ASSESSMENT OF SMALL WATER BODIES IN IRELAND

Freshwater Biologists Meeting
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OVERVIEW

**SMALL STREAMS AND LAKES ARE IMPORTANT**
- 1st and 2nd order stream account for 77% of river channel (1:50,000)
- We only monitor a small fraction of the 12000+ lakes
- Their status is ‘extrapolated’ or inferred from main-stem monitoring

**30% OF MONITORED MAIN RIVER CHANNEL FAILS TO MEET GOOD STATUS**
- Half of this – due to ‘point source’ pollution
- And the other half due to ‘diffuse’ pollution
- If small streams account for 77% of bank length they must be managed to prevent pollutants entering
  - They present an ‘easy’ pathway - low banks, easily accessed by cattle, slurry, siltation

**‘SMALL STREAMS RISK SCORE’ (SSRS)**
- SSRS for investigative monitoring
- Tracking down diffuse pollution – biology meets GIS and remote sensing
- Training and QC
SMALL STREAMS AND LAKES IN CATCHMENTS

- Small streams are inherently important
  - Provide significant ecosystem services – biodiversity, dilution water, habitat, etc.
- Approximately 77% of river channel in catchments is 1st or 2nd order - < 3m wide
- Even though catchments under 10 km² in area are not specified by WFD we may fail to deliver on ultimate objective if we ignore them.
Growing Realisation across Europe that ‘Small is Beautiful’

• Brussels Workshop last November:

• ‘The Protection and Management of Small Water Bodies’

• Cion + 60 organisations present

SMALL IS BEAUTIFUL – SMALL STREAMS ARE IMPORTANT

- Stream order breakdown for the catchment of the River Moy:
  - Catchment >2000 km²
  - An important salmon river

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<th>Order</th>
<th>Length</th>
<th>% Length</th>
<th>Cumulative %</th>
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The capillaries of the catchment’s vascular system – damage or blockages may not be fatal but ….
SMALL STREAMS AND LAKES IN CATCHMENTS

- Ireland has over 12,500 lakes
- 745 larger lakes are defined as water bodies for Water Framework Directive
- 222 lakes are included in the monitoring programme
- Thousands sub 50 ha
- Not monitored - similar to the bulk of small streams that we can’t monitor routinely.

- The ecological status of unmonitored water bodies is usually inferred from the monitored network.
- If a main-stem monitored site is polluted – something upstream is responsible
- We take an ‘integrated catchment’ approach
  - Upstream does impact on downstream
  - Can’t fix downstream without fixing upstream
Principal Sources of Pollution

Suspected Causes of Slight Pollution - 547 Sites

- Agriculture: 297
- Municipal: 178
- Forestry: 24
- Industrial: 22
- Peat Harvesting: 15
- Miscellaneous: 11
- Engineering works: 2
- Aquaculture: 4

Total: 547
THE TASK

• 957 of the 2731 river sites currently monitored are ‘polluted’— i.e. at less than good ecological status.

• Approximately half of these are polluted by ‘point sources’ — WWTPS etc.
  • Easily detected – PoMS obvious (if expensive)

• Pollution in the rest is caused by ‘diffuse sources’ — agriculture, forestry, septic tanks, etc.,
  • Can be difficult to track down.

• But if we break it down: the task is as follows:
  • There are approximately 30 sites per local authority
  • Thus, 15 ‘diffuse pollution’ sites per county that need investigation
  • This is where SSRS comes in....
The Small Streams ‘Pathways’ Hypothesis

- 1st and 2nd order streams comprise >77% of bank length in a typical catchment
- The risk of diffuse pollution is proportional to length of river bank.
- Salmon, trout/sea trout, *Margaritifera* and **all ecosystem services** are all placed at risk by pollution (whether point or diffuse)
- Licensed ‘Point-Source’ Discharges easy to detect and locate
- Diffuse Pollution is more difficult to track down and control
- Catchment Improvement Measures that ignore small streams are at risk of failing to meet WFD requirements
  - If we ignore small streams unlikely that we can improve or maintain the quality in the downstream river.

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INTRODUCING THE SMALL STREAMS RISK SCORE (SSRS):

- The SSRS was designed for tracking down diffuse pollution within catchments
- Rapid macroinvertebrate-based method
- Simpler taxonomy than fully-fledged status methods
- Kick sample & scored on the bank – a field method
INTRODUCTION TO SSRS

• SSRS assesses risk on first and second order streams
• SSRS allows surveyors to concentrate on small streams that potentially receive the biggest pollution risk
• SSRS is a rapid technique to pinpoint and identify streams that may require further study
• SSRS only uses certain indicator species to calculate risk;
  • Mayflies - Ephemeroptera,
  • Stoneflies - Plecoptera,
  • Caddis Flies - Trichoptera,
  • Gastropods, Oligochaetes, Diptera And Asellus
• Simple physical and chemical variables are also recorded
SSRS TAXONOMY

- Group 1 - Ephemeropteran (Mayfly Nymphs)
- Group 2 – Plecopteran (Stonefly Nymphs)
- Group 3 – Trichopteran (Caddis Fly Larvae)
- Group 4 – G.O.L.D (Includes Gastropods, Oligochaetes And Diptera Larvae)
- Group 5 – Asellus (The Water Hog Louse)
SSRS CALCULATION IS RELATIVELY SIMPLE

- Risk score calculation is relatively simple
  - Paper or Computerised
- Results in three classes:
  1. Stream at risk
  2. Indeterminate – may be at risk
  3. Probably not at risk
SSRS TRAINING

• Manuals not freely available – training course required.
• Only results from trained operators are considered
• Participation in QC system
• Widely used in local authorities
  • ~200 LA staff trained
• Approved training by
  • Aquens Ltd (Dublin)
  • Aquafact Ltd (Galway)
  • ASU (Cork)
  • WYG (Belfast)
SSRS Coverage for initial WFD Article 5 Characterisation report

Close-up on Moy/Conn Catchment
Tackling Diffuse Sources to Improve Status of all Water Bodies in the Catchment.

- Approximately 15 to 20 diffuse pollution sites per county

- Use SSRS on the ground backed up by GIS and remote sensing
  - We have also made a big investment nationally in GIS datasets, aerial photos and mapping systems
  - In combination these help to pin down the critical source areas typically on smaller streams

- Measures to tackle diffuse pollution need to focus in on problem areas

- National measures while essential only go so far in solving the problem (e.g. GAP regulations under Nitrates Directive)

- Examine the maps:
  - Check land use, bedrock, pathways, aerial photos, etc.,

- Try to focus in on the likely **hot spots** using these GIS tools

- Follow-up with **boots on the ground** using the SSRS to pinpoint the problems more precisely
Some Available GIS Layers:

- Altitude & Geology
- Land Cover
- Forestry
- Soil P levels
- Soil type & Drainage
- Ag Census
- Cattle & Sheep
- Human Census
- Maps and Aerial Photography
- Rainfall
Aerial Photography

(+Google Earth
Google Maps
Street View!)
We need to find the Hot Spots within Catchments in order to control Diffuse Pollution

12D010150 – DERREEN

Field notes – 2007: “Heavily silted d/s of the Br from localised bank disturbance. Seems to be recovering from a pollution event.”

Use Small Stream Risk Score (SSRS) to localise potential problems in waterbody upstream of main monitoring points.
Google Streetview is useful for exploring sites before Investigative Monitoring begins.

OSI Maps give time series – clear felling, new drainage, etc. Also Google Earth has time series aerial photography.
IN SUMMARY

• Growing realisation that small water bodies are important

• Small Streams form the largest proportion of river and stream channel length

• The ‘capillaries’ of the catchment

• Undertake SSRS Investigations together with
  • Examination of GIS, aerial photography, etc.
  • Follow up with chemistry where clarification needed

• Follow up with Measures
  • Walk streams
  • Warning letters, Section 12 notices, etc.
  • Buy-in for fencing animals out of streams.

And…….
Thank You!

...main-stem sites will also achieve good status as a result..
Thank You!
SMALL STREAMS RISK SCORE - CAPABILITIES

- The SSRS can:
  - Be useful in WFD Article 5 Characterisation process
    - Especially the risk aspect
  - Tell if a stream is at risk of failing to meet ‘good status’ on the basis of its macroinvertebrates
    - Benthic invertebrates - one of four key biological quality elements for rivers listed in annex V
    - The one out – all out rule states that if just one BQE fails then the site fails as a whole
SMALL STREAMS RISK SCORE - CAPABILITIES

• The SSRS cannot:
  • Not Suitable for WFD Article 8 Monitoring
  • Too simple
  • Can’t state definitively that a stream is ‘not at risk’
    • Benthic invertebrates - just one of four key biological quality elements for rivers listed in annex V
    • It’s a simple method and even if the macroinvertebrates appear satisfactory other elements may not be satisfactory
    • It cannot be used to assess ecological status (sensu WFD)
    • Assessment of ecological status requires a wider suite of biological and physico-chemical elements – PS, nutrients, hydromorphology
SSRS - TIMING

- SSRS MOST USEFUL IN WINTER/SPRING MONTHS
- OCTOBER TO JUNE
- MOST SENSITIVE MACROINVERTEBRATES SHOULD BE PRESENT
- IF STONEFLIES & MAYFLIES ARE MISSING THEN => AT RISK
- SOME PHYSICO-CHEMICAL INVESTIGATIONS DURING SUMMER FOR:
  - SEPTIC TANKS
  - SMALL POINT SOURCES