NESTBOXES

by CHRIS DU FEU

Extracts from British Trust for Ornithology Field Guide Number 23
with some additions and amendments.

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INTRODUCTION

Garden nestboxes have been a source of pleasure and interest for many years, but now these and other artificial nest sites assume greater importance as a means of protecting birds from the pressures of our ways of life. These pressures come from industry, urban development, agricultural practices, dutch elm disease, the great storms of 1987 and 1990, loss of traditional habitat and interference from human leisure interests. Some pressures make life more difficult for the birds in general, others affect nesting sites in particular. The provision of nestboxes can mean the difference between the survival of a species and its loss from a particular area. Even some of our once common species are becoming not-so-common; nestboxes for them could provide the helping hand they need in an environment where holes and cavities are tidied up. There is almost no habitat where artificial nest sites are inappropriate. Even humble garden nestboxes are important, gardens now forming a major habitat in Britain, covering more land area than do nature reserves. In inner cities there are opportunities to encourage Swifts and Kestrels, not just House Sparrows or Starlings. In addition to their direct value for conservation, properly monitored nestboxes can provide a wealth of information vital for the understanding of basic bird biology and population ecology. They can also contribute to monitoring the overall 'health' of our environment and the birds in it. The chapter Inspection and Recording gives more details of some of the BTO's population monitoring schemes.

The definition of a nestbox taken in this book is very broad. It includes any artificial device constructed with the express purpose of attracting birds to nest. This includes rafts for wildfowl and terns, tunnels for Wheatears, Kingfishers and Sand Martins as well as conventional boxes for Robins, Wrens and Blue Tits. This book does not list all the artefacts which have been used by nesting birds - such things include narrow drain pipes for Great Tits, overcoat pockets in garden sheds for Robins, lorries and cars for Pied Wagtails and even a human skull for Wrens. Instead the book concentrates on good practical designs. A good design is one which has as many of the following attributes as possible. Birds must accept and use the box successfully and produce broods of healthy young. It must be secure from predators and weatherproof. It should be simple and cheap to construct and maintain, convenient to inspect and durable.

Dimensions of boxes need not be measured to the nearest millimetre. If birds were so selective that they took only nest sites of such precise dimensions then there would be insufficient natural sites, making life impossibly hard. Birds are opportunists and may take any of a wide range of nest sites. Our aim must be to ensure that the sites we provide are as suitable and safe as possible. There is no ideal design for a species because the requirements depend on local conditions such as climate, predators, competing species, materials available and the preferences of the population in the area. Nest site preferences differ from one area to another. In some parts, for example, Tawny Owls may use the chimney nestbox design exclusively whilst elsewhere they will only take a more conventional large hole entrance box. For these reasons this book is not dogmatic about the right design, but it does give general principles to be followed for success. There is still plenty of room for experimentation in nestbox design, siting and defence against predators.

There are many opportunities for large scale nestbox schemes. These may either use many assorted boxes in a small area such as a garden or local nature reserve, or more widely spread boxes of a single design aimed at attracting only a particular species or group. In all cases landowners' assistance will be vital and every effort must be made in keeping them in touch with events. Anecdotes and information about nesting success help stimulate interest. Bird ringers should pass on details of numbers ringed and of those found again. Some recorders produce annual newsletters to keep landowners and helpers informed and enthusiastic. The interest created leads to increased assistance and can turn a former persecutor into a keen conservationist. The tangible benefits of contacts with landowners include help with materials, transport and equipment like long ladders and rope. The intangible benefits to conservation are also great. People not directly involved are often most helpful in supplying materials once their interest has been aroused. Various organisations will provide help with nestbox schemes - these include local councils, industry and charities as well as the

county naturalists' trusts. Schools can be involved too. With the current emphasis on project work in schools, well directed work can be of benefit to the birds as well as to the students. Nestboxes are fairly straightforward to produce and it is often possible to use local non-ornithological talent to make them. One county wildlife trust, for example, uses owl boxes produced by inmates at a local prison. Many nature reserves operate sponsored nestbox schemes. This is a sound way of raising funds, providing bird nest sites and creating interest in bird life.

Nestboxes are not always used immediately after they have been put up. This has disappointed many a garden nestbox owner (a typical suburban Blue Tit territory might cover 10 or more gardens). Perseverance is essential. Birds will learn the nestbox habit and eventually local populations can become reliable box users. This learning process may take time. The prize for endurance must go to the Scottish Goldeneye nestbox team who waited 15 years for success, but now have established a secure British breeding population of these attractive ducks. If your box does not attract a Blue Tit to nest it is still not a wasted box. Birds will use boxes for roosting in during cold weather and can help them survive the harshest conditions - there are records of over 50 Wrens roosting in a single box. The box which provides a home for no wildlife whatsoever is exceptional. Bats, hedgehogs, mice, moths, bees, spiders, slugs and many others welcome a safe hiding place.

This document is split into two major sections - Designs and Species Notes. The design section does not give precise dimensions, but only general outlines to be adapted according to species and materials available. Species Notes gives particular details for each species and refers back to the design section. The two sections are preceded and followed by general instructions and other related matters.

This document and web site will not be the last word on nestboxes. Like its printed predecessors it has depended on the many contributions from BTO members and others. The BTO welcomes further ideas, designs or knowledge to add to a future edition. Any ideas or additional information should be sent to the Nest Records Officer at the BTO.

GENERAL INSTRUCTIONS

Any exceptions to the following instructions are detailed under Species Notes.

DIMENSIONS

Apart from entrance hole sizes, dimensions are not critical for most boxes. In the following notes and under Species Notes the broad categories below are used to describe the size of boxes and height of mounting.

Size	**Base** (mm x mm)	**Height** (mm)
Very Small	80 x 80	80
Small	100 x 100	150
Medium	130 x 130	200
Large	200 x 200	450
Very Large	250 x 250	600

Mounting Height	
Low	about waist to head height
Medium	chest height to about 5 m.
High	around 5m. and above

MATERIALS AND TOOLS

Wood is the best material for making nestboxes, but can be expensive. For large scale construction of boxes it is better to obtain wood from sources such as scrap heaps belonging to timber merchants or sawmills. Many companies throw out pallets and packing cases. These provide very useful wood, although dismantling them efficiently takes practice and care. Second-hand timber such as old floorboards can be obtained cheaply but beware of nails. Coastal dwellers may be able to use driftwood including fish boxes or

packing cases which are almost ready-made to use as nestboxes. Wood under 15mm thick may warp, will not provide enough insulation and will become waterlogged too easily. Almost any type of wood will do. Softwood is easier to work, hardwood longer lasting. Cedar is very long lasting, birch is not. Dimensions of nestboxes are generally not critical and it is easier, cheaper and more effective to make boxes according to wood available rather than to adhere slavishly to precise dimensions.
Other useful materials which may be obtained free include sawdust, oil drums, binder twine, car tyres, tractor inner tubes and various bits of piping. Local firms will often be very helpful with a nestbox project if they receive even minimal acknowledgement or publicity.
Materials other than wood have been used for nestboxes. However metal suffers from condensation and is a poor insulator. Boxes made completely from plastic will also suffer condensation, but those with at least some wood components have been found to be satisfactory. Some workers use recycled plastic board for roofs only. This has the advantage of being waterproof and durable and also keeps rain off the wooden parts of the box. Others use thick walled gas pipes for the body of the box with a wooden roof and floor. It is best to use more natural coloured plastics because bright colours will attract unwanted human attention.
Manufactured interior boards such as chipboard are only suitable for boxes located under shelter e.g. Barn Owl or Swift boxes. Marine or exterior plywood (WBP) can be used in any situation. Both are very long lasting but expensive. Other materials such as sawdust/cement and papier-mâché are mentioned in connection with specific types of boxes. This list of materials is not exhaustive. Keen conservationists will often find sources of good, cheap or free, unconventional materials - use them.
For most small boxes only basic woodworking tools are needed. If you intend to make many boxes of different sizes it is worth buying an adjustable drill bit for a hand brace or an electric drill attachment with several different circular cutting blades. A most useful size of drill bit is 28mm ($1^1/_8$") which will make holes large enough for tits but too small for sparrows. This bit is the size used for cutting Yale lock holes in doors.

CONSTRUCTION OF WOODEN BOXES

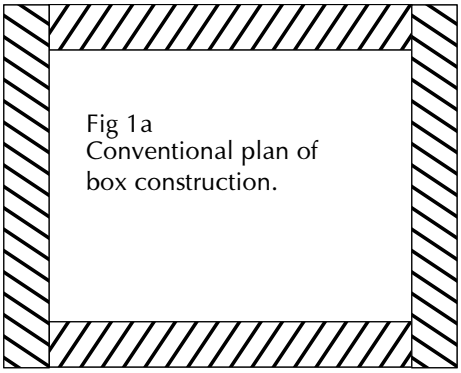


Fig 1a
Conventional plan of box construction.

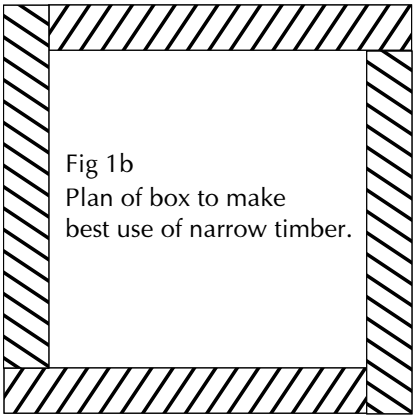


Fig 1b
Plan of box to make best use of narrow timber.

The plans in this and the Designs section do not give exact dimensions and should be modified according to materials available. The dimensions required for particular species are given under Species Notes.
Where possible the grain of wood should be vertical to help rain water drain quickly. Mount the floor just above the lowest point of the side panels to make water drip off the sides rather than seep into the end grain of the wooden base. Where possible avoid exposed horizontal end grain. If your woodworking is so good that the floor meets the walls in watertight joints, drill small drainage holes because any water which gets inside must be able to drain away.
When two pieces of wood are to be joined along their length they may be tongued and grooved, rebated or joined with an inside lining piece to stop wind and rain entering.
Wood may be fixed with nails or screws. Nails are much easier and cheaper. In wetter parts of the country and damp situations it is essential to use galvanized nails or brass screws. Wire nails will rust within a very few years. Top and side joints should be sealed with waterproof glue in wet areas but never rely on glue alone for joints.
Boxes need not have a symmetrical horizontal cross section (Fig 1a) - if very wide wood is not available, narrower wood arranged as shown (Fig 1b) is quite acceptable to the birds. When using plywood never screw or nail along laminations, only perpendicular to them.
Boxes should have a means of easy access for inspection and

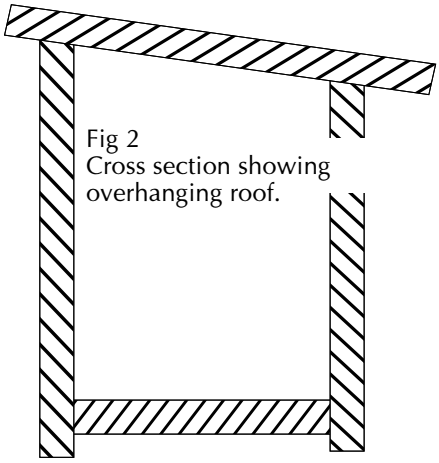


Fig 2
Cross section showing overhanging roof.

cleaning. Apart from the interest provided by observing the progress of a nest, boxes can provide valuable information (preferably to be submitted to the British Trust for Ornithology Nest Record Scheme - see Inspection and Recording). Access may be through a hinged or removable roof or through an opening front. The cheapest hinges are of old tyre inner tubes which also provide sealing from elements and are easy to fit. Hinges with any steel parts will soon rust. Brass hinges are excellent but expensive. Boxes with removable roofs are easier to inspect than those with hinged ones. This is important where many boxes are to be inspected regularly. Removable roofs also allow an overhang on all four sides (Fig 2). This helps to protect the box from sun and rain. Roofs with a flange around the rim (Fig 3) which fits over the top of the box, biscuit tin fashion, are the most waterproof. For extra rainproofing you can cover the roof with felt, vinolay or rubber from old inner tubes. Large boxes in particular will benefit from professional felting techniques - a blowlamp etc. Roofs may be fixed securely using hooks and eyes, loose fitting nails used as locating pins or by gravity (use a heavy stone) according to taste and circumstances. Simple catches can be made of three staples - two on the box, one on the lid - and a locking nail or using wire wrapped round a nail. It is a matter of personal preference whether you use top or front opening boxes. Front openings allow a more waterproof roof, but can be more draughty lower down the box. In general perches are a hazardous feature on all small and medium sized boxes and should not be fitted. They are not needed by birds (with some exceptions given under Species Notes) but do provide a foothold for predators.

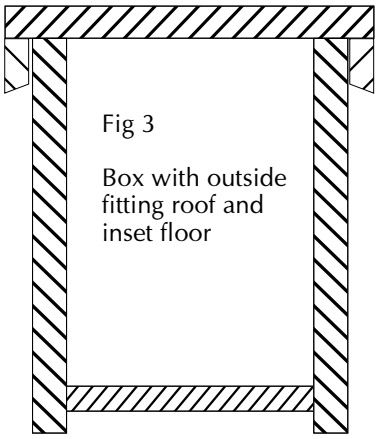


Fig 3

Box with outside fitting roof and inset floor

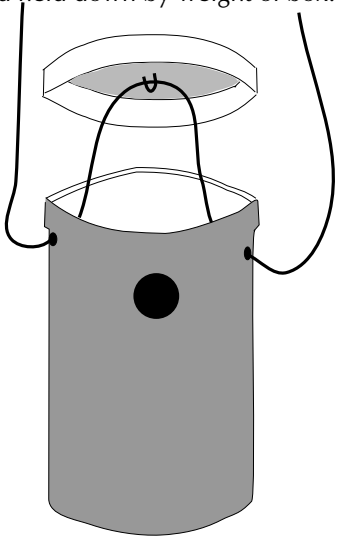
Very large boxes can be reinforced with a jacket of wire netting. This will both hold the joints tightly and prevent warping. Such boxes are often difficult and expensive to make and difficult to erect. It is well worth spending extra time and money to ensure that they last as long as possible.

CONSTRUCTION OF OTHER BOXES

Sawdust/Cement

Many designs of boxes can be made with this mixture. It has the advantages of being fairly predator-proof and of being easy for use in mass production. The disadvantages include the potential difficulty of making the initial mould. The sawdust/cement mixture can be sawn, screwed or nailed once it has set and hardened although initial attempts with these boxes often end in a heap of fragments. The material is suitable for House Martin and Swallow boxes, free hanging tit boxes and many other designs. This material is widely used on the continent for factory, rather than home, produced boxes. Production of these boxes requires practice.

Fig 4
Sawdust/cement box hanging from tree showing lid held down by weight of box.



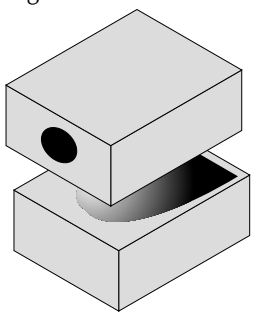
Method. Make a mould from wood or plastic. Soak fine sawdust overnight in a solution containing a wetting agent (any not too frothy detergent). Squeeze surplus moisture out of the sawdust and allow it to dry. Mix the dried sawdust with fresh cement in the proportions 1:3½ by volume cement:sawdust. Add water to make a fairly wet mixture. The mould should be wetted with a strong soap or detergent solution. Pour the mixture into the mould, press down very firmly and allow to dry. Fittings (hooks, locking tabs etc.) to the box may be attached using a strong adhesive. Fittings should be of a rust-proof material. It is essential that the sawdust is thoroughly wetted and that the mixture is very firmly pressed

into the mould. Failure to ensure these two details will make a porous box which cracks when exposed to frost - if not before! A hanging tit box with the lid held on by the weight of the box is illustrated (Fig 4). Alternatively the box can be made with an opening front. Sawdust/cement boxes, made in Germany are now widely available in the UK. Some other German boxes are made from a mixture called Eternit. It seems that these may suffer from high infestation by parasites.

Fibreglass

Fibreglass can be used in a similar way to sawdust/cement. Its main disadvantage is that of cost but it has been used successfully for Kingfisher boxes. Mix some sawdust with the resin to give a roughened inner surface the the box.

Fig 5 Precast blocks

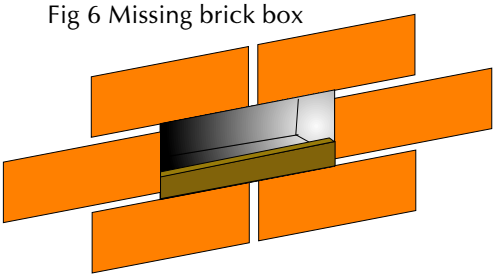


Built-in boxes

Many domestic, commercial and industrial buildings provide suitable sites for built-in boxes. The scope is great. For example some road bridges now incorporate built-in sites for Swallows and Swifts. It is easiest to install boxes during building, although this is not always convenient. Two methods are possible.

The first method involves having a box inside the building with access through a hole in the wall. Swift boxes are of this type. The same technique has been used with ground level entrances for Puffins. Such boxes are very useful for regular observations if fitted with a window and blackout. With indoor boxes it is important to ensure that they are as insect proof as possible, and that cleaning out is done thoroughly late each autumn with a vacuum cleaner. In order to prevent contamination with Salmonella, boxes which are placed inside barns and other such buildings used for storing food must not allow the birds to come into contact with the foodstuffs.

Fig 6 Missing brick box



The second method is to have the nestbox as an integral part of a wall building block (Fig 5). This may require concrete blocks precast in two sections. The lower section contains the nest bowl and the upper the entrance. The upper block should not be cemented in place to allow for inspection. These boxes are of particular value to urban birds and may be set in walls at any height. A 'box' for Spotted Flycatcher (or perhaps Pied Wagtail, Robin or even Black Redstart) consists of a missing brick in a wall, preferably with a very low retaining lip along the front edge (Fig 6).

Several companies now produce ready made building blocks and tiles with integral nest chambers. One design is of a polymerised concrete box which is exactly three brick courses high and half a brick wide. The removable top part of the front allows for inspection and cleaning, or it may just be left off to provide a site for Spotted Flycatchers or Robins. These boxes may also be mounted on existing walls rather than being built into new walls. It is hoped that these will become a common extra to new suburban and rural houses.

Papier Mâché

This material is suitable for House Martin boxes. In making a conventional mixture, use waterproof glue. Place the mixture around a plaster of Paris or other suitable mould and allow to dry. Use galvanized metal fittings and put these in place whilst the mixture is being put over the mould. The dried box can be coated with mud-coloured waterproof paint to aid durability. Boxes may also be made using strips of newspaper glued over a mould with waterproof glue in the manner that puppets are made in school. The stages in construction are fully described and illustrated in the The BTO Nestbox Guide (2004).

Rustic Boxes

There is no evidence that these boxes are taken in preference to any other type (except by humans). Their disadvantages include difficulty of construction. Many garden centre rustic boxes (thatched roof, integral

feeding table etc.) are of fundamentally bad design. Other faults include the perch, an over-large hole set too low down, a fixed roof not allowing cleaning and small size. There are two basic techniques for rustic boxes. The first involves boring a hole down through the centre of a log, then fitting base and roof. This is very time consuming, and often leads to unsatisfactory results with leaky joints. The second technique is to split a log longitudinally into four sectors and remove the apex of each sector, effectively removing the heartwood. Reassemble the four remaining pieces, binding them together tightly. These boxes are easier to make but even less weather proof than the former type. Birch, often used for these boxes because of its attractive bark, rots quickly. A good compromise is to use planks cut from the edge of logs with one flat and one rounded face. These are often thrown out by manufacturers and are easily obtainable.

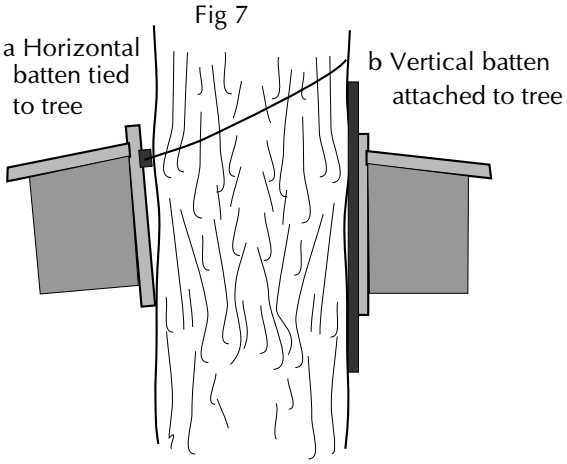
Plastic

A variety of plastic designs is available. Many are ingenious or attractive but are of limited use to birds. Thin plastic offers little protection from the heat of the sun and is no protection against grey squirrels. Heavy reclaimed plastic has been used by some people for parts of boxes - either the roof or the sides. However other people report that such boxes have a lower take-up rate than wooden boxes and that the nests become wet with condensation. Large, thick-walled plastic barrels have been successfully used for owls and Stock Doves. Such barrels must have adequate drainage holes.

Others

Large boxes such as rafts or platforms in water will need a professional standard of work in order to endure severe environmental conditions, their own weight (including gravel etc.) and the weight of occupants including perhaps bird ringers. This work may involve welding in the case of steel girder framed types. No aspect of construction should be skimped as avian or human casualties may result.

FIXING



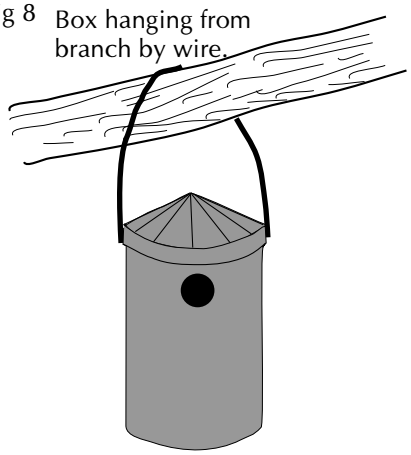
There are many ways to fix boxes. Use the ones which suit you best. A horizontal (Fig 7a) or vertical (Fig 7b) batten may be attached to the back of the box and then fixed to a tree or wall. The batten keeps the box away from the mounting surface and prevents water from running into the box. The batten must be fixed securely to the box. Use screws, safety nails or long nails bent over.

There is no absolutely reliable way of fixing boxes to living trees. If nails or pegs are used they may be gradually pushed out of the tree as it grows. Since the time of greatest growth is in the nesting season there is the danger that the box falls with a nest inside. Nailed boxes must be checked annually. Screws can be used and slackened off a little each year, but this also means annual attention. Nails or screws damage trees and should be avoided on timber with commercial value. Nylon, copper, aluminium, brass and hardwood nails can be obtained which will not damage the woodman's chain-saw (also preventing accidents to the woodman). Steel screws or nails must not be used as they rust quickly and become impossible to remove or adjust. If boxes are to be screwed to trees, select the hard wood ones because screws become very difficult to move in softer trees like sycamore. If you are putting up boxes on other people's property, ensure you have the landowner's agreement about the method of fixing to be used. Boxes may be nailed to trees provided that hardwood battens are used. Holes through the battens should be drilled to fit the nails snugly. Nails used should have flat and circular rather than oval or tapered heads. With this arrangement, as the trees grow, the nails will move out with the batten rather than being pulled through the batten. If you use this method, ensure nails are taken out when boxes are taken down. Do not use nails where there is any possibility of trees being used as commercial timber.

Boxes may be tied using wire (army surplus telephone cable is cheap), robust rubber bands or synthetic twine. Wire needs regular checking to ensure it does not constrict tree growth. Rubber bands (cut from large inner tubes) need checking to ensure they have not perished, but they do allow the tree to grow. Polypropylene binder twine has some elasticity and may be long lasting although some binder twine is now bio-degradable and does not last more than a year or two. Boxes may be loosely tied, the twine making an angle of 30° or so upwards from them. To allow for growth merely edge the box upwards a few centimetres a year. The twine will probably last as long as the box, is relatively cheap and easy to use. Like boxes secured by nails or screws, tied boxes need annual attention. Even twine can kill a tree by strangulation. Plastic covered extendable curtain wire allows the tree to grow, but it is expensive and only suitable for small boxes.

It is possible in some situations to wedge boxes firmly in tree forks without nailing or tying. Some large nesting platforms are probably best fixed in this way, resting on a horizontal fork and jammed into position. This method is illustrated under Chimney Boxes. Larger boxes for Kestrels, wildfowl or owls may be mounted on poles.

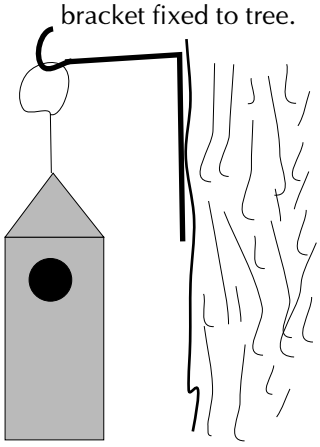
Fig 8 Box hanging from branch by wire.



It is not essential to fix boxes rigidly (although most are), indeed boxes may hang freely attached only by a wire (Fig 8). This will help keep off predators, particularly if the wire is greasy or if it runs through a circular baffle plate, but such boxes may be more obvious to curious humans. Some workers have suspended boxes from brackets or small branches cut down to stumps a few centimetres in length (Fig 9). These boxes are inspected by lifting them down from the hook formed by the stump using a long pole. There is no reason (other than tradition) why boxes for small birds should not be made like miniature chimney boxes to simulate hollow boughs.

Large boxes will need heavier fixing gear. This can include pipe fixing brackets where boxes are to be attached to suitable posts or girders. Modern synthetic ropes can be used in places as they have the advantage of having some stretch in them. When fixing large boxes, block and tackle are useful. A team of at least two people should be employed - not only for ease of operation but also in case of accidents in remote places.

Fig 9
Box hanging from bracket fixed to tree.



In places where boxes are to be inspected regularly a method of fixing which allows easy removal for repairs or relocation is important. In places where boxes are not to be inspected, the method of fixing must allow the tree to grow.

PRESERVATIVES AND MAINTENANCE

Any wood preservative helps prolong box life. Many non-toxic, water-based preservatives are now available. Traditional oil-based preservatives, such as creosote, even where they can still be purchased are not recommended because of the potentially toxic properties. Whatever preservative is used, ensure the boxes have dried before they are put in place so that birds' feathers are not fouled by wet residue. Do not treat the insides of boxes because the long term effects of preservatives, if any, on birds are not known. Boxes can be camouflaged to some extent by treating with preservatives in two colours.

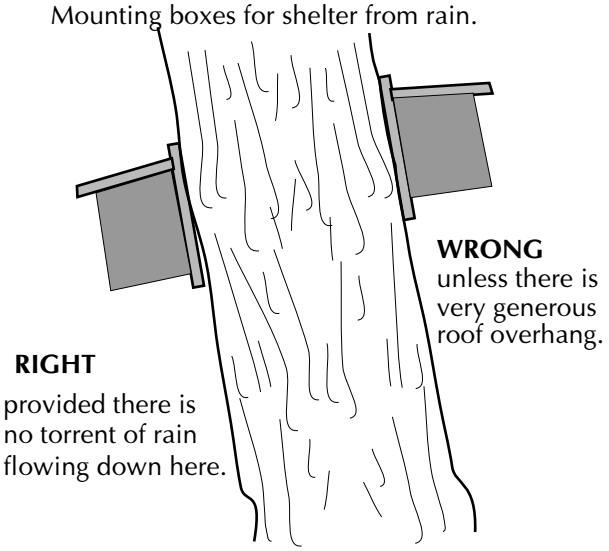
Minor repairs can often be done on the spot. A kit consisting of hammer, pincers, nails, string and rubber, formica or metal patches is adequate for many jobs including dealing with holes enlarged by squirrels. Major repairs are best done by putting up new boxes and taking the damaged ones for repair in a workshop. In places where grey squirrel or woodpecker damage is frequent, it will pay to reinforce the entrance with sheet metal before the box is put up or to enclose the box with a jacket of chicken wire.

All boxes should be cleaned annually. Owl, Swift, hirundine and tit nests are generally heavily infested with

various parasites and must be cleaned by the autumn. Allow 2 or 3 weeks after fledging before cleaning to ensure not to disrupt a possible second brood. If you delouse boxes use a dry short lived natural based insecticide such as pyrethrum powder. Leave a layer of soft material like wood shavings, bark chippings or even polystyrene packing chips in large boxes. Sawdust is not particularly good for lining the bottom of large boxes, as it will clog the drainage holes and when wet is too hard to be workable by the birds. Renew polystyrene foam in excavatable boxes aimed at woodpeckers or Willow Tits in the winter or early spring. Check all boxes in late winter to make any necessary repairs before the breeding season.
Rafts, islands and artificial banks will need annual overhauls or checks. Early spring is the best time once the worst winter weather is past. Rafts which are not needed for winter roosting may be brought ashore for the winter to avoid undue storm and bird dropping damage.

LOCATION

Fig 10
Mounting boxes for shelter from rain.



The direction that the box faces makes little difference provided that it is sheltered from prevailing wind, rain and strong sunlight. The sector from north through east to south east is possibly the most favourable but in shady woodland other considerations like slope of the trunk will override that of direction. Keep boxes away from the wet side of a tree trunk where the rain water flows down in a torrent (Fig 10). It is usually possible to see where the rain water runs down the trunk from the growth of green algae, but if in doubt wait for rain. To give additional shelter to the entrance of small boxes, angle them forwards slightly particularly if the nestbox roof has little overhang. Larger open boxes should be mounted tilted slightly upwards so that the nest rests naturally in the rearmost part of the box. If possible locate away from predators (this may be impossible in many cases, weasels for example can climb almost anything, but boxes in gardens can be placed where cats cannot climb). Prickly or thorny bushes make good sites although inspection can sometimes be hazardous. For many species the height of the box is not important (Species notes give more detailed guidance). It may range from 1m upwards and will depend on ease of inspection, visibility etc. Boxes high on tree trunks are less easy to reach by marauding humans, but may be more visible than lower boxes concealed in the shrub layer of a wood. Except for species which, like Treecreeper, walk into the nestbox the hole entrance must be clear enough from the trunk to allow a convenient flight path in.
The density of boxes depends on the habitat and species involved. A good plan is to begin with a few boxes more or less uniformly spaced, and keep adding until it is clear that lack of nest sites is no longer limiting the population. About ten assorted small boxes to the hectare is a typical density. Colonial species may nest very densely, but in this case try and make all the boxes appear different from each other - a column of identical nestboxes mounted on a telegraph pole would be a recipe for total confusion. Place nestboxes at different height, on different trees and facing in different directions. For non-colonial species, do not put boxes up at such a density that they encourage aggressive behaviour between over close neighbours. For bird population studies, an excess of boxes is desirable although it is generally not possible to have 100% of the population using boxes. For most species 50% of the population using boxes is a high success rate. If you find most of your boxes are occupied successfully you should put up more boxes.
Boxes are often successful in attracting large numbers of birds of many species when placed near the boundaries between habitats, in a mosaic of habitats or in small isolated habitats. Such places include woodland edges or rides, along hedgerows, small copses, along stream sides and in isolated trees.
Garden nestboxes should never be placed adjacent to bird tables or other feeding devices. Large numbers of

feeding birds will disturb potential nesting pairs and attract predators. 'Attractive' garden centre type boxes with integral bird table should be avoided.
The best time to put up boxes is as soon as they are available. Birds may use them at any time of the year for roosting if not nesting. Some birds may need to select nesting sites very early (e.g. during early autumn by Tree Sparrows, and mid-winter by Tawny Owls) so even boxes put up in summer will not be wasted. Occasionally boxes are not used for several years after siting. It may be worth resiting smaller boxes after three or four years, larger ones after six or more years.
Nestboxes are obviously most urgently needed in places where natural holes are scarce but food is plentiful. Places include managed woodland where mature trees are cropped and dead wood removed, farmland with tall trees removed from hedges and old buildings cleared, young forestry plantations and many gardens. With larger boxes for species under threat, such as Barn Owl, make a thorough survey of the area first. Obtain the landowner's permission and encourage his on-site support. Boxes in the vicinity of recently occupied sites may be successful in helping to expand the range of a species locally. Boxes close to a threatened used site (like a dead tree or derelict barn possibly due for removal) may help to keep a species in the area. Large boxes are very visible to humans and so should be sited carefully. It is better not to put up a box, rather than to have birds' eggs being stolen year after year. All birds are protected by law, but some rare or threatened species (on a list called Schedule 1) have special provisions. It is illegal to inspect nests of these birds without a government licence. The Appendix gives more information about obtaining licences.
Take care with ladders. The safest and most useful type is a lightweight alloy extendable ladder with splayed feet for stability. Always have a second person to steady any but the shortest of ladders. An extra C-shaped top rung will make the ladder more stable when leaning on small diameter tree trunks.
Any operations involving large numbers of boxes or large and heavy structures require much time and manpower. Time consuming problems can arise in the field. Thorough planning will go some way to avoiding them. Survey the area in winter when lack of leaf cover makes work easier. Time spent in devising efficient methods will be amply rewarded later in the field. Check-lists of equipment and materials needed are useful. Perhaps simulate the operation with model 'boxes' (e.g. Lego pieces placed on a large map of the site) before embarking on the real thing. It is easier to move wrongly placed models on a map than real ones in the field. Note problems which occur in order to be prepared for next year.

SAFETY

Many activities concerned with nestboxes are potentially hazardous - even the apparently simple act of nailing a tit box to a house wall. It is impossible to list all precautions which should be taken, but the notes below highlight some points.
Be familiar with the safe working practice for any tool which you use, and do not use implements, particularly power tools, for purposes for which they are not intended. Wear protective glasses when using masonry nails (or inspecting owl boxes). Do not use power-saws on reclaimed wood where there is any possibility of striking a nail. Beware of electricity whether it is in an overhead wire under which you are carrying an aluminium ladder or an unprotected wire in the garden shed to which you are nailing a nestbox. Ensure ladders are secure before you climb them. Be particularly careful of ladders against thin trees or ladders resting on branches projecting from the main trunk of trees. It is possible to go on tree climbing courses should you need to scale high trees. You should not take part in any activity on cliffs without full training and safety gear. If you are working with rafts or islands be careful not to overload boats or of working from a small unstable boat. Wear a life-jacket for deep water work. For any of these activities at least two workers are better than one.
Whenever we are working with birds we always make safety of the birds paramount. However, the long term interests of birds will not be well served by unsafe activities of nestboxers. An injured or dead nestbox enthusiast cannot do much for the birds, and sadly accidents of such gravity have occurred. **The BTO can accept no liability for any accidents that occur to fieldworkers who use the Nestboxes guide as a basis for their work. Please do not risk injury to yourself. No amount of nestboxing or fieldwork is worth an accident.**

DESIGNS

The BTO Nestbox Guide gives full instructions for construction of conventional hole-entrance and open-fronted boxes. The instructions for these standard designs are not repeated here. Less conventional designs are described in full. Dimensions required for particular species are given in the diagrams in Species Notes. On any one page of illustrations the scale may vary from one diagram to another. The illustrations serve to give an overall idea of the design and to highlight particular design features.

CHIMNEY BOXES

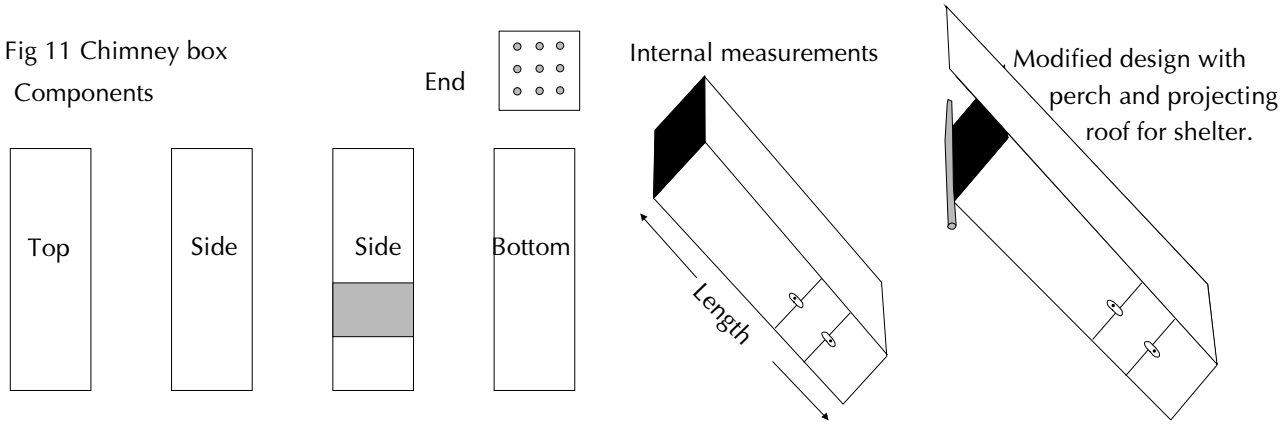
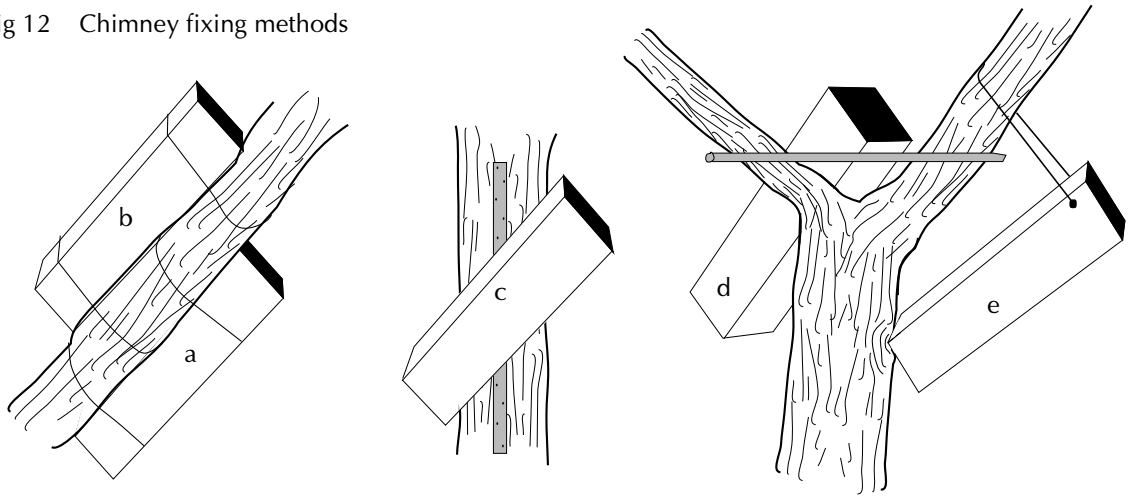


Fig 11 Chimney box

This box was designed specifically for Tawny Owls but has also been used by other species including Kestrel, Stock Dove, Robin, Great Tit, Jackdaw and Starling.

The box has a more or less square cross section, is open at one end and closed at the other. It is generally mounted at an angle of about 45° to horizontal although the angle is not critical. The base, which may be of wood or metal, must have adequate drainage holes since some rain will invariably enter the box. The floor should be covered with bark chippings or similar before use. The upwards facing joints between panels must be waterproof. If in doubt, use roofing felt. The box is very deep so inspection will be through a hatch, preferably in one side. The hatch should be at least 20cm. above the floor to prevent eggs or young falling out. Any method of locking the hatch is acceptable, the wooden turn-buttons illustrated are as convenient as any. The uppermost side can be extended forwards to provide additional shelter against rain. A two or tree centimetre diameter branch fixed across the bottom of the entrance will provide a landing perch (Fig 11). Remote inspection may be through a mirror permanently clamped to an arm fixed at the entrance.

Fig 12 Chimney fixing methods

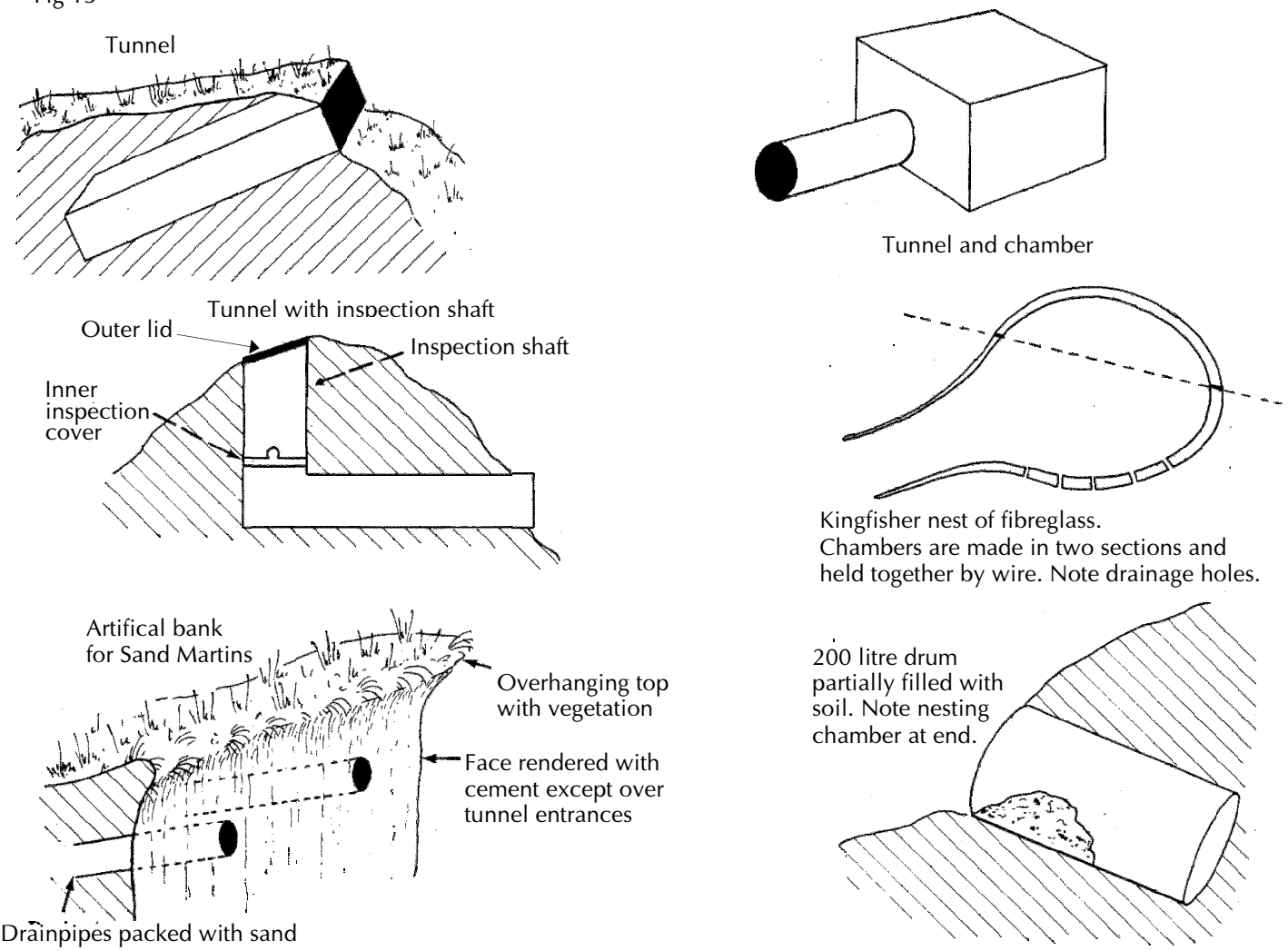


Chimney boxes may be fixed in a number of ways. They may be secured either under (Fig 12a) or over (Fig 12b) an existing branch by wire but remember to loosen the wires each season. They can be fixed using a

batten firmly screwed along one side of the box at 45° to the end and screwed to a vertical tree trunk (Fig 12c). They may have a long batten screwed across the top end of one side then wedged into a suitable fork in the tree (Fig 12d). In this case the batten may not need securing to the tree, the box being held firmly by gravity. Finally they may be fixed at 45° to the trunk of a tree using two wire stays and by pegging the bottom of the box to the trunk (Fig 12e). This simulates a broken off and hollowed branch.

TUNNELS

Fig 13



Tunnels are boxes sited on or under ground, with or without a larger nesting chamber at one end. They may be used by a wide variety of birds including Storm Petrel, Puffin, Shelduck, Kingfisher, and Wheatear, The dimensions given are the cross-section and length of the tunnel, and floor area and height of the chamber. Wood can be used for construction, but often other materials are more convenient or better. These include bricks and flat stones, drainage pipes, driftwood and turf. Tunnels should in most cases be covered with local materials, e.g. a stone cairn on a shingle beach, or built into a natural or artificial bank. They should slope upwards gently from the entrance to allow for drainage, particularly if the floor is waterproof.
Tunnels can be made of concrete or fibreglass sections formed in a suitably shaped mould. The advantage of these over ready-made clay pipes is that the cross section can be made exactly as required rather than circular only.
Some species, such as Kingfisher and Sand Martin, excavate holes. For them, tunnels should be made and softly packed with local materials leaving only a very short section unfilled at the entrance.
Inspection, where feasible, may be through a hatch in the far end of the tunnel or in the nesting chamber. Access to the hatch will be through the covering material. Clean non-inspectable tunnels annually with a long hook.

Tunnels need not have integral floors, though small tunnels are safer with them. Tunnels should have a layer of local material like shingle over the floor.
Many species using tunnels may undertake excavation themselves beyond the limits of the artificial tunnel provided. It is, therefore important that the nesting chamber roof does not collapse if such excavation takes place. Even for smaller species such as Kingfisher and Sand Martin a 60cm square paving slab, supported firmly around its edges should be used. Pack the hole below with natural material leaving just a normal sized nest chamber to start with. If you need to inspect the nest, the paving slab will need a central access hole.
The entrance to tunnels is usually of the same cross-section as the rest of the tunnel, but a few species such as Wheatear require smaller entrances. This may be arranged either by providing the tunnel an end with a hole bored in it, or more easily by partially blocking the entrance with stone. The shape of the cross-section of the tunnel is often not important. Round pipes will do as well as square wooden tunnels.
Predators can be a particular problem with boxes at ground level. The only precautions (other than those mentioned in Pests and Predators) that can be taken are to peg down smaller boxes firmly and to incorporate a mat of barbed wire in the outer burden above the nest chamber. This will secure them against uprooting by foxes or dogs. There have been some reports of predators breaking into floorless tunnels from below. If this is a problem, embed wire mesh in the soil a little under the tunnel.

RAFTS

Rafts and islands provide nest sites for a variety of species including various divers, grebes, ducks, geese and swans. They are relatively safe from predators and are useful on waters where the banks are over-disturbed by fishing etc, but the rest of the water is undisturbed, or where the banks are of inhospitable concrete. In addition to the target species many casuals have nested in the vegetation growing on rafts. These include, for example, Moorhen, Sedge Warbler and Reed Bunting. Gravel extraction companies may be persuaded to provide materials and labour for rafts which are to be sited on flooded gravel pits; local councils or naturalists trusts may do the same for rafts on reservoirs. The same spectrum of species use rafts as use islands. Islands are harder to construct but do last very much longer than rafts. Rafts are most useful in deep water or water whose level varies, otherwise islands may be preferable. Raft designs vary widely depending on materials and skills available as well as the target species. The RSPB River and Wildlife Handbook gives many more ideas and details.
The basic sequence in raft construction is:

1 Construct frame.
2 Add platform, floats and fittings
3 Add soil/gravel/ballast until the raft floats at the correct level
4 Anchor on station

Frame

Four railway sleepers or telegraph poles bolted together in a square with less substantial timbers laid across this frame to provide support for the decking will make a serviceable base. Smaller rafts will need correspondingly smaller timbers. If angle girders, welding equipment and skills are available, use them.

Platform

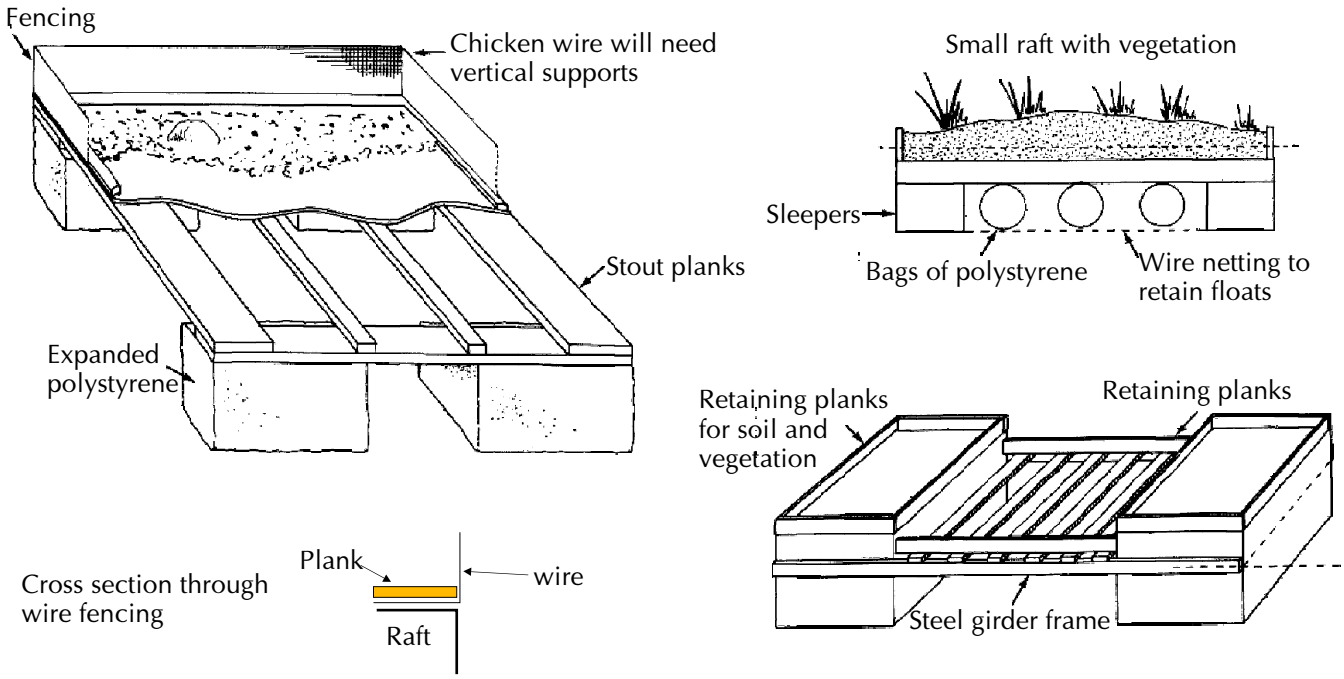
This will depend on the type of raft. For rafts to hold vegetation some wire mesh or gridweld provides the best base. This will allow water access to the roots of the plants but will need a strong supporting frame below. For rafts without vegetation, use a wooden platform. Marine ply is the best material, but any sheets of wood will do. Even old doors will last a season or two. Ensure that there are no small gaps between boards through which young birds might fall.

Floats

Welded steel tanks make the best floats, but these are not easily available and will require professional skills to incorporate them into the raft structure. With large rectangular tanks the top surface can be used as the

platform. In this case it will need a high lip added to retain soil, and arrangements may be made for watering the soil. Once plants are established, rain water will probably be adequate. A raft consisting of a single large tank will be over-buoyant and may be unstable unless adequately weighted below.
Other floats are cheaply available from scrap heaps and building sites. These include:
Polystyrene blocks. These may deteriorate in very rough conditions but are otherwise long lasting and easy to attach. They are held underneath the raft by gravity and a few long pegs through the frame and block to stop sideways movement. Some smaller rafts have used floats of bits of polystyrene enclosed in netting, or enclosed between the platform and netting stretched underneath the frame.
200 litre drums. Metal drums rust quickly and need replacing frequently but are fairly easy to obtain. Plastic drums may become brittle in winter but are valuable in the short term. If you rely on hollow air filled floats of any sort, ensure you have some insurance against puncturing. Floats can be filled with polystyrene before sealing, for example. Using many small containers rather than one or two large ones as floats reduces the risk of sudden catastrophic failure because of puncturing.

Fig 14



Fittings

All rafts need arrangements for mooring. These can be two steel rings fixed to opposite corners of the raft. Rafts with vegetation (for divers, grebes, wildfowl and rails) need retaining walls. Logs or planks will do, but there must be easy access from the water to the raft. If the raft eventually floats with much freeboard then there should be access ramps sloping down to water level. For the species above it is vital that the retaining wall is low enough for chicks to clamber over and reach water in case they need to leave the raft quickly.
Rafts with no vegetation (for terns or Little Ringed Plover) must have a retaining fence about 25cm high around the raft to prevent young from falling overboard. The fence should be of wire mesh with adequate vertical supports. The top of the fence should be finished safely since adult terns will use it for perching on. The fence is vital if tern nests are to be inspected or the young ringed - young terns will abandon ship on the arrival of 'inspectors' if there is no perimeter fence. If shingle is to be placed on the decking, place a black polythene sheet on the raft first. This will help prevent growth of vegetation. There should be a low lip around the raft perimeter (a plank laid flat will do) to retain shingle. A number of larger stones should be sited on the deck to assist the birds and nest recorders to map the nests. Alternatively, a number of wooden tomato trays can be filled with shingle and placed on the deck. Rafts should incorporate shelter from wind

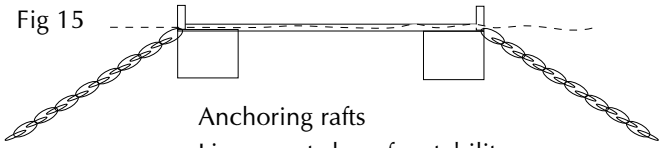
and rain for young birds. A few upturned wooden boxes with one side knocked out can be fastened to the decking for this purpose - the shelters illustrated for Roseate Terns are quite adequate. Alternatively small branches will suffice but do not use boxes which are big enough for wildfowl to nest in.

Ballast

Soil or gravel should be added once the decking is secure. Use these materials to weight the raft until it floats correctly. Ensure it is not top heavy. If it is, reduce top weight and add scrap iron under the frame. The depth of soil must be sufficient to allow moisture retention and plant growth. Ideally the soil should touch the water allowing constant irrigation. Plant the raft with useful species such as hard rush (*Juncus inflexus*). Other local plants should also be used. Very large rafts may take small shrubs. Nestboxes for wildfowl can be sited on rafts.

Mooring

Fig 15

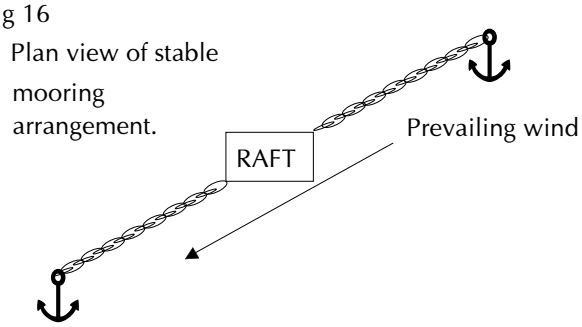


Anchoring rafts
Lines must slope for stability.

Anchor the raft using two weights and chains. Weights can be made of rubble and concrete in strong containers or of scrap iron. Substantial anchors have been made by wrapping several boulders in a length of plastic covered fence wire netting in a manner similar to the mattress raft construction. Anchors of about 300kg are adequate for most situations. For stability the mooring lines should slope up to the raft rather than being vertical (Fig 15). The two anchor lines should also be attached to opposite corners of the raft so that the plan view shows the anchors and raft in a straight line along the direction of the prevailing wind (Fig 16). Anchors can be conveniently carried to their dropping point using the raft as a barge. Tow the raft using a boat, or on smaller waters using hauling teams pulling from both near and far shores. Ensure the mooring rope is sufficiently long **before** you drop the anchor. The rafts should be moored far from the shore and disturbance, but preferably in sheltered situations such as inlets or bays. If the water level fluctuates the raft will hold its position better with long mooring lines at a shallow angle rather than steep, shorter mooring lines. Ensure that the mooring lines can cope with the maximum depth which is likely to be encountered. If the fluctuations through the year are very great it may be necessary to have a means of adjusting the lengths of the mooring lines. When anchoring rafts take particular care to ensure that you and your crew are well clear of the anchor rope as the anchor is dropped.

Fig 16

Plan view of stable mooring arrangement.



Maintenance

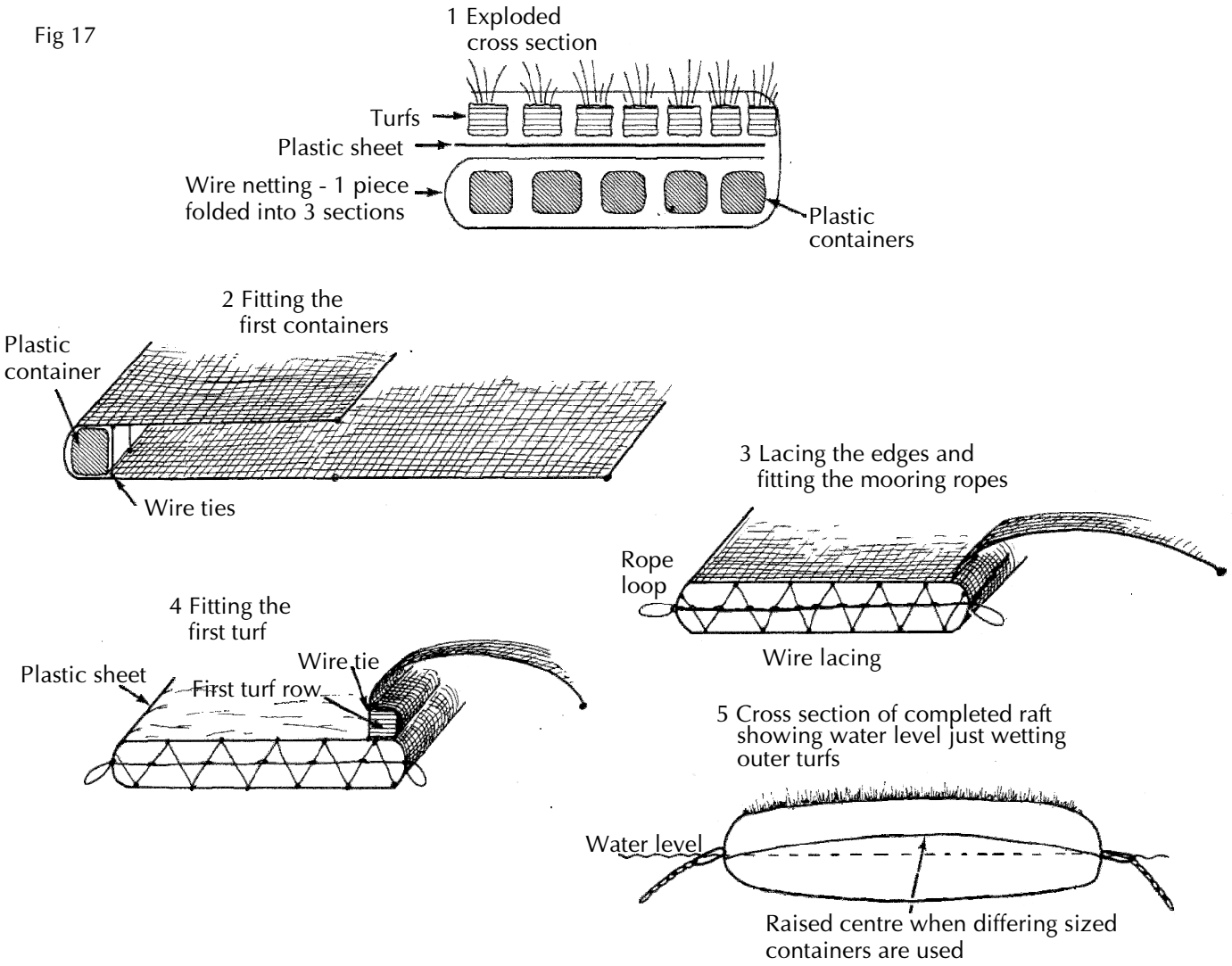
Rafts should be checked once or twice annually and any damage to structure or plants made good. If rafts are not needed by birds over winter they should be brought ashore. This saves wear and tear from weather and loafing gulls. Remember to fix a marker float to the mooring lines when bringing in a raft. Plastic containers make good buoys, but even on small waters they can be very difficult to spot - mark them with bright colours or attach a bamboo pole and flag.

The Mattress Raft

This design has been used successfully in Scotland and elsewhere for divers and other waterbirds. The raft consists of a layer of plastic drums of capacities 5 litres to 25 litres as available. These support a 30cm deep layer of turf. The layers are held together with plastic coated fence wire netting tied with plastic coated wire of a similar gauge. Between the turf and floats is a layer of tough polythene (e.g. Visqueen 500g) which retains soil until the turf roots bind it together. The mattress floats with the bottom of the soil just touching the water. Since this raft without turf is light it can be constructed away from the waterside then taken to the

launching place before turf is added. Rope loops at the corners make carrying handles and are used for mooring. The turfs must not be placed on the raft until it is floating. As more turf is loaded on, float the raft in deeper water. Dragging a 2 tonne raft across a beach is damaging to raft and humans alike!
The numbered illustrations in Figure 17 show the stages in construction - (1) An exploded cross section of the raft. For a 3m x 2m raft you need a 10m x 2m length of netting folded into three equal lengths. (2) Tie each container to both lower and middle wire layers pulling wire ties tightly. If the containers are of varying sizes, place largest ones in the centre. (3) Lace the edges of the raft together tightly with wire and thread with a rot-proof rope around the perimeter of the raft leaving 30cm diameter loops at each corner. Lay the plastic sheet over the container layer and tie it in place. (4) Place turfs on the top, row by row, starting at the end with the fold in the wire. As each turf is laid, tie it in tightly with wire to the upper and central netting layers. The plastic sheet will need to be punctured to achieve this. Lace the upper edges together in the same manner as for the lower edges.

Fig 17

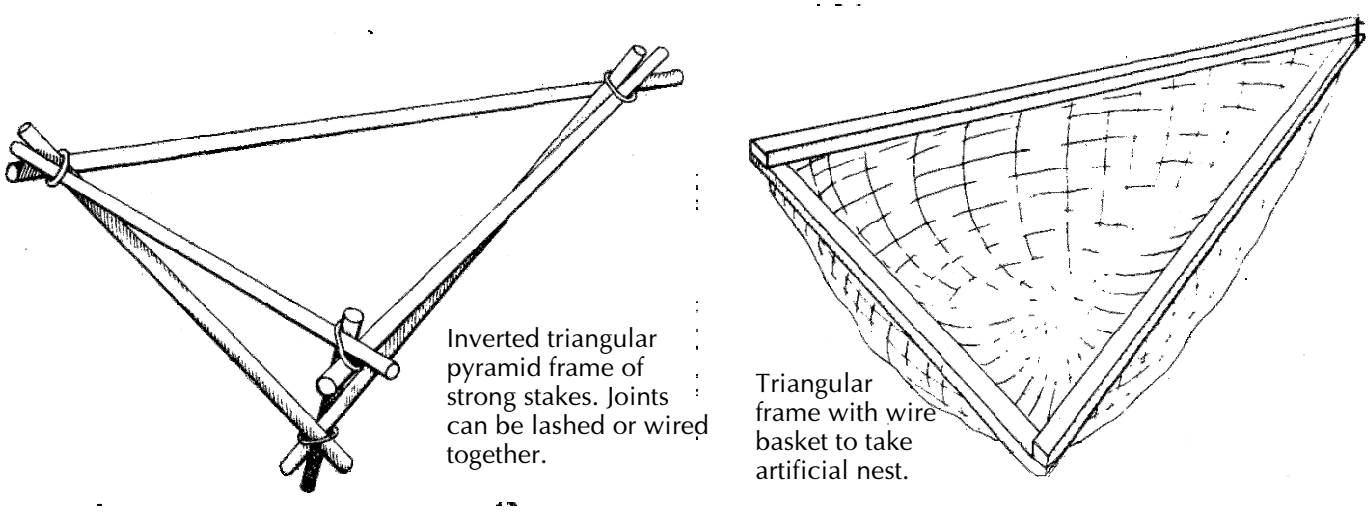


PLATFORMS

Platforms are structures on which nests are to be built. For small birds, almost any old box, tray or even coconut shell fastened in an appropriate site will do. Ensure any such platform has adequate shelter, drainage and concealment. Simple platforms can also be made from weldmesh bent into a bowl shape. Large platforms, particularly for raptors will need a strong frame. A triangle or an inverted triangular pyramid are the best shapes for strong frames (Fig 18). The frame supports a cup of weldmesh with a 'nest' built into it. The nest should be made of pliable twigs woven into the weldmesh, This ensures firm attachment of the nest to the frame. Smaller twigs are woven into the first ones. Cap the twigs with a layer

of peat or inverted turf and make a depression in the centre of this. Secure the frame in place with wire. Wicker baskets and even sturdy seed trays have been used as platforms in various places. An old Crow or Magpie nest can be used for lining the platform or tray. Old displaced corvid nests have been used on their own, tied securely into tree forks. This operation is useful in an emergency when an occupied nest with young has fallen.
Platforms have been made for wildfowl using a weldmesh cup filled with water-weeds and attached to the top of a short pole. The platform should be sited just above the highest annual water level, in a secluded place.
Some nature reserves have successfully used 'oil rig' platforms for nests of Little Terns. These are fish boxes filled with shingle and raised on three wooden posts hammered into the beach (read Species Notes for more information).

Fig 18



ISLANDS

Artificial islands are most useful in relatively shallow waters which maintain a stable level. Even in relatively small ponds a suitable island can be made from a 200 litre drum with one end removed. Fill the drum with rubble and soil, stand it on end in the pond with the top just above water level and plant it with rushes or sedges which will provide cover for a nesting Moorhen. Ensure the sides of the drum are punctured to allow water to flow in and out. If space allows, a larger island can be made using several drums or concrete manhole pipes standing together and filled in the same way.
Some natural islands with traditional nesting sites for geese or swans are prone to flooding. These sites can be made safe by raising their level. Do this by laying one or more old lorry tyres on the site and fill them with stones, soil and turf. Brace the structure with stakes if there is more than one tyre in the pile.
Larger islands, like rafts, fall into two main groups - those with and those without vegetation. Those without do not need a gently sloping access from the water and are easier to construct. Form a retaining wall of large blocks or thick wooden stakes. The wall must not have potential nesting sites for Coot which may disturb nesting terns. Fill the enclosure with rubble then successively finer layers of pebbles, capping it with gravel. Take steps to prevent plant growth - a layer of black plastic sheeting below the top gravel layer for example. The gravel layer will need annual raking over to keep it growth free, and can be pock marked with stones as for a tern raft. An alternative to this island is to make a deck exactly as for a tern raft. This deck is secured to posts or scaffold poles driven into the bed of the water. As with rafts the decking needs regular checking.
Most islands have been built in inland freshwater sites, but marine inlets, sea lochs and bays may provide suitable sites. Islands in tidal areas will need protection from wave action. Breakwaters can be made from wooden stakes. Outer rows of stakes may break up waves and inner rows can encourage accretion of

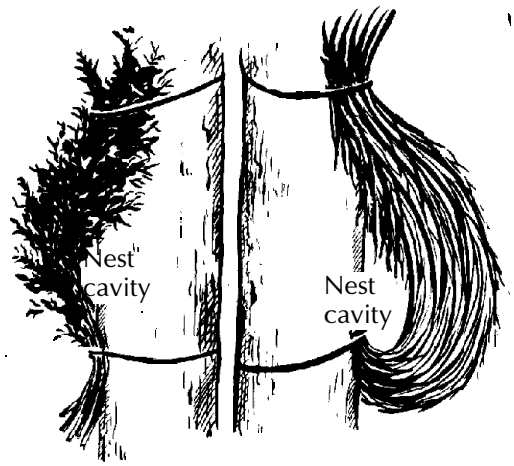
shingle. Islands of this type may not be practical in exposed situations. Further, the protective stakes interrupt the smooth slope of the shingle and make the site unattractive to Little Terns.
For islands with vegetation proceed as above but steps must be taken to ensure several easy access points for birds from the water. Each access point must slope gently to the water and must be long enough to allow for any changes in water level. Many water birds like a secluded access to the island so avoid a barren concrete slipway. If erosion is a problem an offshore breakwater can be made from wooden stakes or concrete blocks. Finish the top of the island with soil and turf. Plant the top, sides and shoreline with local plants. Shrubs and small trees will help in stabilising the structure. Place appropriate nesting boxes on the island. It is probably not worthwhile constructing islands without a retaining wall except in very sheltered waters - islands may be completely eroded before the vegetation around the edges stabilises the structure. The only satisfactory 'all natural' islands are those made by cutting off a spit of land which projects into the water. Such spits are often found in gravel pits. In such a case the gravel company may be persuaded to do the excavation during the normal course of gravel extraction operations. Take extra steps here to ensure that the sides of the island are not too steep and ensure adequate vegetation is planted around the edges. These islands have the advantages of a stable structure, but may suffer from proximity to the shore. The ideal shape for very large islands is cross shaped, providing four bays which will give shelter from adverse weather from any quarter. The shape will also allow a higher density of nesting rails and wildfowl.

NEST BUNDLES

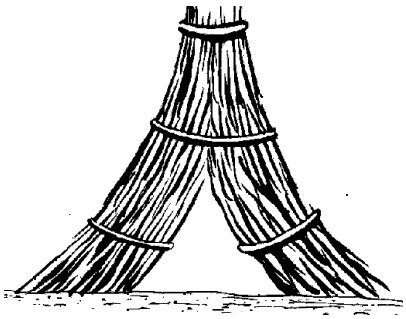
Faggots (Fig 19) of sticks can be employed for nest sites and are ideal for use in gardens. Any sticks will do but thorny ones, though more painful to work with, will provide a better result. Make a faggot up to 2m in length and tied at both ends. Open a cavity in the middle and secure it in an open position using some arrangement of wire or wood. Fix the faggot vertically against a tree trunk or in any other site. A climbing plant like honeysuckle or clematis grown over the bundle will help to camouflage the nest. Another nest site can be made by fashioning a cup shaped depression in the top of the faggot. In this case ensure the outer sticks are strong and firmly tied.

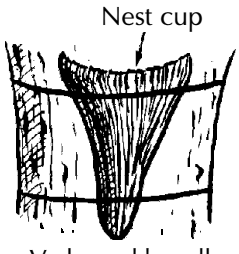
Fig 19

Faggot tied to trunk



Two methods of using conifer branches


Wigwam for wildfowl



V-shaped bundle

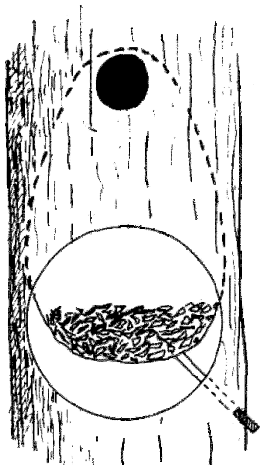
Variations on the faggot theme include narrow V shaped bundles tied to tree trunks with the nest site in the recess of the V. Bundles of conifer branches will provide relatively well hidden nesting sites for thrushes early in the season before deciduous plants have developed thick cover. Once a bundle has been fixed to a tree trunk, it can be manipulated into shape to allow both concealment from predators and adequate access for the birds.
For some wildfowl a cone-shaped bundle with a hollow centre can be made and placed point upwards on the ground. This type of shelter should be surrounded by concealing vegetation.

TREE AND SHRUB IMPROVEMENT

There are many natural sites which, with some attention, will make attractive nest sites. **Before** carrying out **any** of these operations, including using climbing irons, **ensure you have the landowner's explicit permission**. A general agreement to put up nestboxes is not the same as permission to cut and manipulate trees and shrubs. Some operations will involve heavy and skilled work high in trees. Unless experienced power tool operators are available, hand tools only should be used. In any case, never attempt this type of work alone. Aluminium extension ladders are the most convenient devices for climbing trees quickly, but on the feet of an expert climbing irons have advantages.

Natural holes have the advantage over boxes in that they are less conspicuous to humans. Their main disadvantage (in fact one of the main reasons for nestboxes) is that they are not present in sufficient numbers. The types of operation needed on tree holes are outlined below. They often involve use of metal nails or bars. This is unlikely to affect any commercial value of the tree but it will affect possible future operations with chain saws.

Fig 20



Waterlogged Hole

Bore a hole through the trunk, upwards towards the lowest part of the cavity (Fig 20). If the floor is not flat, more than one hole may be needed. Once the hole is drained (sludge will need clearing out), insert plastic piping through the holes. The piping should project clear of the trunk. This pipe prevents the hole from becoming sealed as the tree grows. Continued drainage is obviously essential to prevent the hole refilling. Line the cavity base with pebbles, then with shavings or bark chippings. These layers will keep any nest clear of water which runs into the hole. Before draining a cavity ensure that it is not a drinking place for wildlife - a water-filled hole might be a more valuable resource than a nesting site.

Tree with a large hollow centre

Such holes may be too large for birds to take to readily. Sometimes Barn or Tawny Owls will use these very large holes, so before modifying the hole check for accumulations of pellets. Reduce the depth of the hole by making a false floor. Drill holes around one side of the trunk. Drive pointed metal stakes through these holes across the hollow and firmly in to the other side of the trunk. Saw the ends off flush with the trunk. Cover the grill of bars with large then smaller sticks, finally completing the job with a layer of bark chippings or shavings. Ensure the cavity is not prone to waterlogging.

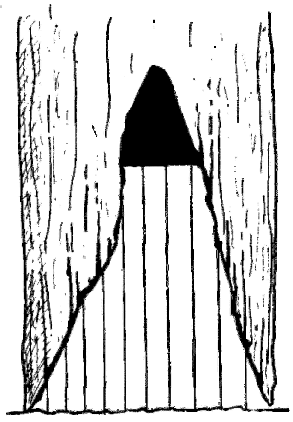
Cracks in the side of a cavity

These can be sealed by nailing wood over them. A more light-proof arrangement is to staple layers of sacking over the crack, coating each layer with bituminous paint.

Entrance hole too small

Use a wood auger to enlarge the hole. This operation may need to be repeated every two or three years.

Fig 21



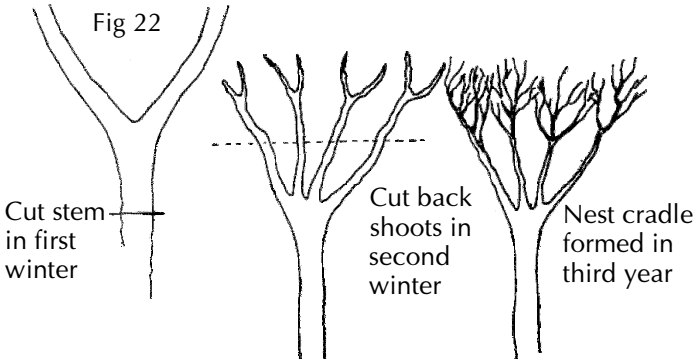
Tree with a large hollow open down to ground level

As for apparently over-large holes, check that the cavity is not currently being used (by mammals or birds) before you modify it. The hole can be boarded up nearly to the top (Fig 21). The gap remaining at the top will make the entrance. Use old weathered boards rather than conspicuous painted wood. This type of hole modification is very obvious and should only be attempted in areas fairly safe from human interference.

Pruning

Various shrubs can be made more useful to nesting birds by judicious pruning. Ensure that any such artificially prepared and attractive sites do not give easy access to predators. Cutting the main stem of the shrub will force a cradle of shoots to grow (Fig 22). This cradle must be pruned again a year later forcing enough shoots to provide a secure concealed nesting site for Blackbirds, thrushes, Goldfinches or Chaffinches.

Fig 22



A circle of young willow saplings can be pulled together and tied about 1m above the ground. This forms a wigwam for a duck or Moorhen to nest under. Clear the floor of the wigwam of woody growth and ensure there is an opening for entry. Similar wigwams may be made using brambles - these could be used by wildfowl or game birds.

Other operations

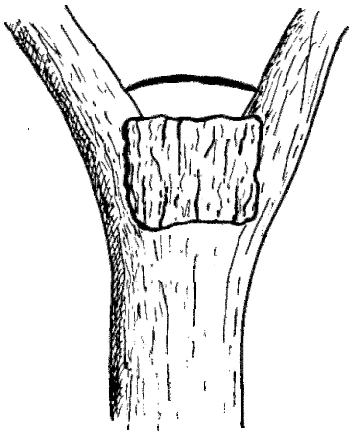
Holes in soft-wooded trees are frequently depredated by squirrels but can be reinforced as for small nestbox holes. Use a metal plate with a circular cut out, or staple chicken wire around the nest hole area.

Cavities can be started in soft-wooded trees and left to enlarge naturally. Scoop out a cavity where a branch has fallen away or where the tree has been pollarded or coppiced much earlier. This cavity will gradually become bigger, providing potential nest sites for a succession of birds.

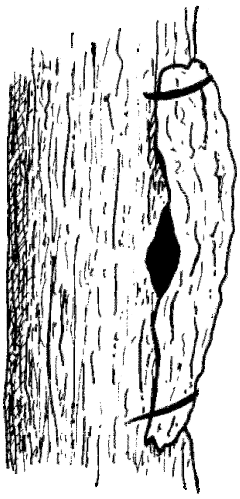
Treecreepers may be attracted to cavities formed using pieces of bark attached to trees in various ways. Typical examples are illustrated (Fig 23).

Fig 23

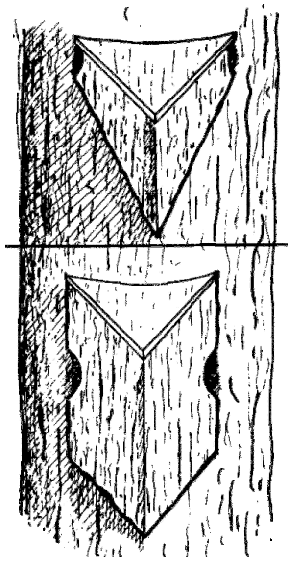
Designs for Treecreepers



Bark cabin in tree fork



Bark fixed over concavity



Two bark sides fixed to trunk
Entrance slits at both sides

SPECIES NOTES

Species are listed below in the systematic Voous order. (This is the order found in most bird identification books.) In addition there are notes for four groups of species - tunnel nesting seabirds (page 23), waders (page 25), ground nesting songbirds (page 30) and open nesting songbirds (page 31). Though species in these groups are not the most regular users of artificial sites and are not closely related, they have very similar nest site requirements.

The list excludes a few species which have been very rarely or only locally recorded in artificial nest sites. Jays are excluded because the one nest found in a box is regarded as exceptional. Reed Buntings have been recorded nesting on vegetated rafts and whilst other small ground nesting birds might do the same, it is unlikely that rafts will be constructed exclusively for them. Most species rarely have individuals which will nest in atypical sites but single records of box use must be regarded cautiously. Hoopoe and Wood Duck are not included for their present scarce status does not warrant it. Species which are specially protected under the Wildlife and Countryside Act (1981), and which must not be disturbed at the nest without a licence, have 'Schedule 1' written against their name. Scientific names of birds described in this section are given after the English names.

Each description begins by naming the most suitable artificial nest site design and size. For most boxes the sizes are given as small, medium or large. The table on page 3 under General Instructions gives the approximate dimensions for these categories and also broad height mounting categories. In addition, most species accounts are accompanied by a sketch giving minimum dimensions in millimetres. Unless indicated otherwise, there is little point in making boxes much larger than this but do not stick slavishly to the exact dimensions. Always make the best use of the wood available.

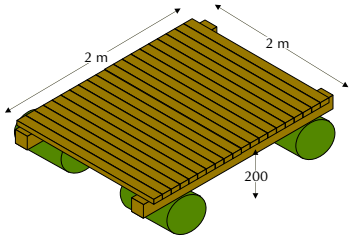
Boxes which do not fit any of these categories have their approximate dimensions indicated. The height of a hole entrance box is the distance from the hole to the floor. All dimensions are in millimetres except where otherwise indicated. A few sizes are critical, these are noted.

These notes do not give habitat details but these may be found in various other guides. Brief details are included of nest structure and eggs. These can only be very general because nest materials vary with local availability and clutch size depends on many factors including weather, time of year, age of bird and habitat. In a typical year you may expect about one quarter of the clutches laid to be outside the quoted ranges.

Divers *Gaviidae* **Schedule 1**

Rafts or Islands

Covered with turf and other local vegetation. At least 2m square with freeboard of about 200mm.



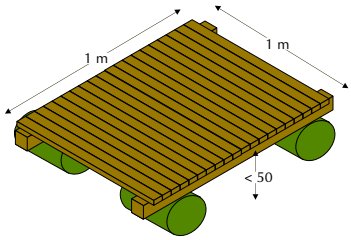
Divers are fairly conservative in their choice of nesting site and so rafts should be sited where divers have bred successfully in the past or have been seen during the breeding season. It is pointless, however, to site rafts or islands where divers currently breed successfully. Suitable sites include lochs with fluctuating water level or disturbed banks. The raft should be set in a sheltered bay or inlet in water 2-4m deep. This water will be too deep for wading fishermen who might otherwise inadvertently disturb the nest.

Nest: a shallow scrape with variable amounts of vegetation added. Eggs: 2, olive-brown with blackish blotches. Young leave the nest when all the clutch is hatched.

Great Crested Grebe *Podiceps cristatus*

Rafts or Islands

At least 1m square.



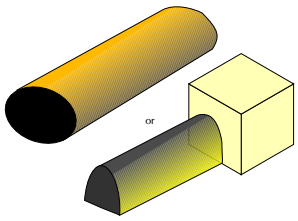
The main requirement is a structure on which to anchor the nest. Any raft with a gently sloping access or only 50mm freeboard will do but some cover on the

raft is preferable. An island of loosely woven willow twigs, about 1m in diameter and firmly anchored, will make a suitable site. One nest has been recorded built in a floating tyre anchored in a river.

Nest: a heap of vegetation with a slight hollow in centre. Eggs: 3-5, whitish, becoming stained with age. Eggs often covered by nest material. Young leave the nest when all the clutch is hatched.

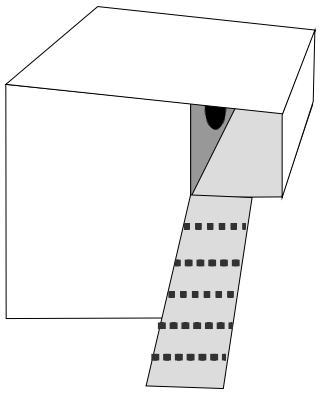
Tunnel Nesting Seabirds

Tunnels



Opportunities for artificial nest sites for these species are clearly limited to a few sites, but at these sites there is potential for many nests. Dimensions of tunnels are not critical - rabbit burrows, which vary in length and cross section, are often used. Tunnels made of flat stones sometimes suffice and there have been tunnels built into harbour walls or the basements of suitably sited houses. All tunnel nesting birds are prone to predation particularly by rats. Manx Shearwater and Storm Petrel are liable to desert if disturbed. Puffin are more tolerant.

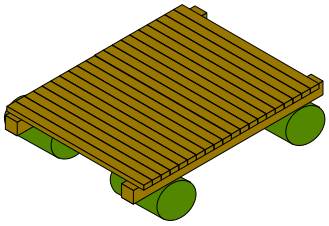
Wildfowl



Wildfowl may nest fairly densely if there are enough sites so ensure that the habitat can support a potentially large nestbox population of young. Ducklings need warm, shallow and sheltered water with plenty of cover. Many species of duck may take artificial rafts and islands. Mallard are the most regular users. Boxes can be sited on short poles in ponds and shallow lakes. All such wildfowl boxes should have a 50mm roof overhang for shelter and a ladder up to the entrance from water level rising at 45°. The ladder is a plank about 100mm in width with rungs nailed on at about 100mm intervals.

Swans and Geese

Rafts, Islands or Platforms in water



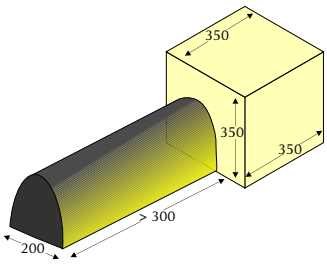
The nest site should have adequate sheltering plant growth. If access to the site is steep or overgrown, make a sloping ramp. Mute Swans and Canada Geese are the most frequent users of artificial nest sites.

Nests: Mute Swan nests comprise unmistakably large heaps of vegetation, usually with the cob on guard nearby. Goose nests are typically a shallow hollow in the ground lined with local materials, down and feathers. Eggs: Mute Swan 6, large and off-white. Young remain in the nest for a day or two after hatching. Geese 4-6 eggs, creamy. Young leave the nest soon after hatching.

Shelduck *Tadorna tadorna*

Tunnel and Chamber

Tunnel 200mm diameter, length at least 300mm. Chamber 350mm cube.



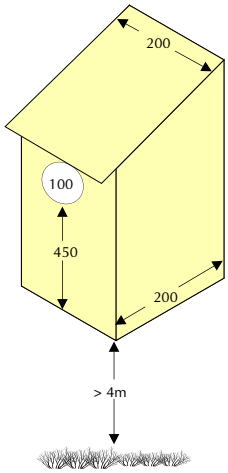
The tunnel should be sited in a predator free area. An island is ideal. Two simply made tunnel designs are, first, a trench dug in the soil and covered with planks then turf and, second, a 200 litre barrel with the chamber made by partially covering the floor with soil. Shelducks may also occupy wigwam shaped bundles placed in thick undergrowth. In some areas tunnels made of bales of straw on the ground or in scrub have been used. Shelduck will also take large hole entrance boxes set on the ground.

Nest: a hollow lined with local vegetation, down and feathers. Eggs: 8-10, creamy. Young leave nest soon after hatching.

Mandarin *Aix galericulata*

Hole Entrance

Large. Some have used long boxes 700mm deep, 250mm wide and 200mm high with the entrance at one end. Hole entrance 100mm diameter.



Mandarin seem initially reluctant to take to boxes put up specifically for them. However once the local population have started using boxes they keep to them. Boxes should be placed about 4 m above ground initially, but once the birds have begun to use them the boxes can gradually be sited lower in following seasons. Boxes should be lined with shavings which will remain loose enough for the bird to hide eggs. Large wood shavings may deter Jackdaws which sometimes take over boxes sited for Mandarin.

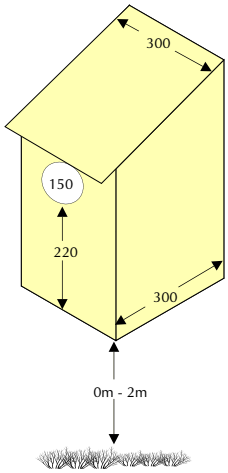
Nest: lined with vegetable fibres and down. Eggs: 9-12, pale buff and white. Young leave nest within a day of hatching.

Mallard *Anas platyrhynchos*

Rafts, Islands, Platforms

Hole Entrance

About 300mm x 300mm x 220mm high, entrance hole about 150mm diameter



Mallard will take a wide assortment of sites. Some take to cup-shaped hollows, preferably primed with vegetation. Rafts or islands should have plenty of vegetation and could even have a nestbox mounted on them. A favoured location for a nest is near the mouth of a creek opening onto the main body of water. Mallard are often recorded in bizarre sites including high window boxes. Pollarded willows are often used.

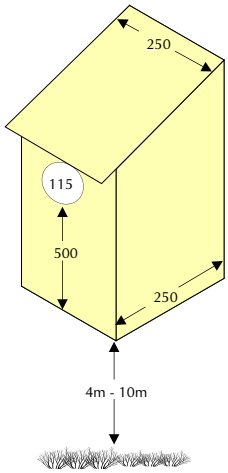
Mallard like to be able to see out from the nest whilst incubating, so narrow horizontal slits in the sides will help. Traditional wicker duck baskets, mounted tilted slightly backwards on tripods of stakes, minimize predation by rats.

Nest: lined with down and breast feathers. Eggs: 10-12, pale greenish, may be hidden under lining. Young leave nest soon after hatching. Feral birds may rear two broods per year.

Goldeneye *Bucephala clangula* **Schedule 1**

Hole Entrance, with or without porch

Large/Very Large or larger. Entrance about 115mm diameter.

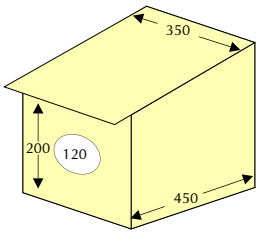


The box must be very soundly made and thoroughly waterproofed. The inside should be of rough wood to allow the ducklings to get a claw hold. The birds like a dark interior to the box which is achieved by the internal height of the box. The box should be fixed with a clear view of open water, not more than 10 metres from the water's edge. Initially place boxes in well spaced groups of 3 or 4 boxes in secluded areas. Boxes should be placed in the upper part of the medium height range. Do not worry about high boxes as ducklings can descend from great heights quite safely. Boxes with porches (see wildfowl) are used in Scandinavia and on various wildfowl reserves.

Nest: lined with wood chips, down and breast feathers. Eggs: 6-11, blue-green. Young leave the nest soon after hatching.

Red-breasted Merganser *Mergus serrator*

Hole Entrance/Tunnel

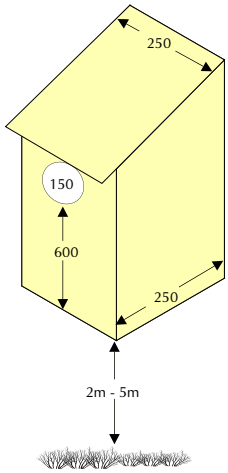


The box should be a long floorless hole entrance box placed on the ground - almost qualifying as a tunnel. Height at least 200mm, width 350mm, depth 450mm. The hole at one end only should be about 120mm in diameter. The box should be placed in thick vegetation facing the water. Take precautions against ground predators.

Nest: lined with plant material, abundant down and some feathers. Eggs: 7-12, stone-buff.

Goosander *Mergus merganser*

Hole Entrance Very Large. Entrance diameter at least 100mm, preferably up to 160mm high and 150mm wide.



Boxes should be placed at medium height initially up to 30 metres from the water's edge with a clear view of, and flight line to, the water. The edge of a wood adjacent to water is a good site to start with, but later boxes may be moved deeper into the wood. Clumping boxes as for Goldeneye may help initially. *Boxes must only be sited in safe areas because Goosanders are conspicuous and subject to persecution*. Put a layer of dried moss or shavings in the box.

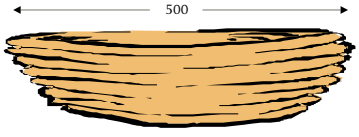
Nest: lined with pieces of rotten wood and much down. Eggs: 8-11, creamy white. Young remain in the nest for one or two days after hatching.

Birds of Prey Many **Schedule 1**

Most raptors require an open platform but there has been limited success in providing artificial platforms in this country. Many raptors use old crow or pigeon nests. Osprey platforms (diameter about 2m) have been used in the USA but at present it is probably not worth attempting to attract Ospreys to artificial sites - persecution rather than lack of sites being a limiting factor. There has been recent success with platforms for Goshawk and Red Kite might possibly use them. In cases of fallen nests with young birds of prey, artificial platforms have been used as an emergency measure - adults desert the young if they remain on the ground. Artificial nest sites can also be used where a tree nest falls during winter gales for species like Hobby which tend to be faithful to a nest site. The broken, fallen nest may be replaced with an artificial one of the same size. Use the general technique described for Merlin but finish the nest with the same type of material as the original.

Merlin *Falco columbarius* **Schedule 1**

Platform

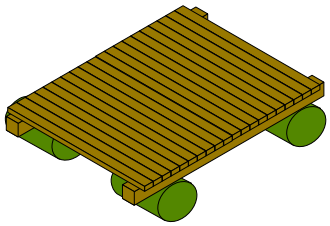


Make a saucer shaped cup of 25mm mesh chicken wire about 500mm in diameter. Weave willow twigs into the wire to form a cup and line it with an inverted sod cut from nearby. Site the nests in pairs, one at a woodland edge close to where Crows are nesting and the other 10m to 20m away inside the wood. Alternatively nests can be sited in a shelter belt or in an isolated birch, pine or rowan near the headwater of a stream.

Nest: a bare hollow. Eggs: 5-6, pale buff with dense reddish markings. Incubation begins before the clutch is completed and hatching is sequential.

Rails *Rallidae*

Rafts and Islands with vegetation



Moorhen and Coot will take to almost any such site, Moorhen nesting on islands only 500mm in diameter. Moorhen often use open or hole entrance boxes provided for wildfowl.

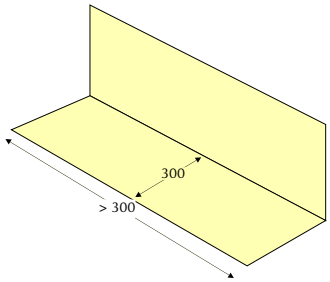
Nest: large heaps of aquatic vegetation. Eggs: typically 6-10, off-white with brownish speckles, but very variable. Some large Moorhen clutches are laid by two females. Young remain in the nest for a few days after hatching. Other nest platforms are built as brooding or roosting sites for the young. Later broods of Moorhen may be fed by young from earlier broods.

Waders Some **Schedule 1**

Waders generally nest in a shallow scrape on the ground. Scrapes are simply depressions in the ground large enough to take the eggs. Experienced birdwatchers develop a feel for the types of site where particular waders are able to dig out scrapes. Snipe, for instance, nest in a depression in the centre of a large tuft of grass or sedge, whereas Lapwings prefer to nest on the top of an undulation near a tuft. Scrapes may be made in older tufts of grass by clearing out the dead grass from the centre. Little Ringed Plover need a small depression in fresh bare shingle - gravel works often have suitable sites. Greenshank, Stone-curlew and various other waders like a clear marker such as a stump or large stone near the nest site. Sites which have no such markers may be enhanced by adding some. Waders such as Redshank, Snipe and Black-tailed Godwit nesting in grazed wet pasture can be assisted by the provision of fenced-off areas to prevent trampling by cattle. Remember to unfence these areas after the breeding season to allow the area to remain as the grazed habitat which these waders require.

Kittiwake *Rissa tridactyla*

Platform



Kittiwakes have begun to nest on man-made sites in some places including the sides of coastal warehouses and piers. In these colonies, and probably in some natural colonies where nest sites are limited, ledges can be provided. Ledges should be about 300mm from front to back. However, the exact width of ledges is not critical since Kittiwake nests can adhere to almost anything and overhang a narrow ledge quite safely. If ledges are mounted above each other it is better to make higher ledges wider to help prevent lower ones becoming fouled by droppings. Ledges may be at any height provided they are safe from wave action at the highest of tides and in rough weather. Ledges may be any length from 300mm for a single nest to as long as the building allows. They should be sited, preferably, overhanging water. When considering new sites for Kittiwakes remember that their colonies are noisy and smelly and some people may not welcome them.

Nest: A firm cup of grass, mud and seaweed with a deep hollow centre. Eggs: 2, sometimes 3, blue-green to buff with brown blotches. Young remain in the nest for about 5 weeks.

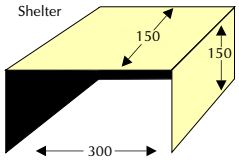
Roseate Tern *Sterna dougallii* **Schedule 1**

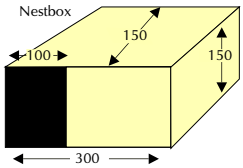
Tunnel 300mm square, 150mm high. Floorless.

Roseate Tern populations are under threat at present and it is possible that if suitable nest sites were available at other tern colonies they might begin nesting there. They require more concealed nesting sites than do Common Terns. Predation of nests and young by gulls, crows and Peregrines is a major threat to breeding success.

Nesting sites can be provided by allowing long rank vegetation to develop above the foreshore. Tree mallow (*Lavatera arborea*) has been planted in one reserve and used by these terns for nesting under.

In the USA old car tyres have been used successfully, although the presence of such 'rubbish' on otherwise 'natural' nature reserves might need explaining to some humans. Roseate Terns have also used wooden boxes for both nesting and shelter. Two types of box should be used. Both are 300mm square by 150mm high and floorless. The first, used mainly as a shelter from the elements and predators by the young, has one side completely open. The second, used mainly as a nest chamber, has a 100mm wide open entrance the full height at the corner of one side.





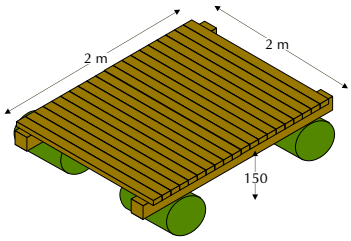
Before attempting any work with Roseate Terns you should liaise with RSPB.

Nest: a hollow, practically unlined, on rock or among shingle or shore plants. Eggs: 1-2, creamy with variable amounts of dark marking.

Common Tern *Sterna hirundo*

Island, Raft or Platform

Islands should be clear of vegetation, covered only in shingle. Any plant growth may encourage Coots which will deter terns. The floor should be about 150mm above water level. Fence the edge to a height of 250mm with a fence strong enough not to be damaged by perching wildfowl. Allow about 0.5m² per pair of terns and ensure there are some markers such as stones for humans and birds to be able to identify territories and nests. Shelters may be used as for Roseate Terns.



Nest: a hollow on the ground, possibly lined with local materials. Eggs: 2-3, creamy with variable amounts of dark blotches.

Little Tern *Sterna albifrons* **Schedule 1**

The main hazards to Little Terns, which nest only at coastal sites, are very high tides, human disturbance and predators. Various nest site creation techniques have been tried but all of them require time, effort and some are expensive in materials. Some have been very successful but artificial islands and the raising of areas of shingle beach using heavy earth moving equipment are expensive and generally ineffective in the long term because of rapid erosion by the sea.

Human disturbance can be partly combatted by wardening, notices and fences. Predation from the ground can be reduced by the use of electric fences. Little Terns often nest in sites accessible to walkers and holiday makers. If electric fences are used, due consideration must be given to the human population.

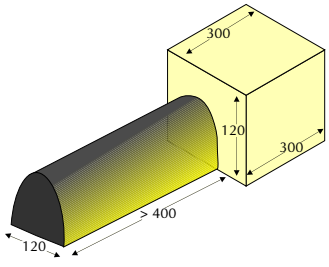
Before attempting any project with Little Terns, you must have appropriate licences for Schedule 1 birds and you should take advice from the RSPB who have experience of such techniques. For more details of the problems and methods see the booklet 'A guide to Little Tern Conservation' (RSPB).

Nest: a hollow, possibly lined with local materials. Eggs: 2-3, generally pale buff with dark blotches.

Black Guillemot (Tystie) *Cepphus grylle*

Tunnel and Chamber

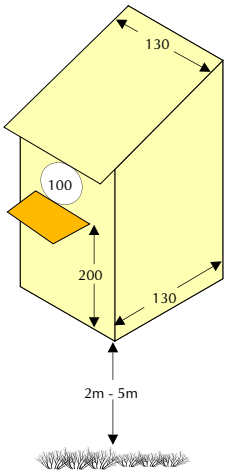
Square or round tunnel of height 120mm and length over 400mm. Chamber at least 300mm square and height 120mm.



The nest chamber should be as light-proof as possible but need not be buried in a heap of soil. The floor of the chamber should contain at least 100 flat pebbles or smooth gravel pieces less than 10mm in diameter in order for the

adults to arrange a nesting scrape. The box can be placed near the shore or at a cliff base in an area free of ground predators and preferably with a suitable take-off platform nearby. Alternatively secure the box to a sea wall, pier or other fixed object about 2m above high water level. In this case a take-off platform about 300mm square should be attached at the tunnel entrance. Tunnels can be incorporated into sea walls under construction or repair. Tunnels need not be straight, but L-shaped, so may be made to fit inside fairly narrow structures. A suitable nest hole can also be made using flat stones or slabs. Black Guillemots are sensitive at the nest site.

Nest: normally an unlined scrape. Eggs: 2, whitish. Young fledge at about 35-40 days.



Feral Pigeon *Columba livia*

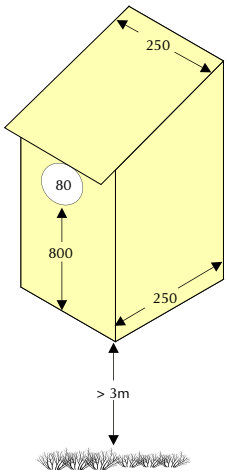
Hole Entrance Medium. Entrance 100mm square. Landing platform or ledge below the entrance. Site at medium height.

Colony boxes with several chambers are acceptable.

Nest: loosely built of assorted materials, often with an accumulation of droppings. Eggs: 2, white. Breeding season may extend throughout the year.

Ring-necked Parakeet *Psittacula krameri*

Hole Entrance 250mm square base and 800mm deep. Entrance hole 80mm diameter. Site at medium height or higher in a tree or on a building.



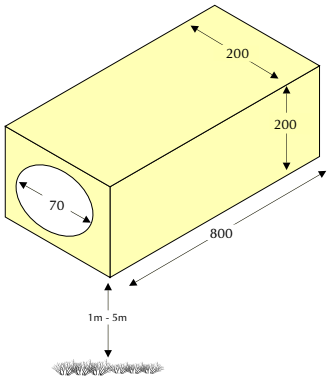
There are now a number of feral populations of this introduced species. Boxes should be made of thick wood to provide adequate insulation and should be thoroughly weatherproof. Ensure the box is relatively narrow and high. Nail some pieces of rough wood inside the box for the nesting birds to gnaw - this will make the box itself last longer. Ensure the inside of the box is of rough wood to allow young to cling to it. Ring-necked Parakeets breed early so ensure the box is in place before mid-winter. Line the bottom with bark chippings or shavings.

Nest: none or a shallow scrape in the debris on the nesting chamber floor. Eggs. 3-5, white.

Little Owl *Athene noctua*

Hole Entrance Large, entrance diameter 70mm.

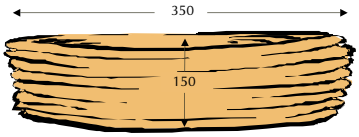
Chimney 800mm long, diameter 200mm, entrance diameter 70mm. Site at medium height.



Little Owls do not take readily to boxes in this country probably because they are able to utilise a much wider range of natural holes than the other larger owls. In areas where even smallish holes are scarce, nestboxes may be used more often. They prefer dark hidden cavities for nest chambers, so make boxes as light-proof as possible. An internal baffle in a hole entrance box may be used. Chimney boxes should be attached either below or above a nearly horizontal branch. A deep nesting chamber can be built at the end of a chimney box, the structure looking like a hanging inverted tunnel and chamber. A perch, sheltered by the roof overhang, should be fitted to allow the male to sit at the entrance whilst the female incubates the eggs. The floor should be covered in bark chippings, arranged to give a horizontal surface whatever the actual angle of the floor of the box. The entrance diameter is

important - any larger size would allow Tawny Owls to enter and drive out the intended occupants. The box may be sited at any height provided it is free from predation and interference from humans or grazing cattle.
Nest: no material added. Eggs: 3-5, white. Eggs hatch almost at the same time. Young leave the nest together, sometimes before being able to fly freely.

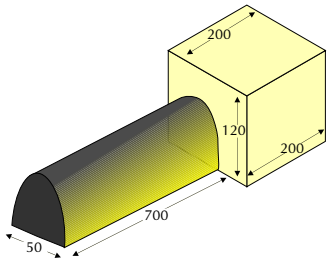
Long-eared Owl *Asio otus*
Platform
The normal nest site is an old nest of a Crow, Magpie or Woodpigeon usually in a copse, shelter belt or plantation.
The most suitable nest is a circular wicker basket 300-400mm in diameter and 150-200mm deep with nearly vertical sides. Hardware stores and garden centres often have a range of baskets, some of which will be suitable. (There may be professional basket makers locally, but if not why not try persuading an amateur basket maker or a school or college art and craft department to do their bit for conservation?) Baskets will last longer if they are varnished before use.



Long-eared Owls are often associated with conifers although any tree which gives adequate overhead shelter is suitable - particularly birch, willow or thorny scrub. Tie or wire the basket in the chosen tree at a height of 4m or above. The wire or cord should be tied to the base of the basket so that it will be hidden after the basket is lined. Once the box is fixed, line it to just under half its depth with dead twigs. Sawdust, shavings and the like are unsuitable for lining these nests as they may become waterlogged in wet weather.
Baskets may be spaced as close as 100m apart.
Long-eared Owls often cannot compete with Tawny Owls although it still may be worth placing boxes for both species in an area where both species are present.
Nest: no material added. Eggs: 3-5, white. Eggs hatch sequentially. Youngest owl often fails to fledge.

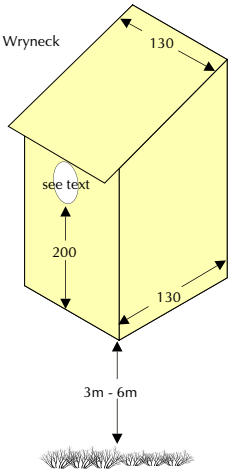
Nightjar *Caprimulgus europaeus*
Platform
Create a bare patch in extensive tracts of heather or bracken exposing sand or peat. This simulates the favoured charcoal burner's sites often used in past.
The bare patch is best in the shade of a bushy shrub 1-3m tall. It should be roughly elliptical, about 1m wide and stretching about 1.5m from the base of the shrub northwards. The bare patch will need to be cleared of weeds annually. Alternatively try a platform made of a cross section of tree trunk 300mm in diameter and 80mm thick placed on the ground.
Nest: an unlined scrape. Eggs: 2, cream with darker blotches.

Kingfisher *Alcedo atthis* **Schedule 1**
Tunnel 700mm long, 50mm diameter, chamber 200mm long and 120mm high.

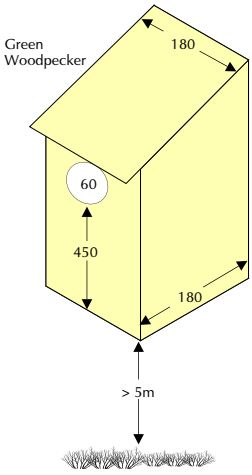


Nesting sites may limit Kingfisher breeding populations in areas where there are no suitable vertical banks or where the bank material is unsuitable for excavation, perhaps because of large stones. In the absence of a vertical bank one may be cut. This operation is much simpler bordering large ponds or lakes than in streams or rivers where erosion by running water may be a problem. Once the vertical wall is cut, tunnels may be incorporated.
Bore a tunnel in a vertical or steeply sloping, preferably north-east facing,

bank. The tunnel entrance should be in a clear face of bank with no overhang, obstructions, cracks or roots nearer than about a metre. Any of these would allow mammalian predators easy access. The tunnel should be wider than it is high and must slope upwards at about 15° to horizontal, starting at least 1m above the highest flood water level. The entrance should, if possible, be at least 300mm below the top of the bank to prevent collapse or predators digging down. Fibreglass nest chambers are more predator resistant and can be safely placed nearer the surface. Alternatively bore an oversize hole and insert a precast concrete or fibreglass floorless tunnel and chamber into the hole. Push the entrance end of the tunnel 100mm behind the bank face. This will both help camouflage and prevent it from sticking out if there is a small earth fall. Refill the chamber and the rear part of the tunnel with soil.
Sometimes Kingfishers may abandon a tunnel during excavation on striking some big obstacle such as a stone. In these cases it is possible to remove the obstacle and perhaps install an artificial nesting chamber at the end of this otherwise natural tunnel.
If there are no convenient perches nearby fix one or two sticks or branches projecting from the bank. There are also opportunities for tunnels in artificially constructed banks or in stone and concrete walls. Tunnels may be sited about a metre apart to allow for more than one brood by the same pair. Kingfishers are very sensitive to disturbance especially early in the nesting cycle. Inspection is best done from a distance.
Nest: no material added, but fish bones collect through the season. Eggs: 6-10, white. Two, sometimes three, broods.

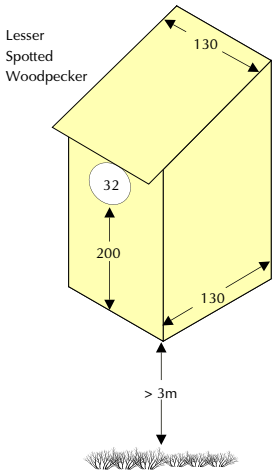


Wryneck *Jynx torquilla* **Schedule 1**
Hole Entrance Medium, entrance hole elliptical, 45mm high and 35mm wide.
It may be preferable to make a concave base to the box. Budgerigar nestbox bases are suitable, white polystyrene foam can be cut to shape easily.
Nest: no material added to cavity. Old material may be ejected. Eggs: 7-10, white.



Woodpeckers
Boxes should be filled with polystyrene foam or substitute except immediately behind the entrance hole.
Nests: no lining material added to cavity.

Green Woodpecker *Picus viridis*
Hole Entrance, filled 450mm high, 180mm square base. Entrance diameter 60mm.
Place the box high on a tree trunk.
Eggs: 5-7, white.



Lesser Spotted Woodpecker *Dendrocopos minor*
Hole Entrance, filled Medium, Entrance diameter 32mm.
Place box at medium height or higher, on the underside of a steeply angled branch.
Eggs: 4-6, white.

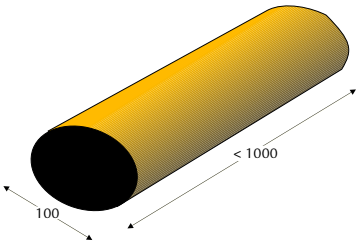
Ground Nesting Songbirds

Skylark, Yellow Wagtail and Meadow Pipit have been encouraged to nest in particular sites by improving them to mimic the most favoured natural ones used by the species. In most cases there will be so many potential natural sites available that such improvement is unnecessary. However, enthusiasts studying the species may find this a useful technique to encourage birds to nest where they wish them to, particularly in large areas of uniform vegetation such as grass or heather. One possible site improvement is to clear the centre of a small tussock of grass to make a nesting space for Skylarks.

Sand Martin *Riparia riparia*

Tunnel filled with sand Up to 1000mm long, 100mm diameter.

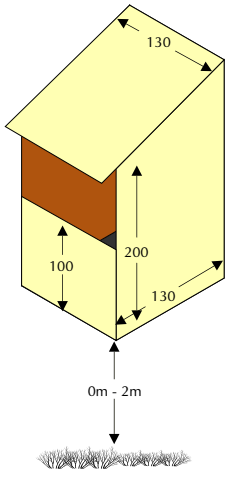
Arrange several earthenware pipes filled with sand in a natural or artificial sandbank. The pipes should preferably be at least 350mm below the bank top and at least 350mm above its base. An artificial bank can be constructed from rubble with a cement facing. Only the pipes themselves will be excavatable by the birds. Loosen the sand at the entrance to the pipe to show the birds where to burrow, but ensure that sand inside the pipe is still easily visible from outside. The pipes should slope very gently down to the entrance to allow for drainage. The bank should be vertical or overhanging slightly. Plant the top with overhanging vegetation. Where tunnels are made in an artificial bank, place a ball of hard packed sand at the far end of the pipe so that the birds can excavate a nesting chamber of greater diameter than the rest of the tunnel. Ensure that the rubble above this sand will not collapse when the sand is excavated. Pipes should not protrude beyond the bank face.



One very successful artificial site was created in a canal bank faced with sheet steel piling. Circular holes cut in the piling formed the entrances to the clay piping tunnels behind. Occasionally Sand Martins have nested in freshly dumped piles of wettish but firm sand. It may be worth leaving such heaps of sand for them. Sheets of corrugated iron separated by a 200mm depth of sand in such heaps will keep the nests free of rain water and also prevent the tunnel roof from collapse. The sheets should slope slightly downwards to the tunnel entrances for drainage. It will be worthwhile digging a few beginnings of tunnels.

In natural banks, Sand Martins can be attracted to nest by starting holes with a trowel. This is useful in places like sand quarries where certain banks are only safe for a season and others are to be removed. Each spring, clean out the artificial burrows and repack them with fresh sand. Inspection of these nests can only be made if a hatch is made in the rear of the pipes or with an endoscope. This is possible if the whole nesting colony is built within a metre-wide artificial bank.

Nest: lined with plant material and feathers. Eggs: 4-5, white.



Grey Wagtail *Motacilla cinerea*

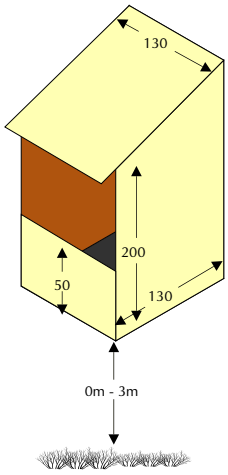
Open Fronted Medium, mounted low.

Site the box immediately above a swiftly flowing stream underneath some natural or man-made overhang such as ivy or a bridge. The box should be hidden from sight from the bank above but have a clear outlook over the water. It should be at least 1m above the flood-water level.

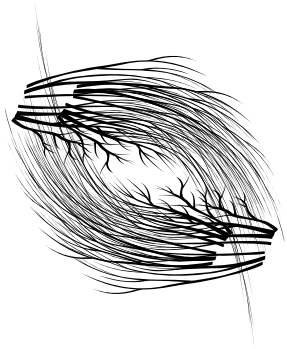
Boxes will be exposed to the wet throughout their lives so it is worthwhile

using galvanized nails and marine ply or tanalised wood. Joints at the top and back should be made with watertight joints but with drainage holes in the base.
Nest: of twigs, roots, moss and leaves, lined with hair. Eggs: 4-6, pale buff, finely speckled.

Dipper *Cinclus cinclus*
Open fronted Medium.

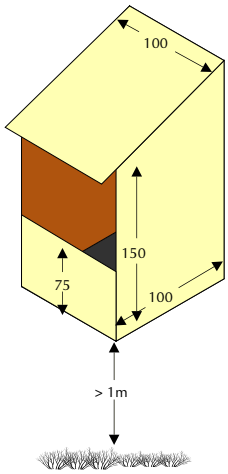


Dipper and Grey Wagtail nest in similar sites, the former preferring cavities with a lower front sill. Both species will take boxes placed for the other and it is worthwhile putting two boxes on structures such as bridges where both species occur. As with Grey Wagtail, boxes need to be made with wetness in mind. Boxes for Dippers have been particularly valuable where older stone, wood or brick built structures have been replaced by concrete ones with few, if any, possible nesting cavities. They have also enabled Dipper populations to increase along rivers (in Britain, Europe and USA) where there are few natural sites.
The front of the box can be very low or even absent, making the box a mere platform. Site the box by water under a bridge or concealed in the bank by overgrowth or other natural features. Boxes can be built into the walls of new bridges by leaving out a brick or building block during construction. Dippers have sometimes nested in tunnels such as drainage pipes although a purpose-built rectangular cavity is far better than a round tunnel.
Nest: a domed structure of moss and grass, lined with dead leaves. Eggs: 4-5, white.



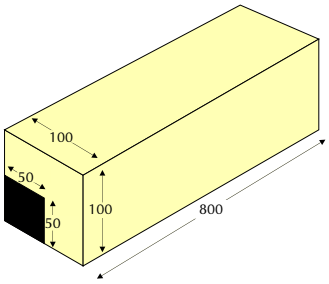
Open Nesting Songbirds
Nest Bundles
This category potentially includes all songbirds which nest off the ground in bushes and shrubs although Blackbird (which may also take to assorted platforms and ledges) and Song Thrush will possibly be the chief users of these sites. Bundles of vegetation (Fig 19) can be placed anywhere in suitable habitats. Gardens, newly coppiced woodland and conifer plantations are places where these nest sites will be of value. Bundles made of evergreen branches will be of greater value early in the season before deciduous plants come into full leaf.

Black Redstart *Phoenicurus ochruros* **Schedule 1**
Open Fronted Small.



A good alternative to a box is a ledge in a large shed or building, high under the roof. Make sure there is a good free access and plenty of other smaller escape holes. Although this is a scarce nesting species, it is worth placing boxes wherever singing males are found in spring.
Nest: a cup of grass, stems and moss lined with wool or hair. Eggs: 4-6, white.

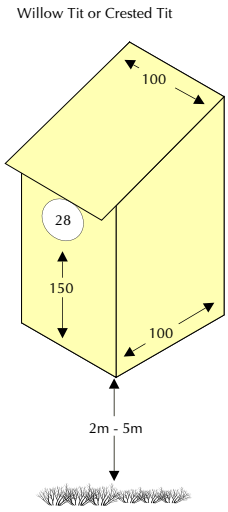
Wheatear *Oenanthe oenanthe*
Tunnel 100mm square , 800mm long.



Position the tunnel in a gently sloping bank or bury it in a pile of shingle. Cover the floor with shingle. The tunnel entrance should be only about 50mm wide. Either partially close the entrance with a stone or fit a front to the tunnel with a 50mm diameter hole. Some workers have had success using a jerrycan as the chamber (with an enlarged entrance) and a tunnel roofed over with

corrugated iron, the entire system covered in shingle.
If an inspection hatch is built into the tunnel, bear in mind that Wheatears often build the nest about two-thirds of the way down the tunnel rather than at the far end. Wheatears need some perches along the approach path to the box. Twigs stuck in the ground or boulders will do.
Nest: a heap of grass, moss, roots and leaves lined with grass, hair, wool or feathers. Eggs: 5-6, pale blue.

Willow Tit *Parus montanus*
Hole Entrance, filled Small, entrance diameter 25mm.
Site the box low down in thick cover. Wood shavings are an alternative filling to polystyrene. To attract Willow Tits to an area, strap rotting birch logs to sound tree trunks - naturally excavated nests cannot be inspected without a small mirror or endoscope. Colonisation of a new area is more likely if there are existing populations nearby, for Willow Tits are very sedentary. Other tits may oust Willow Tits from their newly excavated nest holes.
Nest: often only with a lining of wood fibres but sometimes of moss and feathers. Eggs: 6-9.



Crested Tit *Parus cristatus* **Schedule 1**
Hole Entrance, filled Small, entrance diameter 28mm.
Site the box at medium height. Success with these birds has been variable and it may take a few years for a particular population to take to boxes. Some birds will nest in unfilled hole entrance boxes.
Nest: a typical tit nest inside the excavated cavity; the lining may include spiders' webs. Eggs: 4-8.

Treecreeper *Certhia familiaris*
Natural Site Improvement
The problem in making an artificial site is to produce one which is easy to inspect, to ring the young and which Treecreepers will take to readily. Various inspectable designs (including the often quoted wedge) have been developed for Treecreepers but have met with little consistent success.
Treecreepers will nest between two pieces of wood - an easy way of achieving this is to fix a strip of bark over a concavity in a tree trunk. The cavity behind the bark should be about 70mm wide and 100mm high with a distance of 30mm between bark and tree trunk. Entrances are from either side of the bark strip. Select a rough barked tree and set these bark sites in groups of three or four with the groups spaced out 200m or so apart. Clefts in trees can be used for siting a 'cabin' made out of three pieces of bark (Fig 23). In any design, there must be two entrances adjacent to the tree trunk, one on each side of the box. Alternatively a little bark 'cabin' can be made from three pieces of bark in the fork of a tree. The cabin roof piece should be about 20mm above the top of the walls to give access, and the interior about 50mm deep.
It may be possible to arrange two pieces of timber with bark attached against a trunk. This design will look like an open book facing the trunk. An inspection hatch can be made in the top or sides. Entrance will be through gaps at either side. Two such designs which have been successful in Scandinavia are illustrated (Fig 23). Treecreepers have been known to nest in bat boxes.
Boxes should be placed at heights between 1m and 3m. Treecreepers are sensitive to disturbance.
Nest: a cup of twigs, roots, grass and moss lined with feathers, bark and wool. Eggs: 6, white, finely speckled reddish.

INSPECTION AND RECORDING

The BTO Nest Record Scheme

Nestboxes provide ideal tools for studying breeding birds - natural sites can often be difficult to locate, inspect and record reliably. Nests in boxes are easier to manipulate for experimental purposes. The BTO Nest Record Scheme handles information recorded from nestboxes (as well as that from natural sites). This information, which is now stored on computer files, can be analysed to show anything from basic breeding biology of a species to annual, regional or habitat-related variations in breeding performance for common species.

The Nest Record Scheme is just one of several BTO surveys. Others include censusing breeding populations of birds in woodland, farmland and waterways; counting wading birds on estuaries in winter; counting birds feeding in gardens and ringing birds. Each year there are short term surveys of particular species or groups. Results from some of these surveys, including those from the Nest Record Scheme are being combined in the BTO's Integrated Population Monitoring programme (IPM). This programme is of great importance to conservation. It can detect declines in bird populations at an early stage, give some understanding of the causes of declines and therefore highlight steps which may be taken to reverse them. The IPM programme provides the best possible nation-wide monitoring scheme for our common and not-so-common birds. It is only the combined efforts of our enthusiastic volunteer birdwatchers that allows the BTO to assess the 'health' of our bird populations each year in order that conservation bodies may have the best possible information on which to base their work.

By recording events, even only in the odd garden nestbox, it is possible to help in this national effort for conservation. It does not matter if a nest ends in failure - the scheme needs information on failure as much as on success. The Nest Record Cards are available free from BTO together with an explanatory booklet. In addition, a powerful computer program, IPMR, can be used for nest recording and submission of the data to the BTO Nest Record Scheme. IPMR is available free and can be downloaded from the BTO web site.

The most important items to be recorded are listed below and visits to a nest should be timed if possible with these in mind.

1. Building. Best observed from a distance.
2. Afternoon visits to find date of first egg. Eggs are normally laid in the morning, so a new egg found in the afternoon will be most likely to be an egg of that day.
3. During incubation, one early visit to record the number of eggs laid and another nearer hatching to record whether the eggs are still present and being incubated.
4. Two or three days after hatching to record the number of eggs hatched.
5. Two-thirds through the nestling period to record the number of nestlings which survived through the hatching process.
6. Fledging date. Best observed from a distance. Close inspection now may force premature departure.
7. After fledging. Record the number of unhatched eggs and dead young remaining: some may have been removed by parent birds.
8. Check about weekly for signs of a second clutch.

Inspecting Nests

Under the Wildlife and Countryside Act (1981) it is an offence to disturb or even approach a Schedule 1 bird at the nest, or to handle any wild bird without a licence. Licences for various operations can be obtained by suitably qualified people from the BTO. Species Notes gives some more details of these. Whenever inspecting nests of any sort, the welfare of the birds must be placed before other considerations. Fortunately most species are fairly tolerant of a sensitive human approach, although a few individuals do object. Since most birds have little or no sense of smell, there is no need to fear that they will smell that a human has interfered with the nest in their absence. Mammalian predators do have a keen sense of smell and can follow tracks made by us, so take care not to lead them to a ready food source. Visits may be made

as often as once a day with very tolerant birds, but this is not necessary except in some very detailed studies. In some cases it is better if a sitting bird is gently encouraged to leave its nestbox before it is opened. A human face appearing as the roof opens must be a worrying sight. Tap the tree trunk or nestbox gently and the bird will probably leave. Some individuals will sit tight under all circumstances. It is best not to disturb these - visit the box when the tight sitter is away feeding. In general, as the nest progresses, birds become less likely to desert as a result of disturbance because investment in the young is greater. Egg laying and hatching times can be particularly sensitive. Some species are liable to desert if handled at the nest, and these are mentioned in 'Species Notes'.

When counting eggs in the nest, take care to find all the eggs, which may be very well hidden deep in the nest material. With eggs of small birds exercise extreme care when hunting for hidden ones - the shells are very thin. Inspecting late in the nest cycle must be done with great care. Adults are most tolerant at this time, but the young are liable to fledge prematurely if disturbed. This is an adaptation to counter predator attacks. With hole entrance boxes, if the young explode in this way, gather them up and post them back through the entrance hole. Put your hand over the hole for a few minutes whilst the young settle, then quietly move away.

When inspecting boxes closely, care should be taken to avoid inhaling any dust or other matter from old nests. Boxes may contain, among other things, white pustules of a keratin-eating fungus. (Keratin is the material of which feathers are made.) This fungus can grow in the warm damp human lung and is not easy to remove. It is also easy to catch various intestinal disorders from nest contents. Always wash your hands after dealing with nests and before eating your sandwiches.

Contributors to the Nest Record Scheme should note that, in general, records from open nests that have had anti-predator devices placed around them are not desirable. The number of nests protected in this way is minute compared to the total number of all nests, yet this tiny number could provide the bulk of the recorded nests. Such a situation would cause severe bias in the Nest Record data. Boxes which have been protected from predators before being selected by birds are in a different category and should be recorded. The nature of the protection should be indicated clearly. If in doubt in a particular situation, consult the Nest Record Officer at the BTO.

Nestbox Studies

Recording the basic information on each nest is only the starting point of nestbox studies. The fact that boxes are built, and therefore not natural, allows inclusion of devices to aid observation and recording. For example, glass-backed boxes can be made and fixed on the side of a hide or against a window. Observations can be made from the darkened room behind the window.

Detailed studies which require knowledge of the identities of the adult birds may require trapping at the nest. Ringers will be familiar with the mandatory instructions for trapping birds at nestboxes. These, briefly, state that in all cases where birds are trapped at nestboxes the boxes should be numbered and recorded on a map, a written note must be made each time a trap is set at a nestbox and that there must be a fail-safe procedure ensuring that nest entrances which have been blocked are unblocked.

Non-ringers are not subject to the letter of these guidelines, and in any case will not be trapping or handling birds at the nest (which requires a general ringing permit together with an endorsement for nest trapping). However it is possible that non-ringers may wish to block entrance holes from time to time, to prevent birds flying out in alarm for instance. These guidelines should be adhered to. All boxes with hole entrances which may be blocked temporarily during inspection must be numbered and recorded on a map. The map should be available in the field. Holes should only be blocked with a cloth specifically for that purpose and each person should carry at most one such cloth. Before and after a nestbox checking session, all cloths must be checked. A record of boxes inspected must be made as each box is inspected. Perhaps the simplest and safest method to adopt is to tie the cloth to your ladder or to your clothing with a short string. It is then impossible to leave the cloth in the box as you depart.

Various automatic recording devices have been used. These include cameras triggered by the entry of a bird or by a clock. Micro- or light-sensitive switches attached at the entrance can be used to record frequency of

parental visits. It is quite easy to attach recording devices to a microcomputer. This has the advantages that data collected will be held on computer file ready for analysis and that computer collection is more flexible than other automatic methods. It is important to be aware that automatic data collection will provide a very detailed picture of events at the nestbox being monitored. There is the danger that the nest being monitored is atypical. It is wise to monitor several nests in depth before drawing conclusions about the whole species. There is now a wide array of automatic nestbox monitoring equipment available, including small CCTV cameras and a variety of probes which can be used to record temperature or humidity etc.

Nestbox populations of birds like the commoner tits can be studied in order to throw light on a large number of general biological problems. These include mate choice, mate fidelity, nest site fidelity in male or female, brood parasitism (not only with Cuckoos, also Starling and probably many others) and reproductive success. Coupled with wider bird ringing work, data from ringing nestlings is important for investigations into juvenile and adult survival and juvenile dispersal. Remains of birds including rings are often found in owl and raptor nests. Searching for them may not always be pleasant but it is always worthwhile. Owl pellets and nestbox debris also allow studies of owl diets. Boxes may also be inspected by night for roosting birds (provided the appropriate ringing permits are held). This operation should not be carried out more often than once every three or four weeks and should not be carried out in very cold weather.

There are numerous other fields of study in which nestboxes can be used. There has been very little basic recording of nestbox invertebrate fauna. Contacts with entomologists will help for identification purposes. Identification of box contents is quite likely to provide new records of species simply because of the present under-recorded state. Basic recording can be followed by ecological studies. Even a garden tit nestbox can provide 12 months continuous entomological observation.

Record Keeping

In any nestbox project, details of all boxes should be kept systematically. Boxes must be labelled. The simplest method is to use a spirit-based marking pen (Berol Toughpoint marker pens are very good). Numbering the box takes only a few seconds and the mark lasts several seasons. This is much cleaner and easier than painting numbers. Maps of box locations are essential if more than a handful of boxes are put up or if a detailed recording scheme is operated. The details recorded about boxes will vary according to the nature of the scheme but will probably include box location, type and size, habitat, height, aspect and site. Maps are essential. It may appear to you, as you site your boxes in the autumn or winter when there is little undergrowth, that it will be easy to find them again. Experience shows that boxes can easily become hard to find as the rampant spring and summer undergrowth develops. Memory does not always work, even between one weekly visit and another, particularly when you are tired after a long field session. Even within the space of a week or two the development of undergrowth can hide a box completely.

Recording Technique

People vary in the way they deal with information. It is impossible to state the 'best' way to record events in nestboxes. The ideas below are some which have been found to be useful. Your own system may develop differently but no one dealing with nestboxes should be without a reliable and efficient recording system. Your system should allow you know what to expect when you are visiting each box - recording errors can be detected and unusual observations can be double checked on the spot.

Small hardbacked note books can be used. They require that details of boxes to be visited, together with notes about what to look for, be written before a field visit is made. Other people have found small ring binders or filofaxes more useful. These will have one page per nest, arranged in order of visiting nests. This has the advantage that the complete nest history is available at the nestbox. Inconsistent or unlikely observations can be double-checked on the spot, enabling more reliable data recording. Ring binders can also hold the other vital bits of paper - like your maps and the sheet of codes used by the Nest Record Scheme. Records should be transcribed into a permanent format (e.g. computerised using IPMR or written on nest record cards) as soon as possible, record cards being updated visit by visit. Modern reprographic and desk-top publishing equipment is very useful for producing field sheets of exactly the format desired.

With large numbers of boxes it is helpful to plan visits. The computer software IPMR, when used for nest recording, will predict important dates (such as hatching date). This information can be used to know when boxes need visiting and when they should be left unvisited. IPMR can be downloaded, free of charge to nest recorders, from the BTO web site.
In the field, always record information on the spot. Do not commit anything to memory even for only a few seconds. A minor crisis or distraction can easily cause the transposition of numbers - 6 eggs in box 45 becoming 5 in 46. In th field it is most helpful to record information in exactly the format required for the Nest Record Scheme. This is partly because the codes are short, easy to remember write down in the field. It is also because the codes used in the scheme have been designed to record the important events at the nest. Thus, by using the codes, you are automatically looking for the important details. Some observers use a hand-held cassette recorder for recording events, others use an automatic camera for a permanent record of nests particularly those high in trees.
Be prepared for all sorts of events before you start field work. With experience you will know what equipment you may need, but rather than committing it to memory write a check list in the back of the field book. If you are visiting an area seldom visited by other people, make sure someone knows where you will be. Ensure you have all the equipment before you set off.

Your check list may include:

pen - which works in the wet,
pencil (for when you lose the pen),
note book (and a spare for when the first becomes soaked),
torch and dentist's mirror for looking into Wren and other nests,
hammer,
nails,
string,
metal hole reinforcements,
knife,
mirror on a long stick for looking into high open nests,
ladder,
first aid kit with insect repellent,
anti-mammal pellets,
cloth for blocking holes,
Nest Record Scheme coding sheet,
map of nestboxes.

Extract from Notebook with explanatory notes.

The two-letter 'activity codes', WA, AN, BL, etc. are from the BTO Nest Record coding system. This is fully described in the booklet 'The Nest Record Scheme', free to participants in the scheme, from the BTO.

Page from field book

25/04/92 12.00-13.00

Box	**Species**	**Codes**	**Explanation**
1	Starling	5E WA AN	5 warm eggs; adult at the nest.
7	Blue Tit	7Y BL	7 young birds; still blind.
4	Starling	5Y IP AV	5 young; primary feathers in pin; adult near nest.
5	Starling	6Y IP AV	6 young; otherwise as box 4.
6	Great Tit	8E WA UN	8 eggs; warm and not covered with lining.
9	Starling	5Y BL AV	5 young; still blind, adult nearby.

APPENDIX

1 Useful Web Addresses

Organisation	Initials	Web address
British Trust for Ornithology	**BTO**	**www.bto.org**
Bat Conservation Trust	BCT	www.bats.org.uk
British Hedgehog Preservation Society	BHPS	www.software-technics.co.uk/bhps
Countryside Council for Wales	CCW	www.ccw.gov.uk
Dept. of the Environment for Northern Ireland	DOENI	www.doeni.gov.uk
English Nature	EN	www.english-nature.org.uk
Fauna and Flora Preservation Society	FFPS	www.fauna-flora.org
The Hawk and Owl Trust	HOT	www.hawkandowl.org
Henry Doubleday Research Association	HDRA	www.hdra.org.uk
Mammal Society		www.mammal.org.uk
The Wildlife Trusts (formerly RSNC)		www.wildlifetrusts.org
Royal Society for the Protection of Birds	RSPB	www.rspb.org.uk
Scottish Natural Heritage	SNH	www.snh.org.uk

2 Who to Contact

Bird Surveys, (Nest Records scheme and others)	BTO
Licences for Schedule 1 birds (ringing or recording at nest)	BTO
Licences for Schedule 1 birds (photography at nest etc.)	EN, CCW or SNH
Hedgehog Box plans	HDRA or BHPS
Birds and the Law	RSPB

3 Further Reading and Information

This list is as printed in the 1993 edition. Some books are out of print; some have been superseded by newer books.

The New Atlas of Breeding Birds of Britain and Ireland: 1988-1991; Gibbons, Reid & Chapman. (1993, T & AD Poyser, London)
The breeding distribution, numbers and habitats used by Britain and Ireland's birds.

The Audubon Society Guide to Attracting Birds; Kress (1985, Scribner's, New York)
The American garden bird book with sections on preventing parasites and predators.

Bat Boxes; Stebbings and Walsh (1988, FFPS)
Designs and other information about bats.

Bats in Houses; Hutson (1990, FFPS)
Booklet about all aspects of conservation of bats for the householder.

Birds of the Western Palaearctic Vols 1-9; Cramp et al (1977-1994, Oxford)
The most up-to-date and comprehensive book available for information on all aspects of bird life.

Britain's Birds in 1990-91: Stroud and Glue (1992, BTO/JNCC)
The second annual report of the status of birds in Britain compiled from various major surveys and projects. (Up-to-date information is now available on the BTO web site.)

Collins Guide to Wildlife about the House and Home; Mourier, Winding & Sunesen (1977, Collins)
Contains information on various other nestbox inhabitants.

Directory of Grant Making Trusts, 12th Compilation; (1991, Charities Aid Foundation)
Contains information on grants from various charities.

A Field Guide to Nests, Eggs and Nestlings of British and European Birds; Harrison (1975, Collins)
Essential for identification of nests and eggs and other background information.

Finding and Identifying Mammals in Britain; Corbett (1975, British Museum)
For identifying remains in owl pellets and live box users.

The Garden Bird Book; Glue (1982, Macmillan.)

Information on birds and the garden, including results of some BTO surveys.

A Guide to Little Tern Conservation; Haddon & Knight (1983, RSPB)

An advanced guide also relevant to other major nest site protection projects.

Hedgehogs in your Garden; Sedgeley (1991, Mammal Society)

All aspects of hedgehog conservation for the gardener.

The Identification of Remains in Owl Pellets; Yalden (1977, Mammal Society)

Essential booklet for anyone with more than a passing interest in owl pellets.

Nestboxes for the Birds of Britain and Europe; Bolund (1987, Sainsbury press)

A translation of a Scandinavian book which has additional background information about some of our rarer species of nestbox birds.

The Nest Record Scheme; BTO

Free booklet for nest recorders. It contains full details of the scheme and coding system.

Population Trends in British Birds; Marchant, Hudson, Carter and Whittington (1990, BTO/NCC)

Results of thirty years of BTO populations surveys.

Restoration of Gravel Pits for Wildfowl; Street (1985, Game Conservancy)

An advanced guide which includes designs and instructions for wildfowl nest boxes.

Rivers and Wildlife Handbook; Lewis and Willows (1984, RSPB/RSNC)

An advanced guide with several wetland and wildfowl designs.

Wildlife, the Law and You; (1982, NCC)

A brief guide to the 1981 Wildlife & Countryside Act.