



Children's tree swings

A guide to good practice



Introduction

Welcome to this good practice guide to the safe siting, installation and use of children's rope swings in trees. The guide is intended to help outdoor playworkers to manage the risks - and benefits - associated with rope swings, and to provide practical advice on how to install them effectively.

Outdoor play equipment in artificial play areas is subject to the EN1176 Playground Equipment Standard and the EN1177 Playground Surfaces Standard. These standards do not provide appropriate guidance for temporary play structures in wild spaces however. Such environments inevitably contain many physical features that have not been designed with safety in mind, as well as other risk variables that are beyond any reasonable expectation of direct human control. The fact that a space has not been designed with children's safety in mind does not necessarily mean it is unsuitable for play, but a culture of risk aversion in play provision can lead to this assumption. There is now a growing recognition that risk must be properly balanced against the benefits of access to play in such wild spaces - particularly adventurous play, or play that is perceived as risky - which can make an invaluable contribution to children's wellbeing and development.ⁱ

The guidance in this document relates only to swings installed in natural spaces on a temporary basis. It is not a hard and fast set of rules, and neither is it exhaustive. Natural play environments are subject to too many factors that influence risk in different ways to cover comprehensively in a short document such as this. We have sought to advise on the appropriate management of the most significant and frequent of the risk factors likely to be encountered, so that those involved in the risk management of play provision in wild spaces can be confident that good practice is being followed.

This document has been prepared by Monkey-Do in association with London Play. Monkey-Do is a social enterprise with over ten years experience installing temporary play structures in natural environments. We aim to provide adventure play experiences for those who lack opportunities for active play in a natural environment, and to increase access to the amenity value of parks and woodlands in the UK. London Play is a charity that aims for every child in London to have quality, accessible and inclusive play opportunities. We campaign for more and improved play spaces and services, and support playwork in the capital.

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Selecting a site

The primary criteria for a successful rope swing site are simple and intuitive: look for a large tree with a high limb to attach to and a swing zone that is clear of obstacles. However, good practice demands consideration of a number of other important factors.

Tree species to use

The structural properties of living trees vary greatly between different species, meaning some types of tree make much better candidates for rope swings than others. The same thickness of branch that could offer a perfectly secure anchor point in one species might be dangerously unsound in another.

Table 1 is a guide to the commonly encountered tree species in the UK that are likely to offer the most appropriate supports, and which are best avoided. Confident identification of tree species is essential.

Refer to a field guide or visit www.british-trees.com/treeguide if you are uncertain.

Table 1: A brief guide to the suitability of common tree species for rope swings.

Common tree species and their suitability for rope swings		
Good	Only when limbs are large and the tree is in good condition	Avoid
Beech	Ash	Fir
Hornbeam	Cedar	Larch
London plane	Cherry	Pine
Norway maple	Horse chestnut	Poplar
Oak	Lime	Silver birch
Sycamore	Sweet chestnut	Spruce
		Willow

Particularly old or prominent trees of any species should be protected in order to conserve heritage, amenity, or ecology and so it is advised that such trees are avoided. A patch of bare earth can form under swings created by feet scuffing the floor and so supervisors should consider if this will be acceptable with the site managers.

Tree assessment

A tree assessment must be carried out from ground level prior to any climbing of trees on a site. Where practicable this should then be followed by a climbing inspection to check the limb that will be used to support the rope swing (from a ladder or rope and harness as appropriate). It is preferable to look at the candidate limb from above as well as below as some structural defects may not be visible from ground level. If a climbing inspection is not possible, it will be necessary to test the anchor limb more exhaustively before using the swing; please see the section of this guide on installing a swing from ground level for more on testing. Do not carry out a climbing inspection without the appropriate equipment.

Trees strive for uniform stress distribution over their surface. If this is disturbed by locally high stresses, then the tree will lay down thicker annual rings at this place. Conversely, if it is under-loaded, it will make less annual increments. The form of a tree is thus an indication of its structural condition, the so-called 'body language of trees'. For these reasons visual tree assessment (VTA) is an appropriate and widespread method of tree diagnosisⁱⁱ. The use of VTA when considering installing a rope swing is discussed below:

- Look for cracks, splits, bulges and unusual swelling as these often indicate bio-mechanical tree defects. Frequently these are not particularly significant, although in some cases they leave the tree liable to limb failure.
- Look out for fungal fruiting bodies and decay. Knocking a tree with a hammer (sounding) can help reveal the extent of hollows or decay. Dead branches at the ends of limbs are a sign of decay or infection. Obviously limbs with extensive decay or cavities should not be used to support a rope swing.
- Look at the point where the branch forks from the main stem or larger limb. If there is a seam, crack or "ears" at this point this indicates that the annual rings are not welded and the limb is at risk of tearing out. Limbs with these weak fork unions should not be used to support rope swings.
- Trees that have always grown with a lean should have adapted their growth to compensate and so, in the absence of any structural defects, are likely to be as strong as upright trees. However, trees that appear to have had recent rootplate movement should not be climbed or used for a rope swing.
- Any dead or hanging branches above the swing and areas of activity should be removed or stabilised. Using the swing is likely to dislodge any loose material in the crown that has not been removed or made safe in advance.

The findings of the tree assessment should inform your decision of whether the tree is suitable for a rope swing or not. You should record that you have made a tree assessment and your conclusion as part of your risk/benefit assessment.

Terrain

The terrain around the swing site can make a huge difference to the relative risk to users, as falls from the swing should be expected. EN1176 governs the provision of safety surfacing materials in artificial playgrounds, but rope swing installations in wild environments must work with the surfaces nature provides.

Unsuitable

Hard surfaces such as concrete, tarmac or gravel

Suitable

Grass or bare earth and leaf litter typical of woodland floors

Careful judgement should be used when installing swings over unsurfaced natural pathways that experience very heavy pedestrian traffic as the earth here may become compacted, forming a surface that can be almost as hard as tarmac.

The 'fall zone' of the swing site extends up to approximately 2.5m in every direction from a potential swing's maximum reach when in use, and should be free from additional hazards such as rocks and other trees. Inspect the fall zone and remove any hazardous

objects. If hard tree stumps or large areas of exposed roots or rock are present in the fall zone and cannot be removed or made safe, the site is not suitable for a tree swing. If the support tree or neighbouring trees have any small branches that are within the swing's reach, these should be carefully pruned out of range.

Sites with steep gradients can be more attractive as potential swing sites; they can also be more hazardous. The maximum fall distance from swing seat to ground must not exceed 3m at the swing's likely highest point above the downward slope. Sites where the fall distance is greater than 3m are unsuitable for tree swings, and a less-than 2m maximum fall height is preferable. If users falling from the swing are likely to continue falling further down the slope after making contact with the ground, then the fall zone should be considered to extend as far as the nearest level ground, and the terrain considerations outlined above apply to this whole area.

Water

Limbs of trees overhanging water can be excellent sites for swings, but such sites present their own set of risks. An assessment of their suitability should answer the following questions:

- 1 How deep is the water?
- 2 Are both the bank and the bed of the river/pool free from hazards such as sharp rocks, logs, branches or other hazardous material?
- 3 Is there an obvious clear exit from the river i.e. a place without steep sides that can easily be climbed?
- 4 Is the river/pool free from adverse currents?

If the water is deep enough to swim in then there is a clear risk of drowning, and the swing should not be used without supervision from a strong swimmer with a buoyancy aid. Please see RoSPA's information sheet on water safety for children and young people.ⁱⁱⁱ

Installation

Note: The following guidance is principally directed toward single-rope swing systems, but can also be applied to dual-rope swing systems in which a seat is suspended between two lines. Dual-rope systems are typically used in playgrounds because the swing path is predictable and so other play equipment and playground users can reliably be avoided. Single-rope systems are better for lone tree swings in natural environments, where their freedom of movement and unpredictability help contribute to the wild play experience. Where a site is ideal in some respects but there is a fixed obstacle in one part of the swing zone, consider installing a dual-rope system to restrict the angle of swing to the safe area of the zone.





Selecting an anchor point

Once you have chosen a suitable site and tree for installing a rope swing you should next consider where best to place the swing in the tree.

The rhythm of a swing's progress along its arc is known as its 'cadence', which determines how far and how fast the swing user will travel. In terms of user experience, a good swing has the greatest possible cadence. The greater the distance between the seat of the swing and the anchor point, the greater the swing's potential cadence will be. Therefore the best anchor points for swings are large limbs that are a long distance from the floor, with good clearance beneath them.

When deciding where the rope swing should be installed on the chosen limb, consider how strong the candidate branch is and how much force you would put on the branch when the swing is in use. The lever effect is very significant in this circumstance; the further away the load is from a branch union, the greater the load experienced at the union. Also, if a load is applied to the end of a long branch the movement can cause a branch to crack along its length due to the conflicting forces at the top of the branch and at the underside. This is of course harmful to the tree and in extreme circumstances it could cause the limb to snap.

On the other hand, choosing an anchor point on the limb that is too close to the trunk can cause swing users to be more likely to collide with the tree trunk. If the site is suitable in every other way, then collisions with the supporting tree may be one of the most significant risks to users. Test the typical trajectory of the swing from its likeliest ground access point before use. If collisions with the trunk or other branches seem likely, first see if it is possible to ensure users start each swing from a different point that would result in a safer swing trajectory, consider a dual-rope system, or move the swing to a different anchor point. Equally, if a chosen branch is seen to be bending considerably during use the supervisor should consider moving the rope closer to the fork or taking the swing down altogether.

Equipment

Unlike the support structure (the tree and anchor limb) which is part of the natural environment and therefore always to some extent an uncertain quantity, the other elements that make up the swing

system (the line, attachment point and seat) should be sourced to specification. Do not use old or second-hand equipment with an uncertain history, as it may have damage or weaknesses that are not obvious to the naked eye. In particular natural fibre rope can rot when wet and lose its strength, but this is not apparent until it fails suddenly.

Rope

As a general rule, all equipment used at height as part of a system that carries people is expected to have a minimum breaking load of 22 kN (2243kg) or more. The terminology of rating load-bearing equipment is confusing and sometimes contradictory, with many similar yet distinct terms such as Minimum Breaking Strength (MBS), Total Potential Load (TPL) and Safe Working Load (SWL). It is not important for the layperson to understand the distinctions between these different terms: if an item of equipment is rated to carry people then it is appropriate for use as a component in a swing system.

However, the ideal type of line to use for semi-permanent swings is the thick hemp or polyester rope typically used for mooring boats, which has not been rated to carry humans but is easier and therefore safer for swing users to grip than climbing grade line, which tends to have a much thinner diameter. Newly bought 18mm-45mm diameter mooring line is more than strong enough to carry human beings safely, especially at the levels of force to which a swing is subjected, which are typically much less extreme than the shock loads applied when arresting a fall from height.

For temporary swing installations at remote sites it may make more sense to use lighter 10mm-16mm line. Line of this diameter should be rated to carry people, and in this case it is vital to choose 'static' line rather than 'dynamic' line that is designed for the purpose of arresting a fall (as used in rock climbing). Dynamic line purposely has a lot of stretch built in to allow it absorb shock, meaning a swing constructed using a dynamic line can stretch in use and cause users to collide with the ground. Static line does not stretch in this way, so the length of the swing will not change under force.

Thick ropes give the user something to hold on to, but if they are too thick they become hard for small hands to grasp; so aim to use a rope that is between 18mm and 45mm diameter. 10mm-18mm diameter line is suitable only in conjunction with a swing seat that comfortably supports the users' weight fully (see below).

Seats

A secure swing seat is the most effective measure against the risk of falling. It is acceptable to make a seat by tying a bulky knot in very thick diameter line (above 18mm). This seat type is safer for bystanders than a hard wooden seat, but less safe for users, who may have difficulty staying on while swinging.

On balance, a wooden seat has the advantage in terms of both safety and utility, and is essential when using rope that is under 18mm diameter. The best wood to use for a seat is a freshly cut length of round wood around 30cm long. The swing will be more comfortable if any knobbly bits are removed and the bark is stripped, but if you can find a branch with smooth bark this may not be necessary. Any found dead branch must be tested before it is used as a swing seat; if you cannot break it deliberately without using tools then it is unlikely to break during use.

Determining the correct height at which to suspend the seat is not straightforward. If the seat is suspended too low then users may touch the ground during use. Conversely, if

the seat is attached too high to be accessed easily from ground level by children then boarding and dismounting can become unnecessarily difficult. Living trees are not static objects and even quite large limbs may have some give during swing use, particularly if two or more people board the swing simultaneously (an eventuality that must be planned for as swing use is rarely in the full control of the installer). In general, it is best to aim for approximately 25cm clearance between the seat and the floor at their closest point during use, with up to around 60cm clearance at the access point when the swing is unoccupied.

If you have safe access to the point of attachment to the tree, set seat height here rather than at the seat, as this allows more efficient fine-tuning. Focus first on making a secure seat attachment, and then make any height adjustments in-line. We advise that those without specialist expertise in knots should use a round turn and two-half-hitches (see below) to secure the seat to the swing rope. If you are installing the swing from ground level, you can adjust the height of the seat by feeding line through the round turn at the seat and tying off the excess as additional half-hitches. Regardless of the seat attachment type used, the priority is a secure seat with a properly dressed knot at the line's end.

Allowing for a small tail below the seat can make the swing easier to handle during use, but if a tail is included it should be a short, single section of neat line to avoid snagging. Care should be taken to ensure children don't grab the tail, as this may cause a fall.

Attachment to the tree

Rope swings can be attached to a tree in one of two ways: from ground level, or at height. Each approach carries a different set of risks.

You should only attach at height if you are able to safely access the anchor point. Installation from ground level is clearly the safest option and the first principle of the Work at Height Regulations 2005 is that working at height should be avoided wherever possible. Please refer to the Regulations for details of the statutory duty to manage risk in this context.^{iv}

However, if it is both practical and safe to carry out the work at height, this is the better option. Where practicable the anchor limb should always be inspected from above, as there is a risk that the branch may fail during use if it has structural defects not visible from beneath. It is also easier to securely attach the swing by tying knots at the branch rather than at ground level, and allows the use of optimal attachment techniques that cannot be deployed from the ground.

Attachment at height

Ideally the mobile part of a swing installation should not attach directly to the tree limb. Swing use causes concentrated friction and wear at the anchor point, both to the rope and to the supporting branch. Long-term installations can sustain critical damage at this point over time, causing either the swing rope itself or the supporting branch to become unsafe. Temporary installations may safely attach directly to the tree, but should ensure that an appropriate knot (see below) is used to minimise friction on the cambium (the outermost layer of the tree's living tissue) as even short-term heavy use can cause severe damage in some species.

The ideal attachment for a tree swing installation is a 45mm minimum width nylon or polyester webbing sling (a continuous loop) that is rated to lift at least 22kN and of suf-

ficient diameter to girdle the anchor limb when doubled over (appropriately sized and rated pre-made webbing sling loops are available from arboricultural equipment suppliers, or from Monkey-Do directly). This type of broad, smooth, flat webbing - similar to a seatbelt - distributes force more evenly across a larger contact surface area, helping to minimise damage to the support tree. Pulled through itself, the sling grips the branch in a choke hold when loaded (see www.animatedknots.com/girth). This prevents the anchor point from slipping out of position during use, and also ensures that friction is not transferred from the moving line to the surface of the bark. The choke then relaxes and expands when the swing is not loaded, preventing the attachment from constricting the limb's growth or circulation.

Professional climbers and others with specialist competency in this area are free to choose an appropriate knot to attach the swing to the anchor point in the tree. For the lay-person however, we recommend the round turn and two half-hitches (see www.animatedknots.com/roundturn) regardless of whether or not webbing slings are also deployed. This knot is preferred for a number of reasons:

- It is easy to learn and difficult to tie incorrectly; any mistakes are immediately obvious to the untrained eye during installation.
- It allows easy adjustment of the swing seat height as excess line can easily be fed through the knot before finishing.
- As with slings, this knot applies a choke hold when loaded, preventing slippage and minimising friction and wear during use but expanding with the tree's growth the rest of the time when tied directly around a branch.
- It tightens up under force yet can be easily untied once the force has been removed.
- It can be used at both the seat and the anchor point.
- It can be used to secure the swing rope directly around the anchor limb, or to a webbing sling by simply feeding the round turn through the sling loop.

Once the two half-hitches have been tied off at the anchor point, and the swing seat suspended at approximately the right height, the system should be tested and adjusted as necessary. Use any excess line at either end to continue to tie additional half-hitches along the swing rope until the surplus is exhausted. Additional hitches ensure there is no loose tail and enhance the security of the knot. If there is a great deal of excess line after the anchor point, tie off the excess to the anchor limb or consider cutting the line to a more suitable length.



Attachment from ground level

A rope swing can be both installed and removed safely from ground level using the following technique. You will need a rope that is at least three times the length of the distance between the ground and the anchor limb - 20-25m should be more than sufficient for most swing sites - and preferably not thicker than 12mm as heavier line than this can be very difficult to throw accurately.

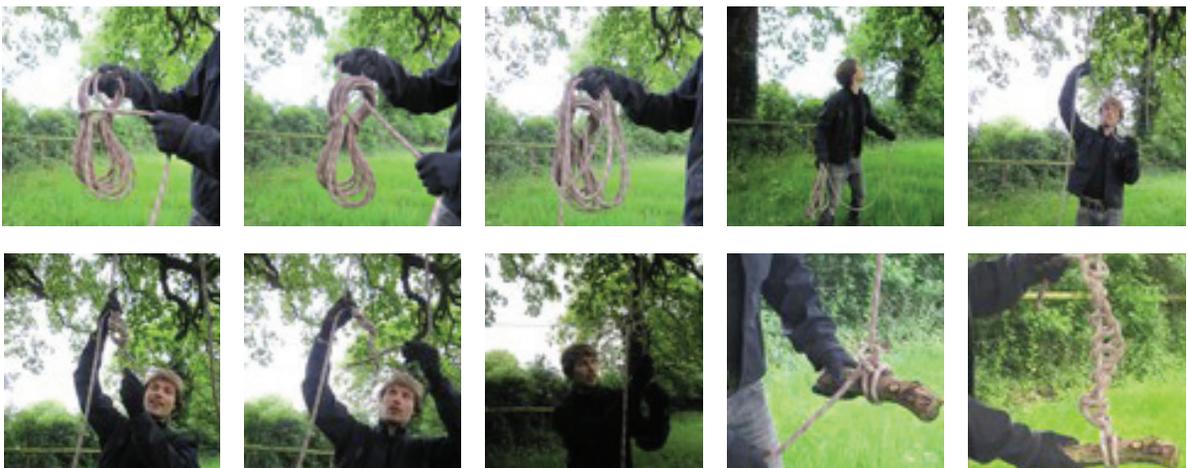
Coil around a third of the line loosely into one hand, making sure the coils do not feel too heavy to throw. Wrap a final loop of line around the coils to keep them together - this is your 'basket' - and then pull a loop or 'bight' through the coils - this is your 'handle'. Holding the 'handle', add a couple more loops of line to your throwing hand and throw the whole 'basket' over the anchor limb. The basket will uncoil the rope back down to you once it is over the limb. It may take many attempts to get the line into the exact position you have chosen for your anchor point, but remember that this is key to the safety and success of the swing, so it is worth getting right.

Once the rope is in the correct position over the anchor limb, ensure that the short end is hanging at roughly head-height, taking care not to let go (hold it in your teeth if necessary). Now take a bight of rope from the long end, also at head-height, and tie it into a figure-of-eight loop (www.abc-of-rockclimbing.com/climbing-knots/figure-eight-loop.asp).

Feed the short end of the line through the eye of the figure-eight, and then continue to pull it through, hauling the figure-eight up the line until it is flush against the anchor limb.

Tie the remaining line that is trailing from the figure-eight off to the tree's trunk or other suitable point where it will not obstruct the passage of the swing user. This is excess line that will not carry any weight so there is no need to use a special knot; just make sure it is out of the way while the swing is in use.

Now attach the swing seat to the other end of the line that has been fed through the figure-eight. This line is secured by the figure-eight at the anchor point, but is now much longer than needed. First attach the swing seat as discussed above, testing and adjusting until it is at the right height. Then tie off the excess line in a series of half-hitches, either to the swing seat itself or back up the line towards the anchor limb. Do not leave long lengths of excess line trailing from the swing.



Thanks to Leo Murray for the above images. To see the full series go to:
www.dropbox.com/gallery/5240473/1/How%20to%20Tree%20Swings?h=1d9ab8#

As with the slings and knots discussed above, this system creates a choke-hold around the limb that protects the tree from friction and prevents the swing from slipping out of position. The difference here is that the anchor knot can be retrieved from ground level after use by simply pulling on the excess line that you tied off to the trunk. Remember to untie the swing seat from the line first; otherwise it can become stuck at the anchor point.

Testing

The swing should be fully tested and adjusted as necessary before use by children. Is the anchor branch bending more than expected? Does the swing carry users closer to nearby obstacles than expected? Is the seat height correct, both for easy access when unoccupied and for ground clearance when in use?

Ensure others are at a safe distance from the swing zone and host tree during initial testing. This is the highest-risk part of the entire process, during which unforeseen hazards can manifest, such as falling deadwood that may have escaped notice during the tree assessment.

If the swing has been installed from ground level without a full inspection of the anchor limb from above, you should apply a higher standard of test to the limb. It is vital to ensure that any structural problems not detectable from ground level are revealed at the test stage. Do not stand directly beneath the branch when loading the line for the first time. Stand at a 90° angle to the direction of the branch, a safe distance away, and have two to three average or large adults apply as much force as they can to the line. If the branch seems sound, repeat this test from the opposite side. An adult may then test the swing as above.

Risk/benefit assessment

Once the swing is installed and it has been tested the risk/benefit assessment can be carried out. Different organisations will have different ways of assessing risk but we advise that the following steps should be followed:

1. Visit site
2. Identify tree species and choose candidate tree
3. Carry out tree assessment
4. Look for potential obstacles on the ground
5. Select appropriate anchor point
6. Select seat
7. Install rope swing using suitable equipment
8. Adjust height of seat
9. Test rope swing
10. Carry out risk assessment
11. Supervise activity
12. Take the swing down before you leave (unless semi-permanent installation has been planned and agreed with site managers)

Lastly note all your actions in your risk/benefit analysis form.

Supervising use

If used sensibly the chance of falling off a rope swing is low and supervision can direct the manner in which the swing is used. One of the most significant risks associated with rope swings are injuries from being hit by the swinger's foot or the log on the end of the rope when it is swinging without a person on it. Therefore it is sensible to keep all those who are not directly engaged in the activity out of areas where such collisions could occur.

Regularly check that the rope is not worn and that any knots are holding firm. If, at any point, you hear a cracking sound from the limb or tree get people off the swing immediately and investigate, if the limb has cracked the swing must be taken down.

Small injuries like scuffs and scrapes are to be expected in this activity. A first aid kit should be present on site; it is also advised that at least one of the supervisors has appropriate first aid training.

You will have an extra duty of care to those children who through disability, low ability or inexperience need support and encouragement to have a go. They may be gently encouraged, but should not be persuaded, belittled or coerced, either by you or by other children, as this may increase the risk of them getting hurt and could induce a liability for any injury on your part.

Semi-permanent installations & maintenance

This guide is aimed primarily at temporary swings where play is supervised and the swing is removed after use. If the location of the swing is suitable, and the swing is found to function well, the swing may be left in place provided that the site owner/manager grants permission to do so. If a tree swing is to be kept on a long-term basis, then it must be subject to an inspection regime by a competent person, ideally the installer. There is no fixed rule for how often inspections should take place; frequency will vary with the site, local usage and existing risk management procedures. A high-use scenario might typically demand routine visual inspection from ground level each week to check for vandalism, wear or damage, supplemented by a comprehensive annual inspection of each individual component of the swing system, including a re-assessment of the support tree. Keep appropriate records of all checks and if in doubt about any part of the swing system, either replace that part, consult an arboricultural professional and / or a safety inspector as appropriate, or remove the swing.

Semi-permanent installations must also consider carefully the implications of unsupervised use, including the possibility of taking additional precautions such as signage. See the Forestry Commission's pamphlet on managing risks from self-built play structures in woodland environments for more advice.^v

Footnotes and references

ⁱ D. Ball, T. Gill and B. Spiegel (2008) Managing Risk in Play Provision: Implementation guide The Department for Children, Schools and Families (DCSF) and the Department for Culture, Media and Sport (DCMS).

ⁱⁱ C. Mattheck (2007) Updated field Guide for Visual Tree Assessment. Forschungszentrum Karlsruhe GmbH. Germany.

ⁱⁱⁱ RoSPA (2007) Water Safety for Children and Young People. Royal Society for the Prevention of Accidents.

^{iv} Work at Height Regulations 2005 www.hse.gov.uk/falls/regulations.htm

^v P. Harrop (2006) Rope swings, dens, tree houses and fires. A risk based approach for managers facilitating play structures or activities in woodland settings. Forestry Commission, England.
[www.forestry.gov.uk/pdf/fce-rope-swings-dens-fires.pdf/\\$FILE/fce-rope-swings-dens-fires.pdf](http://www.forestry.gov.uk/pdf/fce-rope-swings-dens-fires.pdf/$FILE/fce-rope-swings-dens-fires.pdf)

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