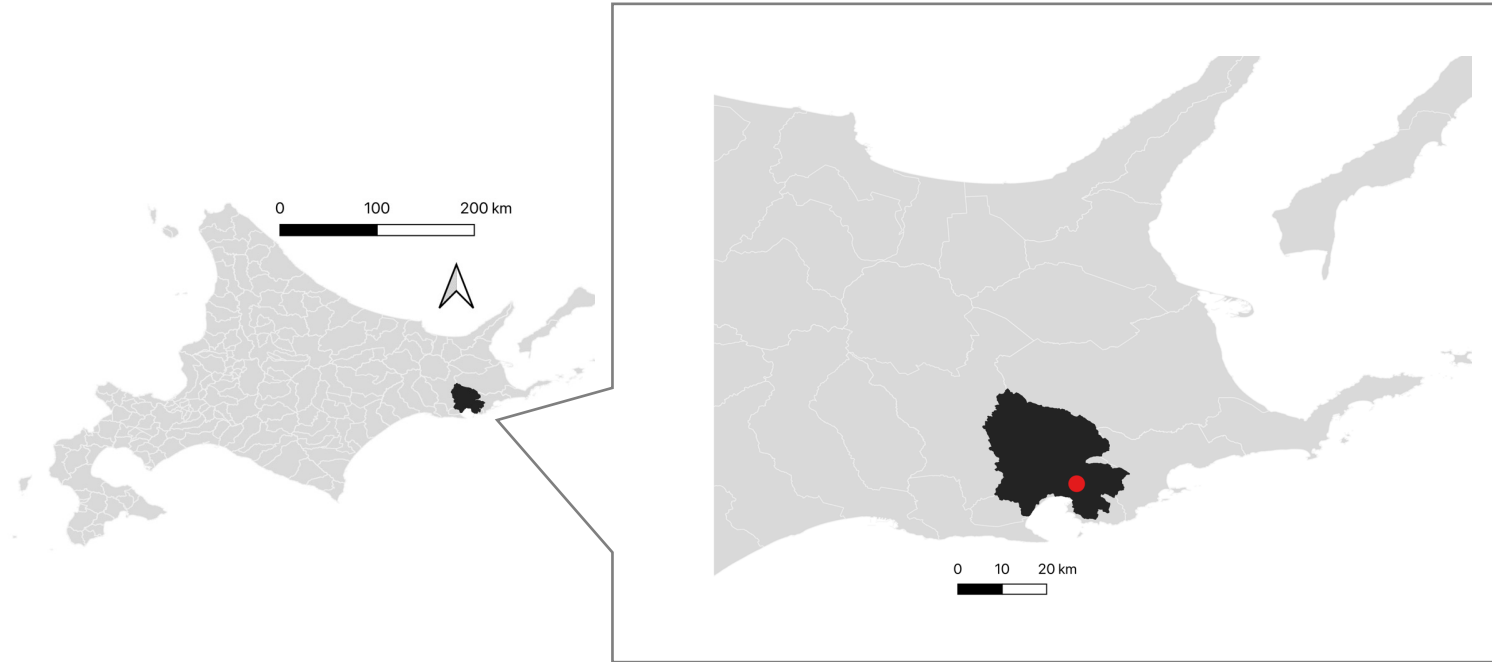
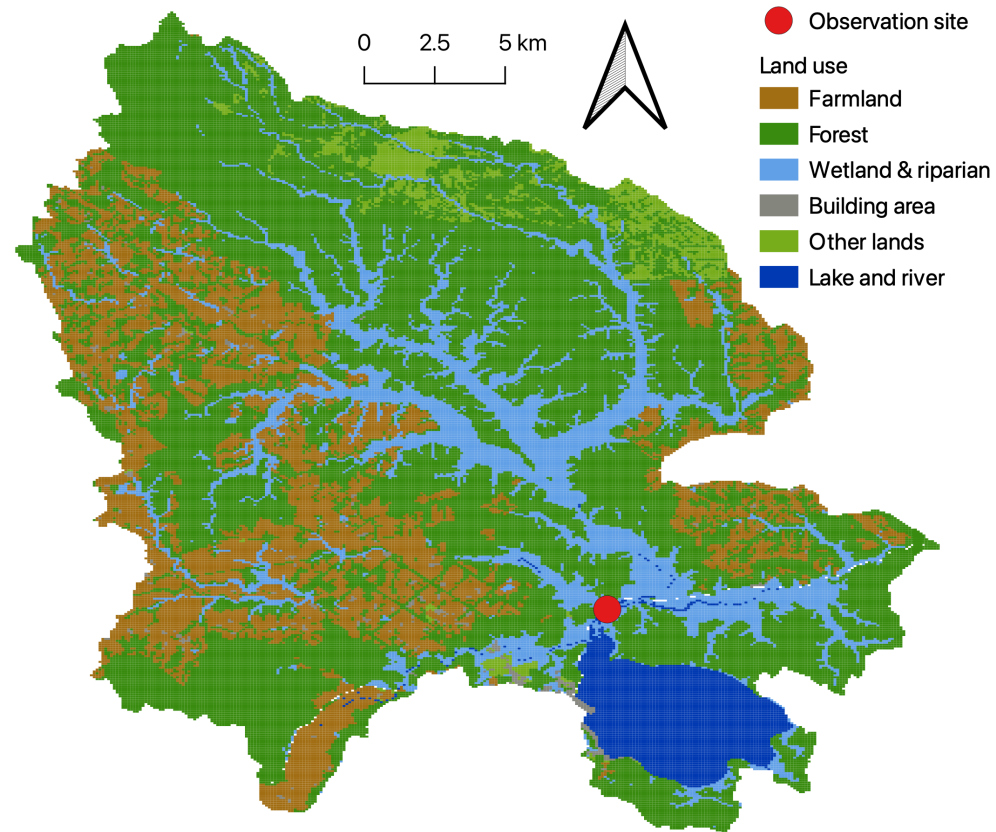


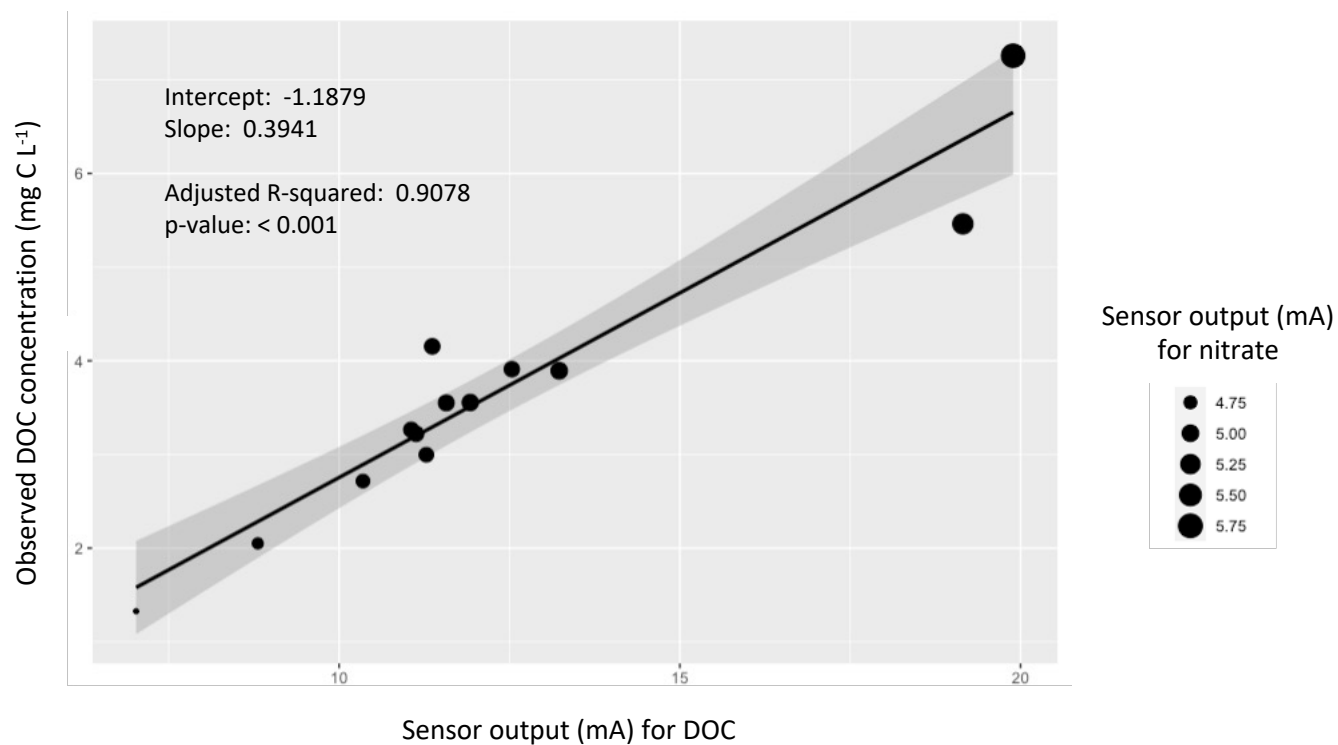
Supplemental figures



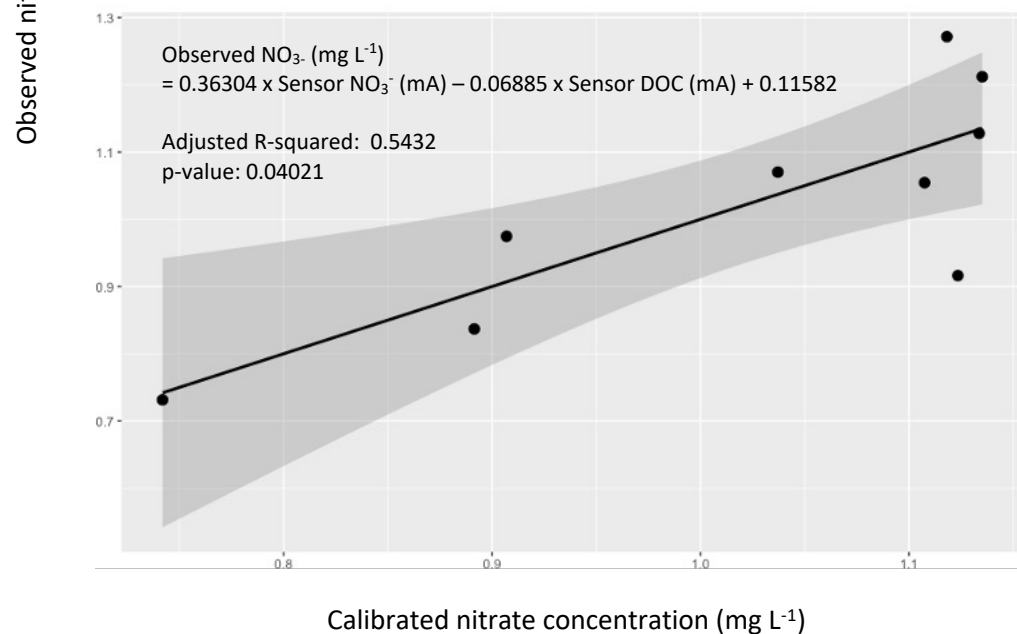
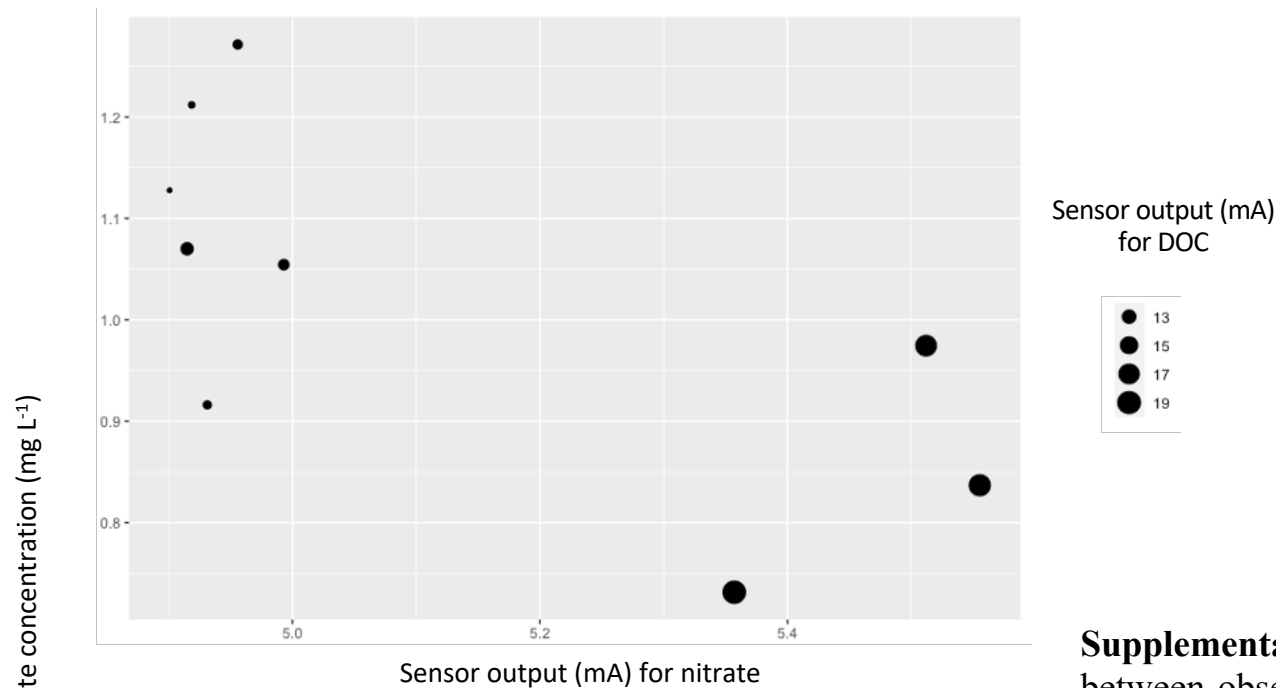
Supplemental Figure 1. Location of the Bekanbeushi watershed in eastern Hokkaido, northern Japan. The red point in the right panel shows the observation site.



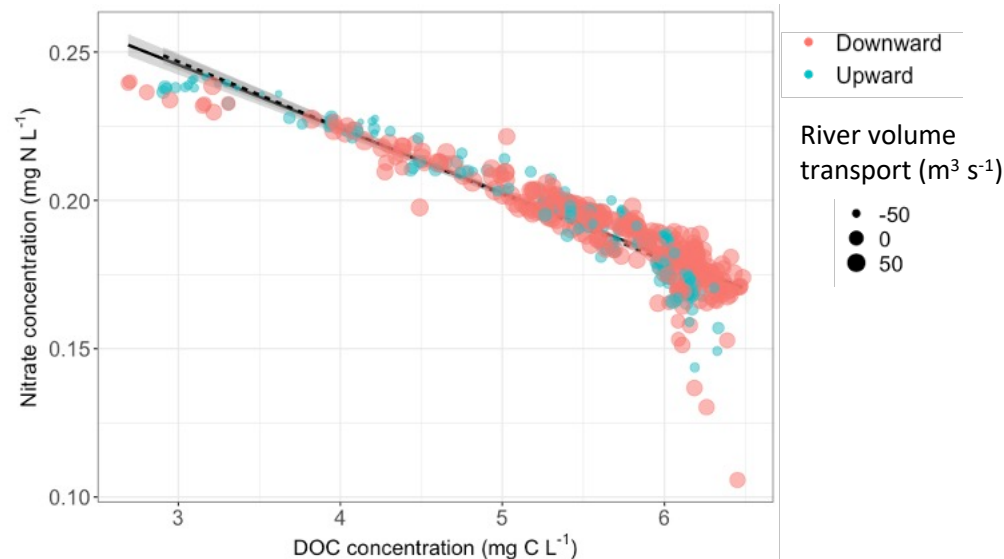
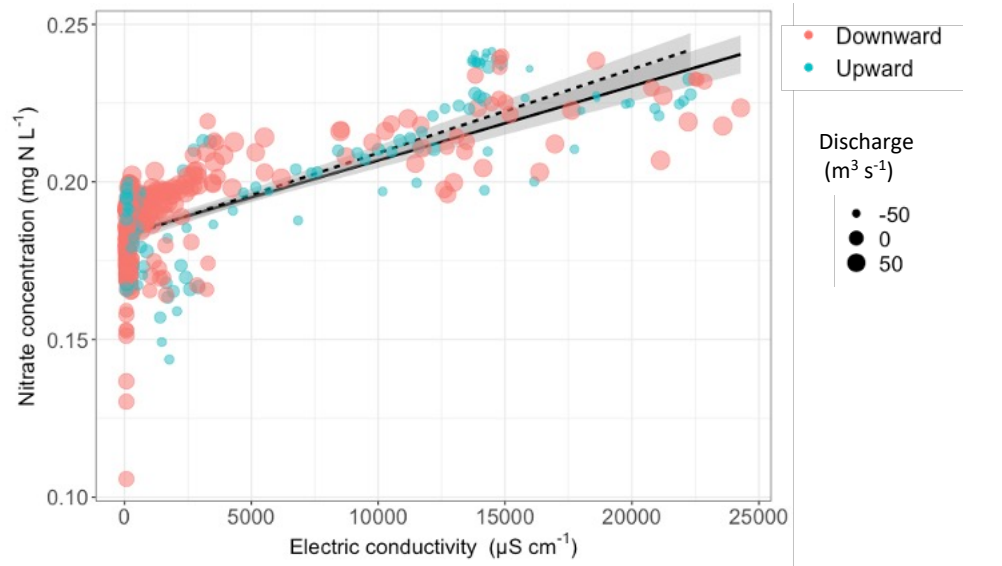
Supplemental Figure 2. Land use distribution in the Bikanbeushi watershed. The red point shows the observation site.



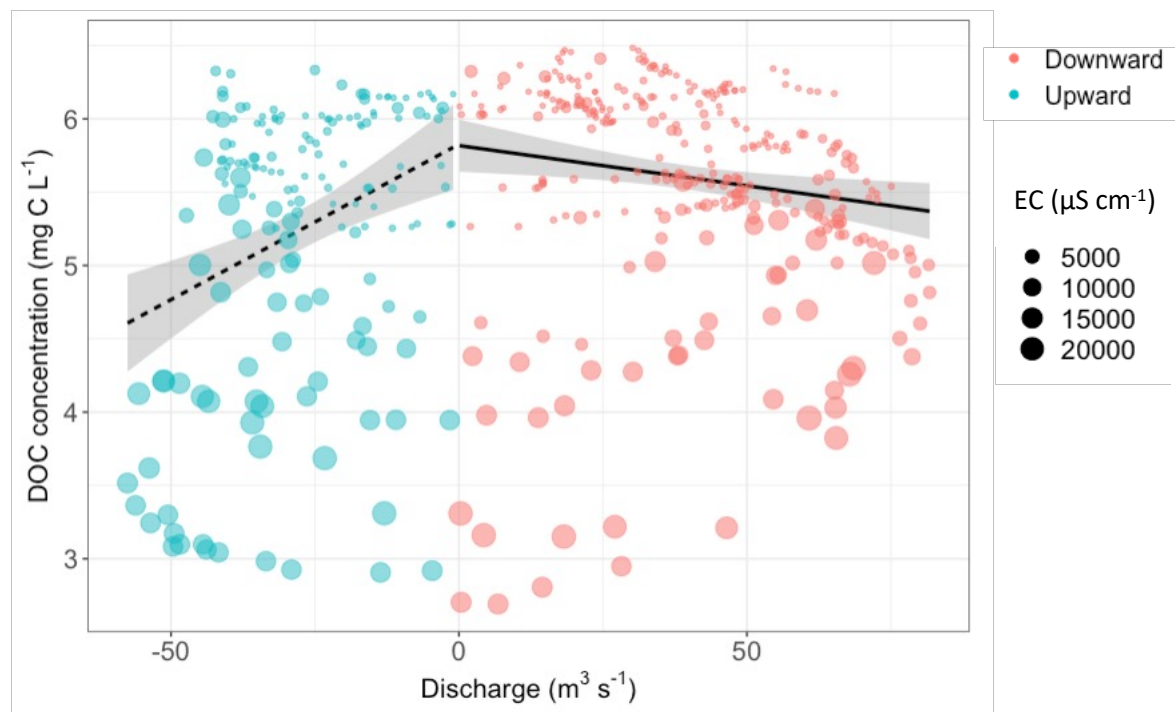
Supplemental Figure 3. Calibration for observed concentration (mg C L^{-1}) of dissolved organic carbon (DOC) to the sensor output (mA). The solid line shows the linear regression line with the 95% confidence interval (dark gray zone). The size of the plot shows the sensor output (mA) for the nitrate concentration (a higher value corresponds to a higher concentration).



Supplemental Figure 4. Relationship between observed concentration (mg L^{-1}) and the sensor output (mA) of nitrate (NO_3^-) in surface river water (upper panel). The size of the plot of the upper panel shows the sensor output (mA) for the dissolved organic carbon (DOC) concentration (a higher value corresponds to a higher concentration). The lower panel shows the regression between the observed and calibrated NO_3^- concentrations. The calibration was made by multiple regression using sensor output for NO_3^- and DOC (the equation is indicated in the lower panel). The solid line in the lower panel shows the regression line with the 95% confidence interval.



Supplemental Figure 5. Relationship between nitrate concentration in river water and electric conductivity (EC) in river water at the bottom layer (upper panel) or dissolved organic carbon (DOC) concentration in river water (bottom panel). The solid and broken line in each panel shows the linear regression line ($P < 0.01$) with the 95% confidence interval (gray zone) for downward and upward river volume transport, respectively. The size of the plot shows the river volume transport. The color of the plot shows the downward and upward directions of the river volume transport.



Supplemental Figure 6. Relationship between river volume transport and dissolved organic carbon (DOC) concentration in river water. The solid and broken line in each panel shows the linear regression line ($P < 0.01$) with the 95% confidence interval (gray zone) for the downward and upward river volume transport, respectively. The size of the plot shows the electric conductivity (EC) in the bottom layer of the river water. The color of the plot shows the downward and upward directions of the river volume transport.