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FEEDING GROUNDS FOR WILDFOWL

The Provision of Feeding Grounds for Wildfowl on Agricultural Land

by G. V. T. Matthews

IN the European wildfowl system, the British Isles are predominantly wintering grounds—for birds that breed in Iceland, Greenland, Scandinavia and Russia. Apart from a substantial population of Mallard, breeding ducks and geese are rather sparsely scattered or absent. It is doubtful whether attempts to increase the breeding of wildfowl in Britain other than Mallard could produce a worth-while effect on the European population. The system of wildfowl refuges which is being built up will therefore be concerned primarily, though not exclusively, with providing protection for wintering flocks while they roost and feed.

The Provision of Feeding Grounds

Often suitable inland waters do not have sufficient feeding grounds near them. This limitation particularly applies to reservoirs, especially those with concrete surrounds. The steady increase in the numbers of reservoirs during recent years has been one of the few favourable developments in the wildfowl habitat situation and has yet to be fully exploited. In the absence of contiguous feeding grounds, either the roost will not be used to capacity or an entirely artificial concentration of wildfowl will be achieved which will have to seek its food outside the refuge. American experience has shown that the latter situation may well lead to an increase in the local kill. A similar, if reverse, situation obtains in some inland areas, notably the Fens, where there are ample food supplies but no large undisturbed areas of water to serve as roosts.

In North America difficulties like these have been resolved by purchasing tracts of farmland and deliberately degrading them back to marshland. This policy was aimed not only at the conservation of wildfowl but at reversing the over-enthusiastic land drainage that had led to the creation of barren 'dust-bowls'. It is not possible to advance such radical arguments for the re-creation of marshland in Britain. Most of the land suitable for such treatment is in productive cultivation and would be very expensive to buy. Moreover, the government and local authorities concerned are committed to maintain a high level of agricultural production throughout the country. The 'wildfowl harvest' doctrine has not yet been spread widely enough for them to consider wildfowl an orthodox 'crop' whose production and maintenance justifies the setting aside of land primarily for these purposes. The supplementary measures adopted in America, planting food crops solely for the use of wildfowl and cultivating aquatic plants as duck food, would likewise find little favour in this country. A compromise solution which does not take land out of agricultural usage is therefore suggested.

It is well established that several species of ducks congregate and feed, as well as roost, on sheets of recent, shallow fresh-water floods over grassland. Berry (1935) investigated the effect on the contained plankton in river water slowly passed over longish grass. He found that in the first few days of flooding almost all the insects and Entomostraca were strained out and 'marsh and wading birds swarm over the meadows and feed royally'. After a short time the plankton stranded on the meadows begin to breed and the meadows become a veritable 'food nursery'. This effect was not confined to small plankton, a surprising crop of *Gammarus* being recorded in one case. If the flood remains out for more than a few weeks, the birds may transfer their attentions elsewhere. It is therefore suggested that areas of grassland should be artificially flooded for short periods in a rotational succession throughout the winter months.

Water-meadows

Deliberate winter flooding of grassland has been an established agricultural practice in Britain since at least the seventeenth century. The permanent 'water-meadows' were to be found particularly in south and south-western England, but also in eastern England and southern Scotland. The most popular method of construction for irrigation was the ridge-and-furrow, or bedwork, system. The catch-water system practised in hilly areas, although much cheaper, does not produce standing sheets of water, and so it is of little use for our particular purpose. Full descriptions of these methods are given by Wright (1808), Carrier (1936) and Moon and Green (1940), while a more up-to-date assessment of their value is given by Stamp (1950). Essentially, water is passed along ridges whose tops are grooved along their length, with a gently falling gradient. Water overflows into the furrows, which are graded in the opposite sense and thence to an outlet channel. By this system a thin sheet of slowly moving water can be passed over the meadow or the ground quickly drained as and when required. The sequence of flooding and drying varies considerably from place to place. Typically, the meadows would be flooded for two or three weeks at a time, with similar intervals of drying, during October, November, December and January. Shorter flooding periods were used during February, and the grass was available for grazing by mid-March.

This periodical flooding has the following advantages: (1) Fresh mineral salts, etc., are deposited, particularly during the early autumn flooding. (2) There is less dependence on rainfall. (3) The slow movement of the water (vertical as well as horizontal) keeps the soil well aerated. (4) The water used is of a higher temperature than the soil water, and so provides protection against frost and encourages early growth.

No recent data are available to indicate the yield obtainable from water-meadows. Peel (1938) gives the following comparative figures:

Type of Pasture	Protein Equivalent (%)			Starch Equivalent (%)		
	Spring	Summer	Autumn	Spring	Summer	Autumn
Good water-meadows	17	14	17	68	65	68
Intensively treated pasture	16	12	14	68	63	66
Good permanent pasture	13	11	13	64	62	64
Temporary ley	13	10	12	64	57	63

These must be treated with reserve, since recent improvements in grassland management will probably have led to increased values for the pastures and ley. But certainly water-meadows did not produce poor-quality grass. No comparative data on the overall annual production are available. Stamp (1950) states that thirty ewes and their lambs per acre could be carried through the spring. It was the production of the early 'bite' and the early lambing which it permitted that gave water-meadows their economic importance. In addition to the spring grazing, a crop of hay was taken in the summer when further grazing by sheep was not advocated owing to 'foot-rot'. At the end of the eighteenth century the production from a water-meadow totalled £12 per annum against £5 from ordinary meadows. The construction cost, of £4 to £6 per acre, was thus recovered in one season.

In view of the advantages of winter irrigation, it may be asked why the system is falling into disuse in England. Undoubtedly the factors causing this decline have been: (1) The sharply increased cost of materials and labour (particularly the latter) needed for their maintenance. (2) The availability of relatively cheap imported feeding-stuffs for use in the spring. (3) A general change-over to dairying from the barley-arable-sheep farming. (4) The development of refined methods of grassland improvement, use of artificial fertilisers, better seed mixtures, etc. (5) The increased difficulty of securing co-operation between neighbours when large estates are broken up. (6) The increased value of fishing rights and objection of owners to the interference caused by the weirs and to the possible loss of fish spawn.

In Italy, with its poorer economy and cheaper labour, a system of water-meadows, known as *marcita,* is still extensively used in the Po Valley.

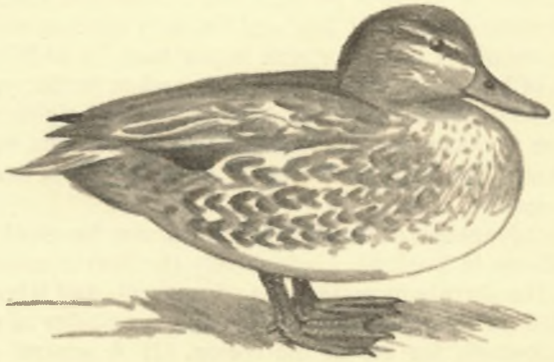
Sewage farming, which is essentially a variant of the water-meadow technique, is also declining in Britain in favour of modern chemical methods of sewage disposal. However, in the west of the U.S.A. more and more 'sewage lagoons' are being constructed for small townships, and are proving highly attractive to waterfowl (Van Heuvelen 1952).

Other Types of Winter Flooding

There is an historical example of the effects of rough-and-ready winter flooding in the alluvial meadows at Oxford (Baker 1937). These have flooded regularly, and until comparatively recently there was no control over the flood period, which could last up to six months. But Port Meadow, 400 acres, has been *continuously* pastured by horse and cattle since A.D. 1085. The Yarton, Oxey and Pixey Meads, 270 acres, have likewise been mown for hay each year for centuries. A stable and yet productive sward has been established without especial efforts at cultivation. Those species of grasses which are best adapted to the conditions become predominant in the sward. Lists of species are given by Fream (1888) and Stapledon (1925), showing an emphasis on moisture-loving grasses of tall habit.

The practice of 'warping' may also be mentioned. This is deliberate autumnal flooding to obtain a deposit of silt brought down from the upper reaches of the river. Warping is thus largely confined to estuarine areas, such as round the Humber in England and the Elbe and Ems in Germany. Again there is a tendency for the practice to become obsolete owing to the availability of other fertilisers, although its basic value is not disputed.

Experiments have been made with a view to determining more precisely the effects of flooding on different types of swards. Davis and Martin (1949) placed a series of turfs in tanks connected with a water supply. Turfs from each seed mixture were subjected to four depths of flooding, to a high water-table and to stagnant water.



Teal ♀

Most of the mixtures were not adversely affected by four weeks of flooding. Timothy, *Agropyron*, *Agrostis* and meadow fescue formed fairly dense swards after ten weeks of flooding. Resistance was greater when at least the tips of the plants were above water and when the water was moving. Davies (1953) and Roberts (1955) report on a field experiment in which strips of different grass mixtures (including clover) were sown down on a slope. The whole area was subject to severe flooding to a depth of 10 feet two or three times a winter for from two to six weeks at a time. The upper part of the slope drained quickly after flooding, the lower part remained water-logged for long periods. After two winters the following analysis was made:

Mixture	Percentage Ground covered by Grass (i.e. not including Clover)	
	On and Off Flooding	Prolonged Flooding
S.23 Perennial Ryegrass	48	13
S.48 Timothy	47	34
S.50 Timothy	36	15
S.215 Meadow Fescue	35	19
S.59 Red Fescue	43	4
Rough-stalk Meadow Grass	23	6
Agrostis tenuis	19	4
Weeds and Weed Grasses (average for all plots)	12	36

These figures demonstrate very clearly the comparative harmlessness of on-and-off flooding as compared with prolonged flooding and water-logging. The varying resistance of the different seed mixtures is also obvious, S.48 Timothy giving the best all-round performance. The sown seeds were still surviving in the upper part of the slope seven years after sowing. Other tests with clover mixtures indicated that Strawberry Clover was outstanding in resisting flooding, with Kentish Wild White a good second best.

Experience in New Zealand (Bell 1935) confirms the flood-resistant properties of Timothy, *Agrostis* and White Clover. But in swamp pastures there three introduced swamp grasses have proved very useful, productive and palatable to stock. *Glyceria aquatia* (Reed Sweet Grass) is a high producer—15 tons of green matter per acre—and is little affected by frost. Although a perennial it seeds vigorously, an additional source of food for ducks. *Paspalum distichum* (Mercer Grass) has an even higher production. Both are dormant in winter but produce a dense sward a few weeks after the recession of flood waters, and both compete successfully with rushes. *Glyceria fluitans* (Floating Sweet Grass) grows in slightly shallower water, has floating stems and is not dormant in winter. Armstrong (1945) also suggested that further use should be made of this species and of *aquatica* on land subject to flooding.

Suggested Procedure

From consideration of the published evidence and after discussion with a number of grassland experts, it is concluded that rotational winter flooding may be applied to established grassland with a marginal quality sward without causing deterioration. Indeed, some beneficial effects can be confidently expected.

High-quality sward intensively fertilised and cultivated would undoubtedly suffer some deterioration through flooding. If land of this type, or arable land, became available, it should be resown with flood-resistant seed mixtures. These should be based on S.48 Timothy and Strawberry Clover, or on the swamp grasses. A good permanent sward will then be formed, though it is acknowledged that production will be less than under intensive cultivation. Whether natural methods of cultivation may not have qualitative advantages is too big a question to go into here, but is one that is attracting increasing attention as 'metabolic disorders' of indeterminate causes increase in domestic livestock.

It will not be necessary to create 'water-meadows' in their full complexity of interdigitating canals. This elaborate construction was aimed at facilitating rapid flooding and drainage. Berry (1935) describes a variant of the system—'sheet-watering'—developed in Dorset with the particular purpose of preventing the loss of fish on the meadows. The field is slightly saucer-shaped and is flooded and drained from the same channel, the water being allowed to stand for a time in between. Very skilful adjustment of levels is called for, and this has prevented general adoption of the method. However, this difficulty could be overcome by the use of efficient, portable diesel pumps of the Petter type. Modern excavating machinery would throw up the perimeter ridges needed rapidly and cheaply. Such ridges on a level site would not need to exceed 18 inches in height, as flooding is required to only a few inches in depth.

Since it is found that a prolonged period of drying-out between short-term floods is not needed, the feeding grounds need consist of only perhaps three areas of grassland of an equal size. A minimal flood of about 10 acres would seem the requirement if large numbers of ducks are to be attracted, making a total area to be set aside of 30 acres.

We live in an age that favours short, easily remembered 'code names' for projects of every sort. In deference to this tendency, we would suggest these artificial feeding areas be known as Grassland Areas Rotationally Flooded (GARF). Since garths are areas of greensward within a cloistered sanctuary, the punning relation is unobjectionable.

It will obviously simplify the water-supply problem if the areas to be flooded are adjacent to the body of water providing the roost. In the case of reservoirs, the seasonal fluctuations of level incidental to their operation could, following the suggestion of Berry (1955), be used to provide winter feeding grounds. At present the summer 'draw-down' results in the exposure of water vegetation which dies off. An unsightly and unhealthy band of mud and decaying vegetation is left, often containing pools in which mosquitoes breed. If the area between maximum and minimum water-levels were planted with flood-resistant grasses, this unpleasant effect would be avoided, and short-term flooding with its positive benefits to wildfowl populations would have been achieved without further effort.

The immediate need is to carry out pilot experiments on suitable land near a wildfowl refuge. It is hoped that this exposition of the probable effects of rotational winter flooding will encourage some landowners to give the scheme a trial. The Trust will be only too pleased to assist in any way they can.

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