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River Habitat Survey Lead Region

A Survey of River Habitats on the River Lune

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A Survey of River Habitats on the River Lune
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1. Introduction

1.1. A survey of the River Lune using River Habitat Survey (RHS) was carried out at 103 sections in February/March 99, to which were added 37 sites surveyed between 1994 - 1996 (Fig. 1).

2. Statistical analyses

2.1. Summary statistics were produced on the distribution and extent of flow features (e.g. riffles, pools, rapids etc.), substrate types, tree and associated features and bank profiles (Table 1). Information on land-use and management was also included in the analyses.

2.2. A Habitat Modification Score (HMS) describing the level of habitat modification was derived for each site and compared to the whole reference network and to rivers of similar types in Britain (Fig. 2).

3. Results

3.1. The Lune catchment is mainly a high energy upland system (see Fig. 3) flowing through glacial and alluvial deposits.

3.2. The Habitat Modification scores show that more than 70% of the sites on the catchment are predominantly unmodified and very few sites are significantly modified (less than 10% of the sites). This is average when compared to rivers of similar type (Fig. 2).

3.3. Highly modified sites are concentrated in the urban areas (Fig. 4) and on the tributaries. The high modification scores are caused in most cases by the presence of bank re-inforcements (Fig. 5). The Lune showed few major channel structures likely to restrict fish migration such as weirs (Fig. 6), culverts or dams (Table 1). The main land-uses present are agricultural or broad-leaved woodland (Table 1 and Fig. 4).

3.4. Trees and associated features are widespread throughout the catchment (Table 1 and Fig.6).

3.5. Cover for fish as indicated by the occurrence of boulders, undercut banks, tree shade, tree overhang and underwater root system, is widely available throughout the catchment (see Table 1).

3.6. Substrate mix is highly dominated by Boulder, Cobble and Bedrock. Cobbles dominate in most of the main stem and the tributaries. Gravel/pebble are poorly

represented in the catchment, and silt and sand are only present in areas impacted by management structures (Fig. 7).

3.7. The channel flow is highly dominated by high velocity features (Table 1 and Fig.8) such as rapids (extensive at 48% of the sites) cascades (extensive at 27% of the sites) and runs (extensive at 62% of the sites). Although riffles (Table 1 and Fig. 5)were present at more than 50% of the sites, they were rarely dominant. Waterfalls occurred at more than 25% of sites.

3.8. 91% of the sites presented some signs of erosion (Table 1 and Fig. 9). 47% of the site had more than half of the bank length showing obvious signs of erosion and 74% of the Lune banks have bare faces

3.9. The flow dimensions were compared to the data collected in 1994-1996. A CA isolated 2 main flow dimensions explaining 50% of the total variability. The main dimension represented a gradient between cascade and glides, the second gradient was associated with riffles and runs. The picture is different from the previous analyses. Fast flow-types are represented in the main gradients, but slower flow-types such as riffles, glides and runs dominate.

4. Conclusion

4.1. The Lune is a high energy upland river system

4.2. The levels of energy are reflected by the distribution of substrate (mainly cobble, boulder) and flow-types (rapids and runs). Fine substrates and slow flow-types were poorly represented.

4.3. Energy drives large amounts of erosion, although no fine deposit could be found in the channel. Erosive features were present at nearly all sites and did not seem to be correlated to land-use, although the analyses did not account for changes in run-off patterns brought about by land-use.

4.4. More than 70% of the catchment shows little signs of obvious modification to the channel and banks.

4.5. Most habitat features important to salmonids were widely distributed throughout the catchment.

4.6. Channel substrate was dominated by cobbles and flow-types were dominated by rapids

4.7. In conclusion, the analyses of the data collected indicate that although river habitats are of good quality. The river processes appear to be driven by natural forces, although land-use is likely to impact on the levels of run-off.

FIGURES

Table 1- Summary statistics for the Lune hydrological catchment.

Figure 1- Comparison of the level of habitat modification on the Lune (100 sites) to the whole of the reference network (266 sites)

Figure 2- Principle Component Analysis on transformed altitude, slope, distance from source and altitude of the source for 5545 British sites.

Figure 3- Land use split by pie charts overlaid onto the Lune hydrological area and river network.

Figure 4a- Distribution of overhanging boughs displayed on a none, present or extensive scale.
   None = 0% Coverage
   Present = >0% and <33%
   Extensive = >33%

Figure 4b- Distribution of reinforced banks displayed on a none, present or extensive scale.

Figure 4c- Number of riffles counted at each River Habitat Survey site on the Lune.

Figure 5a- Location of major weirs on the Lune.

Figure 5b- Tree coverage on the Lune.
   0 = None
   2-3 = Isolated/scattered
   4-5 = Regularly spaced
   6-7 = Semi-continuous
   8-10 = Continuous

Figure 6- Proportions of different channel substrate shown by individual pie charts per River Habitat Survey site.

   Bedrock = Exposure of underlying rock.
   Boulder = Loose rock > 256mm diameter.
   Cobble = Loose material 64 - 256mm diameter.
   Gravel Pebble = 2 - 64mm.
   Sand = 0.06mm - 2mm.
   Silt = Very fine material as a deposit.

Figure 7- Proportions of different channel flow types shown by individual pie charts per RHS site.

Figure 8- Scale of erosion on the Lune catchment based on erosion features collected in the RHS form.

TABLE 1

Lune Fisheries Statistical Analysis

P (PRESENT) = <33%

E (EXTENSIVE) >33%

Total sites = 103

Woodland Statistics

	% E	% P or E
TREE SHADING	34	68
OVERHANGING BOUGHS	39	72
EXPOSED ROOTS	20	67
UNDERWATER ROOTS	2	26
FALLEN TREES	0	47
WOODY DEBRIS	1	42

	Median
TREES	SEMI-CONTINUOUS

River Flow Types

	% E	% P or E
WATERFALL	0	26
CASCADES	27	61
RAPIDS	48	78
RUNS	62	88
BOILS	14	73
GLIDES	13	43
MARGDEAD	1	50
POOLS	0	9
RIFFLES	7	58

Artificial Features

	% Occurrence
CULVERTS	1
WEIRS	12
BRIDGES (MAJOR)	18

Channel Features

	% E	% P or E
EXPOSED BEDROCK	25	47
EXPOSED BOULDERS	36	63
UNVEGETATED MCB	0	15
VEGETATED MCB	0	7
MATURE ISLAND	1	8
UNVEGETATED SB	4	50
VEGETATED SB	0	7

Bank Profiles

	% E	% P or E
VERTICAL/UNDERCUT	56	79
VERTICAL + TOE	28	53
STEEP	43	62
GENTLE	19	42
RESECTIONING	3	5
REINFORCED -WB	13	34
POACHED	0	0

Land Use Statistics

	% E	% P or E
BROADLEAF	26	55
CONIFEROUS	2	5
MOORLAND/HEATH	1	2
SCRUB	1	11
ROUGH PASTURE	27	38
TILLED LAND	0	1
OPEN WATER	1	1
WETLAND	1	1
OPEN WATER	1	1
URBAN	17	40
IMPROVED GRASSLAND	58	69

River Features

	Average
RIFFLES	1
POOLS	0
UNVEGETATED PB'S	1
VEGETATED PB'S	0

Habitat Modification Score

HMS MEDIAN	3
HMI MEDIAN	PREDOMINANTLY UNMODIFIED

Bank Vegetation Structure

Percentage Values	Banktop	Bankface
Bare	5	17
Uniform	73	32
Simple	20	48
Complex	2	3

Erosion

Range	%
0-10	53%
10-20	27%
20-30	11%
30-40	9%

Figure 1

Comparison of the level of habitat modification on the Lune
(100 sites) to similar sites on the reference network (266 sites)
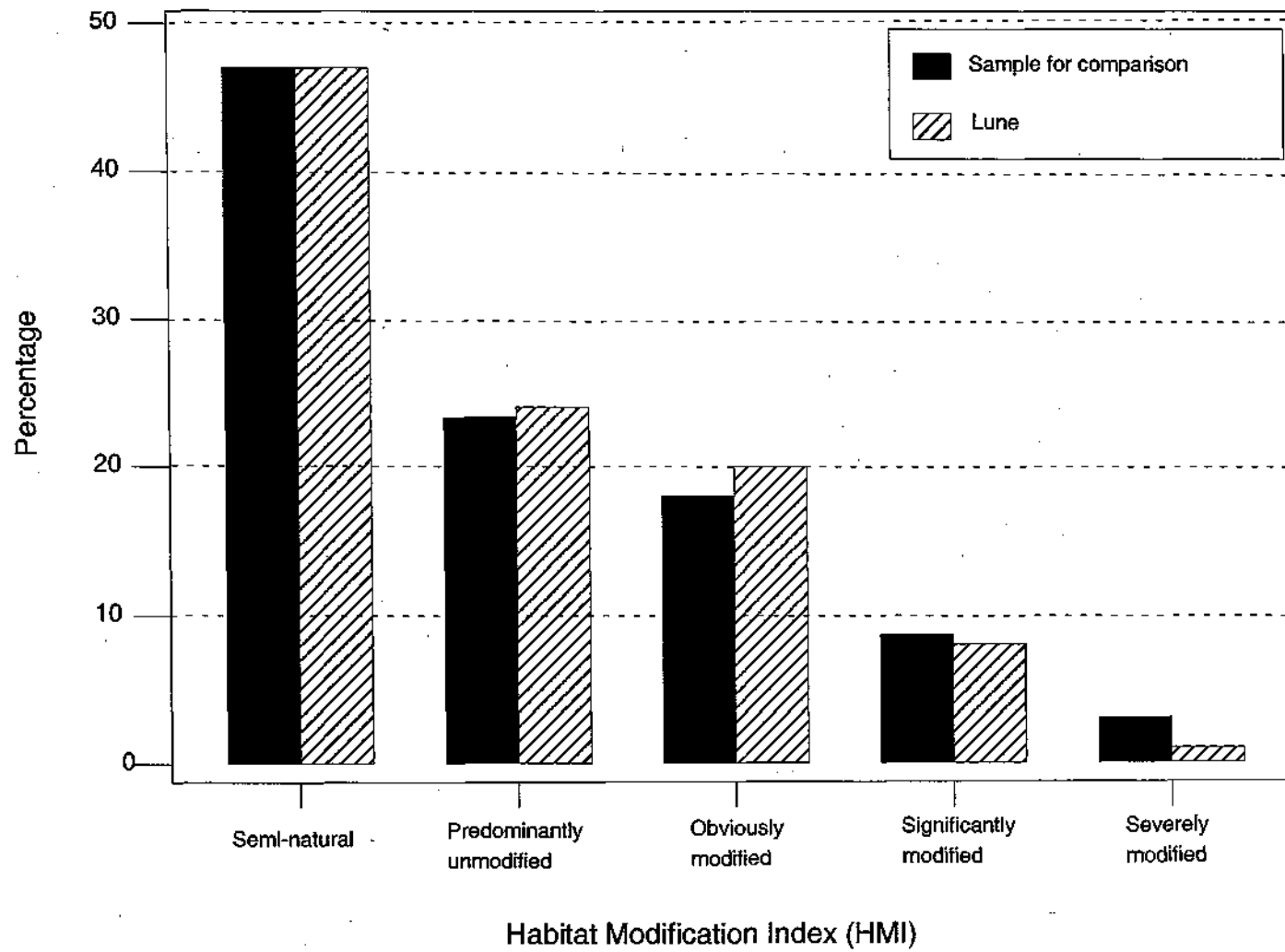
Figure 2

Principal Component Analysis on transformed altitude, slope, distance from source
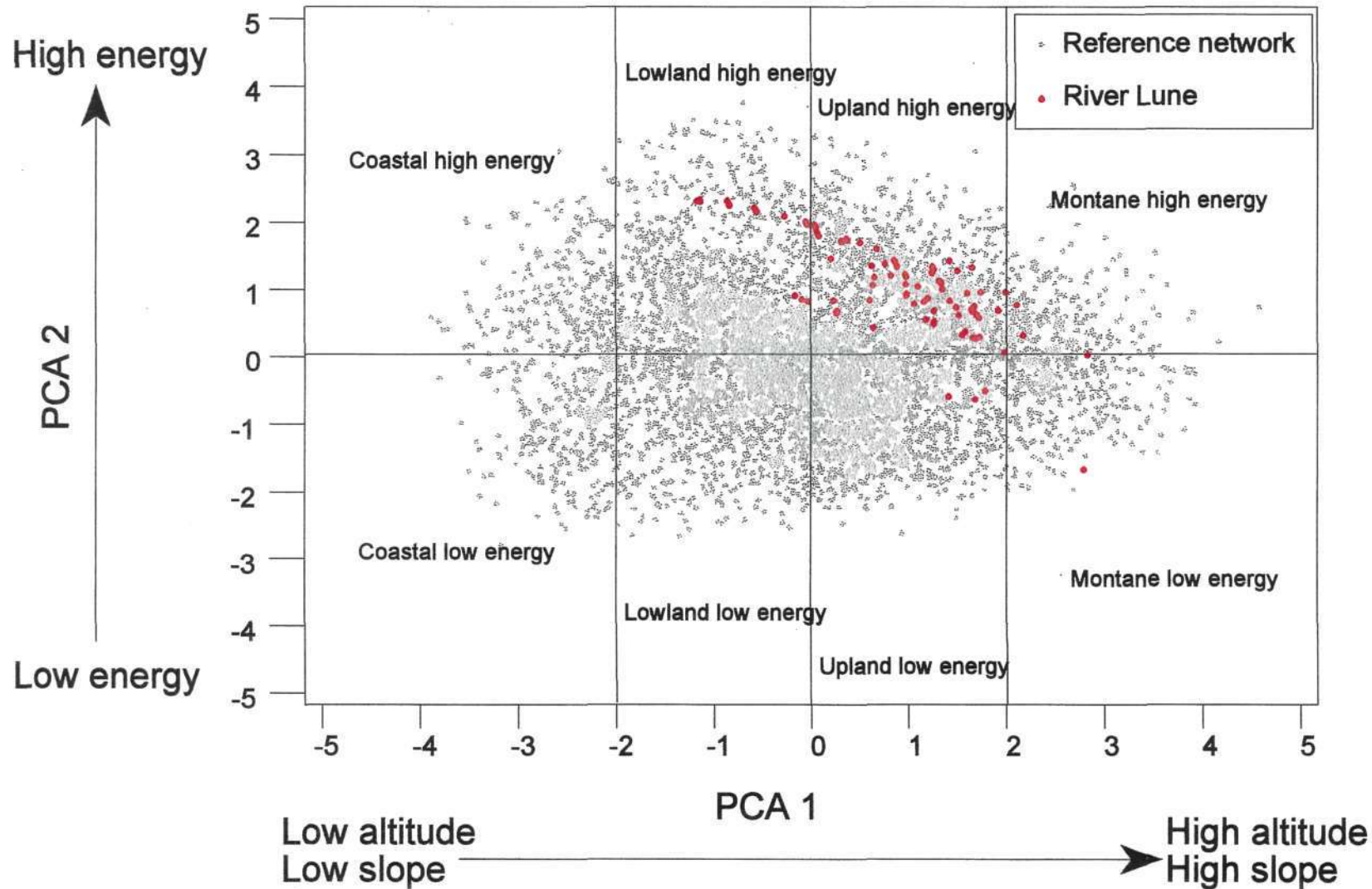and altitude of the source for 5545 British sites
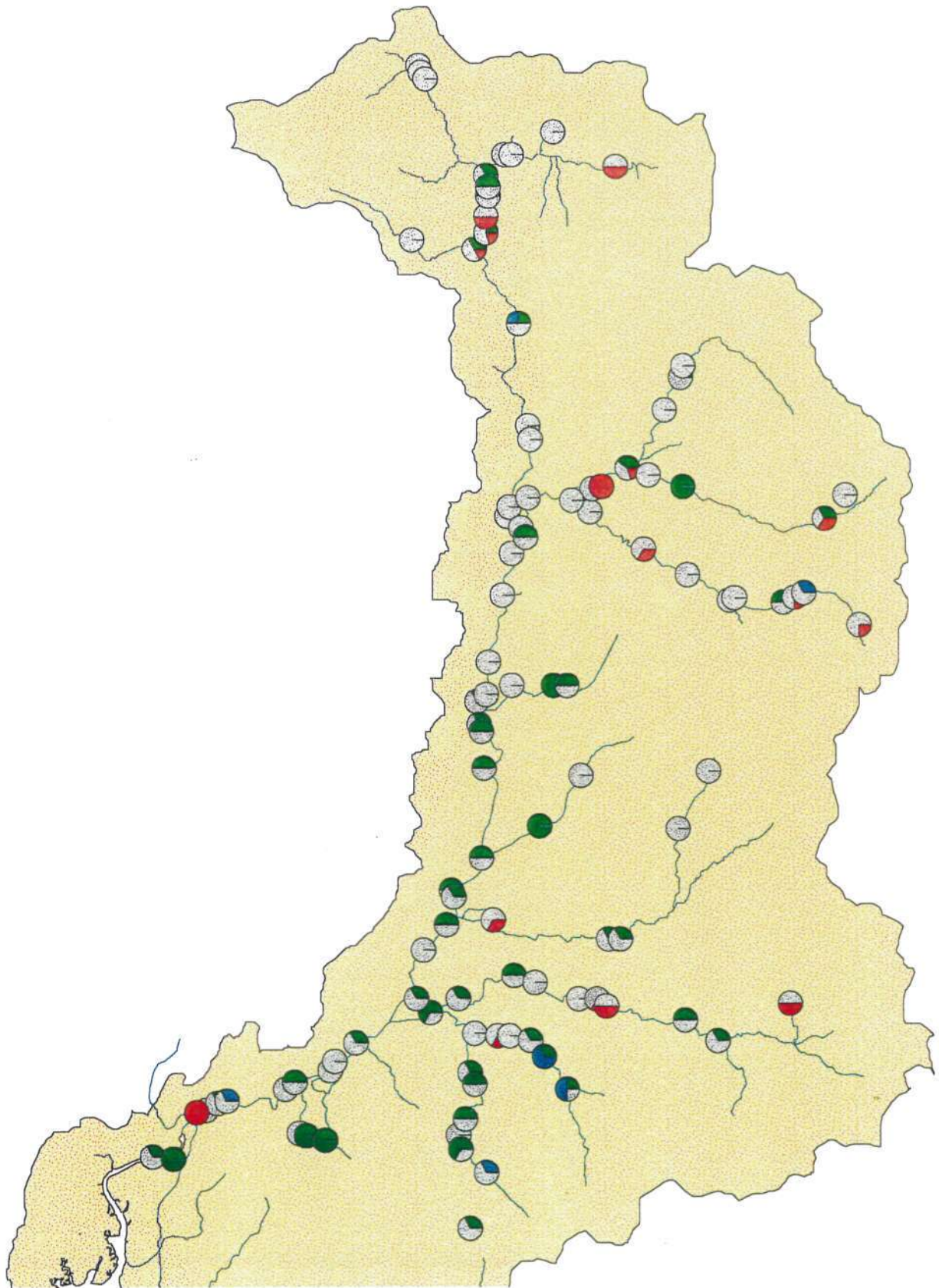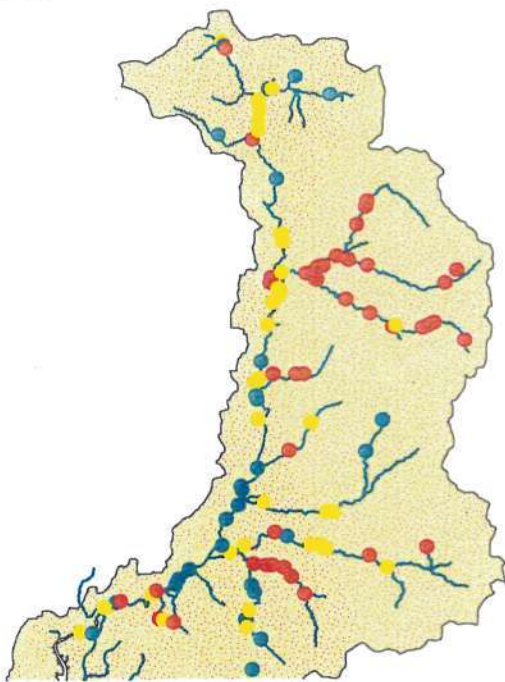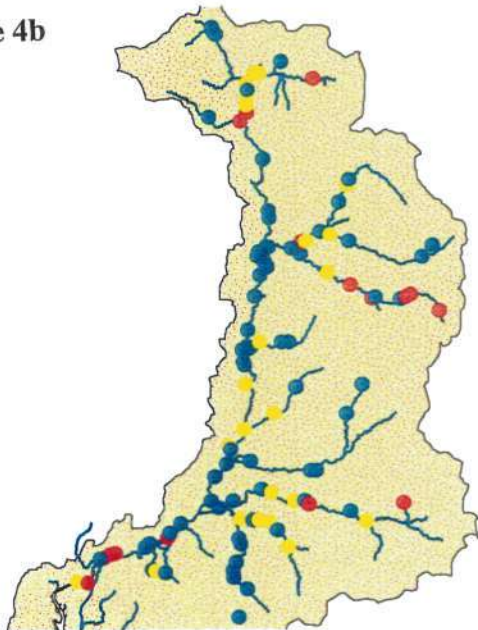
Figure 3

Land Use
- Woodland
- Semi_rural
- Agric
- Urban
- River Network
- Hydrological Areas

Figure 4a

Overhanging Boughs
- None
- Present
- Extensive
- River Network
- Hydrological Area

Figure 4b

Reinforcement
- None
- Present
- Extensive
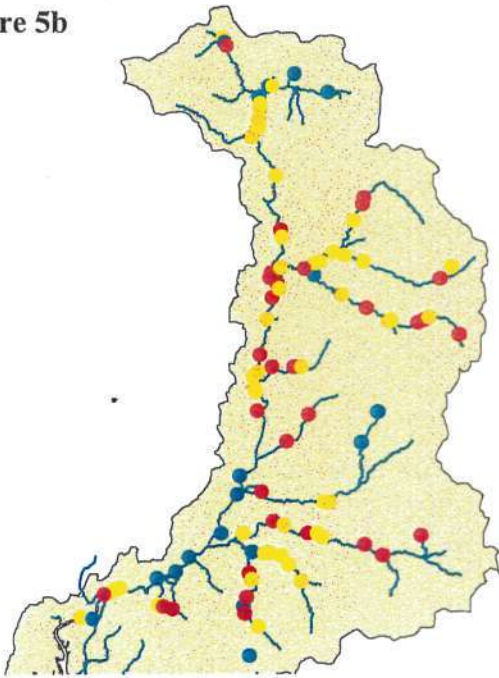- River Network
- Hydrological Area

Figure 4c
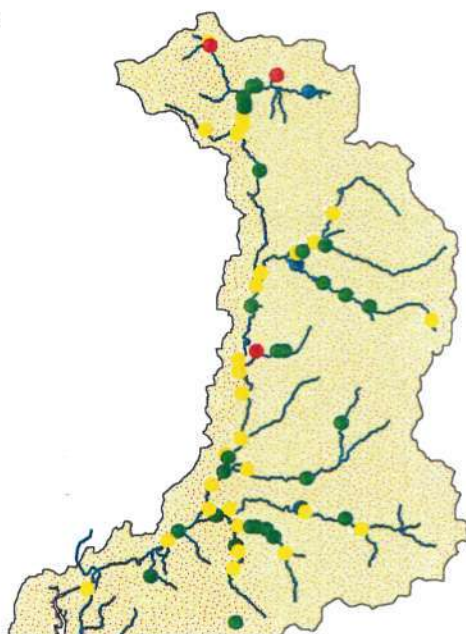
Number of Riffles
- 1
- 4 - 5
- 2 - 3
- 6+
- River Network
- Hydrological Area

Figure 5a
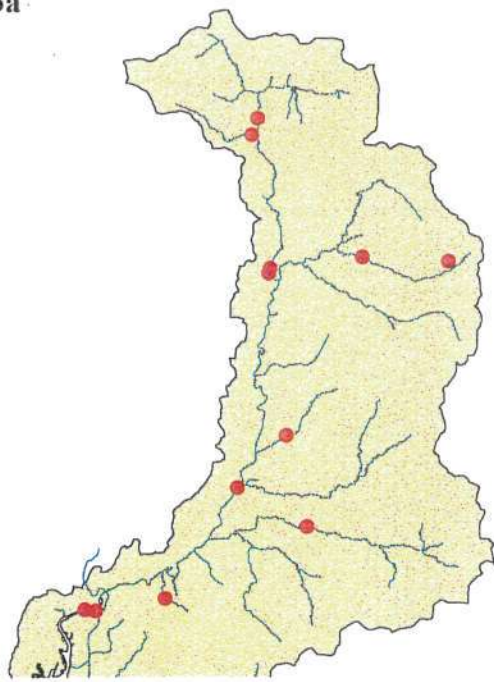
Weirs
- ● Major Weir
- /\\/ River Network
- ☐ Hydrological Area

Figure 5b

Tree Coverage
- ● 0
- ● 2 - 3
- ● 4 - 5
- ● 6 - 7
- ● 8 - 10
- /\\/ River Network
- ☐ Hydrological Area

Figure 6

Channel Substrate
- Bedrock
- Boulder
- Cobble
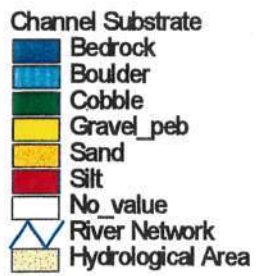- Gravel_peb
- Sand
- Silt
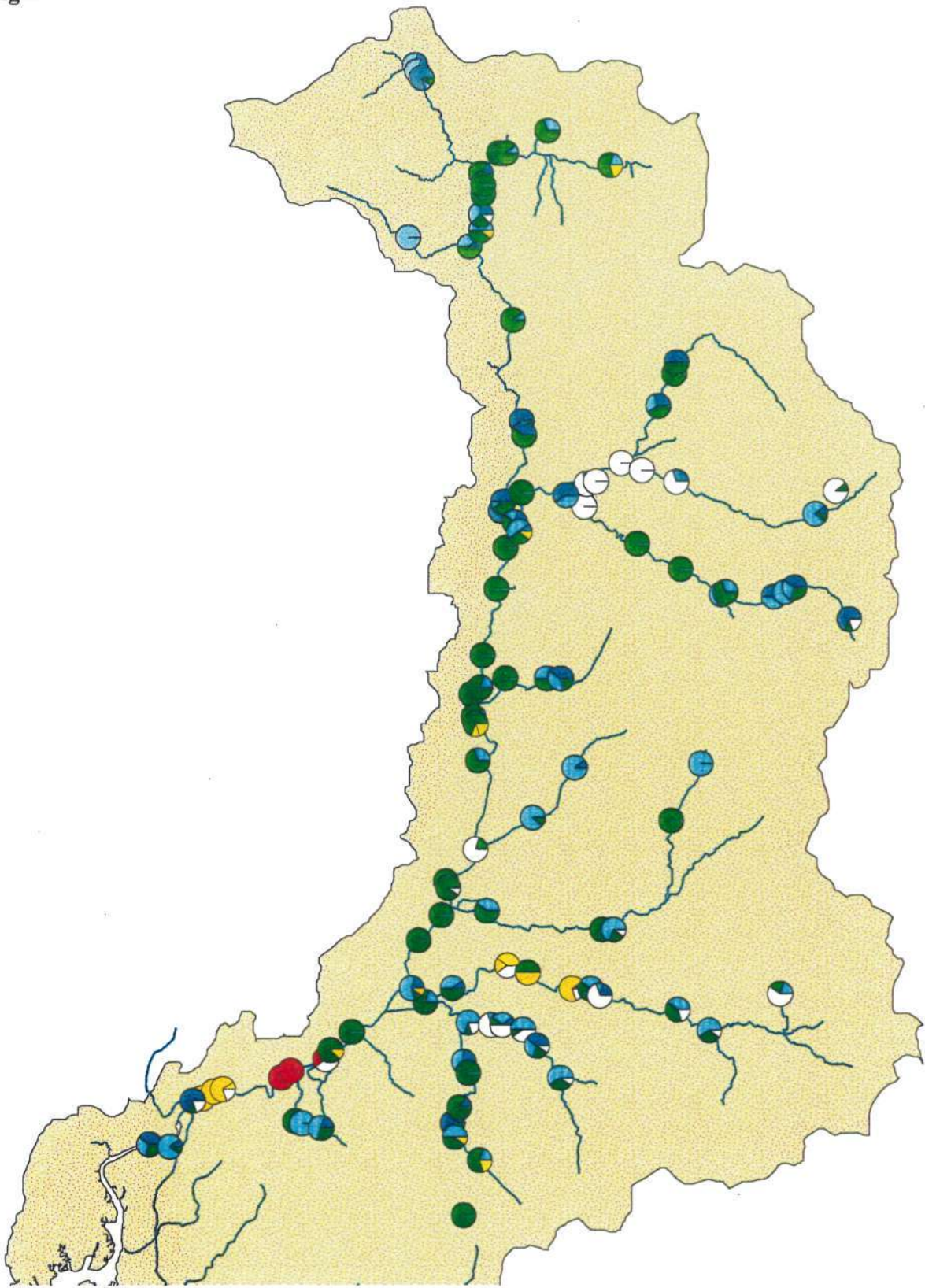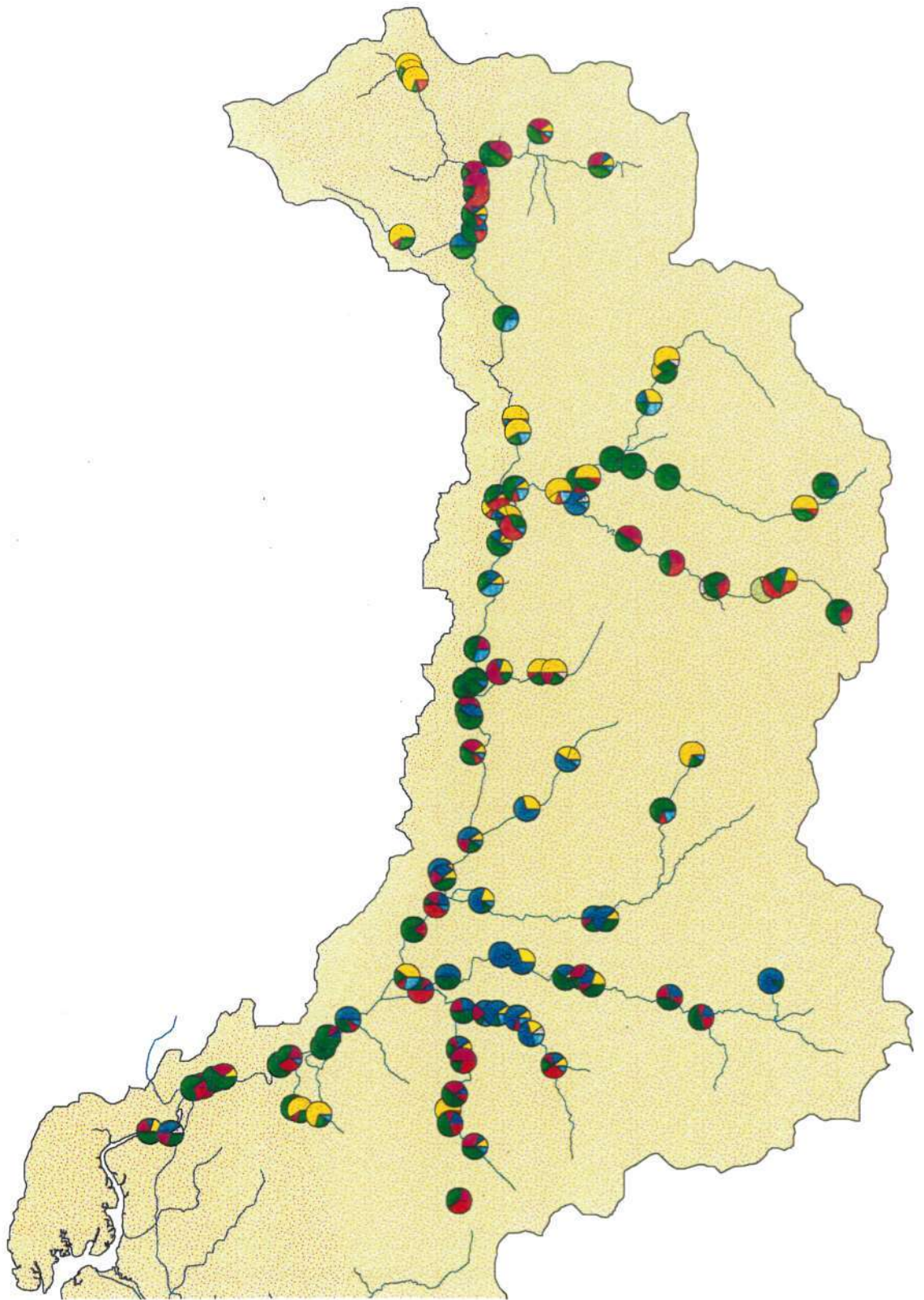- No_value
- River Network
- Hydrological Area

Figure 7

Flow Types
- Waterfall
- Cascade
- Chaotic
- Rapids
- Riffles
- Runs
- Glides
- Boils
- Pools
- Dry
- River Network
- Hydrological Area

Figure 8

Erosion
- 0 - 4
- 4 - 10
- 10 - 18
- 18 - 26
- 26 - 40

∧∨ River Network

Hydrological Area