

Supplementary Table 1. Description of lake wetland sediment sampling sites.

Sample	Water depth (cm)	Sampling zones	Dominant species	Biomass Dry Weight (kg/m ²)
S1	0-10	Seasonally waterlogged zone	<i>Persicaria lapathifolia</i>	1.24±0.15 c
S2	10-30	Helophyte zone	<i>Carex schmidtii</i>	1.93±0.33 b
S3	30-80	Emergent plant zone	<i>Phragmites australis</i>	8.45±1.64 a
S4	80-150	Submerged and floating-leaved plant zone	<i>Stuckenia pectinata</i> , <i>Trapa natans</i>	0.80±0.12 d
S5	>150	Non-vegetated zone	Non-vegetated	0

Note: The values are mean±standard deviation. Different lowercase letters indicate a significant difference ($p<0.05$) among different samples except S5.

Supplementary Table 2. Fluorescence spectrum indices of lake wetland sediment DOM.

Sample	FI	BI	HI
S1	1.672±0.015 a	0.913±0.075 a	2.475±0.400 bc
S2	1.547±0.075 b	0.671±0.050 b	5.085±1.961 a
S3	1.656±0.026 a	0.661±0.013 b	4.026±0.832 ab
S4	1.699±0.041 a	0.787±0.113 ab	2.244±0.242 bc
S5	1.749±0.091 a	0.836±0.079 a	1.677±0.228 c

Note: The values are mean±standard deviation. Different lowercase letters indicate a significant difference ($p<0.05$) among different samples.

Supplementary Table 3. Fluorescence component intensity of lake wetland sediment DOM.

Sample	Fluorescence component					Total component
	C1	C2	C3	C4	C5	
S1	b 915.10±197.04 B	b 854.54±160.51 B	a 1571.87±293.47 A	c 430.78±84.95 AB	b 955.11±133.66 B	4729.41±829.31 AB
S2	a 1305.81±337.10 AB	ab 1045.13±197.71 AB	b 691.23±88.40 C	b 650.63±214.82 A	b 779.82±238.93 B	4476.62±536.51 B
S3	a 1618.35±241.20 A	b 1186.74±164.93 A	b 1086.79±86.41 B	c 639.78±85.83 A	b 1085.39±300.75 AB	5620.06±285.03 A
S4	b 943.82±159.24 B	b 852.89±187.84 B	a 1415.14±268.03 AB	c 345.20±74.09 BC	a 1405.12±316.61 A	4963.15±387.57 AB
S5	c 432.39±57.15 C	c 437.74±49.44 C	b 696.55±86.72 C	d 190.94±27.21 C	a 906.84±70.37 B	2669.45±181.42 C

Note: The values are mean±standard deviation, with the unit being A.U. Different capital letters indicate a significant difference ($p<0.05$) among different samples, and different lowercase letters indicate a significant difference ($p<0.05$) among different fluorescence components.

Supplementary Table 4. DNA copies and community diversity indices of lake wetland sediment bacteria.

Sample	DNA copies ($\times 10^8 \mu\text{L}^{-1}$)	PD	Chao1	Shannon
S1	53.00±1.03 b	522.224±6.992 bc	5509.424±69.509 b	6.811±0.045 c
S2	65.89±13.22 ab	638.817±29.501 a	6605.113±274.366 a	7.605±0.054 a
S3	68.99±7.78 a	634.008±9.282 a	6651.577±232.875 a	7.320±0.024 b
S4	24.79±7.26 c	533.887±22.773 b	6201.946±179.506 a	6.983±0.229 c
S5	6.99±1.74 d	486.878±26.965 c	5117.247±387.851 b	6.801±0.213 c

Note: The values are mean±standard deviation. Different lowercase letters indicate a significant difference ($p<0.05$) among different samples.

Supplementary Table 5. FAPROTAX functional prediction of lake wetland sediment bacterial communities.

FAPROTAX functional prediction		S1	S2	S3	S4	S5
N cycling	nitrate reduction	c	b	a	bc	d
	nitrogen fixation	a	a	a	b	b
	nitrogen respiration	b	b	a	b	b
	ureolysis	b	b	a	c	c
	nitrite respiration	c	d	bc	a	b
	denitrification	c	c	b	a	b
	nitrification	b	b	b	a	b
C cycling	hydrocarbon degradation	c	b	a	d	e
	methanotrophy	b	a	a	c	d
	cellulolysis	b	b	a	b	b
	aromatic compound degradation	a	a	a	b	b
S cycling	respiration of sulfur compounds	b	a	a	bc	c
	sulfate respiration	b	a	b	c	c
	dark oxidation of sulfur compounds	b	a	b	b	c
	dark sulfide oxidation	b	a	b	c	c
	dark thiosulfate oxidation	bc	b	a	bc	c
	sulfite respiration	b	a	a	b	b
	sulfur respiration	c	c	a	b	c
	thiosulfate respiration	b	b	a	b	b

Note: Different lowercase letters indicate significant differences ($p < 0.05$) in the number of OTUs among different samples.