



Wildlife Gardening Forum Conference 25th June 2013

Wildlife in Food-Producing Gardens



Nick Green of Incredible Edible Todmorden sustaining urban wildlife

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Edited by Jan Miller and Steve Head

Welcome and Introduction

Caroline Ware (NHM Wildlife Garden and Forum Trustee)

Welcome to the Natural History Museum! We are delighted to be hosting the summer Wildlife Gardening Forum Conference again this year. Our theme today is wildlife in food-producing gardens.

The Museum's Wildlife Garden is a garden of native plant species – being a living exhibition of lowland habitats – so we don't actively grow food. Or do we? These are lots of edible plants in our Wildlife Garden, such as nettle, wild garlic, garlic mustard, blackthorn and dog rose, but being undomesticated they are not always bountiful.

People have been eating vegetables – either wild or domesticated – for millennia, initially gathering wild plants for food and medicinal use. Some of the species have become domesticated through a process of experiment and plant breeding, with help from introductions from around the world. I would like to introduce the day with a brief look at the ancestors of some of our common vegetables many of which originated from British native plant species.



This rather unruly looking plant is wild cabbage *Brassica oleracea*. It is the source of neatly rolled cabbages, broccoli, cauliflower, purple sprouting, Brussels sprouts and curly kale. This plant is native in coastal areas, mainly sea cliffs, notably Dover and Dorset. There are also escapees or naturalised plants in neglected gardens and allotments



Another important family of vegetables is the carrot or Apiaceae family, which includes carrots, parsnips and celery. So how did this skinny tap root become the modern carrot? Although both are *Daucus carota*, our wild carrot is commonly found in calcareous grassland, and its subspecies, along sea walls and coastal cliffs. The familiar orange root originates from the Mediterranean, Iran and the Balkans. It may seem unlikely that our ancestors would have enjoyed a meal from this

wiry tap root, but they did in Roman and Medieval times and the modern orange carrot wasn't introduced until the 18th century.



Wild celery *Apium graveolens* is not found in the wildlife garden – its preferred habitat is brackish creeks such as Faversham Creek off the Swale where this was found.

Other vegetables with ancestors from this family include wild parsnip *Pastinacea saliva*, again looking little like its domesticated relative.



My third vegetable is from the goosefoot family or Amaranthaceae – Sea beet *Beta vulgaris*, *ssp maritima* a personal favourite – much tastier than spinach or Swiss chard. It is also the plant from which beetroot and sugar beet originate.

Many of our herbs don't need improving but of course they have been and those in the mint family include wild marjoram, thyme and mint.



On the left is wild marjoram *Origanum vulgare* – seen here on the Museum garden's chalk downland habitat, with the bumble bee *Bombus lucorum*.

On the right, sharp-flavoured common sorrel *Rumex acetosa* is perhaps more commonly found in French gardens and French cooking



Most of the soft fruit in your allotment garden is from the rose family Rosaceae.



These wild strawberries are delicious but you'd need an awful lot of them to equal the weight of just one modern strawberry.

Modern strawberries are based on a hybrid between two species from the Americas *Fragaria chiloensis* and *Fragaria virginiana*.

The common ancestor of domestic plums is blackthorn or sloe *Prunus spinosa*, still popular as a wild fruit for jams, jellies and sloe gin. There are over 400 recognised microspecies of the blackberry *Rubus fruticosus*. I don't think you can beat the wild blackberry for taste and flavour, but domesticated thorn-less brambles are a lot easier to pick.

So when you grow or dine on cabbages, carrots, beetroots and strawberries and other luscious produce spare a thought for their wild ancestors, as well as the men and women who since the Middle Ages worked to select and breed the vegetables and fruit varieties we'll hear about later today. Some of the ancestral plants can be seen in the Wildlife Garden, together with the caterpillars, aphids, sawflies, slugs and snails that live on them.

Guerrillas, Wildlife and Community

Dr Nick Green Incredible Edible Todmorden Community Project



The story is set in Todmorden, a market town in the Borough of Calderdale in West Yorkshire, 17 miles from Manchester. It is set in very deep valleys with plenty of back-to-back housing with no gardens or growing space, and only 15 allotments. The population of 30,000 in the 1950's has declined with the

textile industry, to about 15,000 people. There is a great ethnic and economic mix of people, and a history of innovation and social justice.



Incredible Edible Todmorden (IET)¹ started as a Transition Town, but decided to do more than just promote house insulation or bemoan that *we are all doomed*. Instead, we thought we should start something that was fun and would involve everyone. We knew food prices were going to rise, and many people had little money, so we decided to turn the town edible.



Here is a mixed bunch of Todmorden folk who cared and were brave enough to come together to try an experiment. We decided to stop blaming the Government for doing nothing but talk, or the bankers for messing up. We would do something ourselves, we wouldn't wait for permission, it's easier to ask forgiveness than for permission and anyway as Mary says "the prisons are full."

Beware the Power of Small Actions

- *Plant like no one is watching*
- *Love like you've never been hurt*
- *Work like you know you can't eat money*
- *Remember the prisons are full!*

¹ www.incredible-edible-todmorden.co.uk



Planting “Guerilla Beds” with vegetables. Lidl were selling fruit trees for £5, so we planted cherries in their car park



Dead Good Soil!

Todmorden Church of England Primary School had no land to grow food on but weren't going to be left out, so they asked the Vicar if they could grow between the graves. The soil is exceedingly good.



Policemen love a photo opportunity. Here, sweetcorn is planted outside the police station. The project has made a major difference to the rapport between the police and the community, with crimes of antisocial behaviour and vandalism reducing year on year since Incredible Edible Todmorden started.



Here is a tennis court at our largest primary school, transformed with up to 30 family allotment raised vegetable beds. After all, you can't eat tennis balls. The Bengali mother above said her husband wanted to grow *everything*, and it looks like he is succeeding.



Here is the local Job Centre Plus - which is now Plus with fruit growing.

When the old health centre was demolished, we created “Pollination Street” a new street leading from a car park straight to the door of the market hall.

At a recent event there featuring Hugh Fearnley-Whittingstall, Councillor Jayne Booth the Mayor of Todmorden said “What overwhelmed me was the volumes of people who spoke to me about preserving Pollination Street as a community space to be used by the community. It works; it opens up the area and provides a vibrant green space for people. I hope that we can retain this wonderful area for our town.”²



In October 2009 we planted an Apothecary Garden at the new replacement Health Centre.

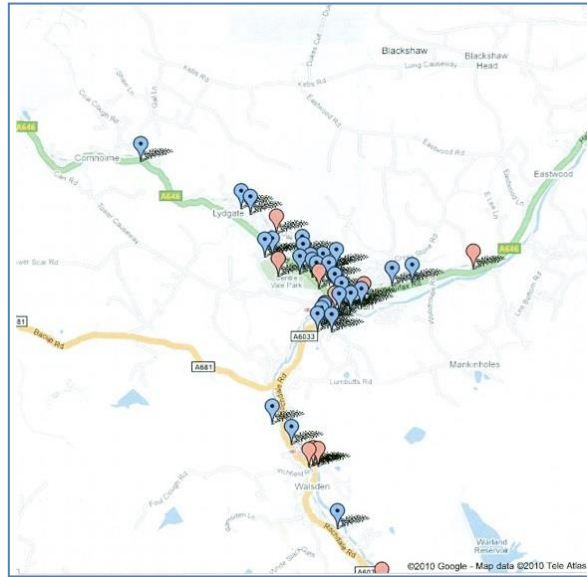


²www.todmordennews.co.uk/news/letters/pollination-street-proved-its-worth-1-6094740



We have moved on from Guerilla planting of fruit trees to propagating them commercially

Here is tree planting at Walsden in April 2010, and the various planting areas are shown on the map



Todmorden is even experiencing Vegetable Tourism, with visitors coming in bus-loads.



Incredible Edible Todmorden has branched out in France, at the village of Colroy La Roche, where the motto is “Nourriture à partager” - food to share.³



³www.incredible-edible-todmorden.co.uk/us/france-going-more-and-more-incredible

What next?

- Is propaganda gardening enough?
- How can wildlife and people coexist?
- How do we do Sustainable Food ?

One answer has come from our spin-off project, “The Incredible Farm”⁴ which is a one acre site located on a field in Walsden by kind permission of Peter Rigg of the Gorden Rigg Garden Centre. The farm was set up for teaching small scale commercial food growing and marketing skills to young people, the aim being to start food production businesses.

Incredible Farm is now a stand-alone not-for-profit company supported by income from produce, plant and fruit tree sales, and from training. We are aiming to explore and model the idea that it is possible to make a career in growing food by teaching youngsters the skills.



The Incredible Farm field in 2010, and how it looked two years later

Work started in November 2010, and now there are three commercial-sized large polytunnels in action, ponds, ducks and chickens and a fruit tree nursery. We have planted 160 fruit trees in the field and many edible plants around the outside of the centre, food to share. There are community growing beds within the centre, and beehives. There are 700 of our own newly grafted apple trees growing for sale next year and you can buy our one year old trees from Riggs.

The teaching centre was been designed, built and run by unpaid volunteers, with help from community-payback workers, who are on site 3 days a week. Students from Todmorden High School have studied for BTEch Level 2 Agriculture with us and we have run a series of very successful adult learning courses from Fruit tree grafting to foraging.

We are producing high-quality fresh wholesome food for the catering trade and have been supplying local pubs and cafes with salad leaves herbs and vegetables since late February 2012. The salad trade with local restaurants brings in £5,000 a year. The farm co-exists with nature, including two of the six ponds set aside for wildlife, and a large wildflower area.



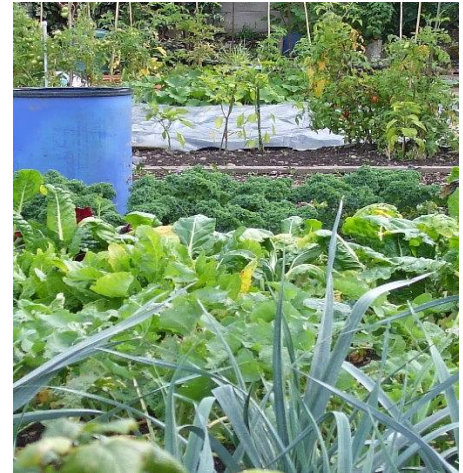
⁴www.incrediblefarm.co.uk

Love Your Bugs: making the most of your predators

Sally Cunningham (Garden Organic and freelance writer, lecturer and gardener)



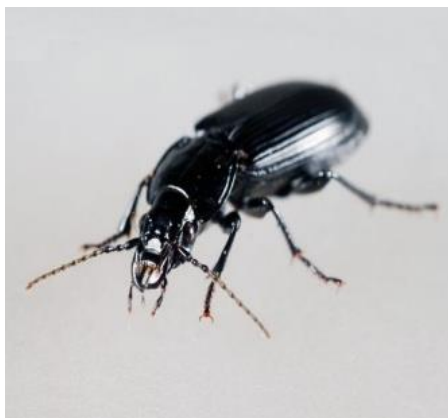
It is possible to grow vegetables and *still* have creatures to enjoy in your garden - you don't need to have the "blasted desert" approach as seen on the left. In particular there are some advantages in a "scruffy" garden with flowers mixed with veg, so that helpful predators of pests have somewhere to hide.



Many sorts of insects are beneficial - not just the ladybirds that everyone is aware of. Basically, if it moves quick it's a predator; if it's still there it's probably eating the plants.

Unfortunately, most people's reaction when they see something like a centipede is to stamp on it, yet nearly all our centipedes are beneficial garden predators.

Much the same applies to the common carabid ground beetle, and even those who appreciate the fast moving adult whose legs move like an old fashioned sewing machine, may not recognise - and so squash - the worm like larva. Like the adults, the larvae are voracious predators, consuming damaging herbivores such as slugs, so don't use slug pellets.



Hoverfly larvae also eat the greenfly you find on lettuce, consuming about 500 before adulthood. Planting coriander seed bought cheaply from an ethnic shop next to your lettuce attracts the adult hoverflies.



Hoverfly larvae



Wasps and hornets are good in early summer because they feed their grubs on pests like sawfly larvae.

There are about seventeen species of lacewing which lay their eggs (like tethered balloons) under blackcurrant and gooseberry bushes. The Lacewing larvae eat about 300 greenfly before metamorphosing, and cover the spines on their backs with the husks of dead greenfly.



Lacewing eggs



Lacewing larva eating greenfly

All ladybird larvae are valuable predators of garden pests. The invading Harlequin Ladybirds have as many as seven generations per year and eat some different species from those eaten by our natives, such as viburnum beetles and other pests.



*Left - Native
Ladybird larva
eating blackfly*

*Right- the
foreign
Harlequin
Ladybird larva*



Some butterflies and moth larvae can be pests to the fruit and veg gardener, like this Beautiful Golden Y moth whose larva is commonly called the Cutworm.



But most of these have their own specific predators that keep them under control, many of which are Ichneumon wasps that lay their eggs in the living body of caterpillars.



Ichneumon wasp

Damselflies eat thrips, among other small pests and Dragonflies eat huge numbers of mosquitoes

Damselfly Pyrrhosoma nymphula



The Nursery web spider, Pisaura mirabilis

Nursery spiders are voracious hunters eating pests that fall off the plants on to the ground.

The message is that you should look after the bugs, and they will help look after the pests, so try to avoid using pesticides unless absolutely necessary. Planting a good variety of flowers alongside vegetables will help egg laying adults to find suitable plants to bequeath their pest-eating larvae.

The Wayside Diner - Wildfood and Wildlife

Alys Fowler (Author and Broadcaster)

While it is quite easy to make decisions within the house to give positive environmental benefits (eg shower not bath), it is more difficult when outside the home - you have no choice for example but to accept throw-away plastic coffee cups at stations.

I have always liked foraging for fun, enjoying the taste, and appreciating linkage with the environment. But most people are plant-blind and “see” nothing on their way to work, although there are living plants everywhere, even in cities.



It is interesting how narratives help us take notice. The trendiness of wild garlic for television chefs has awoken people who now collect it for cooking.

Wild garlic

Excessive foraging of wild garlic is already having an impact on populations of wild plants⁵. But this can be policed by a group memory around a wildlife space – like blackberry picking – which means people want to protect it. Another limiting factor recalls the Lamarkian explanation of giraffe necks. People can only reach so far up bushes and trees for berries, but the birds which feed on them can perch on top of the bushes, where people cannot reach, so don't lose too much.



Also in parks, in dry shade, you can find *Mahonia* berries and Japanese bramble, while raspberries, apple trees and quince are found in supermarket car parks.

Japanese bramble



People don't feel they have ownership of these so don't see them as crops – there is a ‘plant blindness’ amongst people in towns; but if they are encouraged to get something out of the public planting spaces they will want to buy into it and protect the habitat in so doing.

⁵ C.J. Schuler in the Independent 21st June 2013



Alys finds quince and apples in a supermarket carpark

This was the idea behind the Incredible Edible town projects we heard from earlier. The use of community space has to come from the grassroots – getting people to *look* at eg. ‘how many plants you see on the way to the bus stop’ will get more involvement. Generally people’s wildlife interest tends to centre on animals – but plants are just as important.

Even if our aim is to promote wildlife in gardens and green infrastructure - don’t just sell “wildlife” to people. Instead, point out how much there can be for them - you can get some tasty treats from urban nature. This gets people properly interested, and this in turn makes them appreciate green spaces and protect the wildlife that lives in them.

Value Added Territory: Biodiversity and the organic kitchen garden.

Bob Sherman Chief Horticultural Officer, Garden Organic



Once farms were the main residence of British wildlife, but not now, as even organic farms contain relatively few species compared with the past. Organic farms do try however, with sowing flower-rich meadows, good hedgerow management and planting trees.

Our gardens matter for wildlife for a number of reasons.

- They offer the potential for multiple habitats in a small area
- They host more wildlife per square metre than almost any other landscape
- Much of the wildlife is invisible, hence organic methods that manage holistically are good
- Anyone can take part and make a difference
- Soil based food chains are encouraged by vegetable growing
- Crop diversity in gardens is very important - we need to preserve heritage varieties



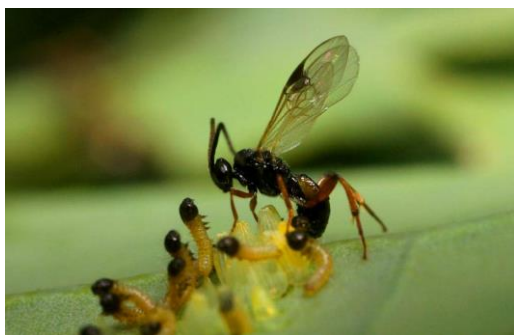
Compost in particular is a hotbed of activity, and composting waste is not just good for the crops, it's also good for wildlife.

Compost hosts great numbers of mites and springtails, centipedes, millipedes and pseudoscorpions.



Compost specialist brandling worms leave the compost bin if it gets too hot, so artificially accelerating the heating of compost is not so good. Many other creatures will feed on this bounty.

Cabbage is a good source of food (except for teenagers), but not just for us. We like to see adult large and small white butterflies, but their larvae eat our cabbages. However the pests are prey for parasitic ichneumon wasps that lay eggs in the caterpillars.



Apanteles glomeratus laying eggs and larvae emerging



The mealy cabbage aphid is a revolting pest that can wipe out whole cabbage crops, but it is prey to anthocorid bugs, the



larvae of the midge *Aphidoletes* and the parasitic wasp *Aphidius*.

Anthocorid bug



Aphidoletes larva

Aphidius



More predators, including hoverflies, ladybirds and lacewings all eat aphids too. Nematodes can help control slugs, and higher up the food chain frogs, snakes, hedgehogs and thrushes all make inroads on slugs, snails and other vegetable pests.



Encouraging natural pest controls means giving wildlife what it wants. A good way to help is to grow large patches of flowering herbs like thyme, marjoram, rosemary and chives, which provide nectar for egg-laying adult predators

By growing food you are providing a fertile environment for wildlife - as long as you don't spray. That's how you get Value Added Territory for wildlife.

[Editor Jan Miller comments - *Fascinating lecture by Marcel Dicke at The Future of Butterflies in Europe Symposium in 2012, where the various insects that eat the cabbage family were shown to give off pheromones and chemicals that deterred other insects from laying their eggs on the same plant, so reducing competition. There may be some interesting pest control methods we could learn from this study⁶ .]*

⁶ www.wageningenur.nl/en/Expertise-Services/Chair-groups/Plant-Sciences/Laboratory-of-Entomology/Research/Marcel-Dickes-research.htm

Wildlife and food gardening in the Netherlands

Dr. Robbert Snep Urban and Landscape Ecology & Green Business Sites University of Alterra - Wageningen

Vroege Vogels (Early Birds) is a very popular and long running radio and TV series in the Netherlands. It has created the web-based Tuinreservaten (Garden reserves) initiative⁷ where if you get 6 out of the 10 features specified for a good wildlife garden you get a sign for your garden:



The website gives advice and displays selected gardens of the week.

a 'Garden of the week'



There are now over 5,000 of these garden reserves, which sounds a lot, but in Amsterdam there are only 125 such gardens out of 200,000 possibles.

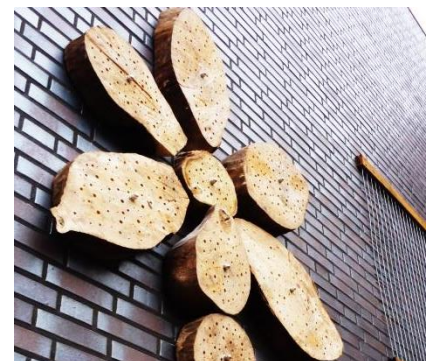
Robbert Snep's PhD topic was on biodiversity conservation at business sites⁸. The Business Park de Hurk in Eindhoven, when seen in infrared light, showed almost no vegetation; the red is vegetation – the business site lies within the red areas.



School grounds also have greening projects and have to look nice for children as well. Robbert is now working as a consultant with a company that puts these ideas into practice.



Sculpture made of insect nesting boxes on school wall



⁷ <http://vroegevogels.vara.nl/Tuinreservaten.952.0.html>

⁸ Eg Snep, R., Ierland, E.O. and Opdam, P. 2009 Enhancing biodiversity at business sites: What are the options, and which of these do stakeholders prefer? Landscape and Urban Planning 91: 26–35

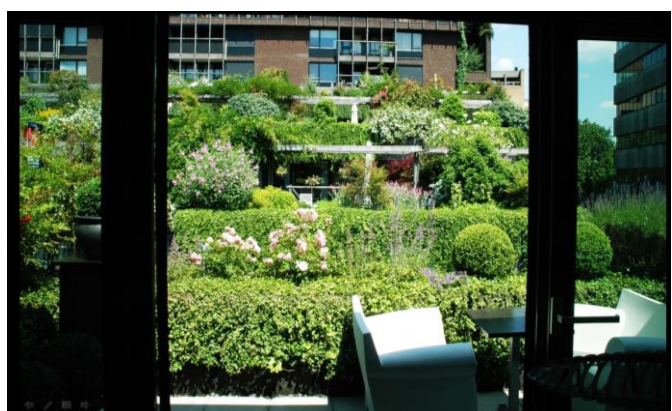
Another variation on this signage theme – a temporary artwork spelling “chirp chirp” in Dutch made of nesting boxes (although the size and plastic thickness may not be a good idea in hot summers – could be made of wood and better shaded)



Making good use of temporarily available land has become important in the Netherlands. Here in Utrecht where a major development of housing is unfolding, areas of unused land are made available for community use. Some parks for children include vegetable growing as part of the playground and adventure areas.



In the city centre – the ‘Hanging Gardens of Babylon’ an apartment block in Eindhoven designed by Neave Brown. This helps with the city ‘heat island’ effect.



Also in Eindhoven, some of the city infrastructure is designed to be “green” such as the advertisement/planter and bus stop below:



This living and edible wall is in the largest garden centre in Eindhoven growing lettuce, kale, chilies etc.



If we talk with project managers about conservation they often have no idea how to integrate this in their constructions. Vogelbescherming Nederland, which is part of Birdlife International, has produced a simple check-list and guide on how to provide wildlife (especially bird) friendly infrastructure in urban environments⁹.

Sometimes people just need to be shown examples of what can be done, as with this before-and after green roof.



⁹ http://www.vogelbescherming.nl/actueel/nieuws/q/ne_id/71

The Dutch firm Soontjens Stadsnatuur designs green and wildlife friendly areas for organisations. This is an example from Kempen Business Park Information Centre.



Bushy plants with lush foliage and bee-attracting flowers provide cover in a both a visual and ecological sense. The logo is a bee-hotel.



These photos show before-and-after views of the entrance to Forbo Eurocol at Zanstaad. This design was chosen in preference to a more conventional but less wildlife-friendly planted bed design.



It is good to have well known media personalities to promote wildlife gardening. Lodewijk Hoekstra was well known as a presenter of the tv house and garden DIY programme Eigen Huis & Tuin, but now runs a company¹⁰ providing ecologically sustainable garden design, often working with children.

¹⁰ <http://www.nlgreenlabel.nl>

Another very useful resource is Urbania Hoeve¹¹ “the city as a farmyard”, with an English language website, and demonstration projects in Amsterdam, The Hague and Maastricht.

Their vision of urban agriculture describes a coherent edible ecological framework within the public space – one that gives the co-operatively managed landscape a park-like nature – and that describes the foundation of an urban agriculture that positively impacts the city at ecological, social, and nutritional levels.

Here are photos of community food production projects at two Urbania Hoeve sites.



The Heineken brewery covers 100 hectares. They have a corporate responsibility to look after this area in an environmentally friendly way. 40 ha of the site are now managed as green space, with less intensive mowing and pollinator plants introduced throughout. There are also landscaped pond, canal and wetland areas that please the eye as well as supporting wildlife.



Overall, the take-home message is;

- Exciting creative and aesthetic concerns have to be included in the design
- Use a multi-stakeholder approach with community, designers and funders
- Link the conservation ideas with other human and society needs
- The starting point should not be conservation but the drive from the stakeholders.

¹¹ <http://www.urbaniahoeve.nl/?lang=en>

Oxford Garden Project: some wildlife notes

Robert Longstaff

For 9 years during the 1970's I was employed by the Ministry of Agriculture, Fisheries and Food to investigate the effects of modern agriculture and particularly pesticides on wildlife and the environment. During this time I specialised in birds, looking at the effects on population, behaviour and habitats and developing techniques of reducing avian damage to crops. This also offered the opportunity to learn about more traditional methods of growing crops and working the land including alternative methods that worked more with than against nature, which I could compare with the demands of modern agriculture.

I learnt all I could about the rhythm of the seasons and the balance of nature and how to work with them, and have continued to learn, experiment, observe, succeed and fail in trying to grow food crops within these parameters, and now attempt to pass on my knowledge and experience. In 2000 Yvonne and I established the Oxford Garden Project¹² at a 1.5 acre site in Longworth, Oxfordshire As we are a not-for-profit social enterprise with affiliations to a number of charities we felt that a pretentious name might help with funding. By 2013 we are working outside Oxfordshire in 7 other counties, London and overseas!



We teach by practical methods and lectures, the growing, cooking, preserving and composting of food and its place in the environment. We grow using organic methods, but because of our overall sustainability ethics we prefer to refer to ourselves as “low input” gardeners. The garden has now been established for the last 28 years as a no dig, deep bed, low-input closed system working in balance with the natural environment.



Our garden is more about experiment, diversity and education than providing food for sale or an income. I also advise, and provide consultancy for numerous social, community and commercial growing schemes and several large estates. We use mixed planting and permaculture techniques, intercropping with plants beneficial to the soil, plant health, predators or pollinators or that will confuse or deter pests.

¹² <http://oxfordgardenproject.co.uk/>



We also have an active wildlife management strategy to help maintain the balance by using natural predators to reduce potential pest species.



Slugs rarely become a problem as we encourage natural predators such as hedgehogs and, in particular, toads. We encourage these animals into the garden by providing them with an environment that suits them by ensuring a food supply, providing safe shelter, overwintering and breeding areas. In undisturbed corners we build log piles or leaf piles that soon find residents. We also try to encourage the toads into the more intensive areas of production so all the glasshouses and polytunnels have refuges such as broken flowerpots scattered through them.

Our no-dig methods seem to suit the toads as the undisturbed and humus-rich soil is full of worms and other prey animals should they run low on slugs, and is particularly easy for them to bury into for overwintering. We have provided a large wildlife-friendly pond to ensure a never ending supply of toads. The pond and the refuges around it attracts snails, which the toads don't like much, but while the snails are around the pond they are not on our crops, and a regular supply of snails in one location is an open invitation to thrushes.

Thrushes don't seem to be quite as dependable as our toads, sometimes being absent all year, but that does coincide with low snail years. We also help them by providing good nesting sites and making sure we are not too tidy so there is plentiful nesting material.



The stones left around the pond as refuges for the snails also make excellent anvils for the thrush to do its job.



We grow quite a lot of fruit, and this is another area where natural balance is important. This year we have planted 52 cordon apples and pears. To help them establish we are using a seep hose connected to harvested rainwater containers. The soil was heavily mulched with garden compost last year, covered in a layer of recycled cardboard and then mulched with chipped bark. This helps to keep the moisture in, the weeds out, and makes it difficult for pest insects to either emerge from or bury into the ground to attack plant roots.

2013 has been an exceptional year for blossom, though not always at the time you would expect. In many areas this led to a worry about pollination as the cold spring seemed to hold back the emergence of pollinating insects. I have been discussing this with a number of groups around the country, all very concerned that they have not been seeing bees. We keep our own bees, but equally have seen plentiful solitary, mason and bumble bees, though not at the time of day you would expect.

We look for balance when it comes to protecting our fruit. Over the winter we remove the top netting from the fruit cage, as we want to encourage as many bird predators as possible. The constant moisture from the seep hose encourages large populations of worms which aerate and enrich the soil, but can also be heard by the blackbirds which scuffle amongst the woodchip to find them, which disturbs any weed seedlings before they can become established. As the crops mature the roof netting goes back on, but we use a mixture of fencing from recycled timber and wire mesh sides that is large enough to allow easy access to small birds which will prey on insect pests but will exclude the damaging blackbirds.



Usually barrier method such as netting is fairly effective in keeping the brassica crop safe whilst enjoying the white butterflies, but make sure the netting is always well away from the foliage. While fabric and plastic netting can be very effective at keeping caterpillars at bay, loose netting can be dangerous by entangling birds and mammals, so netting should be well secured and pulled taut. If used specifically for birds as here to protect peas from pigeons, wire netting works well and is safer to wildlife.

For more info contact; hello@theOGP.org

Organic vegetable growing

Nick Hamilton (Barnsdale Gardens)

Barnsdale has been organic for over 25 years. Nick's late father Geoff was one of the pioneers of organic gardening on TV. But you have to ask just how organic is each gardener prepared to be? Soil Association rules can be off-putting, but some gardeners are "organic until the greenfly strike, then spray". It is not unreasonable to go with organic management as far as it suits you.

The foundation is a healthy soil, and we add farmyard manure and our own compost. The latter is important to reduce costs. Digging-in is better than rotovating for soil structure, and good for the waistline.



It is important to get plants growing well and early, so we use modules to avoid root disturbance. Fertility can be increased with organic fertilisers like chicken pellets and liquid seaweed. At Barnsdale we go further by using green manures like Red Clover which fixes nitrogen in its roots some 6 feet down

Red clover

We crop nettles to make a high nitrogen feed for leafy growth, and comfrey to make a high potash feed for flowers and fruit.

Making nettle or comfrey feed by suspending a bag of leaves in a water butt.



We encourage beneficial insects, which do most of the work for us (except digging). We plant *Limnanthes* and *Tagetes* to attract them.





We inter-plant herbs with our brassicas which helps pollination and attracts beneficial insects. We leave “tatty edges” for wildlife, and these can be pretty - forming wild-flower borders



All wildlife needs water, which we provide with sunken buckets.



Protecting vegetable crops is very important, since customers reject caterpillar-damaged plants. We make a great deal of use of netting to keep most insects well away from the crop. It is vital to maintain constant vigilance, responding to a pest incursion before it becomes a major problem. We can then respond by for example, using yellow sticky-traps for flying insects.

Barnsdale is a difficult site for potato blight in some years, so the 4-year crop rotation is important for disease control as well as fertility. As organic gardeners we have a limited armoury of pest/disease control agents, such as Bordeaux mixture (copper sulphate and slaked lime), Savona (natural fatty-acid pesticide) and soft soap.



We prefer however to use physical barriers rather than sprays. Carpet shops are always glad to get rid of their underlay off cuts, and these can be used around brassicas against cabbage root fly. Various cloches can be made with lengths of alcatene pipe stuck in the ground and underlay or plastic stretched over them. Plastic cloches keep everything out - including pollinators.

Mice can be a major problem, but cats provide an excellent solution. Slugs and snails are more difficult to manage. We use wood ash from a wood-fired bakery around susceptible plants, but this becomes useless when it rains. We have used beer traps, but still have to resort to organic-approved slug pellets in extremis.

Biopesticides: in biological control and Integrated Pest Management.

Neil Helyer Fargo Ltd

Integrated Pest Management (IPM) becomes compulsory throughout Europe in 2014 for horticulture and agriculture. There are a great number of biopesticides available, and they will become the future of crop protection.

Biocontrol agents include:

- Macro-biologicals, various parasitoids and predators; both specific and generalist.
- Micro-biologicals (Bio-pesticides).
- Botanicals – plant derived compounds, from eg pyrethrum or garlic
- Semio-chemicals – pheromones

Fargo produces products like;



Aphids can be controlled by releasing parasitoids, which are insects which lay eggs inside their target species. The hatched larva lives parasitically in the host, but eventually kills it. The minute wasps *Aphidius colemani* are effective for round-bodied aphids, and *Aphidius ervi* attacks elliptical bodied species. Each female wasp produces up to 60 eggs, and they are effective at temperatures ranging from 15° to 25°C, so useful for cool grown crops as during spring.



Aphidoletes aphidimyza is a midge the predatory larvae of which eat many aphid species. The adult needs 18°C for flight and a long day length, making this control agent ideal for summer or heated crops.



Chrysoperla carnea is a green lacewing with another predatory larva that eats aphids and other soft prey. It is ideal to use on organic crops or in high-infestation areas. It has been introduced on hedges to prevent pest migration.



Chrysoperla carnea



Other predatory larvae available as biocontrols include the hoverfly *Episyrphus balteatus* and the ladybird *Adalia bipunctata*.

Another approach for aphid control is by pathogens. *Beauveria bassiana* is a fungal pathogen that can be used to control many difficult pests including spider mite and mealy bugs, but needs high humidity (60-80%) at the leaf surface. It is ideal for severe ‘hot spots’ or mixing with other products such as nematodes. It is commercially available as “Naturalis-L”



Naturalis can also provide control of whitefly in protected ornamentals such as *Fuchsia*, *Lisianthus* and *Alstromeria*; It will also provide good control of spider mites and thrips in chrysanthemums, nursery stock and pot & bedding, and it will also help in the management of capsid, thrip & aphid populations in protected roses.

Fargor’s product Met52 is the fungus *Metarhizium anisopliae* which is usable worldwide to target pests. It takes out ticks and cockroaches on lawns, termites and wasps for beekeeping, beetles, flies and bugs for horticulture, locusts and lepidoptera for agriculture and thrips for forestry.

The bacterium *Bacillus thuringiensis* (*Bt*) is a well-known caterpillar pathogen available as Fargro’s product DiPel DF. During sporulation, many *Bt* strains produce crystal proteins with insecticidal properties. Applied as a spray, the caterpillar ingests the *Bt* product and stops feeding in minutes, giving rapid crop protection. The toxins dissolve in the insect’s midgut, causing gut cell rupture, allowing the bacterial spores to proliferate within the caterpillar’s body and killing it.

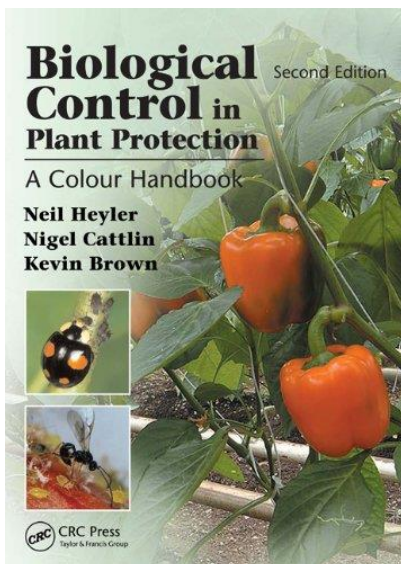
Carpovirusine is a naturally occurring granulovirus which is specific against codling moth *Cydia pomonella* and a few closely related species. Once consumed, the virus granules dissolve and multiply in the gut wall, rapidly stopping the caterpillar from feeding, and causing death by liquefaction. It is biodegradable, leaving no residues, but persistent within the population, and offers a new model of insect control.



We can also use pheromone traps to control moth pests. The chemical is released by females to attract males, but a synthesised version can be used to trap the ~~many~~ males. Generally this is used to monitor pest population levels more than to control them, indicating when a bacterial or fungal control should be applied.

Even more devious is a new product Exosex Auto-Confusion™. It also uses a female pheromone, but lures the males into a dispenser where they become coated with pheromone carried by Entostat® powder, which is a powdered form of a palm tree wax that develops an electrostatic charge, through very slight movement. The charge helps the product to cling to the insect, and the continuous exposure to the pheromone confuses the male and disrupts their mating behaviour.

AQ10, a product containing the fungus *Ampelomyces quisqualis* operates is used as a mycoparasite against a range of powdery mildews. The parasite penetrates the mildew hyphae, and derives nutrition from the fungal host and reproduces. In doing so it destroys the mildew's cytoplasm, killing it. AQ10 can be used in protected crops of: aubergine, courgette, cucumber, melon, pepper, strawberry, tomato, winter squash and pumpkin. It is compatible with predatory mites & parasitic wasps and is safe to pollinating bumble bees.



You can find out more in the book “Biological Control in Plant Protection”¹³ by Neil Heyler, Nigel Cattlin and Kevin Brown.

<http://www.crcpress.com/product/isbn/9781840761177>

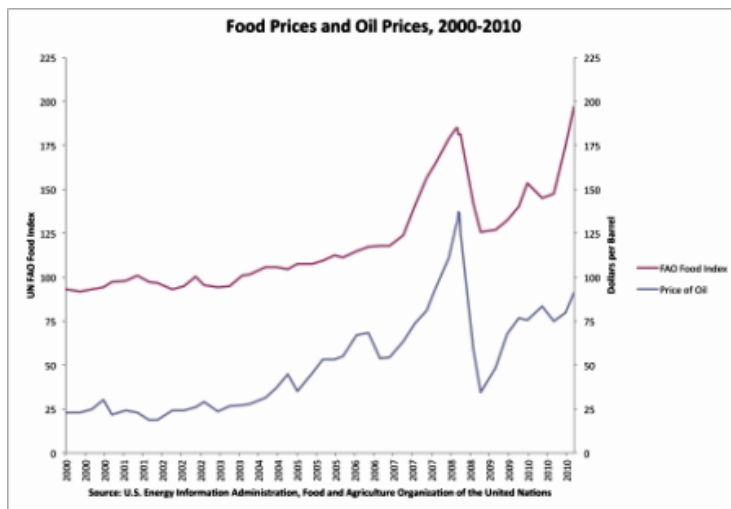
¹³ <http://www.crcpress.com/product/isbn/9781840761177>

The Challenge of Growing Food and Providing Gardens

Kevin Frediani (Foundation for Research into Environmentally Sustainable Horticulture)

Gardens are planned spaces, usually outdoors, for display, cultivation, and enjoyment of plants and other forms of nature¹⁴. Gardens are an old concept originally meaning a private enclosure, but will increasingly become public open spaces. I suggest they are at the root of civilisation! Soon 95% of us will live in an urban setting, and there is a garden for every four urban dwellers.

Only 12,000 years ago we started intentional cultivation (farming). Husbandry (the use of animals and plants) needs more than good practice—it needs Applied Systems Thinking.

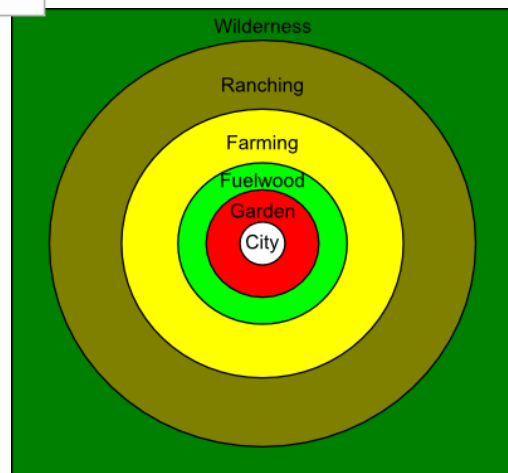
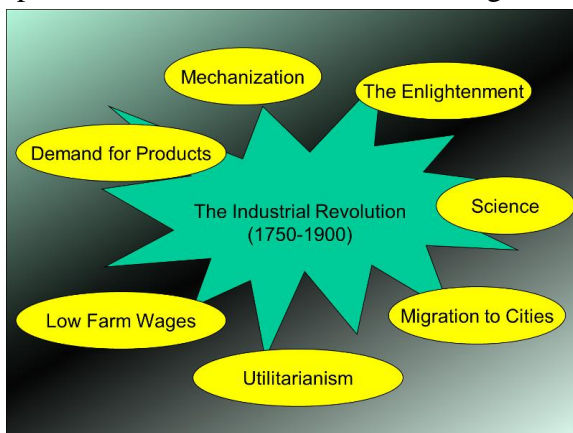


Once most of humanity spent most of its time in procuring food, but now very few people produce the food for everyone else, with the help of machinery. Thus the price of oil and the price of food parallel each other in today's world¹⁵.

(upper curve is food price index, lower is oil price)

Before industrialisation and oil, cities obtained their food from their hinterland, up to 100 miles away, as a zoning of products from increasing distance¹⁶.

The Industrial revolution changed our relationship with the land. This disconnect allowed massive population increase, and unsustainable growth.



¹⁴ <http://en.wikipedia.org/wiki/Garden>

¹⁵ see 'Hungry City' by Caroline Steel

¹⁶ Johann Heinrich von Thünen: The Isolated State (1826)

Green Infrastructure (GI) is our new paradigm for the urban environment, consisting of:

- Living roofs
- Green walls
- Grass areas
- Wooded areas
- Sustainable urban drainage systems
- Reed beds
- Rain gardens
- Nature corridors
- *Not to forget gardens and parks [Ed.]*

Research is taking place on the sustainable urban environment in many organisations. The consortium CityForm¹⁷ addresses a major research question: To what extent and in what ways does urban form contribute to sustainability? We do know that green areas help control urban temperature, grassed areas help clean the air, and Rain Gardens in the USA help flood prevention.

Can we add sustainable urban agriculture to the list of GI services? What impact will it have upon urban ecosystems?



Could we produce a useful percentage of our food in the cities in which we live? Certainly people have been growing food sustainably and encouraging wildlife in London for 50 years.

Unfortunately, a little knowledge can be a dangerous thing. Urban gardeners make much use of plastic growing containers which break down and releasing Bisphenol A and phthalates. These are known endocrine disruptors that interfere with the hormone system, and safe levels of exposure have not yet been established. Then urban soils are frequently contaminated¹⁸, and chemicals used on vegetation can be accumulated within municipal compost. UK toxicity tests originally developed for use in agricultural systems, often use species not indicative of those likely to be present in urban green space. Perhaps urban horticulture and gardening is limited.

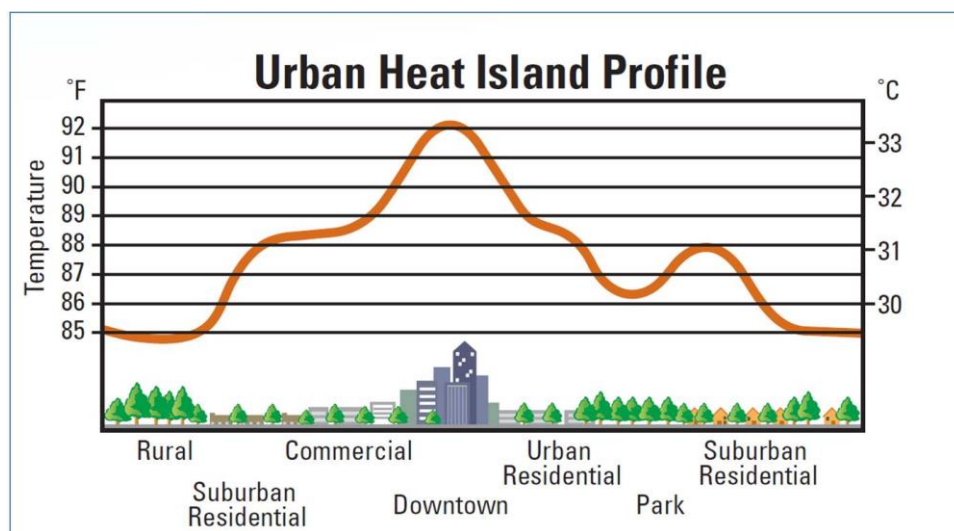
¹⁷ Sustainable Urban Form Consortium <http://www.city-form.org/uk/index.html>

¹⁸ See http://www.epa.gov/region4/foiapggs/readingroom/rcra_community/urban_gardening_fina_fact_sheet.pdf

The good news is that we can grow food anywhere we need to eat it using Urban Agriculture. This already involves:

- Urban farms
- Community gardens
- Home gardening
- Living walls and green roofs
- Market gardens

Should this be through large cropped areas and greenhouses on flat roofs? Perhaps these would be better used for wildlife and ecosystem services such as rain management. Then extensive urban market gardens and home gardening risk the soil contamination issues. There are also issues concerning the urban heat island effect, and vegetated sections can break up the overheated areas of a city.



We need to zone our agriculture to use the best places to produce the food we need. Surprisingly though, it can be more efficient to produce food indoors than out of doors in cities, as in the hydroponics unit at Paignton Zoo¹⁹.



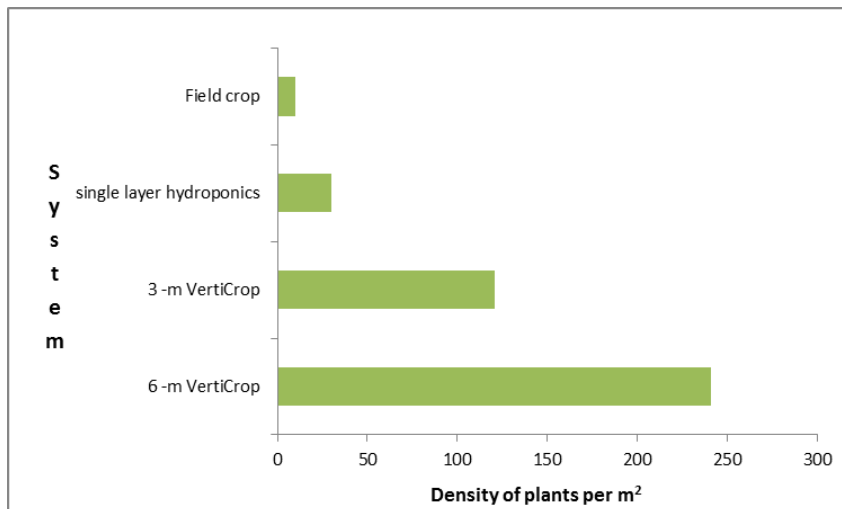
Kevin Ferdiani in his aquaponics greenhouse at Paignton Zoo.

Here, large quantities of fresh leafy crops are produced in stacked trays under cover, with fish in the water to provide fertiliser.

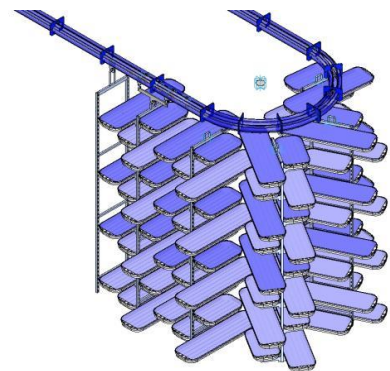
High density vertical growing is revolutionising urban food production. Using redundant warehouses with vertically stacked shelves vastly increases the growing area compared with a field. Even barley

¹⁹ Frediani, K. 2010. Vertical plant production as a public exhibit at Paignton Zoo. *Sibbaldia: The Journal of Botanic Garden Horticulture*, No8 pp139-149

can be grown on this stacked system. Within a system stacked to 6m high, a total growing area of over 6m² is achieved on a ground area of only 1 square metre.



Mechanisation in the form of a conveyor system for vertical growing means you can rotate plants into light, water through a shower, reduce space for operational walkways, and bring plants to harvesting point. Circulating plants creates air movement, improving gas exchange.



Vertical stacking can reduce energy use per unit of product. At Paignton Zoo, the system uses one sixth of the energy per kilo of product than a comparable single layer system. Future urban food production²⁰ will involve high density structures, with recycling of nutrients with anaerobic digesters, aquaponics and probably vermiculture to provide food for the fish.

As a final reflection, Gardens today should be multi-functional:

- Places of sustenance
- Places of education
- Places of rejuvenation & renewal
- Places of repose (for rest & reflection)
- Places of beauty
- Places of succession
- Capturing the spirit of place and time²¹

Can we leave a legacy with all these benefits?

²⁰ Bayely, J., Frediani, K. & Muy, M. (In Press). Sustainable Food Production Using High Density Vertical Growing (VertiCrop™). *Acta Horticulturae*. Symposium 10 IHC 2010 Lisbon proceedings

²¹ *And as places to pay back to wildlife some of the space under concrete we have stolen from nature. [Ed.]*