Wood in Rivers

Investigating the impact on nutrient turnover and greenhouse gas production

Sources
Management schemes often include the addition of wood into rivers:
- Directly, e.g. installing coppice wood fences or log jams.
- Indirectly, e.g. replanting riparian zones or flood plains.

Potential Impacts
Nutrient turnover: nitrate (NO$_3^-$) is the most problematic nutrient pollutant in UK rivers. It can be transformed by microorganisms in a process called denitrification, removing it from the water. When nitrate cones are high, carbon (as an electron donor and source of cellular carbon) is limiting. Wood additions could provide a source of carbon to increase the removal of nutrients.

Greenhouse Gases (GHG): wood additions could also increase the production of GHG's. For example, nitrogen gas (N$_2$O) is produced in leucapile denitrification, and methane (CH$_4$) is produced if carbon is used as a terminal electron acceptor – both are more harmful than carbon dioxide (CO$_2$).

What Goes In?
- River sediment – 3 treatments containing different amounts of organic matter and different grain size distributions.
- Coppice wood – used to make fences which are used in river restoration. Potential source of labile carbon.
- Artificial streamwater - NO$_3^-$ + NH$_4^+$ + HCO$_3^-$ + CO$_3^{2-}$ + (24 mg/L)
- Nitrate (50 mg/L) + injected monthly to see how much of it is transformed.

Mesocosms simulate real-life scenarios under controlled conditions. Here they are used to investigate the impact of wood in river sediments on biogeochemistry.

What Comes Out?
After injection of nitrate and reassurin (every 4 weeks), samples will be taken from the water column and the headspace through tubes with stopcocks, so that the mesocosm can remain closed. Dissolved oxygen, pH and temperature will be monitored.

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<thead>
<tr>
<th>Parameter</th>
<th>Technique</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CO$_2$</td>
<td>Gas chrom</td>
<td>mg C/g dm²</td>
</tr>
<tr>
<td>CH$_4$</td>
<td>Gas chrom</td>
<td>mg C/g dm²</td>
</tr>
<tr>
<td>N$_2$O</td>
<td>Gas chrom</td>
<td>mg N/g dm²</td>
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What Do We Expect?
It is hypothesised that:
- Microbial metabolic activity will be higher in mesocosms containing wood.
- Increases in microbial metabolic activity will be higher in sediments with lower OM.

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<tr>
<th>Parameter</th>
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<th>Units</th>
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<tbody>
<tr>
<td>Organic matter (OM) content</td>
<td>Loss on ignition</td>
<td>% Organic matter</td>
</tr>
<tr>
<td>N$_2$O content</td>
<td>Gas chrom</td>
<td>mg N/g dm²</td>
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About the Author
[Image of the author]
My background is in conservation biology and forest management. I am interested in ecosystem services, nature-based solutions, and how research influences policy, practice, and industry.