'Dandelion Delight & Peregrine Paradise'

QCA Science - Unit 5b: Life Cycles

Undertaking this unit, the children look at the life cycles of a plant and a bird that are both found in a working quarry. They investigate how plants manage to grow in working quarries and create a first-person diary account, imagining they are a dandelion! They also look at the increasing incidences of peregrine falcons nesting in working quarries and find out about these exciting birds and their life cycles.

Unit 5B – Life Cycles
Science Year 5
Dandelion Delight and Peregrine Paradise Quarry

Overview Teacher Introduction:

The themes explored in 'Peregrine Paradise' are designed to be used in conjunction with the teaching of Unit 5B 'Life Cycles'. Through the use of the 'Virtual Quarry' resource, children will learn about what a quarry is and how these can offer excellent opportunities for wildlife. The themes suggested can easily be incorporated into existing teaching to provide a fun and new approach to learning about animal and plant life cycles.

The three lessons provided are designed to be slotted into the existing teaching within this unit. You may find that they can replace some of the lessons that you currently teach. These three lessons are not designed to teach all the objectives within this unit, only the sections highlighted in the QCA Unit document. They are designed to enhance and develop existing teaching.

‘Dandelion Delight & Peregrine Paradise’

Unit 5B – Life cycles Science Year 5

ABOUT THE UNIT

Through this unit children learn that plants and animals reproduce as part of their life cycle and that in every life cycle there are distinct processes and stages. They should begin to understand how reproduction is important to the survival of the species.

Experimental and investigative work focuses on:

- making observations and comparisons
- drawing conclusions.

Work in this unit also offers children opportunities to relate their knowledge and understanding of science to their personal health and to consider ways in which living things need protection.

Some of the work in this unit is likely to be undertaken in relation to the school’s programme for personal, social and health education and must be consistent with the school’s sex education policy.

This unit takes approximately 12 hours.

WHERE THE UNIT FITS IN

Builds on Units 2A ‘Health and growth’ and Unit 3B ‘Helping plants grow well’

Children need:

- to understand the role of light and water in plant growth
- to be familiar with the structure of plants (excluding flower parts)
- to be able to use standard measurements of volume and length.

Links with Units 4A, 5B and personal, social and health education.

VOCABULARY

In this unit children will have opportunities to use:

- words and phrases associated with life processes *eg reproduction, life cycle,*
- names for parts of a flower *eg stamen, style, stigma, sepal, petal, ovary, pollen*
- names for processes related to life cycles and associated verbs *eg reproduction/reproduce, germination/germinate, pollination/pollinate, fertilisation/fertilise, dispersal/disperse fledgling, fledge, incubate*
- descriptions and explanations using a sequence of ideas.

RESOURCES

- collection of pictures of plants with fruit *eg apple trees, vines, dandelions, beans, horse chestnut*
- hand lenses/microscopes
- examples of flowers *eg mallow, buttercup* and pictures of flowers
- collection of fruits and seeds including those dispersed by different mechanisms
- pictures illustrating the plants from which seeds come
- rapidly germinating seeds *eg radish, spring onion*
- thermometers
- containers in which to germinate seeds and selection of gravels / rocks
- Information about dandelions and peregrines
- secondary sources *eg video, CD-ROM, reference books* showing newly born animals and giving information about gestation periods

EXPECTATIONS

at the end of this unit

most children will:	name and explain the functions of some parts of a flower; describe the processes of pollination, fertilisation, seed dispersal and germination; explain how to carry out a fair test to find the conditions necessary for germination; explain that living things need to reproduce if the species is to survive and recognise stages in the growth and development of humans as well as other animals
some children will not have made so much progress and will:	name the parts of a flower and explain how pollen and seeds are dispersed; describe some of the conditions tested in investigating germination and recognise some stages in the development of humans and other animals
some children will have progressed further and will also:	explain why it is important to use a number of seeds or plants in an investigation into growth or germination

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
• that flowering plants reproduce	♦ Remind children of earlier work on seeds and plant growth and show them a series of pictures of flowering plants (or plants if these are available) with ripe fruits and ask children a series of questions to elicit their ideas about fruits *eg* – *Where did the fruits grow from?* – *What will happen to the fruits?* – *Why are they important to the plant?* Remind children that flowering plants produce fruits and seeds from their flowers and that these grow into new plants and ask them to draw a simple sequence of pictures to illustrate this.	• recognise that flowering plants produce seeds from their flowers which grow into new plants	This unit is best carried out at a time of year when there are plants in flower or in the autumn when plants can be seen bearing fruit.
• that seeds can be dispersed in a variety of ways • to make careful observations of fruits and seeds, to compare them and use results to draw conclusions • that many fruits and seeds provide food for animals including humans	♦ Help children to make a collection of fruits with seeds *eg apple, tomato, cherry, strawberry, avocado, mango* and some seed cases and seeds which are not fleshy fruits *eg wheat, maize (sweet corn), dandelion, poppy, winged seed cases (ash and sycamore)* together with pictures of the parent plant. Talk with the children about seed dispersal and use observation and secondary sources to find out and record how the seeds are dispersed including the role of humans and other animals in the process. Using examples or pictures ask children to suggest how an unfamiliar seed is dispersed. Ask children to suggest why plants produce so many seeds. Talk with them about reasons why seeds may not grow into new plants *eg including humans growing some plants to provide food.*	• explain why seeds need to be dispersed *eg to have the best chance of growing into a new plant* • explain that seeds are dispersed by water, wind, explosion and animals *eg coconuts are dispersed by seawater and dandelions have parachutes and are dispersed by wind* • identify by observation how an unfamiliar seed might be dispersed • suggest reasons why some seeds may not grow into plants	**SAFETY** – Children should not taste any of the seeds and fruits provided. Avoid using nuts, especially peanuts, as some children are allergic to these.

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
• that plants reproduce • to consider conditions that might affect germination and plan how to test them • how to alter one factor at a time in order to carry out a fair test • that several seeds should be used in each set of conditions in order to get reliable evidence • to make careful observations and comparisons and use these to draw conclusions • that seeds need water and warmth (but not light) for germination	♦ Remind children that once seeds have been dispersed they need to germinate. If it is spring, look for new plants and ask children to describe where they grow. Ask children to suggest what seeds need in order to germinate and how they could investigate this. Remind children of the need for a fair test and ask them how many seeds they should use in order to get reliable evidence. Help children to set up their investigation and ask them to write an account of how they set up the work. Discuss children's results with them and relate their findings to seeds germinating in the spring after the cold winter. If possible use secondary sources to show the germination and flowering of plants in a desert after rain.	• suggest suitable factors *eg light, warmth, water, soil* to investigate and how they will carry out a fair test of these • use several seeds in each set of conditions in order to get reliable results • state that the seeds in the dark germinated as well as those in the light • state that water and warmth are also needed for germination	Some seeds take a long time to germinate. Radish, lettuce and spring onion seeds which germinate in 7 – 14 days can be obtained. Cress and broad beans can also be used. As the germinated seeds do not need to grow into adult plants this investigation can be carried out over a relatively short period. This work focuses on germination not on growth. Many children think that because light is needed for growth it is also needed for germination. This activity offers children the opportunity of carrying out a whole investigation. It may be helpful to focus on the aspects of investigation highlighted in the learning objectives. **SAFETY** – Seeds from garden centres are usually treated with pesticides but those from health food shops should be safe to handle. Avoid red kidney beans.
• **See Quarry Unit Lesson 1 'Will it grow here?'**	♦ Investigate germination rates of seeds on a variety of substrates that mimic working quarry conditions.	• that seeds are able to germinate on quarry / stone / rock faces where there is little soil	
• that insects pollinate some flowers	♦ Talk with children about what happens to seeds once they have germinated and refer back to what they know about the conditions needed for healthy growth. Visit park or school grounds to look at flowers and insect pollination. Talk to children about the role of the insects and ask them to think about how pollination takes place early in the year when there are few insects about. Relate to hay fever and pollen count.	• explain that pollen has to be transferred from one flower to another during pollination *eg by insects, wind*	**SAFETY** – All off-site visits must be carried out in accordance with LEA/school guidelines.

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
• that plants produce flowers which have male and female organs, seeds are formed when pollen from the male organ fertilises the ovum (female)	♦ Using examples and drawings of flowers help children to observe flower structure and to learn the names and function of parts. Using pictures and other secondary sources, explain to children the processes of pollination and fertilisation and the distinction between them. Using a hand lens or microscope or using secondary sources, observe stamen with pollen and pollen grains from a number of different sources. Challenge children to speculate how the differences might be useful.	• name the parts of the flower *eg stamen, stigma, style, petal, sepal* and explain the function of each • explain that seeds are formed after pollination when pollen fertilises the ovum • state that pollen can be transferred by different means *eg by wind, by insects* • identify differences between pollen grains and suggest a reason for differences *eg pollen from one flower can't pollinate flowers of other types of plant, pollen from some flowers needs to stick to insects' bodies*	Simple flowers *eg buttercup and mallow* are suitable. It is essential to avoid composite plants *eg daisy,* and those with coloured sepals *eg tulip* because at this stage, they are confusing. **SAFETY** – Some children may be allergic to pollen (hay fever).
• about the life cycle of flowering plants including pollination, fertilisation, seed production, seed dispersal and germination • **See Quarry Lesson 2 'Dandelion Diary'** • about the life cycle of a dandelion including pollination, fertilisation, seed production, seed dispersal and germination	♦ Review with children their knowledge of flower structure, pollen dispersal, pollination, fertilisation, and seed development and dispersal. Ask children to choose a familiar plant and introduce the term 'life cycle', create a display sheet to illustrate the complete life cycle of the plant. With the children compare the life cycles of different plants pointing out similarities *eg in the processes* and differences *eg in the types of fruit or the mechanism for seed dispersal.* ♦ Children will research the lifecycle of the Dandelion for a diary.	• distinguish between pollen dispersal and seed dispersal and the mechanisms for these • order correctly the steps in the life cycle of a plant • To write a diary as if they are a dandelion	

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	POINTS TO NOTE
• that adults have young and that these grow into adults which in turn produce young • that human young are dependent on adults for a relatively long period	♦ Talk with children about the growth and development of humans and discuss different stages *eg babyhood, childhood, adolescence, adulthood.* Ask children to devise a time line to demonstrate stages in the growth and development of humans and talk with them about the relative lengths of each stage. Use secondary sources to compare lengths of stages *eg gestation period* for different animals and to illustrate the differences between newly born animals of different species in terms of dependence on their parents, ask children about the implications of these differences	• recognise stages in the growth and development of humans • describe differences in capabilities of newly born humans and other animals *eg in movement, feeding* • recognise differences in the length of time humans and other animals are dependent upon parents	This section of work is likely to be undertaken in relation to the school's programme for personal, social and health education and must be consistent with the school's sex education policy.
• **See Quarry Lesson 3 Peregrine Paradise' – The book!** • That peregrine falcons have young and these grow into adults which in turn produce young • That peregrine young chicks are dependent on the adults until they can hunt for themselves	♦ Children will produce a book for a younger child about the life cycle of a quarry peregrine.		
• that if living things did not reproduce they would eventually die out	♦ Review work on life cycles of plants and animals asking children why it is important for both plants and animals to reproduce. Discuss some examples of animals *eg panda, tiger, cheetah* that are facing extinction and how conservationists attempt to deal with the issue.	• identify one or two species facing extinction and describe a programme *eg breeding in captivity* which tries to overcome the problem	

'Will it grow there?' Investigation

Write here what your investigation is trying to find out. It should be written as a question. You will find out the answer by carrying out the investigation.

Title:

My investigation is to find out…….

Apparatus:

Draw a diagram to show how you are setting up your investigation. Make sure you label it clearly!

Write here what you think will happen in your investigation.

Prediction: **I predict that….**

What we did:

1. The apparatus was set up as in the diagram.

2.

3.

Write here how you carried out your investigation.

Now, write down your results. You may want to display them in a table.

Results:

So, what have you found out? Can you now answer the question you set yourself at the beginning?

What we found out: **We found out that….**

Lesson 2: 'Dandelion Diary'

Prior knowledge / work:

The children will be aware that a variety of plants are able to germinate and grow in the conditions provided by working quarries. Some species, such as dandelions can grow very well in what appear to be quite inhospitable conditions! The children are going to write a diary as if they are a dandelion growing in a quarry. They are going to write weekly entries that start when they are a seed that is blown onto a ledge in a working quarry. They will end when they produce their own seeds that are carried on the wind to a new spot in the quarry, ready to grow. Children will have already learnt about plant life cycles and the processes involved in making seeds and how these can be dispersed.

Learning Objectives:

- To understand the different stages in a dandelion's life cycle
- To appreciate the working quarry as a suitable habitat for wildlife
- To apply this knowledge in a creative way to produce a 'Dandelion diary'.
- To be able to correctly sequence the life cycle of a dandelion plant.

Subject Links:

- Literacy – Writing in the style of a diary

Resources:

- Examples of dandelions at different stages in their life cycle
- Books / images of dandelions
- Worksheet 2 – Diary template

Background Information:

Dandelions are one plant that most children are familiar with and many will have blown the seeds from a dandelion clock. They will also grow just about anywhere, so this makes them an ideal plant for children to study first-hand.

Activity:

The children will need to research the life cycle stages of a dandelion. Most will be familiar with this plant and its different stages can usually be found in the summer term on the school field, verge of local green space. If possible, use real examples to illustrate the life cycle, rather than Internet or book images, although these will be useful.

Explain to the children that they are going to imagine what diary entries a dandelion living in a working quarry might make. Their diary is going to have 6 entries, one at the end of each week

of the dandelion's life cycle. (This is an approximation of the timescales, as they can vary greatly depending on the conditions experienced.)

Once the children are familiar with the different stages, then they can begin to think about how they might split the diary entries onto 6 weeks, i.e:

By the end of week 1 – Seed on quarry ledge and germinated and begun to grow
By the end of week 2 – Leaves beginning to grow, getting taller and stronger
By the end of week 3 – Begins to grow flower bud
By the end of week 4 – Flower opens, is pollinated by bees
By the end of week 5 – Flower dies, starts to produce seed head
By the end of week 6 - Seed head is produced, gust of wind sends seeds off into quarry

The children need to think about what else the dandelion might notice from its ledge! It could comment on the blasting and the removal of the quarried materials by the lorries. It may notice other plants and animals around the quarry. Encourage the children to be as creative as possible and to use the Virtual Quarry to help them.

A diary template is provided in Worksheet 2, if required.

Worksheet 2.

Dandelion Diary

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Lesson 3: 'Peregrine Paradise'

Prior knowledge / work:

The children will now be aware that quarries are not barren places, but can provide habitats for plants and animals, even if they are working quarries. Show the class a copy of the fictitious newspaper report about peregrines (Worksheet 3). This article is based on numerous real articles about peregrines nesting in quarries. One report suggested that nearly 25% of Europe's peregrines were breeding in quarries!

Discuss the article with the children. Find pictures of peregrines either in books or on the Internet, so the children can see what they look like. Images can be seen on the BBC website at www.bbc.co.uk/nature/wildfacts and search for 'peregrine falcon'.

Also discuss with the children the problems that peregrines face from humans. Their eggs are still sought after by collectors and many of the nesting sites now have webcams or wardens protecting them. Peregrines also suffered greatly from the use of DDT in the 70's. This chemical worked its way through the food chain and ended up affecting top predators, such as Peregrines, by making their egg shells very thin so they broke when the female started to incubate them. Many quarries that have nesting peregrines take their 'responsibility' to them and other wildlife very seriously.

Learning Objectives:

- To appreciate that quarries offer excellent nesting sites for peregrines
- To appreciate that peregrine falcons breed by laying eggs and these hatch into young that will grow up to have young of their own.
- To understand that peregrine chicks are dependant on their parents whilst in the nest and for up to 2 months afterwards.
- To apply knowledge and translate this into a story format
- To be able to correctly sequence the life cycle of a peregrine falcon

Subject Links:

- Literacy – Writing an informative story book for a younger child.

Resources:

- As much information as possible about peregrines
- Worksheet 3 – Newspaper report about quarry peregrines
- Story book template

Background Information:

Peregrines are falcons which are found throughout Europe and whose numbers have steadily been increasing in Britain. They have long, broad, pointed wings and a relatively short tail. They

are blue-grey above, with a blackish top of the head and an obvious black 'moustache' that contrasts with a white face. Their breasts are finely spotted.

The peregrine is the fastest moving bird in the world reaching speeds of up to 350 kph (217 mph) when stooping after prey. To enable it to breathe at this speed, it has special baffles on its nostrils which control breathing. The high speed stoop means that whilst hunting by this method the peregrine must catch its prey on the wing to avoid injuring itself on impact.

Peregrines are territorial, with each nesting territory containing one or more sites for an eyrie. Territories can vary in size, depending on how much food is available in the area Suitable nesting sites restrict the distribution of peregrines. The nest is built on a cliff-ledge, quarry or other inaccessible undisturbed location, including old nests of other species such as ravens. Buildings and other constructions are being used more and there are increasing records of peregrines nesting on hospital / office type buildings. The nest itself is only a slight scrape in earth or old nest debris on the nest ledge and no material is brought to the nest. A scrape is formed by the female using her chest and legs.

The 3-4 buff or cream eggs, heavily marked with red-brown, are laid in late March to early April at 2-3 day intervals. The male and female incubate the eggs. They start incubating when the last or penultimate egg has been laid and it takes 29-32 days for the eggs to hatch. The chicks hatch over a period of a couple of days. Most of the feeding of small young is carried out by the female, while the male hunts to supply the food. After the first couple of weeks, the female will share the hunting. The young will fledge at 35-42 days, and will be independent after a further two or more months. One brood is raised each year

Activity:

Discuss what the children think the life cycle of a peregrine would be. Most should know that all birds lay eggs, so the life cycles would start with the eggs being laid in late March. After about a month, they would hatch. By searching on the Internet and using books, encourage the children to find images of the different stages, so they are clear in their mind what happens.

The adults then hunt to catch food to bring back to the nest. Whilst the young are still small, the female will tear off little bits of meat to feed to them. Discuss how long the peregrine chicks stay the nest (just over a month) and compare this to what humans are like when they are a month old. Ask the children what they think happens then. Will they just leave the nest? - The peregrine chicks will be ready to fly, but not ready to hunt for themselves yet. The parents will continue to help them feed for the next two or three months until they are able to hunt for themselves.

Ask the children how old the peregrine chicks are when they are able to look after themselves (about 4 months old). What can a human baby do at four months old?

The peregrine chicks will then being a life of their own and when they are fully grown and mature, they will find a mate and have young of their own, completing the life cycle.

Explain to the children that they are going to write a story book for a younger child, telling the story of two peregrines who are nesting at a quarry. They must show the life cycle of the peregrines in their book, starting with the egg hatching, through chicks, to fledglings, to them leaving the nest, growing up, finding their own mate and making their own nest and with the book ending with one of these new adults laying their egg.

As it is a book for younger children, it is advised that it is only short. The peregrine story splits quite easily into eight sections:

1. Egg is laid on quarry cliff
2. Peregrines incubate eggs, taking it in turns to go off and hunt in and around the quarry
3. Eggs hatch and parents begin to feed chicks
4. Chicks grow fast and have soon grown their feathers and are ready to leave the nest (fledge)
5. Parents help to feed them as they learn to hunt on their own
6. After a few months, they go off to find their own territories
7. A few years later they find mates and a new quarry to nest in
8. Female makes a scrape on the quarry ledge and lays her eggs

Encourage the children to come up with these eight pages themselves. They will then need to decide on a picture and a simple text to go with each picture that explains the life cycle. A storybook template is provided if required. The pages can be photocopied back-to-back and then folded to create an A5 booklet.

Once completed, these can be shared with children in Key Stage 1.

WILDLIFE THRIVES AT LOCAL 'PEREGRINE PARADISE' QUARRY

A local quarry has been nick-named 'Peregrine Paradise' as two pairs of breeding peregrines once again look as if they are going to nest and breed there. Palenstraw Quarry has proved to be the perfect place for these impressive birds of prey to nest as it offers cliff-like faces of rock, perfect nest sites for these birds.

Peregrine falcons are impressive looking birds, with a wingspan of 95 – 115 cm. The adult male has a dark grey head, 'moustache' cheek patterns and grey upper parts. It is paler underneath and barred with black markings.

They are perhaps best known for their dramatic hunting technique. They circle high in the sky, watching for prey, usually a bird in flight. They then snap back their wings and plummet from the sky at speeds of up to 180 mph (290 km/h)! At the last moment, their strong legs are thrust forward and the peregrine hits the prey, instantly breaking its back or neck. The prey is then usually allowed to fall to the ground, where the peregrine eats it, or takes it to its nest.

Visitors to Penstraw Quarry have been able to watch the peregrine story unfold over the last few years as adults have successfully raised numerous chicks.

Quarry Manager, Gill Hibes, explained 'Many people see quarries in a negative light. They think they destroy wildlife. In fact most quarries are excellent habitats for wildlife and peregrines would certainly not have nested in this area if it wasn't for the cliff faces exposed through the quarrying process.'

Local resident Harry Fermwer added, 'I was against the quarry in this area initially, but I have spent many hours here watching the peregrines. I also have seen the plans for this area once the quarrying has finished. It will be restored and hopefully, the peregrines will remain.'

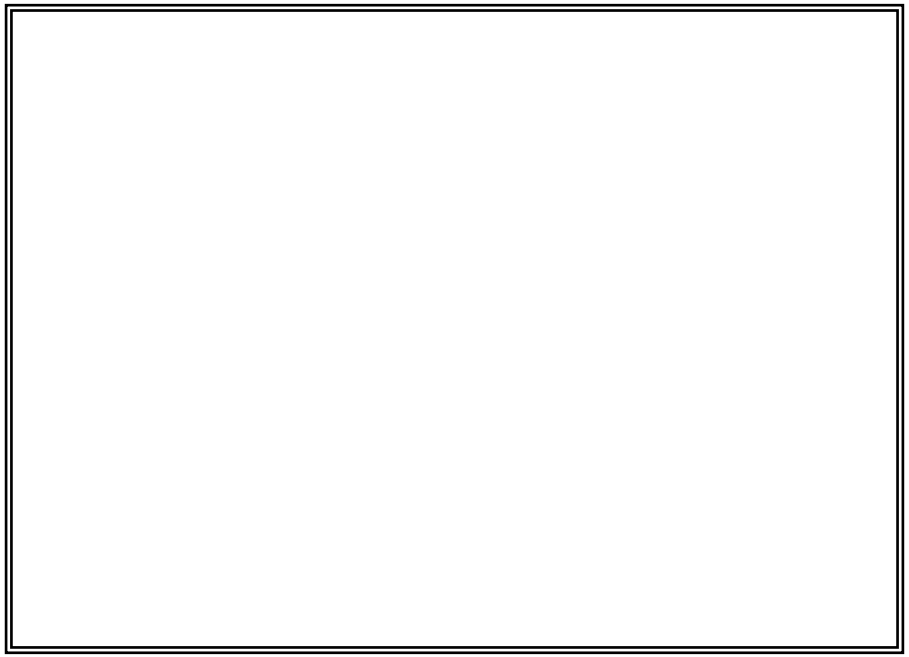
Local residents have also set up a CCTV camera on the nest sites, so everyone can watch the peregrine's progress on the Internet.

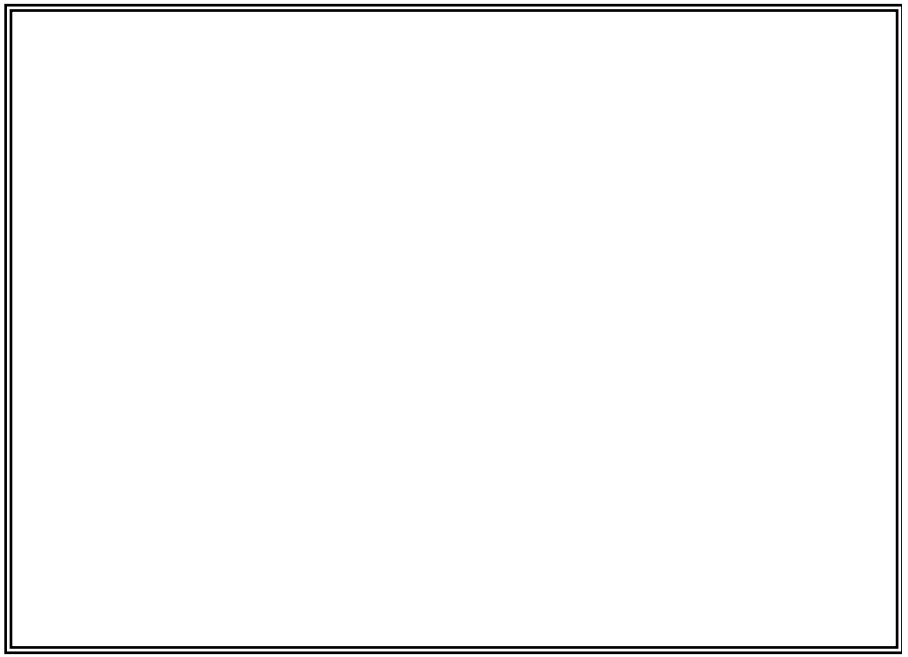
Peregrines aren't the only wildlife to be seen here. Many plants and other birds and animals have made their home in the quarry, putting concerns about this area being used for quarrying to rest. 'We have been pleasantly surprised by the wildlife here,' explained visitor Judith Yates. 'I had thought that quarries only destroyed wildlife. What a wonderful experience it has been to see the peregrines here.'

Peregrine Paradise

The story of two
quarry peregrines

Written & Illustrated by





Toothpaste Technology:

Website Links:

- www.colgate.com
  Excellent site, full of information on oral health. Has kids page and resources for teachers
- www.kingfisher.com
  Site by company who make 'natural' toothpaste. Interesting facts and information.