Supplementary Figures, Table, and Regression Equations

Long term (1998 - 2019) changes in water quality parameters as a function of freshwater inflow in River-Bay continuum

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Supplementary Figures, Table, and Regression Equations

Section A contains Figures S1 – S7 and Table S1

Section B contains:

Linear Regression result to determine P-PO_4 and N-NO_{2_3} concentrations in the Indian River, Indian River Bay, Lewes-Rehoboth Canal, Little Assawoman Bay, and Rehoboth Bay watersheds.

Supplementary Material Section A:

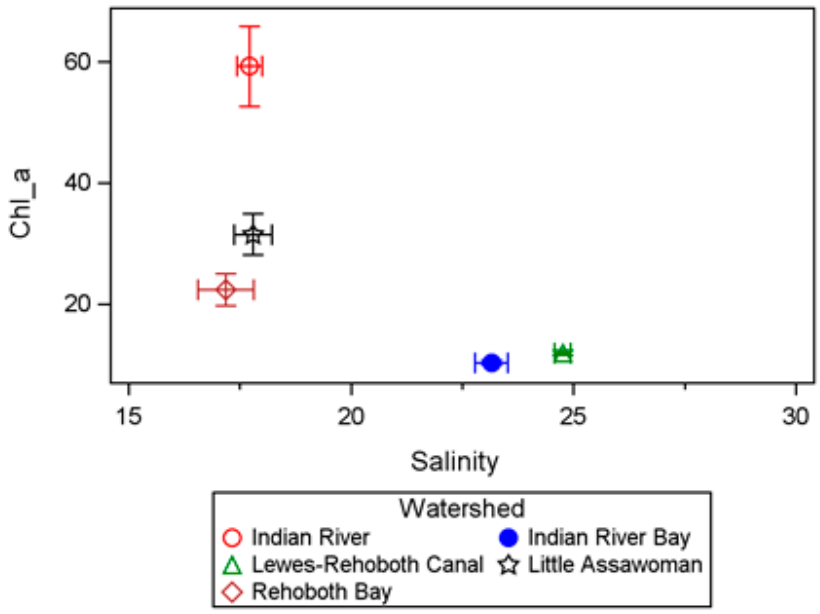

Figure S1. Chlorophyll-a (chl-a) in µg/L concentration along variable salinity gradients in the five watersheds. The length of whiskers represent ranges in vertical and horizontal axis.

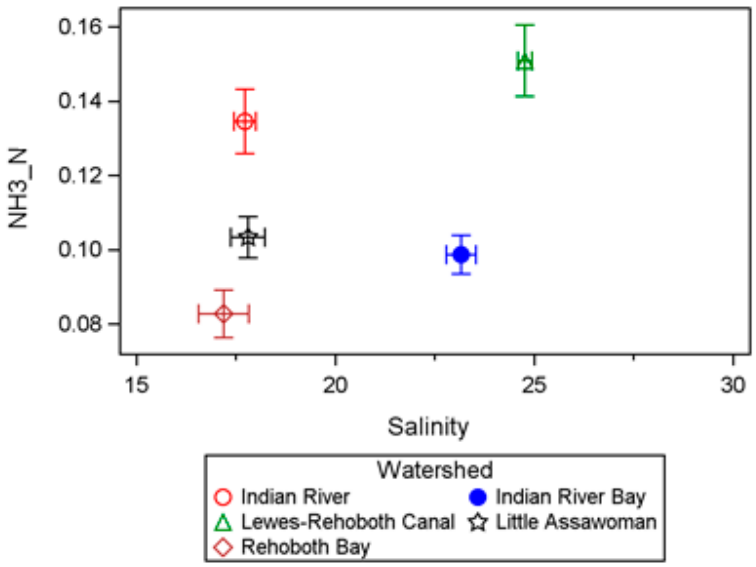

Figure S2. Dissolved ammonia as N (N-NH_3) in mg/L concentration along variable salinity gradients in the five watersheds. The length of whiskers represent ranges in vertical and horizontal axis.

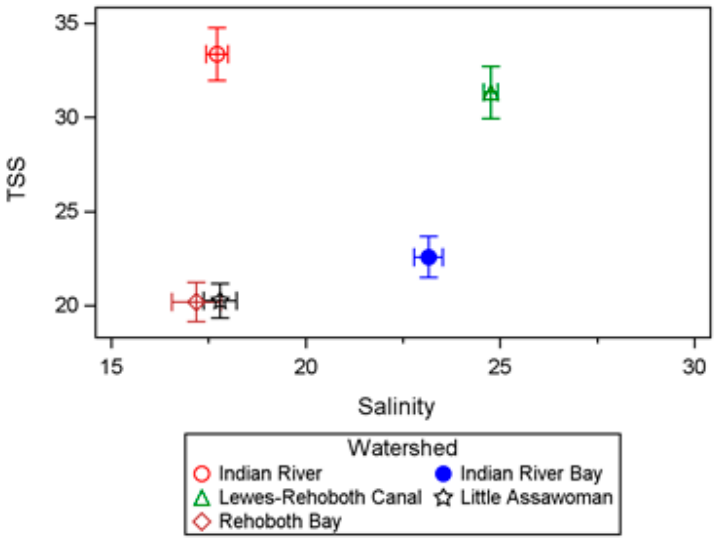

Figure S3. Total suspended solids (TSS) in mg/L concentration along variable salinity gradients in the five watersheds. The length of whiskers represent ranges in vertical and horizontal axis.

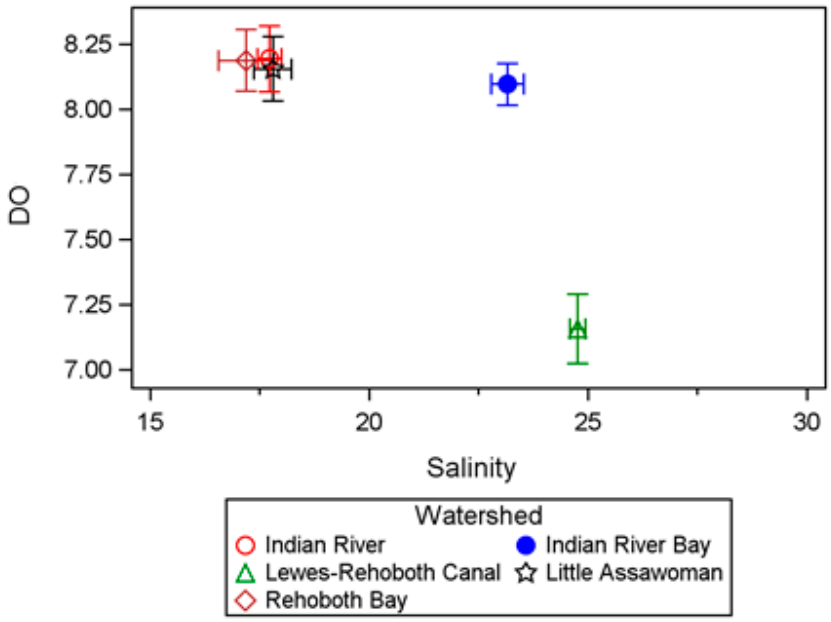

Figure S4. Dissolved oxygen (DO) in mg/L concentration along variable salinity gradients in the five watersheds. The length of whiskers represent ranges in vertical and horizontal axis.

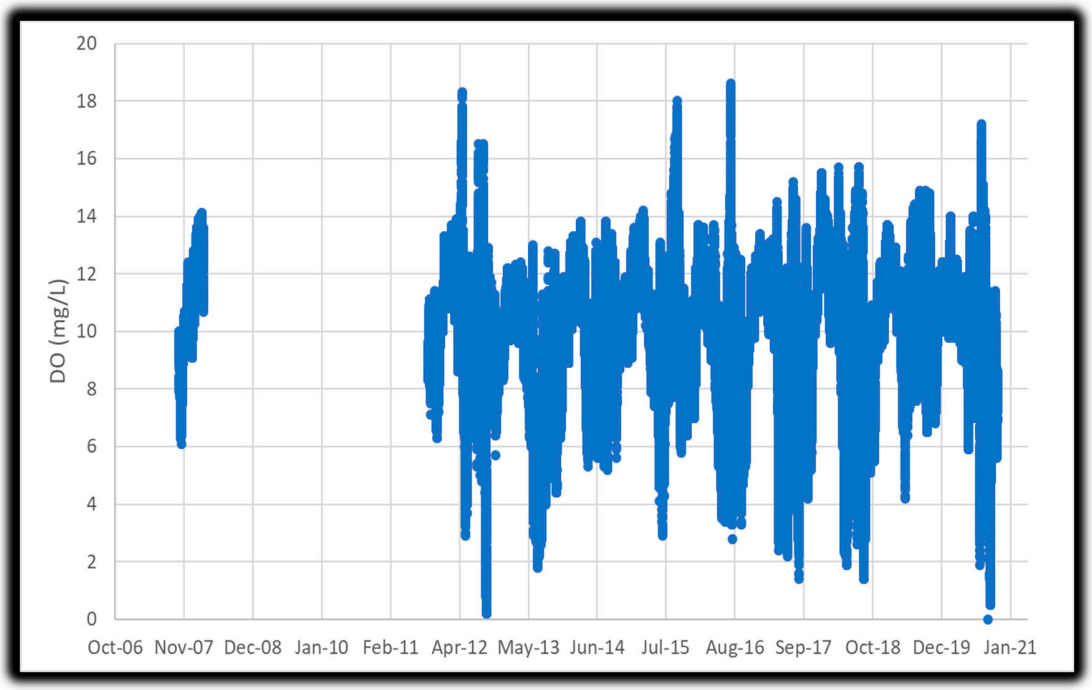

Figure S5. Dissolved Oxygen (DO) at the USGS continuous monitoring (15 mins interval measurement) sites in Millsboro Pond, Indian River from 2007 to 2020

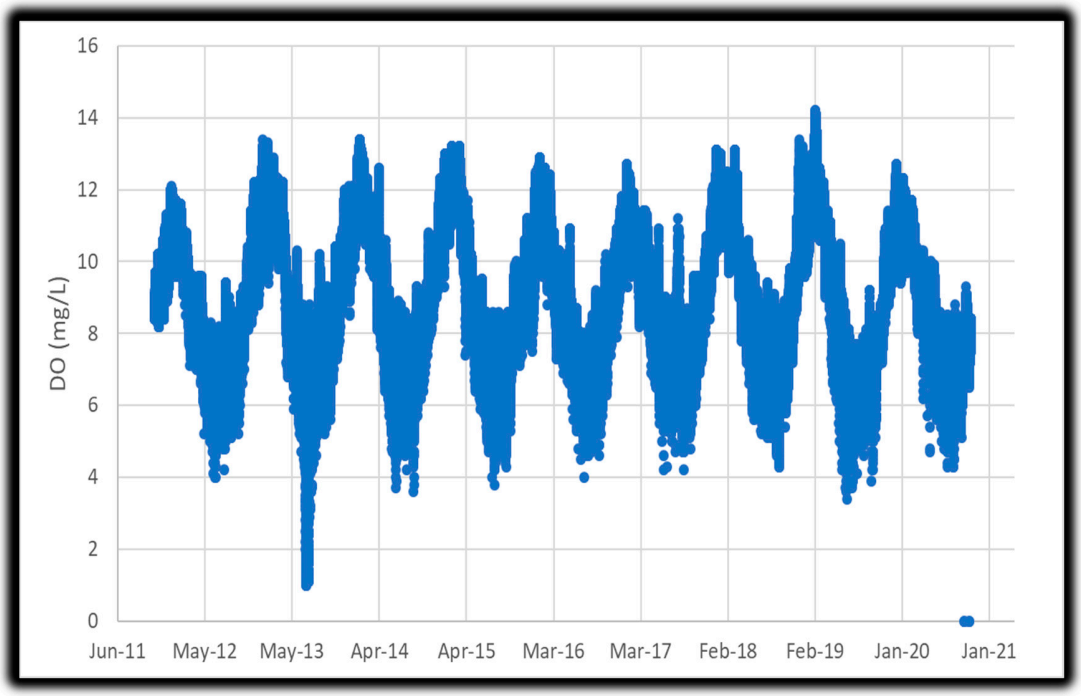

Figure S6. Dissolved Oxygen (DO) at the USGS continuous monitoring (15 mins interval measurement) sites in Massey Ditch, Massey Landing from 2011 to 2020

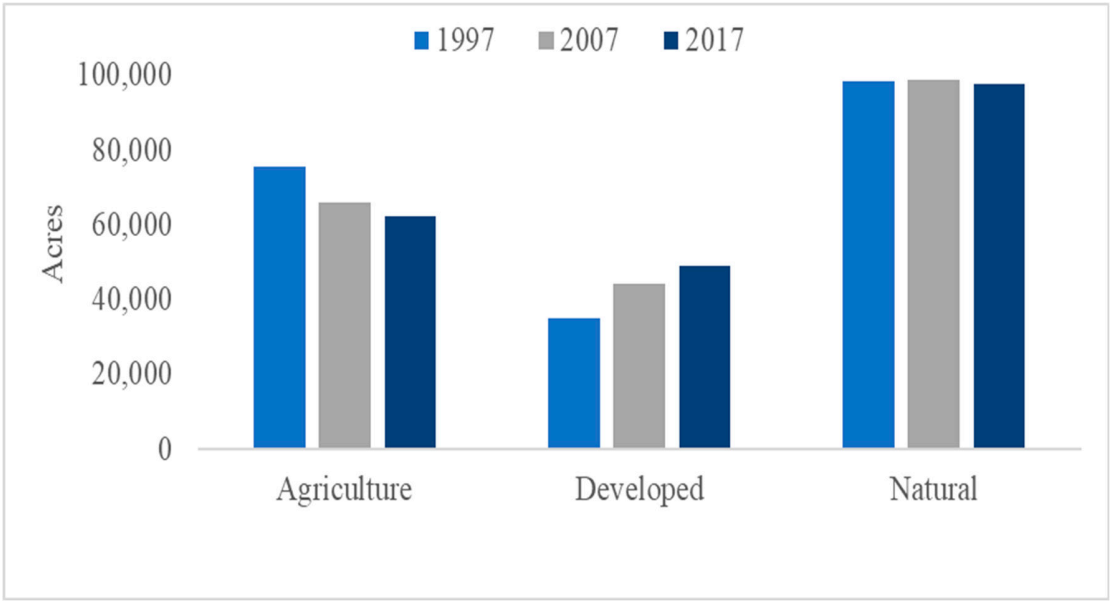

Figure S7. Land use changes in acres between 1997 and 2017 in the Inland Bays watersheds.

Table S1. Mean difference between watersheds for log transformed variables at 5% confidence interval identified by Tukey test. Only significant values are shown. Abbreviation: IR = Indian River; IRB = Indian River Bay; RB = Rehoboth Bay; LRC = Lewes-Rehoboth Canal; LA = Little Assawoman Bay; Chl_a = Chlorophyll a; Cl = Chloride; Sal = Salinity; TempWater = Water temperature; DO = Dissolved Oxygen; $N\text{-}NO_{2\_3}$ = Nitrite+nitrate; $P\text{-}PO_4$ = Dissolved phosphate as P; Secchi = Secchi depth; $N\text{-}NH_3$ = Dissolved ammonia as N; TSS = Total suspended solids. Only significantly different at α=0.05 was listed, * denotes not significant.

Variable	IR - RB	IR - IRB	IR - LRC	IR - LA	RB - IRB	RB - LRC	RB - LA	IRB - LRC	IRB - LA	LRC - LA
Secchi	*	-0.21	*	*	*	*	0.21	0.14	0.25	*
Chl_a	0.65	0.45	0.22	*	-0.2	-0.43	-0.72	-0.23	-0.53	-0.29
Cl	-0.49	-2.43	-3.65	-2.88	-1.93	-3.1	-2.3	-1.2	-0.44	0.77
Sal	0.64	-0.15	-0.56	*	-0.8	-1.2	-0.67	-0.4	*	0.53
TempWater	0.09	0.15	0.15	0.14	*	*	*	*	*	*
DO	*	0.05	0.17	0.04	0.03	0.16	*	0.12	*	-0.13
$N\text{-}NO_{2\_3}$	-0.21	0.32	0.51	0.39	0.54	0.73	0.61	0.18	*	-0.12
$N\text{-}NH_3$	0.02	*	-0.03	*	-0.02	-0.06	-0.02	-0.04	*	0.03
$P\text{-}PO_4$	0.02	0.01	*	-0.02	*	-0.02	-0.04	-0.02	-0.04	-0.02
TSS	0.21	-0.17	-0.6	-0.13	-0.38	-0.81	-0.35	-0.43	*	0.47
pH	*	-0.04	-0.03	-0.07	-0.05	-0.04	-0.08	*	-0.03	-0.04

Supplementary Material Section B:

Section B: Linear Regression result to determine $P\text{-}PO_4$ and $N\text{-}NO_{2\_3}$ concentrations in the five watersheds. Linear regression equation with r-square and p-value for model fit is provided. Below are equations S_1-S_9

Indian River

$P\text{-}PO_4 = 0.024(Chl\_a) + 0.016(temp\_water) + 0.026(TSS) – 0.08$ [$r^2 = 0.45$, p= <0.0001]……*Equation* S_1

$N\text{-}NO_{2\_3} = -0.12(Chl\_a) + (-0.07)(Sal) + 0.24(DO)+ (-1.07)pH + 2.9$ [$r^2 = 0.37$, p= <0.0001] ……*Equation* S_2

Indian River Bay

$P\text{-}PO_4 = 0.011(Chl\_a) + 0.011(temp\_water) + 0.027(TSS) + (-0.016)(Sal) – 0.03$ [$r^2 = 0.30$, p = <0.0001] ……*Equation* S_3

$N\text{-}NO_{2\_3} = -0.07(Chl\_a) + (-0.33)(Sal) + (-0.05)(temp\_water)+ (-1.17)pH + (-0.04)(TSS) + 4.34$ [$r^2 = 0.75$, p = <0.0001] ……*Equation* S_4

Lewes-Rehoboth Canal

$P\text{-}PO_4 = 0.04(TSS) + (-0.03)\ (DO) + 0.02$ [$r^2 = 0.27$, p = <0.0001] ……*Equation* S_5

Little Assawoman

$P\text{-}PO_4 = 0.05(Chl\_a) + 0.021(temp\_water) + 0.014(TSS) + (-0.03)(Sal) – 0.05$ [$r^2 = 0.52$, p = <0.0001] ……*Equation* S_6

$N\text{-}NO_{2\_3} = -0.11(Chl\_a) + (-0.31)(Sal) + 1.36$ [$r^2 = 0.43$, p = <0.0001] ……*Equation 7*

Rehoboth Bay

$P\text{-}PO_4 = 0.02(Chl\_a) + 0.010\ (temp\_water) + 0.016(TSS) + (-0.009)(Sal) – 0.03$ [$r^2 = 0.38$, p = <0.0001] ……*Equation* S_8

$N\text{-}NO_{2\_3} = -0.12(Chl\_a) + (-0.16)(Sal) + (-0.15)(temp\_water)+ (-0.89)pH + (-0.06)(TSS) + 0.33(DO) + 2.75$ [$r^2 = 0.55$, p = <0.0001] ……*Equation* S_9