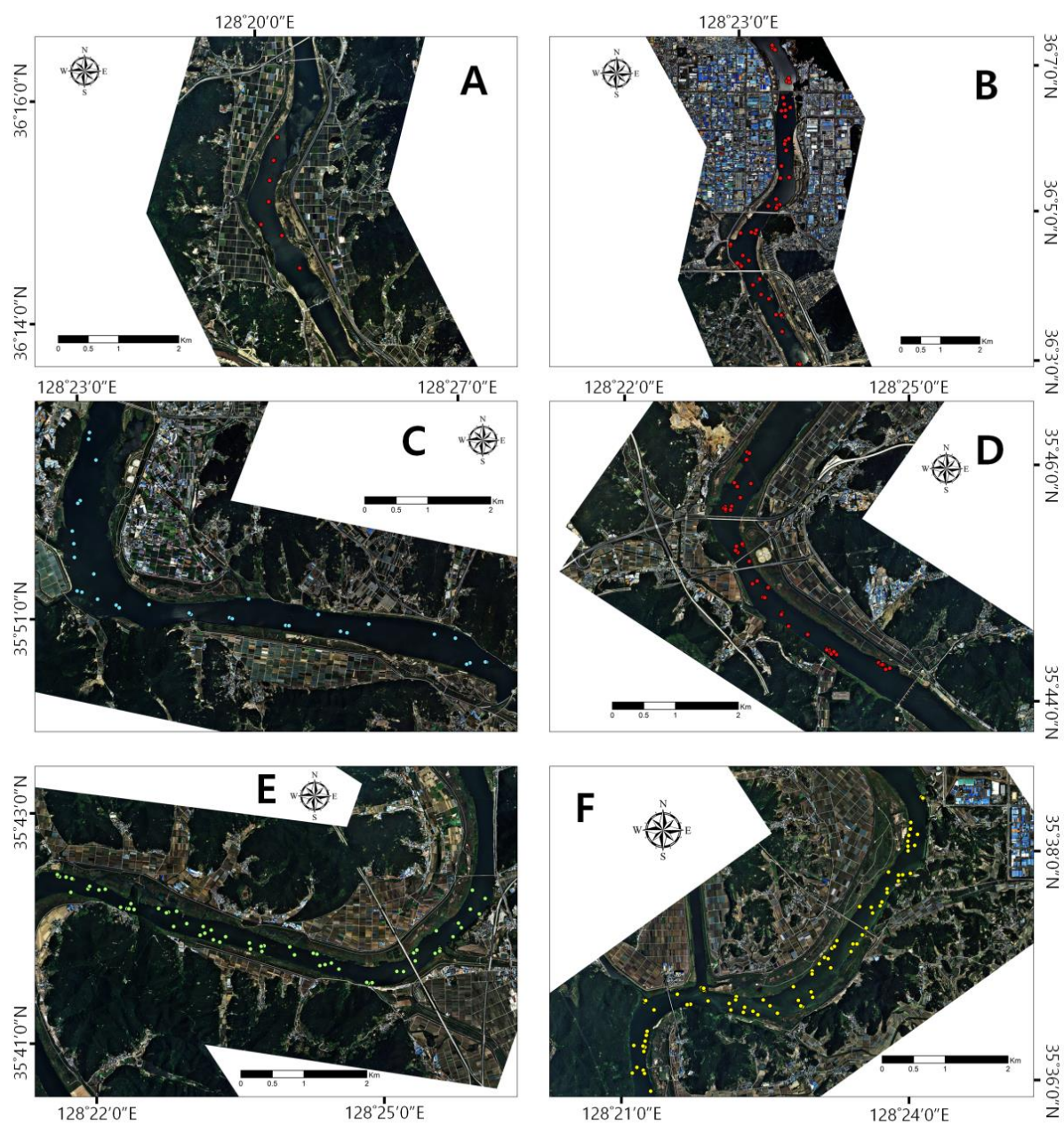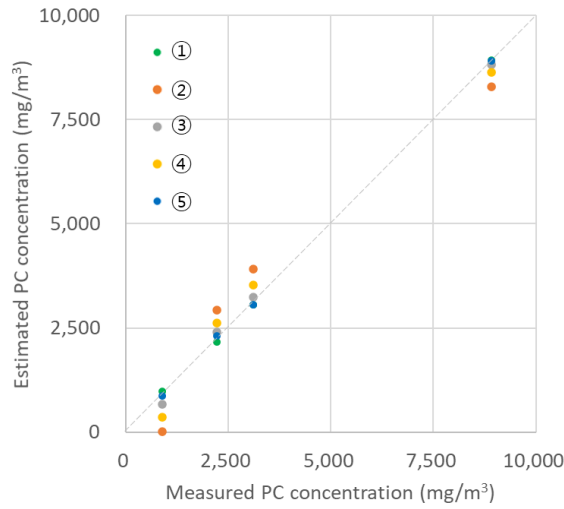# Supplementary Materials

Figure S1. Map of sampling points in zones A–F. The sky blue, light green, yellow, and red dots are sampling points in 2015, 2016, 2017, and 2018, respectively.

No	Expressions	RMSE (mg/m³)
①	$PC = f\left(\dfrac{R_{rs}(700_{peak})}{R_{rs}(620_{trough})}\right)$	63.7
②	$PC = f\left(\dfrac{\Delta\lambda_{peak}}{max(\Delta\lambda_{peak})}\right)$	754.5
③	$PC = f\left(\dfrac{R_{rs}(700_{peak})}{R_{rs}(620_{trough})} \times \dfrac{\Delta\lambda_{peak}}{max(\Delta\lambda_{peak})}\right)$	162.2
④	$PC = f\left(\left(\dfrac{\Delta\lambda_{peak}}{max(\Delta\lambda_{peak})}\right)^a\right)$	415.9
⑤	$PC = f\left(\dfrac{R_{rs}(700_{peak})}{R_{rs}(620_{trough})} \times \left(\dfrac{\Delta\lambda_{peak}}{max(\Delta\lambda_{peak})}\right)^a\right)$	52.1

Figure S2. Plot of the predicted values by candidate equations versus measured data from the lab experiment: ① band ratio of $700_{peak}/620_{trough}$, ② distance of peak shifting, ③ band ratio × distance, ④ power function of distance, and ⑤ band ratio × power function of distance. As seen in the figure, model ⑤, which is identical to Equation (6), shows the best fit (although the $700_{peak}/620_{trough}$ model (green dots) also showed a good fit, but was slightly worse). Note that, although samples of six different concentrations of phycocyanin were tested in the experiment (Table 1), we used only four of these concentrations above; for the other two concentrations, the reflectance signals were too weak to distinguish peaks or troughs.

Table S1. Descriptive statistics of phycocyanin and chlorophyll-*a* concentrations for the samples collected in the Nakdong River from 2015 to 2018.

Year	Date	Area (weir)	Samples (n)	Chlorophyll-*a* (mg/m³)			Phycocyanin (mg/m³)		
				Mean	Max	Min	Mean	Max	Min
2015	Sept 9	Kangjung-Goryeong (C)	20	7.1	11.4	3.0	32.3	56.1	11.7
	Oct 6		15	10.6	16.7	5.3	4.7	8.6	1.8
2016	Jun 2	Hapcheon-Changnyeong (E)	14	57.4	150.9	14.0	62.8	211.7	5.7
	Jun 17		12	28.0	67.2	8.6	36.2	153.0	7.2
	Aug 4		12	17.3	28.7	8.6	23.8	85.6	1.4
	Aug 11		8	29.7	61.6	10.8	147.5	229.8	101.2
	Aug 25		10	107.6	243.9	30.2	189.3	333.7	66.1
	Sept 8		10	10.5	17.2	6.6	6.7	26.8	1.2
2017	Aug 12	Hapcheon-Changnyeong (F)	12	11.9	49.5	5.4	10.6	89.1	0.6
	Sept 13		12	16.5	25.9	5.7	5.6	9.9	1.8
	Sept 14		12	16.7	23.1	11.4	18.1	32.1	8.5
	Sept 18		10	33.5	47.1	17.8	21.7	29.6	10.8
	Sept 19		12	32.7	48.5	22.8	42.8	114.1	3.9
	Sept 25		12	28.5	42.1	14.2	13.5	28.3	8.1
	Nov 9		10	10.6	16.2	4.8	4.7	7.4	3.6
	Nov 21		10	2.2	3.8	1.3	1.8	2.6	1.0
	Nov 27		8	1.4	2.4	0.4	0.1	0.2	0.1
	Nov 28		6	0.7	0.9	0.4	0.1	0.2	0.1
2018	Jul 17	Chilgok (B)	4	18.6	28.0	15.0	3.4	8.8	1.3
		Dalseong (D)	7	7.4	13.2	5.3	6.6	12.9	0.4
	Jul 18	Chilgok (B)	9	14.4	21.7	8.0	4.2	8.5	2.2
		Dalseong (D)	7	7.3	11.3	3.1	21.8	25.9	15.4
	Aug 2	Dalseong (D)	3	51.9	76.1	31.5	177.1	242.2	94.8
		Gumi (A)	7	24.3	52.7	14.4	4.7	11.4	1.7
	Sept 18	Chilgok (B)	10	8.3	11.8	5.2	3.1	4.3	1.6
		Dalseong (D)	7	10.1	14.6	6.5	4.5	6.7	2.1
	Oct 4	Chilgok (B)	7	16.3	21.0	11.3	2.6	3.9	1.9
		Dalseong (D)	7	7.9	10.5	5.1	1.7	2.6	1.1
	Oct 11	Chilgok (B)	7	1.6	2.3	0.8	0.4	0.5	0.4
		Dalseong (D)	5	4.6	5.4	4.0	0.6	0.7	0.4
	Oct 25	Chilgok (B)	8	11.4	12.7	9.9	0.6	0.7	0.4
		Dalseong (D)	7	27.1	66.3	8.1	0.7	1.3	0.4
Total			**300**	20.3	243.9	0.4	25.8	333.7	0.1