THE UNIVERSITY of York

# Ecological Management Plan **2013/18**

# Contents



Photo by John Hollihan. Cover photo by Suzy Harrison

# Introduction

## The University's new Heslington East development is approximately 120 hectares in size. Almost half of this area is designated as peripheral landscape and as such offers a huge opportunity for the creation of diverse habitats to encourage biodiversity.

One of the mandates on the University whilst developing Heslington East was to increase the biodiversity of the site. On the face of it, this seemed relatively easy to achieve, given that the land used to be intensively farmed arable land. Important well-established habitats existed on the land and it was important to preserve and enhance these where possible.

The scale of Heslington East will mean that a substantial proportion of the peripheral landscape will see low intervention management. This should dovetail well with enhancing biodiversity, as most habitats will benefit from being less well-manicured.

Following the completion of Phase 1 of the development, the University commissioned a baseline ecological survey, to obtain information on the existing biodiversity of the site and to gauge how successful habitat creation efforts have been to date.


Heslington East development site

# Over-arching management principles

- Do not inadvertently destroy existing valuable habitats.
- Give preference to native species of local provenance. For example, the Tansy Beetle now has a very limited range along the Ouse. Planting wild Tansy in wetland areas on Heslington East could provide an extended habitat for the beetle.
- Create a mosaic of different habitats that will provide a range of habitats for more species. For example, woodland areas should contain a range of trees, have glades and contain dead wood in the form of nature sticks or log piles.
- Link habitats to enable species movement between them.
- Time management operations carefully to reduce impacts on species that may be feeding, breeding or hibernating.
- Think about pest control – can a chemical control be substituted with a cultural control? Reduce chemical usage generally.
- Compost green waste.
- Keep management intervention to a minimum. Do not over-manage and in doing so reduce habitat potential.
- Consult the UK Biodiversity Action Plan and specifically the Local Biodiversity Action Plan to inform which habitats and species should form the focus habitat creation measures.

Tansy Beetle

Wild Tansy

Photo by Suzy Harrison

# Existing habitats

## Hedgerows

Many hedgerows were lost on Heslington East as a consequence of site development. However to compensate the following principles will be adopted:

- Where hedgerows have been lost there will be compensation in the planting of additional locally appropriate native trees and shrubs.
- Hedgerows around the perimeter of the site will be reinforced and diversified.
- Where possible, existing hedgerows will be incorporated within the design of the infrastructure.

Existing hedgerows were surveyed in September 2011 as part of the ecological baseline survey. The Low Lane hedge qualifies as a hedge of importance under the 1997 hedgerow regulations and offers a good potential for habitat enhancement by:

- Allowing the hedge to broaden.
- Planting additional native tree and shrub species.
- Adding nest boxes and Bat roosting boxes to the mature trees contained therein.

The Low Lane hedgerow currently contains 23 species of tree and shrub. Species appear to have been added at different dates and this, together with current management, has allowed the development of a range of different height structures and enhanced species diversity. As such the hedgerow constitutes a high conservation value and important habitat resource which will be maintained by careful future management.

- Existing hedgerows will be retained where possible and restored so that they are rich in woody species but dominated by Hawthorn.
- New species-rich hedgerows will be planted along suitable parts of the site boundary lacking existing hedgerows.
- The dense habitat of hedgerows will provide valuable nesting habitat. Species that have already been observed within the baseline ecological survey and the winter bird surveys carried out by the consultant ornithologist include Redwing, Mistle Thrush, Goldfinch, Bullfinch, Tree Sparrow and Yellow Hammer.
- Hedges will act as wildlife corridors, in particular linking patches of woodland and are likely to be used by feeding bats, feeding Barn owls, small mammals including hedgehogs.

## Ditches

As with hedges, several ditch courses were lost on the Heslington East site when development took place. One important section of ditch along the south western boundary of the site has however remained and this has great value from an ecological point of view for several reasons:

- It has a hedge line running along its length, which provides associated habitat.
- It provides connectivity to watercourses in farmland to the south of the site and thus provides a corridor for Water Vole particularly to reach and colonise the wetland habitats on Heslington East.
- It is already rich in moisture-loving species and its proximity to the wetland area and top section of the lake should facilitate seed dispersal by these plants.
- Natural colonisation of parts of wetland areas has already taken place with Bullrush and Stickleback, which are likely to have been already present within the ditches and watercourses, prior to development.

Several additional sections of ditch have been added during development, associated with the lake outfall. These ditches also connect to watercourses outwith the site and may also provide migration routes for Water Vole.

Ditches have to be periodically managed so that they maintain their primary function of draining the land. It is important however that management operations are carried out to cause the least amount of impact on the habitat potential, particularly for Water Vole. As such, ditch clearance will take place at intervals according to their importance to drainage. Key drains will be cleared on an annual basis, with subsidiary ones every second or third year, following the National Guidance for Internal Drainage Boards, specifically related to mitigation measures for Water Voles, jointly issued by Natural England and the Association of Drainage Authorities.

Photo by John Hollihan

# Newly created habitat

Swans on lake at Heslington East

## Lake and wetlands

This encompasses a broad habitat range including:

- a 10Ha lake
- associated wetland pools
- a detention basin with fluctuating water levels
- reed beds
- swales.

The lake is a substantial body of water making up eight per cent of the total area of the development site. It is an integral part of the surface water drainage system for the site, but simultaneously presents huge opportunity in terms of habitat creation and increasing biodiversity.

A large proportion of the management problems associated with lowland lakes are a result of nutrient enrichment or eutrophication. Elevated levels of phosphorous typify nutrient enriched conditions. Soil analysis prior to development of the site indicated high levels of Phosphorous, which tends to persist for long periods within the soil.

Tern raft on the lake

Several routine management techniques may reduce Phosphorus availability within the lake:

- plant and maintain 40 per cent cover of aquatic macrophytes
- do not stock with fish
- discourage the residence and use of the lake by waterfowl (Primarily populations of Canada and Greylag geese).

Generally lakes which have a 40 per cent cover of higher aquatic plants will have transparent water, as higher plants assist in reducing the development of algal blooms through shading, uptake of available nutrients and providing a refuge for zooplankton, which in turn graze on phytoplankton. Harvesting of decaying plants in the autumn, will effectively remove Phosphorous from the lake system. This will be carried out on a rotational system with different sections being cut one year in four, or when judged to have become too dense. This should minimise the removal of invertebrates

Studies and historical experience has demonstrated that certain species of bottom feeding fish (specifically Carp and Bream) can encourage nutrient recycling through the disturbance of bottom sediments. Fish will also graze zooplankton, thus removing a natural control on algal blooms.

Fish are expected to colonise the lake over time and there is already an appreciable population of Stickleback. The species range is expected to find its balance over a period of time, with natural controls on population density coming from any predatory fish which colonise and from fish eating birds such as Grebe, Heron and Kingfisher.

Broadleaved pondweed thriving in the lake

Marginal planting around the lake edge

Several features have or are to be incorporated into the design and management of the lake and wider site to discourage geese and thus notionally reduce nutrient inputs from this source:

- extensive planting of reed type marginal aquatics that will resist goose grazing and provide a poor food source once established

Photo by Suzy Harrison

Family of Greylags

- establishment of a broad marginal fringe of vegetation to act as a barrier to reduce access for birds between the lake and surrounding potential grazing areas
- unlike Heslington West, there are no islands within the lake to encourage roosting or breeding.

In the interests of promoting a broader species range across the site it may well be necessary to take more active measures to control over dominant species such as Greylag and Canada geese, as their effect on the environment generally might prove a limiting factor in the longer term to other species by unbalancing the lake ecology. This could take the form of breeding prevention measures such as egg oiling.

## Nutrient management approach

Active management of the geese population on the lake and the Heslington East site generally is only one strand of nutrient management to limit the nutrient loading in the lake water:

- **Soil stripping/inversion.** As part of the initial earth moving and profiling works on site, nutrient-rich top soil was buried and mixed with nutrient-poor sub soil. As part of the lake construction low nutrient sand won from the site was used as an overburden layer for the lake liner and to form an inert planting substrate for the planting of aquatics.

*Phragmites* establishing well in one of the reed beds

- **Water filtration.** The circulation system within the lake sends water through a reed bed filtration system planted with *Phragmites australis* to act as a bio-filter after which the water percolates down through a layer of blast furnace slag which is known to be an effective absorber of Phosphorus.

- **Ring drain.** A ring drain encircles the lake system, which intercepts surface water drainage from flowing directly into the lake and is diverted into the re-circulation system to pass through a reed bed at the eastern end of the lake.

- **Herbage cropping of phosphate rich soils.** Both species-rich and species-poor meadow land is cut on an annual basis with the arisings being taken for a hay crop and thus removing the nutrient contained therein.

## Ponds and wetlands

In the south west corner of the site a wetland area has been created. The area was to comprise a mixture of permanently wet pools with a series of scrapes of varying depths within and around the pools. It was anticipated that several of these scrapes would dry up during the summer and the area generally would support a diverse range of aquatic plant species, which would migrate into the wetland from nearby water courses as well as being sown and form a mosaic of vegetation. Species such as Meadowsweet, Purple loosstrife, Common reed, Great willowherb and Flag iris are likely to be prominent. And a range of aquatic invertebrates, such as dragonflies, damselflies and water beetles. The habitat would in turn become suitable for bird species such as Sedge Warblers, Reed Buntings and Kingfishers. Additionally an abundance of invertebrates should provide good foraging for bats, of which four species have been identified as using the site in the 2011 ecological baseline survey. The expectation is for Great Created newt to colonise the habitat within five to ten years.

The objectives of creating the wetland area can be summarised as follows:

- To increase significantly the existing biodiversity of the site by providing freshwater pond habitat with submerged, floating and marginal vegetation for freshwater invertebrates, amphibian, water vole and bird life.

- To provide water bodies sufficiently large to incorporate shallow margins for Water vole and amphibian access, whilst maintaining a central deeper zone.

Brooklime spreading into the wetlands from neighbouring water courses

Carex riparia introducing itself naturally

- To connect the western lake to the wetland area to provide top up water during periods of drought.

However, the wetland area has not so far developed as anticipated. The pools and scrapes have over filled and joined to become one homogenous body of water (In effect a small lake). This limits the potential of the habitat as described above. Fluctuating water levels in the scrapes would provide suitable habitat for Great Crested newt. Larvae and adults are vulnerable to predation by fish. Scrapes that dry up completely will eliminate fish and thus should allow the newt to breed successfully.

As such, managing the water level within the wetland system has added importance. Supplementary water can be added via the connection to the western lake, but lowering water levels cannot just be left to seasonal variation in rainfall and temperature. An outlet valve would have to be introduced to the system to artificially reduce levels. In the long term this would be a less invasive way of removing water as opposed to periodically pumping water from the system. The alternative is to let the area develop as it is. Much of the area is quite shallow and may eventually grow over. Having one large area of water may not be as beneficial for wildlife in the short term, but longer term it may prove to be better, as deeper water will limit the growth of vegetation.

It is also hoped that in time Water voles will colonise the site. Evidence of Water vole has been found in the water courses of the surrounding farmland, which connect to existing ditches on site in close proximity to the wetland area.

Management intervention within the wetland area will be minimal and may be summarised as follows:

- the introduction of desirable marginal and emergent aquatic species, including the transfer of plants seeds that do well on Heslington West and are of local provenance such as *Carex riparia*, and *Scrophularia auriculata*
- the introduction of subjects such as cowslips, and orchid species such as Northern Marsh oOrchid and Common Spotted orchid
- the introduction of rock and log piles to enhance the suitability of the habitat for Great Crested newt
- the long term removal of dominating vegetation – removed material will be left by the waterside for several days to allow any trapped invertebrates to migrate back to the water
- the removal of large accumulations of fallen leaves
- the removal of any unintentionally introduced alien species.

## Detention basin

Originally planned as a flood plain which would be seasonally inundated with water much like an area of ings. The original concept has had to be abandoned because the basin was dug too deep and is now permanently or partially covered with water, whether from ground water or water running through the Badger Hill surface water drain. This has however presented an opportunity to develop a different type of wetland habitat to the one

Marginal and carr vegetation colonising the detention basin margins

Photo by John Houlihan

originally envisaged. The principles involved in the creation and management of this habitat are as follows:

- zoning areas of the basin according to wetness and selecting appropriate species to introduce into these zones according to water level and frequency of inundation
- allow the basin to flood as prevailing conditions dictate and not try to prevent frequent inundation
- allow natural colonisation of the basin. For example. Reed mace and *Phragmites* have both started to colonise to varying degrees, as have willows around the water margins.

It is envisaged that vegetation zones will broadly follow the descriptions below:

- **W1 (wettest areas).** Introduce a mixture of plants such as Flag iris, Purple loosetrife, Pendulous sedge and Hemp agrimony, with Norfolk reed and bullrush in the very wettest places. This will provide interest at different times of the year and provide a good habitat for invertebrates and birds.
- **W2 Wet woodland.** A strip of wet carr woodland between fenland vegetation and water meadow. Introduced trees would be relatively low growing and able to be cut back periodically, such as Pussy willow, Hazel, Guelder rose and Dogwood.
- The planting of a meandering line of waterlogging tolerant trees, such as Willows, Alders, Poplars and Downy Birch.
- **W3 Water Meadow.** These areas would be seeded with a species mix including Wild tansy, meadowsweet, Bistort and Meadow cranesbill. Over time Common and Spotted Marsh orchids may also colonise
- Specimen trees chosen for good autumn colour to enhance the flooded landscape.

The ongoing management of the detention basin will follow a minimal intervention strategy, with the main management operations being:

- long term removal of over dominant vegetation (most likely bullrush)

- coppicing of low growing carr woodland trees
- seasonal cutting of flood meadow in late July or early August to allow flowers enough time to set seed.

## Reed beds

Reed beds and associated planting will be established in a diverse range and water and wetland areas on the Heslington East site, and these will be managed in line with other marginal vegetation (periodic cutting-back and removal of excess material). However, there are also designated reed bed areas used as part of the lake water recirculation system. The designated recirculation reed beds are part of the lake system because they perform a specific function in filtering recirculated water, but they are also habitats in their own right with water levels and flows controlled by switching the circulation pumps on and off.

During the establishment phase, management of the recirculation reed beds is aimed at encouraging the firm establishment of the Norfolk reeds planted into the over lying soil layer of the reed bed, itself laid over filtering substrates. Over the first two to three years, the circulation pumps will be periodically switched on and off, keeping the growing medium moist enough for the reeds to establish and become large enough for them to withstand inundation on a permanent basis. Once established, it is anticipated that the circulation pumps will run permanently so that water passes continuously through the reed bed allowing it to perform its primary function of removing nutrient from the water. As the reeds act partially as a bio-filter, taking nutrient from the water as they grow, the reeds need to be harvested every year to remove this nutrient from the lake system. At the same time, the arising could provide a useful seed source for the propagation of more reeds. Additionally, pieces of rhizome could be dug out which could be planted into the wetland environment in subsequent years.

As a secondary function the reed beds will provide ideal habitat for a range of invertebrates and birds.

## Swales

The strategy for draining the new Heslington East site has been developed to provide a sustainable system that will harvest water for discharge into the lake using a combination of swales. Swale design varies in response

Swale outside Goodricke College in Phase 1 development

to anticipated water volumes carried and the character of the landscape setting it passes through. In the soft landscape areas around residences the swales are sinuous dry grassed channels with variations in width and gradient. As the swales progress through the site towards the lake, they take on a different character becoming wider and deeper conveyance swales and having a more 'ditch' like appearance.

As well as being functional, the swales serve a dual purpose of providing a more naturalistic landscaping element to that between the buildings and a link to the peripheral landscape and will provide a micro habitat in themselves for moisture loving plants such as Marsh marigold, Purple loosestrife, meadowsweet, cowslips, some bulb species and to invertebrates such as dragonflies.

The functional purpose of the swales means that maintenance of them is important to ensure water flows are not impeded:

- rubbish and litter will be removed on regularly (weekly)
- during autumn vegetation within the swale channel will be cut down and removed for composting and any accumulations of leaf litter will be removed
- monitoring of Species within the swale channel, with re-planting if necessary to maintain a desirable species mix.

Photo by John Holihan

## Species-rich neutral grasslands

As part of a range of habitat creation measures the Heslington East environmental site management plan identifies the creation of a range of species-rich neutral grasslands. One of the main aims of the project is to create species-rich hay meadows similar to those described in the National Vegetation Classification (NVC). The most suitable type of grassland for this type of habitat is the MG5 *Cynosurus cirstatus – Centauria nigra* grassland, which normally occur on nutrient-poor clay-loam soils. Some parts of the site are quite sandy, although this isn't critical, as the whole site does not have to match a given NVC category. To achieve the necessary conditions for species-rich grasslands to develop has involved a large degree of soil inversion and mixing to bring the sub soil of the site to the surface to provide the low nutrient medium for a species-rich treatment to be successful and to discourage coarse grasses from out competing wild flowers.

Even so it is likely that grasses will dominate in the first few years of establishment, with large patches of clover and Ribwort plantain. Excessive grass development will be controlled to some extent by the inclusion of Hay Rattle in the initial seed mix. This species is semi parasitic on grass and will give the less competitive wildflower species a chance to establish. Over five to ten years the cover of flower and broad leaf species should steadily increase as nutrient levels decline and a more species-rich plant community should develop.

The grasslands in the north western buffer zone landscape have already been established now for two to three years. The baseline ecological survey carried out in 2011 has highlighted some differences in establishment over the area, which most likely relate to the nutrient status of the soil and in turn how effective soil mixing and inversion has been. The species-rich grassland close to the western site entrance has established well, with high overall cover including clover, grasses and herbaceous species.

Hay Rattle

Species-rich meadowland in the peripheral landscape

Conversely, establishment of species-rich grassland in and around the wetland area has been much more patchy with Birds Foot Trefoil dominating. This is consistent with very low nutrient conditions. Progress of the grasslands in this area will continue to be monitored. It is expected that in time the nutrient fixing characteristics of Birds Foot Trefoil coupled with the nutrient inputs from waterfowl excretia will raise nutrient levels and encourage species diversification. Another approach may be to over-sow or plant key missing species, but it may be equally appropriate to just monitor and see what colonises naturally over time.

The base line survey concludes that in general, a good proportion of the species included in the species-rich seed mixes are represented across the site, with the potential for wider dispersal as conditions develop.

The long term management of species-rich hay meadows will be as follows:

- Once established the species-rich meadows will be cut twice yearly in late March/early April and then again in late July/early August once the annual species have set seed. Cutting height will be around five cm and all arisings will be uplifted and removed. It is anticipated that a local farmer will be invited to take the late summer cut so the arisings can be taken as a hay crop.

- Perennial weeds such as Ragwort will be controlled by herbicide spot treatment during late spring.

- Excessive grass development will be controlled with an over sowing of Hay Rattle in autumn, which will locally inhibit grass growth giving less aggressive species an opportunity to colonise. Although this should only be necessary if the Hay Rattle already sown fails to establish.

- No fertilisers or other nutrients will be added.

- Periodic monitoring of the vegetation sward will take place. Any desired species needing to be re-introduced can be done so either by plug planting or over sowing.

Species-rich grassland will provide a naturally colourful display throughout the summer and will support a diverse community of invertebrates, particularly butterflies, moths, grasshoppers and crickets. Perhaps most importantly though, they will provide a good source of food for bees, particularly from the clover contained therein. The large areas of grassland on site also provide excellent habitat for skylarks to breed. This is one of the priority species identified in the local biodiversity action plan. Skylarks have been regularly observed on site in surveys carried out through the breeding season, with more than ten singing males often present on site. The meadows will also provide good foraging habitat for Song Thrushes, Linnets and Yellowhammers.

## Species-poor hay meadow

The sowing down of species-poor hay meadow has been carried out as part of the nutrient management regime. The cropping of these areas is intended to take nutrient from the soil year on year to reduce nutrient leaching into the lake and to eventually make conditions favourable for species-rich hay meadows.

In the short to medium term, species-poor hay meadows will be by cutting twice yearly at approximately the same time as the species-rich meadows. Also, as with the species-rich meadows, a local farmer will be invited to cut the site and take the arisings as a hay crop. As nutrient levels progressively fall, it is anticipated that broad leaved species from adjacent species-rich meadows will migrate in and colonise over time, thus steadily increasing the proportion of species-rich meadowland. One of the best ways to increase the species richness of the species-poor meadows is to take some turves from species-rich grassland (once established) and plant into the species-poor grassland; from which the extra species can spread. Also, spraying out patches of the species-poor grassland (to cut down competition) and sowing (seed/plugs) a species-rich mix can work in the long run. Initially the species-poor meadows should be enriched in the places where the vegetation is relatively thin. There is a great deal of scope for this on Kimberlow Hill.

## Cornfield annuals

Several high profile areas within the Heslington East site have been identified to be planted with drifts of cornfield annuals (Poppies and Cornflowers). The primary function of these areas is aesthetic rather than habitat creation, they will however have a secondary function of providing foraging for bees and other insects and in this respect they are useful.

As these flowers need cultivated ground to grow successfully the initial establishment regime will have to be repeated on an annual basis to achieve the desired effect:

- applying a non-selective herbicide to the area to kill perennial weeds.

- harrow ground to create a seed bed onto which seed mix is sown.

- roll the soil to ensure good contact between seed and soil.

- cut down in September after seed has set to make sure ripe seed is dispersed widely.

- the following spring, plough or rotovate the area and sow an additional amount of seed to supplement the natural seed bank.

Cornfield annuals – a food source for foraging bees

## Naturalistic areas of rough grassland

The area of peripheral landscape, with runs east from the wetland area between the southern shore of the lake and the site boundary hedge is to be treated as an area of naturalistic rough grassland, which will receive minimal management interventions and be allowed to develop as an essentially wild area largely undisturbed by people. In several respects it should provide a similar habitat to the more managed grassland areas, but it is also hoped that it will become a good habitat for small mammals, which in turn would provide a food source for bird species such as Owls and Hawks (Owl and Kestrel nesting boxes are to be introduced into the mature trees along the Low Lane boundary hedge. The connecting ditches from the lake outfall to Germany Beck and Tilmire Drain also run though this area and eventually these ditches may become populated by Water vole.

As stated, interventions in this area will be minimal, only consisting of the following treatments:

- marginal planting along the Southern shore of the lake
- annual ditch maintenance to make sure drainage off site is not impeded (Reference has already been made to National Guidance for Internal Drainage Boards, specifically related to mitigation measures for Water Voles in the section on ditches)
- control of invasive perennial weeds such as Ragwort by spot treatment with herbicide
- selective introduction of wildflowers that would be good food sources for insects and birds, such as Foxglove and Teasel

Photo by John Houlihan

Woodland block planting

Woodland planting block on Kimberlow Hill

- periodic cutting on a three year rotation to prevent scrub and coarse grasses dominating.

## Woodlands

Deciduous woodland is a priority habitat in the UK Biodiversity Action Plan and the creation of this habitat on the Heslington East development site contributes to the national target.

- Blocks of woodland have been planted throughout the peripheral landscape. The primary species are Pedunculate Oak and Ash, but each block contains a broad mix of native species.
- Where possible the plants have been sourced locally, with most being grown within the Vale of York.
- Woodland margins have been planted with smaller decorative berry bearing shrubs such as Spindle, Guelder Rose and Wayfaring Tree, which should provide a valuable food source for birds.
- Additionally, to begin with, the initial batch of trees used in the woodland plantings were planted in a temporary nursery on the development site to give them some time to acclimatise to local soil and weather conditions. From here they were lifted and re-planted to their final positions within the woodland blocks.
- The trees within the woodland blocks have initially been protected from grazing animals by tree shelters. These also provide a micro climate around the tree encouraging their establishment.
- Bio-degradable mulch mats have been placed around the base of trees to exercise some degree of weed control.

- Planting comprises species of tree, shrub and field heights offering a multi – layered environment into which deadwood piles, roosting and breeding boxes can eventually be introduced.

Woodland ground flora is generally recognised as being one of the most difficult habitats to create. A woodland groundflora seed mix is to be sown down within the woodland blocks, but most woodland herbs require shade, which is not possible to provide until the tree canopy has developed.

There are, however, several more woodland areas to be planted and with input from an organisation called Landlife, which promotes and facilitates the creation of new wildflower landscapes, some of these woodland blocks will be sown down prior to tree planting with a woodland wildflower mix. This seed mix will contain species which give significant bee interest and will directly support local initiatives by Friends of the Earth to promote and enhance habitat for bees.

Over time it is expected that a diverse herb layer will develop as the tree canopy closes including target species such as Bluebell, Wood Sorrel, Ground Ivy, Foxglove, Red Campion, Wood Avens and Archangel.

Woodland blocks should also provide habitat for priority bird species such as Dunnock, Song Thrush, Spotted Flycatcher and Bullfinch.

A range of bat species may also begin to use the woodlands for foraging, particularly along the margins where night flying insects may congregate.

Hedgehogs may also colonise the woodlands over time.

Over the initial years of development the woodland areas will be maintained and improved through the following measures:

- periodic inspection, whereby shelters and guards will be adjusted/removed as necessary
- herbicide spot treatment in the first few years to prevent the encroachment of non-desirable species such as Sycamore
- as the canopy begins to close it may become necessary to carry out selective thinning to improve the woodland structure
- at the same time and as more typical woodland conditions begin to develop, woodland ground flora seed mixes will be sown down
- where trees become large enough, bird and bat boxes can be introduced and particulary in existing mature trees which are close to or within woodland plantings
- log piles will be created from wood generated through thinning operations
- ground flora will be assessed to determine the rates of colonisation. If this is poor, the introduction of native species through re-sowing or plug planting will be considered.

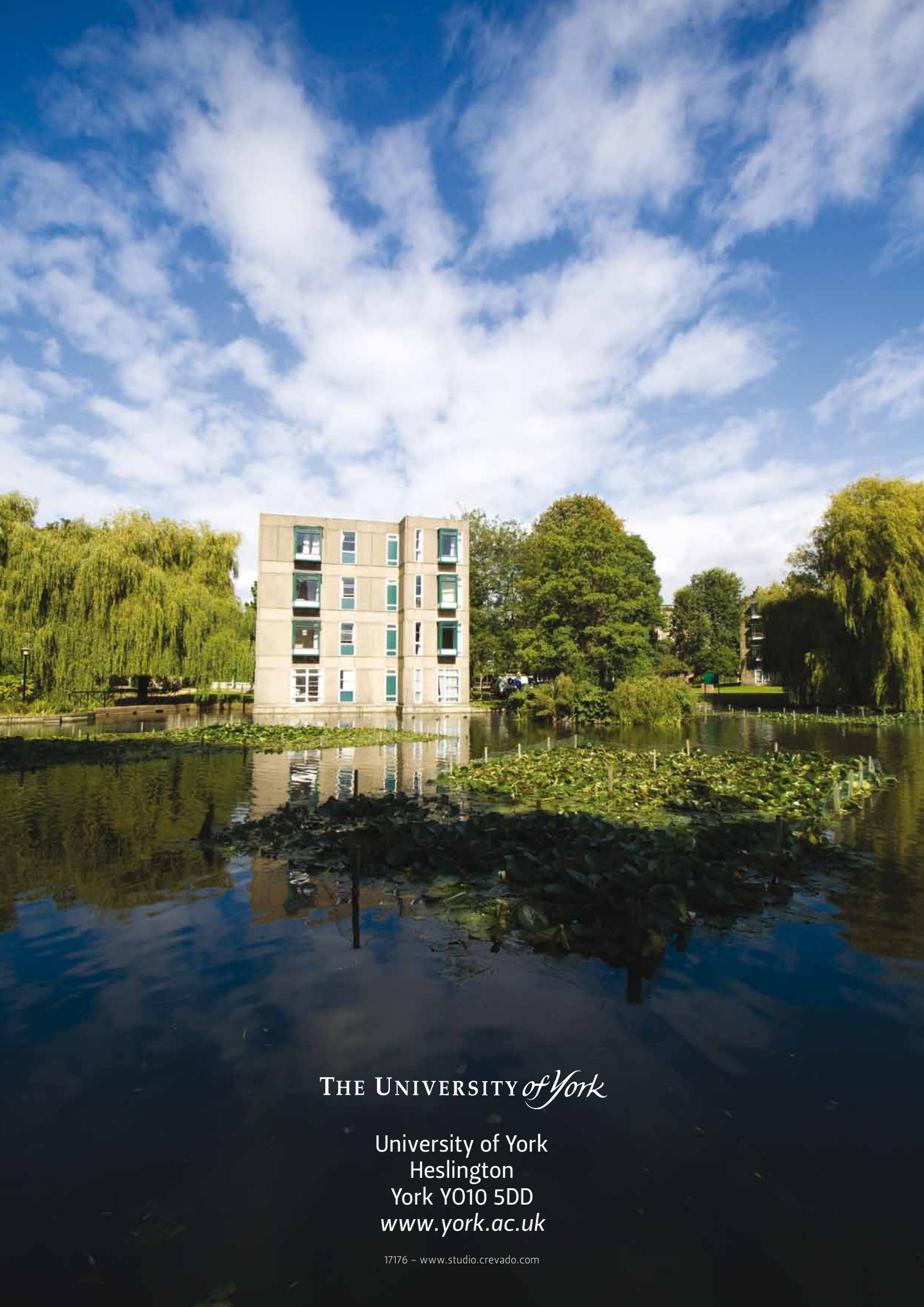
Clearing of glades once the woodland matures. It may also be beneficial to leave a five metre wide grassland strip around the outside of the woodlands. These could be cut periodically, every second or third year. They could provide a good environment for cowslips and possibly wild daffodils and to encourage species-rich conditions relatively early. These areas can also have some suckering shrubs (eg Blackthorn, Guelder rose) that will sucker from the woodland edge, softening the appearance.

*This report is largely concerned with habitat creation measures. As part of those measures it is easy to try to introduce the target flora through sowing and planting. This is not possible with animal species (apart from fish), which must colonise these habitats naturally if the habitat is suitable for them.*

*Baseline ecological surveys have already been carried out, which have included riparian mammals, together with extensive breeding bird surveys. These surveys have already indicated the presence or several target species, along with other desirable species that were probably not initially expected (particularly in relation to avian species).*

*It is important to bear in mind that over time the habitats initially created will mature and change and as they do so, some of the species initially attracted to the site will change with some moving out and others colonising.*

*In the end, the primary objective must be to optimise the potential of the habitats created on the site to attract the broadest range of biodiversity possible.*



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