

1

2

*Supporting Information for*

3

4 **Contrasting Roles of Microbial Heterogeneity and Sediment Heterogeneity in**

5

**Controlling Hyporheic Nitrogen Removal**

6 **Yang Xian<sup>1</sup>, Zhang Wen<sup>1,2\*</sup>, and Stefan Krause<sup>3</sup>**

7

8 <sup>1</sup> Hubei Key Laboratory of Yangtze Catchment Environmental Aquatic Science, School  
9 of Environmental Studies, China University of Geosciences, Wuhan, 430078, Hubei, P. R.

10 China

11

12 <sup>2</sup> State Key Laboratory of Biogeology and Environmental Geology, China University of  
13 Geosciences, Wuhan, 430078, Hubei, P. R. China

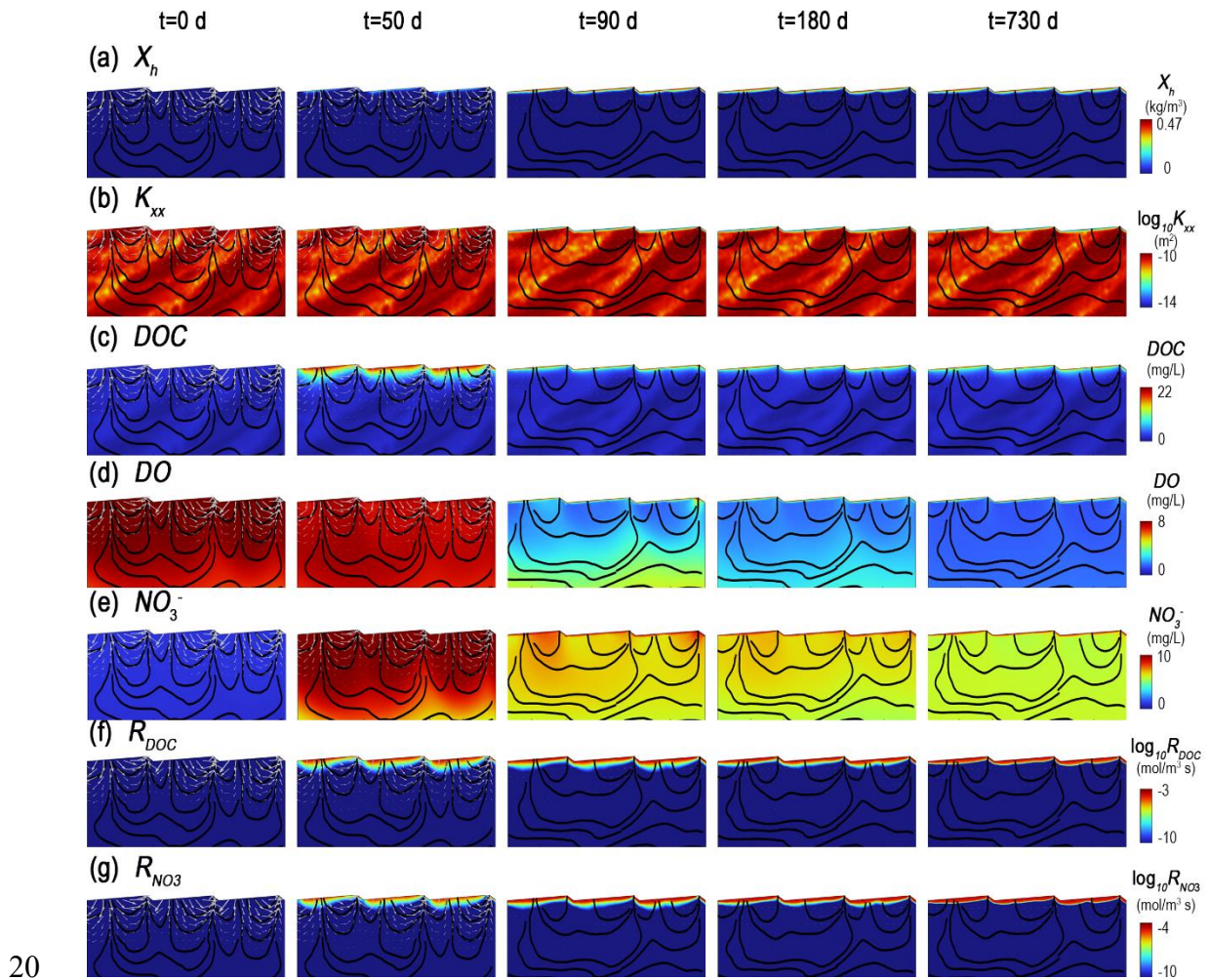
14

15 <sup>3</sup> School of Geography, Earth and Environmental Sciences, University of Birmingham,  
16 UK

17

18 \*Corresponding author: Zhang Wen (wenz@cug.edu.cn)

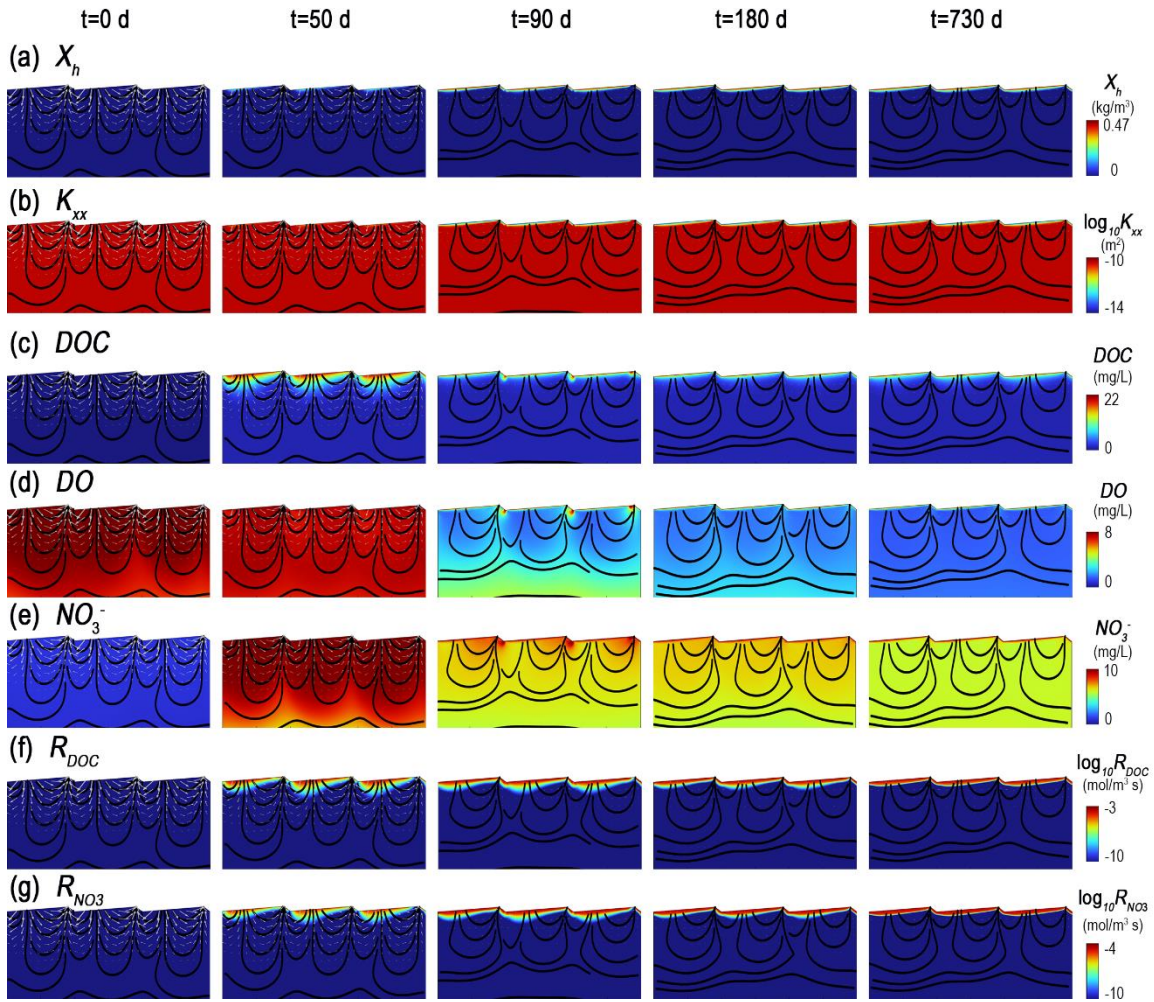
19



20

21 **Figure S1.** Evolution of spatial distribution of (a)  $X_h$ , (b)  $K_{xx}$ , (c) DOC, (d) DO, (e)  $\text{NO}_3^-$ ,  
 22 (f)  $R_{\text{DOC}}$ , (g)  $R_{\text{NO}_3}$  over time in the *Hetero. Sed. & Bio. Growth* model of the Brazos River  
 23 under high stream nutrient condition (DOC=20 mg/L,  $\text{NO}_3^-$ =10 mg/L) average stream  
 24 flow velocity  $U=0.2$  m/s.

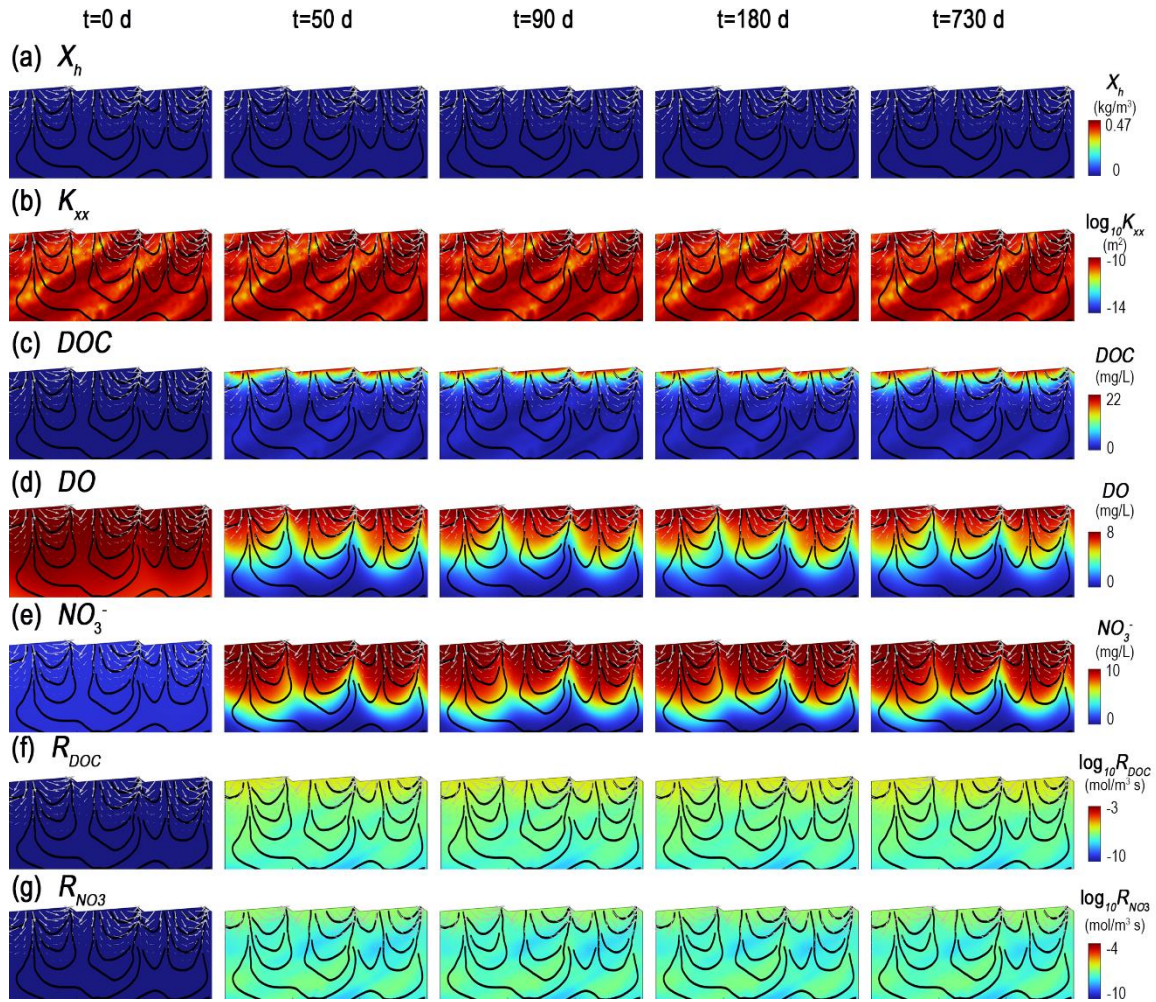
25



26

27 **Figure S2.** Evolution of spatial distribution of (a)  $X_h$ , (b)  $K_{xx}$ , (c) DOC, (d) DO, (e)  $\text{NO}_3^-$ ,  
 28 (f)  $R_{\text{DOC}}$ , (g)  $R_{\text{NO}_3}$  over time in the *Homo. Sed. & Bio. Growth* model of the Brazos River  
 29 under high stream nutrient condition (DOC=20 mg/L,  $\text{NO}_3^-$ =10 mg/L) average  
 30 stream flow velocity  $U=0.2$  m/s.

31



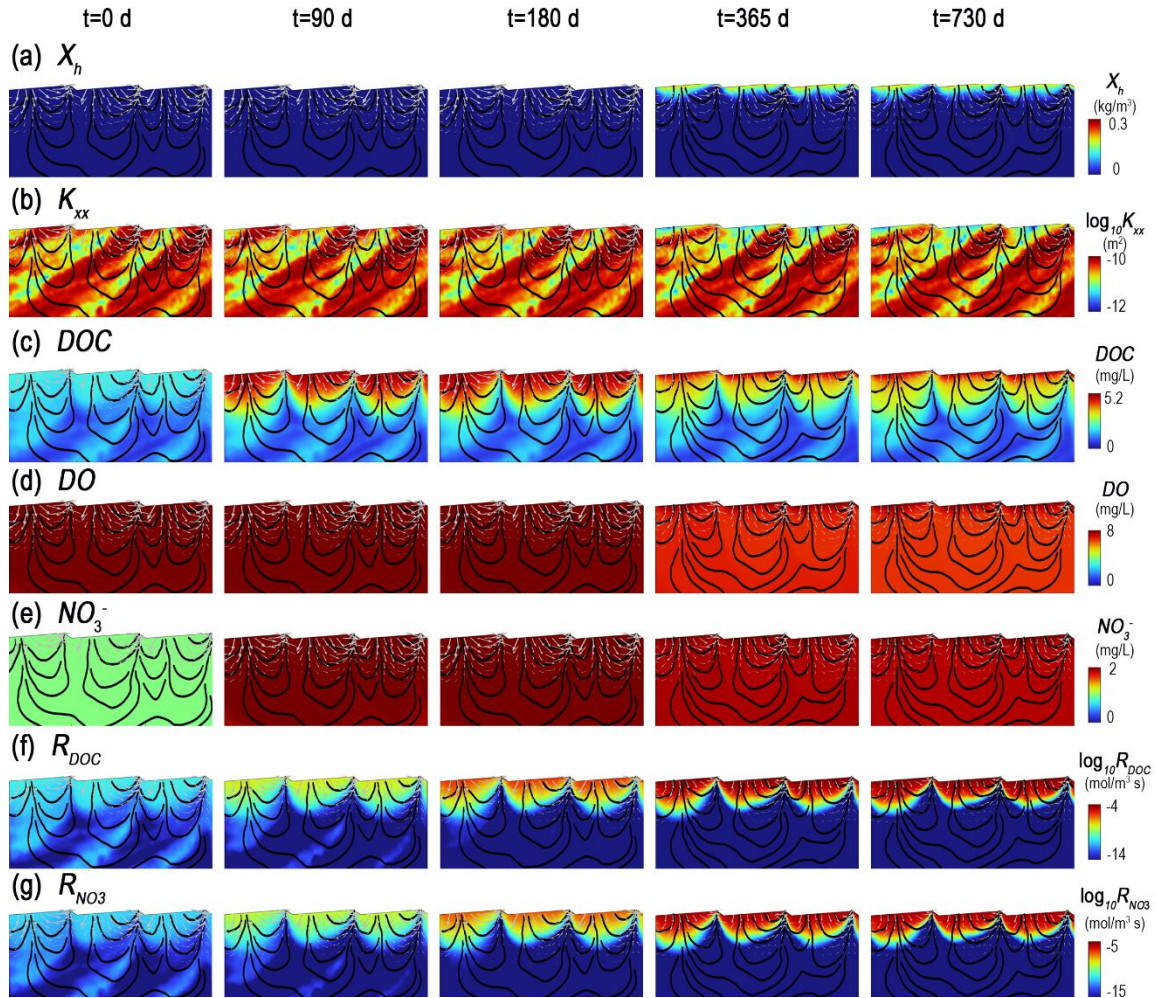
32

33 **Figure S3.** Evolution of spatial distribution of (a)  $X_h$ , (b)  $K_{xx}$ , (c) DOC, (d) DO, (e)  $\text{NO}_3^-$ ,

34 (f)  $R_{\text{DOC}}$ , (g)  $R_{\text{NO}_3}$  over time in the *Hetero. Sed. & Const. Bio.* model of the Brazos River

35 under high stream nutrient condition (DOC=20 mg/L,  $\text{NO}_3^-$ =10 mg/L) average stream

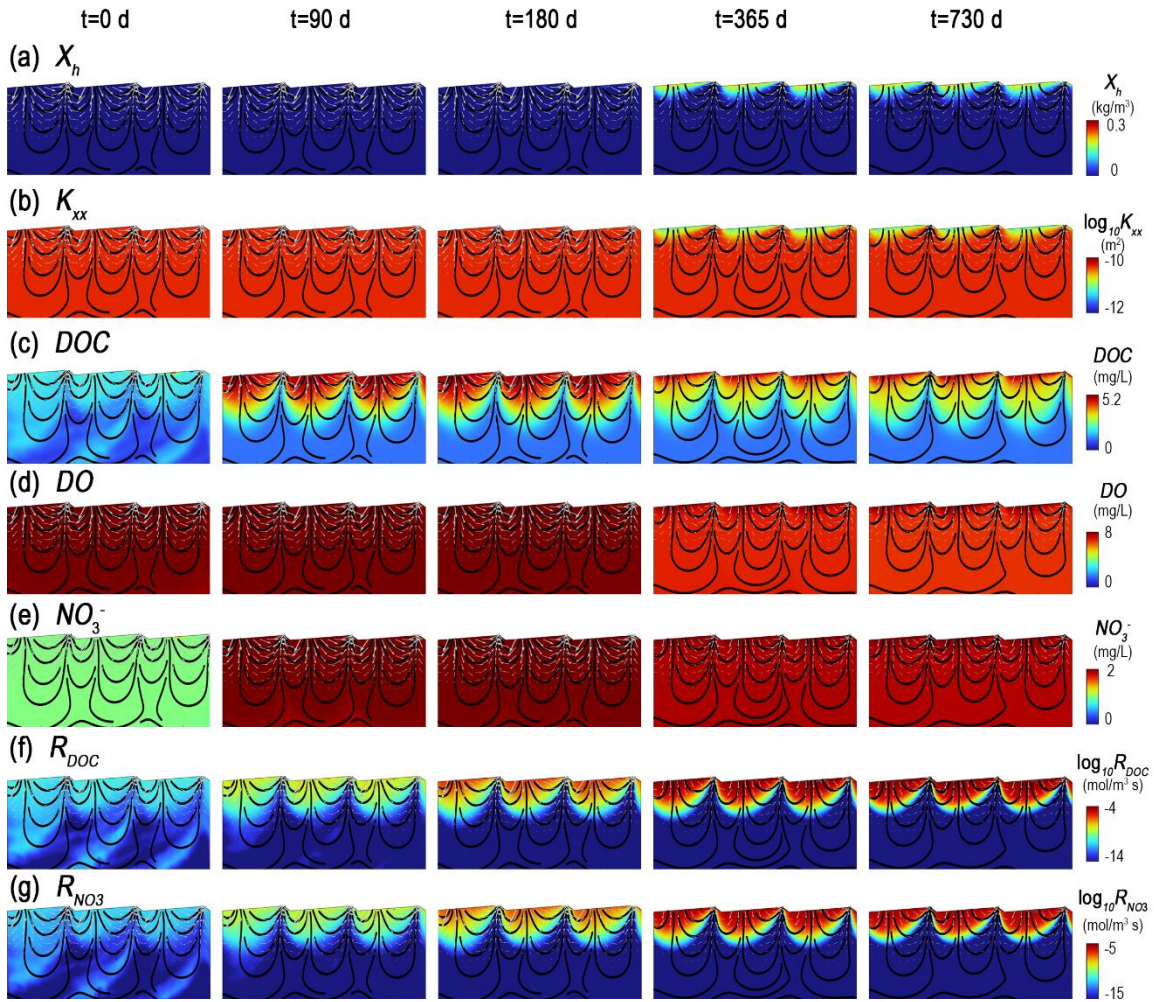
36 flow velocity  $U=0.2$  m/s.



38

39 **Figure S4.** Evolution of spatial distribution of (a)  $X_h$ , (b)  $K_{xx}$ , (c) DOC, (d) DO, (e)  $\text{NO}_3^-$ ,  
 40 (f)  $R_{DOC}$ , (g)  $R_{NO_3}$  over time in the *Hetero. Sed. & Bio. Growth* model of the Brazos River  
 41 under high stream nutrient condition (DOC=5 mg/L,  $\text{NO}_3^-$ =2 mg/L) average stream flow  
 42 velocity  $U=0.8$  m/s.

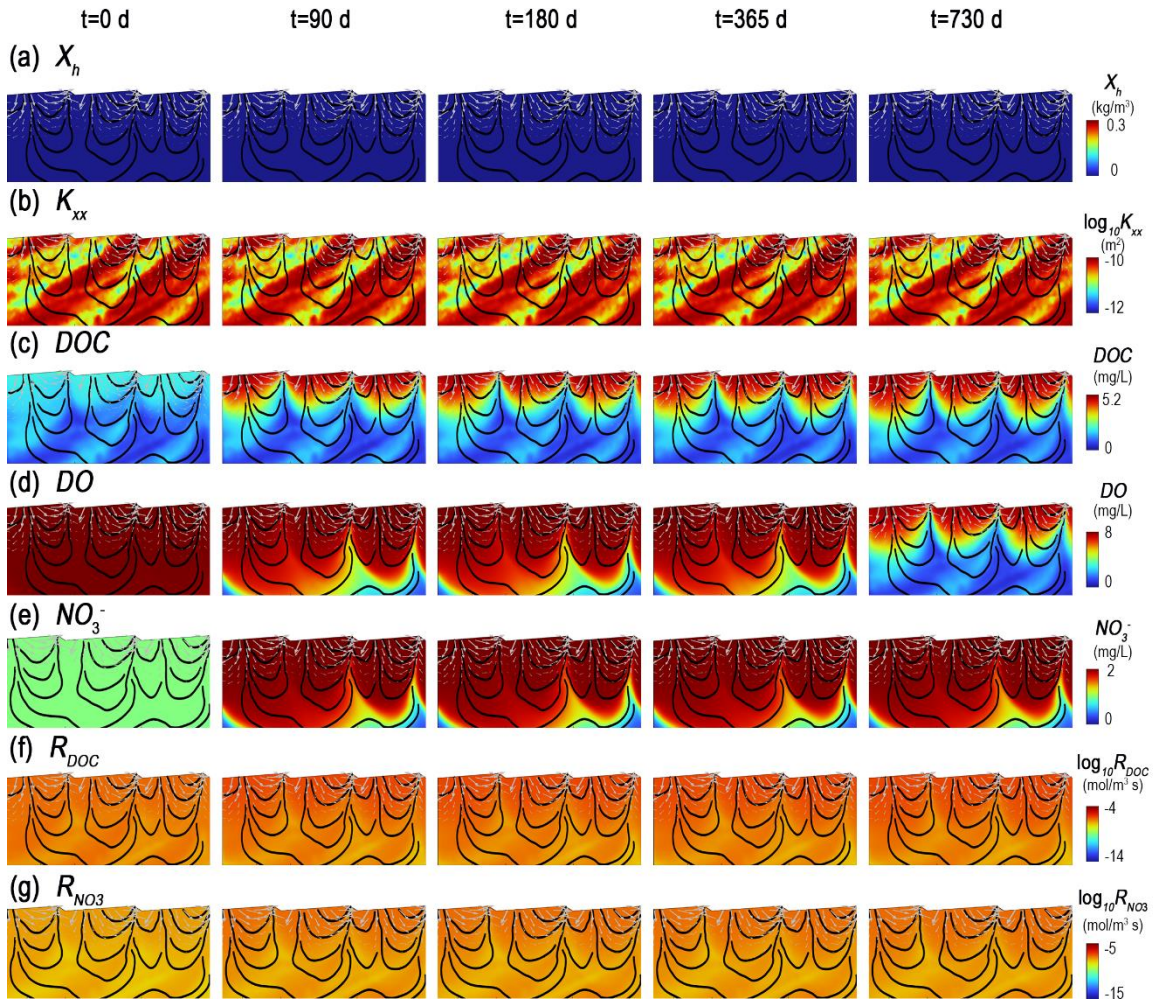
43



44

45 **Figure S5.** Evolution of spatial distribution of (a)  $X_h$ , (b)  $K_{xx}$ , (c) DOC, (d) DO, (e)  $\text{NO}_3^-$ ,  
 46 (f)  $R_{\text{DOC}}$ , (g)  $R_{\text{NO}_3}$  over time in the *Homo. Sed. & Bio. Growth* model of the Brazos River  
 47 under high stream nutrient condition (DOC=5 mg/L,  $\text{NO}_3^-$ =2 mg/L) average stream flow  
 48 velocity  $U=0.8$  m/s.

49



50

51 **Figure S6.** Evolution of spatial distribution of (a)  $X_h$ , (b)  $K_{xx}$ , (c) DOC, (d) DO, (e)  $\text{NO}_3^-$ ,  
 52 (f)  $R_{\text{DOC}}$ , (g)  $R_{\text{NO}_3}$  over time in the *Hetero. Sed. & Const. Bio.* model of t the Brazos River  
 53 under high stream nutrient condition (DOC=5 mg/L,  $\text{NO}_3^-$ =2 mg/L) average stream flow  
 54 velocity  $U=0.8$  m/s.

55