

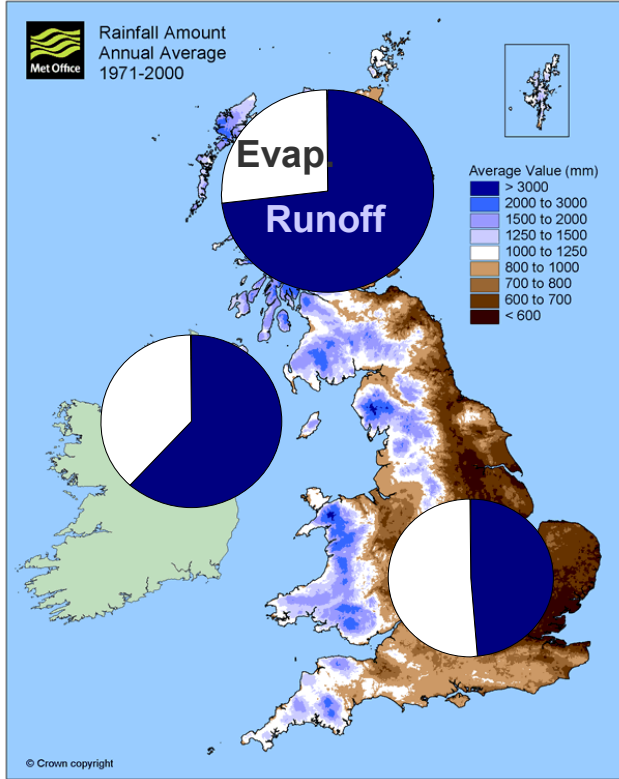
**EVALUATING THE INFORMATION VALUE OF THE
SCOTTISH HYDROMETRIC NETWORK FOR
SUPPORTING SUSTAINABLE WATER RESOURCE
DEVELOPMENT IN SCOTLAND.**

Richard Gosling

Outline

- Water resources in Scotland
- Scotland's River Basin Management Plan objectives and what they mean for monitoring
- The method for determining hydrometric information value for supporting RBMP objectives
- Conclusions

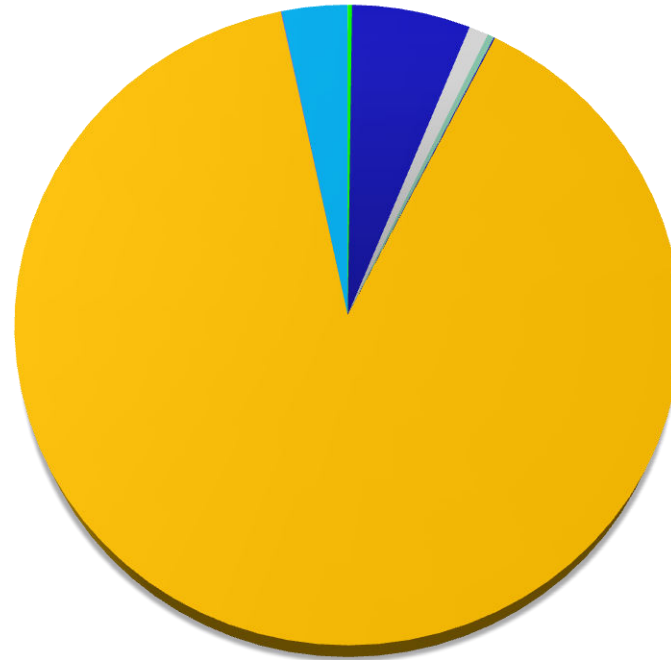
Water quantity



	Rainfall mm	Runoff %
Scotland	1435	73
Northern Ireland	1060	62
England & Wales	895	49

What do we use it for in Scotland?

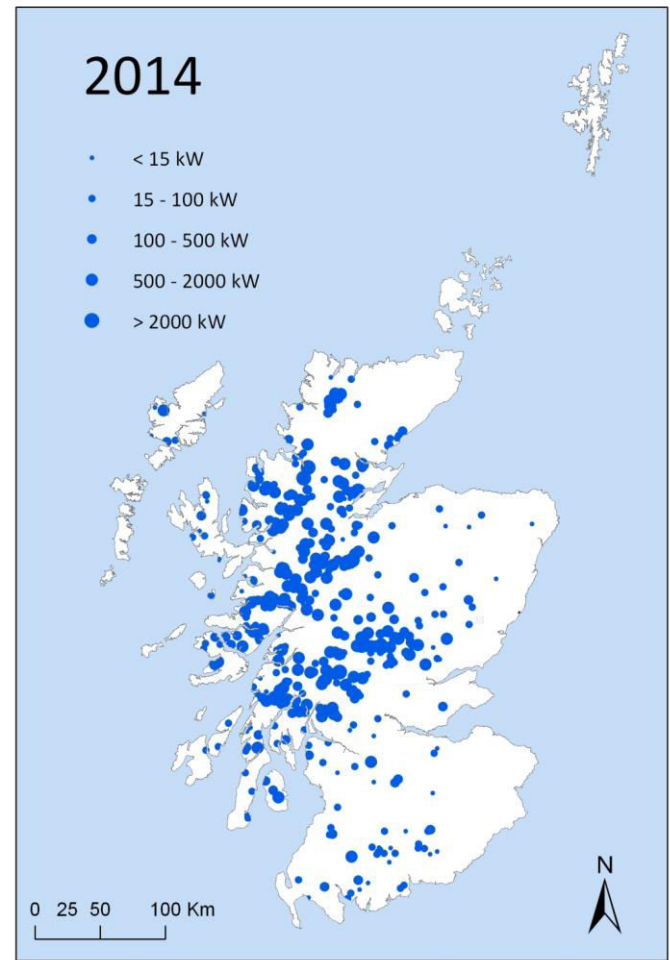
Annual licensed abstraction volume



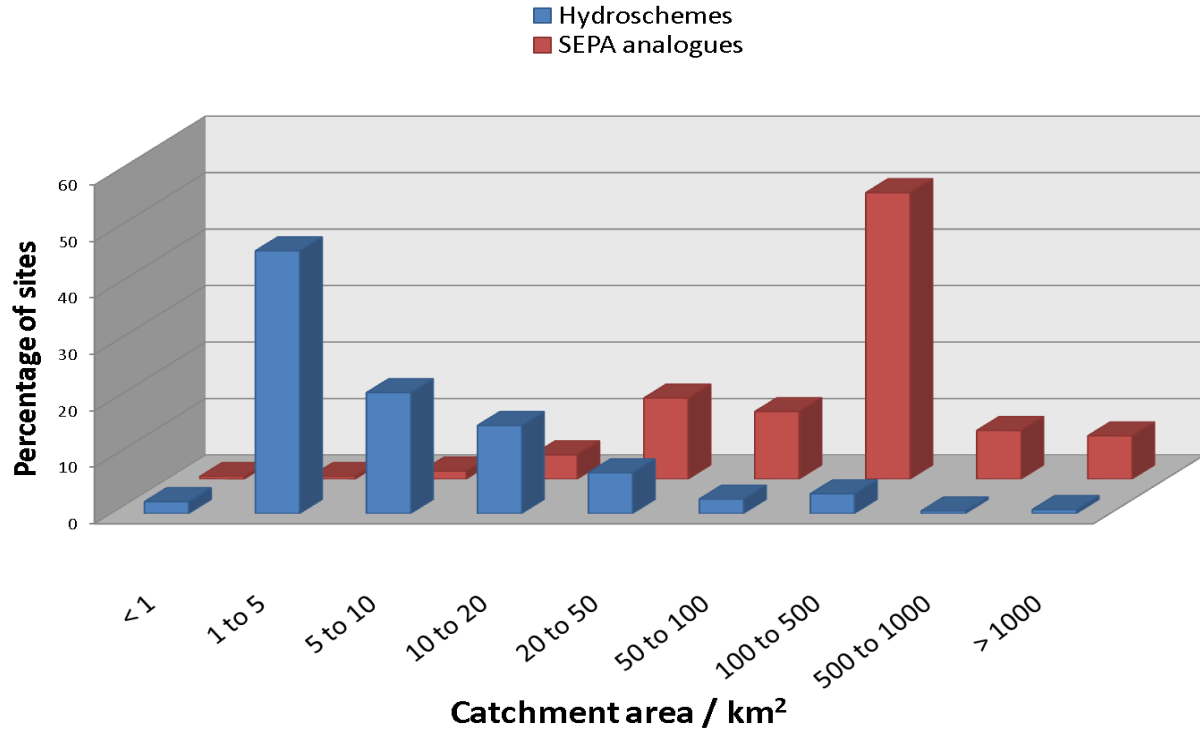
- Agriculture
- Aquaculture
- Food and drink (incl. whisky)
- Textiles
- Paper and pulp
- Oil
- Hydro electricity
- Other electricity
- Water supply

Run of river hydropower development in the 1st RBMP cycle (2009 to 2015)

Rise in hydropower
development fuelled by low
carbon electricity
generation subsidies

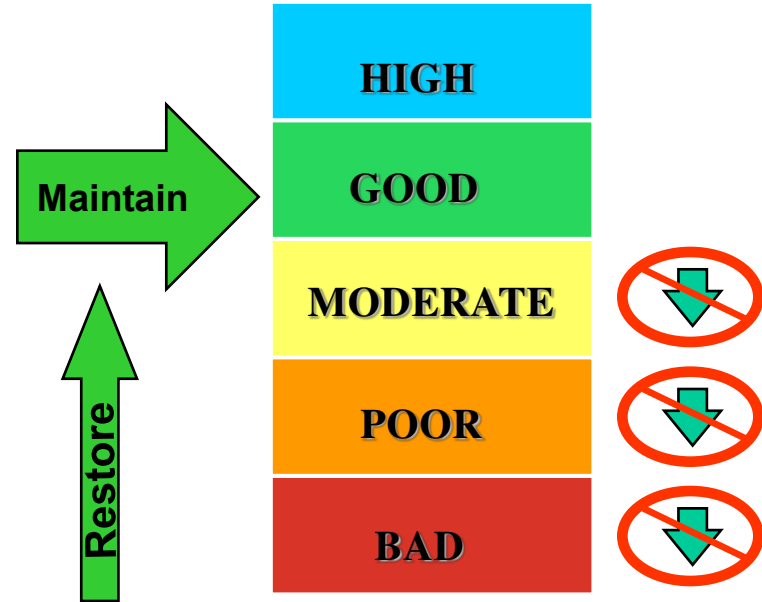


Comparison of the distribution of catchment areas between Scotland's run of river hydro schemes and SEPA's surveillance flow gauging stations



Water Framework Directive River Basin Management Plan (RBMP) Objectives

- Improve to Good Status
(improvement)
- No deterioration
(protection)

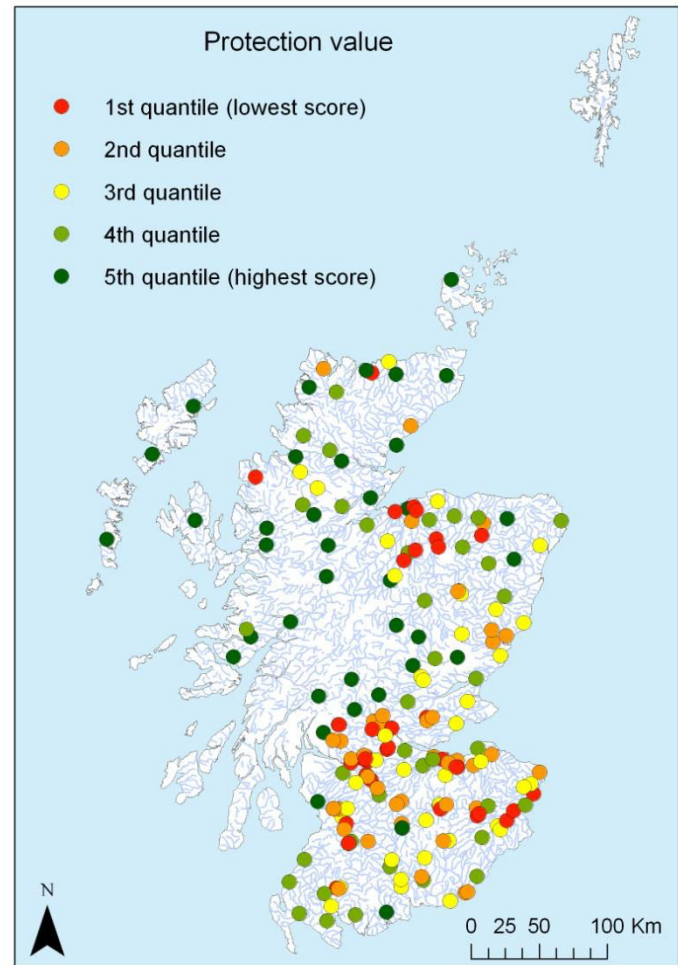


Monitoring review methodology

- Only considering water resource issues here
- Using a multiple index approach to determine information value.
- Indices:
 - Environmental protection value
 - Environmental improvement value
 - Time series independence
 - Hydrometric sensitivity

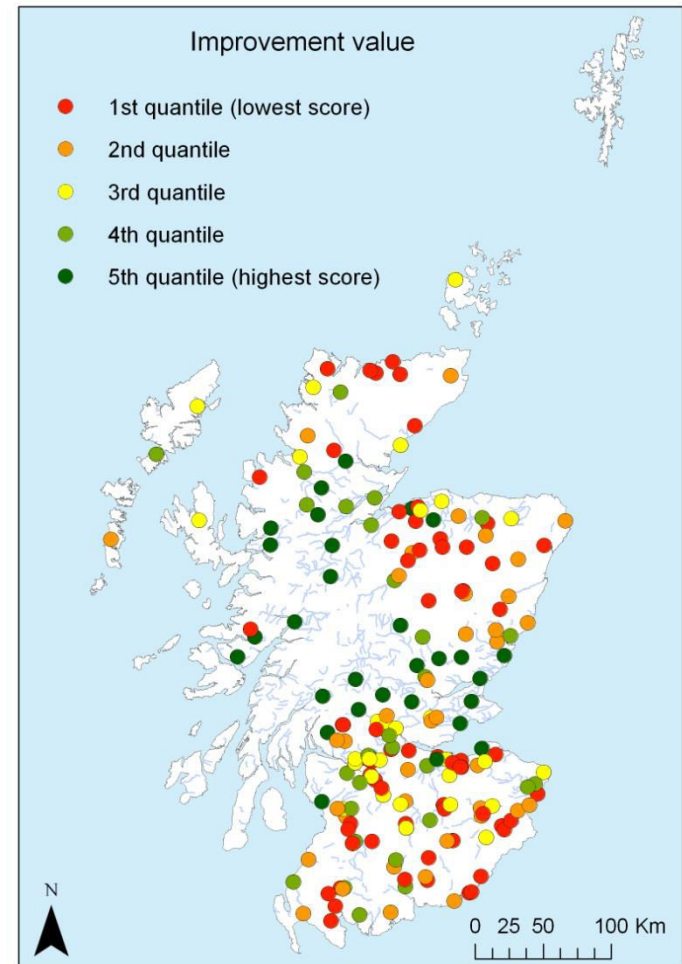
Environmental protection value

- Gauging stations valued on how well they represent Scotland's water bodies
- Assessed using similarity to water body catchments in terms of:
 - Proximity
 - BFI
 - Rainfall
 - Catchment area



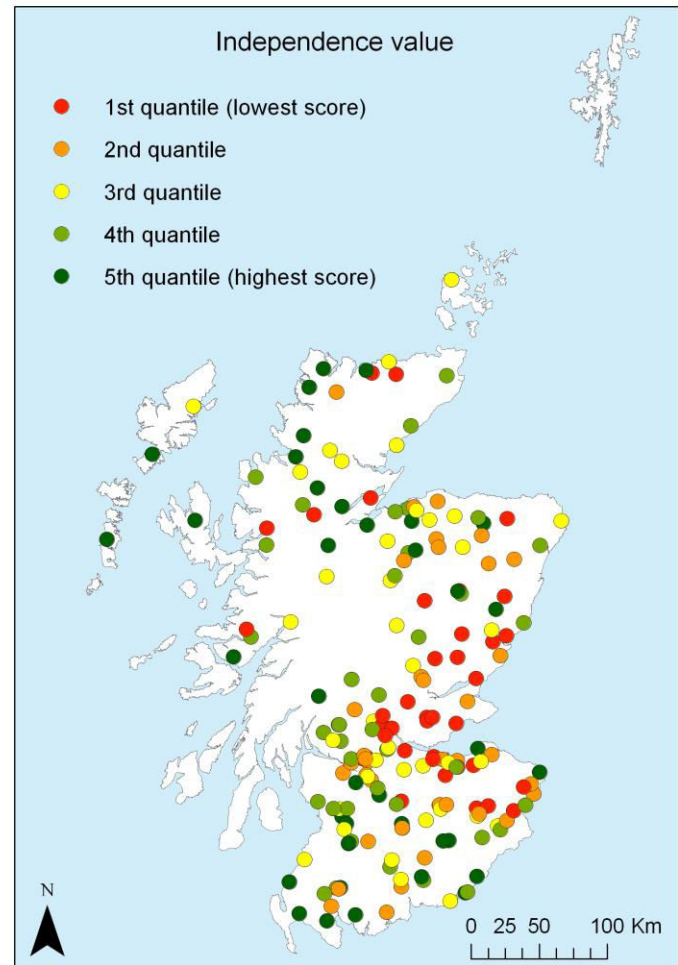
Environmental improvement value

- Same methodology as protection value but limited to water bodies less than good status



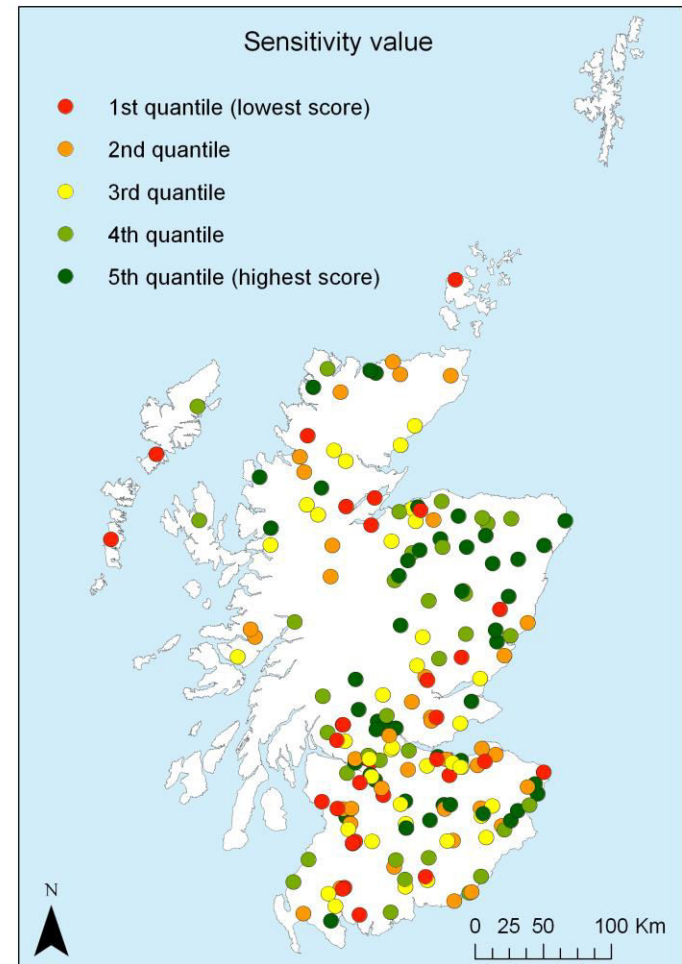
Independence value

- This score assigns a value based upon how independent the flow time series is i.e. it penalises monitoring redundancy.
- Uses a Spearman's rank correlation matrix of all daily mean flow time series
- Analyses the correlation coefficient of the 97.5th percentile (6th most similar)
- A low coefficient translates to a high independence value



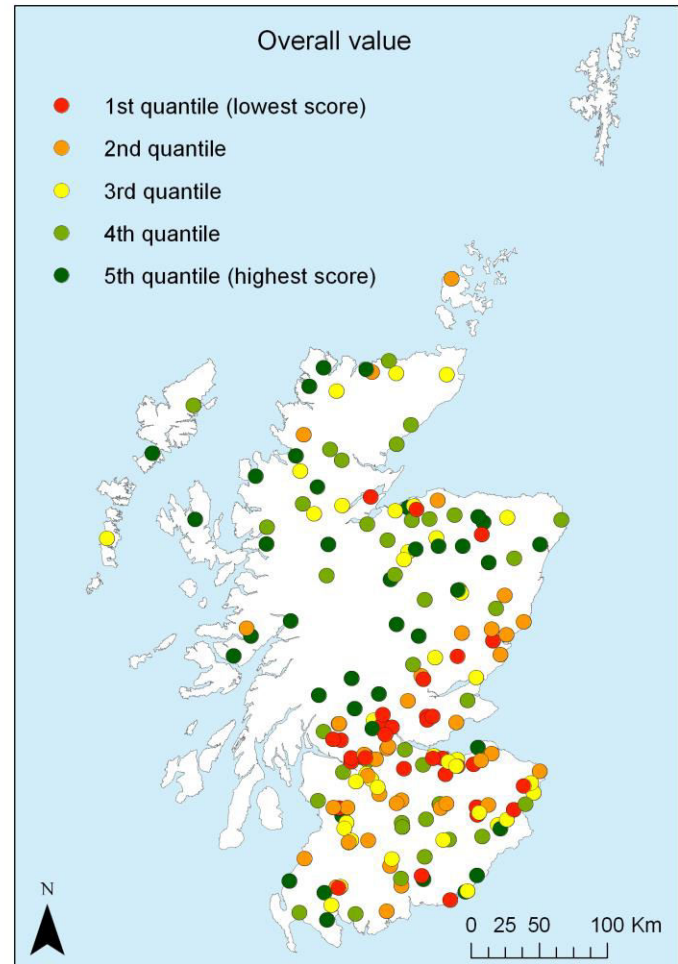
Sensitivity value

- This score assigns a value based upon how sensitive flow records at low flows are to measurement inaccuracy
- The score is the percentage change in flow resulting from 10mm level change at Qn95



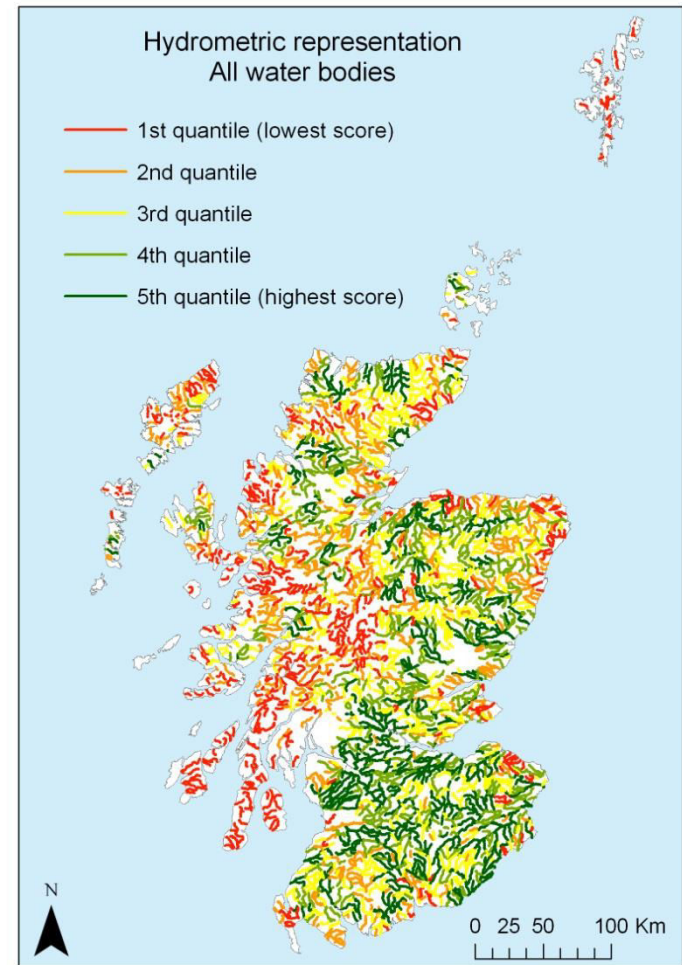
Overall value

- Each of the previous scores are ranked (a high score = a high rank)
- The overall score is the sum of ranks
- A high score indicates high value for the purposes of supporting the aims of preventing deterioration and improving to good ecological status



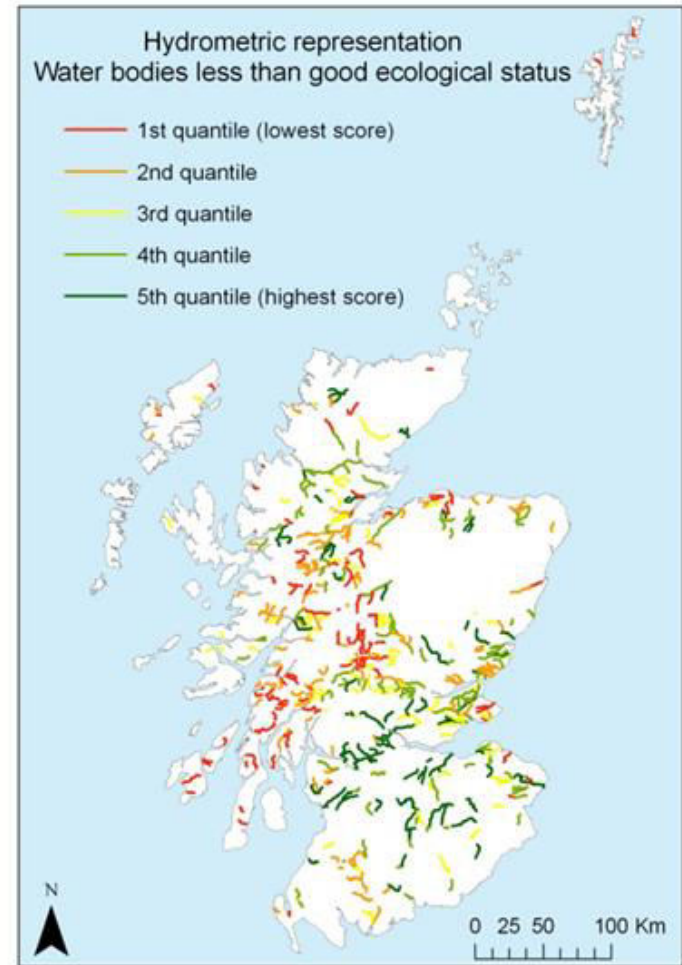
Hydrometric representation

- Using the hydrometric information value score it can be determined how well each water body is served by the hydrometric network
- This can be used to identify areas for improvement



Hydrometric representation

- This is the same as the previous score but filtered to those water bodies currently at less than good ecological status
- This is useful for determining the monitoring strategy for the next 2 RBMP cycles



Summary

- SEPA's hydrometric network carries out many functions, including supporting WFD RBMP objectives
- A multiple index system for attributing value to flow records can illustrate how well the network serves the various drivers e.g. protection and improvement
- The methodology determines which stations are most valuable and which rivers are less well served and will be used to inform future network improvement
- Different drivers, e.g. flood warning or climate change can be 'bolted on' using this approach