**Supporting information**

**Fig. S1** Seasonal dynamics of water table depth relative to soil surface (a) and soil temperature at 10 cm depth (b) under different treatments from 2011 to 2013. Negative values indicate water table position below soil surface. Bars show ± *SE* (n = 5). CK, control; WT, water table lowering; N, nitrogen deposition; WT + N, combined water table lowering and nitrogen deposition.

**Fig. S2** Differences in daytime (9:00-12:00) average net ecosystem carbon dioxide exchange (NEE) (a), ecosystem respiration (ER) (b), and gross ecosystem productivity (GEP) (c) under different treatments from 2011 to 2013. Bars show ± *SE* (n = 10). The arrows indicate the dates of nitrogen application. WT− − WT0 indicates the differences between water table lowering and no water table lowering across different nitrogen deposition levels, and N+ − N0 indicates the difference between nitrogen deposition and no nitrogen deposition across different water table levels. \*: statistically significant at *P* < 0.05.

**Fig. S3** Differences in daytime (9:00-12:00) average methane fluxes (CH4) (a) and nitrous oxide fluxes (N2O) (b) under different treatments from 2011 to 2013. Bars show ± *SE* (n = 10). The arrows indicate the dates of nitrogen application. WT− − WT0 indicates the differences between water table lowering and no water table lowering across different nitrogen deposition levels, and N+ − N0 indicates the difference between nitrogen deposition and no nitrogen deposition across different water table levels. \*: statistically significant at *P* < 0.05.

**Fig. S4** Diurnal patterns of net ecosystem carbon dioxide exchange (NEE) (a) and ecosystem respiration (ER) (b) on 21 June, 14 July, 21 August and 6 September in 2012 for the control plots.

**Fig. S5** Diurnal patterns of methane (CH4) (a) and nitrous oxide (N2O) fluxes (b) on 26 June, 29 July, 21 August and 1 September in 2012 for the control plots.

**Fig. S6** Effects of water table lowering and nitrogen deposition on the abundance (× 104) of genes associated with methane production (a), methane oxidation (b, c), nitrification (d, e) and denitrification (f, g, h, i) in September 2013. Bars show ± *SE* (n = 10). WT0 and WT*−* indicate no water table lowering and water table lowering across different nitrogen deposition levels, respectively. N0 and N+ indicate no nitrogen deposition and nitrogen deposition across different water table levels, respectively. ns, and \*: not statistically significant and statistically significant at *P* < 0.05.

**Fig. S1**

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**Fig. S2**

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**Fig. S3**

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**Fig. S4**

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**Fig. S5**

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**Fig. S6**

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