17,71	0,00	13,04
% S&B Agriculture*	**19,06**	0,00	1,73	0,46	0,23	3,39	**7,06**	0,00	0,32
% Exposed soil	**5,76**	2,40	1,95	2,74	0,62	0,49	**8,51**	0,00	0,00

*** Slash-and-burn agriculture > Cassava, corn, cowpea, pepper and passion fruit**

Sampling stations of the nine catchments



Methods

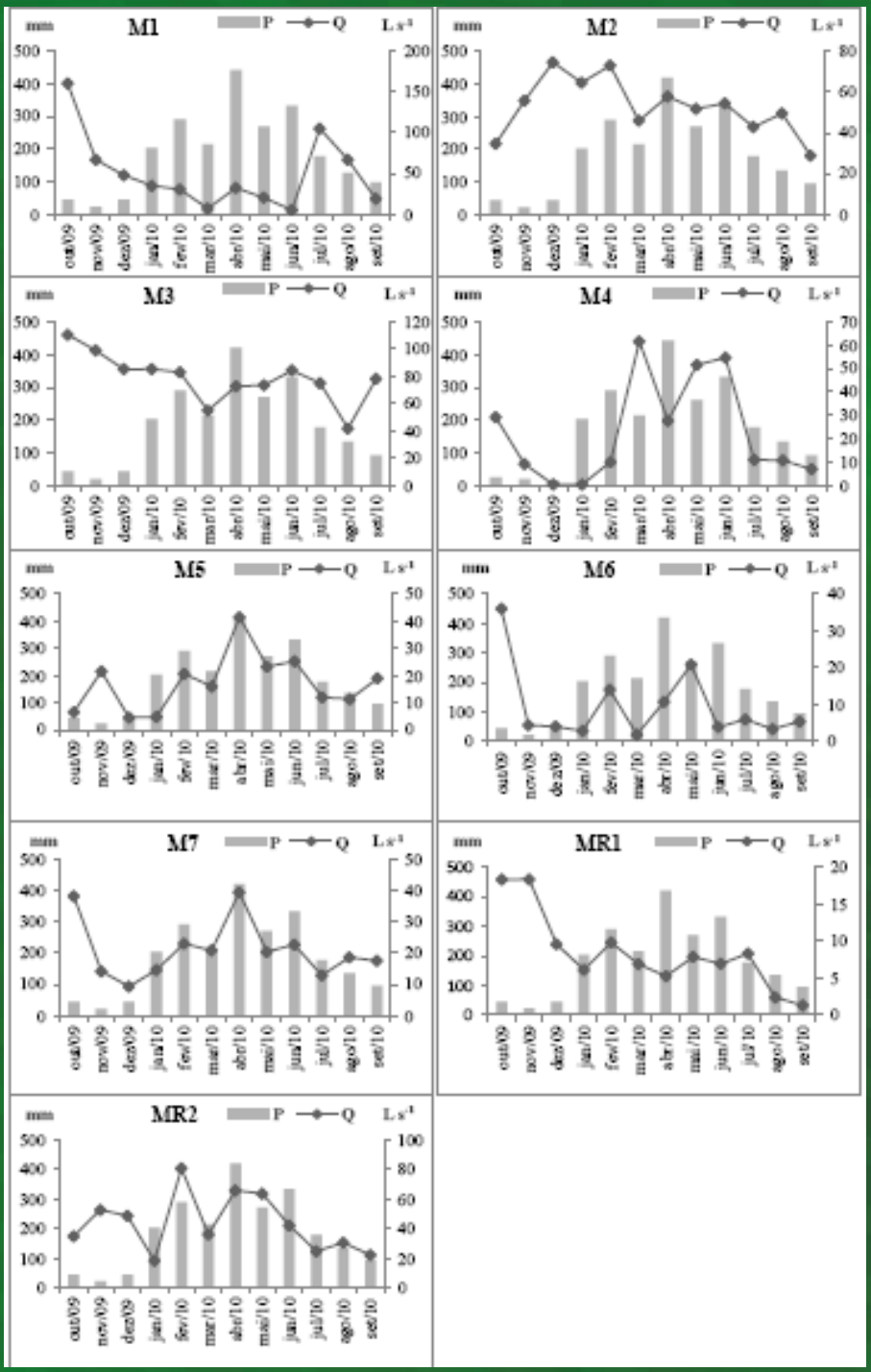
- Weather station in the experimental area of UFRA (01°12'S, 47°36'W). About 20 km far from Areas 1 and 2.

- Field campaigns from Oct/2009 to Sep/2010.

- Monthly instantaneous discharge measurements in the outlet of each catchment using a Global Water FP201 current meter and cross-sectional areas.

- Monthly EC, DO, pH, and temperature in situ measurements by: VWR® 2052 conductivity meter; YSI® 55 oximeter; and ORION 290A plus pHmeter.

- Water sampling collections for Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, $NH4^{+}$,Cl^{-}, SO_4^{2-}, NO_3^{-} and PO_4^{3-} ion chromatographic analysis (Dionex DX-120).



Discharge x Rainfall:

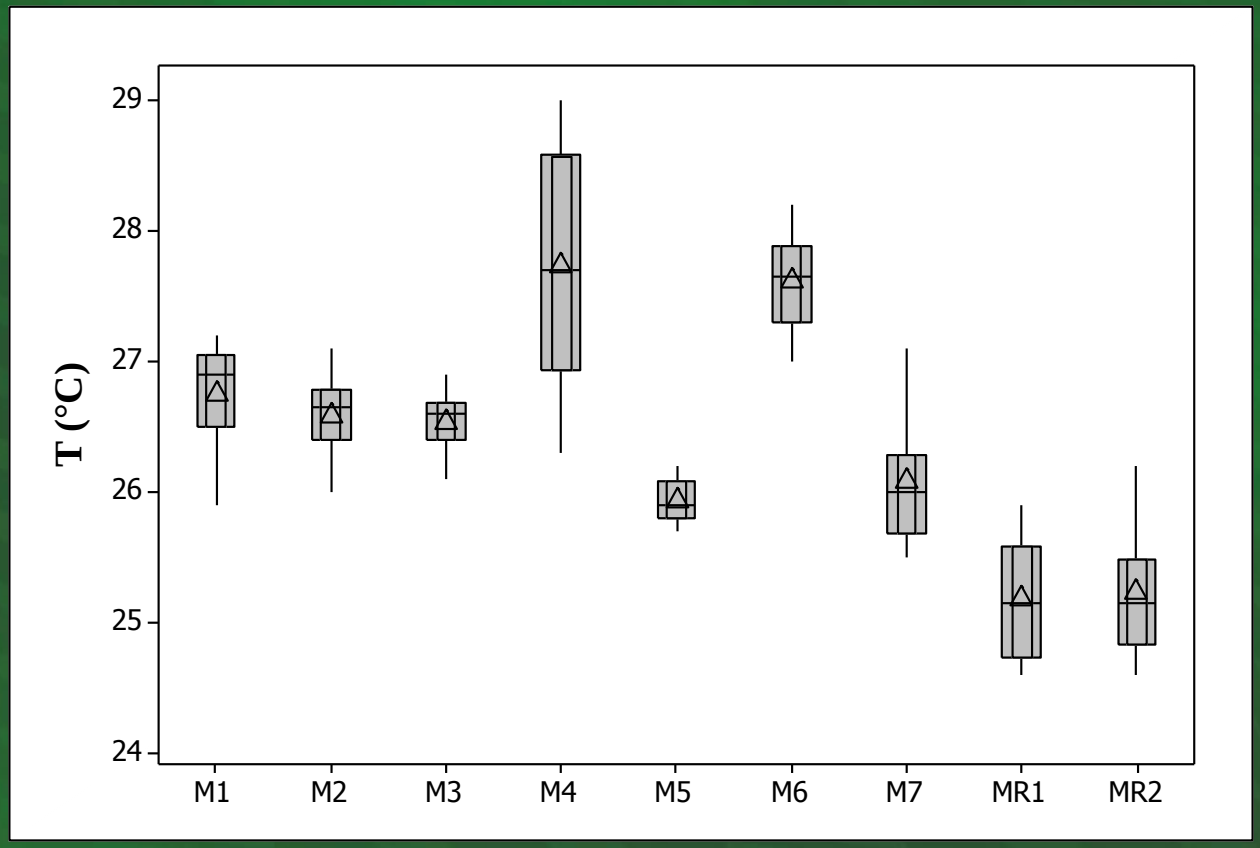
- quick response of small streams to rain events / monthly instantaneous discharge only

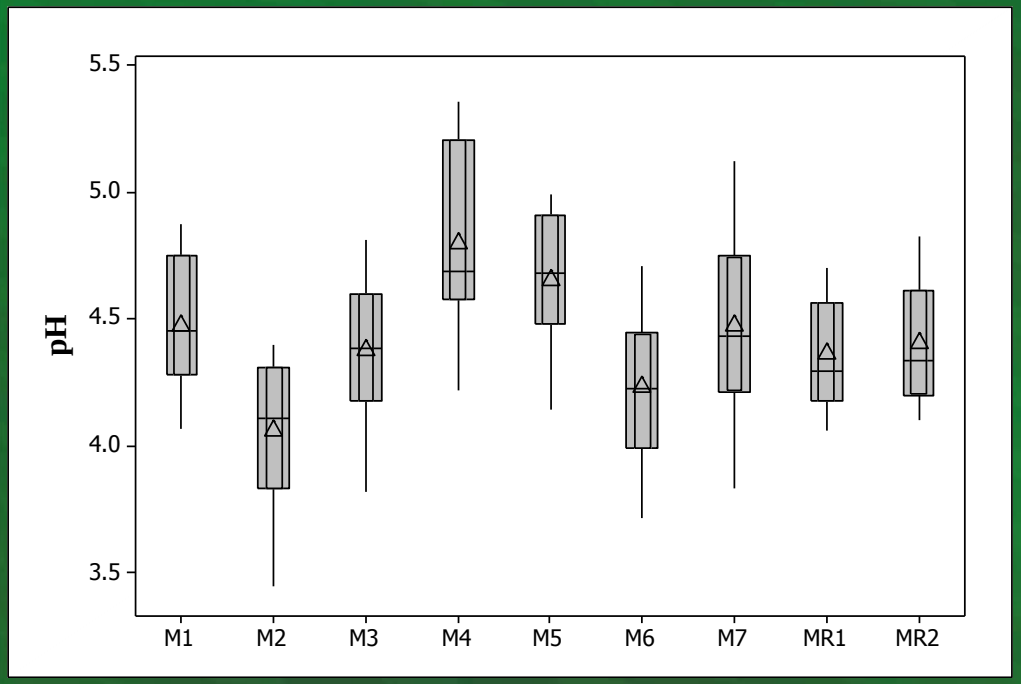
- no correlation

- but M4 and M7 discharges correlate with week cumulative rainfall

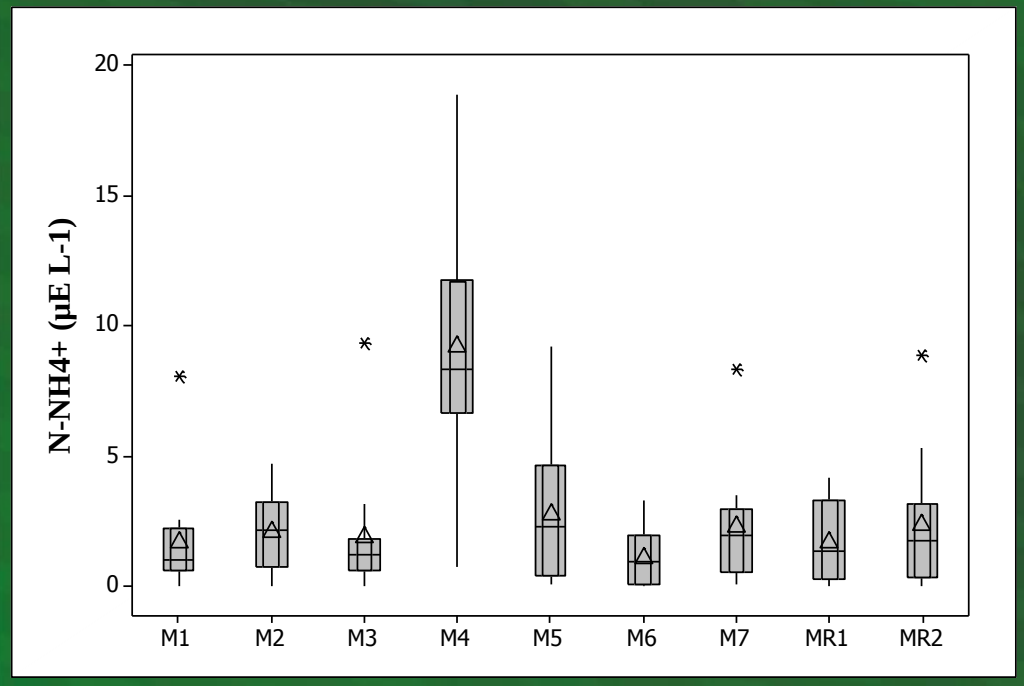
- and M3 and M5 discharges correlate with 2-days cumulative rainfall.

↑ Temperature = ↑ %pasture and ↓ %forest



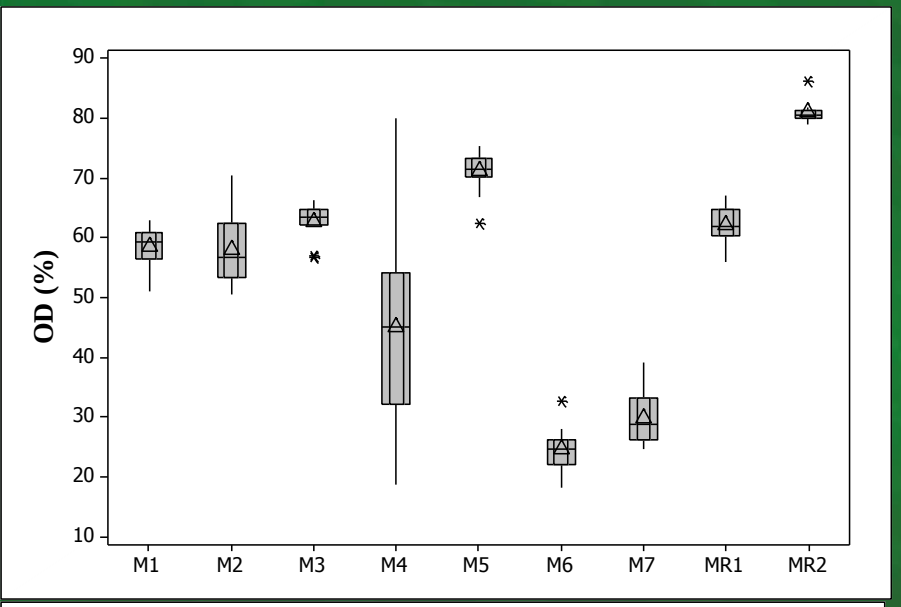


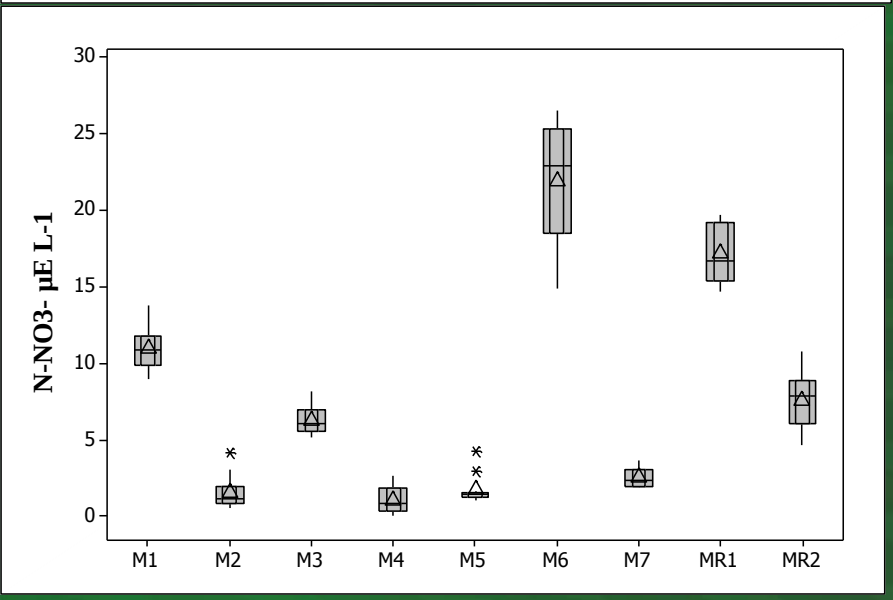
↑ pH (Pasture): no riparian forest and/or burning in pastures (ashes)



↑ NH_4^+ (Pasture): Cattle urine

- Associated to pH increase (Campos, 2010) and DO decrease (Esteves, 1998)



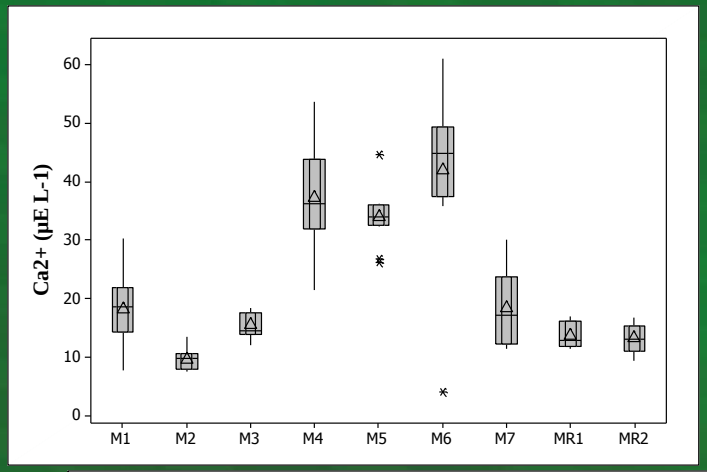


↓DO = ↑ %pasture and S&B agriculture

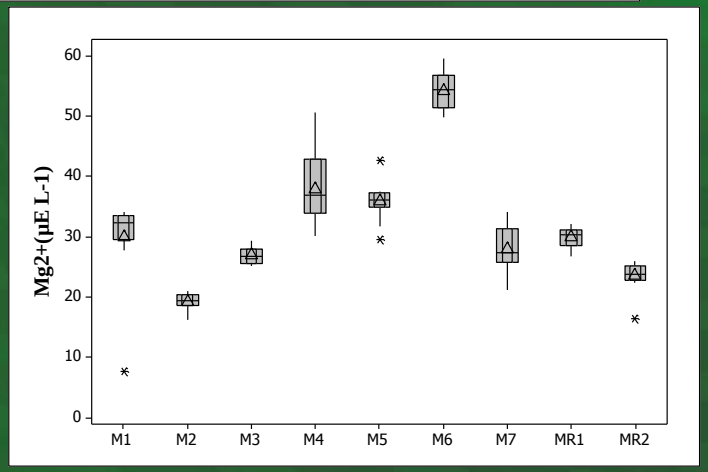
↑DO =↑ %forest

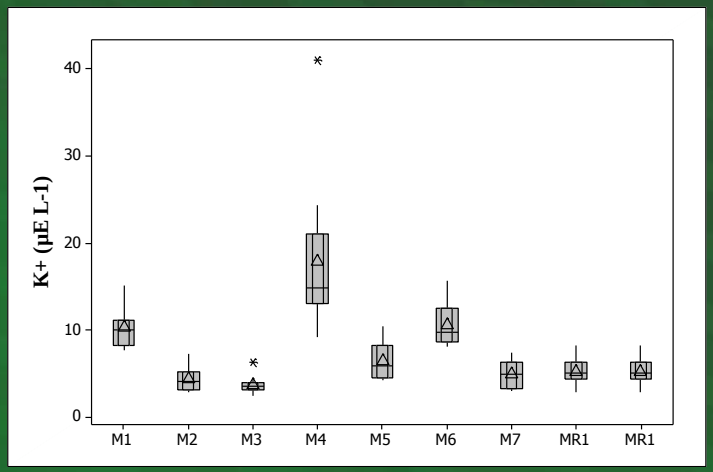
↑ NO_3^- = fertilizers (M1); not identified (M6); OM mineralization (MR1 and MR2)

↓ NO_3^- = Low N pasture soils (M4)



↑Ca, Mg and K = ↑ % S&B agriculture and pasture burning



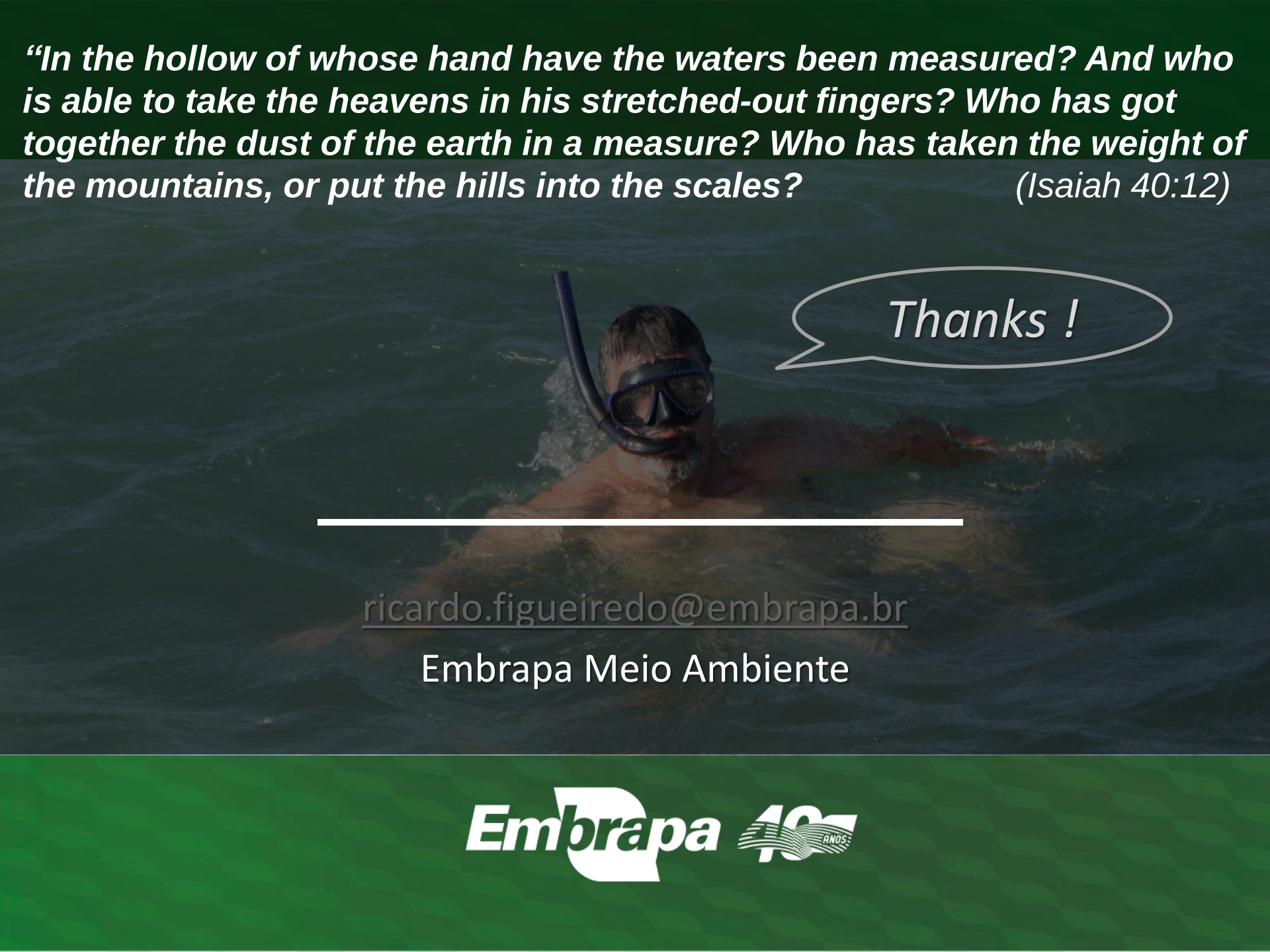


Conclusions

- In this region, riparian forest conservation can be an important management tool for mitigating land use change effects on the water quality, together with agriculture conservation practices techniques that avoid the use of fire to clear land for crops and pasture.

- Simulations using SWAT could confirm the long term data we observed on water quality as a response to land use change and agriculture practices. The problem is the lack of long term data series in the region.

“In the hollow of whose hand have the waters been measured? And who is able to take the heavens in his stretched-out fingers? Who has got together the dust of the earth in a measure? Who has taken the weight of the mountains, or put the hills into the scales? *(Isaiah 40:12)*



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