

Figure 1. Example of Certificate provided to citizen volunteers and their mentors, evidencing completion of water sampling training.



Figure 2. Map of sampling stations and observed point sources. Most stations have been sampled during low-flow events via “grab-type” sampling and some stations are designated for storm sampling. A description of each station number is detailed in Tables 1 and 2.

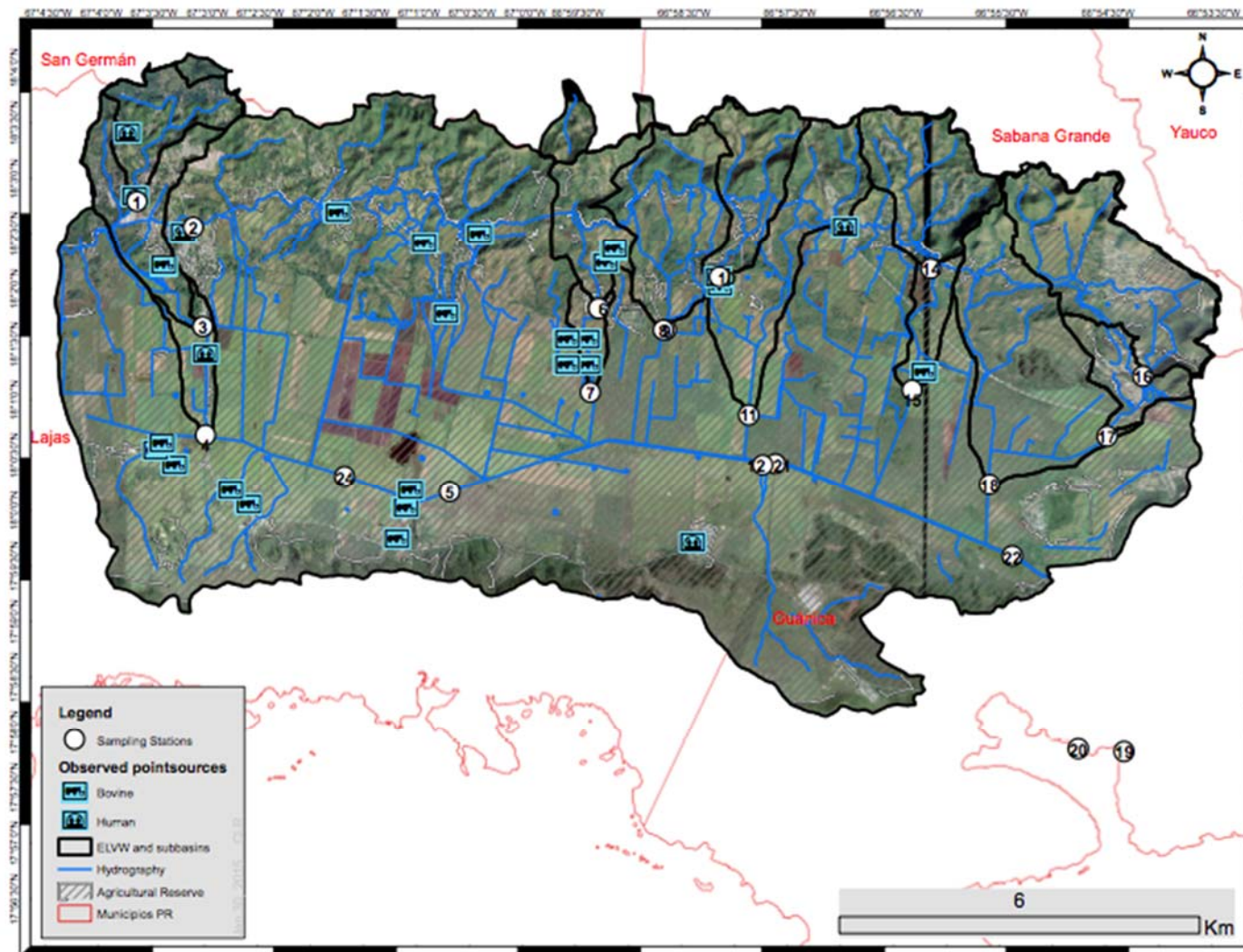


Table 1. Description of sampling stations and dates of grab sampling for each station.

Station ID	Station Name	Sampling Type	Geographic coordinates		Grab sampling incursion				
			Latitude	Longitude	I	II	III	IV	V
1	Lajas WWTP Outfall	Professional (Grab)	18.046533	-67.060897	8/12/2014	9/24/2014	1/9/2015	4/14/2015	6/2/2015
2	Irrigation Canal at Lajas	Volunteer	18.042714	-67.052012	8/6/2014	9/29/2014	1/12/2015	4/16/2015	6/2/2015
3	Qbda. Mondongo I	Volunteer (Grab) + Professional (Storm)	18.027597	-67.050236	8/6/2014	9/29/2014	1/12/2015	4/16/2015	6/2/2015
4	Qbda. Mondongo II	Professional (Grab)	18.011500	-67.049985	8/12/2014	9/24/2014	1/9/2015	4/16/2015	5/27/2015
5	Drainage Canal I	Professional (Grab)	18.003080	-67.011524	8/11/2014	9/24/2014	1/9/2015	4/10/2015	5/29/2015
6	Qbda. Jicara (El Salao)	Professional (Grab + Storm)	18.030972	-66.988333	/ 1	/ 1	/ 1	/ 1	/ 1
7	Qbda. Jicara (Pagan Dairy)	Professional (Grab)	18.017501	-66.989453	8/25/2014	/ 1	/ 1	/ 1	/ 1
8	Qbda. La Plata	Volunteer (Grab)	18.027796	-66.978134	8/5/2014	9/29/2014	1/12/2015	4/20/2015	6/4/2015
9	Caribbean Fisheries	Volunteer (Grab)	18.027444	-66.977917	8/5/2014	9/29/2014	1/12/2015	4/20/2015	6/4/2015
10	Qbda. de El Rayo (El Tuque)	Professional (Grab + Storm)	18.035056	-66.969306	8/25/2014	10/22/2014	1/14/2015	4/7/2015	5/28/2015
11	Qbda. Bárbara	Professional (Grab + Storm)	18.015543	-66.964654	8/18/2014	9/25/2014	1/14/2015	4/7/2015	5/29/2015
12	Salinas Creek; West of Bayer, drainage from south	Professional (Grab)	18.006944	-66.960556	/ 1	/ 1	/ 1	4/9/2015	6/1/2015
13	Upstream Lajas WWTP outfall	Professional (Grab)			/ 2	/ 2	/ 2	4/14/2015	6/2/2015
14	Qbda. Maginas I	Professional (Grab)	18.036136	-66.936131	8/20/2014	9/25/2014	1/14/2015	4/7/2015	6/4/2015
15	Qbda. Maginas II	Professional (Grab + Storm)	18.018528	-66.939167	9/3/2014	9/25/2014	1/14/2015	4/9/2015	5/28/2015
16	Qbda. Cristales I	Volunteer (Grab)	18.019861	-66.902250	8/5/2014	10/1/2014	1/19/2015	4/6/2015	6/3/2015
17	Qbda. Cristales II	Volunteer (Grab) + Professional (Storm)	18.011667	-66.908333	8/5/2014	10/1/2014	1/19/2015	4/6/2015	6/3/2015
18	Qbda. Cristales III	Volunteer (Grab)	18.005000	-66.926944	8/6/2014	10/1/2014	1/19/2015	4/9/2015	6/3/2015
19	Guanica town SW Runoff	Professional (Grab)	17.964167	-66.907500	/ 2	10/14/2014	/ 2	4/24/2015	6/5/2015

Station ID	Station Name	Sampling Type	Geographic coordinates		Grab sampling incursion				
			Latitude	Longitude	I	II	III	IV	V
20	Guanica WWTP Outfall	Professional (Grab)	17.963889	-66.912500	/ 2	10/14/2014	/ 2	4/24/2015	6/5/2015
21	Drainage Canal II	Professional (Grab)	18.005722	-66.954558	8/11/2014	9/22/2014	1/16/2015	4/9/2015	6/1/2015
22	LV - Drainage Outlet	Student (Grab)	17.990417	-66.917778	8/6/2014	9/22/2014	1/19/2015	4/6/2015	6/3/2015
23	USGS station Las Latas	Professional (Grab)	18.006926	-66.876108	8/26/2014	10/1/2014	1/26/2015	/ 1	/ 1
24	Drainage Canal, downstream Artau	Professional (Grab)	18.005258	-67.027863	8/11/2014	9/24/2014	1/9/2015	4/10/2015	5/29/2015
25	LV - Drainage Channel downstream of #26	Professional (Grab)			/ 2	9/22/2014	1/16/2015	4/10/2015	6/1/2015
26	Outlet from Cuesta Blanca Community outlet to LV	Professional (Grab)			/ 2	/ 2	1/16/2015	4/10/2015	6/1/2015

/ 1 There was no flowing water to be sampled

/ 2 This station could not be sampled

Table 2. Description of sampling stations and dates of storm sampling for each station.

Station ID	Station Name	Sampling Type	Geographic coordinates		Storm sampling incursion				
			Latitude	Longitude	I	II	III	IV	V
3	Qbda. Mondongo I	Volunteer (Grab) + Professional (Storm)			5/28/2015	5/31/2015	/ 3	/ 3	/ 3
6	Qbda. Jicara (El Salao)	Professional (Grab + Storm)			/ 3	/ 3	/ 3	/ 3	/ 3
10	Qbda. de El Rayo (El Tuque)	Professional (Grab + Storm)			5/28/2015	/ 3	8/7/2015	/ 3	/ 3
11	Qbda. Bárbara	Professional (Grab + Storm)			/ 3	/ 3	8/7/2015	/ 3	/ 3
15	Qbda. Maginas II	Professional (Grab + Storm)			/ 3	/ 3	8/7/2015	/ 3	/ 3
17	Qbda. Cristales II	Volunteer (Grab) + Professional (Storm)			/ 3	/ 3	8/7/2015	/ 3	/ 3

/ 1 There was no flowing water to be sampled

/ 2 This station could not be sampled

/ 3 This sample is pending

Figure 3. Land-use map of Lajas Valley watershed as determined from groundtruthing excursions. The map includes observed point sources.

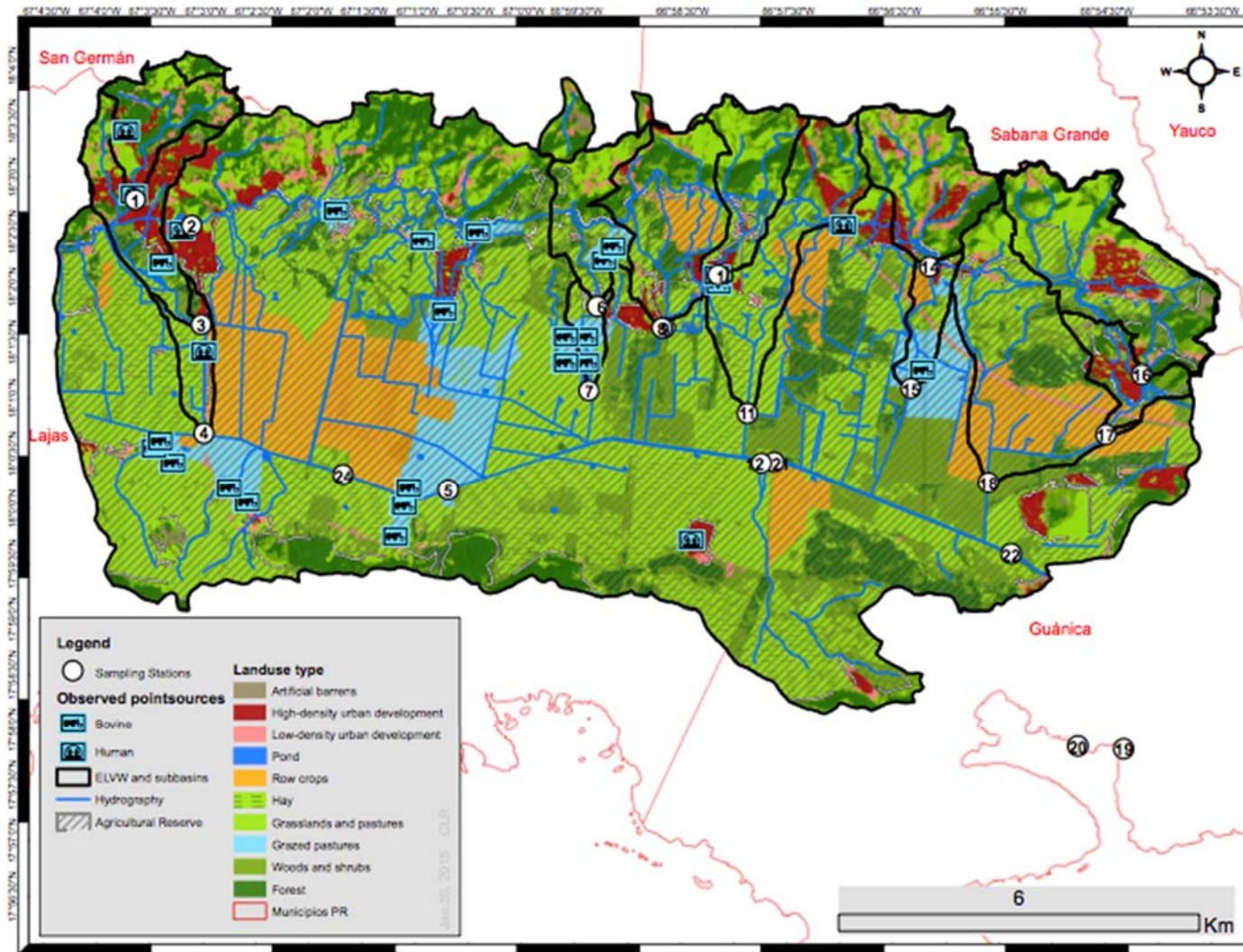


Figure 4. Land-use map of lower portion of the Río Loco watershed.

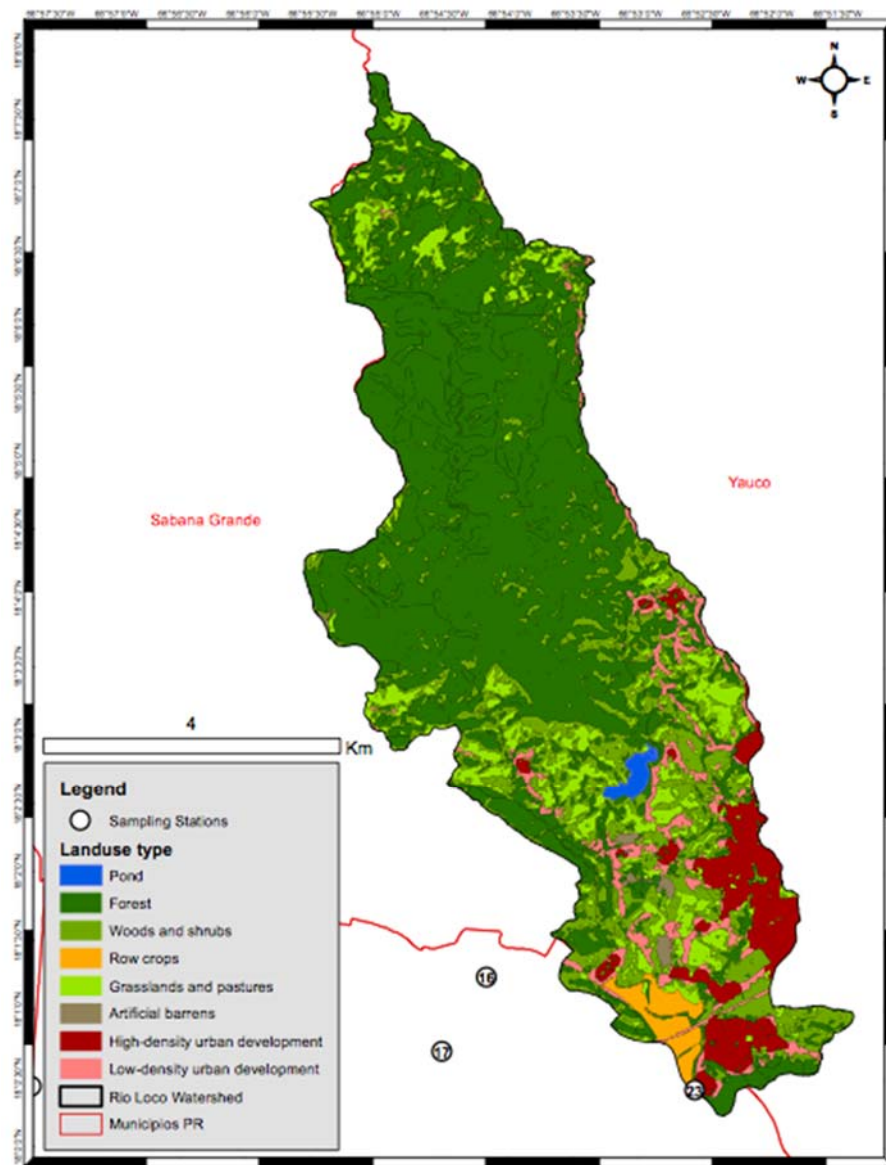


Table 3. Land use analysis of select subbasins within the Lajas Valley and Río Loco watersheds. See Figure 2 for the spatial location of sites.

Station ID	Sub-basin Total Area (km ²)	Landuse type as percent of total sub-basin area										Important sources of fecal and nutrient contamination ¹
		Artificial barren	Forest	Grasslands & pastures	Grazed pastures	Hay	Row crops	Ponds	Urban-high density	Urban-low density	Woods & shrubs	
1	274.4	0.07	46.08	21.72	0.00	0.00	0.00	0.00	11.40	10.06	10.87	WWTP, Urban and suburban discharge
3	552.3	1.00	42.52	29.23	0.60	12.24	0.00	0.00	5.38	4.75	5.13	WWTP, Urban and suburban discharge, Grazing animals
4	979.1	0.60	32.83	17.41	0.35	9.85	1.52	0.00	17.02	7.68	12.74	WWTP, Urban and suburban discharge, Grazing animals
6	344.3	0.00	23.07	30.07	7.08	0.13	0.00	0.00	3.51	4.73	31.41	Grazing animals
7	417.4	0.07	33.90	24.04	6.63	0.10	0.00	0.00	3.36	4.12	27.78	Grazing animals
8	464.5	0.00	23.93	26.81	0.06	1.00	17.04	0.00	5.65	6.27	19.24	
10	310.6	0.00	25.48	44.58	0.00	0.00	0.00	0.00	5.51	3.96	20.47	Urban discharge
11	556.2	0.22	11.85	45.57	0.00	14.64	3.69	0.05	7.22	2.20	14.56	Animal waste
14	392.3	0.07	22.55	25.58	1.00	0.00	0.00	0.00	10.93	12.81	27.14	
15	518.2	0.05	18.06	24.91	8.34	0.00	3.32	0.05	9.93	10.43	24.91	Grazing animals, Crop fertilizer
16	169.2	1.55	23.02	13.44	0.00	0.00	6.70	0.65	19.83	3.81	31.00	
17	816.1	1.14	24.35	28.19	0.00	0.00	1.39	0.13	11.54	4.57	28.68	Crop fertilizer
18	1377.5	0.60	19.24	26.36	0.47	0.00	18.42	0.09	6.39	3.95	24.48	Crop fertilizer
23	4204.6	0.44	58.21	10.35	0.00	0.00	1.59	0.50	5.88	4.32	18.71	

¹ Important sources of fecal contamination and nutrients described are those that have been visibly corroborated.

Table 4. Number of grab samples analyzed or in progress to be analyzed (in parenthesis) per parameter during project. NA means not analyzed.

Sampling Incursion	Samples collected	Temp	SPC	DO	Flow	NO ₃ -N	TKN	Total P	OB	SS	Heavy metals	Enterococci	Human bacteroidales	Cattle bacteroidales
I	19	19	19	19	17	18	19	19	19	18	NA	19	19	19
II	21	21	21	21	15	20	21	21	21	20	20	21	18	18
III	23	23	23	23	18	21	21	21	21	23	1	23	NA	NA
IV	23	23	23	23	21	21	21	21	20	23	NA	23	20	20
V	23	23	23	23	21	23	23	23	23	23	NA	23	NA	NA

Table 5. Number of storm samples analyzed or in progress to be analyzed (in parenthesis) per parameter during project. NA means not analyzed.

Sampling Incursion	Sample collected	NO ₃ -N	TKN	Total P	OB	SS	Heavy metals	Enterococci	Human bacteroidales	Cattle bacteroidales
I	3	3	3	3	3	3	NA	3	NA	NA
II	1	1	1	1	1	1	NA	1	NA	NA
III	9	(9)	(9)	(9)	(9)	(9)	NA	9	NA	NA
IV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
V	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Temp = Temperature

SPC = Specific conductance

DO = Dissolved oxygen

TKN = Total Khedjal Nitrogen

OB = Optical Brighteners

SS = Suspended Solids

Figure 5. Historical monthly precipitation for Lajas Agricultural Experiment Station (AES) and Santa Rita Guánica, and monthly precipitation for Lajas AES during 2014 and 2015.

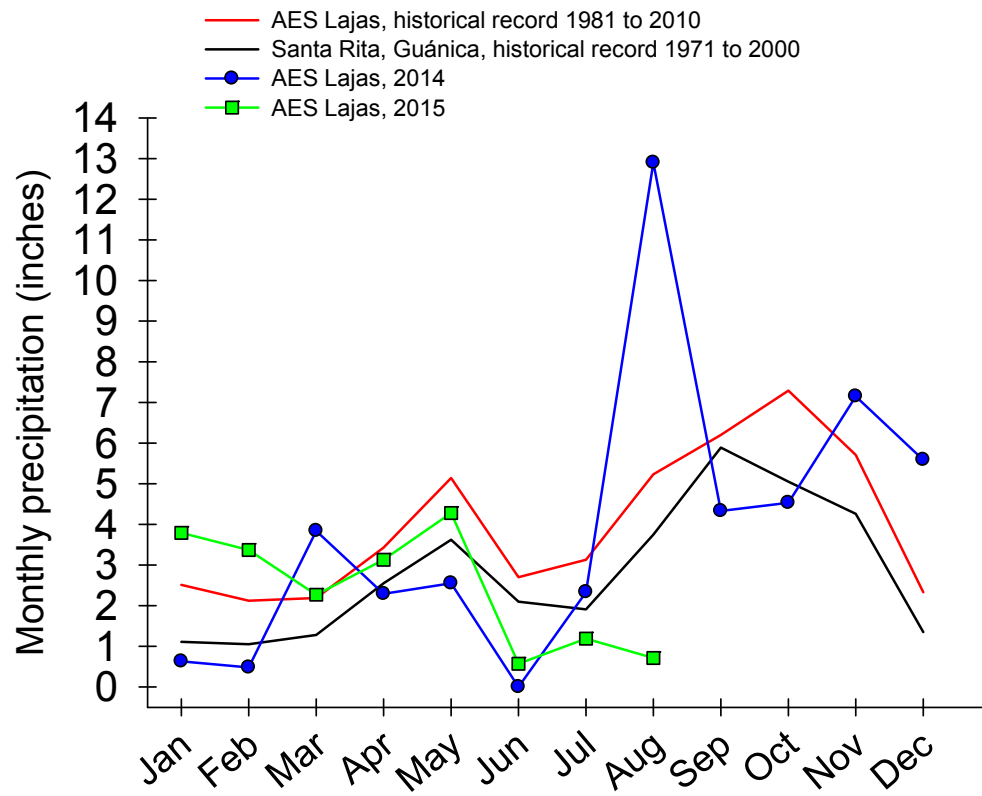


Figure 4. Summary of water quality data collected from two sampling events. Open symbols indicate that there is at least one sample that tested positive for optical brighteners.

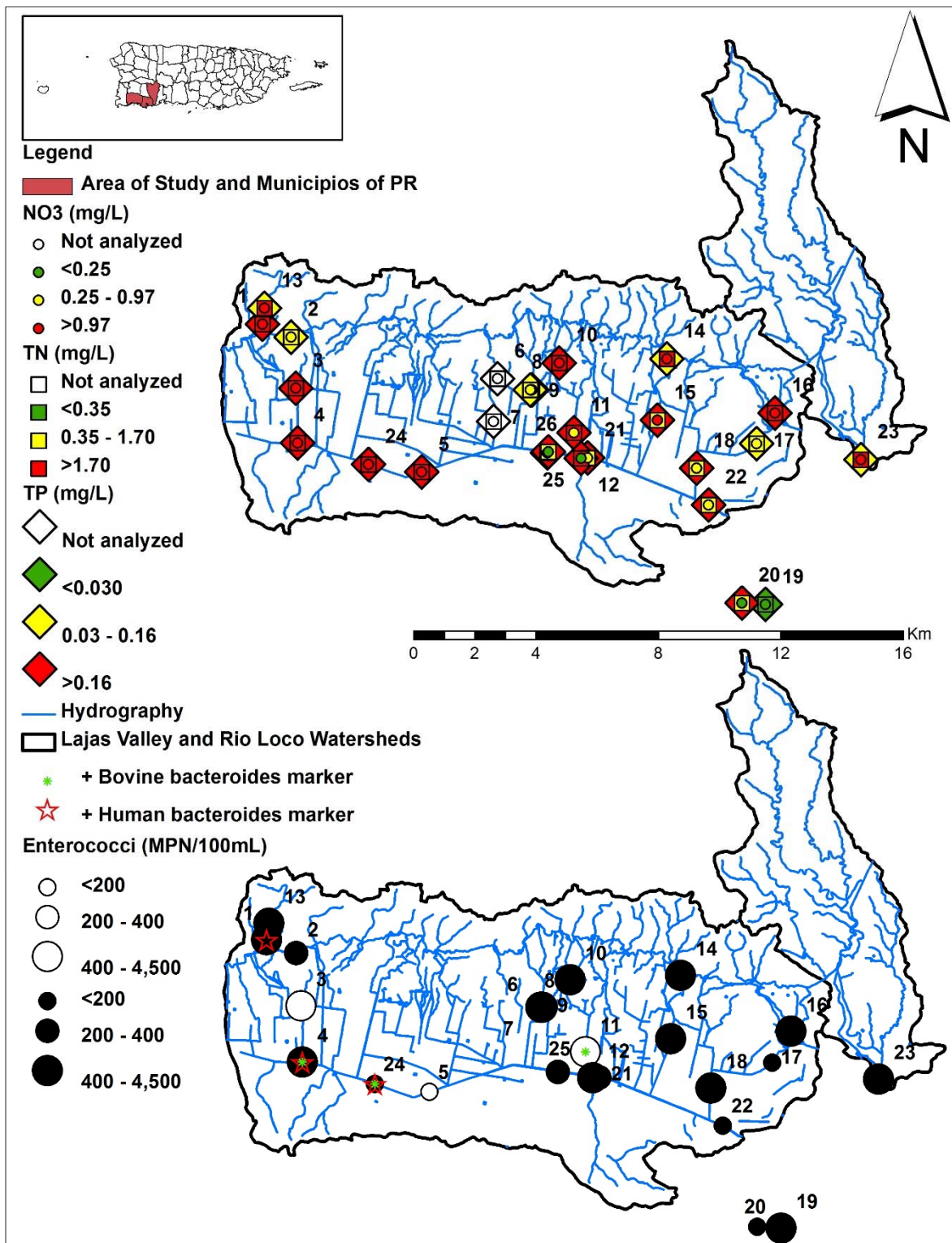


Table 6. Mean comparisons of water quality indicators among subbasins.

Basin ¹	TP		TN			NO3-N		Enterococci		
	-----mg/L-----							-----MPN/100mL---		
Maginas	0.34	B ²	1.44	A	B	1.30	ns	695.90	C	B
Mondongo	0.67	A	1.93	A		1.28		1140.41	B	A
Barbara	0.36	B	1.35		B	1.10		1833.55		A
Cristales	0.41	B	1.08		B	0.72		358.72	C	
All basins	0.46		1.44			1.08		938.20		
	N=58		N=60			N=59		N=57		

- 1 Mondongo basin include stations #1, #3, #4; Cristales basin includes stations #16, #17, #18; Bárbara basin includes stations #10, #11; Maginas basin includes stations #14, #15.
- 2 Means among basins with different letters are significantly different at P<0.05.