Ecosphere
# Riparian soil nitrogen cycling and isotopic enrichment in response to a long-term salmon carcass manipulation experiment

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Appendix S1

Equation S1: Mixing model calculation applied to Quinn et al. (2018) data where %MDN is the percentage of MDN in a given sample, TEM is the terrestrial end member ($\delta^{15}N$ value representing 0% MDN), MEM is the marine end member ($\delta^{15}N$ value representing 100% MDN) which is typically 12.65‰ for sockeye salmon. SAM values were the mean enhanced (10.7‰) and mean depleted (7.65‰) values; TEM was the mean control value from white spruce >50m from Hansen Creek edge (-1.74‰) from Quinn et al. (2018). MEM were the maximum and average $\delta^{15}N$ of $NH_4^+$ observed in this study.

$$\%MDN = \frac{SAM - TEM}{MEM - TEM} * 100$$

Table S1: The candidate model set tested for each response variable using AIC analysis. * denotes models used for all response variables, additional models were used for net mineralization and net nitrification where substrate represents organic nitrogen concentration and $NH_4^+$ concentration, respectively. For $\delta^{15}N$ data, GW was not tested as a covariate and total [N] was tested instead. The three tested hypotheses are: 1) a bank and/or distance effect caused by site variability and not salmon; 2) a bank and distance effect as a quadratic interaction indicting a response to salmon manipulation, and 3) no difference caused by distance and bank indicating support for the other covariates tested. Response variables include: $\delta^{15}N$ and $\delta^{13}C$ of bulk soil, $\delta^{15}N$ of $NH_4^+$, $[NH_4^+]$ and $[NO_3^-]$, net mineralization and net nitrification, $[N_{org}]$, gravimetric water content (GW), and C:N.

| **Candidate Model Set** | **Hypothesis** |
|---|---|
| *Response Variable = bank + ε | 1 |
| *Response Variable = bank + GW + ε | 1 |
| *Response Variable = ln(distance) + GW + ε | 1 |
| *Response Variable = ln(distance) + ε | 1 |
| *Response Variable = bank + ln(distance) + bank:ln(distance) + ln(distance)$^2$:bank + GW + ε | 2 |
| *Response Variable = bank + ln(distance) + bank:ln(distance) + ε | 1 |
| *Response Variable = bank + ln(distance) + bank:ln(distance) + GW + ε | 1 |
| *Response Variable = bank + ln(distance) + bank:ln(distance) + ln(distance)$^2$:bank + ε | 2 |
| *Response Variable = bank + ln(distance) + bank+ ε | 1 |
| *Response Variable = bank + ln(distance) + bank + GW+ ε | 1 |
| *Response Variable = GW + ε | 3 |
| Response Variable = bank + substrate + ε | 1 |
| Response Variable = ln(distance) + substrate + ε | 1 |
| Response Variable = bank + GW + substrate + ε | 1 |
| Response Variable = bank + ln(distance) + bank:ln(distance) + GW + substrate + ε | 2 |
| Response Variable = bank + ln(distacne) + bank:ln(distance) + substrate + ε | 1 |
| Response Variable = bank + ln(distance) + bank:ln(distance) + GW + substrate + ε | 2 |
| Response Variable = bank + ln(distance) + bank:ln(distance) + ln(distance)$^2$:bank + GW+ substrate + ε | 2 |
| Response Variable = bank + ln(distance) + bank:ln(distance) + ln(distance)$^2$:bank + substrate + ε | 2 |
| Response Variable = bank + ln(distance) + GW+ substrate + ε | 1 |
| Response Variable = bank + ln(distance) + substrate + ε | 1 |
| Response Variable = substrate + ε | 3 |
| Response Variable = GW + substrate + ε | 3 |

Table S2: Summary statistics mean (standard deviation) of each response variable

| Distance | **1 m** | | **3 m** | | **6 m** | | **10 m** | | **20 m** | |
|---|---|---|---|---|---|---|---|---|---|---|
| Bank | **Enhanced** | **Depleted** | **Enhanced** | **Depleted** | **Enhanced** | **Depleted** | **Enhanced** | **Depleted** | **Enhanced** | **Depleted** |
| Bulk $\delta^{15}N$ (‰) | 7.4(2.3) | 7.2(1.9) | 9.2(1.0) | 7.8(2.2) | 8.5(1.9) | 6.9(1.2) | 8.2(1.5) | 7.3(1.6) | 6.5(1.0) | 6.6(1.2) |
| Bulk $\delta^{13}C$ (‰) | -27.1(0.6) | -27.2(0.4) | -26.9(0.5) | -27.1(0.6) | -26.6(0.5) | -26.7(0.3) | -26.5(0.5) | -26.6(0.3) | -26.4(0.5) | -26.4(0.4) |
| $\delta^{15}N$ of $NH_4^+$ (‰) | 10.1(1.8) | 8.7(2.8) | 16.2(10.7) | 8.5(2.5) | 13.3(10.5) | 6.3(2.8) | 8.4(2.5) | 5.8(2.9) | 6.1(2.3) | 6.5(3.3) |
| $[NH_4^+]$ (μg N $g^{-1}$) | 47.5 (91.6) | 22.3(16.4) | 62.9(101.5) | 10.6(9.4) | 52.5(82.8) | 11.0(12.7) | 12.3(13.1) | 11.5(8.2) | 8.6(4.4) | 13.2(11.6) |
| $[NO_3^-]$ (μg N $g^{-1}$) | 6.0(5.4) | 3.4(4.4) | 10.8(13.5) | 4.3(4.7) | 7.6(8.0) | 3.3(2.8) | 2.4(2.3) | 4.0(4.2) | 2.8(2.8) | 1.7(1.2) |
| Net Mineralization (μg N $g^{-1}$ $d^{-1}$) | 2.8(2.0) | 1.8(1.2) | 4.4(5.2) | 1.1(1.0) | 2.1(3.6) | 3.0(3.6) | 1.2(1.1) | 1.4(1.0) | 1.1(1.5) | 2.3(1.9) |
| Net Nitrification (μg N $g^{-1}$ $d^{-1}$) | 1.7(1.6) | 1.2(1.4) | 3.4(4.5) | 0.8(1.2) | 2.8(2.9) | 1.7(1.9) | 1.0(0.9) | 1.4(0.8) | 0.6(0.7) | 1.6(1.9) |
| $[N_{Org}]$ (mg N $g^{-1}$) | 22.0(4.7) | 19.11(5.8) | 18.0(8.2) | 19.7(7.6) | 17.7(6.6) | 19.5(8.5) | 13.0(6.3) | 18.4(8.9) | 9.5(3.3) | 13.9(5.5) |
| GW | 2.6(1.1) | 3.2(1.6) | 2.4(1.5) | 2.2(1.1) | 2.2(1.5) | 2.8(2.2) | 1.5(0.9) | 2.6(1.8) | 1.4(0.6) | 1.9(0.8) |
| C:N | 11.9(1.4) | 11.2(1.1) | 11.7(1.6) | 10.9(1.5) | 12.8(2.2) | 12.1(2.7) | 14.2(1.7) | 12.1(1.9) | 17.0(2.0) | 14.1(3.0) |
| % Nitrification | 54.8(44.7) | 67.9(43.8) | 75.4(35.5) | 49.3(39.7) | 75.7(36.2) | 53.1(39.0) | 65.9(36.4) | 87.9(15.8) | 50.6(33.5) | 56.2(39.2) |
| % C | 30.0(5.5) | 25.5(8.8) | 26.4(10.1) | 24.7(9.7) | 25.7(8.2) | 27.5(13.3) | 21.3(8.8) | 25.2(11.7) | 19.0(6.7) | 21.2(6.7) |

Figure S1: Predicted verse observed values and predicted verse residuals for the model with the most support (Table 1, Figure 2) for each the response variables