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Creation and Management of Artificial Nesting Sites for Wetland Birds

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Since 1963 about 270 islands and 40 rafts have been constructed and managed in Britain by the Royal Society for the Protection of Birds, mainly at its wetland reserves. These structures are primarily aimed at providing secure breeding sites for terns, waders, gulls, wildfowl and divers, including nine species of particular conservation importance in Britain. Use of islands and rafts by different breeding species is dependent upon their vegetation cover and geographical location. Bare shingle, or sparsely vegetated islands and rafts, attract the most breeding species in southern coastal locations (up to 20 species), including five species of conservation importance, namely Sandwich tern (*Sterna sandvicensis*), little tern (*Sterna albifrons*), avocet (*Recurvirostra avosetta*) and, occasionally, Mediterranean gull (*Larus melanocephalus*) and roseate tern (*Sterna dougallii*). Similar unvegetated or sparsely vegetated islands on the coast in the north, or inland in the north or south of Britain, support few breeding species, and none of conservation importance. The composition of the bird assemblage breeding on well-vegetated islands and rafts in Britain (up to 20 species) is less influenced by geographical location, but species of conservation importance such as pochard (*Aythya ferina*) are found mainly in the south, and common scoter (*Melanitta nigra*), red-throated diver (*Gavia stellata*) and black-throated diver (*Gavia arctica*) exclusively in Scotland.

Keywords: islands, rafts, breeding birds, Great Britain.

1. Introduction

Islands and rafts have been created by the Royal Society for the Protection of Birds (RSPB) at wetlands primarily because many bird species select them as breeding and loafing sites in preference to mainland locations with similar habitat features (Axell, 1982; Brookes, 1981; McIntyre and Mathisen, 1977; Giroux, 1981; Hill, 1984*a,b*; Street, 1989; Swift, 1982). Artificial islands and rafts are probably chosen as nesting sites because they provide greater protection from mammalian and avian predators which have difficulty gaining access to them (Hill, 1984*a,b*; Giroux, 1981). Such artificial nesting sites have particular value for bird conservation in Britain because they can attract several priority breeding species (see Bibby *et al.*, 1989; NCC/RSPB, 1990).

Moreover, rafts can be used on deep waterbodies, or ones with fluctuating water levels, to attract breeding birds in areas where suitable natural nesting sites are not available.

An additional factor favouring the creation of islands and rafts on nature reserves is that they can be used to concentrate breeding and loafing waterbirds in front of hides. This enables reserve visitors to obtain good views of birds, sometimes including secretive species which they would otherwise have difficulty in seeing.

This paper briefly describes the creation of islands and rafts by the RSPB, reviews the management they have received to attract and maintain populations of breeding birds, in particular priority species, and summarizes their conservation benefits. The data are mainly based on replies to a questionnaire from 10 RSPB reserve wardens in England, one in Wales and six in Scotland. Additional information was obtained by personal communication with wardens and RSPB regional offices throughout Britain.

2. Construction of artificial nesting sites

2.1. ISLANDS

Nesting islands on RSPB reserves have been constructed in two basic ways:

1. by dumping locally derived material into shallow water until it protrudes above the water surface (deposit islands); and
2. by leaving some island-shaped mounds when excavating an area; these remain proud of the water surface when the area is flooded (remnant islands).

The surface areas of the islands so produced have varied between 5 m² and 2000 m², with most being 30–500 m² in extent. Usually, they are isolated by stretches of open water at least 2 m wide and 0.2 m deep to make access by predators more difficult. The cost of creating a deposit island varies between £1.00 and £2.00 per m² of surface area in 1–2 m deep waterbodies. The cost of a remnant island is contained within the costs of excavating a waterbody at a wetland reserve.

Some of the islands created by the RSPB have been in existence for over 25 years (e.g. Minsmere in Suffolk), with the only damage arising from wave erosion of the island edges. However, erosion can be a more severe problem, and in the most severe cases (e.g. Dungeness in Kent) all island material protruding above the water surface can be removed. In locations where wave erosion is likely, special precautions must be taken during island construction, especially if they are built out of unstable material such as shingle or gravel. Methods used to overcome or reduce erosion have included:

1. constructing wave deflecting structures around the islands;
2. producing a 1 in 10 sloping base to the island, which is relatively stable under all conditions;
3. planting emergent vegetation around the island, especially on the side of prevailing wind;
4. covering the island with plastic netting;
5. piling stakes into the windward side of the island;
6. situating the island in a sheltered bay where it is less subject to wave damage;
7. surrounding the island by a beach of large pebbles.

2.2 RAFTS

Two main types of raft have been constructed by the RSPB: (a) shingle-surfaced wooden rafts with polystyrene floats, and (b) synthetic rafts surfaced or filled with local vegetation which aim to look as much like the natural surrounding vegetation as possible (see Burgess and Becker, 1989, for design details). These two types of rafts are aimed at attracting terns, and wildfowl and divers, respectively.

The surface area of the rafts constructed has been between 1 m × 1 m and 3 m × 3 m. The rafts have cost between £100 and £300 each, depending on their size and complexity. Rafts need to be firmly anchored to the substrate to prevent them floating away (see Burgess and Becker, 1989). In windy locations it may be difficult or impossible to prevent the raft drifting or breaking loose of its moorings during the winter; hence, it is advisable to either remove the rafts completely, or move them to a more sheltered location during the winter.

3. Management of surface conditions to attract priority breeding birds

Many years of management experience on RSPB reserves has identified the surface conditions required to entice birds of high conservation priority (Bibby *et al.*, 1989; NCC/RSPB, 1990) to breed on artificial islands and rafts.

On the coast, management has been directed at the following key breeding species: avocet, Sandwich tern and little tern; all of which are known to prefer sparsely vegetated or bare surfaces for nest sites (see Axell, 1977). Other priority species with similar requirements are roseate tern and Mediterranean gull.

In freshwater situations in England, the key breeding species which can be attracted is pochard. In Scotland, the key breeding species are red-throated and black-throated diver (Campbell and Mudge, 1989), with common scoter also having similar habitat requirements. All these species are known to favour nesting in well-vegetated situations.

3.1. SPARSELY VEGETATED ISLANDS/RAFTS

Two main methods are used to produce and maintain sparsely vegetated conditions on artificially created islands or rafts.

3.1.1. *Shingling*

To create an unvegetated shingle island, two or three layers of thick plastic sheeting (often old fertilizer bags) are placed on the island substrate. A 10–30 cm layer of 6–18 mm diameter gravel and finer sand is then added on top of the plastic to provide the material on which birds can nest (Figure 1). The addition of shingle to an island occupies around 1 man day per 5 tonnes of shingle if work is done from a boat (equal to c. 10 m² of island surface). The main benefit of placing shingle over plastic-sheeting is that it permits rapid run-off of rainwater from the island and also restricts the availability of ground water to colonizing plants. As a consequence, such islands remain largely free of all but the most desiccation-resistant plant species for several years after their creation. The management required to keep these islands attractive to breeding birds comprises only a couple of hours hand weeding or strimming of small plants per annum.

Shingled rafts generally have a 10–20 cm thick layer of shingle over the raft surface, with side boards to retain this material. The shingle may have to be replaced following severe winter weather but otherwise such rafts require little maintenance.

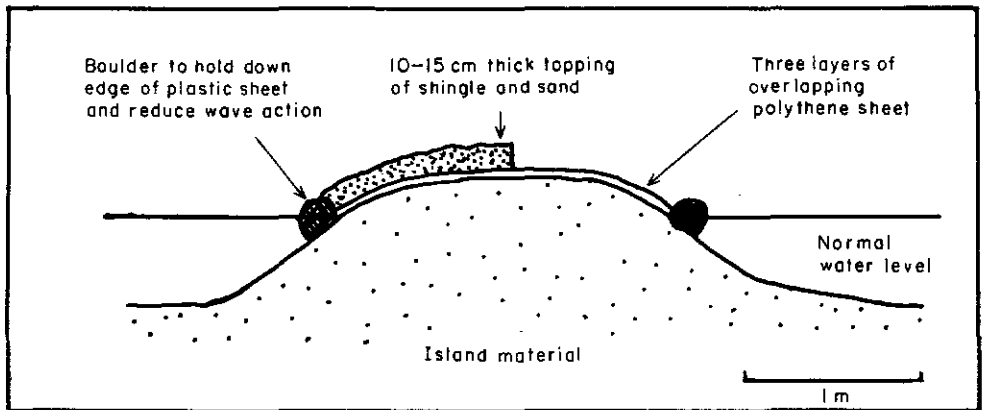


Figure 1. Generalized design of a shingle/sand covered, sparsely vegetated island with a plastic underlay.

3.1.2. Vegetation removal

In order to maintain bare conditions on islands lacking a layer of subterranean plastic, the majority of the annual vegetation growth must be removed each year, generally in the spring and autumn. Methods which have been used to remove vegetation include hand pulling, rotovating, ploughing, flooding over winter, herbicide sprays or a combination of methods (Table 1). Mechanical methods are less labour intensive than manual ones, but manual vegetation removal is often necessary on the smallest islands. In general, several man days are needed per annum to maintain a single 100 m² island. Regardless of the method, vegetation management must be repeated each year otherwise the island quickly becomes overgrown with dense vegetation, rendering it unattractive to priority bird species which need bare conditions.

On sparsely vegetated rafts, any vegetation is normally removed by hand weeding, but this is rarely a problem as rafts do not provide particularly suitable conditions for colonization by wetland plants.

3.2. WELL-VEGETATED ISLANDS/RAFTS

If islands receive little management after their construction, they are rapidly colonized by wetland and ruderal plants (Figure 2), which provides suitable breeding habitat for wildfowl and divers. Alternatively, an island may have turves of the local vegetation placed over its surface to speed the colonization process. For vegetated rafts, clumps of local wetland vegetation are often used to produce the surface and hence provide as natural a finish as possible.

If the vegetation on islands is never managed, woody species such as alder (*Alnus glutinosa*) and, especially, willow (*Salix* spp.) will eventually colonize. This colonization will reduce their attractiveness for breeding waterbirds as the herb layer which forms the nesting substrate is eventually shaded out. On most RSPB reserves, the vegetation of well-vegetated islands is cut at the end of the breeding season (August/September) to retard the growth of woody species, checking the natural succession and retaining a herb layer in which wildfowl and divers prefer to nest.

TABLE 1. Management operations on islands at selected RSPB reserves

	Reserves										
	Blacktoft Sands	Ken/Dee	Leighton Moss	Loch Strathbeg	Havergate Island	Vanc Farm	Sandwell Valley	Strump- shaw Fen	Titchwell Marsh	Minsmere	Snettisham
1. Sparsely vegetated islands											
Operation											
Weeding in autumn	+	+	+		+		+			+	+
Weeding in spring	+		+		+					+	
Cutting in winter								+			
Flooding during winter	+		+		+				+		
Chemical sprays											+
Adding shingle	+		+	+	+		+			+	+
Burning	+				+						
Cutting in autumn	+										
Digging in autumn/ winter	+		+							+	
Strimming	+	+			+					+	
2. Well-vegetated islands											
Weeding in autumn			+								+
Cutting in winter								+			
Winter flooding					+						
Herbicides	+		+								
Burning	+				+						
Cutting in autumn (vegetation removed)	+		+		+					+	
Strimming		+			+						+

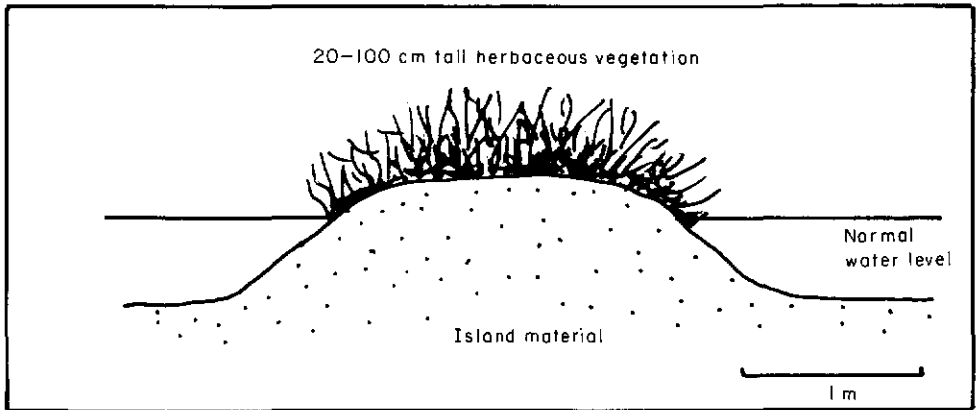


Figure 2. Generalized profile of well-vegetated islands.

4. Use of artificial sparsely and well-vegetated islands and rafts by breeding birds

Thirty species of bird have been recorded breeding on islands artificially created by the RSPB (Table 2). The number and type of birds varies markedly, depending on the vegetation cover of the island/raft and its geographical location in Britain.

For example, the 20 species recorded as breeding on sparsely vegetated islands/rafts at southern coastal reserves are mainly waders, terns and gulls. These include several species of conservation importance, namely, avocet, little tern, Sandwich tern, roseate tern and Mediterranean gull. In comparison, the 20 species recorded breeding on well-vegetated islands in the north and south, and at inland reserves in the north comprise mainly wildfowl. The species of conservation importance breeding on these islands/rafts are pochard, common scoter, red-throated diver and black-throated diver (Table 2).

Sparsely vegetated islands at coastal reserves in the north, or at inland (freshwater) reserves in the north and south, only support between nine and 10 breeding species, and none of conservation importance. However, well-vegetated islands at coastal reserves and inland in the south support between 13 and 19 species, but apart from pochard, species of particular conservation importance are absent (Table 2).

4.1. EXAMPLES OF THE USE OF ARTIFICIALLY CREATED SPARSELY VEGETATED OR BARE ISLANDS AND RAFTS

In the south of Britain, sparsely vegetated islands and rafts have been mainly created to provide breeding habitat for avocet and terns. For example, at Minsmere on the Suffolk coast, the population of breeding avocet has increased as a larger number of suitable island nesting sites have been provided [Figure 3(a)]. Also, on the Suffolk coast at Havergate Island, the preference of avocets for island nest sites was demonstrated when, following the creation of 25 shingled islands, most of the birds ceased to breed on the lagoon margins and moved to the islands [Figure 3(b)]. Similarly, after the creation of islands in shallow brackish coastal lagoons at Titchwell Marsh on the north Norfolk coast in 1982, and their annual management to maintain a vegetation free surface, avocets colonized in 1984 and rapidly increased in numbers to 45 pairs in 1989 [Figure 3(c)].

Artificially created sparsely vegetated islands are also attractive to breeding terns and some gulls. For example, at Dungeness in Kent, the creation and management of c.20 shingle islands in a 46 ha lagoon has attracted up to 350 breeding pairs of Sandwich and common terns [Figure 3(d)], up to 1000 pairs of black-headed gulls and, occasionally, a few pairs of common gull (*Larus canus*), Mediterranean gull and roseate tern.

At Minsmere, shingle islands have also been attractive to little terns. Some of the islands in the coastal lagoons have been newly resurfaced with shingle over the past few years and have attracted these terns in larger numbers than were previously present [Figure 3(e)]. Rafts covered by a fine layer of shingle have also attracted breeding population of common terns to areas where they were previously absent [Figure 3(f)].

4.2. EXAMPLE OF THE SUCCESS OF ARTIFICIALLY CREATED WELL-VEGETATED ISLANDS AND RAFTS

The provision of densely vegetated islands at reserves such as Strumpshaw Fen in the Norfolk Broads, Minsmere, Titchwell Marsh, Dungeness and Blacktoft Sands on Humberside has attracted breeding populations of gadwall (*Anas strepera*), shelduck (*Tadorna tadorna*), pochard and teal (*Anas crecca*) where previously they were either absent or present in very low numbers. In recent years, vegetated rafts floated on to Scottish lochs have been successful in attracting nesting red and black-throated divers and common scoter (Campbell and Mudge, 1989).

5. Discussion and conclusions

Sparsely vegetated islands created at inland waterbodies, or on the coast in the north of Britain, are of lesser importance to the conservation of priority British breeding birds than similar islands at coastal reserves in the south and east. Well-vegetated islands have similar value for the conservation of non-priority species throughout most of Britain, but have attracted three priority species in Scotland.

As well as their value for nesting birds, islands and rafts also provide a safe preening, loafing and roosting position for migrant and wintering waders and wildfowl. In Britain as a whole, 25 species of wader and 14 species of wildfowl have been recorded using artificially created islands and rafts on migration, with the highest number of species recorded near the east coast. Similarly, 14 species of wader and 14 species of wildfowl have been recorded using islands and rafts in the winter (Burgess and Becker, 1989). The value of shingle-covered islands to loafing waterfowl has been discussed by Street (1989).

In conclusion, islands and/or rafts are an inexpensive way of increasing the conservation interest of most waterbodies. If they are in a suitable geographical location and managed appropriately, they can attract priority birds to breed.

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TABLE 2. Birds which have bred on artificial islands and rafts created and managed by the RSPB in Great Britain

Reserve location† ...	Northern reserves				Southern reserves			
	Inland		Coastal		Inland		Coastal	
	Well-veg.	Sparse/bare	Well-veg.	Sparse/bare	Well-veg.	Sparse/bare	Well-veg.	Sparse/bare
Red-throated diver	+	+	-	-	-	-	-	-
Black-throated diver	+	+	-	-	-	-	-	-
Great-crested grebe	-	-	-	-	+	+	+	-
Little grebe	-	-	-	-	+	-	-	-
Mallard	+	-	+	-	+	-	+	-
Teal	+	-	+	-	+	-	+	-
Gadwall	+	-	+	-	+	+	+	+
Tufted duck	+	-	-	-	+	+	+	+
Pochard	+	-	-	-	+	+	+	+
Red-breasted merganser	+	-	+	-	-	-	-	-
Shelduck	+	-	-	-	+	-	+	-
Common scoter	+	-	-	-	-	-	-	-
Canada goose	+	-	+	-	+	-	+	+
Greylag goose (feral)	+	-	+	+	+	+	+	+
Mute swan	+	-	+	-	+	-	+	-
Coot	+	+	+	+	+	+	+	+
Moorhen	+	+	+	-	+	+	+	+

Lapwing	+	+	+	+	+	+	+	+
Oystercatcher	+	+	-	+	-	-	+	+
Ringed plover	-	-	-	+	-	-	+	+
Avocet	-	-	-	-	-	-	-	+
Little ringed plover	-	+	-	+	-	+	-	+
Redshank	+	+	+	+	+	-	+	+
Common gull	-	-	-	-	-	-	-	+
Mediterranean gull	-	-	-	-	-	-	-	+
Black-headed gull	+	+	+	+	+	+	+	+
Common tern	+	+	+	+	-	+	+	+
Sandwich tern	-	-	-	-	-	-	+	+
Little tern	-	-	-	-	-	-	-	+
Roseate tern	-	-	-	-	-	-	-	+
Total species	20	10	13	9	16	11	19	20
No. waders	3	4	2	5	2	2	4	6
No. terns	1	1	1	1	0	1	2	4
No. gulls	1	1	1	1	1	1	1	3
No. wildfowl	11	0	7	1	9	4	9	5
No. divers	2	0	0	0	0	0	0	0
No. other waterbirds	2	2	2	1	4	3	3	2

† Islands were defined as coastal if they were within 10 km of the sea, and north if they were north of a line between Liverpool and the Humber.

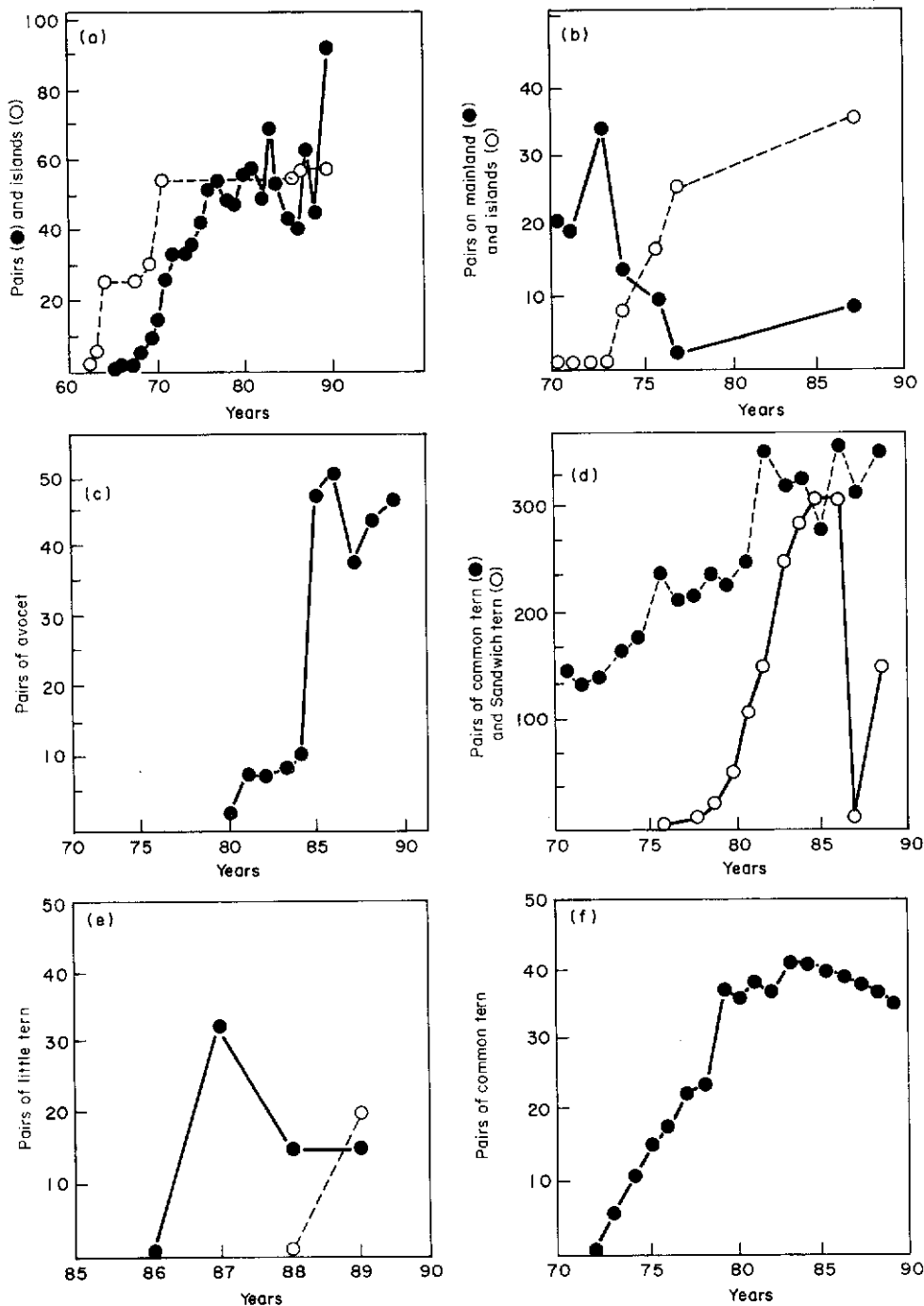


Figure 3. Breeding populations of avocets and terns breeding on sparsely vegetated or bare islands and rafts at various RSPB reserves. (a) Breeding numbers of avocets at Minsmere on the Suffolk coast: from 1960-1989 (—●—); and the number of nesting islands (—○—). (b) —●—, breeding numbers of avocets nesting on the mainland; and —○—, islands at Havergate Island on the Suffolk coast, following the creation of 25 shingled islands in 1974. (c) Breeding numbers of avocets at Titchwell Marsh on the North Norfolk coast from 1970-1989, following the completion of brackish lagoons and nesting islands in 1984. (d) —●—, breeding numbers of common; and —○—, Sandwich terns at Dungeness in Kent, following the construction of a coastal lagoon with nesting islands from 1969 onwards. (e) Breeding numbers of little tern following shingling of islands at Minsmere: —●—, island 65 shingled in winter 1986/1987, and —○—, islands 59 and 60 shingled in 1988/1989. (f) Breeding numbers of common terns on shingled rafts located in old sewage lagoons at Rye House Marsh in Hertfordshire between 1972 and 1989.

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