Best Practice Guidelines

Artificial Bank Creation for Sand Martins and Kingfishers

Laura Hopkins
Assistant Conservation Officer
The Environment Agency
May 2001

ENVIRONMENT AGENCY

Contents

Acknowledgements

I would like to thank the following for helping me to produce this document:

Dusty Gedge, Richard Bullock, Ken Goodrich, Brian Uttley, Nicky Penford, Paul Kent, Mike Wiley, James Burke, Graham Scholey, Andrew Crawford, Tim Maidwell, Martyn Aspinall, Keith Bedford, Francoise Scire, Richard Spowage, Nigel Lewis, Rachael Hill, David Webb, Teg Jones, Alana Ecology and the site manager at Ryemeads Nature Reserve.

Photographs were taken and supplied by Paul Kent, David Cole, John Strachan, Ken Goodrich, Brian Uttley, Andrew Crawford, Alana Ecology and Laura Hopkins

Introduction

Sand martins

Adult sand martins, *Riparia riparia* are sandy brown above with whitish under parts with the characteristic brown band across the breast. Their tail is short brown and shallowly forked. The bill and legs are small and black and their eyes are relatively large.
(Sterry and Flegg 1995).

(Holmes 1985)

Sand martins are one of the group of migratory species that are known to be severely affected by droughts in the Sahel regions of Africa and population levels may fluctuate from year to year. (Andrews and Kinsman 1990).

The Sand Martin is one of the earliest summer migrants to return to Britain (Standley *et al* 1995).

They visit between March and September. (RSPB *et al* 1994).

In late summer reedbeds may be used at dusk by large flocks of roosting sand martins and gravel pits or reservoirs may be especially important as feeding areas for early returning migrants in spring. (Andrews and Kinsman 1990).

Sand martins nest colonially usually in the sheer faces that develop naturally on river meanders or are created in the course of sand and gravel mining. Sites are abandoned once the face slumps, becomes overgrown with vegetation or accessible to predators such as weasels. (Andrews and Kinsman 1990).

(Holmes 1985)

Colony size ranges widely from fewer than a dozen pairs to large groups of several hundred. The height of banks used for nesting also ranges widely, from less than 2m along some rivers to 4-5m or more in sandpits. The nest hole is usually 35cm-1m long and is excavated over a period of two weeks by both parents.

To excavate the tunnel sand martins hover at the face of a sand cliff and scratch with their feet which gradually starts the tunnel. Once they have a ledge to rest on, it stands and kicks backwards. (Holmes Nigel, 1985).

(Holmes 1985)

In stable substrates the same hole may be used in several years and it is difficult to estimate how many pairs are present each year simply by counting the total number of new or old holes. (Andrews and Kinsman 1990).

Sand martins are highly opportunistic in their choice of nest sites that are usually found in sandy banks along rivers, in coastal areas and increasingly in man made habitats such as quarries, sand and gravel pits. Sand martins are not exclusively waterside birds and breeding colonies may occur wherever suitable banks occur. Such banks are often highly unstable and colonies may be forced to move from year to year. Where substrates are more stable, they may re use a site for many breeding seasons. (Andrews and Kinsman 1990).

(Holmes 1985)

Two broods may be raised each year. Although they will feed on airborne insects over water or reed beds close to the colony, sand martins tend to roam very widely to exploit abundant insects wherever they may be available. Their presence as breeding birds at a particular site is most likely to be determined by the presence of a suitable nest bank, rather than any particular rich local feeding conditions. (Andrews and Kinsman 1990).

When suitable pits are lacking, sand martins readily use other types of holes. This adaptability is shown in many examples. Past examples include sand martins nesting in 1917 in trenches created for military training at Gidea Park, Essex and several birds being observed carrying nesting material into holes in the brick work of the regularly used platform at Rye House near Hertford (Fitter 1945).

Other man made sites where they have been recorded include railway or road cuttings, foundation diggings for buildings, silage pits or even heaps of graded sand. Fine soil in clay and chalk pits may be used and there are also records of birds breeding in heaps of sawdust, in rotten brickwork and down drainage pipes in hard masonry walls. (Holmes Nigel, 1985).

Bedding 1m lengths of 10cm-polythene pipe into a bank constructed from sand and gravel can create safe and long lasting artificial sites. A sheer front face can be created with a weak or dry mix of concrete built up against shuttering, which should then be removed. The face should drop into fairly deep water both to prevent colonisation by tall, emergent vegetation that would obstruct the birds flight paths and also to restrict access by predators and humans.

The lowest row of pipes should be 1m above summer water level, sloping slightly down towards the entrance, with rows 0.3m apart and pipes at 0.2m spacings. Each pipe should be filled with sand and the entrance half blocked with a cement filler. The birds will then excavate their typical oval tunnel along the top half of each pipe. (Andrews and Kinsman 1990).

Sand martins are a priority species in the London Biodiversity Action Plan.

Kingfishers

Adult kingfishers, *Alcedo atthis* have electric blue-green upper parts with a dark blue crown with pale blue flecks. Their cheeks are orange and white and they have bright orange brown under parts. Their bill is dagger like and dark and they have small scarlet feet (Sterry and Flegg 1995).

(Sterry and Flegg 1995)

Kingfishers breed beside still or slow flowing freshwater however wintering birds may be forced by freezing weather to find unfrozen water elsewhere and estuaries are especially favoured (Andrews and Kinsman 1990).

Kingfishers do and will nest along lakes, docks and canals. They will also when there are no available nesting banks, take to nesting on ledges and gaps in walls.

During the breeding season kingfishers feed mainly on small fish such as minnow, stickleback and fry, supplemented by a variety of aquatic insects, including caddis flies and the nymphs of dragonflies. Kingfishers will eat tadpoles, small molluscs and crustaceans such as crayfish. (Holmes Nigel, 1985).

To rear a brood successfully, kingfishers need to catch about 100 small fish a day for up to four weeks (RSPB *et al* 1994).

Fish are caught by diving, either from a perch over the water or from hovering flight. Although fish may be taken from a depth of up to 1m, shallower water is preferred. Clear water is essential, since the kingfisher needs to see its potential prey. (Andrews and Kinsman 1990).

Pairs are solitary and territorial and, although feeding may take place up to 1km from the breeding territory, each pair usually occupies a length of watercourse or shoreline of 0.8-1.5km. (Andrews and Kinsman 1990).

Although the nest site may occasionally be as far as 250m from the waters where the birds feed, it is usually found in a vertical or steep earth bank at or very close to the waters edge. If there are not any suitable banks available they may nest among the roots of fallen trees or in a sandpit. (Holmes Nigel, 1985).

The nest tunnel is excavated by both parents usually 1-2m above the normal water level. It is horizontal or upward sloping and as much as 1m in length. It takes 7-12 days to create and two and very occasionally three broods may be reared in a single season. (Andrews and Kinsman 1990).

(Holmes 1985)

Throughout autumn and much of the winter individual kingfishers keep to their own territory, male and female using separate areas of water; but in January or February the pair bond is established or renewed. As the weather warms up the pair look for a nesting site. They excavate their tunnel by flying at the bank and driving in their strong bills. They create a chamber at the end of the tunnel that can be anything from 15-100cm long depending on the soil type.

Kingfishers lay eggs at any time between the end of March and early July. At the end of the breeding season the young are chased out of the territory by their parents (Holmes Nigel, 1985).

Kingfishers are protected by special penalties at all times under Schedule 1 of the Wildlife and Countryside Act 1981. It is an offence to intentionally kill, injure or take kingfishers. To take, damage or destroy their nest, or to take or destroy an egg. It is also an offence to disturb kingfishers while building a nest, or in a nest, or to disturb dependant young.

Habitat Requirements

Sand martin	Kingfisher
If sand martins are already present in an area the best thing to do is to preserve and protect the banks that they are already using. The stability of the bank is a factor here and measures may need to be taken to stabilise them and to prevent erosion (Andrews and Kinsman 1990).	Still or slow flowing rivers and streams with shallow areas of clear water (RSPB *et al* 1994).
Where sand martins are not present it may be possible to retain or create suitable banks. To maximise success, banks must be vertical, stable and to minimise the possibility of predation or other interference, should be 3-4m high. They also need to be soft enough for burrowing (RSPB *et al* 1994).	Suitable perches from which to fish are necessary at the water's edge or in the water, over or very close to areas of shallow water. Overhanging branches or posts driven into the shallows will be used (Andrews and Kinsman 1990).
Nests in burrows excavated in soft or sandy cliffs generally over water. Nest site an average 1.8m above water. Opportunistic and may nest in pipes in walls (RSPB *et al* 1994).	Vertical or very steep bare earth banks at least 1.5m high, preferably at the edge of the water. Or otherwise within 250m and are essential for nesting. Nest in tunnels excavated in steep or vertical banks normally over water. Most nests 90-180cm above water. (RSPB *et al* 1994).
The area in front of the banks should be kept clear of tall vegetation such as bushes and trees and whilst public viewing from a distance can be encouraged there should be no direct public access to the banks (Andrews and Kinsman 1990).	The actual extent of the bank may not be critical but the more that can be provided, the greater the chance that kingfishers will find it attractive (Andrews and Kinsman 1990).
Where nesting occurs in low waterside banks it is important to prevent water levels rising during the breeding season (Andrews and Kinsman 1990).	Fluctuating water levels, particularly rapid rises during the breeding season, may cause nests to be lost by flooding (Andrews and Kinsman 1990).
Areas of extensive reeds and marginal emergent vegetation which encourage insect populations may help to attract feeding or roosting	Banks may be created during excavation or result from wave action, but active erosion during the breeding season is undesirable. On the other

sand martins even if they are not breeding in the immediate vicinity (Andrews and Kinsman 1990).	hand, small-scale winter erosion is beneficial in maintaining steep faces largely free of plant cover (Andrews and Kinsman 1990).

Case Studies

Sand martins

Old Lea Bridge — Case Study 1

(Hopkins 2000)

SITE SUMMARY

Location: Near bridge on the A11 over the Three Mills Wall River (River Lea) near Pudding Mill Lane DLR, Stratford
Grid Reference:383835
Banks: Concrete defences

Description

Within the concrete channel drainage holes present in the walls have been used by Sand Martins to access the earth banks behind.

Construction

This example was not created for Sand Martins but is a good example of their opportunistic nature and ability to make use of man made structures.

Old Separating Pond, Stratford Case Study 2

(Hopkins 2000)

SITE SUMMARY

Location: Gas Depot, Abbey Lane, Stratford
Grid Reference:387834
Banks: Concrete walls of old separating Pond
Site Manager: Transco

Description

This old separating pond similar to the above example is also being used by Sand Martins who are again taking advantage of man made holes in the wall structure.

Construction

This also is an example that was not created for Sand Martins but illustrates their opportunistic nature and ability to make use of man made structures.

Forest Farm Country Park Case Study 3
Sand martin Cliff

(Kent 2000)

SITE SUMMARY

Location: Whitchurch, Cardiff
Grid Reference:
Banks: tyrolean render
Site Manager: Paul Kent, Countryside Ranger, Cardiff County Council

This sand martin Cliff was built as a result of summer flash floods inundating a natural sand cliff nesting site on the River Taff in 1996. It was built in the winter of 1996/97. It faces due north and is four metres from the artificial lake. The Cliff can be viewed from a bird hide.

Description

The cliff is curved, 12 metres long and 1.8 metres high and has forty access holes.

Construction

It has an overhanging lip to shed rain and is finished in a tyrolean render. See Appendix p27 for details.

The wall was constructed from donated materials as a palisade which had weld mesh attached and then rendered.

One metre lengths of 100mm ceramic sewer pipe built into the structure with a slope of 1/60 to the front for drainage. At the end of each pipe is a standard bag of builder's sand (40g) that is laid down in layers. As the wall is back filled the plastic bag is removed

(Kent 2000)

(Kent 2000)

when the next layer of fill is applied. The holes are refilled with sand before each nesting season.

The holes are in three rows at 800mm horizontal spacing and 450mm vertical spacing in a checkerboard pattern. The bottom row is 550mm above ground level.

Success

It has been successful every year except 1999 when a late snowstorm caused the birds to leave prior to nesting. The spacing seems correct as all the top two rows of holes are used. There were 19 pairs in the year 2000 using the bank.

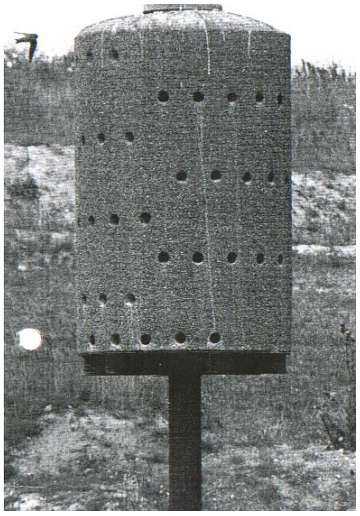
(Kent 2000)

NB.

The bottom row of holes has never been used suggesting that they are too close to the ground. The construction technique is not recommended for others as it does not use standard materials and is technically complicated. A better technique to use would be to use conventional block work retaining wall techniques with a render coat like this example.

Sand martin Barrels Case Study 4

SITE SUMMARY
Location: Tullo Farm, Oldmeldrum, Inverurie, Aberdeenshire
Grid Reference: NJ 805 309
Designer: John Strachan based on an idea by Dennis Lambert with advice from Nicky Penford, Grampion FWAG
Site Manager: The former owner John Strachan


(John Strachan)

Description
A method of providing artificial nest sites for sand martins.

Construction
Entrance holes were cut in an old concentrated fruit juice barrel using a jigsaw. Then the barrel was covered with Evostick and rough sand. The stand was concreted into the ground at the chosen location. The inside of the barrel was lined with waterproof paper and placed onto the stand. The barrel was then filled with a 15 to 1 mixture of sand and cement and allowed to dry for about 10-14 days.

The entrance holes were then bored out using a 5cm diameter pipe sharpened from the inside out. The tunnels sloped gently upwards and were 35-75cm long. Using a 2cm diameter iron rod with the end of which bent over, flattened and sharpened the nest sites were scraped out to a 13-15cm diameter. Then the holes were filled with rough dry sand. The tunnels are cleaned out and refilled at the end of each nesting season. The barrels are covered each winter with black polythene to protect from the frost. The cost of materials is estimated at £250 per barrel.

Success
The first Barrel was installed in March 1995 and was colonised as soon as the birds arrived. There are now two barrels in which 15 pairs raised two broods each in 1997 and have been used

annually since then. The barrels have the advantage that they can be constructed anywhere near water and offer greater security from ground predators.

NB.

Idea also used for Newbury Bypass mitigation.
The Barrels were used in preference to an existing natural bank which had holes bored for sand martins (See Appendix for diagram).

Rutland Water Nature Reserve **Case Study 5**
Sand martin Cliff

SITE SUMMARY (Hopkins 2000)

Location: Rutland Water
Banks: Concrete blocks with clay pipes
Designer: Senior Warden, Martyn Aspinall
Site Manager: T P Appleton
Photographs: supplied by David Cole

Description and Construction

The site, on the bund on lagoon II was chosen after careful consideration (fig 1). The area was dug out down to water level, hardcored, with 50 mm clean limestone, rolled, then covered with 6 inches of reinforced concrete 8ft wide by 50ft long (fig 2).

Fig 2

Fig 1

The bank was then constructed using 9 in x 18 in hollow concrete blocks. Two blocks were laid side by side for four courses, and then the blocks were turned on their side giving an 18 in deep hole (fig 2). There were four walls, two at 43ft long, one at 6 ft long, and the end wall at 6 ft but with a 2ft 6 in doorway (fig 2 and 4)

The holes then had 3 in x 12 in clay pipes inserted, which were cemented in, giving a 6 in compartment at the back. Each of these compartments had a door fitted on the inside of the building. There were 347 holes (fig 3 showing one wall of holes).

Fig 3

These holes were then filled with sand and later raked out. A pattern of two full, two half full and two empty which was continued on all 347 holes.

Fig 4

The front, back and end were Tyrolean rendered (fig 3). The roof was constructed of 4ft x 2 in roof beams with 8ft x 4ft Far Eastern Ply on top. Hot tar was then poured on top of the ply, and covered with gravel (fig 5).

Fig 5

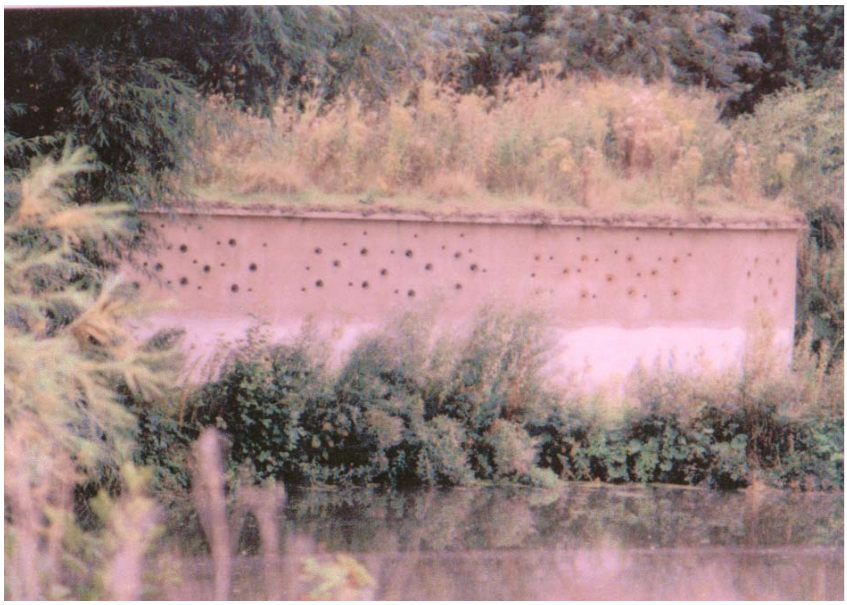
Success

The first year (2000) there was no interest in the bank until May 16th when sand martins started to go into the holes. Then there were about 30 nests but only two were completed. This was possibly because it was so late in the season. It was found that the sand martins used the empty and half-full holes, but never attempted to use the full holes. There were also two successful tree sparrow nests in 2000. This year (2001) the bank was occupied from mid March onwards.

This year an anti-predator skirt was put around the bank (fig 6) to prevent weasel or stoats from climbing the walls.

Fig 6

Watermead Country Park, Case Study 6



(Goodrich 1998)

SITE SUMMARY

Location: Watermead Country Park
Grid Reference: SK 605 113
Banks: Hollow concrete blocks on a reinforced concrete base 15 m long by 2.1m high.
Designer: Idea and research by Ken Goodrich and Tim Maydwell. Detailed drawings by Andrew Rorrison (Leicester County council).
Site Manager: Tim Maydwell (Watermead Country Park).

Description

This site originally used for processing fine gravel and 30-40 pairs of sand martins nested frequently in the storage heaps. In 1988 the site was cleared, and Ken Goodrich suggested to the Leicestershire County Council the building of an artificial bank to help keep the colony going. After researching the project, including visiting an artificial bank at Applegarthtown Wildlife Sanctuary near Lockerbie in

(Goodrich 1993)

Scotland, fundraising began with help from members of Birstall Bird watching Club. Building began at the

beginning of February 1993 and was completed by the 6th March 1993.

Construction

The front of the bank stands on a reinforced concrete slab 1.5m wide 150mm thick and is built in 200mm hollow concrete blocks reinforced and filled with concrete. The face was then rendered with sand and cement 18mm thick at the base and 38mm thick at the top, making it lean forward to help prevent predators from climbing up.

At the back of the bank it was filled up to 1.2m high by 1m deep with large stone to help with drainage, then the remainder was compacted material suitable for sand martins to excavate for their nests. It then had a covering of Teram to help prevent rabbits etc digging in to it, and finally topped with a row of slabs. The ends of the bank consisted of stacked sand bags filled with sand and cement.

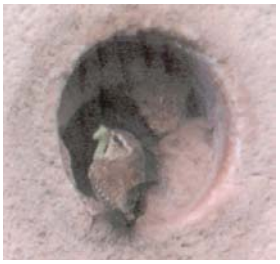
(Goodrich 1993)

(Goodrich 1998)

There were two different types of nesting holes, one being 100mm clay pipes and the others 40mm drilled holes through the concrete blocks (this was done before the blocks were filled with concrete).

Success

Sand Martins nested in the bank for the first time in 1994. The sand martins seem to prefer the 40mm drilled holes



(Goodrich 1998)

although some did use the 100mm pipes. A wren used a 100mm pipe in 1998, also a kingfisher used one in 1997/98/99 having three broods each year. A blue tit regularly nests in one of the 40mm holes.

NB
Natural unwashed sand was used to pack the right hand half of the bank, and fine granite dust (the same material which sand martins nested in prior to the bank being built) was used for the left hand side. No preference was shown for either material.

A bank of similar design was constructed near Dishley Pool, Loughborough in 1998 and was immediately successful, with 35 holes being occupied in the first breeding season, some having two and three broods.

Hosehill Local Nature Reserve Case Study 7
Sand martin Bank

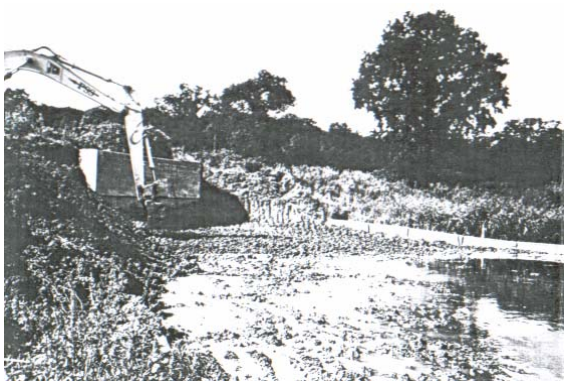
(Uttley 1999)

SITE SUMMARY
Location: Theale
Banks: Concrete block wall

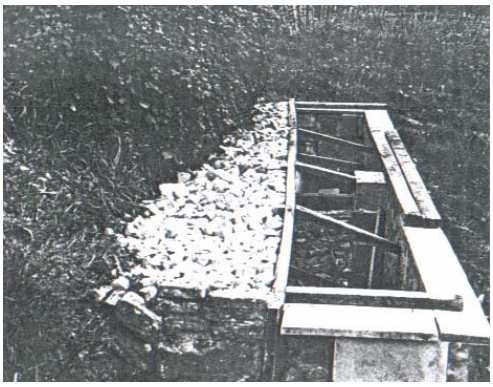
Description

This bank is made with a concrete block wall in front of a sealed rear chamber filled with sandy loam and a roof on top. Water flows to the foot of the wall. This bank was completed in Spring1999.

Construction



(Uttley 1999)



(Uttley 1999)

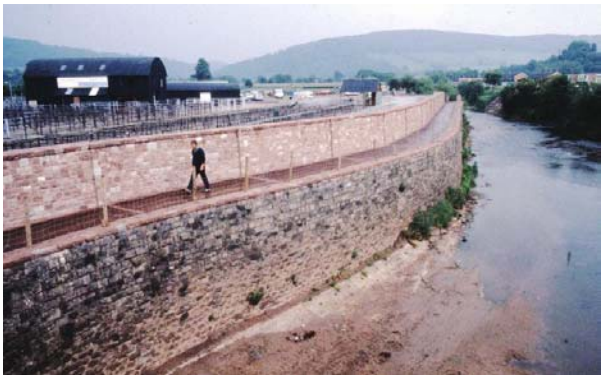
Success

This year there were 73 nesting pairs.

(Uttley 1999)

Stone Retaining wall of the cattle market in Monmouth

Case Study 8



(Crawford 1990)

SITE SUMMARY
Location: Monmouth
Banks: Stone retaining wall

Description

Although not purpose built for sand martins the stone retaining wall of the cattle market in Monmouth has been occupied by several birds. The wall looks out over the river and has four inch diameter clay pipes built into it, and the entire top row of theses were occupied a few Years ago.

(Crawford 1990)

Construction

Stone retaining wall

(Crawford 1990)

Success

Population pressure was such that some sand martins were occupying the lower holes that were only 0.6m above water level.

Kingfishers
Rye Meads Nature Reserve Case Study 1

SITE SUMMARY (Hopkins 2000)

Location: Rye Road, Hoddesdon, Hertfordshire, EN11 0EJ
Grid Reference: TL389103
Banks: Concrete base, soft sand, sharp sand:cement 10:1, reinforced concrete, topsoil.
Designer: Keith Bedford
Site Manager: RSPB

Description

Large artificial bank at the RSPB Reserve. There are a few posts placed in front of the bank for use as perches.

Construction

The bank was constructed on a concrete base 5m length x 150cm breadth x 150cm height. On the back and sides a three course wall of 18" x 9" x 9" blocks was built and the front shuttered. A layer of soft sand was 20cm thick was placed inside the walls and shuttering. This was saturated with water then capped with 5cm of 10:1 sharp sand: cement and left for 2 days. These two layers were repeated twice more, leaving each for 2 days, then topped with reinforced concrete, making 30cm overhang. The top sides and back were covered in topsoil.

See design diagrams in Appendix.

NB: - Usually one pair of Kingfishers here raise three broods each year, occasionally only two broods.

Alana Ecology Brochure **Case Study 2**

Description

A ready made Kingfisher box designed in close consultation with leading bird experts made by Schwegler. This box costs £54.95 (2000 price) and is ideal for sinking into a site. It also has an inspection hatch for checking and cleaning.

Construction

The box is constructed from a concrete wood mixture.

NB.

To find out more information contact: -
Alana Ecology Ltd, The old Primary School, Church Street, Bishop's Castle, Shropshire, SY9 5AE, Tel 01588 630173, Fax 01588630176, E-mail, info@alana-eco.net, Website, www.alana-eco.net.

Hosehill Local Nature Reserve **Case Study 3**
Kingfisher Bank

(Uttley 2000)

SITE SUMMARY
Location: Theale
Banks: turf bank built on log piles

Description

The kingfisher bank was completed in September 2000 and consisted of a turf bank built on log piles. It has a back frame of posts and corrugated sheeting and was infilled with fine loam. It has a sheeting roof and holes drilled into the front structure. There is deep water in front of the bank to deter access.

(Uttley 2000)

Construction

If anyone would like to know how the bank was built they need to contact Brian Uttley (See Contacts list in Appendix).

Top Tips

Do's	Don'ts
Best if bank face drops into fairly deep water. This helps prevent predation, disturbance and colonisation by tall emergent vegetation that can obstruct flight.	Site of bank does not have to have rich local feeding conditions as presence is more likely determined by the presence of a suitable nesting bank.
A minimum of 2m (sand martin) and 1.5m (kingfisher) above the normal water level is preferred for the height of the bank. Steep or vertical stable bank close to water is preferred.	Don't put holes in artificial bank lower than 1m above the normal water level.
Nest hole between 35cm-1m long (sand martin) and 1m in length with a chamber at the end 15-100cm long depending on substrate (kingfisher).	A kingfishers nest site does not have to be next to water as nest sites have been found up to 250m from water.
The favoured pipe diameter for sand martins is 40mm. However bedding 1m lengths of 100mm diameter pipes into a bank constructed from sand and gravel can create a safe and long lasting artificial site.	Don't think that a site is unsuitable because it does not have the best conditions for the species, as sand martins are opportunistic and will use the most unlikely places to nest. Kingfishers are often found nesting in the roots of fallen trees and sandpits.
Spacing between pipes is recommended at 800mm horizontally and 400mm vertically.	The actual extent of the bank may not be critical but the more provided the greater chance that it will be favoured.
Found that half-filled pipes and empty pipes are preferred. Need to make sure that the substrate is soft enough for burrowing.	If no suitable banks are available or can be constructed can use the barrel idea (Case study 4) to provide an artificial nesting site.
Pipes should slope downwards towards the entrance for drainage. (a slope of 1/60 is recommended)	Don't be impatient!! This particularly applies to sand martins, as they may not use the bank in the first year, as they look a year in advance for nesting sites.
Do place perches in front of the bank, as this will help Kingfishers dive for fish and keep an eye out for predators.	

Contact Details

Name	Organisation	Case Study	Address	Telephone number
Alana Ecology	www.alana-eco. net	King-fis her :2	The old primary school Church street Bishops castle Shropshire SY9 5AE	01588630173 info@alana-eco.net
Martyn Aspinall	Rutland Water Nature Reserve	Sand martin: 5	AWBC, Rutland Water Nature Reserve, Egleton, Okeham, Rutland, LE15 8BT	01572 770651
Andrew Crawford	Environment Agency	Sand martin: 8, Mon-mouth	Sentinel House, 9 Wellington Cresent, Fradley Park, Lichfield, Staffordshire, WS13 8RR	01543 444141
Ken Goodrich	Watermead Country park	Sand martin: 6		01162674813 kjgood1532@aol.com
David Webb	Environment Agency		Swift House, Frimley Business Park, Camberley, Surrey, GU16 7SQ	01276 454439 david.webb@environment-agency.gov.uk
Paul Kent	Cardiff County Council	Sand martin: 3	Forest Farm Country Park	02920612213
Nicky Penford	Grampian FWAG (Sand Martin Barrels)	Sand martin: 4	Old Estate Office, Cluny Castle, Sauchen, Inverurie, AB51 7RT	01330 830080 Fax: 01330 830081 grampian@fwag.org.uk
Site Manager	Rye Meads Nature Reserve, RSPB	King-Fisher: 1	Rye Meads Sewage Treatment Works, Standstead Abbotts, Harts, SG12 8JY	01279 793720
Brian Uttley	Hosehill Local Nature Reserve	Sand martin: 7, King-fisher: 3		01189783783

References

Andrews John and Kinsman David (1990) Gravel Pit Restoration for Wildlife A Practical Manual RSPB

Fitter R. S. R. (1945) London's Natural History Collins

Holmes Nigel (1985) Along the river bank Eaglemoss Publications Ltd

RSPB, NRA & the Wildlife Trusts (1994) The New Rivers and Wildlife Handbook RSPB

Standley Peter, Bucknell N.J., Swash Andy and Collins Ian D. (1996) The Birds of Berkshire Berkshire Atlas Group

Sterry Paul & Flegg Jim (1995) A photographic guide to BIRDS of Britain and Europe New Holland (Publishers) Ltd