

OUTDOOR SKILLS



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OUTDOOR SKILLS

CONTENTS

INTRODUCTION

- | | | | |
|-------------------------------------|----------------|---|----------------|
| 1 SITES AND EQUIPMENT | <i>page 5</i> | 7 FIRE PROJECTS | <i>page 41</i> |
| a. Finding a site | | a. Charcoal | |
| b. Equipment and materials | | b. Food safety outdoors | |
| 2 KNOTS AND ROPE WORK | <i>page 10</i> | c. Pointy stick | |
| a. Buying rope | | d. Bread | |
| b. Knots | | e. Jam | |
| i. timber hitch | | f. Baked potatoes | |
| ii. round turn and two half hitches | | g. Marshmallows / fruit kebabs | |
| iii. rolling hitch | | 8 WILDLIFE IDENTIFICATION | <i>page 47</i> |
| iv. bowline | | a. How to use a scientific key | |
| v. figure of eight | | b. Example keys | |
| vi. sheet bend | | i. trees | |
| vii. square lashing | | ii. invertebrates | |
| 3 SHELTER BUILDING | <i>page 17</i> | iii. freshwater invertebrates | |
| a. Improvised shelters | | iv. rockpools | |
| i. ridge | | c. How to build your own wildlife key | |
| ii. teepee | | d. Tree guide | |
| iii. trench | | 9 WILDLIFE CONSERVATION | <i>page 54</i> |
| b. Snow shelters | | a. Environmental Impact Assessment | |
| c. Tarpaulin shelters | | b. how to use binoculars | |
| 4 BUSHCRAFT PROJECTS | <i>page 20</i> | c. minibeast hunting | |
| a. Tripod | | d. pond dipping | |
| b. Wooden Frame | | e. rockpools & seashore | |
| c. Rafts | | f. Bug hotels | |
| d. Catapult | | g. Nestboxes | |
| e. Basher | | APPENDIX 1 | <i>page 62</i> |
| f. Brushwood sofa | | Further reading and contacts | |
| 5 TOOLS | <i>page 26</i> | APPENDIX 2 | <i>page 63</i> |
| a. Introduction to timber and trees | | Sample session plans & curriculum links | |
| b. Tool safety | | 1 Scottish Access Code | |
| c. The tools | | 2 Identification keys | |
| i. loppers | | 3 Use of bow saws/secateurs/loppers | |
| ii. bow saw | | 4 Tool use 2 | |
| iii. billhook | | 5 Knots and shelters | |
| iv. bushcraft knife | | 6 Bill hooks and mallets | |
| v. peeler | | 7 Fires | |
| 6 FIRELIGHTING | <i>page 31</i> | 8 Making charcoal and games | |
| a. Science of fire | | APPENDIX 3 | <i>page 72</i> |
| b. Fire safety | | Risk assessment | |
| c. Where to light a fire | | | |
| d. How to light a fire | | | |

OUTDOOR SKILLS

INTRODUCTION

This is a guide to some of the most important practical outdoor skills needed to run education sessions in an outdoor environment. Many educators do not themselves spend a lot of time in an outdoor environment and skills like tying knots, lighting fires and using tools are being lost. Similarly educators are often lacking knowledge and awareness of the natural world. With the Curriculum for Excellence, outdoor learning is an essential part of the education of every child in Scotland. This guide is here to help teachers, assistants and parents to get the skills they need to run these sessions.

This guide is designed to be used alongside a training course where you get the opportunity to practice these skills with the guidance of a Countryside Ranger or other expert. **YOU SHOULD NOT USE THE SKILLS IN THIS BOOK AS PART OF A SCHOOL SESSION UNLESS YOU HAVE ATTENDED AN APPROPRIATE TRAINING COURSE.**

Some of the chapters concentrate on the basic skills of working in the outdoors. Others look at projects that can be done with a group using these skills. This guide is not intended to provide a comprehensive plan for how these skills and projects can be incorporated into school lessons. The program below is just an example of a series of sessions that could be run in a woodland setting with a class of level 2 children over six sessions. This should not be seen as the only way or the best way to structure such sessions it is just an example. Many other ways of using these skills may be more appropriate depending on the location where you are working, the group that you have, your topic and your own skills and confidence.

A set of lesson plans with links to Curriculum for Excellence Experiences and Outcomes can be found in Appendix 2.

Sample program

WEEK 1

- Knots
- Shelter building

WEEK 2

- Wildlife Identification
- Environmental Impact assessment (pond dipping / minibeasts hunting)

WEEK 3

- Firelighting
- Charcoal

WEEK 4

- Tool Use
- Making a basher

WEEK 5

- Conservation work
- Nestbox building

WEEK 6

- Campfire cooking
- Bread & Jam, Marshmallows / fruit kebabs

OUTDOOR SKILLS

CHAPTER 1 – SITES AND EQUIPMENT

FINDING A SITE

The skills outlined in the guide can be used in many different places so the precise location that you use for your outdoor learning area can be whatever you have in your local area. In order to make the site a sustainable resource for the school it should be within walking distance. If a minibus is required to access the site you need to consider the cost of this and how much the site will be used. Sometimes it is better to build a simple area within the school grounds that gets used every day, rather than an ideal site that is too far away and only gets used once or twice a year.

LOCAL SITES

If there is a suitable local site within easy walking distance of the school this is ideal. As well as giving a more diverse habitat than is possible within the school grounds it creates a sense of a journey while walking to the site. It also provides an opportunity to learn about the local area.

Ideally a site should be between 200m and 1km from the school. This is far enough to make it separate from the school but near enough to easily get to. When considering a site, the route between the school and the site should also be considered as a walk along a main road is likely to be a far higher risk than anything done on site.

Scottish Outdoor Access Code

Under the Land Reform (Scotland) act 2003, people in Scotland have the right of responsible access to most land in Scotland for educational purposes. This means that you do not have to ask a landowners permission to enter their land with a class and run educational activities as long as you are not disturbing them in any way, interfering with their work or damaging anything on their land.

However we always recommend talking to the landowner before using a site and only use it if they are happy with you doing so. Most of the time landowners are very supportive of educational activities and will often allow you to use the site for far more than is allowed under the Outdoor Access Code.

For more information go to www.outdooraccess-scotland.com.

WOODLAND

Woodland is fantastic for running outdoor learning. It has the advantages of being somewhat sheltered from wind, rain and sun and a diverse landscape allowing for hiding games and building shelters. There are also many resources in woodland such as sticks, logs, trees, leaves and flowers that can be used for games and projects. However running sessions with large groups can have a very significant impact on an area of woodland and many of the skills in this guide are not considered responsible under the Scottish Outdoor Access Code when in a woodland without permission from the landowner.



OUTDOOR SKILLS



BEACH

Although very different to woodland and offering very different opportunities it is an equally rich environment for outdoor learning. Coastal areas will often lack the supply of sticks and logs that the woodland has so these either have to be brought onto site or activities requiring them cannot be done. Beaches are also often much more exposed than woodland so weather can be more of a problem. On the other hand beaches have potential for a range of activities not possible within woodland with plentiful supplies of sand, rocks, shells and water depending on the type of beach.

FARMLAND

Access rights do not cover land on which crops, including grass for silage, are growing and disturbing animals is considered irresponsible behaviour by the Scottish Outdoor Access Code. However many farms have fields which are not used regularly or where activities can be done without disruption and many farmers are keen to help educate about farming and land management. A field with a few trees can be a fantastic place to run outdoor learning with the permission of the farmer.

TOWN PARKS AND NATURE RESERVES

Local amenity areas owned either by local authority or a local community group can offer an ideal location for running outdoor learning as they often have a mixture of trees, small woodland areas and large areas of grass. However many of the more adventurous activities such as firelighting and using tools are not appropriate in a public location. There are also risks involved if members of the public are using a site at the same time as a school.

SCHOOL GROUNDS

Grounds vary dramatically from one school to another so it is best to get advice from a Ranger about your specific site. However all school grounds from the smallest concrete playground to the largest field can be used for a wide range of activities in this guide. The main advantages are that permission to use the site and transport are not an issue. On the other hand the sense of travelling to a new site is lost and resources such as trees, timber, rocks, water and wildlife may not be available. In many cases the school grounds can be improved for outdoor learning by changing the site management (less grass cutting), planting trees, creating habitat piles and building facilities such as benches.

If you get stuck trying to find a suitable site try talking to other teachers, local residents, parents, countryside professionals or landowners. A good look at an ordnance survey map of the local area and going for an exploratory walk can also help.

OUTDOOR SKILLS

EQUIPMENT LIST AND SUPPLIERS

COUNCIL PROCUREMENT.

The council's procurement system has contracted suppliers for most of the equipment on this list so if buying through the council we are required to use these. There are links on the table to websites where you can buy these products but they can also be ordered through PECOS. If the equipment is being bought by someone outside the council, either because the school is not a council run school or if the equipment is being bought by a parents group, local charity or other organisation then there are other suppliers that can supply cheaper than those listed below. Council suppliers can change regularly so the suppliers used to buy something once may not always be available to use again.

The two council suppliers that can provide most things needed for outdoor learning are;

Stax Trade Supplies - <http://www.staxtradecentres.co.uk/>

Findel Education Resources - <http://www.findel-education.co.uk/>

ROPE

Lots of rope is useful for many activities. The following table shows an ideal selection but any rope will suffice. Generally around 100m of cheap 8mm polypropylene will do for everything. String or wool is also useful.

Number	Length	Diameter	Type	Purpose
3	10m	10mm	3 strand polypropylene (normal blue rope)	Ridge line for shelters or screens. Clothes line for hanging coats. Long rope for games. Improvised fire circle.
10	5m	8mm	3 strand polypropylene (normal blue rope)	General rope for construction. Smaller clothes line. Guy lines for shelters.
30	2m	4mm	3 strand polypropylene (normal blue rope)	Lashings.
30	1m	4mm	Multi-braid	Individual knot practice. Handcuffs for games (not as bad as it sounds, trust me).

TARPAULINS

Tarpaulins are useful not only for shelter building but for a variety of practical uses, construction projects and team games. More expensive tarpaulins are not always more durable and it is often better to get cheap ones and replace them when needed.

Small, 1 for each group shelter.

Large 1 for main shelter, 1 for toilet screen if needed, more for sitting on or keeping bags dry if needed.

Large tent pegs – these can be made from sticks found on site if there is suitable wood and tools available, otherwise standard large tent pegs can be used. Plastic are generally safer than metal.

Wooden poles, 1.5m to 2m long and 25mm thick. The best thing to use is hazel coppice which can be gathered on site if the trees are around and if you have permission to cut them. Other trees can also be used but will not be as strong or long lasting. Alternatives such as bamboo canes can also be used. If none are available ask your local Ranger Service. It is also possible to buy suitable poles.

OUTDOOR SKILLS

TOOLS

Some tools can be acquired from council suppliers but we would recommend getting them from hardware rather than educational suppliers as they are normally cheaper and better quality.

If tools are bought then suitable storage needs to be arranged. A wheeled tool box is useful for small tools such as billhooks but bow saws and loppers are normally too big to fit inside. When not in use tools should be stored in a secure locked cupboard in the school or a locked shed.

Work gloves - gloves are vital for many activities and certainly if using tools. However they can also be difficult to provide as in most schools many different sizes of gloves will be required. Gloves bought from hardware suppliers will be cheaper and probably last longer but will only come in adult sizes. Education suppliers will sell children's work gloves but these are always more expensive than adult ones.

Bow saws – larger 2 person bow saws are usually better as long as you have space to use them. Consider getting spare blades to keep them sharp. Blunt saws are really hard to use.

Loppers – there are several types of loppers and all work well, however you get what you pay for and cheap loppers will not last long. Loppers with extending handles are not ideal for use in schools so get fixed handles.

Bill hooks – there are many different designs of billhooks and it is important to get the right sort as some have a blade on both sides and therefore cannot be used for splitting with a basher. The Devon pattern billhook is a standard design that works well.

Potato peelers – a safer alternative to a knife. Any will work but old fashioned peelers with a fixed blade help to develop knife skills as they are used in the same way. Modern ones with slightly rotating blades do not do this so are not recommended for knife skills training.

POND EQUIPMENT

Nets - to an extent any net will work for pond dipping or rockpooling. However cheap ones will have larger holes in the net so not catch as much and will not last as long. Long handled nets are best for ponds and short handled nets best for rockpools.

Trays - any plastic trays can be used for pond dipping. White ones are better than any other colour as things are easier to see.



OUTDOOR SKILLS

LIST OF EQUIPMENT

This table should not be seen as a complete list. Nor is everything on the list essential. It is just an example of equipment that could be purchased for outdoor learning sessions with a class of 30.

The prices given here are just a guide and may change due to the council negotiating contracts.

Item	Number	Council supplier	Cost (approx.)		Example Link
			£ Each	£ Total	
Rope 100m reel	1	Stax	20	20	http://www.staxtradecentres.co.uk/products/519344/cardoc-plastic-reel-blue-poly-film-rope.htm
Tarpaulin small	6	Stax	5	30	http://www.staxtradecentres.co.uk/products/323042/harris-tarpaulin.htm
Tarpaulin large	2	Stax	10	20	http://www.staxtradecentres.co.uk/products/302812/tarpaulin-12-x-18-ft-35m-x-54m-eco.htm
Large plastic tent pegs	Pack of 30	Findel	20	20	http://www.findel-education.co.uk/product/Ground-Pegs-HE254559
Children's work gloves	10	Consortium	2.50	25	http://www.educationsupplies.co.uk/children-s-gardening-gloves
Adult work gloves	10	Stax	1	10	http://www.staxtradecentres.co.uk/products/300340/showa-golden-grip-latex-gloves-cat-2.htm
Bow saw 24 inch	2	Stax	15	30	http://www.staxtradecentres.co.uk/products/838900/bahco-ergo-force-bow-saw.htm
Loppers	2	Stax	15	30	http://www.staxtradecentres.co.uk/products/597387/fiskars-powergear-bypass-lopper.htm
Bill hook	2	Stax	30	60	http://www.staxtradecentres.co.uk/products/400649/1807-bulldog-bill-hook-half-turn-devon-5-.htm
Peelers	Pack of 6	Findel	15	15	http://www.findel-education.co.uk/product/Whittling-Tools-HE254442
Pond nets	6	Findel	7.50	45	http://www.findel-education.co.uk/product/Bottom-Net-B8G87765
Hand nets	6	Findel	2.50	15	http://www.findel-education.co.uk/product/Aquarium-Net-B8G65409
Bug boxes	2 Packs of 10	Consortium	7	14	http://www.educationsupplies.co.uk/curriculum-resources/science/nature-studies/bug-pot
Wildlife keys	6	Findel	3.50	21	http://www.findel-education.co.uk/product/Key-The-Rocky-Shore-B8R00457

Total

£355

OUTDOOR SKILLS

CHAPTER 2 - KNOTS AND ROPE WORK

The use of knots in an outdoor learning environment has two major purposes.

Firstly it is incredibly useful in the practical running of a session.

- Putting up a shelter to hide from wind, rain or sun.
- Simple structures like seats and benches.
- Lines for hanging coats on, screens in front of the toilet area.
- Harnesses for carrying equipment.

Secondly in doing these activities you are achieving objectives from the Curriculum for Excellence.

BUYING ROPE

The suppliers used by the council are listed in the equipment section of chapter 1 but any rope can be used.

For the practical running of an outdoor learning space it is useful to have a selection of ropes. The table in chapter 1 shows an ideal range of ropes to have for a class of 30. This selection would allow you to build 2 shelters, a toilet screen, play games and have individual ropes for practice and personal projects.

CUTTING ROPE

If the rope is purchased in one length and needs to be cut to shorter lengths this can be done with a sharp knife. If this is done the end will need binding to prevent it from fraying, this should be done immediately to preserve the rope. If the rope is made of plastic then this can be done by melting the end carefully with a lighter, match or in a fire. As the end of the rope will melt this must be done with great care to prevent burns. In the shop rope would be cut using an electric hot knife which will bind the end as it is being cut. A normal knife should never be heated up to do this as this will seriously damage the knife. If the rope is made of natural materials including cotton, hemp or sisal it cannot be melted and will have to be whipped with thread. We recommend using plastic rope.



OUTDOOR SKILLS

THE KNOTS

The following six knots will allow you to do almost anything that you need to with ropes in an outdoor learning space. The most important and simplest are shown first so they should ideally be learnt in order. There are a great many other knots for specific purposes but these six should be prioritised as they have many uses. Individuals that master all of these and show enthusiasm can be introduced to other useful knots. Information on where to find details of other knots can be found in the further reading section at the end of this guide. All the projects listed in this guide can be done using only these knots.

We recommend not teaching more than three knots in one session as it is difficult to remember more than this. After the session any opportunity to use the knots should be taken as without frequent practice they will be forgotten.

TERMS

There are a few naming conventions when tying knots that will be used in this guide for clarity.

Standing part – the end of the rope that is attached to something else.

Running part – the end of the rope that is loose and is used to tie the knot.

Turn – passing the rope around or through an object such as a tree or an eyelet in a tarpaulin.

Round turn – passing the rope twice around an object so that it is entirely encircled.

Bight – a section of rope that is formed into a U shape. To tie a knot on a bight you take a section of the middle of a rope, bend it into a U shape and then tie the knot with the doubled rope.

For each of the knots there is a technical description of how to tie it, a series of pictures to show you how to tie it and a description of its uses.

WHAT KNOT FOR WHAT?

Job	Best knot
Tying a rope to a tree	Timber hitch
Tying a rope to a tree under tension	Round turn and two half hitches
Tying two ropes together to make one long rope	Sheet bend
Tying two ropes together under constant tension	Reef knot
Tying a rope on to the middle of another rope	Rolling hitch
Tie a knot in the end of a rope to prevent the rope from passing through a hole	Figure of eight
Create a loop in the end of a piece of rope	Bowline

OUTDOOR SKILLS

TIMBER HITCH

The timber hitch is used to tie a rope onto a tree or log. Traditionally it was used to tie a rope onto a log that could then be dragged away often by a horse. In an outdoor learning space it is often used on one end when tying a rope between two trees. The timber hitch is very strong but it cannot be tied when the standing part is under tension. If you need the rope to remain tight after tying the knot you should use a round turn and two half hitches.



1

Take a turn around the tree



2

Pass the running part over the top of the standing part this creates a loop between the standing part, the running part and the tree.



3

Pass the running part through this loop three or four times wrapping the running part around itself.



4

Pull the running end back around the tree and the standing part away from the tree to tighten the knot.

ROUND TURN AND TWO HALF HITCHES

This is the knot to use to tie a rope to a tree or other object when you need to tie or untie the rope while it is under tension.



1

Take a round turn around the tree – this means passing the rope around the tree twice.



2

Pass the running part over the top of the standing part and then take it up the gap between the rope and the tree. This is a half hitch.



3

To do another half hitch pass the running end over the standing part, this creates a new loop between the running and standing parts, pass the running end up this loop and pull back towards the tree.

OUTDOOR SKILLS

ROLLING HITCH

The rolling hitch is used to tie the end of a rope onto the middle of a rope. If tied correctly it can be slid in one direction but will hold in the other direction. It is used in the woods to tie a guy rope so that it can be tensioned as needed.



1

Pass the running end over the rope that it is to be tied to, in the case of a guy rope this is itself.



2

Take two turns under the rope on the side which the knot must not slide.



3

Pull the standing part in the direction that the knot will slide.



4

Take another turn under the rope. This creates a new loop, pass the running end up through this loop and tighten the knot at both ends.



5

The red rope will hold when pulled in this direction.



6

The knot can be slid along the blue rope in either direction.

OUTDOOR SKILLS

BOWLINE

This is used to tie a rope onto a tree, pole or eyelet. It is a very strong knot and can be tied with a loop of any size. However much tension the rope has been under while the knot has been tied it will always be easy to undo. This makes it a very useful knot however it cannot be tied or untied when under tension.



1

Make a loop in the standing part with the running part under the standing part.

2

Pass the running end down through the loop.

3

Pass the running end over the standing part.

4

Pass the running end back up through the loop.

FIGURE OF EIGHT

This is a very simple knot that can be used to tie a knot in the end of a piece of rope that will prevent the rope from going through a hole or eyelet. The knot is very easy to untie regardless of how much tension has been on the rope.



1

Create a loop with the running part over the top of the standing part.

2

Pass the running end under the standing part.

3

Pass the running end down through the first loop.

OUTDOOR SKILLS

SHEET BEND

The reef knot is commonly used to tie two ropes together however it can easily come undone if it is not under constant tension or if tying two ropes of different thicknesses. The sheet bend is a much better knot and unless the knot needs to be tied under tension and will be kept under constant tension it should always be used instead of a reef knot.

To show clearly which rope is which a red and purple rope have been used for the illustrations.



1

Take a bight in the end of purple rope.



2

Pass the running end of the red rope through the bight, and then take it under the purple rope.



3

Tuck the red rope under itself and pull both ropes tight.



OUTDOOR SKILLS

SQUARE LASHING

This is used to tie two poles or sticks together at right angles. It is the basis of a great many projects.



1

Take your sticks and place them overlapping where you want to tie the lashing. Fold your rope in half and pass the loop formed in the middle over the top stick.



2

Pass both ends of the rope over the top stick...



3

...under the bottom stick...



4

...over the top, under the bottom



5

All the time going around in a square

6

When you have about 30cm of rope left start going around the opposite direction, this time going under the top stick and over the bottom.



7

When you have almost run out of rope take the two ends of the rope, split them apart and take one an extra half a turn around.



8

Bring the ends across the middle and tie them together with a reef knot.

OUTDOOR SKILLS

CHAPTER 3 - SHELTER BUILDING

IMPROVISED SHELTERS

In a woodland environment with plenty of dead wood lying around improvised shelter building is one of the most popular activities that you can do. Although allowing children to design and build shelters themselves encourages design skills and independence the shelters will be much more effective with a bit of guidance. Balancing this along with ensuring safety is the key to running improvised shelter building sessions.

SAFETY

Given the chance, children building improvised shelters will use the largest logs that they can carry. When these are used to create the roof of a shelter the risk of a log falling on someone's head becomes a serious concern. Smaller sticks can also create a risk of eye or ear injury especially when lots of children are running around in a small woodland. To minimise these risks the shelters should be supervised while they are being constructed and a few rules put in place while building them.

- No running while carrying things.
- Sticks longer than you are tall should be carried by two people, one at each end (this prevents the classic turning around and walloping someone on the head with the end of the stick).
- No stick thicker than your arm should be placed above your head.

TYPES OF IMPROVISED SHELTER

Ridge shelter

- Find two trees about 3 metres apart with sturdy branches at about head height.
- Place one sturdy pole resting on the branches between the two trees, this is your ridge pole.
- Collect long poles and branches and lean them against the ridge pole to create a tent shape.
- Collect thinner sticks and weave them between the upright sticks to create a lattice.
- Cover this with leaves or other available materials.

Tepee

- Built when there are no trees but still a good supply of sticks.
- Take three long sturdy poles and tie them together at the top to create a tripod.
- Lean other sticks around the tripod to create a structure.
- Use thinner sticks to weave between the uprights.
- Cover with leaves or other materials.

Trench shelter

- Generally only worth using when a suitable indentation in the ground already exists.
- Can be a good shelter to build on a beach.
- Dig a trench in the ground big enough to lie down in.
- Cover the trench with sticks leaving one end open as an entrance.
- Cover the sticks with leaves or other materials.

OUTDOOR SKILLS

SNOW SHELTERS

Snow is a fantastic opportunity for outdoor learning and one of the best things to do is to build snow shelters or igloos.

Snow shelter

- Build a pile of snow as large as possible try not to compact the snow.
- Dig into the pile from one side keeping the entrance as small as possible.
- Hollow out the pile throwing the snow out of the entrance and back on top of the pile.
- Be sure to keep a thickness of at least 50cm of snow on all sides.

Igloo

- Real igloos are built using dense compacted snow and ice which is cut into cubes with a saw.
- It is possible to create these building blocks artificially using snow and a large ice cream tub or other rectangular plastic tub.
- Fill the plastic tub with snow and compact it down.
- Turn the tub upside down and thump the bottom, lift it up and hopefully the cube of snow will come out.
- Create a circle of these cubes the size that you want your igloo, bear in mind that you will need a lot of snow.
- Once the first circle is complete start building the next layer on top.
- Remember to leave a gap for the door.
- To create the roof you need to build a tower of cubes on the wall on opposite sides of the igloo and then carefully lean them towards each other until they meet in the middle. It is best to have several people to do this.



OUTDOOR SKILLS

TARPAULIN SHELTERS

Building a shelter with a tarpaulin and a pile of ropes is easier than an improvised shelter and if done properly the shelter can be used to keep out of the wind and rain while eating lunch or talking to the group. In bad weather it is often a good idea to put up a large tarpaulin shelter at the start of the session to give a place to keep equipment dry and to retreat to if the weather becomes too bad. Be careful if there is a strong wind as the tarpaulin can rip, the ropes snap and the knots come loose leading to flailing ropes. Large tarpaulins blowing across a site is a significant risk.

Tie a rope between two trees

- The trees should be far enough apart that your tarpaulin fits easily between the two trees but not too far apart to allow the rope to sag in the middle.
- Use a timber hitch at one end and a round turn and two half hitches at the other.
- Get this rope as tight as possible to prevent the rope from sagging when the tarpaulin is placed over it.

Tie a rope to each corner of the tarpaulin.

- If there is no wind or you are very confident of the eyelets in the corner of the tarpaulin you can use a bowline to tie a rope through the eyelet. However these will often tear out if put under much stress.
- Otherwise use a stone wrapped in the corner of the tarpaulin and tied in place with a round turn and two half hitches.
- Place the tarpaulin over the rope and stretch the four ropes out at 45 degrees from the tarpaulin.
- Take each rope around a peg in the ground or a suitable tree and tie a rolling hitch.
- Tighten up each guy rope by sliding the rolling hitch towards the tarpaulin.

Tarpaulins can also be used when building improvised shelters where there are not enough sticks and covering materials such as leaves.



EMERGENCY SHELTERS

The emergency bivvy bag is a simple shelter that is used when protection from the elements is needed in a hurry.

OUTDOOR SKILLS

CHAPTER 4 – BUSHCRAFT PROJECTS

TRIPOD

A simple wooden tripod can be used to hold one end of a shelter, as a stand to store coats and jumpers off the ground or to hold a cooking pot or kettle over a fire. They can be of any size but generally it is worth building one that is larger than you think you are going to need. Using poles about 1.5 metres long will give a useful sized tripod. To build one you use a tripod lashing, this is related to the square lashing but is a bit different.



Find three wooden poles of the same size, lay them out side by side.



Take a length of rope and fold it in half and pass the loop in the middle over the middle pole.



Pass both ends of the rope around each of the poles in turn going over one, under one, over one etc.



When the rope is nearly used up take a turn around the rope in between each of the poles to tighten the lashing.



Split the two ends of the rope and pass one each side of the middle pole and tie them together with a reef knot.



Spread the legs of the tripod apart and stand it on the ground. The height of the tripod can be adjusted by spreading the legs wider apart to make it lower or bringing them closer together to make it higher.

OUTDOOR SKILLS

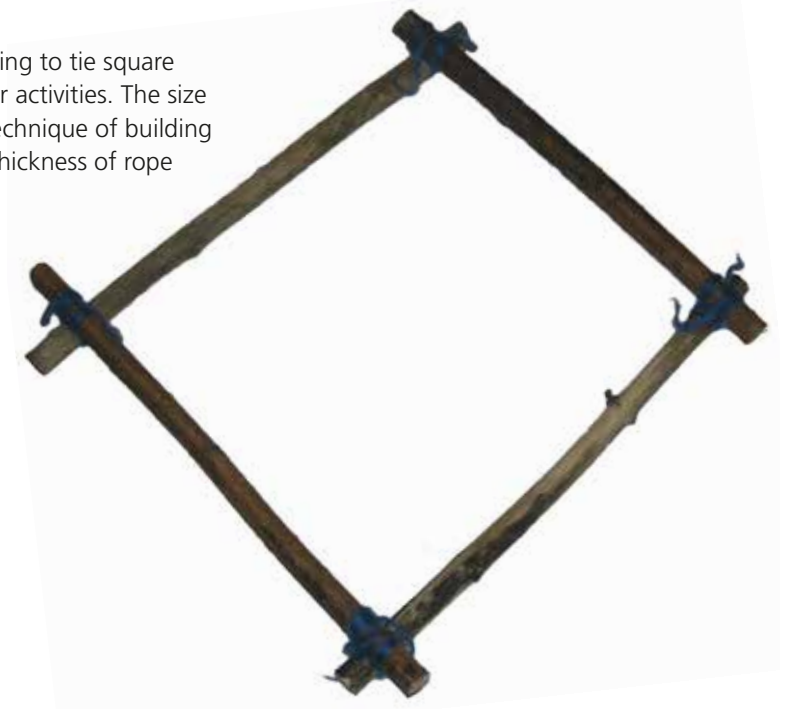
WOODEN FRAME

Building a square wooden frame is the best way of learning to tie square lashings properly. It is also the start of a great many other activities. The size of the frame depends on what it is being used for, the technique of building it is the same although you need to use an appropriate thickness of rope for the size of the sticks.

- Find four sticks the same size
- Place them in a square overlapping at each corner
- Tie each corner with a square lashing

The frame can be used for the following activities

- A frame for a picture made from natural materials
- A quadrat for sampling in scientific activities
- Counting the number of flowers in a field
- Survey of plants in an area
- Frame for a natural materials weaving loom
- Rafts



RAFTS

Building full size rafts that can carry people is a great activity but the area of water required to test the rafts and the safety equipment required make it an activity to be done at a watersports centre rather than in a school session. However building miniature rafts large enough to carry an object down a small stream is a good activity to develop ropecraft skills. Allowing children to design and build their own raft encourages creativity and improvisation while hopefully putting the ropecraft skills already learnt into a real world context. Because of this the design described here is just an example and far from the only way or even the best way of building such a raft.

A large part of the purpose of this activity is to get across the concept of floatation. Therefore a small but heavy object should be selected as the cargo that the rafts have to carry. A stone weighing roughly 1kg is ideal, a raft designed around the size of the stone will probably sink when the stone is placed upon it as more floatation is required. This gives the opportunity to do some iterative design after a first unsuccessful test of the rafts.



- Start with a square wooden frame as described in the previous section.
- Find four or five fat sticks / logs slightly longer than your frame that will fit inside the frame when placed side by side.
- Tie them each onto the frame, these do not have to be square lashings and any knot can be used.
- Turn the entire raft the other way up so that the frame rests on top of the logs.

Testing the rafts is an opportunity to talk about basic water safety. Even a very shallow stream or pond can be dangerous so testing the rafts should only be done under supervision. If the water is deep or fast flowing then the rafts should be launched and recovered by adults. If the water is wider than arms reach then a throw rope is essential.

OUTDOOR SKILLS

CATAPULT

This is a very popular activity with the children that links well into history topics on Romans, Ancient Greece or Medieval Britain. The design of catapult shown here is not historically accurate but uses the principles of the trebuchet, one of the simplest and most common medieval siege weapons. Ancient Roman and Greek catapults such as the ballista and onager worked on very different principles which are difficult to build safely in a school environment.

The ballista used the same power as a crossbow with a string between two large springs which was pulled back and a projectile placed in the middle of the string. When the string was released the projectile was thrown forward by the springs.

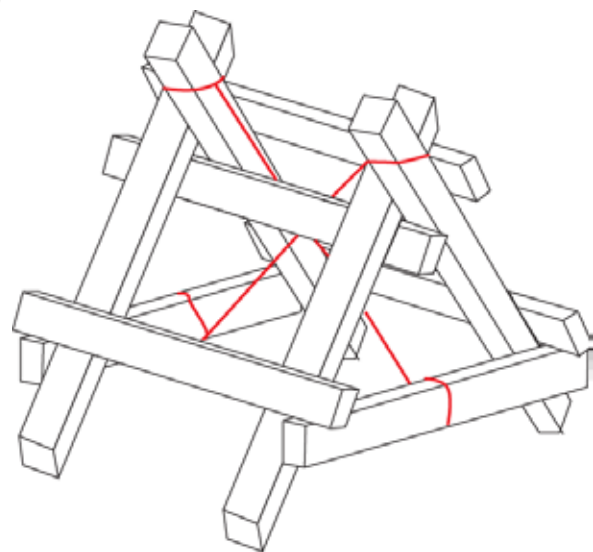
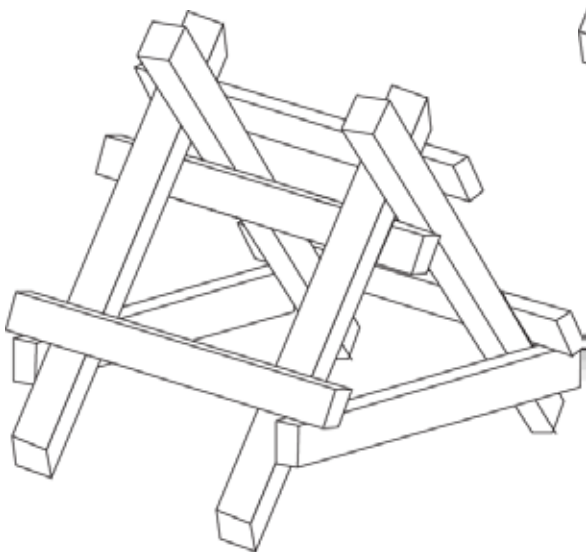
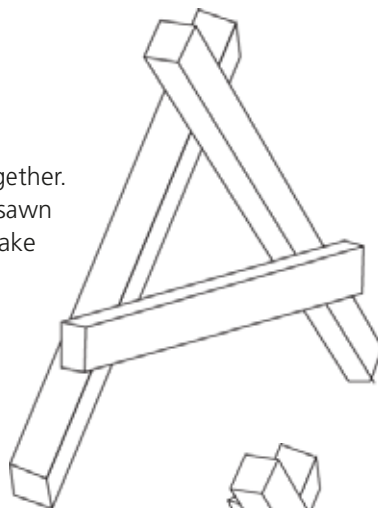
The onager looked very similar to the catapults we are building here but the principle is very different. The projectile was held on the end of a long arm, the other end of which was held in a bundle of ropes that was twisted to create torsion. The arm was pulled down against the torsion of the ropes, the projectile put into the end of the arm which was then released.

The trebuchet uses a heavy weight attached to one end of an arm and the projectile is placed in a sling on the other end. The arm is attached to a frame in the middle with an axle. When the arm is released the weight pulling down throws the other end of the arm upwards until it is stopped by the frame and the projectile is thrown out.

The trebuchet probably originated in China but the first use in European history was in the Byzantine Empire in the 5th century. They were commonly used across Europe throughout the medieval era. They were also used in World War 1 for throwing grenades across large distances and more recently in riots in Syria and Ukraine to throw projectiles.

The catapult built here is technically a traction trebuchet, powered by people pulling on ropes.

Build two simple A frames using square lashings to hold them together. These can be built using square sawn timber and nailed together to make the activity easier.



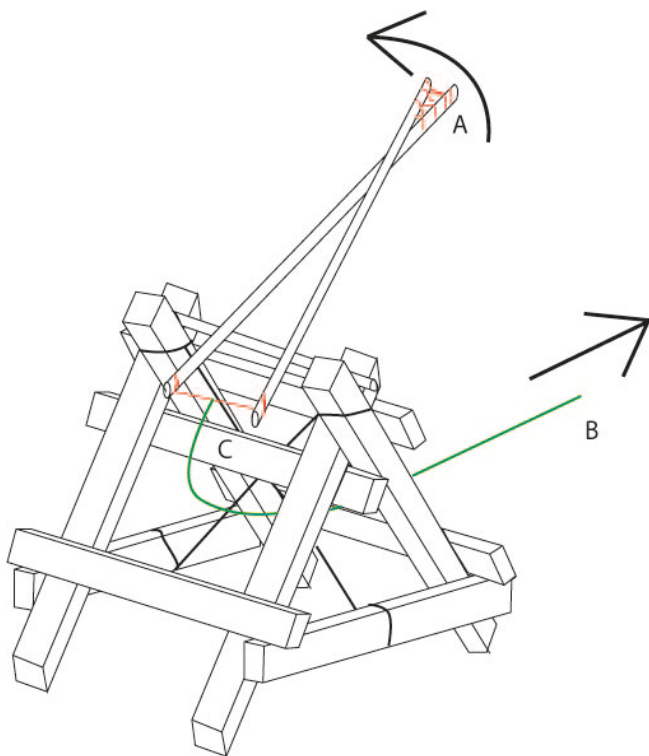
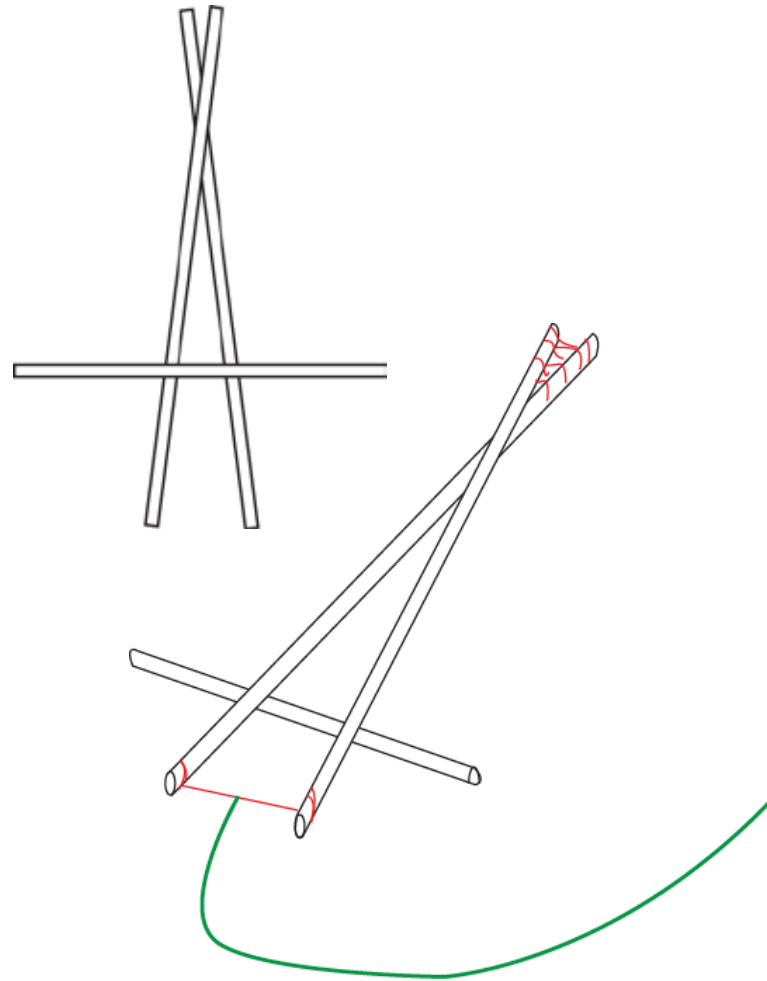
Connect the two A frames together with four poles or square section planks, two at the bottom on the outside, one at the top on the outside and one at the top on the inside. Tie these on using square lashings. The resulting structure will be decidedly wobbly.

Tie a length of rope from the top of each A frame to the middle of the bottom of the other A frame. These should be as tight as possible to add rigidity to the structure.

OUTDOOR SKILLS

Construct another A frame, this time using round timber with the two diagonals longer than the horizontal and only narrowly spaced. Square lashings should again be used to make this the lashing holding the ends of the long poles will be difficult to tie as they are at a close angle. This will be the arm which holds the projectile. The area where the two long poles cross over at the end can be made into a simple basket by wrapping rope around both poles. A rope should be tied between the other two ends of the long poles to hold them together and a long rope tied in the middle of this one.

This assemblage is then placed with the shorter pole in the top of the two A frames on the main part of the catapult. It will then rotate using the short pole as an axle. A rope should be tied around the top of the two main A frames to prevent the arm from coming off when the catapult is fired. The long rope is taken through the middle of the catapult and out of the back. Pulling on this rope should cause the arm to swing upwards.



To fire the catapult place a soft projectile such as a soft toy or ball in the end of the arm A. Ensure that everyone is at least arms distance away from the catapult and that no one is standing in front of it. Pull rope B as hard as possible. Arm A will swing upwards until it is stopped by block C at which point the projectile will fly out.

OUTDOOR SKILLS

BASHER

This is a good project to develop skills with billhook and bow saw and the resulting bashers are useful tools for other jobs such as splitting wood and hammering pegs in the ground. Bashers can be made from any logs but hardwood is best, the end of the log that is to become the handle should be as straight and free from knots as possible. The end that is to become the head of the basher should have as many knots in as possible.

- 1) Cut the section of log that you are going to use, at least one end should be straight and free of knots.
- 2) Saw down into the log from all sides at the place where you want the handle to join the head. Do not saw all the way through but about 1/3rd of the way to leave a section in the middle about the size that you want the handle to be.
- 3) Take the billhook and split the handle end of the log 1/3rd of the way across down to where the saw cut is. Do this on four sides, then take off the corners.
- 4) Hopefully you should now have a basher with a somewhat rough, octagonal handle. You may need to keep splitting with the billhook to bring the handle down to a sensible size. When you are happy with it you can start to clean the rough angles off the handle with a knife or potato peeler.



OUTDOOR SKILLS

BRUSHWOOD SOFA

This simple low cost seating is made using a traditional fencing technique. Originally it was used to make deer baskets, small circles of fence built around young saplings to protect them from deer. Being easier to do and done with lower quality wood it was used instead of a proper wattle fence which would last a lot longer but was much more expensive.

As an activity it develops use of the loppers and bow saw. The seating can be moved around if it is needed in a different area or to prevent too much disturbance in one location. To build them you do need a lot of brushwood (sticks and branches ~2cm thick).

For each bench;

- 1) Cut four logs, about 1m long (shoulder to opposite fingertips) and about 5cm thick (thick as your wrist. Use a bow saw to cut one end flat and one end at a steep angle (at least 60 degrees).
- 2) Decide where you want your sofa to go, place sticks on the ground to mark it out.
- 3) Using the basher hammer the logs into the ground (sharp end down) until they are about half in and half out. They need to go about 30cm (fingertip to elbow) in from each corner, along the long side.
- 4) Fill the space in between these posts with the rest of the brushwood. Ideally it should be cut to the length of the sofa using the loppers or bowsaw but shorter pieces may be needed to achieve an even height along the length of the sofa.



OUTDOOR SKILLS

CHAPTER 5 - TOOLS

Using tools in an outdoor learning environment enables learning of personal safety and risk assessment, practical skills, design, and an understanding of natural materials. It also allows practical jobs to be done such as cutting wood for firefighting, making implements for cooking and constructing facilities such as benches.

There are a vast number of tools that are used in an outdoor environment which are suitable for school groups. However there are five tools which between them will do almost all of the jobs that may be required and which are for the most part simple to use and inexpensive.

Loppers – used to cut wood thinner than your thumb.

Bow Saw – used to cut wood thicker than your thumb.

Billhook – used to split wood along the grain.

Mallet (basher) (tapometer) – used with billhook to split wood and hammer in pegs.

Knife or potato peeler– used to shape wood and to remove bark.

GREEN WOOD AND DEAD WOOD

When working in woodland there is normally plenty of readily available wood both live (green) and dead (seasoned). Using dead wood found on the ground is normally fine under the outdoor access code but permission of the landowner is required before cutting anything from living trees, even small branches. Working in a farmland, heathland or coastal environment will mean less readily available wood and it may need to be brought onto site from elsewhere.

Green wood is easier to work with most tools because it is softer. However it contains sap which will clog up tools and if not cleaned cause them to rust. It is also cleaner and far less likely to have insects or fungus growing on it so is better for using for cooking utensils. There are however some trees that are poisonous so it is important to know which woods can be used when cooking.

Dead wood is tougher and harder so is better for making things that need to be strong. It is harder to work but can be easier to split and will not clog up tools. It is also better for burning.

Native trees such as oak and ash should only be cut if they are abundant in the woodland and doing so will not harm the tree. Any cutting of trees should be agreed with the landowner and should be done in accordance with the land management plan. Full details on identification and use of different trees can be found in the wildlife identification section of this handbook.

TOOL SAFETY

For all of the tools there are some standard rules that will keep everyone safe.

Working distances – The safe working distance is the length of your arm and the length of the tool. The only people who are allowed closer than this are people who are directly working on the same object, i.e. holding the other end of a piece of wood, or the supervising adult.

Tool storage – There should be a set place for storing tools. If the tools are small enough they should be kept in a toolbox, otherwise a central location should be identified where the tools are kept when not in use. All tools must be returned to the storage space immediately after use and should never be carried around or left unattended.

Tool maintenance – A sharp tool is a safe tool. All tools should be kept in good condition, sharpened regularly and free of rust and dirt. Handles should be checked regularly and a tool with a loose handle or chips in the handle should not be used. Tools should always be cleaned after use and ideally dried and oiled, especially if they are going to be stored for more than a few days.

OUTDOOR SKILLS

TOOL TALK

The tool talk is used to give information from the risk assessment to everyone using a tool. It outlines the standard operating procedure for that tool. Although it is different for each tool there is a pattern as the same type of information has to be provided.

- Name of the tool.
- What it is used for.
- Where it is stored.
- How it is carried safely.
- How it is passed safely from person to person.
- Where it is placed when not in immediate use.
- Safe working distance when using the tool.
- Summary of the parts of the tool, including any sheath or cover.
- How to use the tool.

Apart from the last two points this will be almost the same for all tools.

LOPPERS

Loppers are used to cut wood that is thinner than your thumb. They can be used on dead sticks or on living branches but will cut green wood more effectively than dead wood.

Tool Talk

- These are called loppers.
- They are used for cutting live or dead wood that is smaller than your thumb.
- They are stored next to the tool box and must be returned there after use.
- They are carried with the blades pointing towards the ground and the handle under your arm.
- They are passed handles first.
- When not in immediate use they are placed beside you with the blades closed and pointing forwards.
- Safe working distance when using the tool is the length of your arm and the length of the tool.
- Summary of the parts of the tool.



Use of tool:

- 1 Hold the handles at the end.
- 2 Open the blades and move them over the wood to be cut.
- 3 Close the blades firmly.
- 4 If possible keep the blades pointing towards the ground with the wood to be cut on the ground and away from your feet.
- 5 If you have to cut a branch that is above your head take care to ensure it does not fall on your head.

Maintenance

- Ensure that the bolt holding the loppers together is tight and that there is no sideways movement in the handles.
- Clean after use and oil the blades regularly
- Loppers can be sharpened but it is difficult without special equipment so we recommend getting a professional to do it



OUTDOOR SKILLS

BOW SAW

A bow saw is used to cut wood that is thicker than your thumb. It can be used on dead sticks or on living branches but it needs different blades to cut green wood properly.

The green wood blade has a double edged tooth every few inches which acts to clear the shavings away from the cut. This is needed because the sticky sap will mix with the wood shavings and clog up the blade.

The dead wood blade has regular triangular teeth all along the blade.

A greenwood blade can be used to cut either green or dead wood. A dead wood blade can cut green wood but will tend to get stuck.

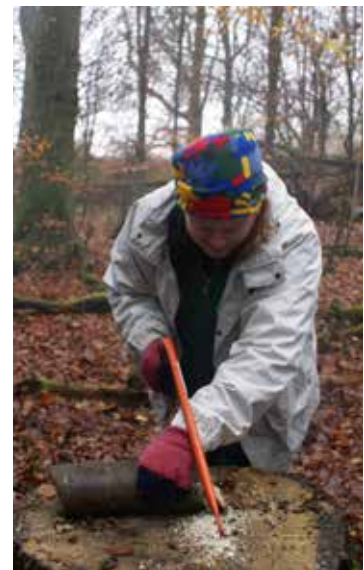
Tool Talk

- This is a bow saw.
- It is used for cutting wood that is larger than your thumb.
- You need to use the right blade for the wood that you are cutting, green or dead.
- They are stored next to the tool box and must be returned there after use.
- They are carried down by your side with the blades pointing towards the ground.
- They are passed handles first, blade downwards.
- When not in immediate use they are placed beside you with the blades pointing inwards.
- Safe working distance is the length of your arm plus the length of the tool.
- You must wear a glove on the hand that is not holding the saw but not on the hand that is holding the saw.
- The blade cover should be replaced on the blade as soon as the saw is no longer being used.
- Summary of the parts of the tool, including blade cover.



Use of tool:

- 1 Whenever possible two people should use a bow saw to make it easier.
- 2 Carefully balance the wood to be cut on top of a stump, log or other surface.
- 3 One person should kneel either side of the wood that is to be cut with both legs behind the end of the saw.
- 4 Remove the blade cover and place it to one side where it will not get lost.
- 5 Each person holds one end of the handle.
- 6 Each person then passes their other hand through the middle of the bowsaw and places it on the wood on the other side.
- 7 The two people agree which way they are going to start sawing.
- 8 The two people should agree a system of communication so that they know who is supposed to be pulling and who pushing such as.
 - One – two – one – two
 - To me – to you – to me – to you
- 9 Once the blade is two inches down into the wood they may remove their hands from the middle of the saw.
- 10 When the saw cut is finished replace the blade cover.



Maintenance

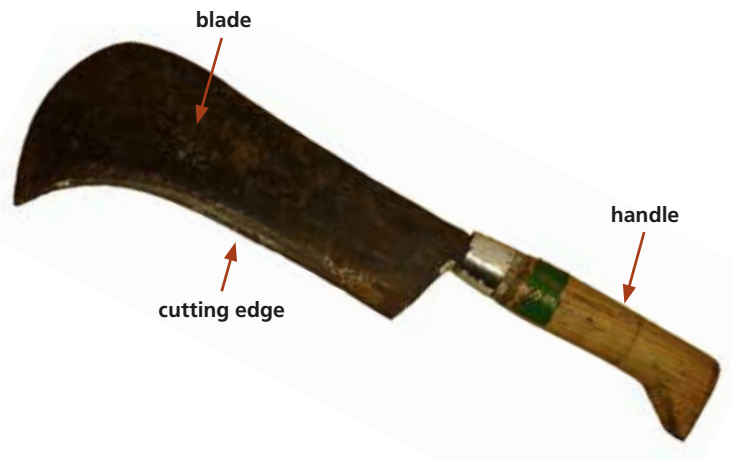
- Clean blade after use and keep oiled.
- Most bow saw blades are hard point and cannot be sharpened.
- Replace the blade frequently to maintain sharpness.

OUTDOOR SKILLS

BILLHOOK

The Billhook is used to split wood. It should never be used for anything else. Other tools that will do the same job include the axe, bushcraft knife and froe.

A billhook can be used with any large lump of wood as a mallet but a properly built mallet or basher, either bought or made on site will work better. Any mallet used with a billhook is likely to break over time either by splitting or gradually disintegrating so mallets made on site are better than expensive bought ones. Also making a mallet is a good green woodworking activity for most groups. See the bushcraft projects section of this book for instructions on how to make a basher.



Tool Talk

- This is a Billhook.
- It is used for splitting live or dead wood.
- They are stored in the tool box and must be returned there after use.
- They are carried by the handle, down by your side, with the blades pointing towards ground.
- They are passed handles first.
- When not in immediate use they are placed beside you with the blades pointing inwards.
- Safe working distance is the length of your arm plus the length of the tool.
- Summary of the parts of the tool.

Tool use:

- 1 Whenever possible two people should work together when using the billhook, one with the billhook and one with the mallet.
- 2 Carefully place the wood to be split on an appropriate working surface such as a stump.
- 3 One person should kneel either side of the wood.
- 4 Place the billhook blade across the end grain of the wood to be split where you want it to be split. One person must hold the billhook carefully by the handle keeping their hands away from the blade.
- 5 The other person takes the mallet and asks the following questions:
 - Are you ready?
 - How many times?
 - How hard?
- 6 Assuming the answer to the first question is yes the person with the mallet then hits the billhook the number of times and at the hardness given.
- 7 If the wood has not split after this ask the questions again and continue until the wood splits.



Maintenance

- Keep blade clean and oiled
- Check that there is no movement between handle and blade. A small amount of movement can be fixed by pouring epoxy (araldite) into the crack where the blade does into the handle. A large amount of movement will require a new handle.
- Replacing a handle is a difficult job that should be done by a professional.
- Billhooks should be sharpened regularly using a cigar stone.

OUTDOOR SKILLS

BUSHCRAFT KNIFE

The bushcraft knife has many uses in an outdoor learning environment enabling many activities to take place.

Because of the exposed and extremely sharp blade it carries a risk alongside axes. In order to ensure safety we recommend that the following safety rules are kept to when using knives;

- A maximum of 6 people should be using knives at any one time.
- Anyone using a knife should be directly supervised by a trained adult.
- No-one under the age of 8 should use a bushcraft knife.

This is difficult to achieve in a whole class environment. We therefore recommend that knives are kept for special sessions and anyone wishing to run knife work with a class should attend further training.

Many of the uses for bushcraft knives in an outdoor learning space can however be achieved using potato peelers. These are safer and can be used by younger children. It should be noted that potato peelers are still very sharp and can be dangerous if not used correctly.



PEELERS

Normal potato peelers are very effective for removing the bark from wood and if the right peelers are used the technique is very similar to how a bushcraft knife is used. This allows them to be used where knives are not appropriate. When using peelers they should be treated as any other tool and a tool talk done. This is partly to reinforce the basics of tool safety and partly because peelers have very sharp blades even if they are less exposed than some of the other tools that we use.

Tool Talk

- This is a peeler.
- It is used for removing the bark from sticks.
- They are stored next to the tool box and must be returned there after use.
- They are carried with the blades pointing towards the ground.
- They are passed handles first.
- When not in immediate use they are placed beside you.
- Safe working distance is the length of your arm plus the length of the tool.
- Summary of the parts of the tool.

Tool use:

- 1 Always sit or kneel down when using the peeler.
- 2 Hold the handle firmly in a fist with the blade on the bottom side of the peeler.
- 3 Take your stick in your other hand and place it under the peeler blade.
- 4 Pull the stick back towards you against the blade of the peeler to remove a thin strip of bark.
- 5 If the peeler does not cut, roll the hand holding the peeler away from you.
- 6 If the peeler catches the wood and gets stuck, roll the hand holding the peeler back towards you.



OUTDOOR SKILLS

CHAPTER 6 - FIRELIGHTING

A fire can be both a useful source of warmth and a valuable learning resource. However it also has both significant risk of injury and potential long term health effects. Therefore any fire lit in an outdoor classroom must be done with care to ensure safety.

CHEMISTRY OF FIRE

The simplified chemical reaction of fire, the combustion of carbon is;



This reaction requires a high temperature in order to occur.

Of course a campfire is far more complicated than this because it involves a great many other chemicals. Wood is composed mostly of cellulose which is a type of carbohydrate. When it reaches a temperature of about 500°C it reacts with oxygen in the air. The products of this reaction are carbon dioxide (CO₂) and water (H₂O). Because these are produced at high temperatures they are both in the form of gas and it is these along with light particles of ash that make up the smoke. The ash that is left over is made up of parts of the wood that are not combustible. The precise components of wood ash can vary considerably but often contain calcium carbonate, potassium and traces of metals.

There are also other combustible chemicals in wood such as lignin which have different reactions. So the full chemical reaction involved in a campfire is extremely complex.

FIRE TRIANGLE

In order to have a fire you need 3 things, fuel, oxygen and heat, if you have difficulty lighting a fire you need to work out which of these the fire is lacking. This is called the fire triangle.

1 -FUEL

Fuel can take many forms and is one of the most important factors in firelighting.

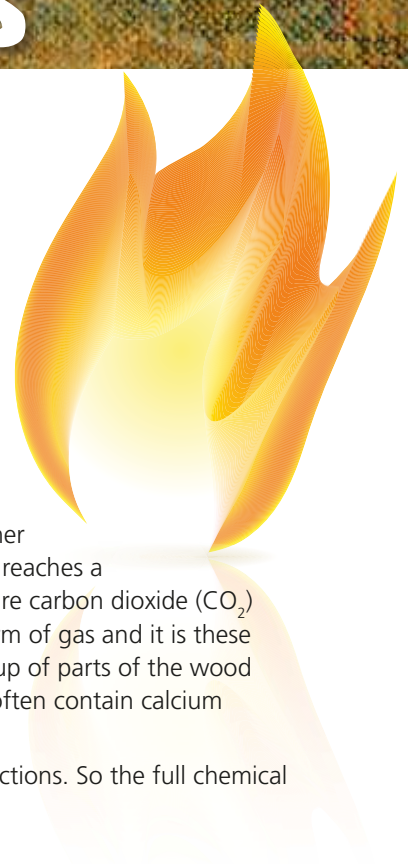
Dry wood

This is probably the most important factor in successful firelighting and although it seems obvious many people do not really appreciate how big a difference a small change in moisture content can make. Although clearly wet wood is easy to identify wood that is apparently dry can still contain significant moisture that will make it harder to light.

The dryness of wood is however not an absolute thing, good well seasoned firewood will have a moisture content of about 20%. Green timber will vary according to the time of year when it is felled. In the winter it will normally have a moisture content of around 50%. In the summer it can be much higher.

Wet wood will not burn for two reasons. Firstly the water prevents the oxygen in the air and the fuel in the timber from making contact. Secondly when water evaporates it reduces the temperature around it, this is why wet hands feel cold in the wind.

Dry wood can be difficult to find on a rainy day but it is usually possible. If the ground is wet then any wood left on the ground will soak up moisture. Therefore not only should you not use wood found on the ground but any dry wood that you have must be stored off the ground. To find dry wood on a wet day you should search for dead wood that is held off the ground, either dead branches or sticks hanging up in trees. Obviously wood that is under the canopy will be drier than that in the open. The alternative is to cut and split larger logs. On a rainy day a well seasoned log will be wet on the outer few centimetres but depending on how rotten the wood is, what species of tree it is from and how long it has been raining, the centre of the log may well be perfectly dry. Therefore sawing and splitting the log can give plenty of good dry wood to burn.



OUTDOOR SKILLS

Green wood

Normally green wood is of no use for burning. Some species such as ash and spruce will burn when green but will often spit and spark as the sap evaporates. Green wood can be of use when you do not want the wood to burn, such as sticks for cooking on or creating a wall around the fire so that embers will build up.

Oily materials

In order to get the initial flame from which you can build the fire it is useful to have fuel that contains oils which will ignite much more easily than wood. There are a few materials that are commonly found in the wild that contain sufficient oil that they make fantastic tinder.

Birch bark

Very good tinder, difficult to light from a spark unless torn up into very thin sheets but ideal for building the fire from the first flame. Obviously only small pieces of bark that are easily peeled off the tree should be used in order to prevent damage to the tree.



Grass seed heads

The seed heads of many species work very well for getting the first flame from the sparks, anything with a fluffy feel is likely to work.

Orange peel

This makes very good firelighters which burn with a hot green flame.



2 - OXYGEN

Most often a fire which is already burning but which is not burning fast or hot enough will be lacking for oxygen. Giving fire more oxygen is simply a case of moving air through the fire. In a household fireplace or a woodburning stove as the chimney heats up, the air inside starts to rise and draws more air through the fire. The warmer the chimney the more air is drawn through and the hotter the fire. In an outdoor setting there is no chimney to create this draw so if we want to increase the air flow we have to use other methods.

Wind

On days when there is a strong breeze this will normally give the fire enough oxygen. Starting a fire in these conditions can however be difficult as the wind will also take heat away from the fire. Also you will often find that on a windy day the fire will burn too fast, burning through the wood and not building up enough embers. It is necessary to control the wind around the fire by building it out of the wind. This can sometimes be done by placing removable wind breaks. We can then control the flow of air over the fire by removing them if we need it to burn faster.

Puff

Blowing on a fire to give it more oxygen is a well known and effective method that children will often enjoy as they have seen the technique used in survival programs on TV. However often the amount of puff required to get a fire going will often be well out of the abilities of the average ten year old. Also blowing directly onto a fire can end up with smoke billowing back when you stop blowing, leading to a lungful of smoke as you breathe in. Due to the harmful nature of wood smoke this is best avoided.

OUTDOOR SKILLS

Blow pipe

A hollow stick used to blow directly into the middle of the fire can be much more effective than just randomly blowing at the edge. This is because the oxygen ends up where it is most needed and the air flow can be directed so that it is not blocked by sticks on the edge of the fire. Using a pipe also keeps you away from the fire preventing harm from both sparks and smoke. You must remember to take your mouth away from the pipe when breathing in.

Fan

Any large flat object can be used as a fan. Ideally it should be around 50cm² flat and rigid. Fanning the fire can produce far more air than blowing on it and the air flow can be kept up for as long as is needed.

3 - HEAT

When a fire is going, the heat needed is generated by the fire. However in order to get a fire going you need to give it enough heat to start the reaction. This is what the match, lighter, sparks or magnifying glass is doing. The amount of heat required to light a fire depends on how warm the fuel and air is to begin with. If wood is perfectly dry but has been stored outside in winter it can still be at a sub zero temperature. Therefore before it will burn it will need to warm up. If you are having difficulty lighting a fire in cold weather this is often the problem. Storing some wood in a warm place to get the fire going makes life easy. If you have no warm wood you can put a small amount of kindling inside your jacket where your body heat will warm it up before you try to light the fire.

Flammable and non flammable materials

The entire area in which an outdoor classroom is situated and everything in it can be split into two categories. Flammable contains everything that can burn, even if it is not currently possible to set it on fire like wet leaves. Non flammable contains everything that it is not possible to burn including water. The balance between the two will depend largely of the nature of your site. Almost everything in a woodland is flammable with the only exceptions being stones and water. Conversely on a beach almost everything is non-flammable except driftwood and plant matter.

It is important to know if the ground on which you are lighting the fire is flammable or not. Soil is made up of dead plant material and crushed rock. A predominantly mineral soil will not burn and is therefore safe to light a fire on. A peat soil on the other hand is entirely plant material and when not waterlogged is flammable. Most soils are somewhere in between so are to some extent flammable.

Knowing what is and what is not flammable is important for both the group and the leaders in order to both light a fire in a safe and appropriate manner and to easily identify fuel, tinder and kindling.



OUTDOOR SKILLS

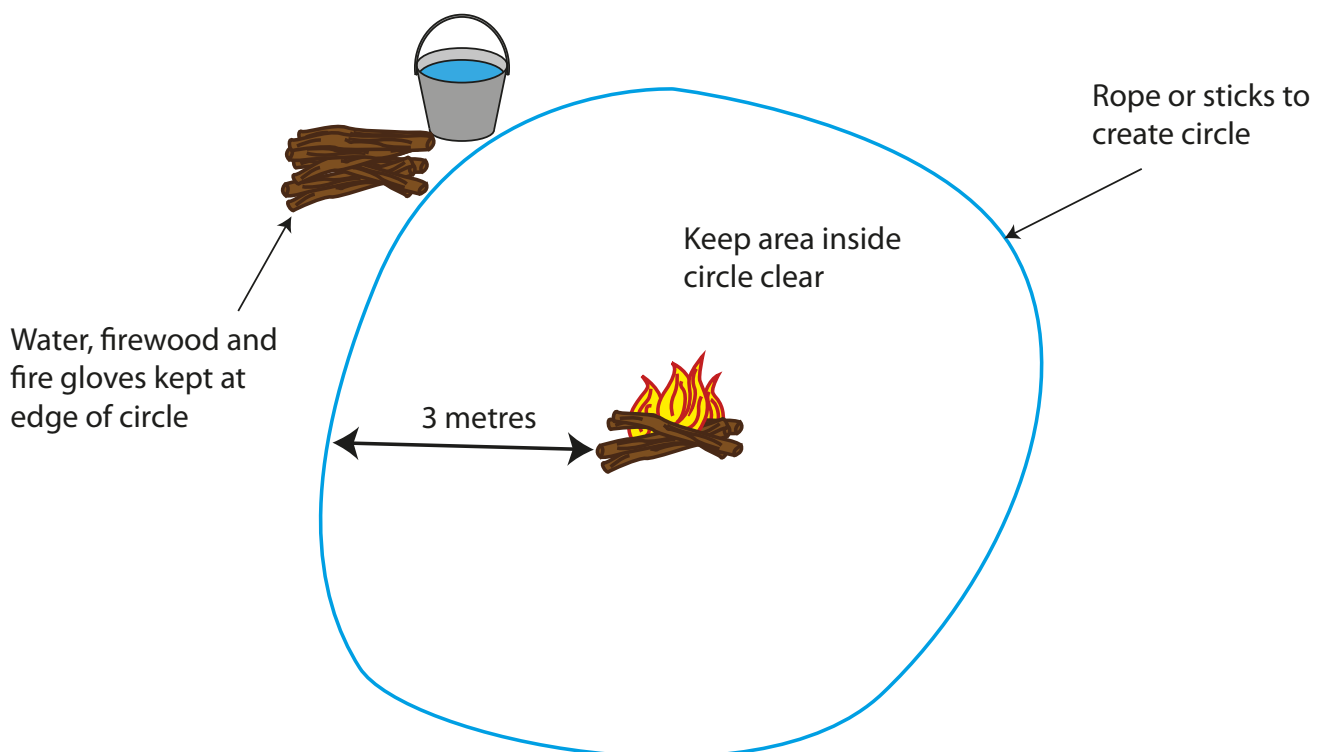
Safety around the fire

Crowd control is always a priority when working in an outdoor learning space and when you have a fire lit it becomes even more important. It is important to discuss safety issues with the group to make them aware of the reasons behind the rules and help them assess the risk of what they are doing. Fires are an excellent opportunity to do this. It also allows you to take a moment, sit down with the group to make everyone aware that when the fire is lit the rules change and everyone has to change their behaviour accordingly. As such, all safety rules for around the fire should be discussed with the group regarding why they are in place and not simply stated as rules to be followed.

When you light a fire with a small group of people, around six or less including adults, it is feasible to simply include everyone in the process of lighting the fire and make sure everyone knows the rules. However normal class sizes can be above thirty plus six to eight adults. A large group can become a hazard simply due to overcrowding at a fire site even when everyone knows and is obeying the safety rules. To avoid this when working with a large group a fire circle of some sort should always be used. The following is an example of a fire circle and other systems can be used in different situations.

Fire circle rules

- Only one person is allowed in the fire circle at a time unless the group leader says otherwise.
- No-one should be inside the fire circle unless they are doing a job which requires being near to the fire.
- No equipment, firewood, seating or any other potential trip hazards should be left inside the fire circle.
- Fire gloves and water should be left at the edge of the fire circle to be collected by the person looking after the fire if required.



OUTDOOR SKILLS

Fire safety rules

RESPECT POSITION

The respect position is kneeling down on one knee. It is used whenever working at the fire as it is a stable position where you are unlikely to lose balance and fall into the fire but at the same time can easily and quickly stand up and move away should you need to. It should be used whenever putting sticks on the fire, cooking or otherwise working at the fire.

WATER

A ready supply of water should always be kept near to the fire in order to both control the fire if it becomes too large and use for first aid if anyone suffers from burns. A bucket of water on the edge of the fire circle is the simplest way to do this but other water containers can be used if easier for carrying.

FIRE GLOVES

These should be large heavy fireproof gloves such as welding gauntlets. They should be kept on the edge of the fire circle and used whenever touching anything that has been on the fire. For example sticks that have fallen off the fire or need moving, hot items like baked potatoes that have been on the fire.

BEHAVIOUR

Running, pushing, playing and throwing things like balls or frisbees should all be kept well away from the fire circle for obvious reasons.

Where to light a fire

In choosing a location for a fire there are two considerations. Firstly position the fire where it can best be used as a learning resource. Secondly ensure that it is safe and not going to cause harm to people around it or to pose a risk of setting fire to the surrounding area.

Choice of a site should take the following into account;

- keep well away from any areas that are of high risk of fire such as coniferous woodland and heather, take particular care of this in hot dry weather.
- remain downwind of houses and buildings wherever possible.
- out of the wind.

On the ground

Because of the risk of setting fire to soil it is not normally a good idea to light a fire on the ground. If you do you should clear an area of leaves, sticks and other debris. This should be slightly larger than the size of your fire. If possible also dig away any topsoil so that you are lighting the fire on subsoil. Surround the fire with four large logs to create a defined area.

Fire bins

• SATELLITE DISH

Cost - FREE

These are reasonably easy to find as they were commonly given away with TV subscription services a few years ago and are partly being replaced by internet TV. As they are a mesh they will allow air to pass through which will aid the combustion. However they can also allow ash to fall through onto the ground. When used they should be kept off the ground using stones or sticks and great care should be taken to ensure the dish is stable before a fire is lit.

Useful when - teaching firelighting or campfire cooking as the fire is accessible, and close to the ground.

Advantages – cheap, easy to work at fire

Disadvantages - can be unstable, fire is not well contained, difficult to build up embers.



OUTDOOR SKILLS

- **WASHING MACHINE DRUM**

Cost - FREE

Again easy to find and cheap, asking parents or posting on Freecycle for an old broken washing machine will normally get you one.

Pulling the machine to bits to get the drum out can be difficult and should be done by someone who has the right tools and is confident in mechanics and metalworking. An angle grinder is useful for this job but not essential. When you have extracted the drum it is often best to leave it attached to the drive shaft and wheel as this can be used as a stand to keep it off the ground. When placed with the hole upwards the drum has a solid base which will prevent ash from falling through and holes in the sides allowing air to pass through. A metal grid can be placed on the top to use the fire for cooking. Being made of stainless steel it will last almost forever.

Useful when - keeping a fire going all day as a central point to the classroom for cooking or keeping warm, when working with younger children as the fire is well contained.

Advantages – cheap, fire is contained and builds up embers.

Disadvantages - difficult to get at the fire to light and cook on it.



- **PURPOSE BUILT FIRE PAN**

Cost - £50 upwards

Fire pans come in many shapes and sizes and you can spend a great deal of money on a good one. The cheaper ones are made of thin mild steel and will therefore rust quite quickly. They are designed for occasional use on camping trips and with continuous use will quickly end up disintegrating. More expensive ones will be made from stainless steel of a good thickness and will last a very long time. They often have built in poles for hanging cooking gear over the fire and insulated handles so that they can be moved even when hot.

Useful when – you've got lots of money to spend.

Advantages – will build up embers well, easy to access fire, handles do not get hot.

Disadvantages – cost – cheap ones not worth the money.



- **BARBECUE**

Cost - £20 upwards

Although cheap and easily available a barbecue is not designed for wood fires or use as a campfire bin. Like fire bins the cheaper ones are often made from thin mild steel which will not last long. However in the case of barbecues even the expensive ones are unlikely to be good for an outdoor classroom. They are normally designed to be at standing height in order to cook on them. This means that you have to stand up to work at them making it more likely that someone will trip over.

Useful when – cooking sausages.

Advantages – none.

Disadvantages – too high, not designed for wood.



OUTDOOR SKILLS

Alternatives

- **KELLY KETTLE**

Cost - £50

The Kelly Kettle or storm kettle is a way of quickly boiling water using whatever is at hand as fuel. The water is held in a water jacket surrounding a hollow chimney. The kettle is placed upon a metal base in which a fire is lit. The smoke and heat go up the chimney and heat the water that surrounds it. They are very useful for boiling water as they will heat it more quickly than most gas stoves. They come in both aluminium and stainless steel. The durability makes it worth spending the extra on the stainless version.

When using a Kelly Kettle it is very important to keep it on a stable surface as they can tip over easily. Also you must ALWAYS REMOVE THE BUNG BEFORE LIGHTING THE KETTLE. It will build up pressure inside if the bung is left in.

Useful when – boiling water.

Advantages –very efficient - uses little wood to boil water.

Disadvantages – unstable, you need a good base to put them on, quite expensive.

- **CAMP STOVES**

Cost - £20 upwards

Although lighting a fire in a safe and responsible way is allowed under the Scottish Outdoor Access Code, we discourage people from doing so when a small camp stove will do the job just as well and with less impact on the countryside. If the reason for having a fire is just to heat water, to do some outdoor cooking or heat something up it is worth considering a stove instead. A stove does not have the health risks associated with wood smoke, they also do not require collecting wood, are easier to light, are smaller and lighter to carry onto site than a fire bin. It is still important to consider safety as the stove will still have a flame so all the rules such as the fire circle will still apply.

Useful when – you just need to heat something up and do not need a fire.

Advantages – doesn't require wood as fuel. Easy to light, quick to warm up and easy to turn off when finished.

Disadvantages – does not have the excitement or educational value of a fire.



HOW TO LIGHT A FIRE

Regardless of the way in which you light the fire there are some basic skills for building the first stages of the fire that always apply.

Tinder

This is the first stage of the fire, the fuel that gets you from your sparks to your first flames. There are many things in the wild that can be used as tinder but they can be difficult to find and most will only work when dry, so searching in wet weather is pointless. Because of this we would recommend taking tinder with you, natural tinder can be collected if plentiful, dried and kept in a sealed container. Alternatively you can use cotton wool.

Kindling

The second stage is made from small sticks or other flammable items that will burn easily when put to a flame and build up enough heat to get the main fuel alight. To get a good fire going in dry weather you need;

- large fistful of 1-2mm thick dry sticks.
- 6 inch bundle of 5mm sticks.
- 12 inch bundle of 10-15mm sticks.

When these are all alight the fire should have built up enough heat to light larger logs. In wet weather you may need more of the smaller sticks to generate enough heat as any moisture either in the sticks or in rain falling on the fire will take heat away from the fire.

OUTDOOR SKILLS

Sources of ignition

In this guide I am only going to cover firelighting using a fire steel in any detail as this is the most useful when working with groups. However I will briefly go over the main ways of lighting a fire here. For many of these, the technique used with a fire steel will work with only slight differences. For others the techniques used are more than most group leaders have the time or skills to use on a regular basis.

Matches

Matches are one of the best ways of lighting a fire as they bypass the tinder stage, producing a flame and a small amount of burning wood to get the fire started. Unfortunately they have the major disadvantage of not working in wet weather and being very difficult to use in strong winds.

There are two types of matches;

safety matches - these use a chemical reaction between the head of the match and the side of the box to light they are generally easier to light but only work with the box they came in.

strike anywhere matches - light using the heat generated by friction between the match head and sandpaper on the side of the box. They will therefore light by striking on any rough surface.

Cigarette lighter

As with matches a cigarette lighter bypasses the tinder stage. They are an easy way of producing a flame but difficult to use when lighting something that cannot be held in the air above the lighter as you cannot point it downwards. There are special camping lighters with a very strong flame that can be pointed downwards as they are specifically designed for lighting campfires rather than cigarettes. Carrying some form of lighter can be useful as a backup to get a fire going if you are not confident using a fire striker but in that instance you will probably also have to carry some paper or vaseline to have something dry to light.

Fire steels

Rods made from ferrocerium. Invented in 1903 this material is commonly known as flint but is in fact an alloy of iron and cerium, a rare earth metal. It is now used to create the spark in many machines including the cigarette lighter.

Flint

Actual flint can be struck with high carbon steel to produce sparks. This is however much less effective than ferrocerium and considering the difficulty most people have with the artificial rods, the use of flint for beginner firelighting is not advised other than as an example of historical methods.

Bow drill

Friction firelighting is still very common in many parts of the world. It serves as an example of a different method of generating heat. It is also great fun and generating smoke is quite easy. Actually lighting a fire with friction will be beyond most people without considerable practice.

Battery and wire wool

Placing some thin wire wool across the terminals of a battery will cause it to ignite. A dramatic demonstration of transfer of energy and a very different way of lighting a fire. Not a realistic way of lighting a fire on a regular basis but great fun. Be very careful when trying this and never store the wire wool near to the battery.

OUTDOOR SKILLS

FIRE TYPES



Tipi fire

This is the most well known style of campfire and is very effective for starting a small fire in dry weather. It can sometimes lead to the middle of the fire burning out and the sticks around the edge being held up by each other preventing them from collapsing on to the embers and causing the fire to go out.



Lean to fire

This avoids the problem of the tipi fire by building sticks on only the downwind side of the kindling so that the fire will collapse on to the embers as it burns.



Waffle fire

A waffle fire can be more difficult to get started initially but when it is burning it will build up embers better and does not suffer from burning out the centre.

LIGHTING A FIRE USING A FIRE STEEL

- 1 Take a piece of cotton wool and your kindling and place them onto the fire pan that you are using. Keep the kindling in three piles according to its size.
- 2 Tease the cotton wool apart to create air gaps as much as possible and place it in the middle of the fire pan. Put a small pile of the smallest kindling on top of the downwind side of the cotton wool but leave the upwind side open.
- 3 In light winds you need to keep the upwind side of the fire as clear as possible and not blocked by any of the kindling. However in strong winds you may need to build a wall of logs around the edge of the fire pan to protect the fire from the wind.
- 4 Take your fire steel in one hand and the striker in the other, it is easier if they are not connected by string.
 - Place the striker so that it is a few centimetres above the cotton wool.
 - Put the fire steel underneath the striker so that the striker is resting on the top of the steel and push the two together.
 - Pull the fire steel back rubbing it against the striker and leaving the striker where it is.
 - Hopefully the sparks created will ignite the cotton wool if not repeat until the cotton wool is alight. This is a matter of practice and it may be worthwhile to just practice lighting cotton wool and not worry about the kindling.
- 5 As the flame grows carefully place the smallest bits of kindling on top of the flame, always on the downwind side.
- 6 Once the fire has started to grow and the first few embers have formed, start placing sticks from the middle pile of kindling again on the downwind side.
- 7 Be careful not to start placing the larger sticks too soon. It is very easy to let the fire go out at this point by moving on to larger sticks before the fire has enough heat to ignite them. Keep feeding the fire with sticks very slowly increasing their size.



OUTDOOR SKILLS

PUTTING FIRE OUT

It is important when working with a group to stress that putting the fire out at the end is an important part of the activity. Simply flooding the fire with large amounts of water will of course put the fire out but taking some time to explain the different ways of putting a fire out reinforces the importance of it from a safety perspective and also allows you to reinforce the things that have been learnt during the session.

Fire triangle (again)

As a fire needs the three things from the fire triangle in order to burn, taking one of them away will put the fire out.

HEAT – taking away the heat is the usual way of putting a fire out and this is what you are doing when you pour water onto the fire. As the water hits the fire the heat goes into the water, this will cause some of the water to immediately turn to steam which takes a lot of heat out of the fire. The remaining heat causes the temperature of the water to increase so you are left with warm water but not enough heat for the wood to burn. This is also why wet wood will not burn as any heat that goes into the wood will turn the water to steam rather than heating the wood itself. Water does of course also block oxygen from getting to the wood which leads us on to...

OXYGEN – there are many ways of removing oxygen from a fire. A fire blanket is the obvious example as it is designed to act as a barrier between the air and the fire. The use of a fire blanket on an outdoor fire is not ideal but it would work. Sand or mineral soil is a more appropriate method. As long as the fire is entirely covered with sand the air cannot get to it and the fire will go out. Obviously if you are using a fire tray with holes to allow air in the bottom such as a satellite dish this will not work.

FUEL – when using a gas barbeque or stove removing the fuel is how you would turn it off, by simply disconnecting the gas supply from the flame. With a wood fire it is not so simple but the theory is exactly the same. By not putting any more wood on the fire and allowing it to burn down you will remove the fuel from the fire and put the fire out. Of course depending on the size of your fire it could take several hours before it is properly out.



OUTDOOR SKILLS

CHAPTER 7 - FIRE PROJECTS

The campfire is excellent as a focal point for your site, as somewhere to keep warm and tell stories or sing songs. However it is also used for activities which require heat.

CHARCOAL

Time required -

- ~ 1 hour to prepare the charcoal for burning
- ~ 1 - 2 hours on the fire burning

Materials needed -

- good sized hot fire
- old biscuit tin with tight fitting lid
- bundle of straight sticks the same length as the tin
- wire long enough to wrap around the tin

tools needed

- fire gloves
- loppers
- screwdriver



Charcoal is an impure form of carbon created by heating wood in the absence of oxygen so that the water in the wood evaporates. The carbon is unable to burn without oxygen so you are left with sticks of carbon.

Making charcoal in small quantities over a campfire is quite easy to do and takes about 2 hours. The resulting charcoal can be burnt on the fire or in a barbeque or it can be used for drawing. Almost any wood can be used to make the charcoal but the type of wood used will affect the type of charcoal you get. To get good burning charcoal you need a dense wood such as ash, oak or hornbeam, for artists charcoal a lighter wood such as willow is best.

The wood used can be green or dry but must still be sound timber and should be as straight as possible to allow it to be tightly stacked.

Art charcoal - cut sticks around 5mm thick from living or recently cut willow. Excess growth from a willow dome is ideal. Use loppers to cut them to the same length as the tin. Peel the bark from the sticks, if the willow is green this is normally possible without tools but potato peelers can be used if required.

Burning charcoal - collect sticks from the woodland that are straight and about 10 - 20mm thick. Use loppers to cut them to the length of the tin.

Stack these sticks into the tin as tightly as possible.

Take the screwdriver and use it to knock 4 or 5 small holes in the lid of the tin. This can be done by placing the lid on soft ground and stabbing the screwdriver through it. Most biscuit tins are made from thin enough metal that this should not be difficult.

Put the lid tightly on the tin and wrap the wire around the tin to keep the lid down. As the sap evaporates it will create pressure inside the tin so the wire is needed to prevent the lid from popping off.

Using the fire gloves place the tin in the middle of the fire and build the fire up around it. Make sure that you can still see the holes in the lid of the tin.

After about half an hour you will start to see smoke coming from the holes in the lid of the tin, this is the sap evaporating. If the fire is hot enough and surrounding the tin, the gasses coming from the holes may ignite as it comes out, creating a jet of flame coming from each of the holes.

How long it takes to burn will depend on what wood you used, how green it was and the size of the tin but it will generally be between 1 and 2 hours. Keep an eye on it, when the smoke / flames stop coming from the holes, all of the sap in the wood has evaporated and you need to remove it from the fire. This is best done by using a stick to slide it off. It can then be moved using the fire gloves but it will be very hot so be careful. DO NOT OPEN IT YET, instead you need to block the holes to prevent any air getting in and let it cool down. Take a handful of soil, ideally clay or sand, and place it on top of the tin covering the holes and leave it somewhere out of the way.

When the tin is properly cool you can open it and hopefully you should have a tin about half full of charcoal.

OUTDOOR SKILLS

COOKING IN THE OUTDOORS

Food safety outdoors is in principle exactly the same as food safety indoors. All the basic hygiene rules apply. It's just a matter of making sure it is possible to wash hands and equipment thoroughly in an outdoor setting.

1 Make a separate food preparation area

Make sure that this is away from where other people are working, not near the fire and not near any animals or areas where animals have been recently. Ideally you want to cover the area with something clean such as a tablecloth. All food preparation should then be done on this to keep it clean.

2 Wash hands

Hands should be washed thoroughly with soap and water or with cleaning wipes. Hand washing water should be kept separate from both water used for cooking/drinking and water used for the fire. An outdoor shower bag can be used so they can be washed under a flow of water otherwise just getting one person to pour water onto hands from a bottle is fine. After washing hands they should then be disinfected with antibacterial hand gel to be sure.

3 Keep equipment clean

Clean equipment can obviously be brought onto site but should be kept covered before use. After use it should be kept apart from clean equipment that hasn't been used yet. Washing up can easily be done outdoors using water heated over the fire or in a kelly kettle but often it is not necessary and can just be taken back to school.

4 Keep food clean

Food brought onto site should be kept covered until use and prepared as short a period of time before cooking/eating as possible. When eating, food should be on clean plates and not placed onto the ground. This seems obvious but children will often forget basic rules when outdoors as they are unused to the situation.

If these rules are kept to there is no reason that cooking outdoors should present any more risk than cooking in the school.

THE POINTY STICK

Equipment needed,

- Loppers
- Knife/potato peeler

Almost everyone at some point in their lives will have cooked a marshmallow on a pointy stick over a fire. Often barbeque skewers are used for this and they work fine but there are two potential problems with them. Firstly they are quite short so you need to get close to the fire to use them. This is not a problem if there are only a few people but with a large class you do not want people crowding around the fire. Secondly as they are made from dry wood they can quite easily catch on fire.

A purpose made pointy stick made from green wood has advantages. Firstly making the stick helps to reinforce the link between the woodlands and the food that we eat. This shows that not only the food comes from the woodland but also the cooking utensils that we use to cook them. Secondly being much longer and thicker they can be used to cook other things than marshmallows.

- Find the right tree, some trees are poisonous. The best woods to use for cooking include sycamore, lime and willow but even with these three be careful as some people can be allergic to specific types of tree.
- Cut a 50 - 70cm long, straight 5 - 10mm thick twig from a healthy living tree using loppers. Dead wood can have fungi growing on it as can old branches with spots on. Only use young fresh growth with no sign of damage.
- Use a knife or potato peeler to take the bark off one end of the stick to about 20cm from the end. The end of the stick does not actually need to be sharpened as everything we will be using it to cook will be squashy enough to stick on it anyway.

When your sticks are made be sure that you do not put them down on the ground as they are now cooking utensils and must be kept clean.

OUTDOOR SKILLS

BREAD

Known as damper, bannock, snobrod or twister depending on where you are in the world this way of cooking bread is simple, fun and most kids are amazed by the taste of the bread that they can make.

Materials required,

- Self raising flour
- Water

Or for posh stuff

- Milk
- Sugar
- Raisins, nuts, seeds, cheese or anything else you can think of to mix into the dough.

Equipment needed

- Pointy stick
- Mixing bowls
- Fire

- 1 Put a cup or so of flour into a bowl, add a small amount of water at a time and mix with your hands until you have soft but not sticky dough.
- 2 Prepare the fire so that it has good embers and not too many flames. Place a large log on the edge of the fire to balance your stick on as you cook your bread.
- 3 Take a golf ball sized lump of the dough and roll it between your hands to make a sausage. Place one end of the sausage on the end of your stick and wrap it around the stick in a spiral. Once it is all wrapped around squash the whole thing together onto the stick so that it won't come off as it cooks.
- 4 Kneel down in the respect position next to the fire. Rest the middle of the stick on the log at the edge of the fire and hold the bread over the embers but not in the flame. Slowly turn the stick so that all sides of the bread are cooked. Wait until all sides of the bread are brown. If you hold the bread in the flames it will go black but will not have cooked.
- 5 Take the bread away from the fire and wait for it to cool down. When cool enough to touch try to slide the bread off the end of the stick, this may take some effort. If the bread slides off cleanly without leaving sticky bits of dough on the stick then it is done. If there is dough on the stick put the bread back on the stick and continue cooking.



OUTDOOR SKILLS

JAM

Dumfries and Galloway in the summer and autumn is a fantastic place for fruit and most hedgerows have plentiful raspberries in summer and brambles in autumn. This gives us the opportunity to collect wild fruit for simple jam which complements our campfire bread perfectly.

Equipment needed

- Cooking pan and some way of holding it over a fire (see tripod in woodcraft projects)
- Stirring stick (see pointy stick)
- Colander (if using wild fruit)
- Bowl

Materials needed

- Fruit (raspberries are best, brambles work as well, other things can also work, experiment!)
 - Sugar (amount needed depends on what fruit you are using and how sweet your tooth.)
- 1 If the fruit has been collected from the wild it should be carefully sorted to ensure it is all good and no stems/leaves/ worms are attached and then cleaned in a colander under clean running water poured from a bottle. Bought fruit can just be washed and put into the pan.
 - 2 Place the fruit into the pan along with a small amount of water.
 - 3 Place the pan over the fire avoiding the flames but close to the embers. If the pan has cauldron type handle you can use a tripod as described in the bushcraft section to hang it over the fire. Otherwise two large damp logs can be placed on either side of the fire, close enough together to place the pan on top. Use fire gloves when moving the pan.
 - 4 Keep an eye on the pan when it is simmering and the fruit has softened add a small amount of sugar.
 - 5 Keep the mixture simmering, if too hot raise the pan up higher if not boiling lower it closer to the fire. Stir occasionally with the stick. Keep people away from the fire as much as possible while the jam is cooking and do not use the fire for cooking anything else at the same time (except maybe baked potatoes).
 - 6 When the jam is starting to thicken it can be removed from the fire and poured into a bowl to cool. Jam can then be spooned into the hole in the middle of the bread.



OUTDOOR SKILLS

BAKED POTATOES

Really easy and fantastically tasty, baked potatoes in the fire are a classic but you do need to be careful with the time and temperature of the fire as they will burn easily.

Equipment needed,

- Tin foil
- Fire gloves
- Fire big enough to surround all your potatoes

Materials needed

- Potatoes
- Butter and/or cheese (if you're posh)

- 1 Wrap the potatoes in tin foil ensuring that all parts of the potato are covered in foil.
- 2 Wrap the potatoes in tin foil again, ensuring that all parts of the potato are covered. Seriously, I have seen so many potatoes where one side got burned because it only had a single thin bit of foil covering it.
- 3 Place in the middle of the embers using fire gloves and use a long stick to ensure they are surrounded by fire. If you have a potato left on the edge of the fire you will get one burnt side and one uncooked side so make sure they are all in the middle.
- 4 They should take around 1 to 2 hours to cook depending on the size of the potatoes and the heat of the fire. They do not take as long to cook on the fire as they would in the oven so if you're not sure take one out by using a stick to slide it out of the fire and poke it with a fork to see if the middle is hard.
- 5 When they are cooked use a stick to slide them to the edge of the fire, take them out using fire gloves and place them on a plate to cool down for a few minutes before opening the tin foil and cutting them open. If they look like black charcoal when you take them out they are overdone but the middle will still be perfectly edible and very tasty.



OUTDOOR SKILLS

MARSHMALLOWS

Cooking a marshmallow over the fire is a classic activity and everyone wants to do this when they know they are going to have a fire. However it is also an activity that can be quite difficult to do with a large group. The stickiness of cooked marshmallows makes cleaning up quite difficult and also makes them potentially dangerous if anyone gets touched by a hot marshmallow. You also find a lot of people don't actually like them, especially if they have been burnt so you almost always end up with quite a few uneaten ones abandoned and sticking to everything.

One solution to this is S'mores. To make s'mores you take two chocolate digestive biscuits and place them chocolate sides together. When you've cooked your marshmallow you place it between the two chocolate biscuits before sliding it off the stick. This has two advantages, firstly you never touch the marshmallow and it is not on the end of a stick being waved around the place making it safer and less sticky way of eating it. Secondly the biscuit takes the edge off the sweetness of the marshmallow so far more people enjoy it.

The other alternative is instead of cooking marshmallows cook small pieces of fruit. Just like with the marshmallow you skewer it on the end of your stick and hold it over the fire until it goes brown. pineapple chunks, strawberries, mango and orange pieces are all good for this and it is a healthier alternative.



OUTDOOR SKILLS

CHAPTER 8 - WILDLIFE IDENTIFICATION

An understanding of the process of identifying wildlife is both a part of the Curriculum for Excellence and an essential skill for anyone working in an outdoor setting. Knowing which trees are safe to use for making cooking sticks, which of the mushrooms are poisonous and which of the wildflowers are endangered species are all useful things to know.

Having said that, learning to recognise on sight the dozens of trees, hundreds of fungi and thousands of flowers that grow in the wild in Scotland is an almost impossible task and really not necessary. Learning to recognise a few important species is useful but more important is an understanding of how to find out what something is when you need to. To do this you need to understand how to use a scientific key and the fact that this is one of the outcomes of the Curriculum for Excellence is testament to how important a skill it is.



The most common types of key are the visual key and the dichotomous key. The visual key is the wildlife identification book that everyone is used to, containing nice large pictures of the birds, trees and flowers. They are normally organised in a logical way, bird books often by the size of the bird or the habitat that they are found in, wildflower books often by the colour of the flowers. These guides are often very useful and it is worth building a collection of them especially as they can often be found very cheaply in charity shops.

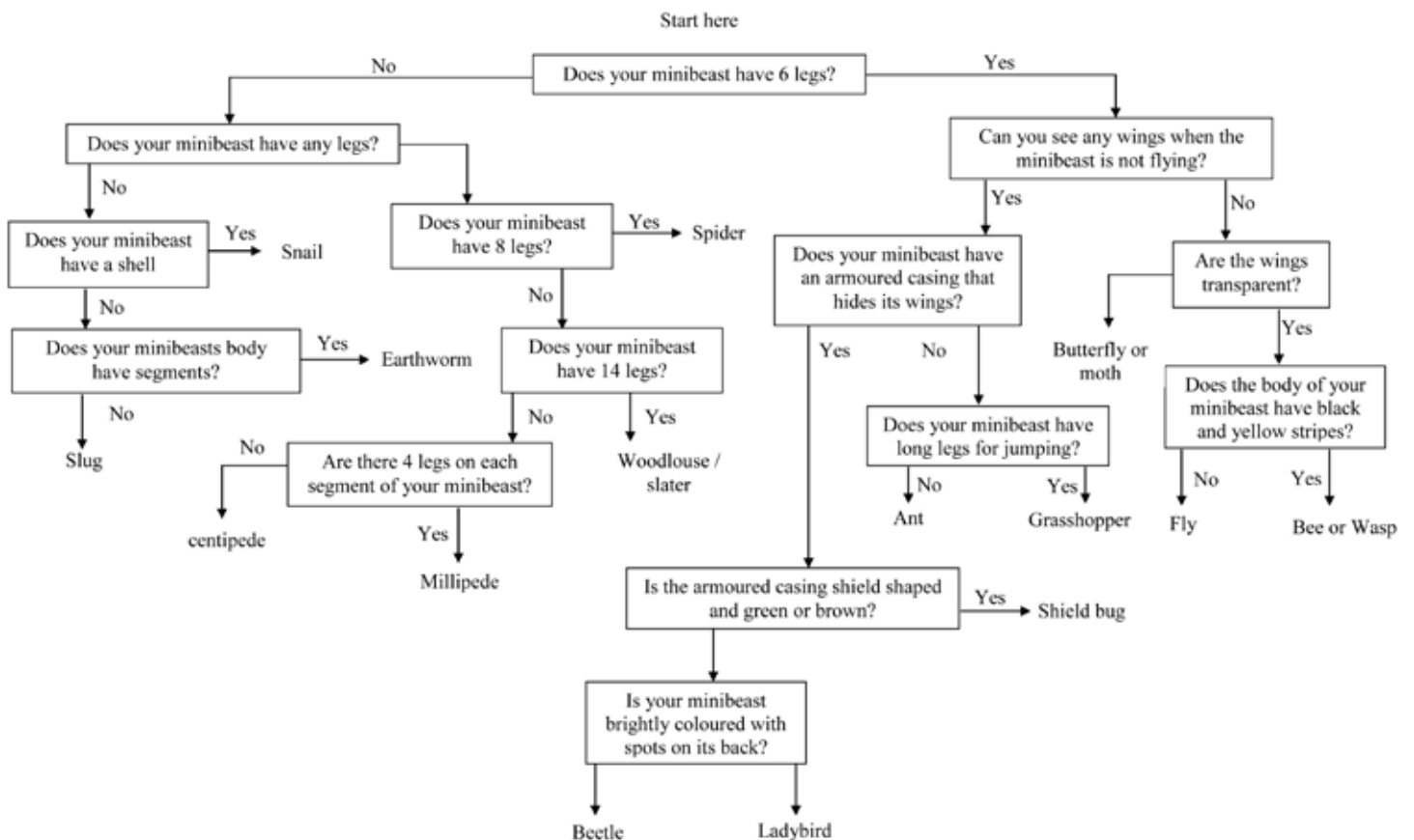
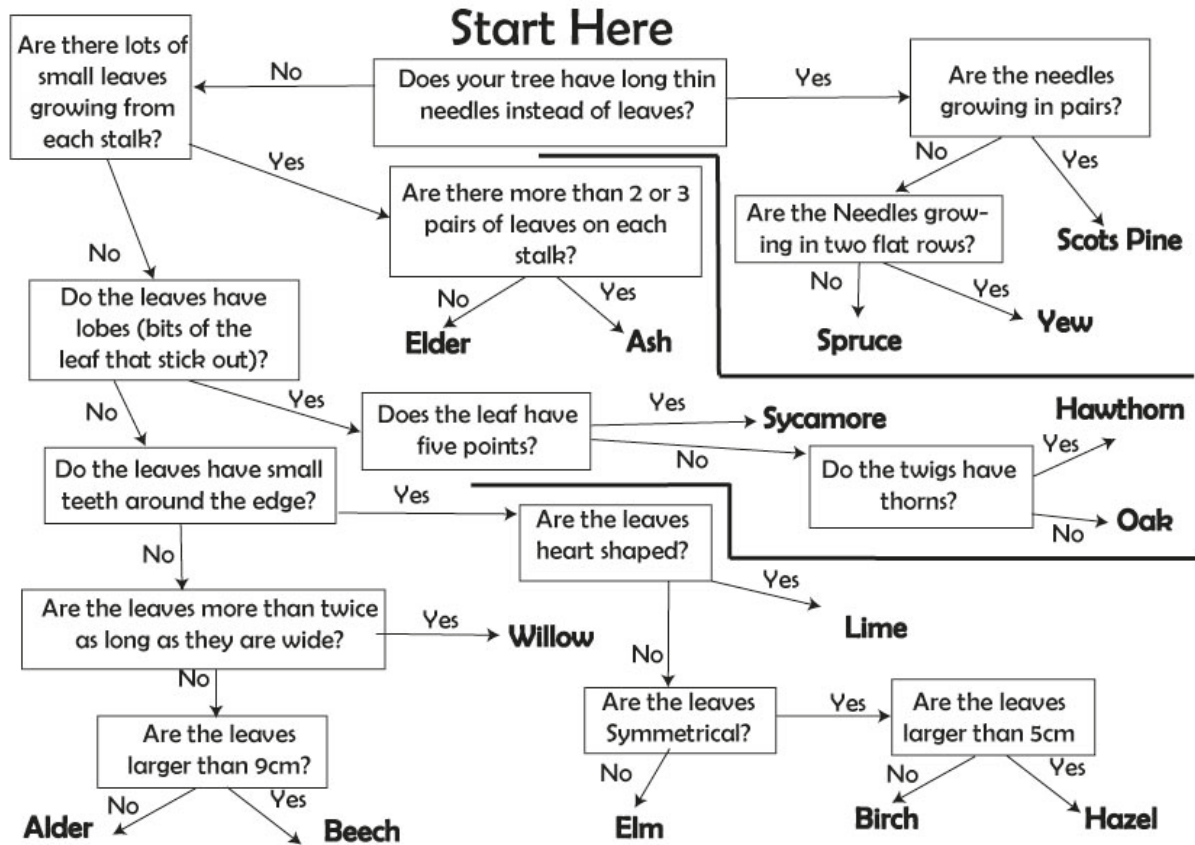
Visual keys do however have problems, especially when there are a large number of species that look very similar. They also do not take into account that wildlife can look very different at different times of year or depending on the age of the animal (or plant). A good dichotomous key is more accurate as it looks at specific identifying features that separate the species rather than just the overall appearance. The keys that make up the rest of this chapter are very simple and are mainly designed to teach the fundamental concepts of using scientific keys. They can be used to identify the most common trees or insects but as each of these keys only includes a few dozen species at most, they cannot show the full range of wildlife in Scotland. For full identification a more detailed key will be needed. Often if you look at the front of the more serious wildlife identification books you will find a full textual dichotomous key that references the pages where you will find the species. These keys can be very long and use technical scientific terminology.

HOW TO USE A DICHOTOMOUS KEY.

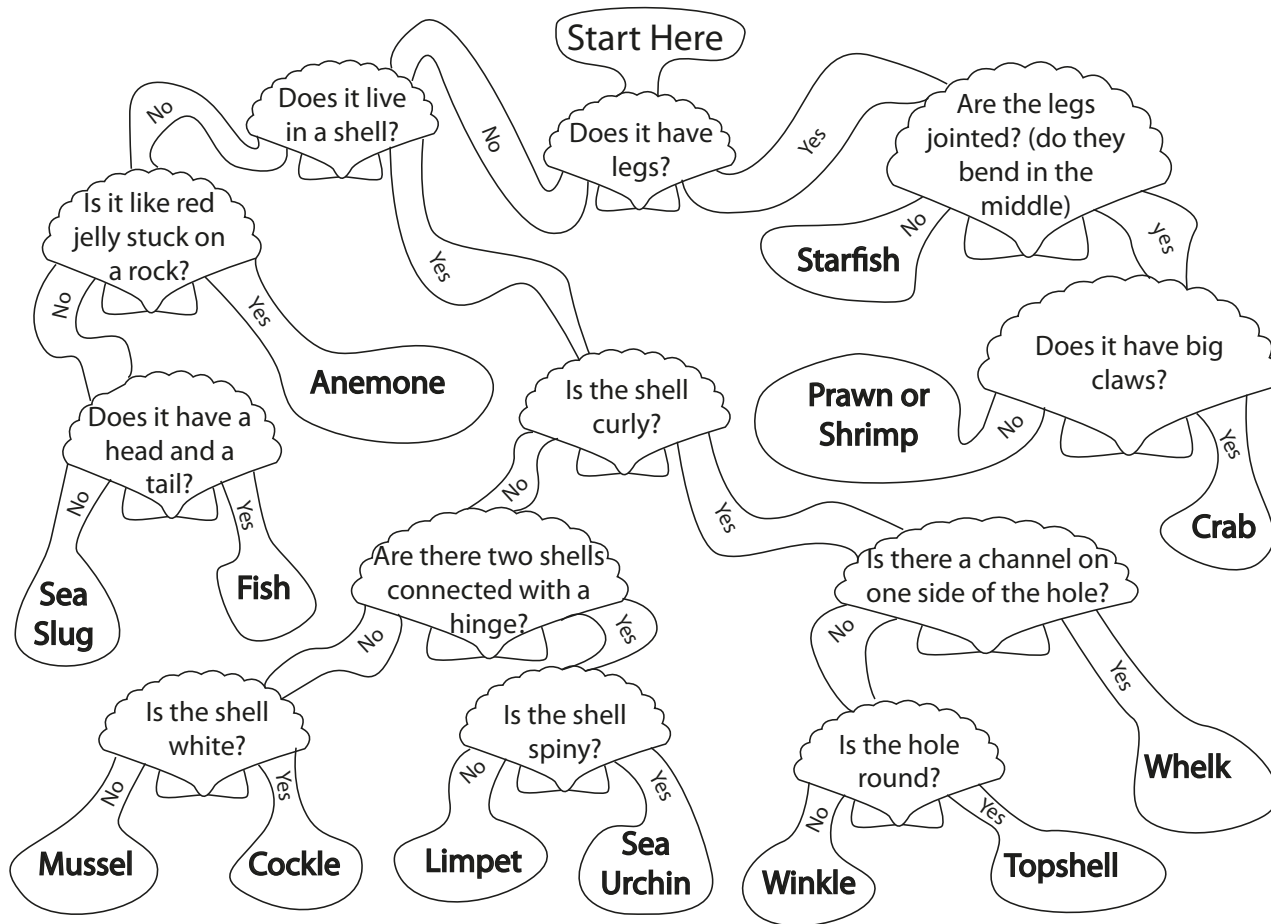
- 1 Start at the top where it says 'start here', follow the arrow to the question, look carefully at the animal or plant that you are trying to identify and answer the question.
- 2 Follow the arrow next to the correct answer, it will lead to another question, answer this question and again follow the arrow
- 3 Continue doing this, eventually you will be led to an answer. The keys in this book have no pictures with them so try looking up the answer in a normal identification guide to see if you were right.

The following Keys use several different designs but all work in the same way.

OUTDOOR SKILLS



OUTDOOR SKILLS



POND KEY

1	Does your invertebrate have legs?	YES Go to 5	NO Go to 2
2	Does your invertebrate have a shell?	YES POND SNAIL	NO Go to 3
3	Does your invertebrate have segments?	YES FLY LARVAE	NO Go to 4
4	Does your invertebrate slide along the bottom of the container?	YES LEECH	NO FLATWORM
5	Does your invertebrate have 4 legs?	YES NEWT	NO Go to 6
6	Does your invertebrate have 6 legs?	YES Go to 7	NO Go to 13
7	Does your invertebrate walk on the surface of the water?	YES POND SKATER	NO Go to 8
8	Does your invertebrate have 3 tails?	YES Go to 9	NO Go to 10
9	Does your invertebrate have hairs down the sides of its body?	YES MAYFLY NYMPH	NO DAMSELFLY NYMPH
10	Does your invertebrate's body have segments?	YES DRAGONFLY NYMPH	NO Go to 11
11	Does your invertebrate have two legs that are much longer than the others?	YES Go to 12	NO DIVING BEETLE
12	Does your invertebrate swim on its back?	YES GREATER WATER BOATMAN	NO LESSER WATER BOATMAN
13	Does your invertebrate have 8 legs?	YES WATER SPIDER	NO FRESHWATER SHRIMP

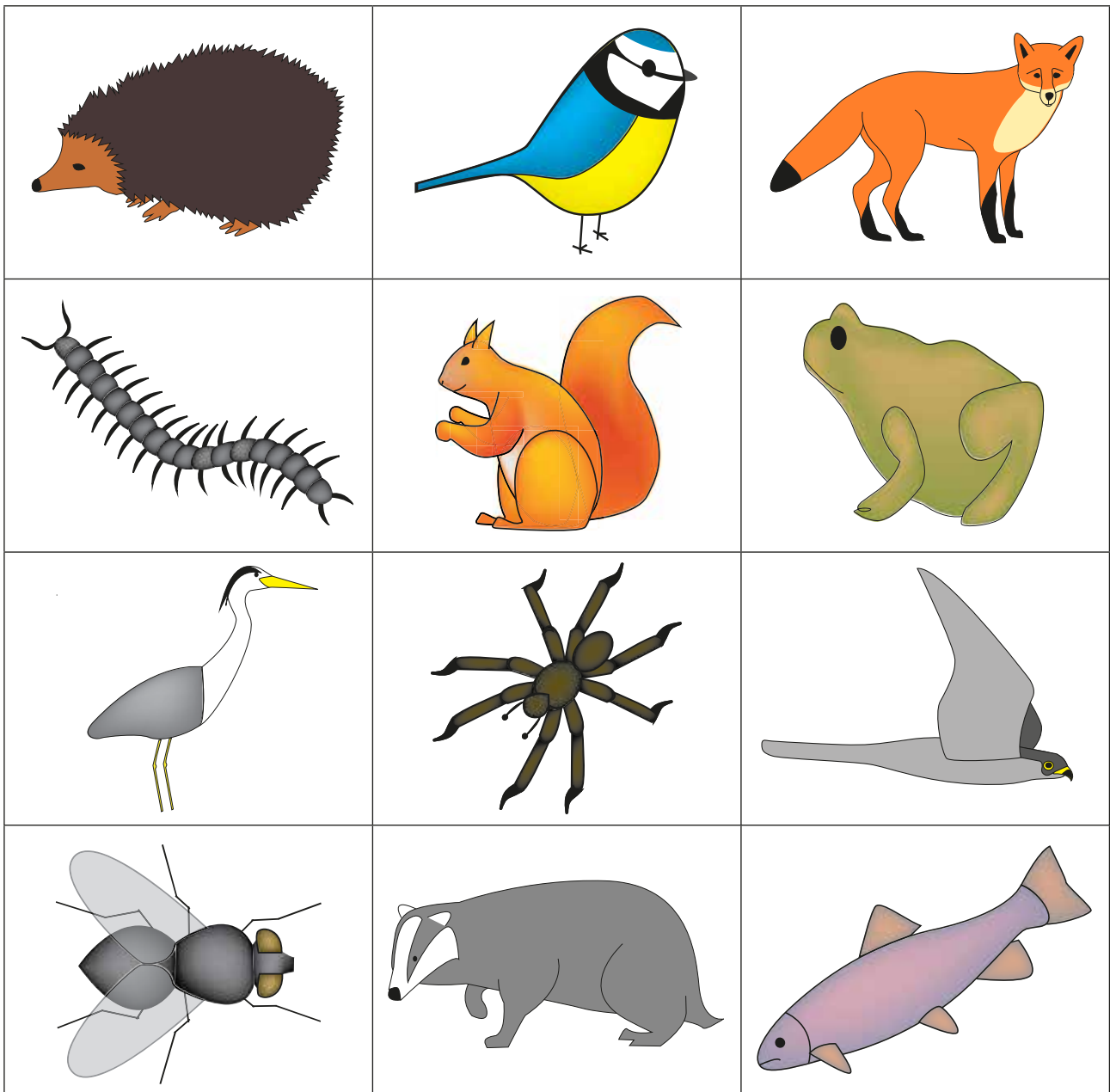
OUTDOOR SKILLS

WRITING YOUR OWN KEYS

Building your own dichotomous key is a great activity that helps to understand why they work. Playing the game 'wildlife stickbacks' is a great way to start as it explains the concept of using a series of yes/no questions and answers to identify things.

HOW TO PLAY WILDLIFE STICKBACKS

- 1 Print out the pictures of animals onto address label stickers or just onto paper, cut them up and put sticky tape on the back.
- 2 Stick one animal onto the back of each person in the group without letting them see what it is.
- 3 Everyone has to find out what animal they are by asking other people questions, there are however three rules.
 - i All questions can only be answered yes or no.
 - ii You cannot use the name of an animal in the question i.e. you cannot ask 'am I a badger'
 - iii You can only ask each person one question.
- 4 When someone thinks they know what animal they are they should ask the group leader to see if they are right.



OUTDOOR SKILLS

HOW TO MAKE YOUR OWN DICHOTOMOUS KEY

- 1 Get a collection of different items together, it doesn't matter what they are, leaves work well for a more advanced group, or animal toys for a younger group.



- 2 Split the pile into two groups which have an easily distinguishable feature i.e. one group of things with legs, one of things without legs. Be sure to write down what the identifying feature you used was and place it between the two groups.

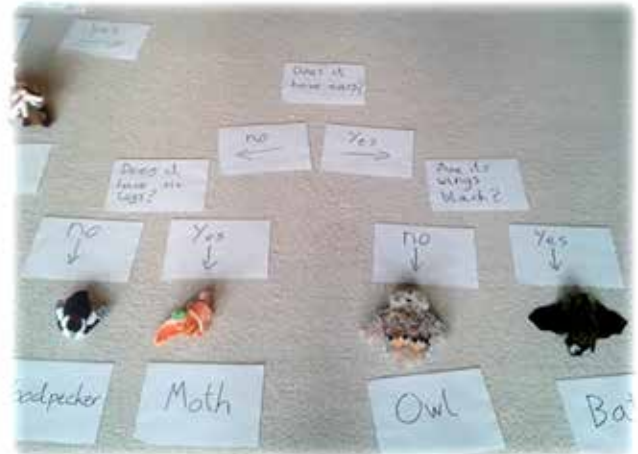


- 3 Split each of the two groups into two groups using another identifying feature again writing down what is was and placing the paper between the two groups.



OUTDOOR SKILLS

- 4 Continue to do this until each item is on its own, you then have your series of unique identifying features that allow you to follow the chain to identify them. All you need to do now is turn the identifying features into yes/no questions and put the whole thing down on paper.



OUTDOOR SKILLS

IMPORTANT TREES

Sycamore

- Soft, clean, food safe wood not very strong.
- Very easy to work, carve, cut and split.
- Not poisonous.
- Not native to Scotland.
- Five lobed leaves, 'helicopter' seeds, bright green buds.

Beech

- Strong hard wood.
- Difficult to work.
- Not poisonous.
- Not native to Scotland.
- Spear shaped leaves, hairy seed cases, long thin buds.

Lime

- Soft clean wood, not very strong.
- Easy to work.
- Not poisonous.
- Native to Scotland.
- Heart shaped leaves, red buds, clusters of branches shooting up from base of the trunk.

Oak

- Very strong hard wood.
- Difficult to work.
- Not poisonous.
- Native to Scotland and important for wildlife.
- Lobed leaves, acorns, brown buds in clusters.

Willow

- Soft clean wood, not very strong.
- Easy to work, tends to split.
- Not poisonous.
- Native to Scotland.
- long thin leaves, brightly coloured shoots.
- Many different species which can be quite different so can be difficult to identify.

Birch

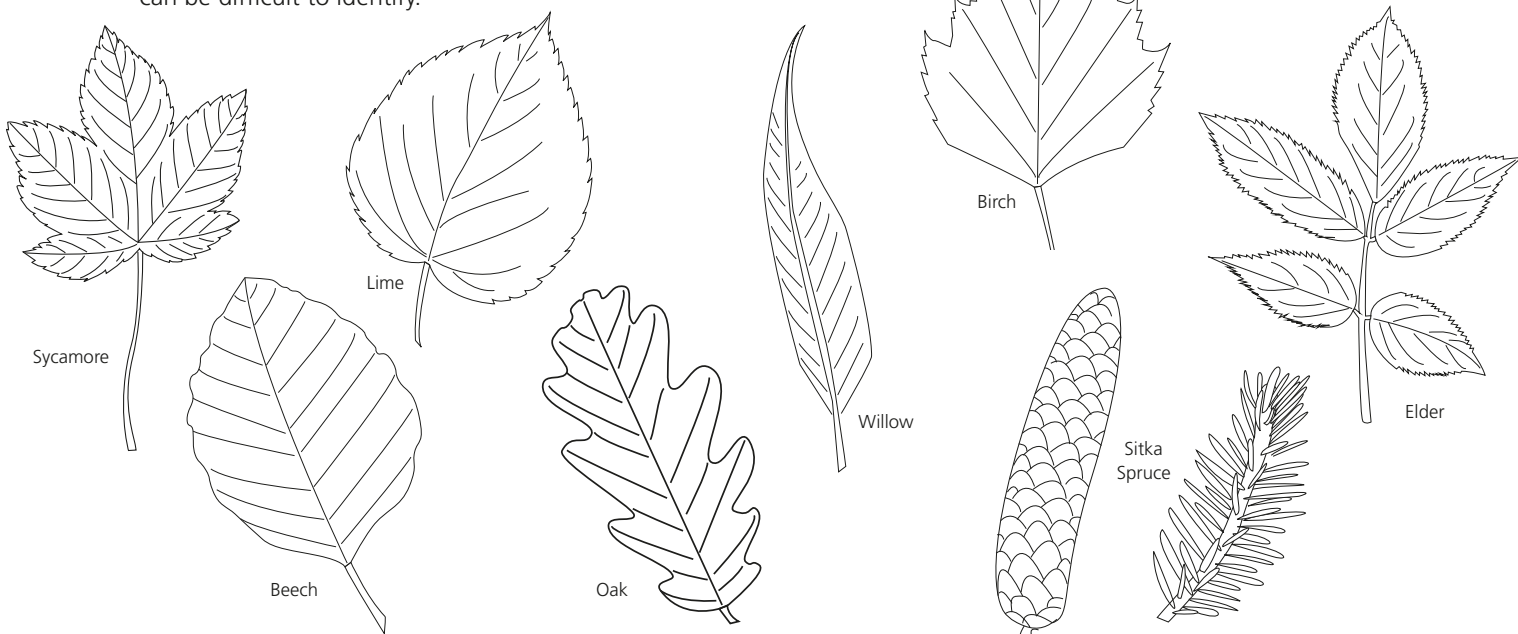
- Good, medium strength wood.
- Easy to work.
- Not poisonous.
- Native to Scotland.
- Small, spear head shaped leaves, small buds and many very thin twigs.
- 'Silver Birch' has white bark, 'Downy Birch' red bark, both have strips that peel off easily.

Sitka Spruce

- The most common plantation tree in Scotland.
- Weak, soft wood.
- Springy and splits awkwardly.
- Many knots make it difficult to work.
- Not poisonous.
- Not native to Scotland.
- Nothing will grow underneath a Sitka plantation due to lack of light and toxins in fallen needles.
- Needles are 1-2cm long and grow individually, cones are 10 – 15cm long and 3cm diameter.
- Burns quickly, lots of sparks, best avoided as firewood if alternative is available.

Elder

- Soft, very weak wood, with hollow core.
- Easy to work and useful to hollow out soft core to make beads, pipes.
- Poisonous.
- Native to Scotland.
- Small bush often found under other trees, hollow branches, white flowers, black berries.



OUTDOOR SKILLS

CHAPTER 9 - WILDLIFE CONSERVATION

The impact that a group of children working and playing in a woodland, field or beach for even one day can have is dramatic. Undergrowth gets trampled, sticks collected up, the ground churned up into mud and just the noise will have most wildlife nearby running within seconds. Despite this apparent destruction the end result of outdoor learning can be positive for the wildlife and landscape as well as the children if thought is given to conservation.

Practical conservation work also fulfils learning objectives within the Curriculum for Excellence. Therefore it is positive if at all possible to include pupils in every stage of this process and not just the fun outdoor pond dipping and minibeast hunting bits.

You should always discuss conservation work with the landowner. They may already have a management plan in place and can let you know of conservation tasks that you could help with. If they do not then most of the conservation work that you could do will need their permission. A management plan should be drawn up with the landowner so that everyone is happy with any work that is being done.

ENVIRONMENTAL IMPACT ASSESSMENT

The Environmental Impact Assessment (EIA) is the system that is used to identify the effects caused by activities and to work out a plan for mitigating or eliminating the problems. Other actions to enhance the wildlife and biodiversity of the area are also included. The way in which you organise the EIA is up to you and will depend on the site that you are working on and the activities that you are doing. You could list all the activities that you intend to do and then think about the impacts they will have. You could identify all the major wildlife, animals, birds, insects, fungi and plants that live on your site and then look at how each will be effected. You could go from one end of your site to the other looking at the impacts on the different locations within your site. Below is a simple EIA looking at a typical woodland site.

Species/feature	Potential impact	Mitigation
Soil layer	Compaction of soil Potential fire damage	Don't walk the same route constantly Set fire off the ground Put it out properly
Ash from fire	Release of nutrients into the soil kill some plants encourage unnatural growth	Spread ashes well out
Wildflowers	Trampling	Stick to one area for main activities to avoid trampling wildflowers across the whole woodland
Burning deadwood	Reduce habitat and damage the food cycle	Non concentrated gathering of fire wood
Toileting	Poisonous to plants Nitrate release	Stick to one area to limit damage. Cover waste and bury
Use of tools	Cut down trees Habitat lost	Agreement with landowner on what to cut Only cut undesirable invasive species
Treading trails	Plant damage Soil compaction	Don't constantly use same path Walk single file reduce damage
Deer	Disturbance	Plenty of other woodland nearby for them to move to while activities are happening so impact should be minimal
Trees, birch, oak, ash, cherry, small number of conifers	Damage to lower branches Damage to saplings Damage to bark	Tell children not to damage bark and not to kill saplings unless it's ok with us i.e. undesirable species.

In order to carry out your impact assessment and also, just for interest and for educational value some basic wildlife recording techniques are required. Some of these such as pond dipping are well known to those working in education others less so. The techniques covered here allow a reasonably thorough survey of wildlife to be carried out. Things not covered are either reasonably easy to survey without any equipment, such as trees or wild flowers or require more in depth skills, equipment and possibly licences.

OUTDOOR SKILLS

BINOCULARS

Use of binoculars for birdwatching or surveying of large mammals such as deer can be very rewarding and they are often essential for a complete survey. However for best results they have to be used properly. Firstly by setting the binoculars up properly and secondly by being in the right place and time when using them.

People who wear glasses

If you wear glasses you may not need to use them when looking through binoculars as the optics in the binoculars can compensate for your eyesight. However some people prefer to still use glasses when looking through binoculars.

As the lens of binoculars has to be kept a certain distance away from your eyes when you look through them there is always some sort of spacer that rests on your face and sits between your eye and the binoculars this is called the eyecup. If you wear glasses they are not needed as the glasses will keep your eyes separated from the lenses to allow this. The eyecups will either be folded away and have to be put out for people without glasses to use them or they will be made of rubber and can be folded back to allow people with glasses to use them.

Setting up binoculars

Binoculars use two separate magnifying lenses which work together to allow you to see something clearly and easily. If the two lenses are not properly aligned one of your eyes will always be slightly out of focus. Because everybody's eyes are slightly different the setup of the binoculars has to be done individually for each person. To enable this binoculars come with two focusing systems, one which focuses both lenses and one which only focuses one of the two lenses. Before using binoculars you need to adjust these so that both lenses are focusing on the same distance for your eyes.

- Look through the binoculars at an object that is around 15 metres away and has sharp edges that can be easily focussed.
- Close your right eye and looking only through your left, move the large focussing wheel in the middle of the binoculars until the object is in focus.
- Then open your right eye and close your left, this time, looking through your right eye you need to move the focussing dial on the right eyepiece until the object is in focus.
- Open both eyes, hopefully the object will be focussed in both eyes and the images will appear as one.



OUTDOOR SKILLS

POND DIPPING

Pond dipping has been a standard activity in outdoor education for decades and for good reason. The opportunity to play with nets and water is something almost all children enjoy and the creatures to be found in a typical pond are weird enough to be fascinating whatever age you are. It is the perfect opportunity to introduce scientific keys, life cycles, food chains and do some detailed research into individual species.

There is also a need to use pond dipping to survey the species that occur on your site for your management plan.

Equipment

POND NETS – long handled nets work best, the more expensive the finer the net will be and the more creatures you will catch. Cheap ones such as those bought at the beach will have larger holes so not catch as much and will not last as long.

TRAYS - any plastic trays can be used for pond dipping although white ones are best as things are easier to see.

Magnification devices – most pond creatures will move too quickly to easily be examined using a handheld magnifying lens. A bug box filled with water can be used or a small low power microscope with a tray that can hold water.

Safety equipment – a throw rope should always be kept to hand when working around water. Long handled nets with a sturdy wooden handle are also useful as a recovery aid if someone falls into the pond.

Technique

Pond dipping is not about going to a pond and fishing for things using a net, Doing so will both increase the likelihood that people could fall into the pond and lessen the usefulness of data collected on the creatures found. Most of the things found are too small to see, so any attempt to look into the water to find things to catch is pointless. Too much energetic sweeping with the net will also risk stirring up mud from the bottom of the pond and collecting leaves and pondweed in the net. This will prevent you from being able to see the creatures when they are transferred to the tray as they will hide in the mud and pondweed. The following technique should prevent this from happening. The technique should be demonstrated to the group before anyone is allowed near the water.

- 1 Fill the tray with about 2cm of water from the pond and place it well away from the edge of the pond. This is to prevent people from crowding around the edge of the pond while looking at the creatures.
- 2 Only one person should be at the pond for each net that is being used.
- 3 Nets should be held with the handles vertically at all times as a long handled net held horizontally presents a risk of knocking people over and potentially into the pond as people move around.
- 4 When standing at the pond you should stand with the pond to the side of you facing along the bank. This is much more stable than facing the pond making you less likely to fall in.
- 5 Take the net and place it into the pond so that the net is beneath the surface but not touching the bottom of the pond.
- 6 Sweep the net through the water, twist 180 degrees and sweep back, continue to do this ensuring that the net is always facing the same direction that you are sweeping.
- 7 Lift the net out of the water and holding it vertically carry over to the tray.
- 8 Hold the net over the tray and turn the net inside out, dunk the net into the tray several times to ensure nothing is left stuck to the net.
- 9 Examine the tray to see what you have caught.
- 10 Use a plastic spoon to transfer individual creatures to other trays or bug boxes with pond water in them in order to examine them closely and identify them. Try not to touch creatures with your hands.
- 11 Only keep the creatures in the tray for about 30 minutes before putting them back in the pond.
- 12 When putting creatures back carefully lower the tray into the water before tipping the creatures out.

OUTDOOR SKILLS

ROCKPOOLS

Although rock pools are in many ways similar to ponds with aquatic and semi aquatic creatures, they are also in many ways very different and so the technique used to sample creatures from rock pools is very different.

Equipment

Rockpools tend not to have the large deep areas that ponds do and even if they do there are often very few creatures living in these areas. Therefore a long handled net is not as much use for a rockpool and will actually make it more difficult to catch things as it cannot get into small areas and the long handle makes it unwieldy. Short handled nets of the sort used for catching goldfish when you clean the tank work far better.

Trays are useful for storing creatures caught. The same trays that are used for pond dipping are fine but it is important to clean them thoroughly after use. The same is true of bug boxes and magnifying equipment but it is less likely that such things will be needed when rockpooling as most of the creatures found are larger.

Technique

- Put about 2cm of water from the rockpool into the tray and place the tray in a clear area away from the rockpool.
- Keep away from the sea and from large, deep rockpools.
- Do not climb on rocky outcrops.
- If you stand in the rockpool, try to avoid moving your feet or you will stir up sand and mud making it difficult to see things in the water.
- Search the rockpool carefully moving seaweed and rocks. When you find a creature place the net in the water and keep it still. Then use your other hand to gently move the creature into the net.
- When the creature is in the net take it over to the tray, turn the net upside down and dunk it into the tray until the creature is in the tray.
- Try not to touch the creatures with your hands.
- Only keep the creatures in the tray for about 30 minutes before putting them back in the rockpool.
- When putting creatures back carefully lower the tray into the water before tipping the creatures out.

MINIBEAST HUNTING

Searching for minibeasts is one of the simplest and most popular activities that you can do and will work in almost any habitat. It is however an activity that should be done with care, both to avoid harming the creatures that are found and also because of the many stinging and biting invertebrates that can be found in Scotland. The only essential bit of equipment for minibeast hunting is a good bug box about 25mm to 50mm in size.

- Do not attempt to catch wasps or bees.
- Do not pick up creatures in your hands.
- Search for creatures in dark damp places such as under dead logs and rocks.
- Take the lid off your bug box, place the box on the ground on its side with the entrance facing towards the creature.
- Encourage the creature into the box using the lid, and then put the lid back on the box.
- Do not keep slimy creatures like slugs or worms for more than a few minutes as they will dry out and die.
- Be sure to put the creature back in a similar place to where you found it.

OUTDOOR SKILLS

HABITAT IMPROVEMENT

Improving the area of land used for outdoor learning for the wildlife that lives there can make the impact a positive one rather than a negative. It also covers a lot of learning objectives, practical skills, ecology and conservation. Exactly what is the best thing to do to improve an area for wildlife can be quite difficult to work out so it is worth getting advice from a Countryside Ranger if possible. Clearing invasive species such as Himalayan Balsam or Rhododendron is a simple and massively beneficial activity. However some invasive species also provide habitat for animals so should not be removed. Removing some species spreads more seeds or fragments which can sprout making the problem worse. Doing this sort of work without expert advice is not a good idea. There are however several simple things which can be done to improve the habitat of an area which will not cause any problems.

BUG HOTELS / HABITAT PILES

Piles of dead wood, leaves, grass, stones, pine cones and similar things provide lots of great habitat for invertebrates. In most places however these will get removed as they are 'untidy'. In a woodland situation trees that are cut down will be removed for the timber and even small branches will often be collected for firewood. Creating large piles of dead wood along with dead plants, leaves and other organic matter replaces some of this. These are known as habitat piles and are as simple as collecting sticks and making a pile.

In a garden or parkland situation it is different and often more difficult. Any dead plants, wood or leaves will often be removed to keep the area 'tidy' leaving very little habitat for invertebrates. Creating habitat piles in these areas will often be met with complaints as they are not 'tidy'. The bug hotel is a more formal construction that tries to create a similar habitat in a more formal way which is aesthetically pleasing and acceptable for putting in a garden, school playground or community area. Searching the internet for 'bug hotel' will show many fantastic designs but a simple version can be made using a pile of pallets. When piled up neatly and nailed together they create a box with many layers and four different compartments in each layer. Each of these compartments can be filled with a different item, leaves in one, pine cones in another, stones, sticks, logs, slates, straw, shells etc. The end result can look fantastic and does create very good habitat for invertebrates.



OUTDOOR SKILLS

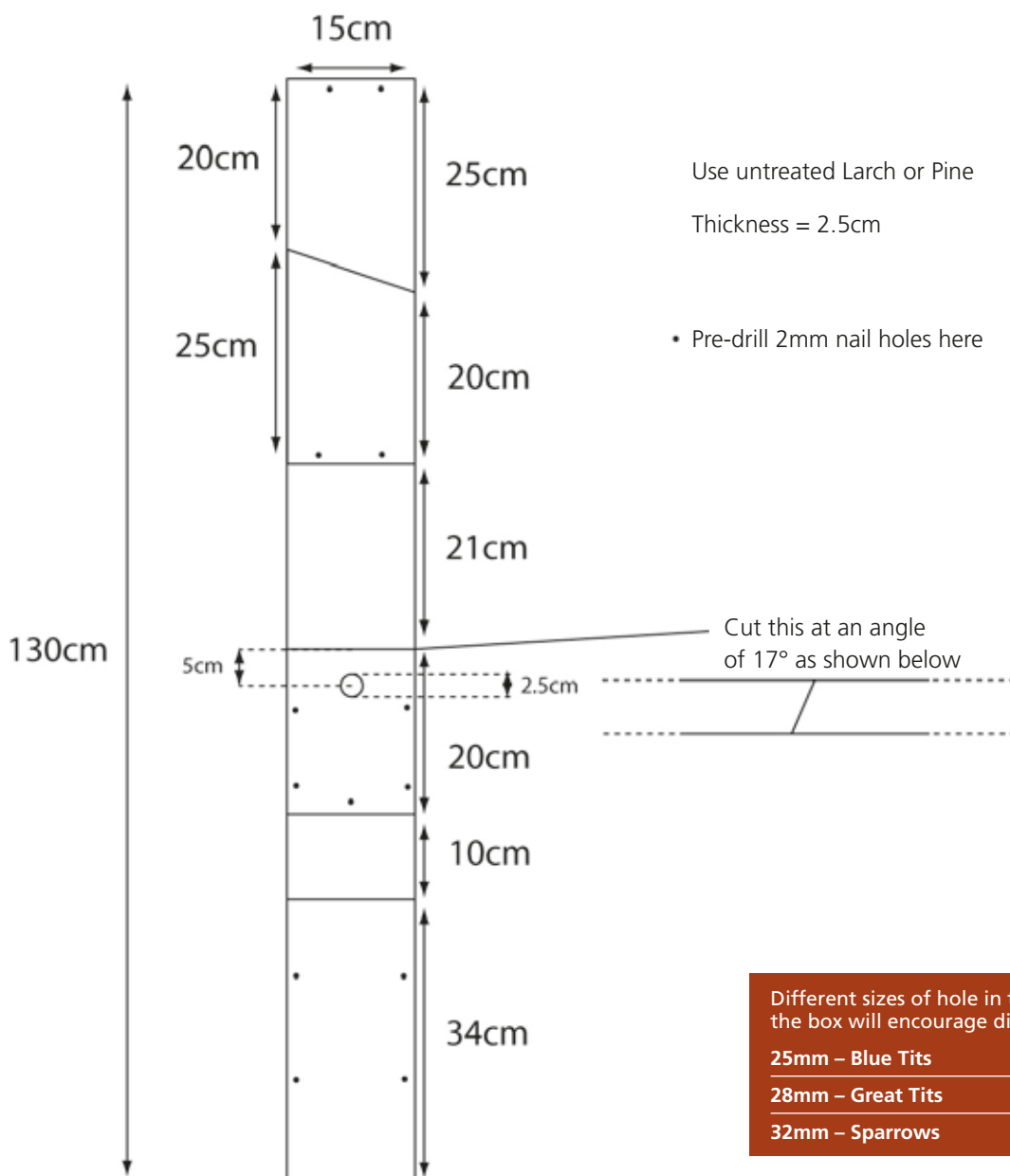
NEST BOXES

Many small birds in the wild build nests inside the hollow trunks of dead trees or dead branches. Unfortunately due to the risk of the tree falling, dead trees and branches are normally removed from areas used by the public leaving a lack of suitable nest sites. This can be rectified by putting up nest boxes giving safe dry spaces which have less risk for the birds as well as people using the woodland.

The instructions here show how to build a simple nest box suitable for a blue tit. With minor alterations the same design can be used for willow tits, great tits, sparrows, robins and many other small birds. It is worth while checking which birds are in your woodland and what other birds the habitat may be suitable for before putting up boxes. There is little point putting up a box for a willow tit in an area where you are never going to get willow tits.



CUTTING DIAGRAM



OUTDOOR SKILLS

Start by hammering nails through the back into one of the sides.



Find the base and place it against the side. Use another piece of wood under the base to keep it in place. Then hammer nails through the side into the base. It is important to put the base on before the second side to ensure that they fit properly.



Put on the other side and hammer nails from the back into the side and from the side into the base.



Now turn the box over, put the front in place and hammer nails through to both sides and the base.



OUTDOOR SKILLS

The lid is not held on by nails as it needs to open.

Place the lid on top of the box. It is easiest if you place it on the edge of the bench so that the back overhangs.

Take the piece of rubber and place it over the top of the back and onto the lid. Then use a staple gun to fix it in place.



Finally hammer in two more nails, one in the side of the lid and one in the side of the front.

Then find a bit of wire, string or a very strong elastic band to wrap around these two nails. Do this on both sides. This will hold the lid down and stop predators from getting inside but also allow it to be opened next year to clean it out.



Where to put your nest box

This nest box is designed for a blue tit although other birds may use it as well. Blue tits like to nest quite high up, in a sheltered position with a clear view in front of the box. Therefore your box should be placed;

- About 2 to 4 metres off the ground on a wall or a tree.
- Out of direct sunlight and strong winds.
- With a clear space in front of it with no vegetation or overhanging branches.
- If attached to a tree it is better to fix it on with thin wire or a giant cable tie wrapped around the tree than nails. This will prevent damage to the tree.

For the safety of the birds there are a few things that you should not do;

- Do not put a perch on the front of the box. The birds will not need one but a predator may use it as a foothold while they try to get inside.
- Do not use any paint or wood preservative on your box, the fumes from these can kill small birds.
- There are also a few things that you should do;
- Open up the box once a year and clean out any nesting material inside. This should be done in winter, around November when the birds will not be using the box. Doing this prevents the build up of parasites in the nest. While you are doing this, also check that the box is still securely fixed in place.
- Make sure there are a few small holes in the base of the box. This will prevent it from filling up with water if the roof leaks.
- Keep an eye on the hole on the front of the box. If something seems to have been gnawing at the wood to make it bigger it will be a predator. This can be prevented by putting a metal plate with a hole in it on the front of the box.

OUTDOOR SKILLS

APPENDIX 1 - FURTHER READING

This guide aims to give a basic introduction to practical skills that are useful when running outdoor learning. However it is by no means a comprehensive guide to any of them. If you would like to know more about any of the subjects covered this list gives a starting point for further research.

COUNTRYSIDE ACCESS

www.outdooraccess-scotland.com - the official website of the Scottish Outdoor Access Code which explains what you are legally allowed to do when taking access to the Scottish Countryside.

www.dumgal.gov.uk/index.aspx?articleid=3812 – map showing the core path network in Dumfries and Galloway, useful for finding walks near to your site.

ROPES & KNOTS

www.animatedknots.com – a very good website with animated instructions on tying hundreds of knots.

Collins Gem Knots (ISBN 978-0007190102), *DK Handbook of Knots* (ISBN 978-1405304672) or many other guides will give instructions on tying a wide selection of knots.

Ashley Book of Knots (ISBN 9780571000739) – More an item of historical interest than a useful guide to tying knots, this is the definitive guide to knots. It contains over 3800 knots with descriptions and illustrations.

BUSHCRAFT

www.bushcraftuk.com – active online community that has a lot of helpful people willing to give advice on any aspect of bushcraft. As always with online communities do not trust everything that is posted there and use a bit of common sense.

Ray Mears Essential Bushcraft (ISBN: 978-0340829714) – all round bushcraft book, a good introduction to the subject.

Food for Free (ISBN: 978-0007183036) – excellent guide to edible plants found in Britain.

WILDLIFE IDENTIFICATION

www.rspb.org.uk – official site for the Royal Society for the Protection of Birds, has an excellent guide to common British birds including many sound clips and pictures.

www.woodlandtrust.org.uk – official site for the Woodland Trust, has an excellent guide to British Trees.

Collins Guides are some of the best wildlife identification guides and there is a complete range a few examples are;

Collins Pocket Guide - Sea Shore of Britain and Europe (ISBN:978-0002199551)

Collins British Bird Guide (ISBN:9780007451241)

Collins British Tree Guide (ISBN: 9780007451234)

For a smaller and simpler guide the Field Studies Council publish an excellent range of identification guides. These can be found at www.field-studies-council.org/publications/fold-out-charts.aspx.

Useful contacts

OWL – the Outdoor and Woodland Learning group are an organisation that supports learning outdoors. The local Dumfries and Galloway group have many members and contacts who can help you set up and run outdoor learning sessions.

owlsotland.org/local-groups/dumfries_and_galloway_cluster_group

dgowlgp@gmail.com

OUTDOOR SKILLS

APPENDIX 2 - LESSON PLANS

A number of the topics covered in the handbook have been incorporated into specific lessons.

Lesson plans for these lessons are included in this appendix

N.B. Although these lessons cover level 3 and 4 outcomes and so are designed for secondary schools, they could easily be adapted for delivery at earlier stages.

However, it is crucial that practitioners do not attempt to deliver sessions until they have undergone Outdoor Skills training and have appropriate risk assessments/safe systems of work in place.

TOPICS COVERED

- 1 Scottish Access Code
- 2 Identification keys
- 3 Use of bow saws/secateurs/loppers
- 4 Tool use 2
- 5 Knots and shelters
- 6 Bill hooks and mallets
- 7 Fires
- 8 Making charcoal and games



OUTDOOR SKILLS

Outdoor Skills

SCOTTISH ACCESS CODE

Possible Lesson Plan

CONTEXT FOR LEARNING

A BGE Science Unit covering a range of mostly science experiences and outcomes, encompassing outdoor learning.

Experiences/Outcomes	Learning Intentions <i>I am learning...</i>	Success Criteria	Evidence/tasks
I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible. HWB 0 to 4-16a	What the key elements of the "Scottish Outdoor Access Code" (SOAC) are.	Can answer 6 questions about the SOAC correctly.	Activity - Brief discussion of the "Scottish Outdoor Access Code" in class, followed by contextualisation during walk outside.
	The importance of appropriate preparation for working outside.	Wears clothing and footwear appropriate to the prevailing weather conditions. Applies sunblock if required.	Activity - Brief preparation for walk. Pupils dress appropriately and emergency procedures and collection of materials discussed.
I know and can demonstrate how to keep myself and others safe and how to respond in a range of emergency situations. HWB 0 to 4-17a	What to do if I or any of my classmates gets injured.	Can state the correct procedures for dealing with an emergency.	Emergency procedures discussed outside. Key Points - Don't move casualty. Get help Keep casualty warm Don't panic
	How to collect materials outside in a safe and non-destructive fashion.	A range of objects (leaves, feathers, stones etc.) are safely collected outside.	Activity – A range of objects collected and stored.

OUTDOOR SKILLS

Outdoor Skills

IDENTIFICATION KEYS

Possible Lesson Plan

CONTEXT FOR LEARNING

A BGE Science Unit covering a range of mostly science experiences and outcomes, encompassing outdoor learning.

Experiences/Outcomes

Learning Intentions

Success Criteria

Evidence/tasks

I am learning...

<p>I can sample and identify living things from different habitats to compare their biodiversity and can suggest reasons for their distribution.</p> <p>SCN 3-01a</p>	<p>How to use a branching key to identify a variety of plants.</p>	<p>Correctly identify six different plant species.</p>	<p>Activity – Identify six different plants and note the features used on the branching key to differentiate them.</p>
	<p>How to identify features of various objects which allows them to be distinguished from one another.</p>	<p>A table detailing the different features of the objects collected.</p>	<p>Activity – For objects collected write down distinguishing features in a table.</p>
	<p>To use distinguishing features to produce a branching key.</p>	<p>Produce a branching key to identify the objects collected the previous day.</p>	<p>Activity – Using information in the table, produce a branching key.</p>

OUTDOOR SKILLS

Outdoor Skills

USE OF BOW SAWS/SECATEURS/LOPPERS

Possible Lesson Plan

CONTEXT FOR LEARNING

A BGE Science Unit covering a range of mostly science experiences and outcomes, encompassing outdoor learning.

Experiences/Outcomes	Learning Intentions <i>I am learning...</i>	Success Criteria	Evidence/tasks
<p>I have gained confidence and dexterity in the use of materials, tools, equipment, software or control technology and can apply specialist skills to make quality products.</p> <p>TCH 3-13a</p>	<p>How to use a bow saw safely.</p>	<p>Carry a bow saw safely, remove the blade guard and put it back on.</p>	<p>Activity - Discuss safety issues pertaining to bow saws i.e. how to carry them and how to take off and put on blade guards.</p>
		<p>Select and cut material in a safe manner.</p>	<p>Activity - Safe use of bow saw described and demonstrated. (Hand holding material gloved and "through" the saw.)</p>
<p>(By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects.</p> <p>SCN 2-07a)</p>	<p>How to use secateurs safely.</p>	<p>Select and cut material of the appropriate thickness (maximum 1cm in diameter) to the required length in a safe manner.</p>	<p>Activity - Safe use of secateurs described and demonstrated. (Hand holding material gloved.) Material of suitable thickness selected and cut to appropriate length.</p>
<p>I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible.</p> <p>HWB 0 to 4-16a</p>	<p>How to use loppers safely</p>	<p>Select and cut material of the appropriate thickness (maximum 3cm in diameter) in a safe manner.</p>	<p>Activity - Safe use of loppers described and demonstrated. (Hand holding material gloved.) Material of suitable thickness selected and cut to appropriate length.</p>

OUTDOOR SKILLS

Outdoor Skills

TOOL USE 2

Possible Lesson Plan

CONTEXT FOR LEARNING

A BGE Science Unit covering a range of mostly science experiences and outcomes, encompassing outdoor learning.

Experiences/Outcomes	Learning Intentions <i>I am learning...</i>	Success Criteria	Evidence/tasks
<p>I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible.</p> <p>HWB 0 to 4-16a</p> <p>I value the opportunities I am given to make friends and be part of a group in a range of situations.</p> <p>HWB 0 to 4-14a</p>	What represents appropriate behaviour in a woodland.	Behave in a safe, appropriate manner (no shouting, running or damaging plants.)	Activity - Explanation of what constitutes appropriate behaviour, and inappropriate behaviour challenged.
	How and when to tie a hitch knot	Successfully tie a hitch knot.	Activity - The purpose of the hitch knot is explained. The knot is then demonstrated.
	How and when to tie a bowline knot.	Successfully tie a bowline knot.	Activity - The purpose of the bowline knot is explained. The knot is then demonstrated.
	How to rig up a simple shelter using a tarpaulin.	Working as part of a team, rig up a simple shelter using ropes and a tarpaulin.	Activity - The way to rig up a simple shelter is demonstrated.
<p>I have gained confidence and dexterity in the use of materials, tools, equipment, software or control technology and can apply specialist skills to make quality products.</p> <p>TCH 3-13a</p>	How to use secateurs safely.	Select and cut material of the appropriate thickness (maximum 1cm in diameter) to the required length in a safe manner.	Activity - Safe use of secateurs described and demonstrated. (Hand holding material gloved.) Material of suitable thickness selected and cut to appropriate length.
	How to use loppers safely	Select and cut material of the appropriate thickness (maximum 3cm in diameter) in a safe manner.	Activity - Safe use of loppers described and demonstrated. (Hand holding material gloved.) Material of suitable thickness selected and cut to appropriate length.
<p>(By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects.</p> <p>SCN 2-07a)</p>	How to use a bow saw safely	Select and cut material in a safe manner.	Activity - Safe use of bow saw described and demonstrated. (Hand holding material gloved and "through" the saw.) Two people use a bow saw to cut through thicker material.

OUTDOOR SKILLS

Outdoor Skills

KNOTS AND SHELTERS

Possible Lesson Plan

CONTEXT FOR LEARNING

A Science Unit covering a range of mostly science experiences and outcomes, encompassing outdoor learning.

Experiences/Outcomes	Learning Intentions <i>I am learning...</i>	Success Criteria	Evidence/tasks
<p>I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible.</p> <p>HWB 0 to 4-16a</p> <p>I value the opportunities I am given to make friends and be part of a group in a range of situations.</p> <p>HWB 0 to 4-14a</p>	What represents appropriate behaviour in a woodland.	Behave in a safe, appropriate manner (no shouting, running or damaging plants.)	Activity - Explanation of what constitutes appropriate behaviour, and inappropriate behaviour challenged.
	How and when to tie a hitch knot	Successfully tie a hitch knot.	Activity - The purpose of the hitch knot is explained. The knot is then demonstrated.
	How and when to tie a bowline knot.	Successfully tie a bowline knot.	Activity - The purpose of the bowline knot is explained. The knot is then demonstrated.
	How to rig up a simple shelter using a tarpaulin.	Working as part of a team, rig up a simple shelter using ropes and a tarpaulin.	Activity - The way to rig up a simple shelter is demonstrated.
<p>I have gained confidence and dexterity in the use of materials, tools, equipment, software or control technology and can apply specialist skills to make quality products.</p> <p>TCH 3-13a</p>	How to use secateurs safely.	Select and cut material of the appropriate thickness (maximum 1cm in diameter) to the required length in a safe manner.	Activity - Safe use of secateurs described and demonstrated. (Hand holding material gloved.) Material of suitable thickness selected and cut to appropriate length.
	How to use loppers safely	Select and cut material of the appropriate thickness (maximum 3cm in diameter) in a safe manner.	Activity - Safe use of loppers described and demonstrated. (Hand holding material gloved.) Material of suitable thickness selected and cut to appropriate length.
<p>(By investigating how friction, including air resistance, affects motion, I can suggest ways to improve efficiency in moving objects.</p> <p>SCN 2-07a)</p>	How to use a bow saw safely	Select and cut material in a safe manner.	Activity - Safe use of bow saw described and demonstrated. (Hand holding material gloved and "through" the saw.) Two people use a bow saw to cut through thicker material.

OUTDOOR SKILLS

Outdoor Skills

BILL HOOKS AND MALLETS

Possible Lesson Plan

CONTEXT FOR LEARNING

A BGE Science Unit covering a range of mostly science experiences and outcomes, encompassing outdoor learning.

Experiences/Outcomes	Learning Intentions <i>I am learning...</i>	Success Criteria	Evidence/tasks
I have gained confidence and dexterity in the use of materials, tools, equipment, software or control technology and can apply specialist skills to make quality products TCH 3-13a	What a bill hook is, what it is used for and how to use it safely	I can identify what a bill hook is	Activity - A recap of the general rules pertaining to safe tool use, introduce what a bill hook is and how it is used
		I can use a bill hook to shape a piece of wood safely	Activity - Safe use of bill hook described and demonstrated. (Hand holding material gloved and importance of communication between partners. "How many and how hard?")
I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible HWB 0 to 4-16a	How to produce a mallet from a short "log" of wood	I have produced an implement which can be used as a mallet	Activity - "Logs" cut during previous session are shaped into mallets

OUTDOOR SKILLS

Outdoor Skills

FIRES

Possible Lesson Plan

CONTEXT FOR LEARNING

A BGE Science Unit covering a range of mostly science experiences and outcomes, encompassing outdoor learning.

Experiences/Outcomes	Learning Intentions <i>I am learning...</i>	Success Criteria	Evidence/tasks
I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible. HWB 0 to 4-16a	What represents appropriate behaviour in a woodland.	Behave in a safe, appropriate manner (no shouting, running or damaging plants.)	Activity 21.1 - Discussion as a means of recapping the key points for behaviour in the woodland.
	How to behave around a fire pit	I prevent myself and others from being burned.	Activity 21.2 - Following an explanation of the rules of behaviour around a fire pit (inc. the fire circle, how and when fuel is added), there is a discussion as to why these "rules" apply.
	How a fire is lit in a fire pit.	A fire is successfully lit.	Under supervision, the group as a whole lights a fire in the fire pit.

OUTDOOR SKILLS

Outdoor Skills

CHARCOAL MAKING & GAMES

Possible Lesson Plan

CONTEXT FOR LEARNING

A BGE Science Unit covering a range of mostly science experiences and outcomes, encompassing outdoor learning.


Experiences/Outcomes	Learning Intentions <i>I am learning...</i>	Success Criteria	Evidence/tasks
I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible. HWB 0 to 4-16a	I am learning – What represents appropriate behaviour in a woodland.	Behave in a safe, appropriate manner (no shouting, running or damaging plants.)	Activity - Explanation of what constitutes appropriate behaviour, and inappropriate behaviour challenged.
I have gained confidence and dexterity in the use of materials, tools, equipment, software or control technology and can apply specialist skills to make quality products. TCH 3-13a	How to apply the skills I have in using secateurs.	Select and cut material of the appropriate thickness (maximum 1cm in diameter) to the required length in a safe manner.	Activity - Safe use of secateurs described and demonstrated. (Hand holding material gloved.) Material of suitable thickness selected and cut to appropriate length.
I have helped to design and carry out practical activities to develop my understanding of chemical reactions involving the Earth's materials. I can explain how we apply knowledge of these reactions in practical ways. SCN 3-19b	How charcoal is produced	Charcoal made.	Activity - Syrup tins filled with sticks of the correct length and placed on the fire. Charcoal produced in about 90 minutes
I value the opportunities I am given to make friends and be part of a group in a range of situations. HWB 0 to 4-14a	To trust others	Allow myself to be guided through the woods by someone else when blindfolded	Activity - One member of a pair is led blindfolded to a tree where they can touch it for one minute. They are then walked away, spun round gently and have to identify the tree they touched.
	How to identify a tree by touch alone.	Successfully identify a tree by the texture of its bark and the arrangement of its lower branches	
I can sample and identify living things from different habitats to compare their biodiversity and can suggest reasons for their distribution. SCN 3-01a	How to identify different plants	Use my powers of observation to identify 5 different tree species	Activity - Leaf game, followed by drawings of different identified leaves.
	Different plants prefer to grow in different environmental conditions	I can measure light intensity, soil temperature and moisture content, and relate these to why certain plants are found in certain places.	Activity - Analysis of different abiotic conditions (i.e. light, soil moisture and temperature) and species distribution.

OUTDOOR SKILLS

APPENDIX 3 - RISK ASSESSMENT

It is **essential** that before carrying out any of the activities in this handbook you draw up a risk assessment for the site you are using.

Ideally this should be done by someone who has completed an appropriate IOSH course, though this is not always possible. The children taking part should be involved in this process.

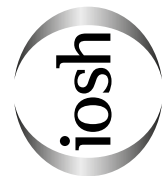
Risk assessment should not be viewed as "something extra". They are a key part of the planning process for any outdoor activity,  helps build confidence when carrying out tasks.

An example of a completed Risk Assessment form is given in this booklet as well as a blank form for photocopying. If you are unsure about your risk assessments, contact the Council's Outdoor Learning Coordinator.



OUTDOOR SKILLS

Name	Keith Walker	End-of-course date	Training provider
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Risk assessment form

Total marks

Marks

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Assessor's name	Date
Description of process, activity or task to be risk assessed	
Describe the location where the activities are taking place	Outdoor classroom in Mabie Forest (Grid ref -55.0181 -3.6516). This site is a small clearing in a stand of mixed woodland (@ 8m x 7m) in an area of relatively flat ground. Loose rocks and branches have been removed from this area, and the central area where fires are lit, is open to the sky. A circle of cut logs serves as seating. The classroom is situated close to a path with a hard surface and is approximately 5 minutes walk from the forest road joining Mabie House Hotel and the bicycle skills area in the Forest.
Describe the activities being performed	Preparation of fire wood. Bow saws, loppers and secateurs are used to cut wood to an appropriate size for burning. Use of an open fire for cooking. The fire is started using a magnesium fire steel and cotton wool.
Describe the equipment and/or substances being used	Fire is set in a purpose built fire pit which is supported above the ground. This is constructed of an alloy which is a relatively poor conductor of heat. Magnesium fire steel, consists of a magnesium flint and steel scraper. Secateurs are checked and oiled prior to use as required. These are used only for small twigs no greater than approximately 1cm in diameter. Loppers are checked and oiled prior to use as required. These are used for larger twigs and branches up to approximately 3cm in diameter. Bow saw blades are checked for tension prior to use.
Describe the people involved in these activities (and others who might be affected)	Primary 6/7 pupils (i.e. 10/11 years of age), their teachers and support workers. Members of the public walking or mountain-biking in the vicinity.

OUTDOOR SKILLS



Risk assessment form

Description of hazard and hazardous event	Who might be harmed?	What risk controls are currently in place?	Current risk rating*			Are further controls needed?	Date to be completed by	Residual risk rating*		
			L	C	R			L	C	R
Location Tripping on uneven surface	Pupils, teachers, support workers	Appropriate footwear i.e. walking boots or thick soled trainers (summer) Flat area chosen. Large branches and stones removed from area	2	2	4	No				
Activities Preparation (cutting) of firewood	Pupils, teachers, support workers	Clear explanation of which tool is best to cut which sizes of wood, and demonstration of safe systems of work for tools. Safety gloves issued.	1	4	4	No				
Equipment and substances Fire going into the ground	Everyone	Fire area above ground level. Minimum of 8litres of water carried plus fire blanket for extinguishing fire. Appropriately trained first aider on site	2	5	10	Yes. Welding gloves required for movement of hot objects to safe location. At least 30 minutes allowed for fire to be extinguished.	25/9/15	1	5	5

Marks

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*Likelihood x Consequence = Risk

OUTDOOR SKILLS

Risk Rating Calculator

Likelihood that hazardous event will occur		Consequence of hazardous event	
1	very unlikely	1	insignificant – no injury
2	unlikely	2	minor – minor injuries needing first aid
3	fairly likely	3	moderate – up to three days' absence
4	likely	4	major – more than seven days' absence
5	very likely	5	catastrophic – death

Action Level Table

Risk rating	Action
20–25	Stop – stop activity and take immediate action
15–16	Urgent action – take immediate action and stop activity if necessary, maintain existing controls rigorously
8–12	Action – improve within specified timescale
3–6	Monitor – look to improve at next review or if there is a significant change
1–2	No action – no further action but ensure controls are maintained and reviewed

Example risk assessment

Description of hazard and hazardous event	Who might be harmed?	What risk controls are currently in place?	Current risk rating*			Are further controls needed?	Date to be completed by	Residual risk rating*		
			L	C	R			L	C	R
Activities Filling car with petrol, leading to spillage	Person filling vehicle and others on forecourt	Auto pump cut off, signage and plastic gloves	4	2	8	Make available paper towels, sand and absorbent material	By next week	3	2	6

OUTDOOR SKILLS

Name	End-of-course date	Training provider
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Risk assessment form

Total marks

Marks

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Assessor's name	Date
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Description of process, activity or task to be risk assessed	
Describe the location where the activities are taking place	
Describe the activities being performed	
Describe the equipment and/or substances being used	
Describe the people involved in these activities (and others who might be affected)	

OUTDOOR SKILLS



Risk assessment form

Description of hazard and hazardous event	Who might be harmed?	What risk controls are currently in place?	Current risk rating*			Are further controls needed?	Date to be completed by	Residual risk rating*			
			L	C	R			L	C	R	
Location											
Activities											
Equipment and substances											

Marks

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*Likelihood x Consequence = Risk

OUTDOOR SKILLS

Risk Rating Calculator

Likelihood that hazardous event will occur		Consequence of hazardous event	
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Action Level Table

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Example risk assessment

Description of hazard and hazardous event	Who might be harmed?	What risk controls are currently in place?	Current risk rating*			Are further controls needed?	Date to be completed by	Residual risk rating*		
			L	C	R			L	C	R
Activities Filling car with petrol, leading to spillage	Person filling vehicle and others on forecourt	Auto pump cut off, signage and plastic gloves	4	2	8	Make available paper towels, sand and absorbent material	By next week	3	2	6

