Sediment and Water Quality

Daire.ohuallachain@teagasc.ie
Water quality

- Decline in water quality
- Various pressures impacting water quality
Sediment

- Sediment - natural phenomenon
  - Weathering of rock, mineral, organic, soil material
  - Land-use can accelerate soil erosion and delivery of excess sediment to watercourses

- What constitutes excess sediment?
Sediment yield from catchments

- 25 t km$^2$
- 8 t km$^2$
- <3 t km$^2$
Sediment yield – intensive catchments (ACP)
Sediment sources – intensive catchments

Grassland- Poorly-drained

24 t km$^2$

5% 25% 70%
Arable- Well-drained

12 t km²

59%

19%

22%

Arable- Poorly-drained

25 t km²

17%

9%

74%
Sediment sources – Extensive catchments

Intensive Grassland
• 20% input; 5% area

Forestry – significant
• Established, historical

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Sediment Contribution</th>
<th>Sediment Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridia</td>
<td>Channel Bank: 20%</td>
<td>5.6 t km²</td>
</tr>
<tr>
<td></td>
<td>Extensive: 40%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road Verge: 30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved: 10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Forestry: 0%</td>
<td></td>
</tr>
<tr>
<td>Owenroe</td>
<td>Channel Bank: 40%</td>
<td>2.7 t km²</td>
</tr>
<tr>
<td></td>
<td>Extensive: 20%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road Verge: 30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved: 10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Forestry: 0%</td>
<td></td>
</tr>
<tr>
<td>Kealduff</td>
<td>Channel Bank: 20%</td>
<td>2.8 t km²</td>
</tr>
<tr>
<td></td>
<td>Extensive: 40%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road Verge: 30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved: 10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Forestry: 0%</td>
<td></td>
</tr>
</tbody>
</table>
Sediment impact: ecology

- Riverbed habitats
  - Clogging gravels
  - Reducing dissolved oxygen
- Turbidity
  - Reduce light penetration
  - Impact on feeding
Sediment impact: multiple stressors

Experiment to assess multiple stressors on aquatic invertebrates
• Sediment, Phosphorus and Nitrogen, individually + combined
• Response of aquatic invertebrates

Conclusion:
• Sediment was the most significant stressor on aquatic ecology.
Sediment mitigation

Source

Pathway

Risk

Receptor

Riparian buffer strips
Riparian buffer strips

Bands of land adjacent to water bodies that are planted with permanent vegetation
SMarter BufferZ

- Designed and managed buffer strips, targeted to Hydrologically Sensitive Areas
- Right Measure – Right Place
Right place
Targeting of riparian margins to ‘Delivery points’ - Reduction of 89-96% in costs (compared to blanket implementation)
Characterise flowpaths

- Right place can inform right measure
Characterise delivery points
Right measure

- Riparian measures are widely implemented
  - Compulsory and Optional
- GAEC - 2m, No fert/pest
- REPS, AEOS, GLAS –No fert/pest, no stock,

Policy has been conservative with riparian design
- Various widths (3m-30m)
  - Wider margins not very popular, low uptake by participants
  - Wide margins not necessarily more effective at buffering
- Alternative management, planting, design?
<table>
<thead>
<tr>
<th>Mitigation action</th>
<th>Diagrammatic representation</th>
<th>Cost</th>
<th>Acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do only the regulatory minimum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear grass buffer strip over all field edges bordering a watercourse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear buffer strip with managed vegetation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Targeted denitrification buffer zone protecting areas of groundwater upwelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Targeted grass erosion buffer zone at surface runoff delivery points</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Targeted erosion buffer zone with erosion traps (sculpted ground)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Targeted buffer zone with actions to intercept subsurface artificial soil drains</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
THANK YOU

Daire.ohuallachain@teagasc.ie

@dohuallachain