

**AUDIT OF PRIORITY SPECIES
OF RIVERS AND WETLANDS**
**Kingfisher *Alcedo atthis* in South
Hampshire and the Isle of Wight**

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ENVIRONMENT AGENCY



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A species audit for the Kingfisher *Alcedo atthis* in the Environment Agency's Southern Region (Hampshire & the Isle of Wight)

Introduction

The following report has been commissioned by the Environment Agency (Southern Region). It has been prepared on behalf of the Hampshire and Isle of Wight Wildlife Trust and is one of seven audits covering species of rivers and wetlands that are considered to be a priority for conservation action by the Environment Agency and its partners.

The species covered by the audits are:

- Wetland and river molluscs:
 - Anisus vorticulus*
 - Pisidium tenuilineatum*
 - Pseudanodonta complanata*
 - Segmentina nitida*
 - Vertigo moulinsiana*
- Fresh water Cray-fish
- Southern Damselfly
- Marsh Fritillary
- Black Bog Ant
- Birds of rivers and reedbeds
 - Kingfisher
 - Bittern
- Water Vole

1. Species description

Kingfishers are small birds 16-17 cm (c.6 inches) in length, with a wing span of 24-26 cm (c. 10 inches). Kingfishers weigh about 39 grams on average (Hickling 1983). The River or Eurasian Kingfisher is a member of the Alcedinidae Kingfisher family which consists of two genera (*Ceyx and Alcedo*) with 22 species occurring in the world. There are two other kingfisher families in the world comprising of a further 11 genera with 65 species.

The Kingfisher is a striking species whose splendid plumage reminds us that it is a member of a mainly tropical family, despite its bright colours it can be easily overlooked when perching in a tree. Its upper wings, back and head are brilliant turquoise blue. The undersides are bright orange from the vent to the throat which is white. The lores and ear coverts are also orange divided from the throat by a blue stripe. Behind the ear coverts is a small white patch. They have relatively long sharp black bills which are used for fishing and nest excavation. In the breeding season the females have an orange base to the lower mandible. Kingfishers have quite short fleshy legs with an unusual foot with the three toes partially joined. Juveniles have dark coloured feet which turn orange after about six months (Baker 1993).

The call of the Kingfisher usually alerts the observer to the species, its penetrating and very characteristic loud "zeeee" is diagnostic, as is its plumage. Its flight is fast consisting of whirring wing beats interrupted by brief glides, as it flashes past its

turquoise-blue back makes it look like an electric blue streak. They feed by plunging after sighting prey from a perch or after hovering over water.

Resident birds pair in autumn but retain separate territories, generally of at least 1 km of stream, territories gradually merge in the spring. Kingfishers are aggressively territorial they display from perches and call from the centre of their territory. Having attracted a mate the male courtship-feeds the female and copulation follows. The best clue to the presence of breeding Kingfishers is a nest hole in a vertical bank. Large nestlings may be very noisy, calling from the nest hole, and droppings at the entrance are a further indication of an occupied nest burrow. Two or three broods are reared in quick succession, and the female often lays again in an adjacent nest hole before the first brood has fledged (Svensson 1978). The nest hole is excavated by both sexes. Up to ten eggs a clutch can be laid, though 6-7 is the normal clutch size, with eggs usually laid between March and July, with April the main month. Incubation takes 19-20 days and the young fledge at 24-25 days. The fledglings first dive after about four days from leaving the nest, these are often disastrous as they dive too frequently resulting in them becoming waterlogged and drowning.

2. Habitat requirements

Kingfishers require access to relatively shallow and still water e.g. backwaters, meanders and pools, as well as slow flowing rivers. Partly shaded stretches of river are most favoured, with some reedy or woody cover at the river edge is desirable for perching sites to enable them to catch their staple diet of minnows, sticklebacks and other small fish (e.g. stone loach, young trout, dace, chub, perch and pike). Aquatic invertebrates, especially dragonfly nymphs, and amphibian larvae are also eaten. In the New Forest a study of food samples collected from the nest tunnels at ten nests, showed that the Minnow *Phoxinus phoxinus* was by far the most frequently caught fish, though size of prey appeared to be the main factor determining prey selection, with Minnows, Bullheads *Cottus gobio* and Trout *Salmo trutta* between 40 mm-70 mm in length being favoured (Reynolds and Hinge 1996).

Throughout the year the highest densities of Kingfishers occur on slow flowing unpolluted rivers, canals, lakes, ponds and at flooded gravel pits in lowland counties of England, Wales and Ireland (usually below 650 m). During the autumn juvenile Kingfishers head to the coast to avoid their greatest enemy - ice. Coastal areas provide ice-free havens in some cold spells, but in some harsh winters even these freeze up which can result in their almost total extermination in some areas. Adults tend to stay on their territories throughout the year unless ice forces them to move away.

Kingfishers usually nest in an exposed bank bordering water, this usually consists of a stone-free sandy soil in a low stream-bank, but they occasionally nest up to 500 m away from water. They will sometimes nest in an up turned root plate in woodland some distance from the nearest stream or pond. The nest holes are 6-7 cm wide and the tunnel is usually 60-90 cm long ending in a nest chamber (Fry and Fry 1991).

As mentioned above some river edge shading from scrub and woodland is essential, though riverside grazing, its intensity and effects on Kingfishers is little known. Some light grazing along river side meadows is obviously desirable, but high intensity grazing leads to poor river edge cover lacking in diversity and structure, this in turn leads to a subsequent decline in invertebrate abundance and diversity, and hence a drop in food supply for some fish species.

3. Conservation status

The Kingfisher is listed under Annex 1 of the E.U. Birds Directive 1979 and fully protected in Britain under the Wildlife and Countryside Act 1981, as they are on Schedule One. They receive special protection with penalties of up to £2,000 for killing or injuring adults or for disturbing, damaging or destroying occupied nests or nests under construction.

The Kingfisher was included in the list of candidate red Data bird species by Batten *et al* (1990) and has since been identified as a species of Conservation Concern in the U.K. and put on the Amber List of species of medium conservation concern. This latest list has been compiled by the leading non-governmental bird conservation organisations after a review of the status of the U.K.'s birds. The species has an unfavourable conservation status in Europe, being categorised as a Species of European Conservation Concern (SPEC 3 category) by Birdlife International (Tucker & Heath 1994).

4. Distribution

a) World distribution

The Kingfisher is one of the most widely distributed Kingfishers in the world, breeding from Britain and Ireland to North Africa and across Europe to the Indian subcontinent, Japan, Sri Lanka, the Philippines and Solomon Islands (Cramp 1985). The nominate race occurs in N.W. Africa, Italy and Bulgaria whereas the race occurring in Britain and Ireland, *A.a.ispida*, breeds also from southern Norway down to Spain.

b) European distribution

Kingfishers breed throughout Europe, about a quarter to a third of the world population lives in Europe, where Kingfishers occur almost everywhere south of 60 degrees N, except for Scotland, southern Norway, parts of east European Russia and Turkey (Tucker & Heath 1994).

Reliable quantitative data are only available from a few countries, though incomplete quantitative data are available for most countries. Russia has the largest population and, although its exact size is uncertain, it probably amounts to 20-50% of the total. Other strongholds include the United Kingdom, Spain, Italy, Poland, and Romania, while Portugal, France, Germany and Bulgaria also have good populations.

In winter the eastern half of the European range is vacated, and migrants move into western and southern Europe, with the Republic of Ireland, United Kingdom, France, Spain and Italy holding the largest populations. Some Kingfishers winter on the east Mediterranean and North African seashores.

The range has expanded in northern Europe during the twentieth century, with increases in Denmark, Sweden, Finland, and Estonia. However, numbers decreased during 1970-1990 in a number of countries with important populations, including the United Kingdom, Spain, Germany, Italy and Bulgaria. In total, population declines have been noted in 12 countries, constituting up to about 40% of the European population in which trends are known (Tucker & Heath 1994).

	No. of pairs	Year	Population trend
United Kingdom	3,600-6,000	1988-91	Small decrease
Republic of Ireland	900-1,600	1988-91	Stable
France	1,000-10,000	1976	Fluctuating
Germany	1,000-10,000	-	Stable
Low countries	375-680	1979-90	Small decrease
Spain & Portugal	8,800-19,500		Small decrease
Italy	(4,000-8,000)	-	Small decrease
Switzerland	150-200	1977-78	Fluctuating
Austria	280-320	-	Small decrease
Eastern Europe	11,500-35,300	-	Small decrease
Scandinavia	110-330	1987-90	Fluctuating
Baltic states	700-1,300	-	Stable
Belarus	1,700-2,000	1990	Stable
Russia	10,000-100,000		Probably stable
Ukraine	3,600-6,000	1985	Stable
Total (approx.)	46,000-190,000		Declining

Figure 1. Numbers of breeding Kingfishers in Europe
(adapted from Tucker and Heath 1994).

Marked fluctuations in northern and central Europe are attributed to hard winters. Cramp (1985) reported a general decline in many countries, citing pollution, river management and persecution as the causes. The Irish population is not subject to such obvious changes as that in Britain, since winters are generally less severe and coastal feeding sites remain ice-free (Ruttledge 1968).

c) U.K. distribution

The British and Irish populations are the most important in the whole of north Europe. Further east, the severity of the continental winters forces breeding birds to migrate and population densities are also generally much lower than here (Cramp 1985).

Kingfishers occur over much of lowland England and Wales. In Scotland most Kingfishers are found in the southern third of the country, particularly in the lowlands bordering the Solway.

Comparisons of the species distribution between the two British and Irish breeding atlas surveys in 1968-72 and 1988-1991 appears to show a decline in many parts of England and Wales, though in Scotland Kingfishers have consolidated and crept north. The Irish population also seems to be undergoing a decline in numbers though the overall range appears relatively unchanged (Gibbons, Reid & Chapman 1992).

The overall population trend on the B.T.O.'s Water Bird Survey (Marchant *et al* 1990) shows a decline since indexing began in 1974, punctuated by cold-winter effects in 1979 and particularly, 1982. However, the Kingfisher is still a species frequently observed on our waterways. The British population is estimated at 3,300-5,500 pairs and a further 1,300-2,100 pairs in Ireland (Gibbons, Reid and Chapman 1993). Kingfishers were recorded in almost 16% fewer ten kilometre squares during the second atlas period compared to 1968-72, when an estimate of the British & Irish

population was given at 5,000-9,000 pairs (Sharrock 1976). Lack (1986) estimated the wintering population in Britain and Ireland to be in the region of 9,000- 15,000 individual birds.

5. Historic records of Kingfishers in Hampshire & the Isle of Wight

Kelsall & Munn (1905) describe Kingfishers as being resident and universally distributed throughout the county and the Isle of Wight. They state that few reaches of the Test and Itchen were without their pair of Kingfishers, and that they were present on the smaller New Forest streams. On the upper Test they described them as plentiful, though never more than one pair was found in a single stretch of river. More (1860) stated that just a few pairs remain on the Isle of Wight in the summer to breed, with hardly any seen in the winter, though they are plentiful in the autumn frequenting the shore. Kelsall & Munn (1905) also noted that the species occurred on the coast in greatest numbers in the autumn. They did not consider that Kingfishers were being persecuted or declining in Hampshire at the turn of the century.

In both Cohen (1963) and Cohen and Taverner (1972) the species is described as nowhere numerous and in some parts, particularly the coast that it is strictly a winter visitor. Cohen (1963) quoted a P.E. Brown who described them as unwelcome on some of the best fishing reaches of the Rivers Test and Itchen from where the records are fewest. Cohen and Taverner had little detailed information on breeding numbers, but said that they were recorded as breeding or suspected to be breeding in a nearly all the mainland Hampshire and north island ten kilometre squares. They quoted nine pairs breeding in the new Forest in 1961 (Hampshire Field Club). Cohen and Taverner stated that the species was almost exterminated in south-east Hampshire following the 1962\63 winter and suffered heavy general mortality. The recovery was quite quick however, with near normal numbers by 1968.

6. Current status of the Kingfisher in Hampshire and the Isle of Wight

a) Hampshire

Kingfishers are still widely distributed in the county. Clark and Eyre (1993) described them as a moderately common resident that can be severely depleted following harsh winters. As might be expected the atlas map produced by the Hampshire Ornithological Society's (H.O.S.) breeding survey 1986-91, showed a distribution that correlates well with the main river valleys, see figure two below. However, few nests are found along the main rivers themselves, most being found along their tributaries, side streams and ditches where there are suitable vertical or overhanging banks. Their apparent absence from parts of some rivers e.g. the lower Itchen and parts of the Meon, may be due to lack of nest sites. Kingfishers also breed in suitable banks at gravel pits and in the New Forest enclosures, and occasionally some distance from water, e.g. among the Sand Martin colony at Casbrook Common and in a chalk pit near Alresford! Although the species is usually absent from the coast in the summer, pairs have occasionally bred at sites such as Dibden Bay, Langstone Mill, Netley Shore, Pylewell Park and at Titchfield Haven.

Kingfishers suffered badly in harsh winters such as 1962\63, 1978\79, four times in the early and mid-1980's and again in early 1991. Although the H.O.S. atlas covered a six year period of fieldwork, it probably presents a fairly accurate picture of the species' distribution following a series of mild winters. Clark and Eyre (1993) calculated the population for mainland Hampshire in the range of 200-350 pairs. This represents

about 6.5% of the British population, based on the B.T.O. 1988-91 breeding atlas results.

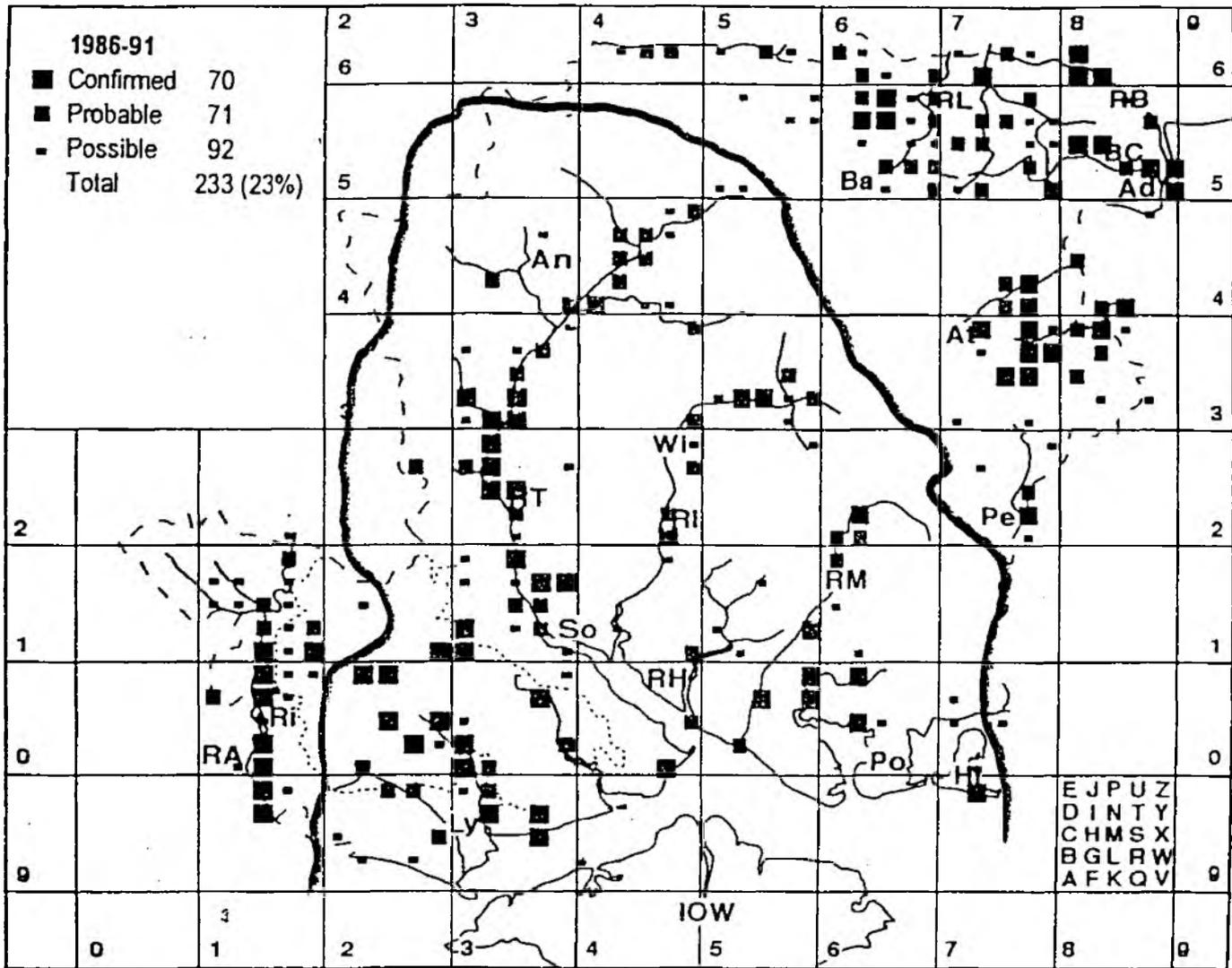


Figure 2. Breeding distribution of Kingfishers in Hampshire during 1986-91, recorded by the Hampshire Ornithological Society. The map is produced by kind permission of the Society. Area within marked line is the region covered by the Environment Agency South region (Hampshire & I.O.W.).

The Environment Agency's Hampshire Region (which excludes the River Avon and the north east and east Hampshire streams) holds an estimated population of 130 pairs, though a range of 100-160 pairs is probably a safer guide. This is based on an estimated 1-2 pairs per tetrad where breeding was either confirmed or suspected and an average of 0.5 pairs per tetrad where it was possible and making a small allowance for overlooked pairs. Table three below gives an idea of the number of pairs per river.

Kingfishers winter along the coast of Hampshire and in the lower reaches of our main rivers, though adults tend to remain on the main rivers all winter to defend their territories. Records along the coast tend to peak in late summer and early autumn. Hampshire ringing studies have confirmed that the majority of Kingfishers occurring on the coast are juveniles that have dispersed from their natal areas (Potts *in litt*). There is some evidence that occasionally European birds move to the south coast of Britain in winter to avoid the cold continental winter. There are two examples of foreign

ringed birds (from France and Holland) being trapped in Hampshire in the late autumn (Evans 1983 and Potts 1996).

River	Confirmed breeding	Probable breeding	Possible breeding	Total number of tetrads with Kingfishers
Test	12	16	14	42
Itchen	3	5	7	15
Hamble	0	1	3	4
Meon	3	3	1	7
Wallington	3	0	1	4
Beaulieu	1	1	0	2
Lymington	5	2	3	10
Avon Water	0	4	0	4
New Forest streams	6	0	5	11
Coastal sites	4	3	9	16
Totals	37	35	43	115

Figure 3. Breeding distribution of Hampshire's Kingfishers.

Courtesy of Hampshire Ornithological Society's breeding survey 1986-91 in the Birds of Hampshire (Clark & Eyre 1993).

b) Isle of Wight

The breeding population on the Isle of Wight is still quite low and put at about 3 pairs, with pairs nesting at Newtown Harbour and on the River Medina. The wintering population is estimated to be in the region of 15-20 birds along the north coast of the island (S Colenutt pers. comm).

7. State of knowledge of the Kingfisher in Hampshire and the Isle of Wight

Although the Kingfisher is an easily recognisable species it can be overlooked, especially during the breeding season. Survey work for the breeding atlas was not complete along some of the stretches of the main river valleys due to access problems, this may have lead to a number of pairs being overlooked. Although records of wintering Kingfishers are submitted to the county ornithological society by some observers many go unrecorded and so the true wintering population remains relatively unknown.

Unfortunately just two to three Water Bird Survey plots are monitored annually in Hampshire, so consequently no quantitative information is available to detect fluctuations in the county's breeding population. The number of birds ringed in the county is usually less than 30 (Potts 1994-96), which again makes analysis of recoveries and the health of the population difficult to assess.

The status of the species on the Isle of Wight is little known, which is partly due to the smaller number of observers on the island. However, it is also due to the failure of birdwatchers to submit their records to the island's ornithological society, which makes an accurate assessment of their status more difficult (S Colenutt pers. comm).

The most recent account of the status of the Kingfisher in Hampshire is found in Clark and Eyre (1993). Records for the Isle of Wight have not been reviewed since Cohen and Taverner (1972).

8. Tentative predictions as to possible additional locations for Kingfishers in Hampshire and the Isle of Wight

There may well be stretches of Hampshire's rivers that hold pairs of Kingfishers that go unrecorded during census periods. A small proportion of the county's breeding pairs or territories are reported annual to H.O.S. and although observer coverage is greatly increasing, many useful records are unfortunately lost as birdwatchers all too frequently do not bother submitting their records.

9. Current/past conservation work

Very few examples exist of specific Kingfisher conservation work within Hampshire and the Isle of Wight. Artificial breeding banks have been tried at many sites across England, though none to my knowledge in Hampshire. Elsewhere in the Environment Agency's Southern Region successful examples do exist, for example at Arundel Wildfowl & Wetlands Trust reserve in West Sussex. Unfortunately many banks created with good intention have ended up becoming covered in vegetation due to a lack of management work, this makes them unsuitable for nest excavation. It is of course more sustainable to encourage natural banks through natural fluvial processes.

The provision of fishing perches does occur on some nature reserves, for example at Titchfield Haven National Nature Reserve on the River Meon where such perches are readily used by families of Kingfishers in the late summer, through to mid winter.

General improvements in water quality, though perhaps not specifically intended to help conserve Kingfishers, have obviously helped them as their prey have been able to increase the numbers again.

10. Current conservation issues - threats to Kingfishers

Hard winters

This can outweigh all other threats to Kingfishers' survival. In the severe winters of 1961-62 and 1962-63 the species was almost totally exterminated in parts of Europe, including Britain (Dobinson and Richards 1964). Numbers in Wales fell to about 15% and in England to just 5% of the previous levels (Smith 1969). Although breeding productivity is high (Morgan and Glue 1977), recovery took up to nine years. The species response to weather may mask other influences on the population.

Chemical and biological pollution of rivers

The two principal sources of freshwater pollution are industrial waste disposal and agricultural chemical runoff (pesticides and effluent, notably slurry and silage and sheep dip chemicals) into our water courses. Air pollutants leading to acidification of watercourses, will also affect fish supply available for Kingfishers. In England and Wales, a significant correlation between low Kingfisher density and high levels of pollution has been demonstrated (Meadows 1972). However, it is unclear whether the situation is improving, worsening or in fact stable. Only long term monitoring and effective policing will help solve this problem.

Canalisation of streams and vegetation control

Increasing the efficiency of our drainage systems by straightening our rivers, removing meanders, shallow pools and oxbows, which provide good feeding areas at times of high flow and the clearance of emergent vegetation, are both highly detrimental to Kingfishers as the habitat losses diversity (Holzinger 1987). This is most likely through the loss of nesting sites, but also due to the loss of feeding habitat and declines in fish numbers. The latter can be brought about by the removal of bankside cover and overgrazing of the riparian fringe. Engineering or agricultural works can also lead to increased turbidity and an increased suspension of solids, this may in turn lead to reduced feeding efficiency. All of these factors contribute to less optimum conditions for Kingfishers.

Persecution

Though one would hope that persecution no longer exists, Kingfishers have been "controlled" in the past at hatcheries and on some kept rivers to allegedly protect fish fry. Kingfishers were once hunted for the feather trade. Both such activities today are of course illegal and completely unjustified.

Disturbance

Kingfishers are susceptible to disturbance during the breeding season when they may desert their nests in extreme cases. The ever increasing pressure on the countryside from recreational activities e.g. walkers and anglers, together with such activities as flood defence work can cause problems for Kingfishers. The creation of new footpaths along water courses can lead to stretches of rivers becoming too disturbed for Kingfishers to breed, along some such paths dogs have proved a real problem with disturbance in the stream itself and in causing erosion of some banks.

Causes of death recorded from national ringing recoveries

An analysis of causes of death of 274 ringed Kingfishers reported to the B. T. O., found that of those that had specific causes of death recorded almost 16% died on our roads, 8% were killed by cats, 3% collided with windows and 2% were recorded as shot or hunted (Hickling 1983). The domestic cat is implicated and large French type windows overlooking garden ponds can prove fatal to Kingfishers. One such household adjacent to Titchfield Haven National Nature Reserve handed in three Kingfishers in the space of two months! The latter problem can be overcome to a certain extent by putting up hawk silhouette

Falling watercourse levels and increased nesting failures

Over abstraction of water leading to low flows can exacerbate pollution and cause stress to fish when temperatures are high, or which result in sections of rivers drying up all together. These factors may well be leading to the significant trend of decreasing brood size has been demonstrated by the B.T.O.'s Nest Record Scheme. The scheme monitors a small number of Kingfisher nests annually throughout the U.K. Recent long dry summers, combined with lowered water tables in many waterways may have contributed to this and it needs to be investigated in more detail given the species' threatened status. Kingfisher nests have also showed increased losses in recent years which have been attributed to increased predation and limited feeding possibilities associated with falling watercourse levels. Both of these factors are worthy of examination in a more detailed study (Crick *et al* 1996).

Sudden rises in water levels

Unexpected rises in water levels, whether due to natural phenomena (e.g. storms and excessive rainfall) or from large releases from impounded bodies can cause high flows. This can make feeding difficult and could cause flooding of nests.

11. Future opportunities

Recent initiatives such as the Biodiversity Action Planning, both nationally and on a local level, River Catchment Management Plans and Water Level Management Plans, all offer opportunities for habitat management, this should lead to the conservation of habitats that in turn provide opportunities for Kingfishers to flourish. Additionally Set-aside and Habitat Enhancement Schemes should be promoted when MAFF grants are available, along river edges to farmers and other landowners. When grants are not available the Environment Agency should be encouraged to consider funding under their conservation or flood defence budgets, to fence off riparian strips and to re-excavate old oxbows etc..

New life can be put back into some of our over managed water courses, for example the Hermitage Stream at Havant. Here the Environment Agency and Havant Borough Council are working together to restore the river, where possible to a more natural state, creating habitats for wildlife and in so doing making it more attractive to Kingfishers. Projects such as these should be warmly welcomed. The creation of bare banks where possible should be encouraged to provide new nest sites and the provision of fishing perches should also be considered when planning such projects. In undeveloped flood plains natural fluvial processes would normally provide suitable nesting and fishing sites.

The on going management of our rivers and streams should take into account the needs of Kingfishers. Low intensity riverside management keeping natural blockages which create small pools in streams should be retained where ever possible, as these often become favorite fishing spots for Kingfishers. Over turned root plates should also be retained as possible nest sites close to water courses.

12. Potential future opportunities in Hampshire and the Isle of Wight

Mechanisms are needed to enhance waterways habitats and in turn the species abundance. River Catchment Management Plans, Water Level Management Plans (aimed at raising water levels in some of our wetlands) and the Countryside Stewardship Scheme, Waterside Landscapes category, could all include sections on the specific requirements of a range of threatened species, including the Kingfisher.

Further work to improve some sections of our water courses for wildlife might include, removing artificial banks and putting some of the natural bends back, these would all help the Kingfisher and other associated wildlife. Kingfishers usually chose actively eroding banks for nesting. On sites where stabilisation is absolutely essential planting alders *Alnus glutinosa* behind the cliff to act as a "stop" will prove a better solution for Kingfishers than the more intense engineering works we have become used to along our rivers. Planting alders can consolidate a bank within 10-15 years, this type of action offers the added benefit of allowing the bare cliff face to remain available as a potential nest site for Kingfishers during this period (Lewis and William's 1984). Obviously the grading of banks will destroy Kingfisher nest sites. protecting a vertical

earth bank from erosion will almost certainly make it unsuitable for nesting within a few seasons.

Where Kingfishers nest on nature reserves and on country parks opportunities could be taken to get the public more aware of their conservation, through for example video links of their nests or regular perching spots, to information centres where visitors, especially school groups can learn about these spectacular birds. This approach has been taken in West Sussex at the Woods Mill centre in the past with great success.

13. Discussion\summary

- The UK. is internationally important for Kingfishers due to our relatively mild maritime climate and making it the most important population in northern Europe.
- Kingfishers have been declining throughout Europe in the recent decades, including the U.K..
- Hampshire and the Isle of Wight hold about 7% of the total British population
- About 130 pairs of Kingfishers breed in Hampshire and Isle of Wight area of the Environment Agency' s South Region.
- Kingfishers require slow flowing rivers and streams with abundant small fish and suitable bare earth banks in which to nest.
- The coastal marshes and estuaries are important wintering areas for juvenile Kingfishers and adults in hard winters.
- Threats to Kingfishers include hard winters, industrial and agricultural pollution, and canalisation of our rivers.

14. Conclusion

Recent improvements in water quality have helped improve conditions for our wetland wildlife including the Kingfisher. Further improvements in water quality are needed to continue this trend. The future of the Kingfisher in Hampshire and the Isle of Wight should be good as long as steps are made to improve our waterways through less intensive river management.

15. Annex 1 : Recommendations for future works and actions

Action	Cost	Priority
<ul style="list-style-type: none"> Carefully vet land drainage consents and proposed flood defence work, especially during the breeding season, so that nests are not inadvertently destroyed or disturbed. 	Nil	Very high
<ul style="list-style-type: none"> Through river habitat and river corridor surveys identify degraded sections where habitat diversity could be improved. 		High
<ul style="list-style-type: none"> Modify future River Corridor Surveys to improve the identification of Kingfisher nest holes and to collect records of birds. 	Nil	Low
<ul style="list-style-type: none"> Encourage land owners to create, or to allow natural erosion to create, nesting banks and provide fishing perches for Kingfishers through reasonable grant aid schemes. Also encourage the retention of fallen trees. 		Medium
<ul style="list-style-type: none"> Promote, in development plans, the creation of nest sites for example at sand and gravel workings which would hopefully attract Kingfishers to breed. 	Nil	Medium
<ul style="list-style-type: none"> Continue to encourage bird watchers and members of the Environment Agency to record breeding and wintering Kingfishers in Hampshire and the Isle of Wight, by sending in their observations to the relevant county recorder. 	Nil	High
<ul style="list-style-type: none"> Establish a number of Water Bird Breeding Surveys on main rivers to monitor Kingfishers and other birds. A reasonable sample would need to be undertaken annually to make comparisons in population trends statistically viable. This could be done by contract ornithologists or volunteers prepared to walk a 5km stretch of river on at least six occasions each spring and early summer. Volunteers could be encouraged by perhaps offering expenses to undertake such surveys, administered through the relevant county ornithological society. 	£3000	Medium
<ul style="list-style-type: none"> Environment Agency to work more closely with both the Hampshire Ornithological Society and the Isle of Wight Ornithological Society to provide a detailed account of the species' status on an annual basis. 		High
<ul style="list-style-type: none"> Undertake ringing studies to give a better understanding of how Kingfishers use main rivers and the coast is. A targeted ringing project of this type could also be useful in monitoring the health of the population, providing information on the age structure and condition of the birds. 		Low
<ul style="list-style-type: none"> Monitor the health of Kingfishers by analysing corpses for pesticides. The public should be encouraged to collect any Kingfishers found dead and send them to the Institute of Terrestrial Ecology at Monks Wood who undertake such work. 		Medium
<ul style="list-style-type: none"> Liaise with the Test & Itchen Associations, discussing river side management with specifically reference to Kingfisher conservation. 	Nil	High
<ul style="list-style-type: none"> Provide training for Environment Agency engineers and mineral planners to promote the conservation of Kingfishers and their requirements. 		High

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