Table S1. Used watershed/stream variables to build the temporal averaged stream DOC/DO model

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| Used variables | Variable name | Sources |
| Annual mean temperature (℃) | TOT\_TAV7100\_ANN ,CAT\_TAV7100\_ANN (logCAT\_TAV) | PRISM,2008 |
| Annual mean precipitation (mm) | TOT\_PPT2100\_ANN, CAT\_PPT2100\_ANN (logCAT\_PPT) | PRISM,2008 |
| Annual mean Runoff | TOT\_RUN7100, CAT\_RUN7100 (logCAT\_RUN) | (Schwarz *et al* 2018) |
| Basin drainage area (km2) | TOT\_BASIN\_AREA (logTOT\_BASIN\_AREA)  CAT\_BASIN\_AREA | (Schwarz *et al* 2018) |
| Basin elevation (m) | TOT\_ELEV\_MEAN (logTOT\_ELEV\_MEAN), CAT\_ELEV\_MEAN | (Schwarz *et al* 2018) |
| Basin Slope | TOT\_BASIN\_SLOPE  CAT\_BASIN\_SLOPE | (Schwarz *et al* 2018) |
| Stream Slope | TOT\_STREAM\_SLOPE (logTOT\_STREAM\_SLOPE), CAT\_STREAM\_SLOPE | (Schwarz *et al* 2018) |
| Soil permeability (inch/hr) | TOT\_PERMAVE (logTOT\_PERMAVE),  CAT\_PERMAVE (logCAT\_PERMAVE) | STATSGO2 soil databases |
| Soil organic matter (%) | TOT\_OM (logTOT\_OM), CAT\_OM | STATSGO2 soil databases |
| Soil bulk density(g/cm3) | TOT\_BDAVE, CAT\_BDAVE | STATSGO2 soil databases |
| % Sand | TOT\_SANDAVE, CAT\_SANDAVE | STATSGO2 soil databases |
| % Clay | TOT\_CLAYAVE, CAT\_CLAYAVE (logCAT\_CLAYAVE) | STATSGO2 soil databases |
| % Silt | TOT\_SILTAVE, CAT\_SILTAVE | STATSGO2 soil databases |
| % wetland area (%) | twetland (logtwetland), wetland (logwetland) | National Land Cover Database 2001 (NLCD 2001) |
| % Forest area (%) | tforest, forest (logforest) | National Land Cover Database 2001 (NLCD 2001) |
| % Urban area (%) | turban (logturban), urban (logurban) | National Land Cover Database 2001 (NLCD 2001) |
| % Shrub area (%) | tshrub (logtshrub), shrub(logshrub) | National Land Cover Database 2001 (NLCD 2001) |
| % Agriculture area (%) | targc (logtargc)  agrc(logargc) | National Land Cover Database 2001 (NLCD 2001) |
| Summer vegetation index (enhanced vegetation index, EVI) | TOT\_EVI\_JAS\_2012 (logTOT\_EVI),  CAT\_EVI\_JAS\_2012 | MODIS imagery |
| Topographic wetness index (TWI, m) | TOT\_TWI, CAT\_TWI | (Schwarz *et al* 2018) |
| Baseflow index (BFI) | TOT\_BFI, CAT\_BFI | (Schwarz *et al* 2018) |
| Dam storage (NID\_STORAGE2010) | TOT\_ NID\_STORAGE2010 (logTOT\_NID), CAT\_NID\_STORAGE2010 (logCAT\_NID) | (Schwarz *et al* 2018) |
| TN concentration (mg/l) | tn (logtn) | SPARROW 2012 |
| TP concentration (mg/l) | tp (logtp) | SPARROW 2012 |
| Parenthesis value is the variable name after log transformed. ‘CAT’ represents flowline catchment value. ‘TOT’ represents total upstream routed accumulated value. ‘tforest’ and ‘forest’ represent the percentage of combined forest lands (mixed forest, deciduous and evergreen forests) from the total upstream drainage area, and catchment drainage area, respectively. Other land classes follow the similar naming. | | |