**Table S1** Model fit diagnostics and prediction error for each Poisson-lognormal model (PLN models) in impoundments (*Im*) and free-flowing segments (*Fr*), respectively. BIC, non-traditional Bayesian information criterion; RMSE, cumulative root mean squared error.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Selected variables** | ***Fr*** |  |  | ***Im*** |  |  |
|  | BIC | RMSE | *R2* | BIC | RMSE | *R2* |
| Site name | -**2503.34** | 0.32 | 0.96 | **-2315.86** | 0.32 | 0.95 |
| Dissolved oxygen | -2510.42 | 0.31 | 0.96 | -2338.32 | 0.31 | 0.95 |
| Wetted width | -2504.84 | 0.32 | 0.96 | -2331.93 | 0.31 | 0.95 |
| Water depth | -2520.74 | 0.31 | 0.96 | -2321.80 | 0.31 | 0.95 |
| Current velocity | -2513.08 | 0.31 | 0.96 | -2328.02 | 0.31 | 0.95 |
| Substrate coarseness | -2509.42 | 0.31 | 0.96 | -2325.76 | 0.31 | 0.95 |
| Substrate heterogeneity | -2513.33 | 0.31 | 0.96 | -2331.90 | 0.31 | 0.96 |
| Site name +Dissolved oxygen | -2541.32 | 0.32 | 0.95 | -2364.47 | 0.32 | 0.95 |
| Site name + Wetted width | -2536.78 | 0.32 | 0.95 | -2356.93 | 0.32 | 0.94 |
| Site name +Water depth | -2554.25 | 0.32 | 0.96 | -2347.67 | 0.32 | 0.94 |
| Site name +Current velocity | -2547.64 | 0.32 | 0.96 | -2352.65 | 0.32 | 0.95 |
| Site name +Substrate coarseness | -2542.15 | 0.32 | 0.95 | -2349.76 | 0.32 | 0.94 |
| Site name +Substrate heterogeneity | -2546.18 | 0.32 | 0.95 | -2358.88 | 0.32 | 0.95 |
| Dam height |  |  |  | -2326.40 | 0.31 | 0.95 |
| Dam length |  |  |  | -2327.69 | 0.31 | 0.95 |
| Site name +Dam height |  |  |  | -2355.98 | 0.32 | 0.95 |
| Site name +Dam length |  |  |  | -2351.60 | 0.32 | 0.94 |