

Learning Objectives	I can statements	Suggested Activities	Extension	Outcomes	Resources and web links
<b>(1) Using clues from Nature to learn about past climates – sediment cores</b>					
<p>To understand that climate change has happened before.</p> <p>To understand how we can use clues from nature to find out about past climates.</p> <p>To understand the evidence that tells us climate has changed in the past.</p>	<p>I can explain how I know that Earth's climate is always changing.</p> <p>I can make measurements to collect data from real samples.</p> <p>I can use a key to analyze data.</p>	<p><b>Introduce the idea that nature holds many clues to what climates were like in the past.</b></p> <p>- Show the children a log of wood or show the photo  <a href="http://buildaroo.com/news/article/climate-change-tree-growth-rings/">http://buildaroo.com/news/article/climate-change-tree-growth-rings/</a>  and ask them what them to describe what they see and if they have any ideas about how they got there.</p> <p><b>Teacher notes- Tree Growth Rings</b>  <i>In areas of the world where there are large variations between summer and winter climate, many trees form clear, annual growth rings around their circumference. The thickness of these rings depends on many things including temperature, water availability, light levels, which insects were around and how long the growing season was. The rings can also be affected by variation in the concentration of gases in the atmosphere. By studying these tree rings, scientists have access to a year-by-year record of the climate stretching back hundreds, and sometimes thousands, of years. Fossilised trees can also be used, providing data which goes back even further.</i></p> <p>- Explain that each year the tree grows a new ring is formed. Ask them to work out the age of the tree by counting the rings. (See also teacher notes)</p> <p>- Explain that trees grow faster when it is wet and slower when it is dry. Therefore there are broad rings when it is wet and thin rings when it has been dry. Show tree_ring_images.doc– which tree</p>	<p>Further analysis of sediment core data- pupils could swap their own made sediment cores and analyse as in the class- sediment core analysis:</p> <p>- pupils tabulate the results, work out the climate for each year and then draw a pie chart or bar chart showing how the climate has changed over 5000 years.</p> <p>- They could then write a letter to a friend explaining what they have found out and what they think it means.</p>	<p>Understand that trees can be used to obtain climatic data.</p> <p>Understand what sediment cores are.</p> <p>Understanding how sediment cores give climatic data from over the whole world.</p> <p>To be able to use a key to identify different climatic temperatures.</p>	<p>Background reading for teachers:</p> <p>(1) Background Information Sheet for Teachers  <a href="http://www.rsc.org/learn-chemistry/resource/res0000782/the-ozone-story-timeline">http://www.rsc.org/learn-chemistry/resource/res0000782/the-ozone-story-timeline</a>  <a href="http://www.rsc.org/learn-chemistry/resource/res0000778/mario-molina-puts-ozone-on-the-political-agenda-teachers">http://www.rsc.org/learn-chemistry/resource/res0000778/mario-molina-puts-ozone-on-the-political-agenda-teachers</a></p> <p>(2) 'RSC Climate Change' book by Dorothy Warren available through  <a href="http://www.rsc.org/shop/books/2001/9780854049547.asp">http://www.rsc.org/shop/books/2001/9780854049547.asp</a> especially information about:</p> <ul style="list-style-type: none"> <li>- Collecting climatic data from ice and sediment cores</li> <li>-Collecting climatic data that is millions of years old</li> </ul> <p>Log showing tree growth rings</p> <p>Computer &amp; internet (for teacher), projector and whiteboard</p> <p>Globe or world map</p>

		<p>lived in a wet climate and which tree lived in a cold climate? How do you know?</p> <p><i>Tell them that although we get climatic data in this way – we need to get lots and lots of data from trees before we can really build up a clear picture of what is happening. We also want to try and build up a global picture. To help confirm the results scientists look for other sources of data all over the world.</i></p> <p>- Have pupils look at a world map or globe and ask them to locate oceans, seas and lakes. Ask questions about what they think may be found at the bottom of the ocean, sea or lake? How did it get there?</p> <p>- Introduce the idea of sediments by showing the children some sand, gravel, mud and ask them to describe it. Could also talk about weathering and where sediments come from.</p> <p>- Show sediment_core_image.pdf or use the first part of the video clip <a href="http://icestories.exploratorium.edu/dispatches/lake-coring-in-greenland-and-nyc/">http://icestories.exploratorium.edu/dispatches/lake-coring-in-greenland-and-nyc/</a> -)</p> <p>Explain that each year there is a new layer laid down on top of the old one, so by counting them, we can work out the age. Explain that in each layer clues such as pollen, midges, algae, shells are trapped. Different types of pollen, algae, midges etc lived in different temperatures and this information is well-known. Scientists use this information to learn about past climates.</p> <p>-Make a model sediment core with the class - by putting different layers into a 2 litre drink bottle – garden soil, coarse sand, fine sand, gravel clay, peat etc. Say that each layer represents 1000 years (as noticeable changes occur slowly)</p> <p><b>Make sure that pupils realise that layers at the</b></p>			<p>2 litre drink bottles, with tops cut off (see also health &amp; safety note)</p> <p>Garden soil Coarse sand Fine sand Gravel Clay Peat /compost</p> <p><b>-OR-</b> Pupils could collect some samples themselves e.g. soil from the schools grounds, sand from sandpit.</p> <p>Coloured card or plastic counters to represent pollen, midges or shells</p> <p>Plastic bags and labels Trays</p> <p><b>Health &amp; safety notes fro handling soils:</b></p> <p>- Pupils may handle soil with normal supervision - Take note of any warning lables - Cover open wounds when handling soil - Wash hands after use, even if gloves are worn - Warn pupils to avoid rubbing their eyes - Warn pupils to avoid putting their fingers in their</p>
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		<p><b>bottom are the oldest, and layers at the top are the youngest.</b></p> <p>Analyse a model sediment core</p> <ul style="list-style-type: none"> <li>- Make up another core before the lesson</li> <li>- Each layer represents 1000 years</li> <li>- Into each layer mix about 30 small pieces of coloured card or counters. These will represent different pollens or species of mides that are found in different climates – see sediment_core_key.pdf</li> <li>- During the lesson, spoon out each layer and put it into a labelled plastic bag</li> <li>- Give one bag to each group to analyze</li> <li>- Empty out on to a tray and count the different colours</li> <li>- Record on a chart</li> <li>- Use a key to find out what the climate was like</li> <li>- Put all the results from the class together</li> <li>- Relate back to original model to see how the temperature changed over about 5000 years.</li> </ul> <p>Use a plenary session to go over the main ideas.</p>			<p>mouths</p> <ul style="list-style-type: none"> <li>- Do not use soil samples likely to be contaminated with sharp or other dangerous objects or with animal urine, faeces or other products.</li> </ul> <p><b>Storage</b></p> <p>Soils should be stored in a cool, dark place with some ventilation. Damp, airless conditions encourage mould growth; it may be better to allow soils to dry out and to add water before use, though some types of compost are more difficult to reconstitute than others.</p> <p><i>Reference</i> available from <a href="http://www.cleapss.org.uk">www.cleapss.org.uk</a>. <b>Using Chemicals safely – G5P Cleapss June 2010</b></p>
<b>(2) Using clues from Nature to learn about past climates – leaf shape activity</b>					
Same as above.	Same as above.	<p>Show children a smooth leaf and a serrated (toothed) leaf and ask them to describe them and compare the differences.</p> <p><b>-OR-</b> Take the children out into the school grounds to look for different leaves. Sort them into smooth and jagged leaves.</p> <p>Explain that leaf shape is related to the climate in which the tree grows. Scientists who study leaves have found that leaf shape depends on how hot it is and how wet it is. Therefore, oak trees growing in different parts of the world have different shaped leaves.</p>	Use the 'leaf graph' image (print ahead of time enough for each group of children, or put up on the whiteboard) to work out the mean temperature shown by the leaves on each card.	Understand that leaves can be used to obtain climatic data.	<p>Background reading for teachers:</p> <ul style="list-style-type: none"> <li>- Background Information Sheet for Teachers</li> </ul> <p>Computer &amp; internet (for teacher), projector and whiteboard</p> <p>World map</p> <p>Laminated smooth and serrated/toothed leaves</p> <p><b>-Or-</b> print out images from</p>

		<p>Show the children some pictures of oak leaves from different parts of the world using the internet</p> <p>For each leaf, locate its country of origin on a world map.</p> <p>Use the climate zone website, <a href="http://www.climate-zone.com/">http://www.climate-zone.com/</a>, to find the average temperature and rain fall for each country. <b>To make a fair comparison, children will have to decide on which month they are going to collect data for.</b></p> <p>Put data into tables and ask the children if they can see any patterns. <i>Generally – smooth leaves are found in warmer climates and jagged or toothed leaves are found in cooler climates. It is not really understood why but some scientists think jagged/toothed leaves may help to increase the sap flow in cooler climates.</i> <b>Then explain to the class that because the shape of the leaves change with climate, fossilised leaves are used to help learn about past climates.</b></p> <p>Finish with children undertaking through the ‘Using leaves as thermometers’ activity using cards already printed/cut out from ‘leaf cards’ image</p>	<p>Answers to extension question</p> <p>a) 12°C b) 22°C c) 7°C d) 28°C e) 10°C f) 16°C</p>		<p><a href="http://www.gardenaction.co.uk/trees/quercus/oak-identify.asp">http://www.gardenaction.co.uk/trees/quercus/oak-identify.asp</a></p>
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### (3) The story of ozone

<p>To understand that ozone is needed to protect the world from the sun’s harmful radiation.</p> <p>To understand that human activity sometimes damages the environment.</p> <p>To understand that</p>	<p>I can explain why ozone is needed to protect the earth.</p> <p>I can give examples of how human activity has damaged the environment.</p> <p>I can explain why scientists must</p>	<p><b>Prior learning – no actual prior learning is required to access this work; but it does follow on nicely from the ‘Earth as an orange’ activity (Module 1 Upper KS2 SoW) which tackles the misconception that the hole in the ozone layer causes global warming.</b></p> <p>In groups, children use websites to answer questions and make an information poster about the ozone layer - use ozone_layer_questions.pdf</p> <p>Working in groups, children can then take on the</p>	<p>Children could carry out further research about the story of ozone to add to the timeline.</p>	<p>Understand why it is important it is to care for the environment</p> <p>Appreciate that science can be complicated, as sometimes solving one problem causes another</p>	<p>Background information for teachers:</p> <p>(1) Teacher Information Sheet_ozone.pdf</p> <p>(2) ‘RSC Climate Change’ book by Dorothy Warren page 44 onwards ‘Mario Molino puts ozone on the</p>
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<p>scientific theories must be supported by evidence.</p> <p>To learn about how scientists work.</p>	<p>collect evidence to support their theories.</p>	<p>roles of:</p> <ul style="list-style-type: none"> <li>• Mario Molino</li> <li>• Other scientists</li> <li>• Researchers</li> <li>• Manufactures</li> <li>• Busy parents</li> </ul> <p>and retell the story from different points of view, using the <b>'role play cue cards'</b> -or- they could use the cue card to re-tell the story using a cartoon strip. When they have retold the story, ask the children what they think Mario Molina should do?</p> <p>The aim of the next part of the activity is for the children to find out what actually did happen over the next 40 years by walking through a timeline, from 1970 to 2011. <i>You will need to decide where your timeline is going in the room. It could be stuck on the wall or different places in the room could be different decades etc</i></p> <p>The children should remain in their original roles. Give out the <b>'timeline cue cards'</b> to the appropriate children. In order, starting with 1973, each group should read out what happened that year and stick the card on the timeline / or take it to the correct place in the room. This will help them realise how long it took to go from initial theory to action being taken and finally a solution put in place.</p> <p><b>To help children appreciate the timescale, use the 'What else is happening?' cue cards. There are some blank cards for the children to add their own ideas.</b></p> <p>When the timeline is finished, go over the main events with the class to make sure they follow the story – try to generate discussion about the scientific process, and ask if there are parallels to other environmental problems today that cause</p>		<p>problem to arise.</p>	<p><i>political agenda'</i></p> <p>(3) <a href="http://www.rsc.org/learn-chemistry/resource/res00000778/mario-molina-puts-ozone-on-the-political-agenda-teachers">http://www.rsc.org/learn-chemistry/resource/res00000778/mario-molina-puts-ozone-on-the-political-agenda-teachers</a></p> <p>Access to Internet or copies of information take from websites.</p> <p>Coloured papers, pens, pencils for making posters</p> <p>Timeline 1970 to 2011 Scissors &amp; Blu-tac</p> <p>Role play cue cards Props for roles e.g. white coat, magnifying glass, brief case, books, toys etc</p> <p>'Timeline' &amp; 'What else is happening' cue cards which can be downloaded from <a href="http://www.rsc.org/learn-chemistry/resource/res00000782/the-ozone-story-timeline">http://www.rsc.org/learn-chemistry/resource/res00000782/the-ozone-story-timeline</a></p>
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		<p>controversy? (e.g. human caused climate change).</p> <p>Then tell them that the story is not over yet. Explain that even though CFCs have been banned, and are no longer made, they will continue to damage the ozone for many years. <i>CFCs are very stable and can remain in the atmosphere for 200 or 300 years.</i></p> <p><b>Stress also that this story shows how powerful scientific evidence can be. You could also have a class discussion about how scientists work.</b></p>			
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