



Figure S1. Variations in total phosphorus (TP), total nitrogen (TN), and water temperature profiles from December 2014 to June 2015.

Table S1. Threshold concentrations of cyanobacteria and Chl-*a* applied to an algal alert system in Korea.

Alert level	Measurement	
	Cyanobacteria (cells/mL)	Chl- <i>a</i> (mg/m ³)
Advisory	500	15
Warning	5,000	25
Bloom	1,000,000	100

Note) The system was revised in 2016, and only cyanobacterial concentration is used.

Table S2. Long-term (2002~2020) precipitation data of study area.

Year	Yearly total (mm)	Monsoon total (mm)	Percentage (%)
2002	1,819.5	931.0	51.2
2003	1,930.4	1,116.5	57.8
2004	1,600.4	865.8	54.1
2005	1,569.6	943.1	60.1
2006	1,566.1	846.9	54.1
2007	1,457.6	809.0	54.8
2008	1,201.4	539.3	44.9
2009	1,398.9	741.0	53.0
2010	1,528.5	813.6	53.2
2011	1,598.5	807.7	50.5
2012	1,614.5	931.4	57.7
2013	1,433.2	659.9	46.0
2014	1,376.8	608.9	44.2
2015	1,194.7	369.5	30.9
2016	1,500.4	629.6	42.0
2017	1,388.9	698.2	50.3
2018	1,669.2,	779.1	46.7
2019	1,391.1	640.5	46.0
2020	1,949.1	1,211.4	62.2

Table S3. Overall and seasonal relationships of nutrient (total nitrogen, TN, mg/L; total phosphorus, TP, mg/L), chlorophyll *a* (Chl-*a*, µg/L), and Secchi depth (SD, cm) of Yongdam Reservoir in period 1 and 2 based on linear regression models using least squares method. *a* and *b* indicate slope and intercept of the regression equations (e.g., log(Chl) = *a* log(TP) + *b*) for each pair in the first column.

Period 1	Post-monsoon (Sep.~Dec.2014)			Pre-monsoon (Mar.~Apr.2015)			Monsoon (Jun.~Oct.2015)					
	R ²	<i>a</i>	<i>b</i>	R ²	<i>a</i>	<i>b</i>	R ²	<i>a</i>	<i>b</i>			
Chl-TP	0.24	0.20	0.81	0.27	0.37	0.05	0.33	0.47	0.30			
Chl-TN	<0.01	0.02	1.02	0.61	1.98	0.03	0.02	0.34	0.66			
Chl-SD	0.40	-0.78	1.44	0.41	-0.75	1.17	0.51	-0.76	1.13			
Chl-TN/TP	0.20	-0.17	1.37	0.10	-0.23	1.06	0.29	-0.44	1.76			
SD-TP	0.12	-0.12	0.66	0.10	-0.19	0.97	0.74	-0.66	1.15			
SD-TN	0.05	0.26	0.50	0.77	-1.91	1.29	0.05	-0.59	0.67			
TN-TP	0.05	-0.06	0.22	0.07	0.08	0.20	0.02	0.05	0.23			
TN/TP-TP	0.94	-1.06	3.21	0.92	-0.92	3.20	0.91	-0.95	3.23			
TN/TP-TN	0.21	1.78	1.83	<0.01	0.04	1.61	0.02	0.47	2.16			
Period 2	Pre-monsoon (May.2016)			Monsoon (Aug.~Sep.2016)			Post-monsoon (Nov.2016)					
	R ²	<i>a</i>	<i>b</i>	R ²	<i>a</i>	<i>b</i>	R ²	<i>a</i>	<i>b</i>			
Chl-TP	0.37	0.25	0.23	<0.01	-0.05	0.79	0.09	-0.17	0.83	0.41	-0.19	0.73
Chl-TN	0.13	-10.34	5.20	0.13	-1.34	0.77	0.09	0.60	0.50	0.09	0.33	0.57
Chl-SD	0.35	-0.54	0.65	0.47	-1.05	0.99	0.15	0.34	0.57	<0.01	-0.07	0.66
Chl-TN/TP	0.37	-0.25	1.11	<0.01	-0.05	0.85	0.14	0.19	0.19	0.47	0.19	0.13
SD-TP	0.95	-0.49	0.94	0.14	-0.22	0.46	0.28	-0.33	0.66	0.08	-0.11	0.38
SD-TN	0.08	9.15	-3.73	0.02	0.36	0.23	0.30	1.21	0.01	0.67	-1.23	0.59
TN-TP	0.41	-0.01	0.48	0.32	0.13	-0.10	<0.01	-0.02	0.42	<0.01	-0.02	0.22
TN/TP-TP	0.99	-1.01	3.48	0.96	-0.87	2.90	0.93	-1.02	3.42	0.94	-1.02	3.23
TN/TP-TN	0.42	48.81	-20.53	0.14	-1.49	2.07	0.12	1.30	2.40	0.11	1.34	2.43

Table S4. Regression analysis of non-algal light attenuation coefficient (K_{na}) with nutrients (TP: total phosphorus, TN: total nitrogen), Secchi depth (SD) and chlorophyll-a (Chl-*a*). *a* and *b* indicate slope and intercept of the regression equations for each pair in the first column.

Period 1	Post-monsoon (Sep.~Dec.2014)			Pre-monsoon (Mar.~Apr.2015)			Monsoon (Jun.~Oct.2015)					
	R ²	<i>a</i>	<i>b</i>	R ²	<i>a</i>	<i>b</i>	R ²	<i>a</i>	<i>b</i>			
TP	0.03	-29.28	16.02	0.09	148.35	50.48	0.88	47.28	3.71			
TN	0.08	-1.49	1.49	0.46	3.93	1.77	0.14	0.54	1.84			
SD	0.15	-4.63	3.68	0.80	-16.90	6.83	0.55	-3.02	4.57			
Chl- <i>a</i>	0.14	-23.95	11.74	0.12	15.69	4.08	0.48	11.60	4.78			
Period 2	Pre-monsoon (May.2016)			Monsoon (Aug.~Sep.2016)			Post-monsoon (Nov.2016)					
	R ²	<i>a</i>	<i>b</i>	R ²	<i>a</i>	<i>b</i>	R ²	<i>a</i>	<i>b</i>			
TP	0.98	104.37	-8.55	0.59	14.69	8.85	0.34	8.46	1.90	0.03	4.26	2.70
TN	0.02	-0.02	2.95	<0.01	-0.02	1.10	0.33	-1.51	2.89	0.70	1.61	1.05
SD	0.70	-3.70	5.55	0.34	-0.66	2.31	0.81	-6.31	4.50	0.97	-2.86	3.27
Chl- <i>a</i>	0.04	1.22	2.44	<0.01	-1.40	10.10	0.42	-7.91	7.25	<0.01	0.30	4.35