



SCIENCE AND
EDUCATION **FOR**
SUSTAINABLE
LIFE

Effectiveness and lifetime of measures around Björnöfjärden, Stockholm Archipelago

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Trends - General Additive Models (GAM)

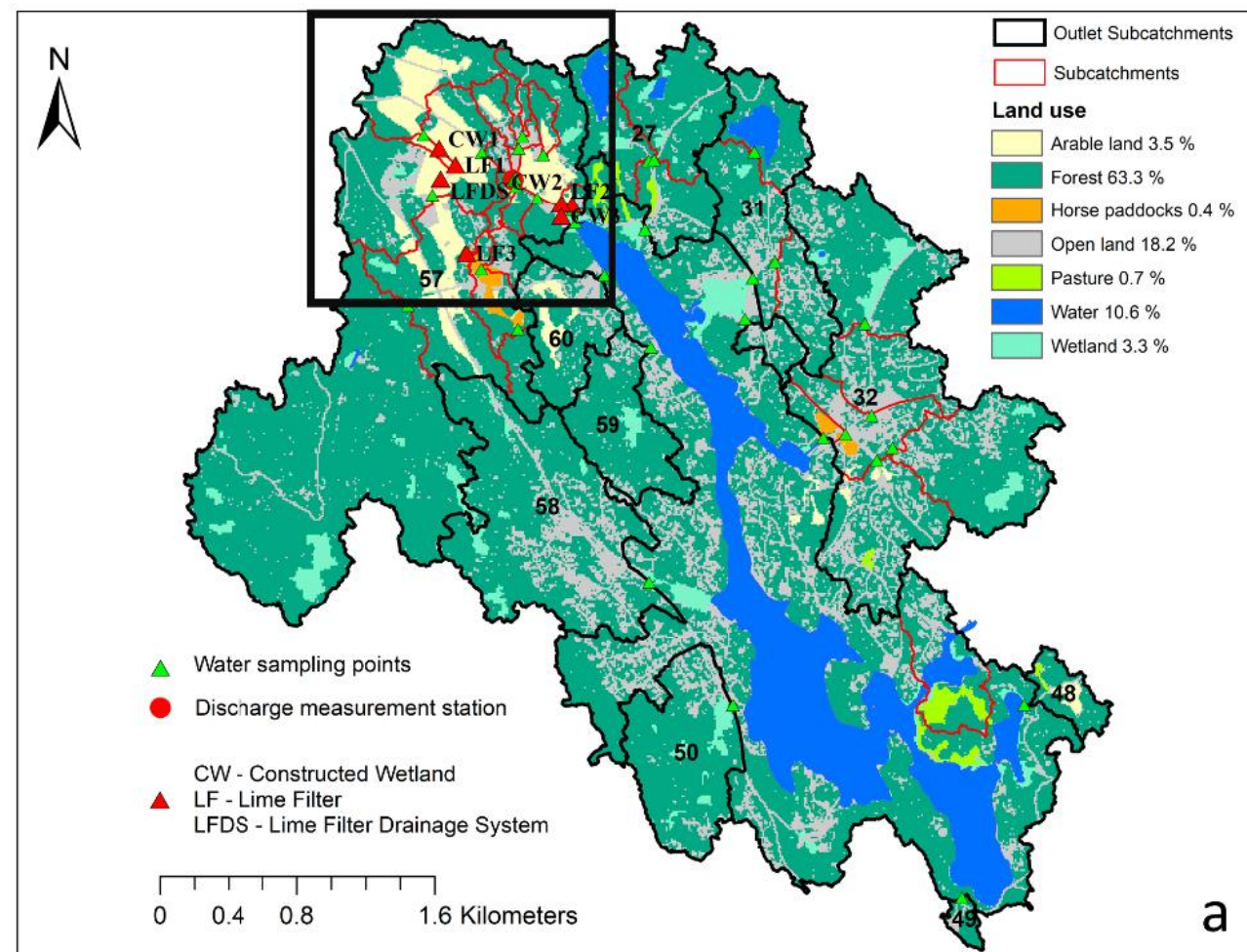
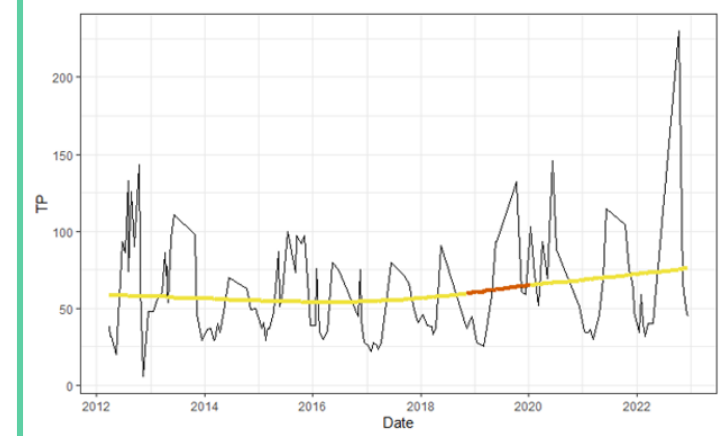


Trends Mann-Kendall

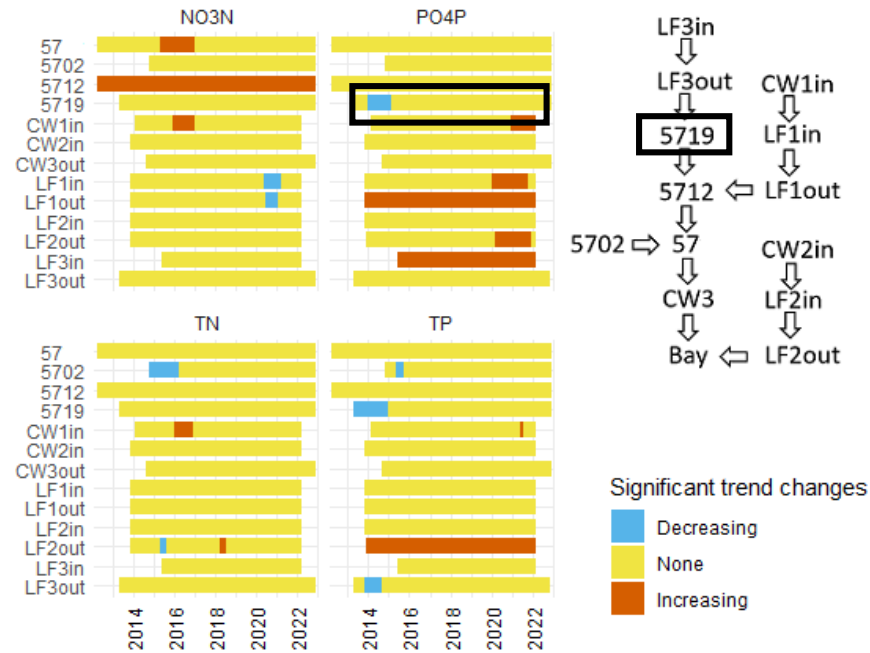
Mann-Kendall statistics (Theil Sen Slope and p-value)

(*p < 0.05; **p < 0.01 and ***p < 0.001)

ID	NO ₃ -N	TN	PO ₄ -P	TP
27	11.0*	22.0***	-0.3*	-0.8
31	14.5*	20.8*	-0.1	-0.5
32	1.2	25.5*	-0.6	-0.4
48	-0.2	-8.0	0.2	0.2
49	0.7**	5.4	0.1	0.4
50	-5.2	34.5	0.1	0.3
57	94.5***	44.6*	-1.7*	-3.3*
58	3.7	6.5	-0.7*	-1.0*
59	1.9	-2.9	-0.1	-0.4
60	0.8	-14.6	-1.1*	-4.6**



Trends General Additive Models (GAM)



Trends Mann-Kendall

Mann-Kendall statistics (Theil Sen Slope and p-value)

(*p < 0.05; **p < 0.01 and ***p < 0.001)

ID	NO ₃ -N	TN	PO ₄ -P	TP
57	94.5***	44.6*	-1.7*	-3.3*
5702	-21.1	-17.5	17.8	23.8*
5712	113.8***	62.3***	-1.3***	-3.0***
5719	43.6***	26.2	-0.8***	-2.3*
CW1in	160.6*	153.9*	-0.7	-1.3
CW2in	-53.1	-18.2	-1.3	-1.8
CW3out	57.7	-0.7	0.2	-0.4
LF1in	-7.4	-45.6	-0.1	1.7
LF1out	-0.8	-61.7	1.0***	1.5
LF2in	-56.2	-161.4***	0.2	-6.9
LF2out	-14.5*	-131.0***	12.6***	22.4***
LF3in	30.1	17.2	0.9	0.7
LF3out	28.1**	18.2	-0.5	-1.2

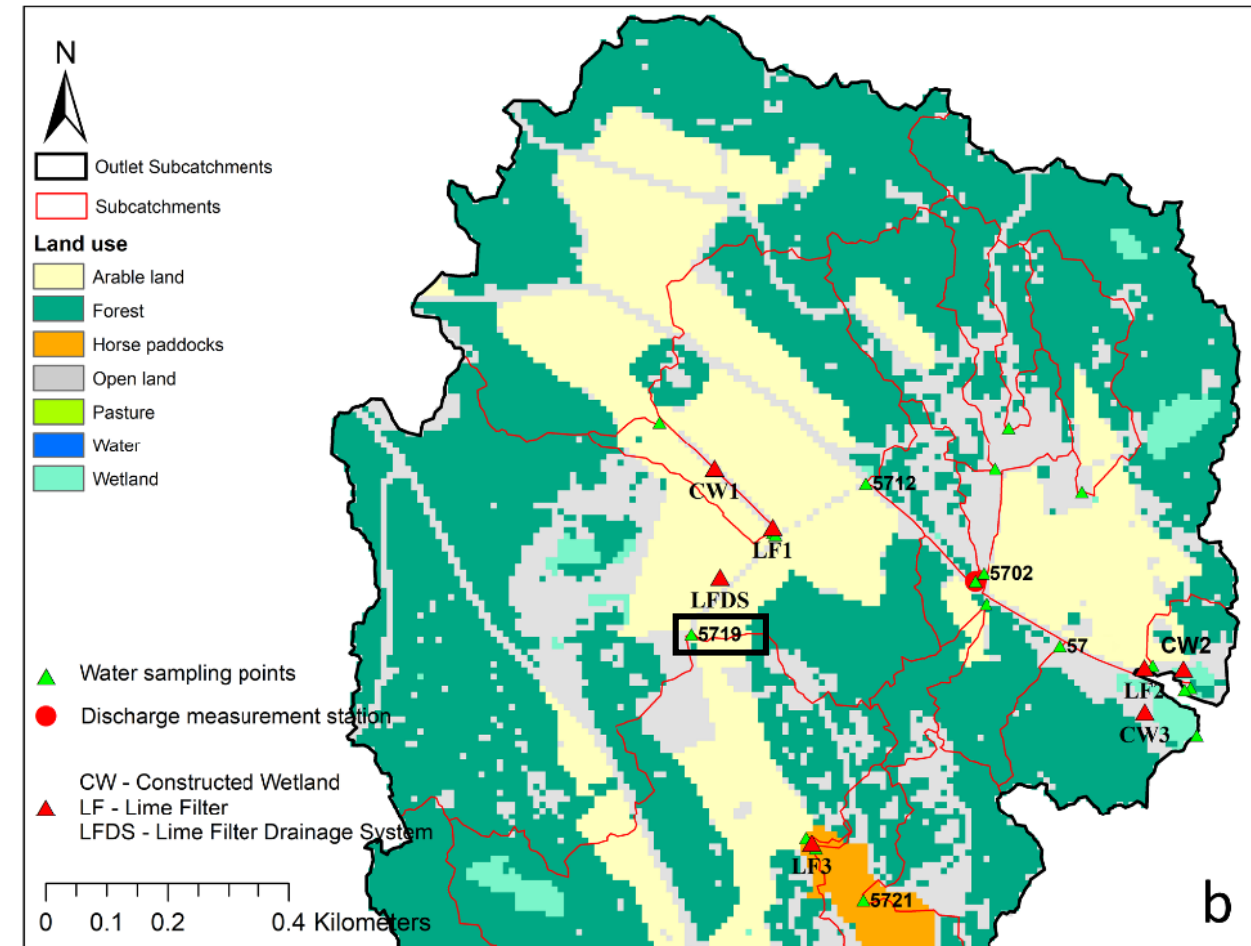
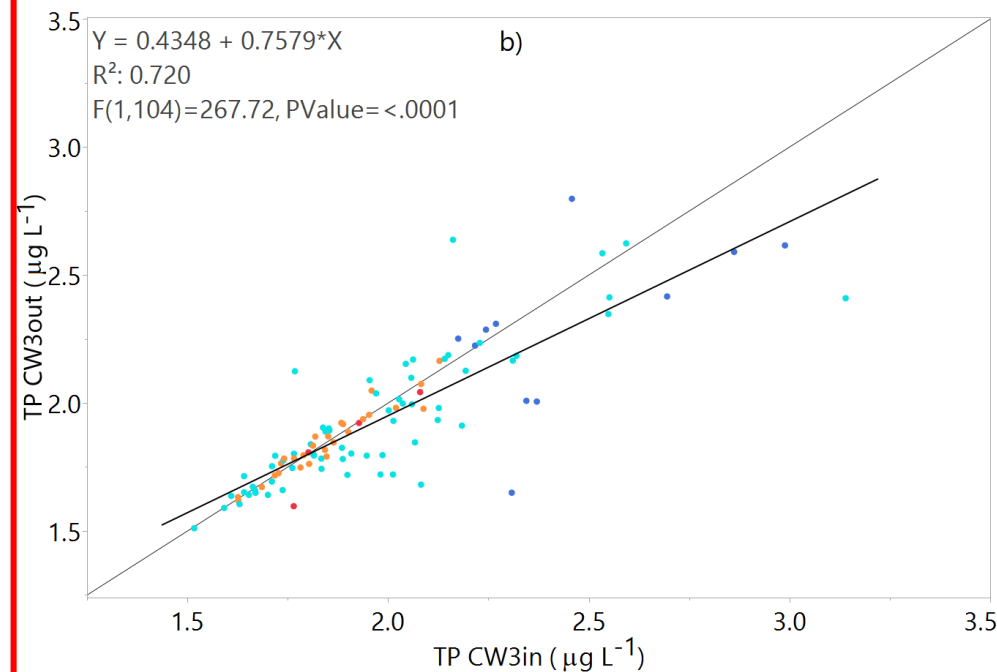
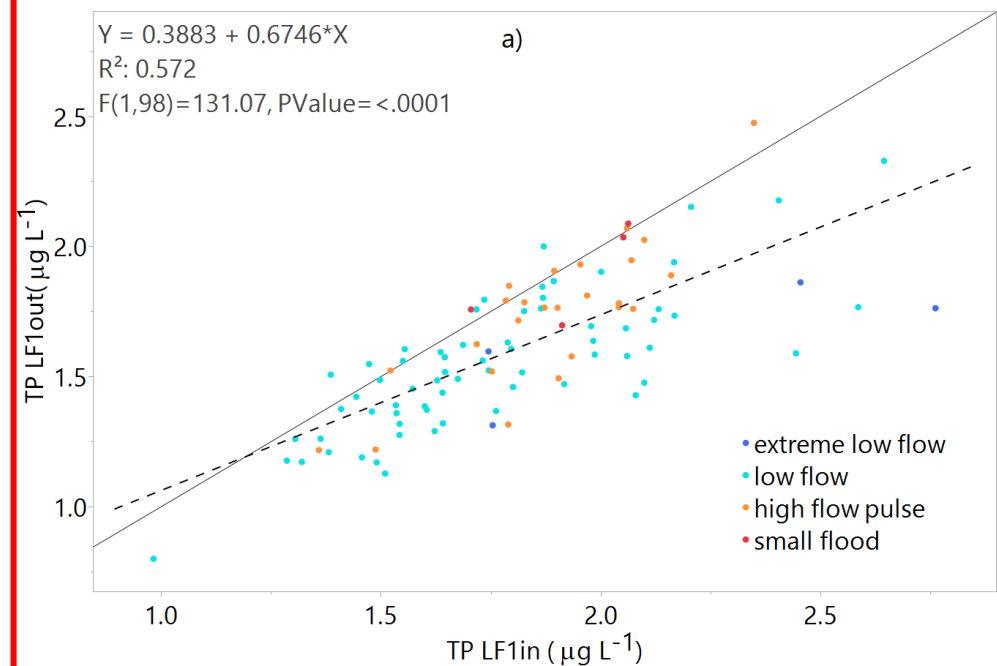
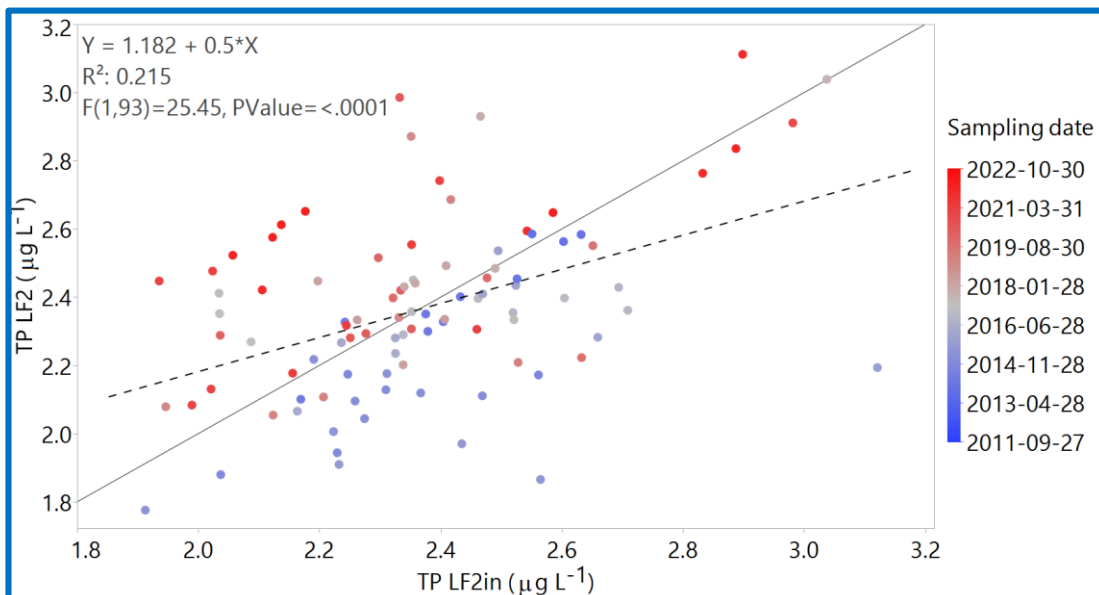


Table 2. Effect (%) of implemented mitigation measures in reducing nutrient concentrations and loads, based on ANOVA comparison of incoming and outgoing nutrient concentrations, and coefficient of determination (R^2) between incoming and outgoing nutrient concentrations. Blue indicates significant reductions, yellow no significant differences, and red a significant increase. Level of significance: * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

Concentrations								
	PO ₄ -P	TP	NO ₃ -N	TN	PO ₄ -P	TP	NO ₃ -N	TN
	%				R^2			
CW1	-9*	13***	-26***	-3*	0.10*	0.10*	0.23***	0.32***
LF1	-21***	-12***	ns	ns	0.32***	0.57***	0.80***	0.88***
CW2	-9**	ns	-28***	-6***	0.03	0.05*	0.13***	0.21***
LF2	ns	ns	-14*	ns	0.37***	0.22***	0.53***	0.60***
LF3	ns	ns	ns	ns	0.89***	0.71***	0.77***	0.81***
CW3	ns	ns	ns	ns	0.73***	0.72***	0.57***	0.69***
Loads								
	PO ₄ -P	TP	NO ₃ -N	TN	PO ₄ -P	TP	NO ₃ -N	TN
	%				R^2			
CW1	ns	ns	-33***	ns	0.78***	0.82***	0.76***	0.93***
LF1	-80*	-23*	ns	ns	0.82***	0.94***	0.90***	0.99***
CW2	ns	ns	-35***	ns	0.58***	0.70***	0.55***	0.90***
LF2	ns	ns	ns	ns	0.80***	0.84***	0.72***	0.96***
LF3	ns	ns	ns	ns	0.98***	0.91***	0.92***	0.98***
CW3	ns	ns	ns	ns	0.90***	0.95***	0.87***	0.99***



- ✓ Do right things – identify main source(s)
- ✓ Do things right – implementation phase – placement, design, size, "best before date"
- ✓ Identifying trends problem
 - ✓ According to Betanzo et al. (2015), the minimum duration of monitoring at monthly time step required in small watersheds to detect water quality change is 8 years, assuming 40% reductions in PO₄-P and TP over a period of 20 years. Likewise, Wellen et al. (2020) estimated that detection of 40% reductions in flow-weighted mean concentrations would require 3-10 years of TP data, 5-25 years of PO₄-P data, and 2-6 years of NO₃-N data.
- ✓ Monitoring water quality to follow up the effect of measures (frequency – duration – expected effect – cost)

Thank you!



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