A Review of Management Options for Resolving Conflicts with Urban Geese.

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1 Background

1.1 Population sizes

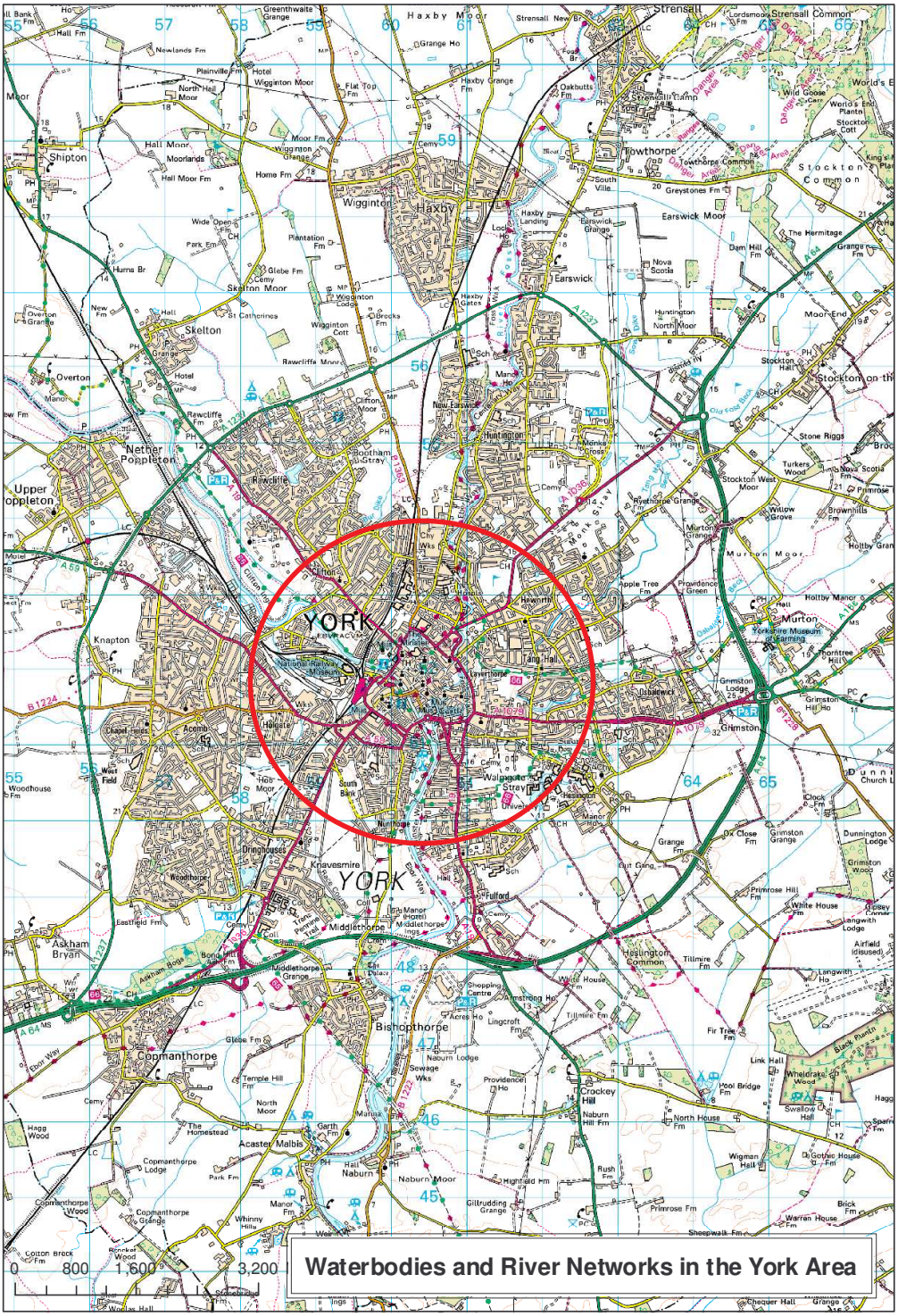
Canada Geese (*Branta canadensis*), and Greylag Geese (*Anser anser*), have established large feral breeding populations throughout England over recent decades. Canada Geese are widespread in England and have an expanding range in Wales and Scotland (Gibbons et al. 1993). They are now classified as 'abundant' with a peak population size now estimated at c.127,000 in the UK (Austin et al. 2007). The population of feral Greylag Geese is estimated at somewhere in the region of 20,000 birds (Fenland Wildfowlers Association data) and is growing at a rate of over ten percent a year (British Library data). This is hugely increased by the arrival of 'wild' Greylag Geese from Icelandic and other Arctic environments each winter. However, both species do, however, tend to remain within a given area once settled.

The main issue regarding managing populations of these species is their current success rate and the associated regular increases in annual population size. Canada Geese in the United Kingdom, for example, are descended from birds originally introduced from North America in 1665 (Allan *et al* 1995). Their numbers only began to increase rapidly, after a relocation scheme implemented by the Wildfowl Trust and Wildfowler's Association between 1953 and 1957 (Ogilvie 1978) was initiated. The population in Great Britain rocketed from around 2,000 individuals to reach over 64,000 by 1991 (Rehfisch *et al* 2002). Increases of around 8% per year have subsequently occurred. Whilst the feral Greylag population is estimated at a much lower level than Canada Geese, their population is increasing at around 10% per year. Any management activity to resolve local conflicts therefore needs to consider the underlying drivers affecting these increases. Both Greylag and Canada Geese are hereby referred to as Feral Geese for the purposes of this document.

Feral Geese in Europe have adopted a residential strategy and do not undergo long distance migrations (Cooleman 2005). Many birds now stay on or around the same water body throughout the year venturing only as far as necessary to find food, safety and breeding sites. The UK is not alone; Canada Geese in the USA have adopted similar behaviours, remaining at more southerly latitudes throughout the year, possibly attracted to urban areas by the increasing amount of suitable habitat such as city parks, rivers and lakes. With ample forage available (from grass, bread provision, waterweeds etc.), safety from predators (variable size lakes, ponds and rivers etc.) and large open spaces or islands that offer security or breeding sites, the survival rates of young geese generally higher than those of 'wild' geese. The increase in populations is therefore being driven by high levels of breeding success (recruitment), rather than immigration from the wild population. Any efforts to control local populations, therefore, do require long-term pressure to ensure they are not offset by immigration from other populations in the near vicinity.

In York, central population levels of both species vary significantly during the year. A census undertaken when adults were present with Goslings (late May 2009), revealed 187 adults and 40 juvenile Canada Geese and 290 adults and 92 Juvenile Greylag geese. i.e. a summer population of 609 feral geese (+16 hybrids). Key sites at this time of year were on the Ouse and Foss and the University for Greylag geese and the same, plus Rowntree Park, for Canada Geese. Given the corridors that the rivers provide, it is not surprising that movements and linkages between sites occur throughout the area. This census did not venture outside the central region approximately demarked on the following map.

Figure 1. Census coverage for Greylag and Canada Geese in York, May 2009.



1.2 Concerns caused by increasing local populations

Natural and feral populations of geese across Europe and North America conflict with human and environmental interests in a wide variety of fields. Agricultural crop predation, amenity grassland damage, golf course deterioration, water pollution (Allan et al. 1995, Rusch et al. 1998) and risks to flight safety (Baxter & Robinson 2007) are all key problems caused by these species. Fouling of pasture can deter sheep and cattle from grazing, with damage levels directly correlated to the number of geese present (Spurr and Coleman 2005).

1.3 Disease transmission

Of perhaps the greatest concern is the potential for feral geese to act as vectors of avian borne disease (individuals that can carry disease within intestines or droppings for example, and transmit it to other species or locations). They may therefore be able to indirectly transmit disease to humans via land or water contamination. Water body eutrophication (where droppings result in a lack of oxygen or blooms of algae due to the extra nutrients being deposited in the water) can be a significant issue when large numbers of geese, sustained by open areas of grassland, roost on small water bodies. Although faecal matter (droppings) tends to sink to the bottom and remain within the sediment (Unckless & Makarewicz, 2007), it can lead to pollution with outbreaks of avian botulism or salmonella after periods of drought or when sediment is disturbed. Such events are not uncommon, an example being a small lake in north west London in 2008 having over 40 out of 80 geese and 15 Swans dying (Little Britain Lake, Uxbridge). Avian and human pathogens have been isolated from goose faeces including avian flu virus, Salmonella and E.coli (Allan et al.1995, Bonner 2004, Kuiken et al. 2006, Feare et al. 1999). They have the potential therefore to indirectly affect people (Bonner 2004) and other waterbirds (Blair et al. 2000).

Some studies suggest the risk of disease transfer to people may be over played. Geese are not, for example, important vectors of cryptosporidium (Kassa et al. 2004) and the risk from contact with their faeces probably varies according to season and area (Converse *et al.* 2003). Not withstanding this, the distribution of Canada Geese is widespread, and their behaviour has enabled them to thrive in urban settings. They therefore pose a greater potential risk to human health than other waterfowl (Feare 1999). When congregations of birds remain in the same areas for long periods they can emaciate grass, nutrify soils (through excessive faecal deposits), and make public areas unusable for picnics, resting or general park activities. Such situations are common in the York Park environments in areas close to waterways.

2 Potential Management Options

Management options currently available fall into two categories:

1). **Behavioural modification** by scaring, use of chemical or natural repellents, physical exclusion and habitat management.

2). **Population management control** by preventing eggs from hatching, shooting in or out of season, culling at moult, culling with other capture techniques and/or by relocation.

2.1 Behavioural modification

2.1.1 Acoustic stimuli

The gas cannon is the most commonly used acoustic scaring device. Whilst this can be effective in some environments, it is unlikely to be suitable for urban parkland and will not be suitable for specific targeting of one species. It is well known that acoustic scarers also need to be moved regularly and be deployed for long periods if they are to remain effective. This, however, has the potential to result in habituation (where birds begin to learn that a deterrent does not constitute a threat) hence they need to be used alongside other measures to maintain their effectiveness (ADAS 1987). Urban geese, which are not hunted and are used to a wide variety of man made noises may, therefore, quickly habituate. Deterrence via acoustic reports (loud bangs) would therefore require the use of reinforcement shooting so could only reasonably be deployed to prevent feeding in crop fields away from the public environment.

Others devices available produce loud shrieks or broadcast pre-recorded distress calls, infrasound or ultrasound. Geese do not hear ultrasound, and the few infrasound trials undertaken suggest they will not respond to this (Fidgen, unpbl 2005). Many species habituate less quickly to scaring devices that incorporate their own species' distress calls. Distress calls of gulls, crows and wading birds are used extensively to deter these species from airfields. The success of the method is, however, very dependant on how it is applied. Recent research successfully reduced crop damage by Canada Geese only when calls were used 'on-demand' (Whitford 2008). This basically meant that instead of using an automated method that set off deterrence calls every 10, 20 or 30 minutes (routinely), the method was only implemented whenever birds arrived at the site. A study by Mott and Timbrook (1988) was also successful for short periods (2-3 weeks), although the birds rapidly returned once scaring had stopped. A report commissioned by the acoustic control manufacturer "Goose Buster", suggested habituation to distress and alarm activity within 5-7 days, but longer success of 3-5 weeks when birds had a choice (i.e. Moving geese to another adjacent area) (Streng & Whitford 2001). Such activities were, however, deployed against migrant, rather than feral geese. Another study failed to scare any geese (Aguilera *et al.* 1991) and the method may be least effective against established resident and/or urban populations. The responsiveness of Canada Geese to distress calls (c.f. alarm calls) has not been tested in scientific trials although an independent user (Horton, pers comm.), suggests it can be effective in a parkland environment at moving birds to the nearest alternative safe environment. As with any other acoustic deterrents, their use may be inappropriate in areas where people find the noise levels offensive (Allan *et al.* 1995).

2.1.2 Visual stimuli

Visual scaring devices come in a variety of forms, from scarecrows, to plastic strips attached to poles, kites, balloons, imitation figurines of birds of prey, birds of prey themselves and even inflatable human figures that rise from a box in the ground carrying an imitation gun (Scareyman). Just like acoustic devices they only remain effective for as long as the birds natural neophobia (fear of the new) persists. An eventual habituation to these devices is usual and urban geese may be far less easy to scare than other more timid species (Allan *et al.* 1995).

The use of birds of prey is, as far as we are aware, untried against urban geese. Whilst this method can have excellent results and clear large areas of target birds such as gulls and corvids from landfill sites (Baxter 2005), its success is often reliant on deployment of birds that actually hunt the prey species. Flights of falcons, when flown to a lure to "simulate" a hunting bird, are unlikely to impact on feral goose populations. Habituation by gulls took around five weeks in the urban environment when intensive non-hunting falconry was implemented in Dumfries in 2009 (Baxter, in press). Large falcons e.g. Gyr x Saker hybrids, or trained Eagle species may create fear in urban geese but their deployment would need significant, research, skill and investment and may prove difficult to implement in the urban environment.

Dogs (generally trained Border Collies), are frequently being used at airbases and in public spaces in the USA (e.g. www.wildgoosechasers.com). There is little to suggest they would not be effective but the length of time needed to implement deterrence is not clear. Rowntree Park, for example, could be patrolled by a Border Collie on a daily basis, weekly basis, mornings, afternoons etc. Birds may disperse across the Ouse or further a field hence monitoring would be needed to evaluate whether dispersal was successful on a site by site basis or across a wider area. It is possible that, for example, deployment in key areas for alternate one-week periods (e.g. in April to reduce breeding use and June to prevent birds staying to moult), could be beneficial. This would need to be monitored and tested to determine the frequency and effort needed to maintain effect. It would appear that a full time programme is used in Stratford to achieve this aim (Feld 2005).

Laser bird deterrents have been in use for several decades and represent a possible option for dispersing feral geese. An evaluation of lasers to disperse American crows from a series of roost sites (Gorenzel 2002), suggested that single deterrence efforts each night were effective at dispersing birds but did not result in them staying away for the whole night. Deterrence against gulls at a UK winter roost took this methodology forward and implemented dispersal every 30 minutes throughout consecutive nights for as long as necessary. Full deterrence of the gull roost was achieved (Baxter 2007iii). Whilst not reported within this paper, a flock of around 80 feral geese were also dispersed to adjacent fields although small numbers of Mute Swans did not respond. Similarly, diving ducks and grebes responded by diving but dabbling ducks flew away. The predator response was therefore initiated by affected species. A similar trial of lasers was undertaken, against feral Canada Geese, at a small lake in London. About 120 birds were dispersed with a 90 second sweep of the site on one night, with zero birds returning to that roost after 3 nights of deterrence. This was a post-moult roost site used as a base to forage from (Baxter, pers obs). Lasers therefore have the potential to disturb and disperse birds (at night only), and may prove a useful tool within an overall integrated strategy.

2.1.3 *Lethal control as deterrent reinforcement*

Shooting, although usually regarded as a means of population control and discussed later, can be used to reinforce most other non-lethal scaring effort. The action of shooting combines visual and acoustic stimuli and can be used to reinforce methods by the occasional killing of a bird. Increased shooting pressure appears to improve the responsiveness to other scaring methods but is unlikely to be practicable in urban areas for safety and public perception reasons. It is nevertheless highly beneficial when confirming response rates of birds to other methods.

2.1.4 *Repellents*

Few chemicals that successfully deter, rather than poison, birds have been identified. Diazinion, an organophosphorous insecticide, has been effective in preventing damage by Canada Geese to golf courses but proved fatal to other wildfowl. Such chemicals are not approved for use in the UK. Naturally occurring plant products or their derivatives may provide a solution but again have issues in terms of UK regulation. Research in America and the UK, for example, suggests that Methyl Anthranilate (MA) and Cinnanamide can be effective in preventing many birds feeding on treated foods (Cummings et al. 1991, Crocker and Reid 1993). During commercial product testing in the USA, products such as “Rejex-IT” and “Goose chase”, which have MA as their active ingredient, are reportedly effective at reducing foraging activity on grass. MA is a derivative of grape juice, is widely used in the USA, and creates a bitter taste on the grass. It is viewed as harmless in the USA but is not licenced for use in the UK as it has the potential to cause harm to the birds. MA is extremely cheap to purchase and could possibly be used under a trial licence from the HSE in this country (manufacturers details from http://www.bird-x.com/goose-chase-p-8.html). Cinnanamide (taken as an extract from cinnamon), has been tested in cage-trials in the UK under licence but there is unlikely to be a sufficient market for the product to warrant further development.

More recent work has investigated the affect that endophytes have on the palatability of grasses and how incorporating them in some swards improves their repellence to herbivores such as geese (Cheplick and Faeth 2009). Endophytes are bacterium or fungi that live within a host plant for at least part of their life cycle. All plants have them, and their relationship with their host appears to be symbiotic. Many important forage and amenity grasses have fungal endophytes and their presence can improve the swards resistance to stresses such as drought and grazing. Particular strains, however, have now been developed in New Zealand that have an endophyte within them which massively increases the unpalatability of grass which results in digestive malaise (stomach upset) in geese. The manufacturer is currently seeking opportunities to trial its success in grassland environments against species such as geese. The issues at the moment involve whether or not large enough quantities of grass seed can be provided to cover sensible size areas (rather than, for example, 10m x 10m sample plots).

2.1.5 *Physical exclusion and habitat modification*

Geese can be excluded from sites through the use of fencing, wires or tape. These methods can be used effectively to restrict access to ponds, ditches and even cereal fields (Rochard and Irving 1987, Summers and Hillman 1990) but will only work under certain circumstances. Adult geese, for example, can fly for all except the moult period (c. mid-June to mid-July). Any mesh fence designed to prevent breeding

on a site is therefore reliant on the adults realising that nesting on a proofed island will result in their chicks being unable to escape. Traditional mesh designs with a gap at the bottom allow geese to exit after hatching whereupon they do not need to return to the island. Breeding control netting therefore needs to be at least 90cm high and fitted without gaps at the bottom.

Deterrence fencing has been used against other species (e.g. Lapwings) on airfields by spacing 1m rolls of orange plastic mesh fencing at 20-50m intervals across grassed areas so birds do not have a suitable view of the surrounding area (Deacon 2003). This results in the security offered by large open space security being removed and birds becoming more easily 'spooked'. The method is untried against geese but could create a useful barrier for short periods prior to, for example, events or picnic periods. It could create a relatively unsightly and unaesthetic result for the public, however.

In some cases habitat modification can be used to make places less attractive to geese. Geese typically choose to feed close to water, in places that are open and provide easy predator detection as well as flight escape routes (Conover and Kania 1991). Separating grassed areas from water bodies with a stand of trees that would need geese to have to fly out at an angle greater than 13º may be sufficient to prevent their access. Replanting areas with unpalatable swards and modifying cropping patterns so that fodder is not available close to water bodies may also help reduce damage by geese (Allan *et al.* 1995). It has been suggested that strips of longer grass can provide effective barriers to goose grazing. Strips of grass over 6" (150mm) in height around 10m or so wide surrounding waterbodies could be trialled. Our interpretation is that even if geese do not feed on this grass, they are likely to create trampleways through it, or fly over it and it is unlikely, however, to be effective.

Restricting access and habitat modification can be effective in the right circumstances, but can also affect other species, reduce public access or impact on recreational and landscape quality in public areas. Mesh fence netting to prevent breeding on islands is generally the most practicable solution presented for the majority of sites which use it.

2.1.6 Education

As a key driver of urban population control is the availability of food resources from the public, opportunities to minimise or ban the feeding of urban geese can be highly beneficial. The population of Canada Geese on a section of the river Thames that runs through central London halves in winter. The primary driver of this is a lack of publicly provisioned food and a lack of grass growth in winter.

Given that geese are known carriers of Avian Botulism, Salmonella, E.coli and Avian Flu, for example, and that there is potential risk of disease transmission via faeces present on grass (e.g. small children picnicking and retrieving dropped food), education to reduce feeding may be prudent. Similarly, the usual food source provided is bread and this is at risk of causing malnutrition to birds and a wing deformation known as "angel wing" (Manitoba, 2009).

Signage confirming geese / rats / pigeons carry diseases could be beneficial. Geese can also become aggressive when defending young. Educating the public about these problems may help to reduce the likelihood of them providing additional food.

3 Population management control

3.1.1 Population Control and the Law

All birds are protected under the Wildlife and Countryside Act (WACA) 1981 as amended. However, exemptions are available that allow control of some species for Public Health and Public Safety and Air Safety.

Canada Geese (*Branta canadensis*) can be controlled at any time to preserve public health or public safety under a general licence; this permits the use of both egg control (via oiling or pricking) and lethal control (using permitted methods) of adults. It is expected that all non-lethal methods of deterring populations have been tried and can be shown to be ineffective. Licences are available on-line from Natural England.

Greylag Geese (*Anser anser*) are not covered under the general licence and therefore specific licences would need to be obtained to allow egg or adult control techniques to be used legally. All non-lethal methods used for controlling populations need to be listed within the licence application to confirm lethal control is a necessary measure. Licences can be obtained through Natural England. Greylag geese can, however, be shot under the WACA (1981) Schedule 1 Part 2, during an open season, which runs from 1st September until 31st January, with landowners permission.

3.1.2 Controlling reproduction

A key driver behind preventing population increases locally is to prevent internal recruitment (breeding) from occurring. This can be achieved humanely by preventing either the adults breeding (through deterrence) or their eggs hatching. Various options are available. Chemosterilants for Canada Geese are not available although surgical sterilisation of males would be effective but is extremely difficult to achieve across all individuals and incurs the expense of veterinary deployment. Nesting adults sit closely on their nests and can be easily shot at close range whilst defending their eggs. However, other, often more publicly acceptable methods include egg destruction, removal or treatment to prevent hatching.

Treatment usually entails pricking the eggs, boiling the eggs, replacing the eggs with dummies, or coating them in paraffin oil (Allan *et al.* 1995). Treated eggs are left in the nest to allow the female to continue incubating them as normal. Doing so is more effective at controlling reproduction than destroying clutches or removing them. This merely results in the females relaying (Baker *et al.* 1993).

Canada Geese are long-lived birds and have especially low mortality at urban sites (12-16 year life spans are not unusual). It may therefore take many years of concerted effort before a programme of reproductive control begins to reduce an *in situ* population size. Furthermore, if a few clutches are missed and allowed to fledge the limited recruitment can be sufficient to replenish the normal annual losses of adults. A concerted effort is therefore required to ensure 100% of eggs are oiled in at least 95% of nests. Non-feral goose populations that do not have immigration issues can be held static by collecting 72% of eggs each year (Barnard 1991). Over 50% reductions in Canada Geese populations (4000 birds at 58 sites across a 100 sq km area), have been achieved using integrated programmes of annual egg oiling at all sites and adult moult culls at upto 15 key sites (Baxter *pers. obs*).

3.1.3 Shooting, culling and trapping

Populations of wild geese in the USA have been shown to withstand heavy shooting pressure. Annual harvests of up to 40% appear to have no impact on overall numbers (Shaeffer *et al.* 1987). Similarly, in both Finland and New Zealand winter shooting alone and extensions in the shooting season, respectively, caused no reduction in the population size (Vikberg and Moilanen 1985, Imber and Williams 1968).

Furthermore, in many urban scenarios shooting may be impossible due to reasons of safety considerations and public perception.

Other methods of culling geese are possible. Large numbers can be caught during their annual moult. At this time the geese are flightless for around 3-4 weeks (Cramp and Simmons 1977) and can rounded up or corralled into enclosures that can be set up on appropriate waterfronts. Once caught, geese can then be despatched humanely using cervical dislocation, lethal injection or shooting (note that some methods may require the presence of a veterinary officer and a specific licence even for Canada Geese). This form of cull is advantageous in so far as it causes an immediate reduction in numbers, decline in damage and removes a large proportion of adults from an area.

Fera has undertaken a number of such culls under licence in the UK with high success. Nevertheless, repeat operations over 2-5 year periods may be required if mop up breeding control is not continued in future years. Surplus non-breeding birds may also choose to moult elsewhere and can then repopulate an area the following year if not deterred. When these birds return to their natal sites (where they hatched) they typically fill in the gaps made in populations by any moult-cull.

Trapping can be used to catch small numbers of geese. This, however, often requires a period of baiting as well as acclimatisation to the traps presence and, therefore may not be discreet enough in public areas (P. Irving *pers comm.*). The use of bait treated with stupefacient may also be feasible but runs the risk of affecting non-target species and would require a trial licence to use in the UK.

3.1.4 Relocation

Relocation has been used very successfully in America to reduce resident Canada Geese populations. The relocated birds have been used to boost hunted populations or form new colonies (Conover 1993, Cooper 1986). However, mass relocation is an expensive operation and given the current problems here in the UK as well as the rest of Europe, many landowners are unlikely to want them and the UK government is unlikely to licence such activity. Further redistribution is also likely to encourage their geographical spread and so should be discounted as a control option (Allan *et al.* 1995).

3.1.5 Integrated strategies

It is rare that a single strategy can be effective at all sites, all of the time. Integrating options therefore represents the most effective way of approaching wildlife management problems. Several examples exist whereby resources have been targeted at each area where problems have been occurring in order to facilitate an overall reduction. Battersea Park in the mid 1990's (Underhill 1996), represents such a case. A suite of measures were used as part of an integrated management strategy (IMS) to reduce the attraction of the area by fencing, food reduction, education and

lethal control. Any birds that continued to attempt to breed following the fencing operation had their eggs oiled or pricked, after which 154 out of 262 adults present were culled. Numbers fell to 63 the following year (down from the 108 remaining in 1994). The overall sub-population (including nearby areas) only declined by a total of 66 birds. This indicated either local recruitment, dispersal or immigration had occurred. Despite this, the park itself showed a significant decline in numbers and had the programme been continued or expanded across the area, may have resulted in long term or wider area declines. Independent monitoring in 2007, however, showed greater numbers were present than in 1994 (Baxter, 2007i).

A recommendation from this research was that the process should be implemented across a wider range of sites to include all birds within local sub-populations (birds that move around but remain within a given area). This has been done in west London since 2000 and has covered egg oiling at 58 sites over 100 sq km area alongside moult culls that have removed over 1500 adults at 15 key sites (Baxter 2009). This strategy has resulted in a population of 3750 birds that was expanding at 12% a year in the year 2000, being reduced to less than 2000 birds by 2008. Sites at which culls have been undertaken have declined by around 67% with some now abandoned altogether. Without additional work to remove or prevent birds being able to utilise attractive habitat, however, such activities will need to be continued year on year.

Similar strategies have been deployed by the 'Geese Peace' organisation based in the USA (Feld 2005). They include elements of scaring, limiting food access and egg control. These strategies rely on acceptable and unacceptable areas in which humans and Canada geese can co-exist. The objective is to arrange, via local contributions and training of volunteers, a reduction in Canada goose numbers from key areas by egg oiling, and a deterrence of moulting birds by regular and routine patrols from Border Collie dogs. The programme has had a level of successful deployment in Stratford upon Avon in the UK (http://www.geesepeace.org/Stratford-upon-Avon.htm). From discussions with the president of this organisation they also encourage artificial feeding of birds using foods that do not contain bread in order to reduce the risk of flightless birds developing (bread does not contain sufficient calcium and minerals to allow correct bone formation resulting in birds with weak, upward bending wings developing). Data from the Stratford Society suggested reductions from around 800 birds to 120 birds had been achieved by autumn following the year the programme started. It is understood from discussions that continued dog work has, to date, prevented the majority of moulting birds from returning but that the 'resident' population remains stable. Similar moult dispersal could be possible in York as geese have access to rivers and can therefore move freely between areas.

Removing the availability or attraction of an area through habitat management, dispersal of birds away from key areas and prevention of population rises provide the main drivers behind the integrated management strategies available for York.

4 Management Options

Feral geese in York breed along the banks of the two main rivers and occasionally in local parks. Ringing returns (Bone pers comm.), show that some birds move significant distances but the majority remain faithful to York as long as they have breeding sites, feeding sites and security available throughout the year. In urban environments current best practice emphasises the use of integrated management strategies that combine techniques (Mott and Timbrook 1988, Heinrich and Craven 1990) and the use of repellents and population control to reduce damage at sensitive sites (Conover 1993). No single technique is likely to resolve the overall issue.

Habitat Management

Habitat management techniques require geese to feel insecure and unwelcome by prevention (physical exclusion) or habitat modification (removal of attractive sites). Options include:

- Identification of all breeding sites
- Installation of goose proof fencing to all breeding sites where possible
- An education programme to prevent birds being fed by the public
- A refresh of signage
- The prevention of access to grass areas via fencing or planting
- Application of MA under a trial licence
- Sowing of endophytic grass seeds if available

Reducing the security, proofing or removing breeding sites and minimising or eliminating feeding opportunities should be the primary methods used so that remaining birds can be dispersed or moved more easily.

Egg management

Egg management is one of the most effective ways of containing population growth provided coverage is high and the vast majority of nests and eggs are located (estimates of over 90% coverage needed to prevent growth). Options include:

- Continue ongoing egg oiling programme, under licence for Greylag Geese.
- Work with other landowners to include more nest sites within the treatment area.

Deterrence or removal

Following as much habitat management and egg control as possible, deterrence or removal strategies should be targeted at the remaining key times and locations. In general, techniques that modify behaviour such as scaring can be advantageous as they are more publicly acceptable. Use of these techniques may be time limited to coincide with peak periods of conflict. However, the main problem with these techniques is habituation. Options include:

- Deterrence at night by lasers
- Deterrence during the day by trained dogs
- Testing the use of distress calls
- Testing the use of falconry

Birds will, however, become accustomed to many stimuli if they are not reinforced (e.g. shooting) or varied. Some scaring and exclusion techniques can also be unselective and influence the behaviour of other species. Loud or visual stimuli may also conflict with public access or land use requirements.

Shooting in fields known to be frequented by York birds (via monitoring from August to confirm movements), may provide a method by which reductions could be made in the problems associated with geese without culling in the urban area. Reductions in this way could be achieved by:

- Culling in urban area during moult
- Shooting in surrounding farmland during autumn (either in season or under licence).

Conclusions

A combination of techniques, tailored to individual sites represents the most appropriate way forward. This could entail education and breeding control across York, followed by deterrence from key sites that cause the most concern. Similarly a moult round-up and cull could reduce the overall issues significantly but may not prove to be an acceptable way forward.

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