A gravel pit wildfowl reserve*

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FIVE years ago, Mr. George Wallis of the Kent Sand and Ballast Company gave permission for his two gravel pits to be used as a local wildfowl reserve and since then it has been managed by the first two authors on behalf of the Kent Wildfowlers' Association, with special advice from the third author on behalf of the Wildfowl Trust regarding wildfowl foods and their propagation.

The lakes are situated in the Darenth Valley, near Sevenoaks, and are surrounded by grazing land and water meadows, with some small peat bogs and boggy woods. Prior to 1935 sand and gravel had only been extracted down to water level, but in that year the company installed a modern plant with suction pumps to win material below water level, which in the low ground on each side of the river is about three feet below field level.

Three lakes have been formed during the past 26 years, one of which, comprising about 15 acres, has been reclaimed. The other two will remain lakes and they cover some 50 acres and will ultimately extend a further 40 acres. The winning of material from the face is now carried out by floating grabs and the depth of the water reaches a maximum of 80 feet.

Improving Wildfowl Habitat

(a) *Mechanical*

These particular gravel pits suffered from two disadvantages—a lack of shallow water with its associated vegetation, and a lack of islands—and our efforts have been planned to alter this situation. To be worthwhile, any habitat improvement schemes require the use of modern mechanical methods and it goes without saying that but for the enthusiastic help of Mr. Wallis and his Company, we could have accomplished very little.

The drag-line has now been used to construct four shallow pools, giving us in all about 800 square yards of water about 18 inches deep. One such pool of about 200 square yards took only four hours to dig, including the construction of two islands with stony bases covered with peat soil, the material for this being delivered by dumper.

The drag-line has also been used to slope the vertical banks of the smaller west lake (now disused) in preparation for tree planting and to divert the course of the river from the east lake, involving over half a mile of new river bed. This was to prevent silt from being washed down river, as it was seriously interfering with water-plant growth and with trout cultivation.

To overcome the lack of islands, the Company has designed two types of raft, of which we now have six in all at anchor. These are of two types: the first consists of three metal float tanks welded together to make a square raft 12 x 12 feet. The edges are lined by poles held with metal straps and these retain the soil in which vegetation grows well. Such rafts have about a foot of freeboard, are completely stable and are capable of withstanding the full force of winter gales. They serve a dual purpose, for in winter they are greatly favoured by duck and geese as resting islands and in spring they are popular with nesting Canada Geese, as already described in a previous report (Harrison 1959). That paper featured our original wooden rafts, but this design is now obsolete, not being sufficiently strong.

*In April, 1962, this gravel pit was designated as a Wildfowl Trust Experimental Station, with the full approval of the Wildfowlers' Association and the Kent W.A.

The other type of raft now used was originally designed by Mr. Wallis and consists of a float tank at each end with railway sleepers in between, so that the centre part is almost at water level with the ends about a foot above. A Canada Goose has nested on one end for each of the three years since the raft was made and in 1961, after the goslings had gone, a pair of Great Crested Grebes built their nest of sticks on the low central part of the raft, hatching off two young on 5th September. We believe that this is the first time that this species has nested on a raft and this model is now familiarly known as " the Wallis triple purpose raft " in honour of the event.

(b) *Planting*

The objects of any planting programme are to provide food and cover for both adult and young wildfowl and there is no doubt that cover is almost as important as food. There is unfortunately no easy mechanical answer to planting—it calls for plenty of hard and often muddy work—but it is great fun for picnicing and a day out.

It is a fact well worth remembering in planning the planting of newly dug ponds that frequently those plants which occupy the area first and produce a good growth may effectively exclude their more vigorous competitors. Hence the type of *initial* planting will determine the composition of the pond's vegetation for years to come. Since plants have fairly definite environmental requirements, food species should be selected which would be expected to do well under the conditions which already prevail in the area. They should therefore, where possible, be taken from the immediate vicinity or from areas where the habitat is the same.

In these gravel pits the species of plants used have been those which by viscera-analysis of locally shot duck have been shown to be favourite food plants.

1. *Trees*

As food and cover for adults, trees lining the water's edge are invaluable. On these gravel pits the trees being used are Alder *Alnus glutinosa,* Silver Birch *Betula pendula,* Oak *Quercus robur,* and Willow *Salix* sp., the first three all providing food seeds, while all except Oak are quick in growing. Alder and Willow are planted close to the water's edge, Oak and Birch a little back on drier soil. The Company is planting large numbers of Birch, Alder and Willow around the banks of the main waters, both from our point of view and as part of their landscape work and we have concentrated on planting around the new shallow pools. As an example of what can be done, 7 hard-working adults planted 51 Alders and 57 Silver Birch saplings, up to 5 feet high, in one and three-quarter hours, the trees having to be dug up from nearby.

2. *Pond-side plants*

A most successful pond-side plant of known food and cover value to local ducks is the Common Bur-reed *Sparganium erectum.* At first we planted this in the autumn, but many of the roots were washed out of the sand during winter storms. Spring planting on the other hand is excellent—almost all the plants taking and even seeding well in the following autumn, by which time they have spread considerably. We have found that this species grows best just in the edge of the water and particularly where some shelter is provided, as in the lee of a bank. Transplanting Bur-reed is hard and wet work, but two people working for six hours dealt with 206 roots. A nice hot day is best, for

" the coolie method " can be used, in which one wades about clad only in shorts, planting by hand as in a paddy field! Other food plants successfully established around the pools include Reedgrass *Glyceria maxima,* Hairy Sedge *Carex hirta,* Persicaria *Polygonum persicaria,* Knotted Persicaria *Polygonum nodosum,* Water-pepper *Polygonum hydropiper,* and Orache *Atriplex patula.* With all these species whole or divided plants have been used, and in the case of Water-pepper and Orache seedlings have also been successfully replanted.

3. *Water plants*

The main object in constructing shallow pools is to provide a suitable habitat for water plants, which then prove attractive to small animal life, so that a food supply is provided for young duck. All the pools have been dug in sandy soil, but as we had a good supply of peaty top soil available, some of this was first put into the bottom of the pools to enrich the growing potential. The first pool was planted in early summer with the following species, all of which were successful:- Water Crowfoot *Ranunculus circinatus,* Starwort *Callitriche* sp., Horned Pondweed *Zannichellia palustris* and Canadian Pondweed *Elodea canadensis,* while Milfoil *Myriophyllum* sp. and Floating Reedgrass *Glyceria fluitans* appeared naturally. Although the first year's growth of all these plants has been good, it is likely that certain of them will become dominant next year at the expense of the others. Insect life appeared almost simultaneously with the water plants, particularly large numbers of water boatmen *Notonecta* and *Corixa* sp. and pond-skaters *Gerris* sp. The most encouraging feature of the whole enterprise was the regular sight of twenty or more young Mallard busily feeding among the flowering Water Crowfoot in mid-summer—a sight to please the heart of any wildfowler-conservationist.

One other water plant was introduced in the autumn of 1961—Mare's Tail *Hippuris vulgaris,* a local but exceedingly good wildfowl food plant, which we found growing on Lord Stanhope's lake at Chevening. With his permission we transplanted a number of roots from this predominantly muddy lake to one of our predominantly sandy pools, where some have undoubtedly taken, changing from the narrow, pointed type of growth of the plant above water to the more proliferative underwater type. Whether it will survive the winter remains to be seen.

An interesting natural growth of Canadian Pondweed also occurred in the summer of 1961, when the west lake became disused, the plant appearing all round the edges. This will encourage animal life and should make the water a better holding ground for duck, particularly for Tufted Duck and Pochard.

It is probably useful at this stage to list some of the difficulties encountered and the reasons why failures may occur. (a) Plants may be washed away or silted over by wave action—this danger may be reduced by spring planting and by placing breakwaters (wooden planks, etc.) to the windward side of the pond. (b) Plants, rootstock or seeds may be eaten by other animals and some form of wire netting may be necessary in the initial stages. Livestock should be excluded as much as possible from the ponds. (c) The pond may be too new and requires some period of settling down in order to allow the bottom to mellow properly and for the initial turbidity to disappear. (d) To save time and money, plantings should be attempted only on a limited scale at first in order to see if they are to be successful.

Status of Wildfowl

(a) *Mallard*

Having considered the improvement of habitat, it is of interest to review the status of wildfowl using the gravel pit, in particular the Mallard *Anas platyrhynchos,* as being the commonest species and therefore the most instructive. The first complete series of counts from autumn to spring was made in 1957-8 and these have been continued annually ever since. Prior to this it was unusual to see as many as 10 Mallard, but in the previous autumn 18 feather-pinioned birds had been liberated on the water, a gift from the Wildfowl Trust. In 1959, 113 full-winged young were liberated, 114 more in 1960 and 112 in 1961, all carrying Wildfowlers' Association rings. From the autumn of 1957, the number of wild-bred birds visiting the reserve has steadily increased and in this way the hand-reared birds have been successfully infiltrated into the wild population. A comparison of the 1957-8 and 1960-1 graphs with that for 1961-2 shows what has been accomplished in the establishment of a local population.

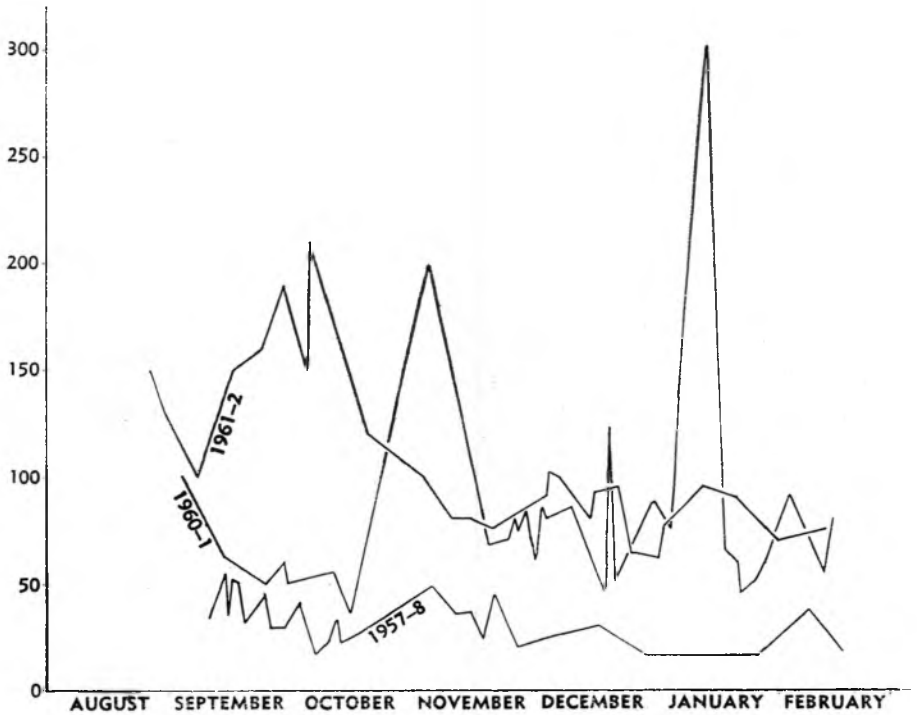
That there is considerable movement is indicated by the peaks. The fall in number in early autumn demonstrates the dispersal of the hand-reared birds with the wild-bred ones and this is followed by a late autumn peak. Whether the peak of 300 in January, 1961 will be repeated remains to be seen, but as would be expected, the severe frosts of December 1961 appear to have driven many of the local Mallard away. These peaks probably indicate little more than local movements and concentrations, for ringing recoveries have all been within 10 miles, except for one bird, which was shot on the Thames Estuary. It will be noted that there has been a definite increase in the average population present during these years.

By early spring the number of Mallard using the reserve falls sharply as they disperse for nesting. At this time it is extremely difficult to estimate the nesting success, but in the summer of 1961, approximately 160 young were known to have been reared within five miles of the water, mostly along the Darenth. These were the offspring of some 30 pairs of Mallard, half of which were hand-reared birds. This represented a 50% increase over any previous summer.

In winter there has been a definite change in flighting habits associated with the increased food supply available around the water. Thus, flighting from the ballast water at dusk began to decrease during the winter of 1960-1, more birds remaining to feed during the night. In the autumn of 1961, birds were observed for the first time flighting on to the ballast water at dusk and counts made soon after dawn were the highest during the 24 hours. It must be remembered that during the daytime two tugs with their barges are at work on the water, so that some disturbance is inevitable.

It might be said that it was a pity to have liberated any hand-reared birds on the gravel pit, and that it would have been more interesting to study the effect of habitat improvement without the presence of hand-reared birds. Be this as it may, we wished to bring about as rapid an increase in local population as possible but, even so, it is quite apparent that the holding potential of the gravel pit has been greatly improved by our efforts.

In the autumn of 1961 a considerable number of Mallard, both wild and hand-reared, have been found to contain thorny-headed worms of the species *Polymorphus minutus* and this outbreak is being carefully studied.



(b) *Other duck*

It is difficult to say whether the increased number of Mallard on the reserve has attracted an increased number of other duck, but it is reasonable to suppose that this might happen. Certainly the list of species recorded is now quite impressive: Wigeon *Anas penelope,* Teal *Anas crecca,* Tufted Duck *Aythya fuligula* and Pochard *Aythya ferina* are regular each winter in small numbers and again on spring migration. There has been a definite increase in Pochard and Tufted Duck in November and December, 1961 and the latter are sometimes seen in summer and have nested in the area, but not on the ballast water as yet. Shoveler *Anas clypeata* are seen occasionally, usually on spring migration, but in 1961 small numbers including a family of five appeared for the first time in July. Their arrival coincided with big decreases in the remarkable summer population on Stodmarsh, near Canterbury, so that it is possible that some of these were moving through westwards. A drake Gadwall *Anas strepera* was shot with a Mallard on nearby floods in December, 1958 and a duck Gadwall has now returned to some lakes half a mile away for the sixth winter running, accompanied by a drake in 1960, which left after two weeks. Shelduck *Tadorna tadorna* have been seen on three occasions; a pair of Goosanders *Mergus merganser* were present for four weeks in February-March, 1961 and there are single records of Garganey *Anas querquedula,* Mandarin *Aix galericulata* and Common Scoter *Melanitta nigra.* Another nearby gravel pit produced first records in the area of Long-tailed Duck *Clangula hyemalis* and Goldeneye *Bucephala clangula* in the easterly gales of November, 1961.

This then, was the position up to the severe cold spell from 23rd December, 1961 until 5th January, 1962, which provided us with many exciting records. All the waters in the district became icebound with the exception of our own and the neighbouring mile-long Chipstead ballast water. This is used for yachting and does not as a rule provide many interesting records, but the cold spell kept the water deserted by boats and there was a constant interchange of fowl between the two waters.

As already mentioned, the only duck to decrease were Mallard, as their feeding grounds became ice-bound. Initially both Tufted Duck and Pochard increased to peaks of 49 and 28 respectively, but counts were changing almost from hour to hour and it was evident that many were on the move through the area, but numbers fell considerably from New Year's Day and eventually all the Pochard left and most of the Tufted Duck.

A large scale weather migration took place between 26th December and 1st January and notable arrivals on the ballast waters included small numbers of Shoveler, Wigeon and Teal, an adult drake Goldeneye and the first Smew *Mergus albellus,* a "red-head" on 31st December and a party of six adult drakes next day. The first Goosander appeared on 27th December and 10 were present next day, all being "red-heads." One or two observations of fowl on the move indicated an east-west migration route. A duck Teal shot nearby on 27th December had been ringed on Texel, Holland, in September 1961.

Coots *Fulica atra* increased to 130 and many have remained and an immature Great Northern Diver *Colymba immer* was present from 26th December to 2nd January.

Following the thaw at the end of the first week of January, three of the Goosanders remained until 3rd February and a single drake Smew was present until 27th January, when it was last seen in close association with a duck Goldeneye. These two species occasionally hybridise in the wild and it is interesting to speculate that it may be in exceptional circumstances like this that pairing is encouraged.

Up to the end of February, numbers of Pochard and Tufted Duck remained slightly lower than last year, but there have been no fewer than six more records of Goldeneyes, another duck Goosander, which arrived on the north gale of 12-14th February and remained until 5th March; a flock of 23 Wigeon on 26th January (the largest party so far) and several Teal. About 25 Coots remain on the west lake in March, feeding largely underwater, so food supplies must be becoming adequate and it will be interesting to see if they colonise the lake, having arrived as weather migrants.

The cold spell of late February and early March was not productive of any further weather migration, but Pochard reached a peak of 21 on 7th March and an adult drake Goldeneye and duck Goosander were seen next day.

(c) *Canada and Greylag Geese*

In June, 1956 12 Canada Geese *Branta canadensis* were liberated on the reserve and a further 24 in the following June, all obtained from the Wildfowl Trust. This species quickly established itself, nesting freely on rafts provided for the purpose. Nesting successes have been notable for the fact that in five years only one gosling hatched has failed to reach maturity—this being a late-

hatched bird, the parents swimming off with the remainder of their goslings before it had dried off.

Yearly figures were as follows:-

1957 2 pairs reared all 13 goslings.
1958 2 pairs reared all 6 goslings.
1959 5 pairs reared 22 out of 23 goslings.
1960 6 pairs reared all 24 goslings.
1961 4 pairs reared all 13 goslings.

This gives a total of 19 pairs rearing 78 out of 79 goslings with an average of 4.1 goslings reaching maturity per pair. These figures would have been higher but for the fact that in 1958 poachers broke into a boathouse and raided five clutches off nesting rafts when they were within a week of hatching and only two pairs renested to rear six young. In 1960 all the goslings together with their parents were caught up and redistributed, hence the lower figures for 1961.

We intend in future to catch up and remove the majority of Canada Geese and to replace them with Greylag Geese *Anser anser*, of which three pinioned birds were placed on the water in 1960 and one more in 1961. On 31st March, 1961, a full-winged and wary Greylag flew in to join our birds. It settled down and has remained ever since, becoming reasonably tame. It is unringed.

It is worth mentioning that we have found it extremely easy to alter the feeding grounds of the Canada Goose by the use of "bangers" fired half-hourly.

Other Nesting Species

The effect of such an area on bird life in general is bound to be considerable. Mention has already been made of the nesting of the Great Crested Grebe. One pair of Little Ringed Plover *Charadrius dubius* has nested annually since 1957 and in 1961 we had two pairs out of four nesting in the whole of Kent. Marsh Warbler *Acrocephalus palustris*, Sedge Warbler *Acrocephalus schœnobœnus*, Grey Wagtail *Motacilla cinerea*, and Tree Sparrow *Passer montanus* have all been proved to nest successfully for the first time in the past five years. A flourishing colony of Sand-Martins *Riparia riparia* is being ringed, 71 being caught during the first attempts last summer. One of these was caught and released two weeks later near Orleans, France.

Migrants, etc.

The various species, particularly terns and waders, now for the first time proved to be regular in West Kent are too numerous to list. A paper dealing with the considerable change in status of gulls in the district has been published recently (Harrison 1961), but since this was written the water has become a night roost for considerable numbers of Black-headed Gulls *Larus ridibundus* during rough weather, when they are loath to fly back to the North Kent coast. At times like this, the rafts are packed with sleeping gulls, which is yet another use for them.

The distinctive habitat of the gravel pit appears attractive to a number of interesting passerines, particularly both races of Wheatear *Oenanthe œ.*

œnanthe and *Oe. œ. leucorrhoa,* Winchat *Saxicola rubetra,* Stonechat *Saxicola torquata,* Black Redstart *Phoenicurus ochruros,* Yellow Wagtail *Motacilla flava* and Snow Bunting *Plectrophenax nivalis.* A male Bearded Tit *Panurus biarmicus* was seen in the valley on 10th December, 1961.

Poachers and Vermin

Considering that the reserve is within easy reach of the outskirts of London, we have little trouble from poachers, largely owing to the fact that the Company's men are almost always about and there is a night watchman. The two poachers who raided the rafts made a safe escape although chased, but a further poacher in March, 1958 was successfully caught after an exciting chase. He was armed with a .22 rifle, the registration number of which was filed off and which he had " found in a field " and for which he had no police permit. He had the rifle confiscated and was fined £5. That was our last poacher, but in summer roaming parties of children, often with uncontrollable dogs and catapults, are far more of a nuisance.

At all times we try to keep the vermin under control. The Company deals with the rats, while we endeavour to control the winged vermin, particularly Carrion Crows *Corvus corone.* It may be that by taking first clutches of duck eggs, second broods stand a better chance, and some people even maintain that crows are useful, but this cannot apply when ducklings are taken one by one off the water or when a pair of Great Crested Grebes loses three consecutive clutches. We regard them as a menace and our best year so far was 1958 when 44 were killed. We do not anticipate that numbers will ever reach these heights again. At least two Hooded x Carrion Crow intergrades have been seen in the area in this time. It should be noted that Canada Geese are well able to protect their young from the crows' attentions, always swimming in formation with the young between their two parents.

This, then, is a brief description of a local wildfowl reserve on an industrial ballast water. Its particular interest is that it shows how valuable such places are for the establishment of new wildfowl habitat, even though the water is still being worked for sand and gravel. As the water continues to enlarge, so we hope will the scope of our activities.

Acknowledgements

We would like to express our thanks to Mr. George Wallis for permission to use his gravel pits. Without his help and enthusiasm we could have accomplished very little. His nephew, Mr. Angus Meikle, is also a great help to us, particularly over the construction of the pools and the planting programme, and without exception all the men at the works take the keenest interest in our activities. We would also like to thank Mrs. Pamela Harrison for the photographs which illustrate this article.

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