

Craig Goch Field Surveys Group Meeting – Malvern, February 1976

UWIST Paper 7

River Wye Vegetation Survey

Introduction

The problem as stated in the contract for this survey is that "the River Wye is regarded as a Grade 1 site in the Nature Conservation Review. The enlargement of an existing reservoir at Craig Goch in Powys intended eventually to regulate the river flow within the Wye and Severn could have an undesirable and adverse effect upon the ecology and Nature Conservation interest of the River Wye."

The object of this survey, again as stated in the Nature Conservancy Council contract, is "to determine the distribution of aquatic and marginal plants within the River, Wye, which is defined loosely as the river plus its retaining banks. To study aspects of the ecology of riparian habitats by relating distribution to recorded variables, and suggest possible means of management."

It is proposed that the vegetation survey is to take 60% of the available time and the experimental side 40%. Mr. D.G. Merry has been appointed as a research assistant for three years to work on the project under the supervision of Dr. F.M. Slater.

Outline of Programme

A. Vegetation Survey

1. Riverside and aquatic habitats.

For this main vegetation survey it is probable that about 48 stations will be used at approximately 5 km intervals together with known sites of particular biological importance. At each station the vegetation will be sampled by transects using the techniques indicated below. More than one transect may be taken at a station if the riverine habitats in that area are not uniform e.g. at Bontrhydgaled (SN 827841) on the upper Wye; alluvial banks, shingle, rock faces, emergent rocks and emergent tree bases can all be found within 100m stretch of river. Additional qualitative vegetation data from 50m stretches of the river will also be recorded to allow for a wider variety of later analyses. At each station, in addition to recording the vegetation, observations will be made to include altitude, aspect, signs of disturbance to the banks, tree cover (as the height and shading potential of the marginal canopy), substrate particle size of both banks and river bed, and the pH values of both river water and the riparian soils.

Mainly in the upper and middle Wye, where regulation effects could be most important from the viewpoint of vegetation, somewhat more detailed transect data will be obtained from a few stations. Here the moisture status of the soil will be examined in terms of percentage waterlogged pore space using the method of Stewart & Adams (1968), integrating where required

using the electrical device of Clymo & Gregory (1975) or a porous pot connected to a mercury manometer (Webster, 1966). Light measurement will be made using a selenium cell connected to a copper nitrate electrolytic cell to quantify shade. Humidity will be measured by a simple capillary evapotranspirometer designed by A.D.Q. Agnew (unpubl.). A miniature temperature recorder marketed by Grants Instruments or a small inexpensive temperature integrator soon to be marketed by Comark Ltd. Will be used on these selected transects.

The habitats to be studied fall into three sub-divided groups as shown below:-

- a) riparian
 - i) alluvial banks – sampled using 400cm² quadrats*
 - ii) shingle – sampled using a 2 x 2m grid*
 - iii) rock faces – sampled with 100cm² quadrat* if bryophytes present.
- b) aquatic
 - i) riffles – line transects used where possible.
 - ii) pools – line transects used where possible.
- c) emergent
 - i) rocks – point quadrat data
 - ii) tree bases – point quadrat data

* It is envisaged that quadrat or grid size will be consistent for a particular habitat type.

2. Associated habitats

- a) Oxbow lakes. A study of water table changes throughout the year to examine the relation with river level.
- b) Riverside meadows. It has been suggested that some of the more interesting riverside meadows still exist because the probability of flooding makes improvement uneconomical. If this probability were reduced would farmers improve this land? By examining management practice in terms of a flooding index for the land obtained from river flow and land height data, it is hoped to predict the effect of less flooding on these marginal meadows assuming present agricultural practice is maintained.

B. Experimental Approach

River regulation is liable to alter both the gross distribution of individual species and the interspecific relationships within riparian communities. Both of these merit detailed research in their own right but here investigations will be limited to two aspects of each, together with a complimentary study of the river as a seed vector.

- i) The effect of changed river levels on individual species.
 - a) *Tortula stanfordensis*. This moss was first discovered in Britain in 1958 and has since been widely found on the banks of several British rivers.

These include the Wye, for which, according to Whitehouse (1975), there are numerous records upstream to Erwood (G.R. SO14). It grows on shaded silty banks and is spread by surface erosion of the substrate carrying away its rhizoidal gemmae as propagules. It is proposed to grow the plant on a suitable alluvial substrate in an experimental plot, and study its propagation under different artificial irrigation regimes for as its distribution is flow dependent – it rarely produces spores – it could be markedly affected by changed flow patterns.

- b) Allium schoenoprasum (Chives). Found native in Britain in no more than six localities outside the Wye Valley, is mainly recorded from “rocky pastures usually on limestone” (Clapham, Tutin & Warburg, 1962). In the Wye valley it tends to grow close to the river and on emergent rocks in the river in areas not necessarily on limestone. By means of plot inundation experiments it is hoped to evaluate the plant’s reaction to changed water regimes, for morphologically it appears to be an almost ideal experimental plant, with leaves, bulbs and flowers all readily measurable.

ii) The effect of changed river levels on riparian communities.

- a) Shingle. This provides a largely unstable habitat for primary colonisation. Habitat stability is in this case mainly river flow dependent. Regulation leading to fewer spates would reduce erosion of shingle and allow colonisation to move to a later successional stage. There appears to be little information on the colonisation of such habitats and so an experimental approach is proposed to attempt to evaluate the relation between plant colonisation and the stability of the habitat in three well separated shingle areas. At each site a grid of 2 x 2m mesh will be painted onto the shingle and the vegetation within each square of the grid recorded. At gridlines interselextions graduated metal stakes will be driven into the shingle and the original level noted. Over two winters the accumulation at these stakes, the distortion of the grid and the vegetation changes will be recorded, and this could lead to a better understanding of vegetation and shingle mobility.
- b) Emergent Rocks. Bryophyte communities on emergent rocks and tree bases can be markedly zoned. A prolonged change of even a few centimetres in river level could well have a marked effect upon them and so it is proposed to alter the height of some such rocks in relation to water level and monitor any vegetational changes that result.

iii) The river as a seed vector.

The importance of water as a vector for plant propagules can readily be seen by the plant colonisation of exposed, marginal reservoir or lake alluvium. The seeds in these cases could be, at least in part, brought in by inflowing streams and rivers. The seed load of a river would be collected from, and deposited on, the river and its banks, and the flood plain. If regulation reduced flooding, it is suggested that this might adversely affect the seed

distributive potential, in particular to riverside meadows. To partly evaluate this two approaches are proposed.

1. A fixed funnel net will be placed in the river to collect river-borne detritus including seeds. The net will be regularly emptied and any seeds identified. This will, however, give only a qualitative measure of general seed diversity as flow through the net would be uncontrolled.
2. Removal of vegetation from sample plots in frequently flooded locations would allow water-borne seed to be deposited and recolonisation to be followed. Controls to exclude soil-dormant and airborne seed would also be necessary.

C. Supplementary Work and Outside Assistance

It is intended that the following people and organisations be consulted about specialised aspects of the work:-

1. Soil Science Unit, University College of Wales, Aberystwyth – soil sampling techniques.
2. Institute of Hydrology, Styalittle and Department of Geography, U.C.W. – hydrology and landuse information.
3. W.N.W.D.A., Hereford and Brecon – river and reservoir data including present and predicted flow rates.
4. Sir William Halcrow & Partners, Rhayader – general data on the Craig Goch Scheme.
5. Local Ordnance Survey Offices, Map and Photograph Library U.C.W. and the National Library of Wales – photographs, maps and general information about the river system.
6. Ministry of Agriculture and Forestry Commission – information about agricultural and forestry practices in relation to the Wye catchment area.
7. Mr A.R. Perry, Department of Botany, National Museum of Wales or Dr. A.E. Smith, University College of North Wales, Bangor may be contracted to help with the identification of cryptogams under a separate contract issued by the N.C.C.
8. Nature Conservancy Council regional staff – will be contacted for their local knowledge.

General Considerations

Time will be allowed in the early stages of this project for Mr. Merry to develop his taxonomic knowledge with particular reference to the cryptogams, and also for him to cover the entire length of the river, mainly on foot but also, in suitable places, by boat. This latter should take about 10 to 14 days. It is considered that this would be the most

effective means of sample site location, identifying as yet overlooked problems which may be worthy of further consideration, and obtaining an outline classification of the whole system.

Work on the detailed vegetation survey will be carried out during the periods March to October 1976 and 1977.

"In fluvio" experiments will be carried out principally in the vicinity of Newbridge-on-Wye for not only is it near the Field Centre but more importantly it is within the reach of the river likely to be most affected if regulation takes place.

It is hoped that this work will lead to the production of a predictive model of the effects of flow regulation on the riparian vegetation of the River Wye.

References

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