Centre for Agricultural Strategy

Volume I

The future of upland Britain

Edited by R B Tranter

CAS Paper 2 · November 1978

29 Quality aspects of water in upland Britain

A B BALDWIN

INTRODUCTION

This paper considers quality aspects of water in upland Britain in a general fashion. It is, therefore, subject to the weaknesses of all generalisations. It considers quality as found today and how this bears on its uses for public supplies. It also makes some limited speculations about the way in which the activities of man may affect water quality in the future.

HISTORICAL ASPECTS

Streams and springs in upland Britain have been used for local supplies of water from time immemorial. As Britain's population exploded during the industrial revolution one of the consequences was the intolerable pollution of lowland rivers, forcing the townsfolk to seek sources further afield. The need for water grew inexorably and it became imperative to have reliable supplies. Water supply headworks with such attributes were created by building reservoirs in the uplands.

These sources of water were, and remain valuable, for a number of reasons. Until quite recently they were remote from man-made pollution. Access and land use on the gathering grounds could at one time be made subject to control by local pressures; later by private Acts of Parliament and advice from the Ministry of Health and now to a limited degree by Town and Country Planning Acts. Locations, such as we are discussing, lie in areas of high rainfall and as most of the uplands are of the older rocks, the geology is often suitable for reservoir construction at no great distance from the large conurbations.

The existence of limestone and chalk uplands are however the exception to

the foregoing. Limestone country is quite unsuitable for building reservoirs and the chalk aquifers are best used as sources of water from underground. Studies of the limestone cap in the Peak District indicate that the fissuring is such that the flows from the limestone are but little modified compared to surface water streams. In the case of the Yorkshire Wolds however the release of water is more impeded so that spring flows can be classed as reliable and the release of underground water to the Rivers Derwent and Hull sustains substantial summer flows.

Existing impounding reservoirs with conventional draw-off towers and aqueducts to cities are seen today to have several disadvantages. A serious disadvantage is that the safe yield from using conservation works in this way is modest, compared with the using of storage facilities in summer, conjunctive with the flow of the river. Long lengths of expensive aqueduct are required to deliver the water. Few suitable sites remain and the environmental lobby fiercely resists the building of further reservoirs.

NATURAL QUALITY

In general upland water is soft, acidic and coloured. These qualities may be ascribed to the widespread presence of peat overlying grits and older rocks. Soft water is noteworthy for washing well with a minimum of soap. Acidic water is corrosive and gives rise to plumbo-solvency health problems, besides its effect on pipelines and plumbing. Colour, once grudgingly accepted, is now a source of complaint from households with washing machines.

It has been shown that there is a statistical correlation between the hardness of water and the occurrence of cardio-vascular disease. There would appear to be some disadvantage in living in an area enjoying soft water.

Quite commonly upland waters carry iron or manganese in solution and often a little of both. After treatment and neutralisation these metals may precipitate causing consumer problems.

Upland water is generally of good quality bacteriologically but sometimes, stored in impounding reservoirs of modest size, the habitual presence of seagulls is a cause for concern.

The EC has promulgated standards for raw water. In general the raw waters of this country comply with both chemical, physical and bacteriological standards but where this is not so it appears to the author to be quite impracticable to abandon any large source presently used which has given satisfaction for generations.

In earlier times water issuing from the uplands had potential energy which was then valuable. This was converted into useable power by water wheels and industry located in the foothills made use of this power. As the need for water power

declined certain industries have continued to find advantage in upland water. For instance, its soft quality has been of considerable value to the textile industry but modern detergents and cleaning methods have reduced the significance of this advantage considerably.

A minority of upland water comes from limestone and chalk catchments. These waters are hard and slightly alkaline. They are generally of good bacteriological and organic quality, the latter depending on peat cover.

EXISTING FACTORS AFFECTING NATURAL QUALITY

The natural quality of upland water is affected by existing land use. This use is largely agricultural and problems can arise from sewerage pollution and the careless disposal of sheep dips. Silage pollution need not occur but does so with regrettable frequency. A more recent development is reclamation of bracken areas to grassland with herbicides. So far no difficulties have been reported from this operation.

The Forestry Commission strives continuously to increase afforestation of upland Britain. In the author's opinion this activity is wholly beneficial to water supplies interests. It has been argued that transpiration losses on afforested areas are greater than non-afforested areas. However, it has been shown that over a period of seventy years of increasing acreage of forest there is no statistically related increase in evaporation and transpiration losses on the catchment area of Lake Vyrnwy.

The use of chemicals on upland catchments should be approached with caution. Activities such as tree dipping with BHC, aerial spraying for pine looper moth, selective herbicides, phosphate rock application, etc. have all been subject to monitoring. These should continue with all developments for here complacency can be dangerous.

Quarrying in upland Britain can give rise to problems with turbidity and suspended matter in upland water. Quarries for building stone, limestone, gannister and refractory clay are common and all can cause serious problems.

The existence of old lead mines may sometimes but not always give rise to quality problems. There is risk that all forms of quarrying may give rise to loss of amenity in rivers. The consequences of quarrying can cause fish mortalities and be ruinous for game fisheries. The upland areas of Britain are being used increasingly for all forms of recreation, including the less formal ones of walking, angling, sailing, canoeing and similar activities. The custodians of stored water in the uplands are unaccustomed to the large numbers now visiting the areas and show signs of concern. They are concerned on four counts. Firstly, there are bacteriological problems arising from excretion. Secondly, visual quality of the environment, both small scale and large scale, suffers from the presence of litter – not long since quite unheard of. Thirdly, vandalism in the uplands is no less evident than in the cities.

Lastly, authorities are worried about possible liability for negligence when harm comes to unsupervised visitors or trespassers.

Generally, angling in upland Britain is limited because the quality of upland water will not generally support a food chain. The exception is the obvious one of limestone and chalk streams which will frequently support salmon and/or trout fisheries.

The natural quality of upland water could today be affected dramatically by spillages from road transport vehicles. Oil and chemicals of almost every conceivable kind can drain to watercourses following road accidents. One of the big worries of today is the presence of polynuclear aromatic hydrocarbons from internal combustion engines.

The Scammonden Dam, providing part of Huddersfield's water supply, is probably unique in the United Kingdom in that the water and highway engineers arranged to use the same embankment. The M62 motorway follows the line of the dam and a considerable stretch of the motorway is drained into the reservoir. In the event of a spillage on the motorway the drainage can be diverted (providing action is quick enough).

In normal circumstances the road drainage enters the dam and is a potential source of polynuclear aromatic hydrocarbons and lead. Analysis of the water shows that these two constituents are well below World Health Organisation limits. One now wonders if it would have been wiser to divert the drainage permanently in view of recent concern about these materials.

It is inevitable that an industrial society must dispose of industrial waste including potentially hazardous waste. The siting of tips is, therefore, an important aspect of community management.

Water supply has, for example, been seriously affected by phenolic wastes at Cowm Reservoir recently and not so long ago the Huddersfield supply from Wessenden Valley was similarly affected.

FUTURE TRENDS

As sites for new reservoirs are limited and objections so vigorous, opportunities to augment upland water resources in this way are rare. Another method is to enlarge existing reservoirs such as the examples at Winscar and Grimwith. Even where powers are obtained to raise a reservoir such as Grimwith there may be violent objection to using such a reservoir for direct supply. Amenity and fisheries interest can prove so powerful that their wishes can dominate the basis under which the scheme is designed. In the Grimwith case the reservoir must be used solely for river regulation with abstraction downstream. This arrangement requires more complex and more costly treatment. It involves risks using lower quality water and the opportunities for Bradford industry to enjoy

soft water are reduced in time. It has been claimed that the additional water in the River Wharfe will be beneficial to the fisheries but the author is not aware of even a modest effort to quantify the benefit.

The possibility of inter-river transfers continues to draw nearer. Before deciding to make any such transfer careful appraisals will be needed of the chemical, physical and biological changes likely to occur. The chances of the unwitting transfer of fish disease and unwanted species of fish will have to be carefully weighed and all concerned will have to be constantly alert to recognise the unexpected.

In the past the liming of fields with MAFF grant appears to have had no noticeable effects on upland water. One can expect however that chemicals will be used in increasing quantity and of wider variety. The maintenance in good condition of increased upland pasture, the herbicide control of bracken and most particularly the addition of quantities of nitrates to the ground may all lead to undesirable concentrations of chemicals in upland water. From now on the monitoring of trends is a necessary precaution. This surveillance should be carried out in co-operation with MAFF and the Forestry Commission.

It has been said that afforestation is more profitable than sheep farming in upland Britain. Were the economics to be much the same in both cases, afforestation has advantages to those interested in upland water which do not obtain when the land is devoted to sheep. Whilst commonsense tells us that transpiration losses may well increase, evaporation losses may, over a year, be little different. Certainly soil erosion is reduced and if this increases the life of an impounding reservoir even modestly, it is a matter of considerable economic significance.

Studies indicate that apart from the occasion when just everywhere and just everything is saturated, the peak run-off is less from an afforested area than from other similar areas. This effect is obvious should one walk through a plantation days after snowfall and see the green fields clear of snow whilst it still lies at the foot of the trees.

The author would deprecate objections to afforestation on the tops of hills on amenity grounds. The sight of a substantial hill planted two-thirds of the way up with the top bare looks ridiculously like a bald-headed old man. This country is obliged to make use of such natural resources as we enjoy. The winning of minerals must go on in the future. The effect of quarrying and mining on upland water can be moderated by input into the planning procedures.

A large increase in the demand for recreation upon and access to land and water can be expected. The opening up of walks such as the Pennine Way and the Lyke Wake Walk can be seen to be a good thing as a matter of broad public policy. One may start off with the same attitude of mind towards meeting

increased demand for sailing, swimming and playing on, in and about reservoirs. The increased public benefit must be weighed against the increased risk to the public. In the case of angling, whilst there are cases of pressure to open reservoirs quite unsuitable for fishing, it must be conceded that fish do exist in some reservoirs where fishing is not presently allowed. Experience would indicate that in today's conditions waters cannot be open for the exclusive use of one small section of the community; they must be open for use by the public at large for all the things they may enjoy, if they are to be open at all.

CONCLUSIONS

Those having the responsibility for managing upland water for public consumption plead that each case should be considered separately on its merits. Water is the important natural resource plentifully available in upland Britain. Its conservation and exploitation can be a source of work and wealth for the indigenous population.

In any particular catchment the water quality is fixed (within ranges) by nature. Changes in this quality occur only by man's actions. Not uncommonly his actions, whether they are to earn a living in agriculture, quarrying or mining or to enjoy life in any form of recreation, have a deleterious effect on the quality of upland water. Unfortunately, this result may also be accompanied by physical damage, disturbance to wild life and risk to flora. Some would have us preserve at least a sample of our heritage for future generations and some would wish to enjoy life unfettered while they can. The choice is a difficult one and in the present state of knowledge is straightforwardly a political decision.