SCIENCE IN URBAN PUBLIC GARDENS

Author of this unit: Sarah Codrington • **Editor**: Jacqui Dean
Field Studies Council adviser: Melissa Glackin • **Health & Safety adviser**: John Tranter, CLEAPSS
Science Learning Centre London Director: Angela Hall

Questions based on Nuffield Primary Science • Pigeon by Lucy Hollis
Produced by the Nuffield Curriculum Centre and the Science Learning Centre London

See also the History, English/Literacy and Art & design units.

SCIENCE IN URBAN PUBLIC GARDENS

These materials contain ideas for field work in urban public gardens. See the Health & Safety notes at the end of this document. The materials were originally developed for primary schools in central London as part of the Gordon & Woburn Squares primary project, but can be used in most urban parks and gardens.

KS1 PLANTS AND ANIMALS IN URBAN PUBLIC GARDENS

[QCA Unit 2B: Plants and animals in the local environment]

A summer visit to a public garden will allow children to experience a wide variety of plants. Animals will probably not be so obvious, but there may be grey squirrels. There are likely to be plenty of pigeons and some other birds too.

This links with work in the classroom on what plants and animals are, and what they need to live. In winter children can see leafless trees for themselves, and consider whether they are alive.

Trees in public gardens may include large plane trees, lime, holly, hawthorn, and cherry trees. The trees are likely to be mostly broadleaf though some are evergreen. There may be few or no coniferous trees because they are more sensitive to pollution.

There may be rose and other flower beds. The wilder areas are likely to have a greater range of plants.

Picking flowers or collecting plants is obviously not a good idea in public gardens!

It would be useful to discuss the visit and what children are to look for before setting off.

Questions for discussion

Q What plants have we found, and where in the garden are they?

Q What animals have we seen? What were they doing? What do you think they eat?

Q Do all the plants have flowers on them? (Unlikely – this will depend on the time of year.)

Q Do all the plants have leaves?

Q What shapes are the leaves? Are the leaves on one tree all exactly the same shape?

Holly will always have leaves - very prickly ones of course. Viburnum, laurel, aucuba and choicya bushes are also evergreen and common in urban gardens.

Plane trees have leaves with an interesting shape, but the hairy fruits and young leaves can cause allergic reactions, particularly if they are handled directly.

There may be ginkgo trees. They have very interesting leaves - the veins are in straight lines. Ginkgo trees are unlike any other and are known as living fossils, because they were around at the time of the dinosaurs.

Look out for ferns in damp areas.

There may be birds such as pigeons and blackbirds. There will be plenty of woodlice, worms, beetles and so on in wilder areas. Beetles and woodlice will be hiding under stones, leaves and other debris. Worms may not be visible at the surface unless it is a damp day. Carry out a risk assessment before looking for any of these in these public gardens – beware discarded needles particularly.

KS1 URBAN PUBLIC GARDENS AS HABITATS

[QCA Unit 2B: Plants and animals in the local environment]

You could visit two contrasting areas in the gardens with the class. Choose a well-maintained place such as a flowerbed, and with care a wilder area. You and the children could photograph the areas for a classroom display and return at different times of the year. Compare two different areas if possible.

The children could record by photographing, drawing and or/writing about what they have seen.

Questions for discussion

Q What differences do children see between two different areas?

Q Why do you think they are different?

Q Who do you think planted the trees and other plants? Did some of them just arrive by themselves?

Q What animals and birds do you expect to see? If you did, what are they?

KS1 FLOWERS IN THE GARDENS

[QCA Unit 2B: Plants and animals in the local environment]

This is obviously material for spring and summer. A visit to a public garden would enable children to see real flowers growing – but this will be a matter of look, don't touch!

The visit would provide a context for classroom work on growing plants and looking at flowers, fruit and seeds.

Wild flowers will have grown from seed shed by previous generations, or brought in by the wind, birds and other animals. Some may have been planted deliberately. Bluebells also reproduce by means of (poisonous) bulbs. So do the crocuses. The roses in cultivated flower beds are likely to have been grown from cuttings, and then transplanted into their present position.

It may be difficult to find real seeds in urban areas, apart from those from plane, lime holly or hawthorn trees. The spiky plane tree fruits hang from the trees for months; but they can cause allergic reactions and are best avoided, and the seeds do not germinate well in Britain. Look out for the red haws on hawthorn trees in autumn, holly berries, and the pretty lime seeds. Look out too for herb bennet (a wild flower with inconspicuous yellow flowers). It has hooked seeds which stick to most things. Willow herb may also have seeds.

You will find new shoots growing in the spring particularly in wilder areas of gardens, but children should keep to the paths.

Questions for discussion

Q What different flowers can you see in the gardens?

Q What are the names of different parts of the plants?

Q Where do seeds come from?

Q Why do you think the plant has leaves, flowers, seeds?

Q How do you think it came to be growing here?

KS1 GROUPING PLANTS IN THE GARDENS

[QCA Unit 2C: Variation: Grouping animals and plants]

Resources: Grouping plants and animals chart

A summer visit to a public garden may be a stimulus or follow-up to work in the classroom on grouping plants and animals.

You can take advantage of being in the gardens to look at the whole plant rather than just a leaf or flower.

Children can look at plants in different parts of the gardens. Look at some of the flowers in the gardens. Children can learn some of the plants' names.

Children can take digital photographs and print them out back in the classroom, write and draw pictures to show what they have found. It may help if they have a table to do this. They should not pick leaves or flowers in the gardens.

About how many are there of each kind of plant? Children could record their results using a block graph.

Children can also discuss how to group the photos. They can group, then justify their grouping to others. It's easier to group by having something to move around physically – they can even in some cases create Venn diagrams using hoops in the playground or classroom.

Questions for discussion

Q What living things are there in the gardens? Are they animals or plants? How can you tell?

Q What plants grow in the different areas of the gardens? Why do some plants grow in certain areas and not others?

Q Look at the trees. Do they all go in the same group? What will children use for grouping – the leaves? (Almost all the trees may be broadleaf rather than coniferous, though some are evergreen. There are likely to be both trees and shrubs.)

Q Look at the plants in the flowerbeds. How could we group them? (If they are all roses, they can be grouped by flower colour.)

Q What about grouping other wild flowers?

Q What about the grass? – what group is that in? (a question to ask if there are bulbs such as bluebells or crocuses visible). Why are you unlikely to see grass flowers in the gardens?

Q Are there any animals (including birds)? If so what? How would you group them? What about the humans?

Health & Safety

Follow your school or local authority guidelines about taking children out of school. Carry out a risk assessment before allowing children into different areas of a public garden, or before touching anything in the garden. See the notes at the end of this material.

SCIENCE IN URBAN PUBLIC GARDENS

These materials contain ideas for field work in urban public gardens. See the Health & Safety notes at the end of this document. The materials were originally developed for primary schools in central London as part of the Gordon & Woburn Squares primary project, but can be used in most urban parks and gardens.

KS2 (yrs3/4) THE GROWTH OF PLANTS

[QCA Unit 3B: Helping plants grow well]

Work in public parks and gardens is mostly observation – there is little opportunity for experiments. A summer visit would tie in well with classroom experiments with growing seedlings in different conditions.

(Plane trees have attractive seeds, but note that they do not germinate well in Britain and that they may cause allergic reactions, particularly if handled directly involving skin contact.)

Children could draw what a plant looks like at different times of the year. (Plane trees would be an obvious choice in some areas. A flowering cherry would be attractive too.)

Questions for discussion in the gardens

Q What are plants? –plants include trees and grass.

Q What keeps the plants alive in the gardens? Suppose all the humans left – what do you think would survive?

Q Which plants are living? Are some plants dead? How can you tell? (There are likely to be dead or dying plants in autumn and winter in the wilder parts, particularly under the trees. But the bulbs and some other plants are not actually dying – only their leaves. The same applies to the trees of course.)

Q Are the leafless trees in winter alive? (There are many trees which lose their leaves in winter. In spring you can see the buds before the leaves grow.)

Q Does the plant have anything which makes it easy to live in this place? Why do you think this helps?

Q Do the plants under the trees look as healthy as those in full sunlight? Some may be spindly from lack of light.

Questions for discussion and research in the classroom

Q Why do you think plants have roots?
Why do you think plants have flowers?

Q Why do roses have thorns?
Q Why does holly have prickly leaves?

Q What happens when the plant dies?

Q Where do you think the seeds/fruit grow?
What do you think is inside the seeds/fruit? (Note that plane tree seeds may cause allergic reactions.)

KS2 (YRS 3/4) HABITATS AND FOOD CHAINS IN THE GARDENS

[QCA Unit 4B: Habitats]

Resources: Habitats chart

A visit to a public park or garden can provide the context for work in the classroom on a wider variety of habitats, and what plants and animals need to live. A visit would be best done in summer. Carry out a risk assessment before working in public gardens.

Children are likely to find plenty of habitats in the gardens. Likely examples are: flowerbeds, paths, shrubbery, children's play area, grass, wild area, around an ice-cream kiosk, under trees, among the branches.

Children can make a list of habitats, and describe each one. This could be in words and/or pictures.

Questions for discussion in the gardens

Q What habitats can you see in the gardens?

Q What are the conditions like in each (dark/light, dry/wet, open space or places to hide? How much human interference is there? Are plants and animals likely to be trodden on (in the grass) and does this matter? Does this make a difference to which plants are growing in trodden and non-trodden areas?

Q What plants and animals do you expect to find in each?
What plants and animals are there in each?

Q What plants and animals could not live here?
What could live here but doesn't?

Q Why do you think these plants and animals live in these gardens?

Further questions for discussion and research

Q Why do you think this is the best place for this animal or plant to live?

Q Could the plants and animals live anywhere else? What other sorts of places might they live?

Q Would each of these plants and animals go on living in the garden if all the humans left?

Q Does each plant or animal have anything which makes it easy for it to live in this place? Why do you think it helps?

Children could choose some plants and animals in the gardens. They could draw several plants and animals in the place they think is best for them to live.

You can also do work on food chains. and discuss with children what the animals eat.

Likely examples are pigeons, which eat anything they can find including remains of people's food. Blackbirds eat worms, woodlice, and so on. Woodlice eat decaying leaves. Worms eat decaying material in soil. Micro-organisms in the soil break down decaying plant material into a form that can be absorbed by plant roots.

If there's a buddleia in flower, it may have butterflies feeding on nectar.

There might be a kestrel. What do children think kestrels eat? (pigeons, and presumably there are mice in the gardens too).

Health & Safety

Follow your school or local authority guidelines about taking children out of school. Carry out a risk assessment before allowing children into different areas of the gardens, or before touching anything in the gardens. See the notes at the end of this material.

SCIENCE IN URBAN PUBLIC GARDENS

These materials contain ideas for field work in urban public gardens. See the Health & Safety notes at the end of this document. The materials were originally developed for primary schools in central London as part of the Gordon & Woburn Squares primary project, but can be used in most urban parks and gardens.

KS2 (YRS 5/6) LIVING IN THE GARDENS

[QCA KS2 Yrs 5/6 Environment and relationships between plants and animals]

A visit is an opportunity for children to frame their own hypotheses, and to carry out close observation of living organisms.

Visiting the park or garden in May and June is likely to be most rewarding, but could be contrasted with a February visit.

Children could photograph the gardens and the trees in February, for comparison. They could draw the trees at different times of year. How much shade is there? Compare different areas, one wilder than the other. Encourage longer-term investigations through questions such as 'Which trees flower first, or come into leaf first?' Plot the number of different animals and plants present at different times of year. Children could investigate where some of the plants came from originally.

Plant and animal adaptation

Urban public gardens may be dominated by plane trees. How are plane trees adapted to their environment? Their most characteristic feature is that the bark is shed – see their mottled tree trunks. This means that pollutants do not build up.

There may be few coniferous trees, because they are sensitive to pollution. The larger trees may have survived the era of smoke from coal fires. You could relate this to the damage caused for instance in Scandinavian coniferous forests by pollutants, including acid rain from industry in other parts of Europe.

Pigeons and other birds: children could observe these in the area, and watch what they eat. There might be a kestrel feeding mostly on the pigeons. Close observation of any feathers found should be made with due regard to hygiene.

Grey squirrels: there may be several of these in the urban space you are studying, and children could research these. It may be less easy to see them when there are lots of people about. Are there any dreys in the area?

Compare these with birds' nests, and suggest reasons why they are positioned where they are.

Activities

Choosing a defined area and counting the number of different species: this is likely to be most rewarding in a wilder area, with due regard to health & safety. Children can practise using keys to identify plants. They can observe the whole plant in its environment. They can also photograph what they find.

Looking at flower parts will be best done back in the classroom, since you shouldn't pick flowers in public gardens.

Consider relationships between different plants. You could look at which plants grow in the shade of the trees and which need full sun. Which plants dominate their area, and which are interspersed with others?

Think about the timing of plant growth and flowering during the year. Bluebells take advantage of the light in early spring, before trees come into full leaf.

What is living in each area? Children can use keys to identify plants.

The range of animals observed is likely to be small, and using keys to identify animals is likely to have to be done using pictures in the classroom.

Why these trees? Children can research some of the species they've identified. Children can map where the species originated and find reasons why people chose to plant them in the gardens. This work has links with Geography, History, and PSHE.

For example, some older trees in public gardens may have been planted by Victorian or Edwardian collectors, who were keen on the fashionable hobby of travelling and discovering unusual species.

Identified plants can be entered into a class database. Fields could include Name, Species, Country of origin.

Questions for discussion

Q Do the number and type of plants change from one part of the garden to another? What might cause these differences?

(Human activity is a very important factor. The areas have been deliberately planted in different ways and are being cared for. There are many human visitors to the gardens.)

Q What plants would survive without human attention?

Q What plants would die if humans didn't look after them?
What about the animals?

Q What would happen if no-one tended the gardens for 1 year, 5 years, 20 years?

(This is a matter for speculation, research, and observation of what happens elsewhere if possible. Some plants would survive in the short term, but after a few years would have been overwhelmed by others.)

KS2 (YRS 5/6) PLANTS AND WHERE THEY COME FROM

A science and history cross-curricular activity

In British cities, up to 40% of plants have been introduced from elsewhere in the past. Many of them have become naturalised, and are thought of as native plants. The same is true of many animals; for example, the grey squirrel we can see all over Britain comes originally from North America.

Plants from all over the world have been brought to Britain by humans since Neolithic times. The various origins of plants and animals *'means that cities are not only multicultural in terms of their human inhabitants, they are multicultural in terms of their plant and animal residents'* (Agyeman, J, 1995, *People, Plants and Places*, Southgate Publishers).

Where do the plants in your local public garden come from?

Children can use keys and other resources to identify and record trees, shrubs and other plants. Then children research the plants' origins.

Q Which are native plants, originating in Britain?

Q Which are exotic, originally from other countries?
When did the exotics arrive in Britain?

Q Which have become naturalised?
Where did they come from?
Who might have brought them? Why? How?

The children can research the plant origins on the internet – simply type the name into a search engine (e.g. Google) and several useful sites giving information about plants and their origins should be listed.

The children can now mark the origins of the trees and shrubs on an outline map of the world. You could also create a wall display of the origins of the gardens' plants. Plot them from the children's maps onto a large world map, and illustrate it with pictures of the trees and shrubs, their leaves, seeds and bark.

SCIENCE IN URBAN PUBLIC GARDENS

HEALTH & SAFETY

Under the *COSHH* and the *Management of Health and Safety at Work Regulations,* employers must protect the health and safety of their employees and are responsible for assessing risks for them. This protection should be extended to others who may be affected, for example, children at school. Teachers are required to co-operate with their employers by complying with such risk assessments. Education employers normally use model risk assessments which schools are required to consult. For primary schools, most employers have endorsed the publication *Be safe! Health and safety in primary school science and technology* - published by the Association for Science Education (3rd edition, 2001, ISBN 086357324X) - as providing suitable risk-assessment guidance.

Therefore, before taking children out of school, teachers should always check that what they are proposing is compatible with their employer's risk assessments (normally *Be safe!*). Any local rules issued by the employer must always be followed, whatever is recommended here.

Age, responsibility and maturity of pupils
Consider how pupils are likely to behave when working outdoors. An adequate ratio of adults to pupils is needed in order to ensure that the intended activities are performed safely. The precise ratio will be determined by the risk assessment. It should not be assumed that the normal level of pupil supervision in classrooms will be appropriate out of doors.

Hazards in the environment
Make decisions about where it is safe for children to go - carry out a risk assessment, which will normally require a survey of the area to be visited. Discarded syringes and hypodermic needles are a particular hazard because of the risk of transmission of disease. Don't touch these – contact the organisation in charge of the garden if you find them. There may be other unsafe items, for example, broken glass or discarded cans hidden in grass or soil which cause cuts if accidentally encountered. All these should be removed and disposed of safely. There may be other hazards such as pot holes in the ground or other unsafe structures which could cause wounds or children to trip. Children should be warned to avoid these hazards.

Disease
Several diseases may be transmitted via injury, contaminated hands or through cuts and grazes. These include:

- AIDS from discarded needles and syringes

• Toxoplasmosis and toxocariasis from plants and soil contaminated by cat or dog faeces;

• Tetanus from cuts or wounds contaminated with soil.

Ensure that all hands are washed properly. With younger pupils, this should be seen to be done. Cuts and grazes on exposed skin must always be suitably covered. Look for (and remove hygienically) any animal faeces in the areas to be studied.

Allergies
There is the possibility of exposure to plants or animals that may trigger an allergic response (see below). Consider also general exposure to pollen, triggering reactions in asthmatics and pupils suffering from hay fever. Be alert for the development of allergies and asthmatic attacks, which will be dealt with according to the school's normal policy.

Plants and fungi
There are several poisonous flowering plants, as well as mushrooms and toadstools, that may be found in urban public gardens. For many poisonous species, all parts of the plant are toxic. In others, the poison is concentrated only in specific organs such as bulbs, fruits or leaves.

Some species are not so much poisonous as irritant or allergenic when their seed cases, leaves and stems are handled or sap is smeared onto the skin. Plane trees are an example. Handling the bulbs of several species may cause dermatitis. Some plants with prickles, thorns etc may cause injuries to the skin and eyes.

Risks of poisoning, however, are minimal since serious ill effects are only likely if quantities of poisonous plants are consumed. Adequate supervision will prevent pupils eating suspect plants or fungi. Gloves or plastic bags should be worn when handling plants that may be irritant, allergenic or have thorns etc. Consider eye protection when working near spiky plants.

Sunburn
There is the possibility of sunburn on unprotected skin on sunny, summer days, if exposed for more than 20-30 minutes. Encourage the wearing of long-sleeved shirts and hats and the use of sun creams where appropriate. Ensure that there is a sufficient supply of drinking water.

Hygiene
This is an important requirement for working outside. It is needed whenever animals, plants, or soil, have been handled. Pupils may attempt to eat sweets etc with dirty hands; teachers should dissuade pupils from such snacking. Adequate provision for hand washing needs to be readily available; if teachers and pupils have to walk some distance to reach suitable facilities, they will often forget or not bother to wash their hands. The use of alcohol gels or other hand sanitisers should therefore be considered. Paper towels, rather than communal towels, should be used. Baby wipes are good.

GROUPING ANIMALS AND PLANTS

Use this chart to record and count the different kinds of animals and plants you find in your area.

Animals		
Name of animal	How many?	Type of animal (e.g. bird; insect)
Plants		
Name of plant	How many?	Type of plant (e.g. grass; tree)

HABITATS

Choose a habitat in your area, no more than 1 metre across. Make a record of its features on this chart. Tick the boxes that fit your habitat, and record the plants and animals you find there.

Where is your habitat ? .....

Light	Shade	Semi-shade	A mixture
Dry	Moist/damp	Wet	A mixture
Grassy	Stony	Sandy	A mixture
Flat	Uneven/bumpy	A hollow	A mixture
Open	Places to hide	Trodden by humans	A mixture
Plants		Animals	
Why do you think the plants grow in this habitat?		Why do you think the animals live in this habitat?	

Trees and shrubs are also habitats. How would you record these habitats? What descriptive words would you put into your chart?