Supported by Sida

YOUTH AND UNITED NATIONS GLOBAL ALLIANCE LEARNING AND ACTION SERIES

Forests Challenge Badge

Resource and Activity Guide

CBD :: FAO :: THE GREEN WAVE :: UNESCO :: WAGGGS :: WWF :: WOSM

Sida

This document has been financed by the Swedish International Development Cooperation Agency, Sida. Sida does not necessarily share the views expressed in this material. Responsibility of its contents rests entirely with the author.

A United Nations Decade on Biodiversity, 2011-2020 product.

21 March International Day of Forests

Table of Contents

Join us to make a difference!

The Youth and United Nations Global Alliance (YUNGA) is a partnership between United Nations agencies, government institutions and civil society organizations that have joined forces to encourage children and youth around the world to become aware of the issues that affect all human beings everywhere. YUNGA was conceived as a gateway to assist the engagement of young people in activities of key environmental and social concern and to promote their participation in the initiatives of the United Nations.

Children and youth have the right and the responsibility to be informed and take action. By providing practical tools, YUNGA and its partners educate young people and motivate them to become actively involved in the protection and sustainable use of our natural resources and the life it sustains. Children and youth are responsible citizens capable of taking up the challenge and acting as effective agents of change.

Agriculture, biodiversity, climate change, energy, forests, hunger, nutrition, oceans and water are only some of the thematic areas on which YUNGA and its partners are working. Their strong commitment to making an impact on youth's lives has guided them in the development of fascinating resources which have a global coverage, but with a local outreach. YUNGA is already making a difference, and everyone is invited to join in!

Children and youth have the strength and the ideals to make the world a better place for themselves and for the generations to come. As their leaders and teachers, you can empower them through sharing knowledge and encouraging their participation. If you believe, as we do, that young people have an important role to play in addressing and overcoming these and other issues, the ***Forests Challenge Badge – Resource and Activity Guide*** *is a great way to start shaping the future leaders of our world!*

Introduction

The *Forests Challenge Badge – Resource and Activity Guide* is designed to support you in educating children and youth about forests, the social, cultural and economic value of forests and the importance of using its resources in a sustainable way. The guide contains simple teaching tools to make learning appealing and fun, and provides a selection of activities and exercises to encourage young people to understand the link between forests and human well-being and to engage in efforts to preserve and improve forests. The guide can be used to achieve the Forests Challenge Badge or can be used separately.

The materials we propose seek to ensure that young people consider the environmental, economic and social impacts of their actions and decisions in the local and global community. By using the guide you will help them understand that all members of society have the right to live in and enjoy a safe world where they can ensure their health and happiness. Although these activities teach specific skills and knowledge, their broader intent is to stimulate thought and discussion about the issues that affect our world today, and its consequences for the future.

Other materials

This guide complements the Forests Challenge Badge activity booklet, which has been designed to help educate children and youth about the crucial role forests plays for life on our planet. You can find this and other resources at www.yunga-un.org

To receive updates on new releases and other YUNGA news register for the free YUNGA newsletter by emailing yunga@fao.org

Help your group take up the challenge, use these materials to motivate them to learn and act, they have a lot to say about the issues that are affecting everyone on Earth and possess unique insights into solving problems in their communities. Children and youth have a loud voice, so encourage them to raise it and tell the world they are here to stay and make a difference!

How the resources are organized

The activities and exercises have been organized in the same order as in the Forests Challenge Badge. These are divided into four main sections:

A. **Forest life:** introduces basic facts about forests and forest life and explores the different types of forests.

B. **Forest in use:** takes a closer look at the wealth of services and resources that forests provide.

C. **Forests and culture:** explores the cultural significance of forests around the world, and the role forests play in recreation.

D. **Forests at risk:** discusses the ways in which natural and human processes can harm forests, harming life on Earth as a result.

E. **Take action:** suggests ideas to motivate and help your group or class undertake forest-related initiatives within your local communities.

Each activity of this guide contains:

Aim	A statement of the knowledge the activity wishes to transfer.
Materials	A list of the materials needed for the activity.
Time	The amount of time needed to carry out the activity.
Background	Some activities contain useful information that provides an overview to the focus of the activity.
How to do it	A clear explanation of the steps needed to develop the activity.
Discussion	Useful questions for you to use when discussing about the issues that are being considered.

More resources

Useful **Web sites** are provided at the end of each section to help you obtain valuable information for you and your group and, of course, to get you moving! A **glossary** explaining key terms can also be found at the end of the activities sections.

Age ranges of activities

To help you and your group select the most appropriate activities, a coding system is provided to indicate the age group that the activity is most suitable for. Next to each activity you will see a code, for example **'Level 1 and 2'**, which indicates the activity should be suitable for five to ten years old and eleven to fifteen years old.

Please note that this coding is only indicative. You may well find that some activities at other levels are more suitable for your group or particular individual.

Level 1 FIVE TO TEN years old
Level 2 ELEVEN TO FIFTEEN years old
Level 3 SIXTEEN PLUS years old

How to use this document

Step 1

Activities are provided for each category: **"Forest Life"**, **"Forests in Use"**, **"Forests and Culture"**, **"Forests at Risk"** and **"Take Action"**. Use the activities you think will work best with your group, according to your possibilities, needs and interests. The activities listed are just ideas, so we encourage you to be creative and modify them or come up with new ideas. Most of all, think of ways to make the activities lively and fun, for example through songs, games, plays, concerts, paintings, photography, posters, collages, poems, quizzes, essays, fairs, conferences, workshops and many more. Some activities can be done individually, and others in small groups.

You can contact others to join the discussions. Invite families and the community to contribute to and participate in your activities. You can also invite media representatives to help you publicize your event and promote public awareness.

Step 2

Support and guide your group while they carry out each activity. Allow enough time for the children and young people to prepare adequately. Encourage them to think and act creatively when undertaking their activities.

Step 3

Encourage discussion. Providing an opportunity for questioning is a good way to promote a deeper understanding about a topic and develop thinking skills (see the **'How to ask good questions'** box on the next page). Moreover, this will lead them to reflect of ways in which they can take action in their lives

and their communities. Let your group discuss different points of view and come up with possible solutions. You can finish by reaching some general conclusions.

Step 4

At the end of the activity, allow enough time for a feedback; see what individuals thought of the activity and what they have learned. Will this motivate them to make changes in their daily lives? See if they are interested in doing another activity, maybe they want to carry out an initiative in their school or local community. You can introduce them to the ***Forests Challenge Badge***; see if they are interested in facing the challenge and getting the badge.

Step 5

Share with YUNGA! We are always delighted to hear how you have been using our resources, so send us your stories, photos, drawings, ideas and suggestions to: *yunga@fao.org*

How to ask good questions

Avoid questions that can be answered by 'yes' or 'no'. Let the participants know that you want them to reflect about a specific topic. Remind them every idea is important. Encourage them to ask questions.

Remember you don't have all the answers. Let the participants discuss possible answers and come up with creative solutions. Answer a question with another question. This helps the participants to think further and draw conclusions.

Sample questions:

* *What would happen if...?*
* *What did you notice about...?*
* *What are some possible explanations of...?*
* *What is the role of...?*
* *How do you think you/them would feel about...?*
* *If you were ... what would you do?*
* *What would you have done differently?*
* *What are the advantages and disadvantages of...?*
* *What can this teach us about...?*
* *Can you describe several things we can do to...?*
* *Would everyone agree with...? Why or why not?*
* *Can you name some good examples of...?*
* *What changes can you make to...?*

Be safe and sound

The Resource and Activity booklet has been designed to support you in undertaking educational activities. However, as you will be implementing these activities in different contexts and environments, it is up to you to ensure that the activities you choose are appropriate and safe.

Exploring the great outdoors is a fantastic way to learn about the natural world; nevertheless, it is important to take some precautions to ensure nobody gets hurt. Please plan carefully and make sure you have enough adult support to keep participants safe, especially when near water. Some general precautions to consider include:

Look after yourself

* Wash your hands after every activity.
* Don't look directly at the sun.
* Don't taste things you find unless you are certain they are not poisonous.
* Don't drink water from natural sources unless you are sure it is safe.
* Be particularly careful when you're near water (especially non-swimmers). Make sure there is a lifebelt to hand if you are near deeper waters.
* Be careful when using sharp objects and electrical appliances. Young children should be supervised by an adult at all times.
* In some activities, you have the option of uploading pictures or videos to the internet on websites such as YouTube. Always make sure that everyone in the pictures or video, and/or their parents, have given their permission before you post anything online.

Look after the natural world

* Treat nature with respect.
* It is better to leave nature as you found it. Never pick protected species. Before collecting plants or picking flowers, get permission. Only take what you really need and make sure you leave at least one third of anything you find in the wild.
* Be careful if you are working with animals. Wear protection if necessary. Be gentle. Make sure they have appropriate food, water, shelter and air. When you're done, return them to where you found them.
* Recycle or reuse the materials used in the activities as much as possible.

Forest Life

Introduction

Have you ever thought about the definition of a forest? Well, it is a little bit more complicated than you can imagine. A forest is a very complex **environment** that is constantly changing and that is made up of living and non-living things. The living things include animals, plants, fungi and microscopic soil **organisms**, while the non-living things include water, air, sunlight, soil, rocks and **nutrients**. In a forest, all these elements combine to create a unique habitat that provides amazing goods and services to our world.

There are many different types of forests around the world and they are generally classified according to location and climate. For example, **tropical rainforests** are located near the equator and present high temperatures and abundant rainfall; **boreal forests**, on the other hand, inhabit the cold, windy regions around the poles and present low temperatures. But, despite their diversity, there is one element that unites all forests, they are mostly made up of trees. Forests and trees come in many sizes and forms and they cover 31% of our total land area.

Forests are essential for the maintenance of life on Earth. They are among the most valuable storehouses of biological diversity on our planet. They help to maintain clean water supplies and prevent soil **erosion**. Trees absorb **carbon dioxide** and release oxygen which humans and other **organisms** need to live. Human beings obtain many different timber and non-timber products from forests, and forests provide us with various recreational options. Forests really are magical!

Our world is changing and it needs your help! It is time for you, the children and young people around the world, to use your amazing energy and creativity to assume different challenges to protect forests and promote the sustainable use of its resources. Many young hands are already working hard to raise awareness about the vital role forests play for life on Earth, but there is still a long way to go, they need you! Remember, if you start working today, you can make a difference tomorrow!

Activities

Tree Hunt

Level 1

Aim

To reflect about the incredible forms found in forests.

Materials

An open space with trees, pencils, notebooks.

Time

20 minutes.

How to do it

1. Take your group to an outdoor setting and explain to them that they will be going on a tree hunt.
2. Tell the participants to walk around and look for the following trees:
   - ***Trees in strange shapes.***
   - ***Trees twisted with vines.***
   - ***Trees lumpy with burls.***
   - ***Trees growing in unusual places.***
   - ***Trees that serve as a home for other plants and animals.***
3. Ask the participants to use their notebooks to draw their trees, so that they can show them to the rest of the group.
4. Have each participant present his/her findings and say three things that they enjoyed about their tree hunt.

Discussion

Where you able to identify other special characteristics about your trees? How might they have gotten that way?
What are the benefits of enjoying time outdoors?
Why is it important to protect our forests?

Behind the Lens

Level 1 2 3

Aim

To discover the different elements that make up a forest.

Materials

A trip to a forest, a photo camera (or a cell phone with camera), a computer, poster boards, adhesive tape and markers.

Time

Two 1 hour sessions.

Background

A forest is not just a big collection of trees, it is a natural, but complex **ecosystem** that is constantly changing and that is made up of living things (like wildlife, trees, shrubs, wildflowers, ferns, mosses, lichens, fungi and microscopic soil **organisms**) and non-living things (like soil, rocks, **nutrients**, sunlight, water and air). Trees, of

course, are the biggest part of this amazing community.

How to do it

1. Ask your group to help you define what a forest is and discuss about the different elements you can find in this incredible place, living and non-living. You can make a list to help them remember.
2. Next, ask the participants to take some pictures of all the forest elements you just talked about. Once they are done, have them sit in a circle and go through the pictures they just took; choose the best ones.
3. Print your favorite pictures and put up an exhibit for other classes or groups or, if you prefer, prepare a computer presentation and show it to them.

Discussion

Why can we say that a forest is not only a group of trees?
Why are trees important for this **environment**?
Can you think about some of the benefits we receive from a forest?

Get in Touch With Trees

Level 1 2

Aim

To discover different shapes and textures in nature.

Materials

An outdoor setting, shoe box, collection of objects from a wooded area, blindfolds, copies of the word search puzzle, notebooks, pencils.

Time

45 minutes.

Background

Trees are the biggest living thing that make up part of our forests, and they play an essential role in our lives as they give us food, oxygen, shade, construction materials, medicines, and many other things. Trees are an important part of every community; they help to maintain a healthy **environment** as they bring natural elements and wildlife habitats into our cities.

How to do it

1. Before venturing outdoors with your group, take a walk yourself and find an area where a few different tree **species** grow. Collect one or more objects from the ground underneath the trees. Place the objects in a 'mystery box' so they can be felt but not seen.
2. Take the participants to your collection spot, have them feel the items in the mystery box, and challenge them to search the collection area to find the matching objects. Ask:
   - What is important about your sense of touch? How do you use it?
   - What would life be like without your sense of touch?
   - Can you identify objects by only feeling them?
3. Complete this word search puzzle with the participants to discover ten words that describe texture:

Texture Word Puzzle

Z	Y	S	U	T	F	O	S
M	P	C	T	S	A	M	P
A	D	P	S	I	O	L	O
F	H	R	H	O	C	R	N
U	H	A	T	M	O	K	G
Z	B	H	B	U	M	P	Y
Z	H	S	G	Y	B	T	U
Y	O	H	A	R	D	G	R

Words: bumpy, fuzzy, hard, moist, rough, sharp, smooth, soft, spongy, sticky.

4. Blindfold the participants and have them examine trees using only their hands. Can similarities and differences be found?
5. Next, ask the participants to carefully observe trees and ask them the following questions:
   - What is the shape of the trunk? Tall, straight, bent, or gnarled?
   - Is there one trunk or does it split into multiple trunks?
   - What colour is the bark? How does it feel? How does it look?
   - What shape are the branches and twigs?
   - Are there any seeds, flowers, fruits, nuts, or cones on the tree?
   - What colour and shape are the leaves or needles?
   - Where are they located on the tree?
   - What is the overall shape of the tree crown?

   Compare and contrast different trees and record your observation data.

Discussion

What did you enjoy the most about this experience?
Can you name some similarities and differences between trees?
What changes can you make in your everyday life to protect trees?

Source: Project Learning Tree, Get in Touch With Trees, and The Closer You Look, www.plt.org/stuff/contentmgr/files/1/e3fbfdab383fcb60e1db3e2dc4585be2/pdf/plt_activity_2_get_in_touch_with_trees_lo.pdf

Answer:

Z	Y	S	U	T	F	O	S
M	P	C	T	S	A	M	P
A	D	P	S	I	O	L	O
F	H	R	H	O	C	R	N
U	H	A	T	M	O	K	G
Z	B	H	B	U	M	P	Y
Z	H	S	G	Y	B	T	U
Y	O	H	A	R	D	G	R

Healthy Forests

Level 1 2 3

Aim

To identify and understand the marks of a healthy forest.

Materials

A trip to a forest, notebooks, pencils, poster board, coloured pencils or markers.

Time

3 hours.

Background

A forest is an area of plants and animals made up mostly of trees. Every forest has layers of plants. These main layers are the **canopy**, the **understory**, the **forest floor** and the emergent layer.

- The *emergent layer* consists of the tallest trees that stick out even above the **canopy**.
- The *canopy* is formed by the branches and leaves from the tallest trees.
- Beneath the **canopy** is the *understory*, where shorter trees and shrubs grow.
- The *forest floor* has seedlings, grasses, ferns, and crumbling plants and logs.

Different kinds of plants and animals live in different layers of the forest. Any product or benefit that comes from the forest is a forest resource.

How to do it

1. Before leaving for the field trip have the participants think about the following questions:
   - Do you believe cutting trees to produce the products we use is necessary and good?
   - Could we live without wood products?
   - Can we go into the forest and cut down all the trees to get the wood we need for the things we want? Why do you think this would be healthy or unhealthy?
2. Define **forest floor**, under-story, **canopy** and emergent layer to the participants.
3. Explain that the **forest floor**, the **understory**, the **canopy** and the emergent layer are all connected in making the forest healthy. When they are in the forest they will examine all four and make a record of what they find.
4. Explain that today they will look at a healthy forest and identify what makes it healthy and discuss when it is good to cut the trees.
5. At the field site:
   - Ask the participants to look at the **forest floor**. What and how much is growing there? Are the plants all the same or is their variety? Do they see any signs of animal life?
   - Instruct the participants to look around them at eye level and slightly above. What do they see in forest growth? Can they see some animals too?
   - Direct their attention to the **canopy**. What can they see above? Is it solid or is there sun shining through? Do they see any animal life in the **canopy**?
6. Bring the class together for discussion.
   - Discuss what they saw on the ground. Discuss that good soil is needed to grow healthy plants and trees, and to provide food for animals.
   - Discuss what they saw in the **understory**. The smaller trees provide shelter to

wildlife and birds, and are the big trees of the future.

- Discuss the **canopy**. It gives shade to the **forest floor**, to trees that need to grow in the shade, and protects the **understory**. It provides homes for wildlife and it also provides shade for streams, so these can keep the temperatures cool enough for fish to live in. Can you see something above the **canopy**?
- Discuss that trees have a life span. If they are not cut and used, they will eventually die. Ask the participants if it is better to let them die or to be used for products we use.
- Ask the participants to consider that, if it is better to cut trees, how would a good forest manager choose which ones to cut. Some ideas to discuss are:
  - Trees that are crowding other trees and not allowing them to grow
  - Trees shading smaller trees that need more light to grow
  - Healthy trees with straight trunks
  - Trees that provide shade needed for smaller trees to grow

  Discuss that good **forest management** carefully selects what will be cut to benefit the remaining forest and provide the wood products that people need. Good **forest management** can also bring an unhealthy forest back into balance and provide wood in the future. Cutting trees is often necessary to maintain healthy forests.

7. Divide the participants into small groups. Explain to them that they will draw a poster demonstrating what they saw in the forest. The **forest floor** should show low growing plants, the **understory** a variety of smaller trees and shrubs, the **canopy** a healthy cover of mature trees. The participants need to point out a couple of trees that it would be wise to cut down to allow others to grow. They should add and identify some trees that protect smaller ones or shade a stream. Animal shelters should also be included.

Discussion

Can you define a healthy forest?
How can we get the wood we need without doing damage to the forest?
What is our responsibility to our forests?

Adapted from: PennState, College of Agricultural Sciences, Healthy Forests, Forestry/Natural Resources Lesson Plans, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/k-5/healthy-forests

What a Tree Craves

Level 1 2

Aim

To identify the basic requirements for tree survival.

Materials

An open area, 'What a Tree Craves' role card for each participant (strung with loops of string or wool to fit over participants' heads), 'Tree Need' cards – 50 each, made of squares (approximately 3 x 3 inch) of coloured cardboard in blue (water), green (food/minerals), white (air), and yellow (sunlight). (See page 19 for pre-made cards).

Time

30 minutes.

Background

A tree is composed of several structures and each has a specific function that enables the tree to survive:

- ***Leaves:*** use water, sunlight, and **carbon dioxide** gas from the air to make food (in the form of sugar). Enough food is made by the leaves to supply the whole tree with food energy.
- ***Branches:*** hold the leaves in place and help them to make the food.
- ***Trunk:*** the food moves through a system of 'straws' or tiny pipelines in the wood from the leaves into all of the other parts of the tree. The trunk also helps the tree to stand tall, enabling the leaves to reach the sunlight they need, and stores food for the tree to use during the winter.
- ***Roots:*** gather water and **nutrients** (minerals) from the soil, which are transported up the trunk to the leaves, where they are used to make the food. The roots also hold the tree in place and store some food for winter use.

How to do it

1. Help your group to identify the requirements for tree growth: **nutrients**, sunlight, water, and air. Describe for them the parts of a tree that are responsible for the functions that enable the tree to survive.
2. Divide the participants into four groups: roots, trunks, branches, and leaves. If there are an odd number of participants, make the extra students leaves and branches. Give each participant a ***'What a Tree Craves'*** role card to indicate the role he/she is playing.
3. Scatter the ***'Tree Needs'*** cards onto the ground nearby. Tell the participants that the different needs of trees are represented by cardboard squares in the following colours: blue (water), yellow (sunlight), green (food), and white (air).
4. Explain to the participants that they must each search through the cards on the ground or amongst the other players to find the needs that are listed on their role cards. For example, 'roots' must each find a water card and a mineral card. 'Trunks' must find a 'root' player who has already found its survival needs and escort that person to a 'branch' player, who has already found a 'leaf' player with all its survival needs met. The lucky 'trunk' will be the one who finds the extra branch/leaf, since that tree will be more able to make food for winter survival.
5. Start the game by yelling, 'Go!' In short order, all the connections should be made so that there are a number of completed trees in the forest, each having what it needs in order to survive.

Discussion

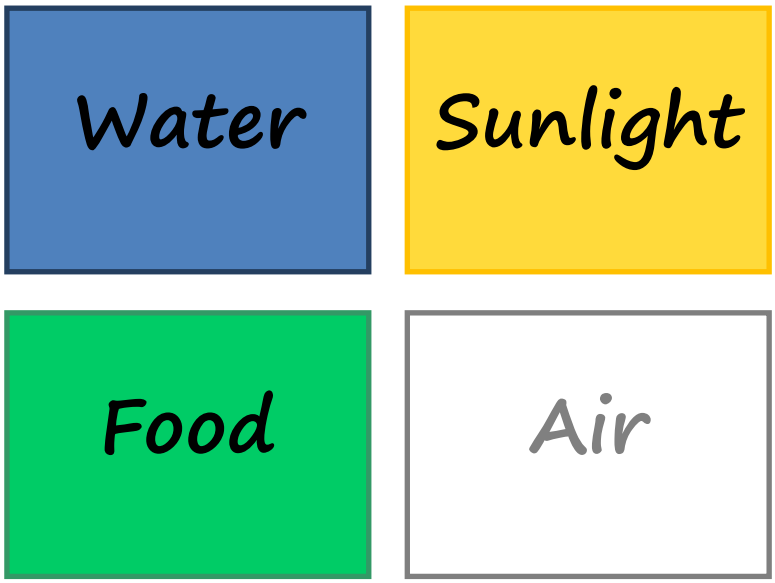
Can you name the main parts of a tree? Why is each of these important?
What would happen if you did not have sufficient food to grow? Is this the same for trees?
How can we help trees to have the basic things they need to grow and stay healthy?

Source: PennState College of Agricultural Sciences, What a Tree Craves: Air, Sunlight, Food, and Water, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/k-5/please-trees

What a Tree Craves Role Cards

ROOT	TRUNK
Water Food (minerals)	Root Branch Leaf
LEAF	**BRANCH**
Sunlight Air (carbon dioxide) Water	Leaf

Tree Needs Cards



Tree Growth

Level 1 2 3

Aim

To understand tree growth and the conditions that affect it.

Materials

- Physical model of the tree layers
  - Heartwood: cylinder or can labeled with the word 'heartwood'.
  - New wood: tape a piece of construction paper around the cylinder and label it 'new wood/xylem'.
  - Cambium: tape a piece of craft foam over the previous layer and label it 'cambium'.
  - Inner bark (phloem): tape another piece of construction paper over the previous layer and label it 'inner bark/phloem'.
  - Outer bark: wrap the model with a piece of tree bark (or attach pieces of bark mulch to resemble bark).
- Cross sections of wood for each group.
- Copies of the handout of the cross-section of a tree listing factors influencing growth, downloaded from the PennState College of Agricultural Sciences Youth webpage:
  http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/lesson-plan-pdfs/tree-growth-2
- Paper, pencils.

Time

1 hour.

Background

How does a tree grow from a tiny shoot into a forest giant? Trees undergo three different kinds of growth:

- *Height growth:* a tree expands in height from the growing points at the end of branches and stems. This means that trees grow from the top up, not from the ground up.
- *Diameter growth:* a tree grows not only up, but also out. Just beneath the bark is a thin layer of living cells called the cambium. The cambium is like a factory that makes two kinds of products. One, the wood, or xylem, is formed on the inside of the cambium layer. The other, called the inner bark, or phloem, is added on the outside of the tree. If you hurt the cambium by bumping the tree with a lawn mower or carving your initials into the trunk, you damage the tree's factory.
- *Root growth:* roots expand in diameter from a cambium layer also. They grow longer from their tips, just like branches and main stems do. The major difference is that roots grow down instead of up.

How to do it

1. Hold up the model of the tree layers and ask the participants what they think it is. Explain that it is a model of a tree and that today you are going to take it apart one layer at a time to see what is really underneath.
2. Tell the participants that before you show them the different layers, you must first explain the three ways in which trees grow:
   - Growth takes place at the ends of the branches and stems.
   - As trees get taller, they also grow in diameter to help support the tree.
   - The roots also grow in length and diameter.

   * Explain that the root system of the tree extends well beyond the branches of the tree. You could take the participants outside, look for a tree and measure the distance from the end of the branches to the trunk of the tree. Have the

class form a circle around the tree at a distance twice as long as the branch measurement. The area encompassed contains the roots that support and feed the tree.

3. Tell the participants as you show them the various layers that they will understand where the growth takes place. Beginning with the outer bark, identify and describe the function of each layer before removing it and proceeding with the layer beneath it:
   - **Outer bark:** is the 'skin' of the tree. Outer bark does several things. It protects the tree from injury. The bark is a barrier to insects and diseases. It also insulates the tree from winter cold and summer heat.
   - **Inner bark (phloem):** contains spaces or tubes through which food travels from the leaves down to the branches, stems, and roots. When phloem cells die, they become part of the outer bark.
   - **Cambium:** a cell layer covering new wood. It makes new bark (phloem) and new wood (xylem) every year.
   - **New wood (xylem):** carries minerals dissolved in water upward from the roots.
   - **Heartwood:** is the backbone of the tree. Heartwood is not living wood; it supports the tree. It is also the place where many waste products from the tree collect.
4. Divide the participants into small groups. Distribute the cross section of a piece of wood to each group. Ask the participants to look at their piece of wood and try to identify the various layers. Ask the students to share other things they notice about their wood. Direct questions as necessary, asking such questions as:
   - What are the rings? Trees' annual rings show what their growing conditions were like.
   - What do they mean?
   - Why are the rings light and then dark?
   - Why aren't they evenly spaced?
5. Distribute the handout showing a cross section of a tree listing factors that influence growth. Have the participants read aloud the paragraphs explaining some of the influencing factors of the tree's growth. Discuss other possible influences. Ask the groups to look at their cross section of wood and try to determine what may have caused some of the irregularities in the pattern. Allow them to share their thoughts, giving their reasons for their ideas.
6. Explain that each participant is going to illustrate his/her tree life by showing it in the form of tree rings. Ask basic questions such as how many rings it will have and so on. Then ask when a tree would have rings close together, far apart, and so forth. Draw an illustration on the board, showing a sample and identifying some influences. Explain to the participants that they should draw their tree life story and identify the influencing factors.

Discussion

Why is it important to learn about tree growth?
Can tree rings help you learn about the history of a particular place? How?
Where you able to reflect tree growth influences, either positive or negative, on your 'tree ring'?

Adapted from: PennState, College of Agricultural Sciences, Tree Growth, Forestry/Natural Resources Lesson Plans, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/k-5/tree-growth

How is Your Forest?

Level 1 2 3

Aim

To learn about and identify forests from other countries.

Materials

Computer with internet access, contact with a person/friend from other country, notebooks, pencils.

Time

A 30 minutes session to contact the foreign friends and a 1 hour session to review the participants' work.

How to do it

1. Remind your group how different types of forests can be found in different parts of the world. Which types of forests can you find in your country?
2. Explain to your group that their task is to contact a friend or family member who lives in another country and to ask him/her all about a types of forest that can be found there. Maybe this person can also send some pictures.
   *This activity can be done in class or as homework, individually or in small groups.
3. Ask each participant or small group to present their work.

Discussion

Why are there so many different types of forests in our planet?
Do we need all these different forests? Why or why not?
Why does **biodiversity** vary from one type of forest to another?

Types of Leaves

Level 1 2 3

Aim

To learn about different types of leaves.

Materials

An outdoor setting where you can find different types of leaves (or you can gather some leaves before the activity).

Time

1 hour.

Background

Leaf identification is a valuable way to learn about your **environment** and some of the oldest creatures living there: trees. There are many different types of leaves and they can be classified according to different characteristics:

According to the petiole:

- Petiolated: leaves that have a petiole.
- Sessile: leaves that do not have a petiole, the blade expands directly from the stem.

According to the blade:

- Simple leaf: shows an undivided blade.
- Compound leaf: a leaf that is divided into numerous small parts, each of these parts is called a leaflet.

According to the edge:

- Entire: has a smooth margin.

- Sinuate: has little curves with smooth edges like waves.
- Dentate: has little teeth at the margin.
- Serrate: has little bent teeth like those of a saw.
- Lobed: has divisions that do not arrive at the center of the blade.

According to the shape of the blade:

- Elliptic: resembling an ellipse, 2 or 3 times longer than wide.
- Lanceolate: spare-shaped, gradually extending at the base and lessening to the apex.
- Acicular: needle-shaped, several times longer than wide, ending sharply at the apex.
- Ovate: egg-shaped, wider at the base than at the apex.
- Cordate: heart-shaped, more extended at the base than the ovate type and with a notch.
- Hastate: halberd-shaped, wider at the base, but with lobes ending sharply.
- Linear: strip-shaped. Several times longer than wide, not pointed at the apex like the acicular type.

According to the veins:

- Parallel veined: the veins run at the same distance to each other.
- Pinnate: there is a main nerve, the midrib, from which the other nerves derive.
- Palmate: the nerves diverge from the main point such as the fingers do in the palm of the hand.

According to the arrangement along the stem:

- Alternate: springing one per node at different levels of the stem.
- Opposite: two per node, facing opposite sides of the stem.
- Whorled: several leaves disposed at the same level around the stem.
- Rosulate: forming a rosette, like a ring around the stem.

Source: Botanical Online, The Leaf: Types, www.botanical-online.com/hojastiposangles.htm

How to do it

1. Take your group to an outdoor setting and ask them to collect different types of leaves.
2. Gather in a circle and start by identifying the different parts of a leaf: bud, petiole, midrib, blade or leaf on a simple leaf and a compound leaf.
3. Next, using the leaves the participants collected, classify them according to: the petiole, the blade, the edge, the shape of the blade, the veins and the arrangement.
   *This can be tricky to learn and hard to remember, so provide multiple examples.
4. Next, play Leaf Hunt. Divide the participants in couples and explain that they will have to look for different leaves according to the specifications you give to them, for example:
   - Look for a leaf that has compound, alternate arrangement.
   - Look for a simple, serrated leaf.
   - Look for a simple, elliptic, entire leaf.

Discussion

Why are leaves important for tree growth and health?
How can you use leaves to identify different types of trees?
Can you think of different ways that leaves are used?

Trees and Light

Level 1 2 3

Aim

To discover why trees need sunlight.

Materials

Black construction paper, tape, scissors, a tree with large leaves (such as maple, linden, oak, or lilac). *This experiment doesn't work well with conifers.

Time

Three 20 minutes sessions.

Background

A tree is alive and requires energy. We humans get energy from the food we eat. A tree captures energy from the sun and converts it. This means that trees must have sunlight in order to live. What would happen to a tree if it didn't get enough sunlight?

How to do it

1. Explain to your group that you are going to do a small experiment to discover what happens when a tree doesn't get enough sunlight.
2. Cut two squares or rectangles of construction paper, large enough to cover a leaf.
3. Sandwich the leaf between the two pieces of construction paper. IMPORTANT: THE LEAF MUST BE ALIVE AND STILL ON THE TREE.
4. Tape the construction paper so that it stays on the leaf. The leaf must be completely covered so that no light gets to it.
5. Leave the paper in place for a few days, then take it off. What happened?
6. Go back and look at the leaf a week after you take the construction paper off. Has the leaf turned green again? Is it dead?
7. Redo the experiment but, this time, cut small circles in the construction paper.

Discussion

Why do leaves and trees need sunlight?
What else do trees need to survive?
What happens when one of these 'resources' are not available or if it is **scarce**?

Source: Forest Academy, Tree and Light, Experiments, www.theforestacademy.com/experiments/trees-and-light

Chlorophyll

Level 1 2 3

Aim

To learn about **chlorophyll** in leaves.

Materials

Stove, a small pan, tweezers, a glass, a container of warm water, rubbing alcohol, a green leaf (needles won't work so well), a microscope or magnifying glass.

Time

Two 20 minutes sessions (1 hour wait).

Background

The food that trees need is made in the leaves. Each leaf contains millions of **chlorophyll** cells. **Chlorophyll** cells are green, which is why leaves are also green. These cells actually make food through a process called **photosynthesis**. **Chlorophyll** cells take in **carbon dioxide** – people and animals breathe out **carbon dioxide**.

Chlorophyll cells combine this **carbon dioxide** with water sent up from the roots of the tree. In the **chlorophyll** cell, sunlight passes through this mixture and turns it into sugar and oxygen. The sugar is the food that trees need to grow.

How to do it

1. Explain to your group that you are making an experiment that will allow you to observe the **chlorophyll** in leaves and to see what a leaf looks like without its **chlorophyll**.
2. Begin by boiling some water in the pan. You don't need very much, just a few centimeters in the pan will do. Turn off the heat. Put the leaf into the water and let it steep for no more than 30 to 60 seconds. Use the tweezers to take the leaf out of the water, and then carefully put it into the glass.
3. Cover the leaf with rubbing alcohol, then sit the glass in the container of warm water and leave it for an hour.
4. While you wait, if there is a microscope or magnifying glass available, show the participants a slide from a leaf so that they can actually see some **chlorophyll** cells.
5. What do you notice when you come back to the leaf? What colour is the leaf? What colour is the liquid in the glass?

Discussion

How would you describe **chlorophyll**?
What would happen if trees didn't have **chlorophyll**?
What happens to leaves during autumn and winter? Why is that?

Source: The Forest Academy, Chlorophyll, Experiments, www.theforestacademy.com/experiments/chlorophyll

Searching for Stoma Activity

Level 2 3

Aim

To understand **photosynthesis** and **stoma** activity in leaves.

Materials

Lettuce leaf, iodine, microscope, slides and cover slip.

Time

1 hour.

Background

The exchange of oxygen and **carbon dioxide** in the process of photosynthesis and the release of water from the leaf into the air in the process of **transpiration** take place through tiny openings in the leaf called **stoma**. The **stoma** are opened and closed by surrounding guard cells, which contain chloroplasts (structures within a cell containing **chlorophyll**).

Photosynthesis is a combination of 'photo' meaning 'produced by light' and 'synthesis' which means 'putting together parts or elements to make a whole'. **Photosynthesis** occurs only in plants that contain **chlorophyll**. **Chlorophyll** is the enabler for the photosynthetic process. During **photosynthesis**, **chlorophyll**, **carbon dioxide**, water and light-energy from the sun are used to make a sugar-like food that becomes the basic source of energy for the plant. While making this food, the green plant gives off oxygen and water vapor into the air.

Carbon dioxide (CO_2) is exhaled by animals, created by **microorganisms** through the process of **decomposition**, and released during the combustion of **fossil fuels**. In the leaf of a green plant, **carbon dioxide** comes in contact with water (H_2O) and **nutrients** that have been drawn up from the soil by the roots of the plant. In the presence of sunshine, **chlorophyll** within the green leaf combines the CO_2 and H_2O. This combination results in the creation of a sugar called glucose that provides energy for the plant and all animals that eat that plant, or eat the animal that ate the plant. Not only are plants the base of **food chains** upon which all animals depend, but plants also produce oxygen, a gas that all animals (including humans) need to survive.

Carbon dioxide enters the leaf and oxygen exits the leaf through the **stoma**, usually found on the undersurface of the leaves. At the same time, water is also released in a process called **transpiration**. Most plants in temperate climates transpire about 99 percent of the water the tree has taken in by their roots. Plant **transpiration** helps modify the temperature and humidity of the surrounding area.

How to do it

1. Explain to the participants that they will have the opportunity to see under the microscope some of the cells that play a major part in the process of **photosynthesis**. Ask them to explain how the process works.
2. Place a drop of iodine on the center of a clean slide.
3. Break a lettuce leaf at a vein on the underside of the leaf and tear off the thinnest layer of leaf epidermis possible.
4. Carefully place the layer in the drop of the iodine stain on the slide; make sure it is laid out flat, not folded back. Place another drop of iodine on top of the lettuce leaf layer. Wait about 30 seconds and add a cover slip, then let the participants start searching for **stomas** using the microscope. Guard cells that are open are easier to spot than guard cells that are closed. They will resemble two green jellybeans formed around an oval. Have students draw and label what they see under the microscope.

Discussion

How important is the process of **photosynthesis**?
What parts of the tree intervene in this process?
Can you describe the **stoma** and their function in the leaves?

Adapted from The National Arbor Day Foundation, Searching for Stoma Activity, Trees are Terrific... Inside and Out!, www.arborday.org/kids/graphics/poster-contest/activity-guide08.pdf, page 20.

Clever Trees

Level 1 2 3

Aim

To conduct temperature and **transpiration** experiments to show how trees shade and cool their surroundings.

Materials

Several plastic bags, 2 or more different kinds of leafy plants if there are no available leafed-out broadleaf trees, 2 or more thermometers, pencils and paper, fan and container with water.

Time

1 hour.

Background

Temperature is a measurement of hotness or coldness. It is measured on a standard Fahrenheit or Celsius scale. **Transpiration** is the process by which water evaporates from plant tissues, primarily leaves. Most plants in temperate climates transpire about 99 percent of the water taken in by the roots. The other one percent is incorporated into the plant's structure. The vast majority of the water transpired by trees escapes through small openings on the underside of the leaf, the side away from the sun. Different **species** of trees and plants transpire at different rates depending on temperature, wind, light, and humidity. Plants in arid climates need to retain the limited moisture they take in, so their **transpiration** rate is much less than plants in more temperate climates.

How to do it

Temperature Experiment

1. Tell the participants that they are going to conduct experiments to see if trees do make a difference to the temperature of an area. Assign them to different groups and help each group to develop an experiment involving temperature. One group might compare the temperature of grass in the sun to the temperature of grass in the shade. Another group might compare the temperature of a sidewalk surface in the sun to the sidewalk surface in the shade. A third group might measure the difference in temperature of asphalt in the sun to asphalt in the shade.
2. Have each group make a prediction about what they think their own group results might be. Remind the participants that everything else in their experiment needs to be constant. Have them brainstorm a list of what those constants need to be. The list might include the time of the day when the temperature is taken, amount of time they leave the thermometer before reading the temperature, the location site for each group: group 1 – grass; group 2 – sidewalk; group 3 – asphalt.
3. Go outside and find a spot for each group where there is the appropriate mix of sun and shade. Each group must record the temperature after a specified amount of time (10 minutes is plenty). When the tests are complete, ask the groups to describe the results of their investigations to the whole class.

Transpiration Experiment

1. Using a transparent bag, have each group wrap a leaf on the potted plant or a small portion of a leafy broadleaf tree branch that is exposed to full sun. Seal the end of the bag as tightly as possible. Do this with several kinds of plants or trees.

2. Have the participants check on the leaf periodically, making notes on what they see. Ask them to indicate how long it takes for water droplets to form inside the bag and record the results. Compare results from the experiment. Do different kinds of leaves transpire at different rates?
3. As the participants are waiting to check their leaves, discuss the process of **transpiration** with them.
   Explain that trees not only provide shade from the sun, they also transpire (release water vapor) through their leaves. This is an additional cooling benefit. Tell them you will show them how this works:
   - Have the participants line up and fill the bucket of water. Ask each participant to dip just one hand in the water to wet it, and then hold both hands briefly in front of the fan. After the entire group has tried this, ask which hand felt cooler. Explain that the warmth of your skin and the air from the fan caused the water to evaporate. That process cools your skin. Nature uses evaporative cooling every day. When we sweat, our perspiration evaporates, cooling us off. When a tree transpires, releasing moisture, that moisture evaporates, cooling the air. Explain that the net cooling effect of just one young, healthy tree is equivalent to ten room-sized air conditioners operating 20 hours a day. Amazing!
4. Remind the participants that water that transpires from the leaves evaporates like the water on their hand, cooling the air around it. Explain that plant leaves have tiny openings, called **stoma** or **stomata**. These little openings are where **carbon dioxide** enters the leaf and oxygen and water moisture leave the leaf. Surrounding each **stoma** are guard cells that open and close the **stomata**. Guard cells are shaped like two tiny green jelly beans on each side of the **stoma**.

Discussion

How might trees help you conserve energy at home?
Does temperature affect the rate of **transpiration**?
Does the size of the leaf's surface affect **transpiration**? Does wind affect the rate of transpiration?
What are some negative effects of **deforestation**?

Source: Arbor Day Foundation, Discover How Trees Conserve Energy, Extension Activity 1, www.arborday.org/kids/graphics/poster-contest/activity-guide10.pdf

Tree Nursery

Level 1 2 3

Aim

To learn about tree nurseries and their work.

Materials

A visit to a **tree nursery**, notebooks, pencils, photo camera (optional).

Time

2-3 hours.

How to do it

1. Explain to your group that you are visiting a **tree nursery**. What can you find there? In a **tree nursery** trees are started from seeds or cuttings in a greenhouse or in an outdoor seedbed, transferred to fields, and balled and wrapped for replanting.

2. Ask the participants to view the different types and sizes of trees at the nursery. Have them take some notes if necessary. If possible, take some photos of the different types of trees, and of trees in different growth stages. The elder participants can prepare a presentation for other groups or classes.

Discussion

Why is it good to have tree nurseries?
Where are these trees taken when they are ready to be replanted?
How do trees contribute to creating a healthy **environment**?

Community Tree Tour

Level 1 2 3

Aim

To identify and learn about different tree **species**.

Materials

Five pre-selected trees close to the school or youth group (for a more interesting tour, choose trees with different leaf shapes such as needles, simple and compound, as well as **native** and exotic tree **species**), poster board, colour markers, crayons, paper, tree field guide.

Time

1 hour.

Background

Have you ever wondered what to call a tree? Each kind of tree has its own name. You need to know how to identify trees if you want to explore each tree's individual traits and uses. The science of tree identification is called dendrology. Trees, just like all other living things, have both a common name and a scientific name. Most people use the common name of a tree. White pine and red maple are common names for trees.

Scientists and technicians use the scientific name for a tree. A tree has only one scientific name but might have more than one common name and may even have the same common name as another tree. For example, a red pine is also called a Norway pine, but it has only one scientific name, *Pinus resinosa*. The scientific system of classifying and naming plants, called taxonomy, helps foresters and others to communicate clearly about trees. Taxonomy organizes living things into groups according to whether they have similar traits.

All living things are divided into two big groups called kingdoms. Every living thing belongs to either the plant or the animal kingdom. Each kingdom is then divided into smaller groups, and then those groups are divided into still smaller groups. The last, and smallest, group is called **species**.

Did you know that leaves are the most common identifying trait of a tree? But what happens when you try to use leaves to identify a tree when it is winter? You will find some trees no longer have their leaves! Most **coniferous** (remember 'cone') trees retain their needles or leaves all winter. **Deciduous** trees drop their leaves in the fall. For this reason, it is smart to learn other special features of a tree too, including: bark, fruit, twigs, flowers, cones, buds, and peculiar odour. To help people identify unfamiliar trees, foresters and taxonomists have developed special identification

charts called keys. Keys help you identity a tree **species** by giving you choices based on the traits of the tree.

Source: The Pennsylvania State University, Trees+Me=Forestry, Name That Tree!, http://ecosystems.psu.edu/youth/sftrc/lesson-plan-pdfs/trees-me-forestry

How to do it

1. Take your group on a tour of the five trees with a good tree field guide. Go over a simple tree key and how to identify these trees.
2. Divide the participants into five groups. Each group will create a 'tree page', one page for each tree featured on the tour. Each tree page should include the common and scientific names of the **species**, a bark rubbing, a leaf print, a simple drawing of the tree's shape, and a short paragraph with natural history about that tree (it could include country of origin, tree uses, and so forth).
   - Older groups can also mention other characteristics such as branching position, types of leaves, types of twigs, bud scale, among others.
3. You can also have a participant make a simple map of the tree tour. Tell him/her to indicate major landmarks such as school buildings and streets and to identify the location of the five trees with a number and a special tree symbol.
4. Give the groups enough time to finish their task, and go on a tree tour to learn all about those trees! You can also invite other groups or classes to take the tour.

Discussion

Can all tree **species** grow in your community?
Why is it important to learn about different tree **species**?
How many **deciduous** and **coniferous** trees did you identify?
How do these trees contribute to your community?

Adapted from: Penn State, College of Agricultural Sciences, Create a Community Tree Tour, Forestry/Natural Resources Lesson Plans, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/k-5/tree-tour

Where Are the Forests?

Level 1 2

Aim

To learn about local forests.

Materials

Poster board, a map of your area, pencils, colour markers.

Time

40 minutes.

How to do it

1. Ask the participants to think about a nearby forest they have visited. Where are the forests closest to your community?
2. Explain to them that you are creating a map of your surrounding area showing the forested lands. Indicate which lands are protected areas. A map of your area might be useful.
3. Place the poster board in a visible place so that others can learn where the closest forests are located; make sure you include a message encouraging everyone to visit them and to protect them!

Discussion

What types of forests can you find in your community?
How are these forests used?

Which are the main threats to the forests in your community? What can you do to avoid these?

What Lives Under That Dead Tree?

Level 1 2 3

Aim

To learn why dead trees are important to wildlife.

Materials

A forest setting; paper bags; leaves, twigs and bark; newspaper; pencils and notebooks; magnifying glasses and/or hand lenses; bug boxes or jars with lids; field guides.

Time

1 hour.

Background

Many things depend on dead trees for food, shelter and/or nesting sites. Fungi, bacteria and wood-eating insects such as termites and some beetles are usually the first to 'move into' a dead tree. As they feed on the tree they help soften the wood, and the tunnels of the wood-eating insects provide access routes through which water and other fungi, bacteria and small animals can enter the tree. Some of the animals lay their eggs in the soft wood and the larvae feed on the wood when they hatch. Others feed on the fungi or animals already living in the dead tree. Some animals also make their nests or seek shelter inside decaying trees. As all of these animals excavate, eat and burrow through the trees, they help to break them down. The process of breaking down a tree into its **nutrients** is called **decomposition**. As a tree breaks down, the **nutrients** it contained are dissolved back into the soil, forming a rich layer of soil called **humus**. It takes a long time to turn a tree into **humus**. The **nutrients** in **humus** can be taken up by the roots of living plants and are used to help make new leaves, twigs, branches, roots, flowers and seeds.

How to do it

1. First, look around your area to find a rotting log.
2. Collect some leaves, twigs, bark and any other tree materials you can find. Put all of one kind of material into the same paper bag. (For example, put all of the leaves in one paper bag, all of the twigs in another, and so on.)
3. Spread out some newspaper in an area where all of the participants can gather around.
4. Explain that as a tree grows it collects minerals and other **nutrients** from the soil and air around it. These **nutrients** – carbon, nitrogen, phosphorus, and some others – are used by the tree to make new bark, roots, leaves, twigs, wood, and seeds. After a tree dies it is slowly broken down into **humus**, a dark, rich layer of soil. The process of breaking down a tree into its **nutrients** is called **decomposition**. The **nutrients** in the soil then become available for animals and other plants to use.
5. Ask the participants what parts of a tree might become part of the soil (all parts). As they give their answers, sprinkle your samples onto the newspaper. (For example, if someone says 'leaves' you can pour the leaves out of the paper bag and onto the newspaper). When you have piled up all your samples, ask the participants if they think the mess on the newspaper is soil. If

they say 'no', ask them if they know what is needed to turn these materials into soil. Then explain how **decomposition** works.

6. Now you will start looking at the rotting log, **so remind the participants not to stick bare hands into dark holes or under branches or logs, to release all animals after observing and sketching them, and to replace the log or branch in its original position after examining it.**
   You can work as a group or, if you prefer, you can divide the participants into small teams.
7. If you have magnifying glasses or hand lenses, pass them around to the participants. Give each group one or more bug boxes or jars with lids. Pass around pencils and notebooks to the groups. Pass out any field guides or keep them in a central location for all the groups to use as needed. You may want to prepare ready-to-use backpacks or bags with all the materials already divided up so you can easily start the activity.
8. Explain to the groups that that they should examine the log and the surrounding area and write and/or draw what they see.
   - One or more groups should look for animals that are using the rotting logs (insects, worms, birds, salamanders, etc.).
   - One or more groups should look for fungus and plants growing on the rotting logs.
   - One or more groups should look at the leaves, if the fallen trees or branches still have any leaves, and the surrounding soil. Using the jars and bags, have each group take samples of the soil from around the tree, and small samples of the bark. They can use a magnifying glass or hand lens to help them see the **organisms** in their samples.
   - If you have field guides available, the participants can try to identify what they are seeing.
9. Have the groups share what they discovered with each other.

Discussion

Can you number some of the ways in which plants and animals use logs?
How would you describe a rotting log now that you know that it is really a 'life-giving log'?
Why is **decomposition** important?

Source: National Wildlife Federation, A Rottin' Place to Live, www.nwf.org/~/media/PDFs/Be%20Out%20There/National-Wildlife-Week/2013/Lessons-Activities/A-Rottin-Place-to-Live_gradesK-8.pdf

Forest Scavenger Hunt

Level 2 3

Aim

To identify concepts and components of a forest **ecosystem**.

Materials

A forest, notebook, pencils, copy of the scavenger hunt list for each group.

Time

1 hour.

Background

Ecosystems are systems formed by the interaction of a group of **organisms** with each other and their **environment**. **Ecosystems** include interdependent plants, animals, the physical **environment**, and the ecological processes (such as the exchange of matter and energy) that connect them. Areas of different sizes can be considered **ecosystems**. A pond, a rotting log, a **grassland**, or the entire Earth can each be considered an **ecosystem**. In this activity, the term **ecosystem** will be used to represent the entire Earth. The entire Earth's **ecosystem** is commonly referred to as the **biosphere**.

On Earth, there are different geographic areas in which the combination of climate, topography (lay of the land), and **geology** (solid Earth and the rocks that compose it) determine what types of plants and animals grow and live there. These areas are called eco-regions. A desert, with its characteristic dry climate, sandy soils, and unique wildlife is an example of an eco-region. Other examples include **grasslands**, **rainforests**, **coniferous** and **deciduous** forests, oceans, arctic areas, fresh water streams, **riparian zones**, and **wetlands**. All of the eco-regions on Earth interact to form one large **ecosystem**.

Human cultures have developed within different eco-regions and have been sustained by them. All the things human beings have depended on for survival and comfort have come from **natural resources**. Over time, attitudes and beliefs about the natural world and the use of **natural resources** have changed. In the not-too-distant past, the human population was sparse compared to the **natural resources** available. Human impact on eco-regions was minimal. As human populations have increased, so have demands on various eco-regions. Some parts of the **ecosystem** are already being heavily impacted and some **species** have become **extinct**.

As people develop a better understanding of the ecological functions and their place in the **ecosystem**, they are incorporating these ideas into the practice of **natural resource** use and management. A recent philosophy adopted by many **natural resource** agencies for managing the Earth's resources is called **ecosystem** management.

Ecosystem management is the careful and skillful use of ecological, economic, social, and business principles in managing eco-regions as part of the larger **ecosystem**. This management's goal is to produce, restore, or sustain **ecosystem** integrity over the long-term. When **ecosystem** managers talk about maintaining the integrity of **ecosystems**, they mean retaining the ecosystem's **biodiversity** (variety of living **organisms**) and the structure and organization of the **ecosystem**. The need to conserve **biodiversity** is at the heart of **ecosystem** management.

While the protection of **biodiversity** is of great importance, **ecosystem** managers

must also consider human needs. People want eco-regions to be maintained for various uses, experiences, products, and services. Recreation, spiritual renewal, economic growth, timber and minerals for homes and other products, and forage for wildlife and domestic range animals are all examples of human needs that may come from a single eco-region. The **ecosystem** manager must take the wide variety of human needs into account, along with the best scientific knowledge about **ecosystems**, in order to manage **natural resources** for **sustainable** use over time.

How to do it

1. Before distributing the scavenger hunt list, add specific animals, plants or other items which represent your local area.
2. Divide your group into small teams. Explain that they are participating on a Forest Scavenger Hunt. Review the list of items together; help the participants to define any unfamiliar terms.
3. Explain that some items on the scavenger hunt list require creative thinking. For example, participants may not see specific animals, but they could find animal signs such as droppings, browse marks or tracks. Similarly, the participants will not see **carbon dioxide**, but they can deduce its presence by their own presence or the presence of animals that breathe it out, or by plants which use it in **photosynthesis** and respiration. Evidence of **symbiosis** might include a parasitic growth on a plant, a deer or moose (which requires microscopic **organisms** to digest its food), a swallow (which must have holes in trees made by woodpeckers or fungi to survive), or seeds that stick to someone's socks.
4. Explain the rules:
   - The participants may not write anything down until the hunt begins.
   - When the participants find an item, they are to write each 'find' on their list rather than collecting it.
   - The participants can use the same item more than once on the list as long as the item fits more than one category.
   - The search ends when any team finds one example of each item on the list, or at the end of a specified time.
5. Once the teams are ready, set clear boundaries for the hunt. Remind students to respect wildlife and the forest **ecosystem** by leaving plants as they find them.
6. When the search ends, the first team that finished reads aloud its list, explaining why their items are examples or evidence. Other teams follow with items that they found which were different from the first team's list.
7. All teams cross from their list anything that another team also listed. Any incorrect answers must also be crossed off. Each team then adds the number of allowed items remaining on its list and scores one point per item. The team with the most points wins.

Discussion

Can you describe the forest **ecosystem** using the scavenger hunt list?
Why is it important to promote **ecosystem** management practices?
What can you do to protect the forest **ecosystem**?

Source: Prince William Network's America's Rainforests, Forest Scavenger Hunt, http://rainforests.pwnet.org/pdf/Scavenger_hunt.pdf

Forest Scavenger Hunt List

Find examples or evidence of the following items and list them in the space at the right:

- A producer
- A carnivore
- A symbiosis
- Photosynthesis
- Parasitism
- An insect
- A herbivore
- Mutualism
- Predation
- Commensalism
- An omnivore
- An animal
- A fungus
- A wild flower
- Microscopic organisms
- A non-living element
- An invertebrate
- A mammal
- Interdependence
- A broadleaf
- A consumer
- A tree
- A bird
- Water
- Humans
- Oxygen
- Carbon dioxide
- Conifer
- Recycling of minerals
- A tree or plant that tolerates shade
- A tree seedling
- A dead tree
- A dying tree
- Moss on a tree
- An insect

Evergreens in Winter

Level 1 2 3

Aim

To enjoy and learn about forests in the winter season.

Materials

A forested area.

Time

1 hour.

How to do it

1. Explain to your group that you are enjoying a winter walk around a forest. Try the following ideas:
   - Stop and listen to the sounds of winter, for example: wind or snow under feet. How does our walk sound, look or smell different from the last time we walked? What is the same?
   - Search on the ground for cones. Look up high in the trees for cones still on the branches. Look at the branches and knobs on **deciduous** trees; with the leaves gone, these shapes are easier to see.
   - Find places that are out of the wind (for example, close to a building or next to a tree or hedge). If you were an animal outside in winter, where would you stay? Search on the ground for tracks and other animal signs.
   - Search for animal homes in **deciduous** trees. Nests and holes should be more visible now. Look for evidence of ways animals survive in winter.
   - Lie down under **evergreens** and look up through the branches. Talk about the visible patterns, and experience the way **evergreens** provide shelter from wind, rain and snow.
   - Look for the whorls of branches on conifers such as pine, spruce or fir. Each year the tree adds a new whorl of branches. You can estimate the age of the tree by counting the whorls. Add two or three years to represent the first few years of growth before the tree started making whorls.
2. Once back inside, discuss about your experience and plan to visit the trees again in the spring to look for new growth.

Discussion

How do forests change during each season?
What makes each tree an important part of the forest?
Why is it important to encourage **biodiversity** in forests?

Source: Project Learning Tree, Evergreens in Winter, www.plt.org/stuff/contentmgr/files/1/f39169ea7fbbf5051a8ed5d3d338d0a4/pdf/plt_activity_ec_6_ad_national_final_low.pdf

Tree Life Cycle

Level 2 3

Aim

To understand the lifecycle of a tree and its importance in the forest **ecosystem**.

Materials

Digital camera for each group, natural area to explore, journal to record information, access to computer and Movie Maker, PowerPoint, i-Movie or other multimedia software.

Time

Three 1 hour sessions.

Background

Many trees get their start in life as seeds. But not all! Did you know there are other ways that trees can reproduce?

- *Stump sprouts* develop from the stump of a recently cut tree. They commonly grow from the stumps of **deciduous** trees such as oak, basswood, red maple, and willow.
- *Root suckers* are new shoots that develop from special buds on the roots of a few **species** of trees. For example, aspen trees grow from root suckers after the parent tree has been harvested. Root suckers grow very fast.
- *Layering* occurs when the branch of a living tree touches the ground, becomes covered by leaf litter or soil, and takes root. A new tree is created at this junction. Northern white-cedar is one tree that can reproduce by layering.

How to do it

1. Ask the participants to give examples of **species** they know that go through various stages of development and describe how they change. Each example should include: birth, growth, aging and death. A discussion of injury and disease should also be included as a stage in life.
2. Be sure to point out that physical changes exist at each stage, as well as the role each plays during the lifecycle. Discuss how this applies to the examples given.
3. Explain to your group that through digital photography they will identify and document the various stages of the lifecycle of a tree. The participants will work cooperatively to create a multimedia presentation using Movie Maker, PowerPoint, i-Movie or other multimedia software to share their discoveries and learning.
4. Introduce the stages of a tree's lifecycle: seed, sprout, sapling, young adult, mature tree, dead tree (snag), and rotting log. Depending on the depth of instruction, the participants can be introduced to the alternative methods of 'birth' for trees which include: stump sprout, root sucker, and layering. Once you are confident that the participants can identify each stage of the lifecycle of the tree, they should be able to go out into the natural world and find examples of each.
5. The participants will work in small groups. Tell them to take turns collecting images on the digital camera and remind them that they can take as many images of the various stages as they wish, as they can edit the pictures inside later. Once they have taken all the necessary images, they will upload their photographs and create a multimedia presentation documenting their findings.
6. Have each group share their multimedia presentations and explain them to the class or group.

7. A follow-up activity could include instruction on the role of each stage of the tree's life in the **ecosystem** of the forest. What plants, animals, and other **organisms** rely on the tree at each stage of its life. The multimedia presentations can then be revised and edited to reflect the new learning.

Discussion

What happens to the **ecosystem** when forests are disturbed?
Why do we need trees in all stages of the lifecycle?
How do humans share the stages of life found in the natural world?

Adapted from: PennState, College of Agricultural Sciences, Discover the Lifecycle of Trees Through Digital Photography, Forestry/Natural Resources Lesson Plans, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/k-5/lifecycle-photography

Types of Forests

Level 2 3

Aim

To discover the different types of forests on Earth.

Materials

Poster boards, colour markers, colouring pencils, books, encyclopedias or internet access.

Time

1 hour.

Background

Forests cover 31 percent of total land area and they are home to 80 percent of terrestrial **biodiversity**. While it is true that trees dominate the **environment** – they are the biggest **organisms** present on Earth and there are many of them – a forest is in fact a community of plants, animals and **microorganisms**. Of course, we cannot forget about the non-living or abiotic components of a forest: soil, climate, water, organic debris and rocks; and take in the complex interrelationships among the **organisms** and the **environment**, then we are closer to accurately describing a forest **ecosystem**.

Forests come in all sizes and types - from the northern **boreal forests** to the **rainforests** of the humid tropics. They are found on moving glaciers, in fresh and salt water, or on arctic mountain slopes. They do not occur in isolation from the rest of the landscape. The type of forest in a given area depends on many elements, including climate, soil, water source, rainfall patterns, seed sources and human influence.

How to do it

1. Remind your group that we can find different types of forests around the world and that they are generally classified according to location and climate.
2. Divide your group into 6 teams and explain that each one will make a research about one of the following types of forests:
   - *Tropical rainforests:* year-round high temperatures and abundant rainfall makes this a dense, lush forest. **Tropical rainforests** are found near the equator. They are vital storehouses of **biodiversity** on the planet.
   - *Tropical dry forests:* it occurs in tropical regions with very distinct dry seasons, most rain falls during a (usually) brief wet season. Plants and animals possess specific **adaptations** to survive the dry season. Most of these

forests are in eastern and southern Africa, where woodlands stretch over large areas. The vegetation is relatively open and is typically made up of a type of tree known as a **deciduous** tree. Because of frequent fires and tree cutting, many of these woodlands have turned into areas called savannahs, where grass and shrubs dominate.

- *Mediterranean forests:* also known as sub-**tropical dry forests**, these forests are found to the south of the temperate regions around the coasts of the Mediterranean, California, Chile and Western Australia. The growing season is short and almost all trees are **evergreen**, but mixed **hardwood** and **softwood**.
- *Temperate deciduous forests:* found in such places as eastern North America, Western Europe, Eastern Asia and parts of Patagonia, **temperate deciduous forests** are associated with a humid **climate** and include tree **species** such as oak, beech, birch, hickory, walnut, maple, elm and ash. Many of these **hardwood species** are highly valued for their wood qualities, and most remaining forests are intensively managed. The forests have well-defined seasons with a distinct winter and sufficient rainfall. These animals have special **adaptations** suited for seasonal life.
- *Boreal forests:* this is the northern most forest type and is found in Canada, northern Asia, Siberia and Scandinavia (Denmark, Norway, Sweden, Finland). **Boreal forests** are characterized by long winters and short summers. Most **precipitation** is in the form of snow. Trees are mostly **evergreen**.
- *Montane forests:* these are also known as cloud forests because they receive most of their **precipitation** from the mist or fog that comes up from the lowlands. Some of these **montane** woodlands and **grasslands** are found in high-elevation tropical, subtropical and temperate zones. Plants and animals in these forests are adapted to withstanding the cold, wet conditions and intense sunlight. Trees are mainly conifers.
- *Mangrove forests:* these forests are formed by specialized types of trees and shrubs that grow at the intersection of land and sea. **Mangrove** plants require a number of **adaptations** to overcome the problems of low oxygen conditions, high salinity and frequent tidal inundation. The unique ecosystem found in the intricate mesh of **mangrove** roots offers a quiet marine region for young **organisms** to thrive. **Mangrove** swamps are found in tropical and subtropical coastlines. Some of the largest areas of mangroves are found in Indonesia, Brazil and the Sundarbans of India and Bangladesh.

Source: World Wildlife Fund, Forests, wwf.panda.org/about_our_earth/about_forests/

3. Explain that each group will have to present a poster that includes some basic information about the forest, such as location, climate, soil, plants and animals, as well as some curious facts.
4. Have each group present their work.

Discussion

Why are forests important for our **environment**?
What can happen if **climate** continues to change?
What types of forests can you find in your own country? Have you visited one?

Tree-mendous facts

Level 1 2 3

Aim

To review interesting and fun facts about trees.

Materials

Cardboard, colour markers, adhesive tape, encyclopedias or internet access.

Time

45 minutes.

How to do it

1. Remind your group that there are many ways in which humans and wildlife interact with trees; can they think of some ideas?
2. Explain that they are looking for some interesting and/or curious facts about trees and their role in our **environment** to share with their school or youth group. Here are some ideas:
   - When wood duck ducklings are ready to leave their nests, which are made in the cavities of trees, they jump from heights of 65 feet and land safely.
   - Trees are the longest living **organisms** on Earth.
   - Beavers are one of the few animals that can actively change an **ecosystem** by blocking rivers with trees.
   - Trees properly placed around buildings can reduce air conditioning needs by 30 percent.
   - Orangutans are the only strictly arboreal ape; this means that they spend their lives in the forest **canopy**.
   - The average tree in a city survives only about 8 years.
   - Mangroves are able to distill fresh water from salt water. In fact, with some **species**, you can actually drink fresh water from a cut root, even though the **mangrove** is growing in salt water!
   - A mature tree removes almost 70 times more **pollution** than a newly planted tree.
   - The scientific name of the cacao tree is *Theobroma Cacao*, which means 'food of the gods' in Greek.
   - One full-grown **canopy** tree can transpire 100 gallons of water every day.

   Sources: http://blog.nwf.org/2013/03/twelve-tree-mendous-wildlife-facts-for-national-wildlife-week/; http://forestopia.net/text/supertree.html; www.savatree.com/tree-facts.html
3. Have the participants make some cool signs or posters with the information they find about trees and place them all around their school or youth group.

Discussion

Why is it important to learn about trees and forests and the benefits we receive from them?
Who is responsible for conserving forests?
What are you doing to help? How can you encourage others to do the same?

A Salted Carrot

Level 2 3

Aim

To learn about mangroves and plant **adaptation**.

Materials

2 small carrots, tap water, table salt, several metric measuring cups, small metric scale, metric ruler, thin strips of paper for measuring diameter, 2 shallow dishes, spoons or stirring sticks, thin tissue or toilet paper, paper towel, pencils, masking tape for labeling the dishes.

Time

A 20 minute lesson and another 40 minute lesson.

Background

Mangroves are trees that grow in tropical and subtropical intertidal zones. These areas are tough places for plants to grow. During low tides, the intertidal zones are exposed to air. During high tides they are covered by salt water. They **flood** frequently. The soil is poor. But **mangrove** trees survive and even thrive in these harsh conditions. Big groups of mangroves and other plants that live here are called **mangrove** swamps or forests, and sometimes simply mangal. Mangroves live in more than two-thirds of the saltwater coast areas of tropical and subtropical Africa, Asia, Australia, and North and South America.

Not many plants can survive in the mangal. Only about one hundred plant **species** are found in most **mangrove** swamps. Some swamps are home to only one or two **species**! The plants that do survive have adapted to deal with the special challenges. One of the biggest challenges is the salinity, or the amount of salt in the water. The water in a **mangrove** swamp is so salty it would kill most plants. But the roots of red mangroves contain a waxy substance that helps keep salt out. The salt that does get through this barrier is sent to old leaves that the trees then shed. White **mangrove** trees have glands in their leaves that let salt pass from the inside of the tree to the outside. The leaves become speckled with white salt crystals, which is how they got their name.

Just as mangroves can keep salt out, they have other **adaptations** to keep **freshwater** in. They can close up the pores in their leaves. They can also turn their leaves away from the sun to keep them from drying out. All of the plants found only in mangroves are woody and tree-like. They tend to be short with tough, **evergreen** leaves, another **adaptation** that keeps the moisture in.

Lack of oxygen is another huge challenge in **mangrove forests**. The soil is covered with salt water every time the tide comes in. Salt water has low oxygen content. So, **mangrove** trees grow fancy systems of roots that make the trees look as if they were growing on a bunch of stilts. The roots breathe through knobby holes called lenticels. They take in **carbon dioxide** directly from the air, instead of from the soil like other plants.

Source: Globio, Glossopedia, Mangroves, www.globio.org/glossopedia/article.aspx?art_id=39

How to do it

1. Explain to your group that they are going to do an experiment to learn about **mangrove adaptations**.

2. Using masking tape, ask your group to label one dish '#1 Fresh Water' and the other dish '#2 Salt Water'. Have them put one carrot in each dish.
3. Ask the participants to take the carrots out, one at a time, and measure their:
   - ***Length*** - measure in centimeters and millimeters with the ruler.
   - ***Diameter at its center point*** - wrap the strip of paper around the carrot, marking where the end meets the paper on the other side; measure that length with the ruler.
   - ***Weight of each carrot in grams*** - weigh on the scale.
4. Have your group record the data on the chart, in the columns for Carrot #1 and Carrot #2. Also, ask them to make observations about the carrots and note them on the chart.

Day 1	Carrot 1	Carrot 2
Length		
Diameter		
Weight		
Texture		
Colour		
Stiffness		
Other observations		
Hypothesis		
Day 2	**Carrot 1**	**Carrot 2**
Length		
Diameter		
Weight		
Texture		
Colour		
Stiffness		
Other observations		
Hypothesis		

5. Ask the participants to measure 120 milliliters of tap water and pour it into dish #1, tell them to leave the carrot in the dish.
6. Have them remove the carrot from dish #2, measure 120 milliliters of tap water and pour it into the dish.
7. Tell them to place a thin piece of tissue paper on the scale, put a small amount of salt on the paper, and have them add or remove small quantities until it weighs 15 grams. Ask them to put the salt into the second dish and stir until it is thoroughly dissolved. Finally, have them place the carrot back into dish #2. Tell

them to write down what they think will happen to the two carrots (their hypothesis).

8. Have your group remove the carrots from the dishes and dry them with the paper towel, being careful not to mix them up.
9. Ask them to repeat the measurements for length, diameter, and weight and note the data on their chart. Tell them to repeat their observations and note them on the chart.
10. Instruct the participants to compare their carrots and the differences they see in their observations and measurements in the Results section of the chart. Make sure they include a conclusion related to the hypothesis, noting whether their guess was correct.

Results	
Do the carrots look the same?	
Has the texture changed?	
Has the colour changed?	
Are the carrots as stiff as they were before?	
Do you see any other changes? If so, what?	
Why do you think the salted carrot changed?	
Was your hypothesis correct?	
Draw pictures of your carrots:	
Carrot 1	Carrot 2

Information for teachers:

Mangrove trees and other plants living in mangroves have to survive in salty water that would kill most plants. Salt affects plant tissues through a process called Osmosis. Mangal plants have special **adaptations** to outwit osmosis and limit the amount of salt in their tissues so they don't die.

What is Osmosis?

Osmosis refers to the passage of water molecules through a membrane (semi-permeable), from an area of purer water, such as tap water (low concentration), to an area of water that has other things dissolved in it, like salt or sugar (high concentration). Think of it as 'light' water and 'heavy' water. If the light and heavy water were on a balance scale or a see-saw, the heavy water would sink down and the light water would roll into it until all the water was mixed together. Then the water on both sides would weigh the same. Nature is always trying to balance things, including the concentration of seawater and plant sap in relation to each other. If most trees and plants were placed in seawater, their low concentration sap would flow out through their cell membranes into the higher concentration salt water, and they would shrivel and die.

Outwitting Osmosis

1. Stay Out!: some trees, like the stilted mangrove, exclude salt from entering with a membrane that acts like a gate. Red mangroves have roots containing a waxy substance that keeps salt out.
2. Pass the Salt: others, like white mangroves, excrete salt through special glands in their leaves. People do the same thing when they sweat. The salty leaves are washed by rain; we take a bath or shower.
3. Game of Concentration: some mangroves concentrate salt by storing it in their leaves. When the leaves get old, they die and fall off, carrying away the salt.
4. Dilution Solution: mangroves can also close their leaf pores (**stomata**) to keep water from evaporating away, helping to dilute the salt that enters through their roots. When the salt gets too concentrated, they can open the pores to release it.

Discussion

Why do we say that mangroves live in a tough **environment**? What are some of the special challenges?
How have plants adapted to live here?
Which **adaptations** do you think relate to your carrot experiment? How?
Why are mangroves important? How can people help save mangroves?

Source: Globio, Glossopedia, Learning Activity Guide, A Salted Carrot, www.globio.org/info2/LAG/GLOBIO_LAG_Mangroves.pdf

Canopy in the Clouds

Level 1 2 3

Aim

To learn about tropical cloud forests.

Materials

Internet access, computers, paper, colouring pencils.

Time

1 hour.

Background

Montane or cloud forests are generally defined by their constant immersion in a layer of clouds. Tropical **montane** cloud forests are very rare and represent only a fraction of the world's remaining tropical forests. The best current estimate is only 0.26 percent of the entire land surface of the planet. In addition to Central America, tropical **montane** cloud forests are found in South America, Africa, Southeast Asia, and the Caribbean.

Since they are almost always covered in clouds, tropical **montane** cloud forests have very unique microclimates. This affects the plants and animals living in the forest and the **ecosystem** as a whole. Tropical **montane** cloud forests are home to an incredible number of plant and animal **species**. In Monteverde, Costa Rica alone, there are approximately 750 tree **species**, and this number will likely grow as rare new **species** are discovered.

How to do it

1. Explain to your group what tropical **montane** cloud forests are and why they

are so special.

2. Use the following web page to learn about and discover how this type of forest looks like:

   www.canopyintheclouds.com

   You can work as a group or you can divide the participants into small teams and have each one investigate a part of the forest.
3. As a group, discuss about your findings and reach some general conclusions. The younger groups can make some drawings about the most important features of this forest.

Discussion

Why are there different types of forests around the world?
What are the benefits of having all these types of forests?
Why should tropical **montane** cloud forests be conserved?

Getting to the Roots

Level 2 3

Aim

To learn about temperate forests and their root system.

Materials

3 potted plants, magnifying glass, newspaper, tweezers, gram scale, rulers, calculators, papers, notebooks, pencils.

Time

40 minutes.

Background

Temperate forests grow between the tropic and the polar regions. They have four distinct seasons with a well-defined winter. Temperate forests have a moderate climate. These forests are home to many plant and animal **species**. Much of the food humans eat is grown in areas where temperate forests have been cleared and transformed into farms.

In temperate forests, the **biomass** (all life) in the subterranean layer can be greater than what is seen above ground! This layer holds millions of **microorganisms**, insects and fungi, but most of the **biomass** is plant roots. Roots come in many sizes and shapes; they carry water and minerals from the ground to the plant and anchor the plant in the soil. Roots create a web that holds soil together and helps prevent **erosion** from wind and water. Moreover, roots can create soil by mechanically wedging rocks apart, and dissolving them with plant chemicals.

How to do it

1. Explain to your group that you are learning about temperate forests and their fascinating root system!
2. To begin, discuss with your group about the three major plant parts (leaves, stem and roots). Discuss the jobs of each part (leaves absorb energy from the sun and convert it into **nutrients**; stems support the leaves and buds and provide a transportation channel for **nutrients**, water and minerals; roots collect minerals and water from the soil and hold plants in the ground).
3. Divide the participants into three teams and give the needed materials to each one.
4. Instruct students to carefully remove their plant from its pot on the newspaper.

5. Have the participants place a sheet of paper on the scale and record its weight. (Tare weight: ____).
6. Ask them to pick up their plant, being careful not to shake off the soil and place it on the piece of paper on the scale. The soil that falls onto the newspaper must be replaced in the pot.
7. Tell the teams to place the plants back on the newspaper and to gently shake and tease as much soil as possible from the roots, then ask them to place the plant back on the scale. They must now subtract the tare weight to find out how much soil the root system was holding. (Plant & Soil: Weight #1____).
8. Instruct the teams to weigh the plant alone. (Plant: Weight #2____). They may subtract weight #2 from the weight #1 to find out how much soil was held by the roots: (Weight #3____). Have them calculate what percentage of the total weight was soil; plant.
9. Next, ask the teams to make some observations:
   - Describe the roots' appearance.
   - Are they forked or branched at the tips? Do they cross over each other?
   - How are the roots different from the plant that is above the ground?
   - Are all the roots the same, or are some different? Are they all the same size?
   - How would you describe the whole mass of roots?
   - How do roots help anchor the plant in the ground? Which roots do this the best?
   - What do you think the smallest roots are for?

10. Finally, have the teams do the following:
    - Measure the length of one long root.
    - Measure the lengths of the smaller roots that branch off of the long root.
    - Add their measurements and write the total.
    - Try to measure the even smaller roots that branch off of those and add them to the total.
    - Challenge the participants to calculate the percentage of the one long root that all the small roots make up when added together. (If the long root is 10 cm long and all the small roots together add up to 5 cm, then the small roots are 50 percent of the large root's length.)
    - Estimate the total length of all the roots on the plant together.

Discussion

How do the roots help the plants? How do the roots affect the forests?
Which do you think are the most amazing facts about roots?
Which do you think are the main threats to temperate forests? What do you think the world would be like if they were all destroyed?

Source: Globio, Glossopedia, Learning Activity Guide, Temperate Forests, www.globio.org/info2/LAG/GLOBIO_LAG_Temperate_Forests.pdf

Forest Crossword

Level 1 2

Aim

To review some basic facts about forests.

Materials

Pencils, copies of the quiz, an outdoor setting.

Time

40 minutes.

How to do it

1. Take your group to an outdoor setting and ask them to think about forests and all the fun things they have learnt about these wonderful places. Explain to them that they will work on a ***Forest Crossword*** to test their knowledge!
2. Give a copy of the crossword to each participant and give the group enough time to solve it.
3. Review the answers as a group.

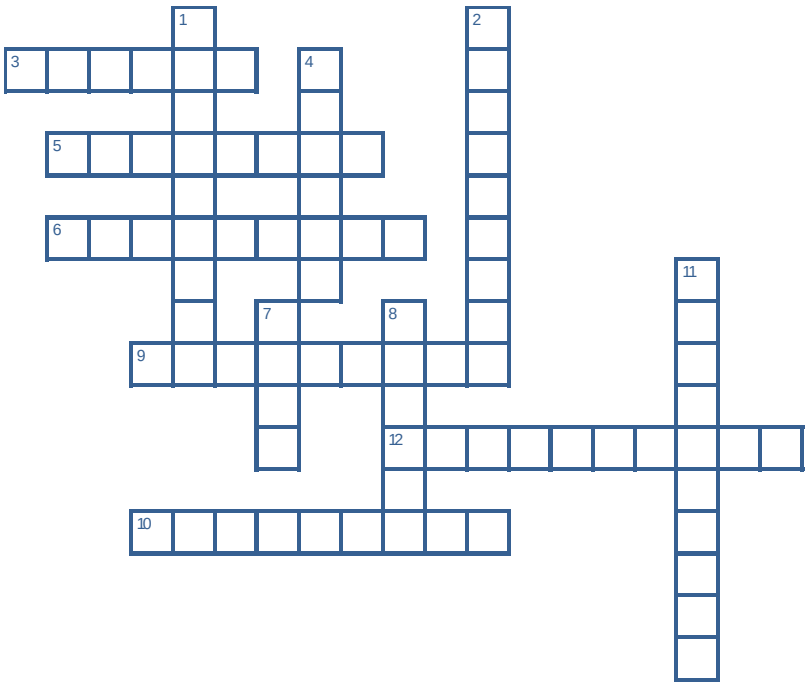
Discussion

Where are the Earth's forests?
Why are forests necessary for life on Earth?
What dangers do forests face?

Adapted from: Kids Discover, Power Vocabulary, Forests, Crossword, www.kidsdiscover.com/free-lesson-plans

Tree Crossword

Boreal	Naturally	Temperate
Deciduous	Oxygen	Tropical
Evergreen	Rich	Earthworms
Medicines	Scales	Naturalist



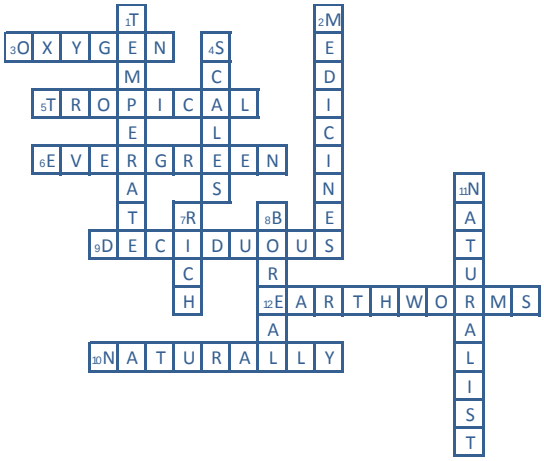
Across

3. A gas in the air that plants and animals need.
5. Of, about, or in hot areas of the earth.
6. Having green needles or leaves all year.
9. Having leaves fall off each year.
10. In a natural way, in a way not caused by people.
12. These help to break down fallen leaves.

Down

1. Of, about, or in areas that are not too hot and not too cold, mild.
2. Things used to make sick people well or to keep healthy people well.
4. Thin, flat, hard parts that cover seeds, buds, or other plant parts.
7. Able to grow many plants easily.
8. Of, about, or in northern areas of the Earth.
11. A person that wants to protect the outdoors.

Answer



Forests All Around

Level 1 2

Aim

To learn about forests around the world.

Materials

Earth globe, pictures of different forests from different countries.

Time

1 hour.

Background

A forest is not just a big collection of trees, it is a natural, but complex **ecosystem** that is constantly changing and that is made up of living things (like plants, animals and **microorganisms**) and non-living things (like soil, rocks, **nutrients**, sunlight, water and air). Trees, of course, are the biggest part of this amazing community.

How to do it

1. Explain to your group that there are different types of forests around the world, and that they are generally classified according to location and climate.

2. Find some pictures of at least five different forests from different countries, for example:
   - A *temperate deciduous forest* in the United States
   - A *mangrove forest* in Ecuador
   - A *Mediterranean forest* in Italy
   - A *boreal coniferous forest* in Russia
   - A *tropical dry forest* in India
3. Have the participants go through the photos and identify any differences. Encourage discussion.
4. Give a small explanation about each type of forest, and have each participant choose a forest and write a small story about an adventure in that forest.
5. Have each participant share his/her story.

Discussion

Which forest did you like the most? Why?
Can you describe a forest you visited? Did it have some similarities with the forests you studied today? And some differences?
Can you mention some special features about forests?

Can It Be Real?

Level 2 3

Aim

To learn about unusual **rainforest** plants and animals.

Materials

Notebooks, pencils, books, encyclopedias or internet access to research about **rainforest** animals.

Time

1 hour.

Background

A beetle that drinks fog. A flower that smells like rotting meat. A fish that 'shoots down' its prey. Are these plants and animals for real? Of course they are! These are extraordinary **rainforest** plants and animals uniquely adapted to their specific environmental conditions. **Rainforests** are defined as dense forests with high amounts of annual rainfall, often located in tropical regions.

Scientists estimate that we share this planet with 40 to 80 million different **species** of plants and animals, most of which are insects. Experts also believe that approximately half of the world's animal **species** live in **rainforests** and that 25 percent of the world's medicines are derived from rainforest plants.

When an **organism's environment** changes, the **organism** must either move, adapt, or die out. The process of an **organism** changing over time to make it suited to its **environment** is called **adaptation**. **Adaptation** is the result of the combined effects of variation and the selecting power of the **environment**. For example, plants in a population have differing capacities for producing cutin (a waxy, outer coating) on their leaves. Some individuals are heavily covered with this

protective layer, and others are only thinly covered. If the **climate** becomes drier, as it did in the Sahara Desert, plants with thicker cutin will not dry as fast as those with thin cutin and may live to set a crop of seed. They have been 'selected'. Succeeding generations will also show variability, and those with the best protection against drying will be the only ones to live and reproduce. In this instance, only one feature, cuticular covering, has been pointed out, but in reality a plant would have to possess a whole range of features that work together. It is the **species**, not the individual, that adapts.

How to do it

1. Discuss how the creators of movies and comic books invent 'mutant and 'alien' life forms by combining and/or exaggerating attributes of real plants and animals. Ask the participants to give you some examples.
2. Explain that you are going to read descriptions of four plants and animals and that they should listen carefully and try to decide if the plant or animal is real or fictitious. They should write their answer in their notebooks. Remind the participants that all of the animals and plants may be real, all of them may be fictitious, or there may be a mix.
3. Read aloud each of the descriptions under 'Who's Who' (p.51). Read only the information that appears in italics. Do not tell the students the names of the animals and plants.
4. Once you have read all the descriptions to your group, ask the participants to raise their hands if they thought it was real. List on the chalkboard the group's majority opinion for each **organism**. Ask several participants why they thought an **organism** was real or fictitious.
5. Tell the participants that all of the plants and animals are real. Discuss each animal or plant using the additional information that has been provided.
6. Ask the participants to describe animals or plants they have actually seen that have unusual characteristics. Encourage them to name local examples, not just exotic ones. Discuss how these life forms benefit from their unusual characteristics.
7. Next, divide your group into small teams and tell them they must pretend they are writers for a movie and that they need to come up with a really outrageous alien creature inspired in **rainforest** animals and their special characteristics. After each team has developed a creature, have the participants explain to the rest of the group what real-life animals inspired the various attributes of their fictional creature.

Discussion

What is the relationship between **species adaptations** and habitat conditions?
What happens when human beings change or destroy **rainforests**?
Is there something you can do to help prevent this?

Adapted from: Prince William Network's America's Rainforests, Can It Be Real?
http://rainforests.pwnet.org/pdf/can_it_be_real.pdf

Who's Who

Ogre-faced Spider

When it's time to catch a meal, this spider has a special trick: first it spins a silk web. Then, it grabs the corners of the web with its four front legs, and it hangs upside down and waits for insects to crawl by along the ground. When they do, the spider drops the web over them like a net and pulls up its meal. Ogre faced spiders live in tropical areas around the world. They are usually active at night. In addition to dropping their web over crawling insects, they may hold their web out in the air and throw it towards flying insects, like a fisherman.

Skunk Cabbage

This plant is like an outdoor hot tub. The temperature inside its flowers is 36-63 degrees Fahrenheit warmer than the outside air. It gives insects a nice warm place to stay when it's cold outside. Skunk cabbage flowers produce little pollen or nectar. Therefore, they rely on their warmth to attract pollinating insects. By successfully capturing warmth from the sun, the flowers attract insects without needing to use their own food energy to produce much pollen. The skunk cabbage provides insects with a warm place in the cold. In turn, the insects end up transporting pollen from one flower to another.

Satin Bower Bird

At breeding time, the male bird builds a house of sticks. Then, he decorates the stick house with shells, feathers, flowers, clothes-pins, jewellery, and other objects that he fancies. His favourite colour is bright blue. He may also paint the inside of the stick house using berry juice and ***charcoal*** *sticks. Female birds are attracted to the male's handiwork.* These birds live in the forests and woodlands of Australia. Females are attracted to the bower, but once a female has mated with a male she goes off on her own to build a nest and raise her young.

Strangler Fig

This tree starts out as a small, non-threatening seed that sprouts on the branch of another tree. Yet, as it grows, its stems, roots, and leaves wrap completely around the host tree, stealing its water and blocking its sunlight. The host tree eventually dies, suffocated to death. There are many different species of strangler fig in the rainforest. The small seeds are dispersed by the many birds and monkeys that eat fruit. Now and again one of these seeds gets lodged in the branch of a tree and germinates. The seedling first sends out a long aerial root. When contact with the ground is made, the young fig starts to grow, putting out more roots from its perch to the ground, and developing stems and leaves. Eventually the host tree is smothered by the fig's foliage, the trunk is encased in its roots, and the tree dies.

Seed Dispersal

Level 1 2

Aim

To learn that trees spread their seeds around with the help of the wind, water, birds, animals, and people.

Materials

A variety of tree seeds, two or three flower pots, pebbles, soil, water, marker, plastic wrap.

Time

40 minutes.

Background

Trees can't move; they can only stand in one place. And yet they must move their seeds from place to place. If seeds just fell to the ground under the tree, they could not grow. There would not be enough light or water. The parent tree takes up too much room. But tree seeds don't just fall to the ground. They are moved to new locations in a number of ways. Other trees, willows for example, grow along stream banks. They may drop their seeds into the water so they are carried and planted downstream.

Flying seeds: some seeds don't need the wind to fly. They just hitch a ride with a bird. Many trees, especially fruit trees, are planted by birds. The seeds of these plants are inside their fruit. Birds pick the fruit, fly away to eat, and drop the seeds. Quite often a fruit tree grows where a seed has been dropped by a bird.

Animal planters: squirrels are very important tree planters. Squirrels hide food away for the winter, especially acorns, walnuts, and hickory nuts. Squirrels bury so many nuts that they don't always remember where they buried them. Inside every nut is a tree seed which, thanks to a forgetful squirrel, can become a full size tree. Other animals plant seeds, too. Plant seeds can cling to the fur of a dog, a fox or a raccoon, only to fall off and grow in some distant location.

We plants seeds too: not always do people plant trees on purpose. In nurseries, trees are started from seeds in trays in greenhouses or outdoors in seedbeds. Around our homes we usually plant trees once they have become healthy young saplings. But people also plant trees accidentally. Like animals, they may carry plant seeds that cling to their clothing. Like birds, people eat fruit and may leave the seeds behind to grow. Every participant has probably picked up an acorn, an apple, a walnut, a buckeye, or a pine cone and carried it to a new location. He or she may have planted a tree and not even know about it.

How to do it

1. Present your group with a variety of tree seeds (nearly any kind, from maple seeds to apple seeds, to avocado or peach pits) and have them describe as many ways as they can think of that each particular seed might be dispersed from the parent tree. Creative possibilities should be encouraged.
2. Plant two or three trees right in the meeting room. Use some small flower pots. Put a layer of pebbles in the bottom of the pot covered with about 3 inches of tamped soil. Add a seed and cover it loosely with soil. If you use potting soil, mix it half and half with sand. Water the soil and label the pot. Water again only when the soil becomes dry. Keep a piece of plastic over the top of the pot until the seed emerges. Keep the pots in a warm sunny location. The plants that

emerge can grow into full-size trees.

3. After the trees are sturdy enough to be replanted they can be taken home or planted in the playground or in a nearby park.

Discussion

What other types of tree seeds have you seen?
What do you think would happen if an animal that disperses seeds in a forest disappears?
Why is it important to continue planting trees?

Adapted from: Illinois Natural History Survey, A Little Help from their Friends, www.inhs.illinois.edu/resources/tree_kit/teacher/lespl4.html

Angiosperms and Gymnosperms

Level 2 3

Aim

To learn about and identify **angiosperms** and **gymnosperms**.

Materials

Pictures of **angiosperm** and **gymnosperm** seeds, some **angiosperm** and **gymnosperm** seeds, flowers or pictures of flowering plants, a world map, pictures of conifer leaves and cones (it is a good idea to use a computer to look for all the photographs).

Time

1 hour.

Background

A seed contains an embryo, a food supply, and a protective seed coat. Seed plants are classified into two classes depending on whether or not their seeds have coverings.

- *Gymnosperms* are vascular plants that develop uncovered seeds. The main group of **gymnosperms** is the conifer. Conifers normally produce seeds in cones. **Gymnosperms** have male and female cones. The male cones produce sperm, which are contained in pollen grains. Male cones are normally smaller than female cones. The female cones produce eggs, which are contained in ovules. Female cones have a sticky resin that 'catches' the pollen released by the male cone. When fertilized, the female cone enlarges and the scales separate. This separation allows the seeds to drop out of the cone and are dispersed by animals, such as chipmunks and squirrels. Conifers are major lumber and paper producers.
- *Angiosperms* are vascular land plants whose seeds develop in fruits. Flowers are the reproductive structure in **angiosperms**. The flower of a plant can contain male anatomy, female anatomy and sterile structures. A plant that contains both male and female anatomy is known as a perfect flower. A flower that only contains male or only female anatomy is called an imperfect flower. The anther releases pollen grains that contain sperm cells. The pollen lands on the stigma. The transfer of pollen from the anther to the stigma is known as pollination. When the pollen grain makes contact with the stigma, it starts to grow a pollen tube. The pollen tube connects to the ovule in the ovary and delivers the sperm cell to the ovule. The sperm meets with the egg in the ovule and fertilization occurs. The fertilized egg will become a seed and the ovary will become a protective fruit.

Angiosperms have three life patterns: annual, biennial, and perennial. **Angiosperms** are a source of oxygen, lumber, and food.

Source: Angiosperms and Gymnosperms, http://teachers.henrico.k12.va.us/godwin/strauss_s/sscwebpage/tutorials/plant%20tutorial.pdf

How to do it

1. Introduce the words **gymnosperm**, which means 'naked seed' and **angiosperm**, which means 'covered seed'. Show examples of each type. Stress that all **angiosperms** produce seeds that are enclosed in a protective covering. Discuss the advantage of producing seeds in a covering. Emphasize the protection this covering offers.
2. Cut an **angiosperm** seed in half and point out the embryo, food supply, and protective coat. The food supply surrounding the **gymnosperm** embryo should not be confused with the fruit of an **angiosperm**.
3. Show the participants some pictures of a variety of **angiosperms**. Stress that this variety enables the **angiosperms** to live in many different **environments** (in deserts, on the Arctic tundra, on mountain slopes, in cracks on the sidewalk, and in water). Point out the differences in flowers (colour, size, shape, and odor).
4. To stress the importance of the flowering plants, have the participants discuss different ways in which people rely on plants. Besides their direct uses (food, oxygen, lumber, and so on), ask the students to brainstorm some indirect uses of plants, (for example, animals that we depend on for food and clothing also feed on plants).
5. Discuss the four orders of **gymnosperms**: the cycads, the gingkoes, the gnetales, and the conifers. On a world map, show where these **gymnosperms** are found. Introduce the term conifer. Ask the participants to name the different kinds of conifers. Point out that conifers hold some of the records for size and age.
6. Show your group a variety of conifer leaves and have them note the common characteristics. On a world map, show the students where conifer forests are located. Point out that the size and shape of the needles and cones are used to classify conifers. Show examples of needles and cones and have the participants identify the conifer.
7. Compare the life cycle of the **angiosperm** with that of the **gymnosperm**. Define annuals, biennials, and perennials and give examples of each that can be found in your area.
8. Discuss the ways in which flowering plants are pollinated (water, wind, insects, and animals). Ask the participants why **angiosperms** have a better means of pollination than **gymnosperms**.
9. Discuss the importance of conifer products: lumber, paper, and other forestry products. Discuss the role of the conifers (food, protection, shelter) in forests as part of the community and food web.

Discussion

Why are **angiosperms** important?
Why are **gymnosperms** important?
Why can we say that **angiosperms** are the most successful plants?

Adapted from: PennState, College of Agricultural Sciences, Seed Plants: Angiosperms, Seed Plants: Gymnosperms, Forestry/Natural Resources Lesson Plans, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/6-8

Useful resources

Encyclopedia of Life
http://eol.org

Forest Europe
www.foresteurope.org

Forests and Forestry in the Americas: An Encyclopedia
www.encyclopediaofforestry.org/index.php/Main_Page

Kids Do Ecology
http://kids.nceas.ucsb.edu/biomes/index.html

Kids Mongabay
http://kids.mongabay.com

Missouri Botanical Gardens
www.mbgnet.net

Natural Resources Canada
http://cfs.nrcan.gc.ca

United Nations Environment Programme Forests
www.unep.org/forests/Home/tabid/7152/Default.aspx

World Wildlife Fund Forests
wwf.panda.org/about_our_earth/about_forests

Forest in Use

Introduction

Have you thought about the importance of forests for our lives? It is impossible to sum up the importance of these incredible places in just a few words. No matter where you live, you depend on the many services forests provide every day and on the great variety of goods we can obtain from them. Just think of how forests have affected your life today: did you eat some apples, peaches or cherries in the morning, or did you read your favorite book?

Every person in the world uses forests services, even if they may not receive a monthly bill. Forests are critical to maintaining clean water supplies: they absorb water and cleanse it from harmful substances in the ground. Trees also help to slow storm **run-off** and regulate the amount of water that reaches the ground and, thus, help prevent soil **erosion**. Moreover, as trees grow, they remove **carbon dioxide** from the **atmosphere** and help to slow down the rate of **climate change**. When trees absorb **carbon dioxide** they also release oxygen, which we all need to live. Forests provide beautiful and healthy places for thousands of plants and animals to thrive. It would take a really long time to list all the services we receive from forests, but they are all amazing!

We cannot forget that human beings use forests products in their daily lives. Timber products include materials produced from the stems and branches of trees, like paper, pencils or chairs. The uses of wood are virtually endless. On the other hand, non-timer products include resins, oils, leaves, fruits, fungi, animals, among many others. Today the livelihoods of more than 1.6 billion people depend on forests and almost all forests are inhabited; forests provide a home to 300 million people worldwide. As you can see, we have many reasons to thank forests and we are all responsible for taking care of them.

Fun fact: "The coconut palm is one of the most productive tree species on Earth. At least 200 products can be sourced from it, including food, cooking oil, ropes, cosmetics and house building materials."

Source: WWF, Importance of Forests, wwf.panda.org/about_our_earth/about_forests/importance

Activities

Nature's Treasure Chest

Level 1

Aim

To understand the importance of protecting forests.

Materials

5 shoe boxes, 5 wood products, colour markers, construction paper.

Time

40 minutes.

Background

Forests cover about 30 percent of the land area on Earth. But a forest is more than just a group of trees. Forests play a vital role in the **environment**.

The world's forests provide many different goods and services, for example:

- Home for plants and animals, which help to maintain the diversity of life on Earth;
- Food for people and animals;
- Valuable materials for different industries, for example, to obtain medicines or wood for building or energy;
- Filter **pollution** from the air as they soak up CO_2;
- Protect the quality of water and prevent soil loss;
- Produce wood fuels as an alternative to **fossil fuels**;
- Create shade;
- Give people nice places to live, relax and have fun;

And much, much more!

Since the beginning of time, people have used raw materials from forests to help meet society's needs for housing, furniture, paper, and thousands of products used by people all around the world. Chemicals and other tree components are found in many everyday products such as tires, toothpaste, fuel, paint, chewing gum, hair spray or maple syrup. We could never name them all!

During the years, increasing populations have created a bigger demand for forest products. Because of this, we risk destroying entire forests and all of the plant and animal life that exists in them. Moreover, the ability of our forests to store carbon and, thereby, to combat the changes in our **climate** is very important.

Our planet is getting hotter because of global warming. The release of **fossil fuels**, such a as **carbon dioxide**, is increasing the amount of **greenhouse gases** in our **atmosphere**. Forests influence **climate change** mainly by affecting the amount of CO_2 in the **atmosphere**. When forests grow, carbon is removed from the **atmosphere** and absorbed in wood, leaves and soil. Because forests can absorb and store carbon over an extended period of time, they are considered '**carbon sinks**'. This carbon remains stored in the forest **ecosystem**, but can be released into the **atmosphere** when forests are cleared, burned or degraded. Forests have the potential to absorb about one-tenth of global carbon emissions projected for the first half of this century.

Since cutting down trees for wood is one of the main reasons why forests around the world are being destroyed, it is important to find ways to protect forests through our everyday choices and to practice **conservation** to sustain the availability and use of the important resources we obtain from forests. There are many easy things you can do to help, so get to work!

How to do it

1. Collect 5 shoe boxes and cut a hole in the top big enough to put your hand in. Place a different object made from wood in each box. Ideas:
   - Cardboard
   - Newspaper
   - Toy
   - Button
   - Pencil
   - Bracelet
   - Lollypop stick
   - Brush
   - Toothpick
   - Napkin
2. Get your group to put their hands in the box one by one and guess what they are feeling.
3. After they discover all the objects, ask them what these objects have in common, that they all come from wood!
4. Then, ask them to think about how important forests are for our daily life. Tell them to help you make a list of the things they can do to help preserve forests and make a nice poster, so you can put it in a place where everyone can see. Here are some ideas:
   - Write on both sides of the paper.
   - Collect your scrap paper and use it for different activities.
   - Use cloth napkins and towels instead of paper ones whenever possible.
   - Use a reusable bag instead of paper bags.
   - Buy recycled paper.
   - Print only if necessary.
   - Dry your hands with a towel or a hand dryer instead of using paper towels.
   - Plant a tree whenever you can.

Discussion

What products have you used today that are made from wood?
What forest products are present in the classroom or meeting place?
How important is it for everyone to use these products wisely?

Nature Collage

Level 1 2

Aim

To create art using materials found in a forest.

Materials

A forest setting, basket or plastic bag for collecting materials, cardboard, glue, colouring pencils, scissors.

Time

1 hour.

How to do it

1. Remind your group that one thing they can do to make their day at the forest memorable is to create a nature collage out of things they can gather while they are outdoors.
2. Go for a walk in the forest and ask the participants to find nice looking things that they can glue onto their cardboards. These can be anything they might find, such as leaves, twigs, feathers, flowers, shells, and even small pebbles.
3. Next, tell the participants to lay the cardboards down and glue the items trying to make a nice picture. They can also draw or make rubbings of things to add to the collage.

Discussion

What did you want to transmit through your collage?
What other uses can you give to these forest resources?
How might animals use them?

Source: Discover the Forest, Create a Nature Collage, The Book of Stuff to do Outside, www.discovertheforest.org/pdf/book-of-stuff.pdf

We All Enjoy Trees

Level 1 2

Aim

To realize how much we depend on trees on our daily lives.

Materials

A walk to a nearby park.

Time

1 hour.

How to do it

1. Remind your group how in addition to giving us wood, paper, food and other products, trees are invaluable assets to our communities.
2. Take a neighborhood walk, maybe to a nearby park and look for newly planted trees and shrubs. How are they protected? Find a place without trees and compare it with a place with many. Which place do people like best? Why?
3. Look around and observe all the activities that different people are doing that include trees, maybe resting under a tree, watching a squirrel climb up a tree, or playing hide and seek! Do you enjoy being around trees? Why?

Discussion

Have you used anything that comes from trees today?
What do you like the most about trees?
How would life be without trees? Would it even be possible?

Trees as Habitats

Level 1 2 3

Aim

To understand the relationships between trees and the animals that inhabit them.

Materials

A trip to a field site, magnifying lenses, notebooks, pencils, white sheet of cotton, nylon or canvas, a soft pole, length of bamboo or a piece of plastic tubing to use as a tapping stick, field guides (if available), string.

Time

2 hours.

Background

Many threatened or **endangered species** are at risk because of disruptions to their habitats. While some **species** can rely on diverse sources of food or places to breed, a surprising number of **species** are very specific in their requirements. For example, certain butterflies can only lay their eggs on particular host plants that provide food for their caterpillars. Some bird **species** have very particular nesting requirements that are only met by certain kinds of trees. Wildlife depends upon having enough of the right kind of habitat available for their survival and reproduction.

Maintaining a diversity of trees in forest habitats supports a wide diversity of animals in the forest **ecosystem** – producers, consumers and **decomposers.** The producers are the trees themselves and the other forest plants that provide food for other wildlife. The consumers eat the plants or get energy from eating animals that feed on plants. The **decomposers** include fungi, bacteria, earthworms and insects that break down dead material. They recycle the waste products of the forest, turning dead plants and animals into usable **nutrients** such as nitrogen and phosphorus that can be absorbed by tree and plant roots.

There is also diversity in the layers of the forest. The **canopy** layer is made up of branches and leaves of the tallest trees. Beneath that is the **understory** layer made up of smaller trees and shrubs. Beneath that is the **forest floor**, where wildflowers, grasses, seedling trees, mosses and fallen leaves, branches and trees are found. Underneath them all is the soil and the roots of trees and other plants. Wildlife often spend the majority of their time in one of these layers. For instance, red squirrels spend much of their time in the **canopy**, while wild turkeys spend most of their time on the **forest floor**.

Some very important habitats include those found in dead or decomposing trees. Not only do they provide **nutrients** to the forest as they **decompose**, but they also provide places where animals live. Tree cavities are important nesting sites for birds and mammals. Many insects, spiders, reptiles and even bats can be found under tree bark.

One of the most direct relationships between trees and other **species** are those between trees and wildlife that use them for a food source. Leaf feeders may be found almost any time a tree has its leaves, and tree flowers can provide important food for flower specialists. Bark and wood are consumed by a variety of insect larvae, and sap that leaks from trees often attracts butterflies as well as wasps and some flies. Mammals often feed on very energy-rich fruits produced by trees like oaks, chestnuts and beech trees. Those **organisms** that directly consume tree tissues

as food may themselves become food for predators. Caterpillars are eaten by birds and wasps and can serve as the 'nursery' for the larvae of certain wasps and flies. Predators help to control the numbers of plant feeders.

How to do it

1. Take the group to a field site where they can do observations. Divide the group into teams of three or four.
2. Ask the participants to brainstorm what they are likely to observe as evidence of animals using trees, such as nests, burrows, insect galls, chewed leaves or branches, borings in tree bark, caterpillar 'tents', rolled leaves, claw marks on trees or fur caught in tree bark. Keep a list of the ideas from the brainstorming session.
3. Next, ask the participants for any ideas about how the addition of one **species**, such as a moth or caterpillar that eats only one kind of tree's leaves, might attract or support other **species** in the **ecosystem** or might damage the **ecosystem**. Try brainstorming about how the different uses of the tree as habitat might change over the seasons or over the entire life of the tree.
4. Each team should observe three to four trees, ideally in different stages of their lifecycle, including dead standing or dead fallen trees or decomposing logs. Make sure that each team has a notebook and pencil for recording observations and drawing sketches of the habitats. Remind the teams to take care not to disturb any established habitats while they are making their observations. Here are some questions to help guide their observations:
   - Ask them to look at the condition of each tree – is it alive or dead? Does it look healthy?
   - Which animals prefer live trees and which prefer dead trees?
   - What roles do trees play in the lives of animals and what roles do animals play in the lives of trees?
   - What value might dead trees have in a forest?
   - What kinds of animals might you observe during the different seasons?
5. When the teams are done with their observations, ask them to leave the area as clean as they found it – do not leave any litter behind.
6. Discuss with the groups the differences between what they thought they would observe from the brainstorming session and what they actually observed in the field.
7. Find an area with a number of small trees or larger trees with low branches in order to find examples of animals that are using the foliage and branches as habitat. Bring a white sheet of cotton, nylon or canvas (about 2-3 square feet) and a soft pole, length of bamboo or a piece of plastic tubing to use as a tapping stick. With two to four participants holding the corners of the sheet under a leafy branch, have one team member rap the wood of the branch gently but abruptly five or so times to dislodge small animals from the leaves and branch surfaces. Observe and record what appears in the collecting sheet. If you bring field guides with you, you can also try to identify the types of **species**. When you are done observing the animals, gently deposit them at the base of the tree where they were collected.
8. Repeat the activity at another tree of the same **species**. What are the most common types of **organisms** found in that tree **species**? Then try the activity with a completely different tree **species** and see whether the same types of **organisms** are present in that tree **species** or if they are quite different.
9. This is a good idea for elder groups:

Mark off two square areas of equal size (about one meter by one meter) with string – one in the shade of a tree, and one nearby in the sun. Divide the participants into two groups. Pass out magnifying glasses or hand lenses to each group. Ask the participants to count how many insects they find in each area. They should compare the total number and variety of **organisms** found in the shade with the total number and variety of **organisms** found in the sun. Use the following questions to guide discussion:

- What influence does the shade have on the number and type of insects found?
- Do insects appear to prefer to be in the shade or the sun?
- What influence does the shade or sun have on the activity of insects observed? Are they more active, less active, or about the same?
- What other factors could you investigate besides sun and shade?

Discussion

Which is your favorite forest animal? What is the role of this animal in the forest?
Which do you think is the most clever forest habitat? Why?
What can you do to make sure forests are protected in your community?

Source: National Wildlife Federation, Trees as Habitats, www.nwf.org/~/media/PDFs/Be%20Out%20There/National-Wildlife-Week/2013/Lessons-Activities/Trees-as-Habitats_9-12.pdf

Forest Products Life Inventory

Level 1 2 3

Aim

To realize our deep reliance on forest products.

Materials

Publication cited (downloaded from internet), collection of examples of forest products including non-timber products, chalkboard.

Time

45 minutes.

Background

Since the beginning of time, people have found many uses for trees. They have used them to build shelter, as a source of food, to provide heat, and for recreation. An increase in the Earth's population has created more and more demand for products that come from trees. Fortunately, trees are a **renewable resource**. But even though we still have many trees, we don't want to waste them. That is why it is so important to use every part of a tree that is harvested. Over the years, people have found ways to use wood far more effectively than was ever thought possible. We even use it again through recycling. We enjoy the beauty of trees, but trees are also valuable in many practical ways. By using as much of the tree as possible – and by planting new trees – we can be sure that we will always be able to enjoy the benefits that come from this amazing **natural resource**.

How to do it

1. As homework ask the participants to read **'From the Forest'**, a small publication from Georgia-Pacific that talks about the different products we use every day that come from forests – it can be

downloaded from the following webpage:
http://ecosystems.psu.edu/youth/sftrc/lesson-plan-pdfs/from-the-forest

*If you prefer, you could help the younger groups read the publication during the session.

Also, ask the participants to inventory their lives for forest products. Tell them to look all around their house and to make a written list, including non-timber products.

2. Discuss the previous day assignment and develop a master list on the chalkboard. Demonstrate the large number of forest products, both timber and non-timber, using the collection of examples.
3. Define renewable and non-renewable products. Discuss and demonstrate some alternative products that are derived from non-**renewable resource**s. Compare and contrast the cost and benefits of each type of product. Stress the importance of being an informed consumer and making choices that positively affect our resources, especially forest products.

Discussion

What is your favorite forest product?
How does technology help us make the best use of each harvested log?
How can you help forests from home?

Adapted from: PennState College of Agricultural Sciences, Forest Products, Forestry/Natural Resources Lesson ¨Plans, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/9-12/products

Wood Art

Level 1

Aim

To understand that we use wood products every day.

Materials

A trip to an outdoor setting which contains trees; bags to collect twigs; paper cups, cardboard, glue, watercolours, string, and other craft materials might be needed.

Time

1 ½ hour.

How to do it

1. Take your group to an outdoor setting with trees and explain that we make products from wood because it's strong, durable and easy to work with. Ask them: what has a tree done for you lately? Very few people actually live in trees, but many of us live in wooden houses made from trees. Many of the items inside our homes are also made from wood, including furniture, floors, toys, musical instruments, kitchen utensils and much more.
2. Discuss with the participants useful things they could make simply with twigs and branches they find on the ground and string. Lead them on a twig search and ask them to gather enough twigs to actually construct some useful item or items (pencil holder, picture frame).
3. Go back to the class or meeting room and have them build some cool stuff using the twigs they collected. You can also collect some leaves to use as

decoration.

4. Have each participant present his/her work of art.

Discussion

How do people depend on trees?
Why do people plant trees in their yards?
Are there any places in the world without trees? What are they like?

Adapted from: Illinois Natural History Survey Prairie Research Institute, Trees at Work, www.inhs.illinois.edu/resources/tree_kit/teacher/lespl1.html

If the Forest Could Talk

Level 1 2 3

Aim

To learn why trees are necessary to maintain and improve our **environment**.

Materials

An outdoor setting.

Time

1 hour.

How to do it

1. Take your group to an outdoor setting and ask them to carefully look at trees and think about the benefits that our **environment** receives from trees and forests. Here are some ideas why trees are one of the Earth's greatest **natural resources**:

- ***Trees produce oxygen***

Let's face it, we could not exist as we do if there were no trees. A mature leafy tree produces as much oxygen in a season as 10 people inhale in a year. What many people do not realize is that the forest also acts as a giant filter that cleans the air we breathe.

- ***Trees clean our soil***

The term 'phytoremediation' is a fancy word for the absorption of dangerous chemicals and other pollutants that have entered the soil. Trees can either store harmful pollutants or can actually change the pollutant into less harmful forms. Trees filter sewage and farm chemicals, reduce the effects of animal wastes, clean roadside spills and clean water **run-off**.

- ***Trees control noise pollution***

Trees soften urban noise almost as effectively as stone walls. Trees, planted at strategic points in a neighborhood, or around your house, can abate major noises from freeways and airports.

- ***Trees slow storm water run-off***

Excessive **run-off** water, from heavy rains for example, can be dramatically reduced by a forest or by planting trees. The tree roots retain the rainfall, rather than letting it **run-off**. Underground water-holding aquifers are recharged with this slowing down of water **run-off**. One full-grown **deciduous** tree can catch 500 to 700 gallons of water each year.

- ***Trees are carbon sinks***

To produce its food, a tree absorbs and locks away **carbon dioxide** in the wood,

roots and leaves. **Carbon dioxide** is a global warming suspect. A forest is a carbon storage area or a 'sink' that can lock up as much carbon as it produces.

- ***Trees clean the air***

Trees help cleanse the air by intercepting airborne particles, reducing heat, and absorbing different pollutants, such as: carbon monoxide, sulfur dioxide, and nitrogen dioxide. Experts estimate that a single tree can absorb 10 pounds of air pollutants a year.

- ***Trees shade and cool***

Shade resulting in cooling is what a tree is best known for. Shade from trees reduces the need for air conditioning in summer. In winter, trees break the force of winter winds and, thus, lower heating costs. Studies have shown that parts of cities without cooling shade from trees can literally be 'heat islands' with temperatures as much as 12 degrees Fahrenheit higher than surrounding areas.

- ***Trees act as windbreaks***

During windy and cold seasons, trees located on the windward side act as windbreaks. A windbreak can lower home heating bills by up to 30 percent and have a significant effect on reducing snow drifts. A reduction in wind can also reduce the drying effect on soil and vegetation behind the windbreak and help to keep precious topsoil in place.

- ***Trees fight soil erosion***

Erosion control has always started with tree and grass planting projects. Tree roots bind the soil and their leaves break the force of wind and rain on soil. Trees fight soil **erosion**, conserve rainwater and reduce water **run-off** and **sediment** deposit after storms.

- ***Trees provide food and building materials***

Many trees provide food in the form of fruits, nuts, leaves, bark and roots for the consumption of humans and other animals. Moreover, trees provide us with more than 5 000 products that people use every day, from maple syrup to paints, and from toothpaste to bubble gum, tree-based chemicals and other wood by-products are all around us.

Source: About.com, Forestry, http://forestry.about.com/od/treephysiology/tp/tree_value.htm

2. Tell the participants that they are going to transform themselves into trees. Divide your group into small teams and assign one of the ideas above to each one. Ask each group to make a mini role play about it, acting as if the trees were talking. The elder groups can present their acts to the younger participants.

Discussion

Why would one say that trees are 'magical'?
What happens when trees and forests are destroyed?
How can planting more trees benefit your local community?

Re-Tree-Ve the Resource!

Level 1 2

Aim

To have fun discovering things that come from trees.

Materials

Copies of the crossword, pencils.

Time

30 minutes.

How to do it

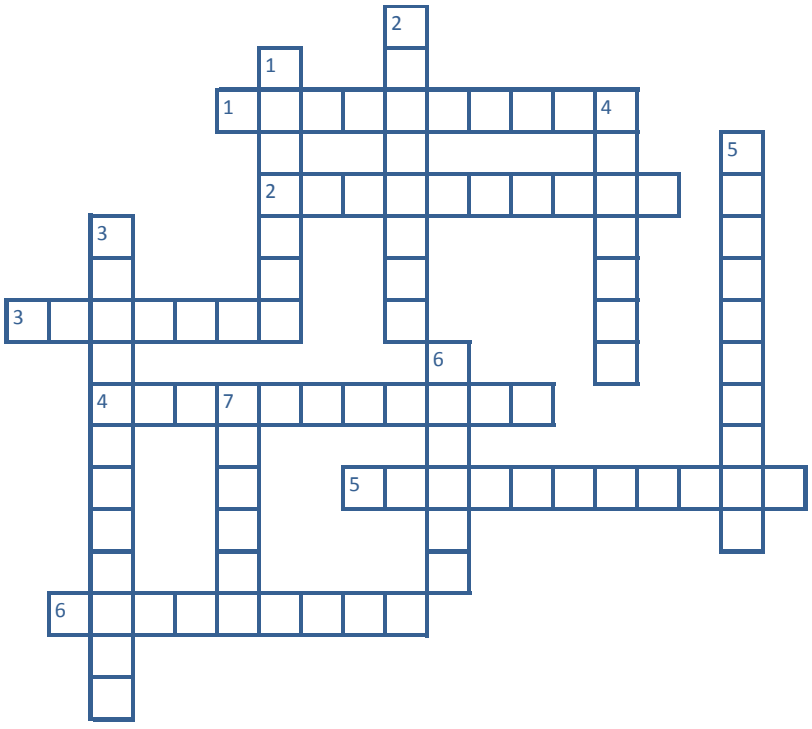
1. Explain to your group that they are going to solve a crossword puzzle that contains many cool objects or activities that involve trees.
2. Hand a copy of the crossword to each participant and give them enough time to solve it (the younger groups can work in pairs).
3. Check the answers with the entire group.

Discussion

Have you used many forest products today?
Which is your favorite forest product? Why?
What can you do to use forest products more sustainably?

Source: PennState College of Agricultural Sciences, Trees+Me=Forestry, Re-Tree-Ve the Resource, http://ecosystems.psu.edu/youth/sftrc/lesson-plan-pdfs/trees-me-forestry, page 5.

Re-Tree-Ve the Resource Crossword Puzzle



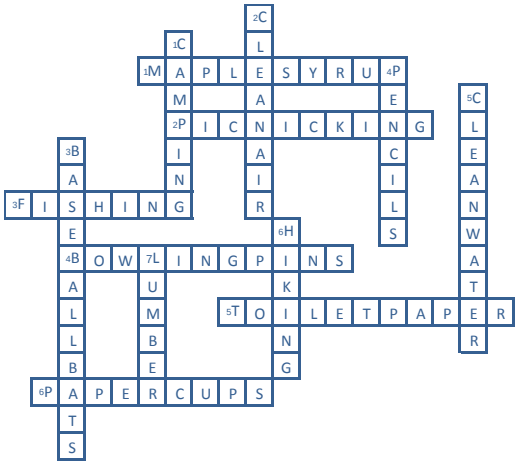
Across

1. This sweet, sticky substance comes from the sap of a sugar maple tree.
2. This involves lunches, fun, and ants.
3. This needs a worm, hook, and lots of luck.
4. These come from maple and like to be 'knocked out' when you bowl.
5. Made from the pulp of trees, this can be found 'rolling around' in bathrooms.
6. These are made from tree pulp and hold lots of lemonade.

Down

1. This requires a tent, cook stove, and lantern.
2. When trees breathe, they make this.
3. These come from white ash trees and turn kids into real sluggers!
4. Made from wood, these help you do your homework.
5. Trees protect this by keeping soil and **pollution** from entering streams.
6. This requires healthy minds, strong feet, and a walking stick.
7. This comes from logs and is used to build houses.

Answer



Forest ABC

Level 1 2 3

Aim

To realize that many different products come from forests, timber and non-timber.

Materials

Poster board, colour markers, whiteboard, whiteboard markers, books or internet for research.

Time

45 minutes.

Background

Trees are amazing! They provide beauty, shade, clean air and water, fruit, nuts and different wood products. These benefits are well known. But did you know that literally thousands of products are made from trees? Many are surprising! From the medicine L-Dopa for treating Parkinson's Disease, to film in your camera, forest products are all around us.

When trees are used to make lumber and plywood, there are leftover chips, bark and sawdust. The chips and sawdust are made into wood pulp for paper and other products. Not too long ago, those leftovers would have been burned as waste. Bark is used for landscaping, and to generate electricity for paper and lumber mills. Modern forest products operations are very efficient at using every part of a tree. Nothing is wasted.

Wood is made of tiny fibers (cellulose) and the natural glue that holds them together

(lignin). When wood is turned into pulp for paper, heat and chemicals dissolve the lignin and release the cellulose fibers. Byproducts of this process are used in asphalt, paint, chewing gum, detergents and turpentine.

Cellulose is used for paper and much, much more. It is a principle part of melamine dinnerware, toilet seats, tool handles and cellophane. It is also used to produce helmets, toothbrushes and electrical outlets. Other refined cellulose products include rayon fabric, and nitrocellulose which is used to make nail polish, solid rocket fuel and industrial explosives.

Wood pulping byproducts are used for many different things, ranging from cleaning compounds, deodorants and hair spray, to artificial vanilla flavoring, medicines and cosmetics. Torula yeast, produced from wood sugars separated in the pulping process, is a high-protein product used in baby foods, cereals, imitation bacon, pet foods and baked goods.

Silvichemicals (chemicals from trees) are so much a part of our civilization that we take them for granted. But they wouldn't exist without wood and wood products. Trees are truly a miracle resource!

Source: Idaho Forests, Wood you believe, We get so much from trees!, www.idahoforests.org/wood_you.htm

How to do it

1. Remind your group that a forest product is any material derived from a forest. These products can be derived from wood, such as timber or paper, or can be **non-wood products** such as food, fodder and medicinal plants. Moreover, tree-based chemicals and other wood byproducts are used to make many different things we use every day such as ping pong balls, cosmetics, tires and rulers. Trees provide us with more than 5 000 products!
2. Explain to your group that you are creating your own Forest Alphabet. For example: A is for Apple, B is for Button, C is for Cutting board… If you have a hard time finding a word with any particular letter, you can use the internet or some books to help you.
3. You can also have your group make a nice poster board with the alphabet and hang it in your class or meeting room, so when they see it they remember how many amazing things we get from forests and trees!

Discussion

How are tree products alike and how are they different?
Were you surprised to know how many things are derived from trees? Which product surprised you the most?
Why might some people not be conscious about the need to protect forests? What can you do about it?

Forest Web of Life

Level 2 3

Aim

To construct and describe food webs that include the non-living elements of a forest **ecosystem**.

Materials

Notecards, pictures of forest plants and animals (from magazines or the internet), string, chalkboard, chalk.

Time

1 hour.

Background

A forest is a living community dominated by trees. Each plant in the forest, from tiny mosses to giant trees, has its own specific needs for things like sunlight and moisture. Because **environments** vary tremendously, a specific location will be better for certain plant **species** than for others, and those **species** will grow more abundantly as a result. The most dominant tree **species** in a forest usually determines the forest's appearance and suitability as a habitat for plants and animals. For example, in some forests, large, dominant trees may reduce sunlight and monopolize soil moisture and **nutrients**, thus limiting the types of plants that can grow beneath them.

While trees and plants are usually its most conspicuous elements, the forest **ecosystem** also depends on animals. Animals are vital to most plants because they help pollinate flowers and disperse seeds. At the same time, animals such as deer, rabbits, and insects may eat certain plants, greatly reducing their presence. Some insects can substantially damage a forest **ecosystem** if their numbers get too high. Insect-eating birds play an important role in keeping insect populations in check.

Another way that forest plants and animals are connected is through a web of eating relationships. One primary function of a forest, like any other **ecosystem**, is to produce and distribute energy. All life depends on the ability of green plants to use sunlight to synthesize simple sugars from **carbon dioxide** and water. Through this process, called **photosynthesis**, plants take energy from the sunlight and make it available to animals. Plant eaters (herbivores) eat the plants directly; and animal or flesh eaters (carnivores) in turn eat both herbivores or other carnivores, thus forming a **food chain**. A **food chain** is a simplified way of showing energy relationships between plants and animals in an **ecosystem**.

For example, a **food chain** of Sun » sunflower seed » mouse » owl shows that a seed is eaten by a mouse, that in turn is eaten by an owl. However, rarely does an animal eat only one type of food. A food web describes the interconnection of the **food chains** in an **ecosystem** and gives a clearer picture of how plants and animals in an **ecosystem** are related to each other.

How to do it

1. Explain to your group that in this activity they will create a **'Web of Life'** to depict the relationships among members of a forest **ecosystem**. This web includes eating relationships (as in a food web), but also shows the various other kinds of relationships found in a forest (shelter, reproduction). The web of life suggests that all living things are connected to all others. No matter how unrelated **organisms** may seem, they are, in fact, connected.

2. Choose the forest **ecosystem** that you want to investigate. Using your local area might be easiest, however choosing a remote forest would be an excellent research project for your group. An example of a list of components for an Alaskan temperate rain forest would be:

Sunlight	Bacteria	Truffle	Protozoans
Air	Gilled mushroom	Springtail	Lichen
Water	Bark beetle	Flying squirrel	Deer
Rocks and soil	Red-breasted sapsucker	Trailing raspberry	Grouse
Sitka spruce	Sharp-shinned hawk	Moth	Crossbill
Red squirrel	Hemlock tree	White-footed deer mouse	Wolf
Goshawk	Sawfly wasp	Marten	Algae
Carrion beetle	Chickadee	Polypore or shelf fungi	Puma

3. Review your group's prior knowledge about **food chains**.
   In food chains, we group **organisms** according to their feeding level or trophic level:
   - Green plants are at trophic level 1
   - Herbivores (e.g. caterpillars) are at trophic level 2
   - Carnivores (e.g. blackbirds which eat herbivores) are at trophic level 3
   - Carnivores (e.g. sparrow hawks) which eat other carnivores are at trophic level 4
   - The leaf litter is the producer
   - The caterpillar is the primary consumer or herbivore
   - The blackbird is the secondary consumer or carnivore
   - If a sparrow hawk successfully hunted the blackbird, it would represent a tertiary consumer or top carnivore.

   Many producers and consumers die without being eaten, so **decomposers** such as woodlice and earthworms, which themselves may become prey items, form an important additional link, decomposing the dead bodies and wastes of plants and animals at all trophic levels in the chain. This way, the materials of life are recycled and can be used again and again (i.e. in **nutrient** cycles).

4. Brainstorm the components of a forest. Encourage the participants to name a mixture of nonliving things (sun, rocks, soil, water, etc.), living things (plants, animals, fungi, etc.), and roles of living things (producers, consumers, etc.). List whatever they mention on the board.
5. Ask the participants to divide the list into living and nonliving things. Next, they must divide the living things into ecological roles (producer, consumer, herbivore, carnivore, omnivore, and **decomposer**).
6. Explain that the classification of living things by their ecological roles is important in understanding how a forest **ecosystem** works. If an **ecosystem** is to survive changes, then all of the ecological roles must be conserved. For example, if an herbivore disappears, the carnivore that eats it will be affected.
7. Create a 'critter card' for each **organism**, either have the participants illustrate each **organism** or find magazine or internet photos.
8. Distribute the critter cards. If few participants are doing the activity, they must hold more than one card from the same ecological role. For example, one participant could hold all of the nonliving cards or all the producer cards.
9. The participants should circulate around the room and introduce themselves to

each other. They must give the name of the item they represent, their type (nonliving, producer, consumer), and what they eat or use to survive. For example, "I am a spruce tree. I am a producer. I make my own food using sunlight, water, minerals, and air" or "I am a moose. I am an herbivore that eats the twigs of birch, willow, and other plants".

10. Whenever a participant meets something that it eats, that uses it (in the case of producers), or that is used by it (nonliving things), those students should join together by holding pieces of string.
11. The participants who are connected by string must move together as a group. The participants in groups can introduce themselves individually, or the top consumer in each group can do the introductions. Other participants will join this group whenever appropriate. Several separate groups will form at first, but eventually, the whole class should become interconnected.
12. Congratulate the class on becoming a forest food web! Explain that a food web contains all the **food chains** of an **ecosystem**.
13. Ask what would happen to the **ecosystem** if one of the **organisms** in the food web was removed. Tug on one player as if to remove him/her. Tell him/her to pass the tug on to all the **organisms** he/she connects. Ask those who feel the tug to raise their hands. Discuss the effects. If desired, repeat this step by removing different kinds of **organisms**. Which causes the most effects, the removal of a producer, herbivore, carnivore, or **decomposer**?

Discussion

Can you identify a **food chain** that includes at least 4 living things from your forest **environment**?
Why is every **organism** from the forest important?
What happens when forests are destroyed? Does this affect a forest web of life?

Adapted from: Prince William Network's America's Rain Forests, Forest Food Web, www.plt.org/stuff/contentmgr/files/1/2d190498df7ed924c4f1fcf31bd0644a/pdf/plt_activity_45_web_of_life.pdf

Making Paper

Level 1 2 3

Aim

To discuss about the importance of trees and to have fun making paper.

Materials

Chalkboard, chalk, large pan (square or rectangular) about 3 inches deep, 3 cups of water, 1 ½ sheets of newspaper to pulp, newspaper sheets to use to soak up excess water (several sections), piece of window screen that will fit in the pan (available at a hardware store), rolling pin, blender.

Time

1 1/2 hour.

How to do it

1. Remind your group that we live in a biologically diverse **environment** in which great natural beauty is created by the numerous **species** of plants and animals. This diversity extends into our forests where a variety of trees, plants, and animals interrelate and affect one another.
2. Ask the participants to think of the trees that are growing in the forests and parks and on our streets. What purposes do they serve in the **environment**? List the participants' suggestions and discuss briefly as they are mentioned. These may include:

Ecology

- Homes for animals (squirrels, birds, insects, etc.).
- Food for animals (fruits/seeds such as acorns, apples, etc.).
- Dead trees and logs serve as homes for animals as well as food sources for insects and fungi.
- Base for mosses and lichens to attach and grow.
- Part of the **water cycle** (trees take water from the soil and return it through **transpiration**).
- Part of the **carbon dioxide**/oxygen cycle (trees take in **carbon dioxide** during **photosynthesis** and release oxygen).
- Part of the nitrogen cycle (trees take nitrogen from the soil and return it when they **decompose**).
- **Erosion** control (trees help hold soil in place).
- Provide nesting materials for animals.
- Help with stream life (trees offer shade and cool water; downed logs make ponds for spawning).
- Provide food supply and homes for insects (termites, ants, etc.)

Special uses in cities

- Provide shade.
- Filter the air (trap dust, ash, smoke) and absorb pollutants (sulfur dioxide and others).
- Twenty pounds of **carbon dioxide** are produced for each gallon of gasoline burned by an automobile. A young tree can remove 25 pounds of **carbon dioxide** in a year! Think of the number of trees that are needed to help keep our air breathable!
- Act as a windbreak.
- Muffle traffic noise.
- Trees are pleasing to look at and offer a recreation spot.
- Place for wildlife in the city (trees provide home and food).

3. Next, remind your group that paper is one of the products we get from trees and explain that now they are making some recycled paper:
   a) Tear some newspaper into tiny pieces.
   b) Place the paper and water into blender. Blend on medium speed for about 5 seconds. You now have pulp! ***Be very careful when using the blender!***
   c) Place the screen in the pan and cover with about an inch of water.
   d) Pour about one cup of the pulp over the screen and spread it around with your fingers. This will become your sheet of paper.
   e) Carefully lift the screen and let the water drain into the pan.
   f) Place the screen with pulp onto half of an open section of newspaper.
   g) Close the section and flip it so the screen is on the top.
   h) Roll over the top of the folded newspaper with a rolling pin to help remove the excess water from the pulp.
   i) Open the section of newspaper and carefully remove the screen.
   j) Leave the newly made sheet of paper on the newspaper and place in an undisturbed area overnight so it can dry.
   k) Once it's dry, you can use it like any other piece of paper! If you want to decorate the paper, you can add glitter or place some dried flowers or small twigs.

Discussion

How important would you say trees are for your life?
Which is your favorite forest product/service? Why?
Why is it important to recycle or even avoid using too much paper?

Adapted from: Prince William Network's America's Rain Forests, Making Paper, http://rainforests.pwnet.org/4teachers/value_challenges.php

Who Works in the Forest?

Level 1 2 3

Aim

To explore a variety of jobs that are related to forests.

Materials

Poster board, colour markers, chalkboard, chalk, scissors, magazines, computer with internet access (optional).

Time

1 hour.

Background

Forestry is more than just planting trees and fighting forest fires, although those tasks may be part of a professional forester's responsibilities. In nature, forest **ecosystems** are controlled by sunlight, rain, and soil fertility. Wind storms, insect infestation, tree disease, and lightning also have a role in regulating forest **ecosystems**.

We cannot depend on nature alone to take care of forests and provide the timber, wildlife, clean air, water, and other forest products that we need today and in the future. In the profession of forestry, people care for forests in ways that mimic nature. Urban foresters specialize in caring for forests that grow in and around metropolitan communities. They pay close attention to factors that affect those forests, such as limited growing space, poor air, lack of water, poor soil quality, and vandalism. Urban foresters try to increase the average life span and maintain the aesthetic quality of trees in city parks or forests.

Forestry activities can also affect surrounding communities. For example, when trees are harvested or pesticides are used, the water quality in nearby streams must be protected. Foresters are trained to care for all the systems in and around the forest.

While foresters are trained in managing all forest resources, they often call on other professionals who specialize in individual parts of the forest, such as soils, water, or wildlife. Some specialists work in computer modeling, mapping, and statistical or budget analysis. Usually, a team of foresters and specialists work together to decide how to care for the forest so that it provides all the things people need and want from it.

How to do it

1. Ask the participants if they have either visited or seen pictures of a forest. Do they think those forests require people to take care of them? If so, what kind of work is necessary? For example, work from a forester, wildlife biologist, hydrologist, soil scientist or geneticist.
   - Elder participants could make a small investigation about different types of jobs related to forestry and **natural resources**, the following webpage can be useful:

http://forestrycareers.org/sub_disciplines.php

2. Discuss with the participants how forests provide plant and animal habitats; paper and wood products; places for recreation; and air, soil, and water protection. Explain that people must manage forests well to enhance all of these. See if the participants can add more jobs to their list by drawing on this discussion.
3. Write the following occupations on the chalkboard: logging truck driver, cardboard box maker, nature guide, wildlife biologist, birdwatcher, newspaper deliverer, wildlife artist, angler, sawmill operator, campground manager, and garden supply store owner.
4. Ask students how each of those workers could benefit from having forests managed by the people they've discussed about. Which workers depend on forests in some way to do their jobs? (All of them). Be sure the participants explain how each person depends on forests.
5. Divide the participants into small groups and have each group create a collage showing how people depend on forests. It can include pictures of forests, trees, people living near forests, forest products, and people using forests or products, and people working in forests. Have the groups present their collages, they could even show them to other classes or groups.

Discussion

Can you mention some of the advantages of taking care of forests?
How do education, research and technology help people protect and maintain forests healthy?
What can you do to use forests resources in a wise way?

Adapted from: Prince William Network's America's Rain Forests, Who Works in This Forest?
http://rainforests.pwnet.org/pdf/Who_works.pdf

Forests of the World Opinionnaire

Level 1 2

Aim

To realize how important forests are for everyone on Earth.

Materials

Copies of the questionnaire, pencils.

Time

A 10 minutes session to explain the activity and another 1 hour session to review the results.

How to do it

1. Remind the participants how many cool things we receive from forests and explain that they are completing a ***Forests of the World Opinionnaire*** with their families.
2. Hand a copy of the opinionnaire to each participant and ask them to complete it for the next day.
3. On the next session, have the participants work in small groups to discuss their different answers.
4. Review the last section as a group and reach some general conclusions.

Discussion

Have you visited a forest in our country? How would you describe it?
Have you visited a forest in another country? How was it similar and how was it different to a local forest? Are both forests equally important?
How do forests contribute to your wellbeing?

Source: Project Learning Tree, Global Connections: Forests of the World, www.plt.org/stuff/contentmgr/files/1/7897702793989bd6b3d097a2f5d6ecb4/files/activity_1__forests_of_the_world_opinionnaire.pdf

Forests of the World Opinionnaire

1. How much of Earth's land area do you think is covered by forests?
   a) 5 percent
   b) 30 percent
   c) 10 percent
   d) 50 percent

2. Which three countries have the most forest land?
   a) United States, Australia, Peru
   b) China, Canada, United States
   c) Russian Federation (Russia), Brazil, Canada
   d) Russian Federation (Russia), Canada, China

3. List five ways how your everyday life is connected to forests:

4. Name a forest you have been to or have heard about. How are you connected to this forest?

5. How do you think humans have affected forests locally or globally in the past 100 years?

6. Do you think people should be concerned about what happens to forests in another country? Why do you think so?

7. Look at each of the following statements about forests. Circle how important each aspect of forests is to you, with 1 being not at all important and 10 being very important. Then, put a square around how important you think each is to the world as a whole.

	Not Important									Very important
A Forests provide food.	1	2	3	4	5	6	7	8	9	10
B Forests help control soil erosion.	1	2	3	4	5	6	7	8	9	10
C Forests play a key role in the Earth's climates.	1	2	3	4	5	6	7	8	9	10
D Forests offer places for recreation: camping, hiking, play, and sports.	1	2	3	4	5	6	7	8	9	10
E Forest plants are sources for medicine.	1	2	3	4	5	6	7	8	9	10
F Forests are habitats for wildlife.	1	2	3	4	5	6	7	8	9	10
G Forests provide a place for people to live.	1	2	3	4	5	6	7	8	9	10
H Forests help keep water clean.	1	2	3	4	5	6	7	8	9	10
I Forests provide products such as lumber and paper.	1	2	3	4	5	6	7	8	9	10
J Forests are places of beauty.	1	2	3	4	5	6	7	8	9	10
K Forests absorb carbon dioxide and air pollutants.	1	2	3	4	5	6	7	8	9	10
L Forests are sacred places.	1	2	3	4	5	6	7	8	9	10
M Forests provide firewood.	1	2	3	4	5	6	7	8	9	10
N Forests are wild places.	1	2	3	4	5	6	7	8	9	10

Answers:

1. b
2. c

Track It Back

Level 1 2

Aim

To discover where some of our most popular foods come from.

Materials

Computer with internet access.

Time

45 minutes.

Background

Tropical forests encompass not only mist enshrouded **rainforests** but also remote cloud forests, endangered dry forests and pine savannas. Tropical forests are not a single **ecosystem**, but millions of unique **ecosystems** that are home to over half of the world's plant and animal **species**. Exotic orchids, stealthy jaguars, giant armadillos, colourful songbirds, noisy monkeys and reclusive snakes are some of the creatures that inhabit tropical forests, along with millions of human beings who have relied on forest fruits, fibers, grains, medicines, cloths, resins and pigments for millennia.

While most of the industrialized world senses little connection with the tropical forest, living in large, busy cities far away from these fertile ecological powerhouses, we continue to rely on them for many of our most basic needs.

The forest regularly helps our global food supply by offering new, disease-resistant crops. Although we have sampled only a tiny fraction of the potential foods that tropical forests offer, they already have a profound influence on our diet. An astounding number of fruits (bananas, citrus), vegetables (peppers, okra), nuts (cashews, peanuts), drinks (coffee, tea, cola), oils (palm, coconut), flavorings (cocoa, vanilla, sugar, spices) and other foods (beans, grains, fish) originated in and around the **rainforest**. If we are not careful though, our appetites for these products could destroy the source from which they came as unsustainable farming methods continue to be a major cause of **rainforest** destruction and **pollution** worldwide. We can help the **rainforest** by supporting earth-friendly farming, a balanced agricultural approach that may draw on both local farming traditions and cutting-edge science.

Many of the Western medicines that we use today are derived from plants, and many more may have pharmaceutical properties. Tropical forests have given us chemicals to treat or cure inflammation, muscle tension, malaria, heart conditions, skin diseases, and hundreds of other maladies.

Tropical forests yield some of the most beautiful and valuable woods in the world, such as teak, mahogany, rosewood, balsa, sandalwood and countless lesser-known **species**. Many are vital to our industries. But only recently has the industrialized world realized the limits to timber extraction. Just like agriculture, logging can either

nurture or destroy an **ecosystem**. It is up to us to support environmentally responsible logging and promote smarter wood production and consumption around the world. After all, a healthy forest can provide a lot more than wood. Tropical forest fibers are found in rugs, mattresses, ropes, fabrics, industrial processes and more. Tropical forest oils, gums and resins are used in insecticides, soaps, detergents, rubber products, fuel, paint, varnish and many more.

Source: The Rainforest Alliance, Tropical Forests in Our Daily Lives, www.rainforest-alliance.org/kids/facts/daily-lives

How to do it

1. Remind your group that different food products are produced in different places around the world, including forests. Ask them if they know where the food they eat comes from, where it is grown or how it is harvested.
2. Use the '**Track It Back**' online game from the Rainforest Alliance Web site to discover the journey that chocolate, bananas and coffee take to get to the supermarket:

   www.rainforest-alliance.org/multimedia/trackitback
3. Ask your group which their favorite foods are and try to find the origin of some of them too.

Discussion

Why are tropical forests important?
What else can you find in a **rainforest**?
How can you help protect **rainforests** through your food choices?

Choose an Animal

Level 2 3

Aim

To identify some animals that live in local forests and describe their habitat.

Materials

Poster boards, colour makers, computer or encyclopedias for research.

Time

Two 1 hour sessions.

Background

If undisturbed, an open field over time will be invaded by shrubs, which in turn will be replaced by saplings, young trees, and eventually a mature forest. Foresters often refer to these phases as the grass and forbs stage, shrub and sapling stage, pole stage, and mature forest. In general, plant communities progress in an orderly and predictable manner known as **forest succession**. However, the rate of **forest succession** in any one place is difficult to predict and may vary with soil conditions, topography, frequency of natural disturbance, and amount of competing vegetation. Fire, logging, ploughing, and other events sometimes disturb an area of land. When formerly dominant plants and trees are removed, **succession** begins. New plants take over the area where the old plants once lived.

The abundance and kinds of wildlife also change as a forest matures because the quantity and quality of food, water, cover, and space are changing. Animals are very particular about their surroundings. Every animal has a specific **environment**, or habitat, that it likes the best. This preferred habitat meets that animal's special needs for food, water, shelter, and space. When a forest changes, the animal

species that live there also change. Different stages of **succession** are the ideal habitat for different types of wildlife.

Some animals are generalists because they like many types of habitats. The black bear, for example, likes berries found in the early successional stages of a forest. Yet the bear also needs mature forests for shelter. Other animals are specialists, like the northern spotted owl, because it survives best in one type of habitat, old forests of Douglas fir and western hemlock.

Source: Forest Succession and Wildlife,
www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_009102.pdf

How to do it

1. Remind your group about the different habitats that forests offer to animals.
2. Divide the participants into small groups. Explain to the participants that each group will have to choose one animal that lives in the forests around you. Tell them their task is to find out what habitat it requires for food, shelter, and space. 'Shelter' can include areas for nesting, sleeping, hibernation, and also escaping from predators or bad **weather**. They should also give a short presentation on which stages of **forest succession** their animal would need to meet these requirements.
3. Have each group present their animal.

Discussion

Why are the different stages of **forest succession** important?
How can **forest succession** affect the types of animals found in a forest?
How can **forest succession** affect the types of products a forest produces?

Adapted from: The Pennsylvania State University, Trees+Me=Forestry,
http://ecosystems.psu.edu/youth/sftrc/lesson-plan-pdfs/trees-me-forestry, page 36.

Forest for the Trees

Level 2 3

Aim

To understand how forest resources are managed to provide products and other benefits.

Materials

An outdoor area, three pieces of cardboard and string to make three signs to go around the participants' necks.

Time

1 1/2 hour.

Background

According to FAO, forests include natural forests and forests plantations. A forest is a land that contains more than 10 percent tree crown cover and an area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m.

Forestlands that are classified as commercial timberland (forests capable of growing merchantable crops of trees) can be owned by three sectors of society: families, public agencies or forest industries. Privately owned forests are managed for many objectives. Many private forests choose to grow trees for wood products such as paper and lumber. Like other forests, private forests not only produce timber and

other forest commodities, but also provide homes for wildlife, produce oxygen, reduce soil **erosion**, help protect water quality, and offer recreation areas.

Although family forest owners often have different goals for managing their lands, most have one thing in common: they want to manage their forests in an aesthetically pleasing and ecologically sound way, while growing trees for forest products. These forest owners can turn to different private or public agencies working with forests to better understand how to sustainably manage their forest land.

Silviculture is the art and practice of managing and regenerating a forest to best meet the objectives of the owner. Family forest owners apply silvicultural techniques to maintain and enhance their forestland. In doing so, they can influence forest composition, structure, and growth. Through various techniques that include harvesting (cutting and thinning), planting, and vegetation control (herbicide use and prescribed burning), a forest owner can manipulate the variety and age of tree **species** within a forest, the density of trees, the arrangement of different layers or stories of vegetation, and lighting and shading. Even before a forest matures, owners must consider how the next forest will be **regenerated** and managed. The management techniques a forest owner applies to his or her land not only affect the present forest but also influence its future characteristics.

How to do it

1. Find a comfortable seating area outdoor where you can arrange the participants in rows. Divide your group into about five rows of roughly equal numbers. Prepare three signs that read FIREWOOD, PAPER, and LUMBER, which will go around the participants' necks.
2. Ask the participants what a tree farm is. A tree farm is a private forest, often family owned, managed for timber production. The term tree farm is also used to refer to tree plantations and tree nurseries. Tree farms can provide many valuable benefits, including wood, recreation, clean water, and habitat for wildlife.
3. Explain to the participants that in this scenario they are going to be a family owned forest. Explain that you want to manage this forest to be a productive tree farm, so you call the National Forest Service for advice and they help you to develop a long range management plan for your land.
4. Based on the National Forest Service recommendations, randomly place the participants within a defined area to start the simulation. After each participant is in place, tell them to crouch down low because they are now tree seedlings. Many of them have seeded naturally, but some have been planted. Tell the 'trees' that they have now been growing for 15 years. They should now kneel and have their arms outstretched. Tell them that they need to be thinned so they can continue to grow quickly. If they are not thinned, they may become crowded and compete for food, water, and sunlight. Such competition may stunt their growth and make them more susceptible to insects and disease.
5. Next, ask the participants which trees should be harvested. Explain that for this thinning, you will remove those 'trees' that are overcrowding others and causing too much competition for water, sunlight, and soil. Some of these 'trees' will be used for firewood and some for making paper. Place a FIREWOOD sign around one participant's neck and have him or her stand to one side where the others can see. Have another tree (participant) that has been harvested wear a PAPER sign. You should remove some other 'trees'

during this initial thinning operation. You can designate these 'trees' as firewood or paper and then have them stand behind the respective participants.

6. Tell the remaining participants that they have now grown for another 10 years. Have them stand with their arms outstretched and ask them what they think you should do now. Explain that the trees need thinning again and that this time you will harvest roughly half of every other 'tree' for paper. This thinning will enable the remaining 'trees' to continue growing at the maximum rate. All 'trees' that are cut down will join the others already behind the PAPER sign. Explain that pulp from the trees will be used to make books, boxes, tissues, and other paper products.
7. After growing another 15 years, the remaining 'trees' will be as big as they will probably get. Have them stand with their arms outstretched overhead. Ask the participants what they think you should do at this point. Explain that if all the trees are left as they are, they may be attacked by insects, infected by disease, or destroyed by wildfire. If any of these things happen, the 'trees' will lose most, if not all, of their value as timber. Therefore, you have decided to harvest most of the remaining 'trees' for lumber. Place the LUMBER sign on one participant and begin to remove most of the remaining 'trees'. When the 'trees' have been removed, explain that you will replant the land with several trees for every one that you removed in the final harvest. Leaving some mature seed trees standing will allow for natural regeneration.
8. For a second simulation, place all of the 'trees' in a defined area, as in the beginning of the activity, and ask them what natural events could drastically change the forest. (Wildfire, insect infestation, or plant disease could kill many trees and plants and could greatly affect the **ecosystem**.) Discuss participants' answers. Pretend you are a wildfire roaring through the forest and destroying many of the 'trees' (all participants sit down). Discuss the results: wildlife is homeless; soil is charred; streams are choked with **sediment** and ash; valuable timber is lost. Explain that although you, the landowner, are very upset, fire is a natural and sometimes vital part of the forest lifecycle (some tree **species** actually need fire to **regenerate** naturally from seed). The forest will return through natural regeneration and planting.
9. For the final simulation, replant the forest or allow for natural regeneration so that all 'trees' are standing back in their places. Tell the participants that you have decided to retire and move away. Before you leave, you must sell the land. You sell to someone who isn't interested in **forest management**. This person has decided to develop the property for housing without consulting forest managers.
10. First, the new landowner puts in a road so prospective homebuyers can see the lots. Remove a portion of the 'trees' where the road will go, and put them aside to be burned. (This is often what happens.) Next, remove some 'trees' next to the road so homes can be built. (Again, put them in a brush pile to be burned.) Continue cutting down 'trees' to make room for the construction of businesses, schools, and roads until all 'trees' are gone. Ask the participants, 'Would you like to live in this community?' Point out the many benefits that trees provide for a development like this. (Beauty, shade, recreation, clean air, and homes for animals.) Discuss how the landowner could have developed this housing community with the assistance of foresters so that many of these benefits could have remained.

Discussion

Can you name some of the benefits forest owners receive when they care for their forestland in a **sustainable** way?
What can consumers do to encourage forest owners to adopt **sustainable** management practices?

Adapted from: American Forest Foundation, Project Learning Tree, Forest for the Trees, www.plt.org/stuff/contentmgr/files/1/7d107c9eeff935991a82355fb8f22640/files/plt_lorax_activities.pdf, page 9.

Town Meeting

Level 2 3

Aim

To understand that the use of forestlands affects different stakeholders.

Materials

An indoor space to develop the meeting, notebooks, pencils.

Time

Two 1 hour sessions.

How to do it

1. Explain to your group that they are going to participate in a '**Town Meeting**' to discuss a serious issue: a logging company has gained the rights to protected forestlands near your community, intending to clear cut the area.
2. Divide the group into small teams and have each one choose one of the following roles and state their case at a mock town meeting about the issue:
   - logger
   - nature enthusiast
   - environmental scientist
   - small business owner in the area
   - forest manager
   - representative from the logging company
   - area economic development manager
3. Give the teams some time to discuss about their role and identify their interests and position.
4. You will have the role of the chair to make sure the meeting is fluent and that all representatives intervene (you can have them intervene in alphabetical order).
5. The group must elaborate a final document that will contain the conclusions that were agreed. Before elaborating the final document give the groups some 10 minutes for discussion and questions; any participant can intervene.

Discussion

What is the relationship between a nation's economy and forests?
Why are there conflicts between logging companies and environmentalists?
Why is it important for us to limit our increasing demands for forest products?
What alternative materials can we use instead of wood products?

Source: Actionbioscience.org, Lesson, Projects, www.actionbioscience.org/environment/lessons/nilssonlessons.pdf

Using Forests

Level 2 3

Aim

To reflect about the way people use forests and the consequences of such use.

Materials

Copies of the cases below, pencils, notebooks.

Time

1 hour.

How to do it

1. Have the participants reflect about the different uses people give to forests and its resources. How might this use be different in urban and rural areas?
2. Divide the participants into four teams and hand a case to each one. Ask them to discuss about their case and to answer the following questions:
   a) Which case did you analyze?
   b) How is the forest used in this case?
   c) Why do people use it this way?
   d) Who benefits from this use?
      For each group of beneficiaries, how essential is this use? (1 = not very essential, 5 = crucial)
   e) Rate how much this use affects the forest itself (1 = low effect, 5 = high effect)
   f) Would you say the duration of the effect is short term (less than one year), long term (greater than 100 years), or somewhere in between?
   g) What would the effects be if more people used the forest in this way?
   h) What might reduce the effect of this use?
   i) Is this use **sustainable**? If not, what element of **sustainability** is missing?
3. Have each group present their case.

Discussion

What uses does your community give to the local forests?
What are the consequences of this uses?
What can you do to promote forest **sustainability**?

Source: Project Learning Tree, Forests of the World, Activity 5, Understanding the Effects of Forest Uses, www.plt.org/forests-of-the-world-activity-5---understanding-the-effects-of-forest-uses

How People Use Forests

Case A: Fertilizer in the Indian Himalayas

People in the Indian Himalayas depend on two harvests a year for their survival: rice and millet in the monsoon season and wheat in winter. This intense farming takes a lot of **nutrients** from the soil, and the farmers use leaves from the forest to make up for this shortage of **nutrients**.

One way that Himalayan farmers use leaves as fertilizer is to lay them directly on the fields as mulch. They also feed leaves to their oxen and water buffalos, which, in turn, transform fresh leaves into manure that can be applied to the soil as compost. In addition to processing compost material, the farmers use the livestock for plowing the fields and for milk for their families.

As in most parts of India, forests are now found only on steep slopes and other inaccessible places. Every year, women work harder and travel farther to collect leaves, putting themselves increasingly at risk for injury when lopping off branches from high trees and walking long distances with their heavy loads of leaf fodder. To save

time, they often take leaves from the nearest trees, and those trees die more rapidly as a result of overharvesting, thus causing the forest to diminish more.

Case B: Ecotourism in Costa Rica

The Costa Rican **rainforest** is rich and vibrant, with more than 12 000 **native** plant **species** and some 300 **native** animal **species**. The wildlife is spectacularly diverse. Because Costa Rica is the bridge between North and South America, many **species** migrating between the two continents can be seen in Costa Rica.

In the 1960s and 1970s, Costa Rica's **rainforest** had been threatened by the increase in human population. Confronted with the tasks of daily living, local people were cutting trees both to clear land for farming and cattle grazing and to obtain firewood for cooking.

Looking for a way to sustain the **rainforest** while providing a living for local people, Costa Rica began an **ecotourism** program in the mid-1980s. **Ecotourism** encourages tourists to visit an area so that they can learn about and enjoy the natural **environment** there. Ecotourists may hike, boat, or watch birds in the forest. In theory, this is a win-win situation where the forest prospers because it is no longer being cut and where the local inhabitants prosper with employment and income. It makes an intact **rainforest** a valuable resource. By 1994, **ecotourism** was second only to bananas in the money it brought to Costa Rica from foreign countries.

Although **ecotourism** has helped the **rainforest**, it has also presented new problems. For example, **ecotourism** brings thousands of tourists to parks that aren't set up for so many visitors; the parks have no parking lots, trails, or nature centers. In some areas, there have been problems with trash and trail **erosion**. There is also some concern that the large numbers of foreign tourists could cause part of the local culture to be lost.

Case C: Charcoal Production in the Democratic Republic of the Congo

Charcoal is one of the main sources of energy for cooking and food production in the Democratic Republic of the Congo. Many people prefer **charcoal** because it has been a part of their culture for hundreds of years. It is a concentrated form of energy, burning hotter and more cleanly than wood. Meat from the forest is typically cooked over **charcoal** and is considered a delicacy prepared that way.

Because it is made from wood, **charcoal** is actually a type of fuelwood. **Charcoal** production begins in the forest, where trees are removed and cut. The wood is then burned slowly with limited oxygen in ovens. This process reduces the wood to its most basic carbon content.

Making **charcoal** brings important jobs to rural areas and can be done in conjunction with farming. Producers can use free raw materials (wood from natural forests) and can turn them into a marketable commodity in high demand. However, in the Democratic Republic of the Congo, **charcoal** production is also a threat to the forest because people cut trees at a faster rate than the trees can regrow. This problem has led to shrinking forest lands and to an increase in the price of **charcoal**. Because the **charcoal** has to be trucked from ever-greater distances, the price has steadily increased. This increase, in turn, has hurt small-scale industries that use wood and has put pressure on household budgets. In addition, **charcoal** use results in high **carbon dioxide** (CO_2) emissions, which is the primary greenhouse gas responsible for global warming.

For those reasons, many people feel that **charcoal** production should be stopped altogether. However, because the Congolese people prefer **charcoal** for cooking, and alternative energy sources are more expensive, attempts to ban the production or the use of **charcoal** have been mostly unsuccessful.

Case D: Senior Housing in Korea

The Republic of Korea (formerly South Korea) was once lushly wooded, but by the 1900s its forests were nearly gone due to centuries of overuse, foreign occupation, and warfare. In the 1980s, Korea began planting trees and setting aside protected forestland. Until these forests mature, Korea must import all of its wood for construction and other uses.

As citizens of a small country with a very dense population, limited resources, and a dependence on imported wood, Koreans have learned to use wood products very efficiently. One issue they currently face is how to

house their seniors in a way that is both **sustainable** and that provides a comfortable and healthy living **environment**. This issue is critical because Korea is projected to become a 'super-aged society' by 2026, when 20 percent of its population will be older than 65 years.

Traditionally, Korean houses included lots of wood and stone building materials. Today, the typical Korean family lives in a cement high-rise apartment or condominium building in an industrialized city. The individual units in this type of housing are generally too small and too expensive to support multi-generational living. Besides, many Korean seniors would prefer housing that is filled with light and wood, and that has views of forests and mountains.

By planning for senior housing that takes into consideration social, economic, and environmental needs, Korea hopes to find a viable solution for **sustainable** growth. Elements of this 'green' approach include placing senior housing at the edges of cities, away from **pollution** and noise and closer to natural areas; and using sustainably-harvested and efficiently-produced wood materials, which also happen to be more insulating and energy efficient than other options.

Where Should I Plant my Trees?

Level 2 3

Aim

To recognize that trees provide benefits to our lives in many ways.

Materials

Copies of the 'community neighborhood', pencils, a walk around the neighborhood (optional).

Time

1 hour.

Background

In the past societies were very rural and people had close ties to nature. Today the majority of people live in urban/suburban areas. Often people think of forests only as distant, vast tree-covered tracts of land. They are unconscious of the urban forest that exists in their own cities and towns. Trees play a vital role in these urban **environments**.

These community trees are working trees. They not only provide beauty, shade our streets and schoolyards, create habitat and food for wildlife, but they also produce oxygen, improve air quality, muffle noise, moderate the temperature, filter **run-off**, protect the soil, and cool the air. More and more research is showing just how essential trees are to the quality of life and environmental health in our cities and towns.

Research shows that trees help reduce stress in the work place and speed recovery of hospital patients. Trees also increase land values. Houses with trees often sell faster and for more money than those without trees. Commercial retail areas are more attractive to shoppers, apartments rent more quickly, tenants stay longer, and space in a wooded setting is more valuable to sell or rent. Studies also show that young children benefit greatly from connecting with trees and nature. A connection with nature benefits children educationally, behaviorally, and developmentally.

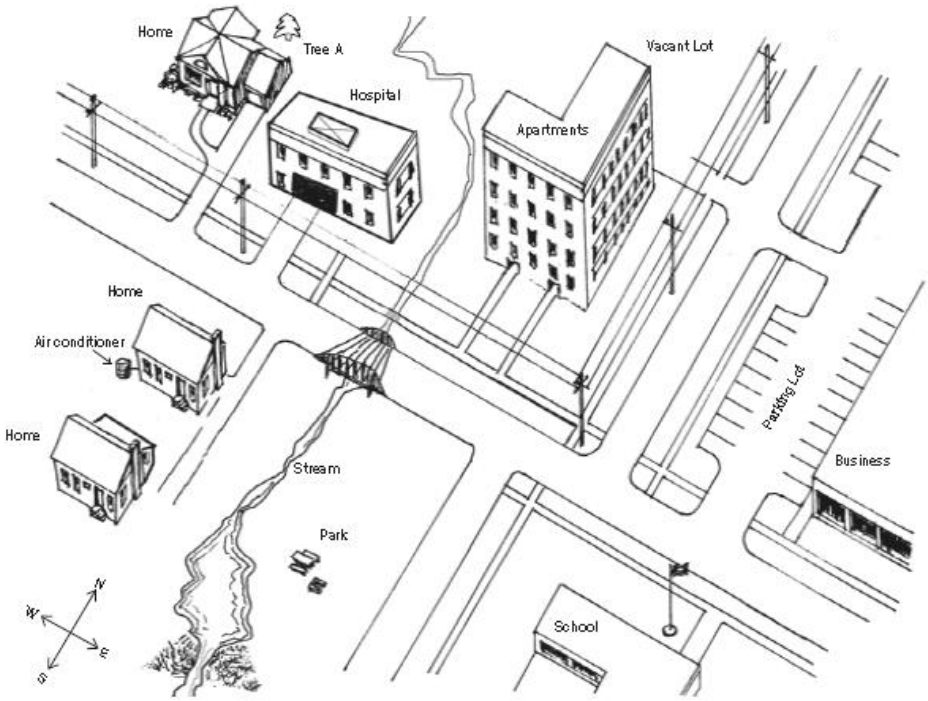
Cities and towns benefit greatly from their urban trees. But trees within cities also have special challenges. There is not as much space for their roots to spread out and urban soils are often poor. Tall buildings can prevent trees from getting full

amounts of sun. Pollution from cars, buses, and factories can affect the health of a tree and impact how well it grows. If the right tree is not planted in the right place, branches can grow and tangle in power lines creating a hazard tree. In spite of these challenges, many **species** of trees have adapted to urban life and grow well, providing numerous benefits to the people that live there.

It takes time, effort, and some funding to establish and maintain the urban forest, but recent studies of the urban forest have shown that city trees provide benefits to the community worth 2-3 times the cost of their planting and care. For many years trees were only valued for the wood products they could produce. Today, scientists have developed ways to measure the economic, social and environmental value of trees to the **environment**.

How to do it

1. Start by making a drawing of a 'community neighborhood' on a paper and make a copy for each participant. Make sure you don't include any trees because these will have to be 'planted' by the participants. Here is an example:



2. Ask your group to discuss about all the benefits we receive from forests and trees. Here are some ideas:
   - Trees properly planted around a home can lower air conditioning and heating costs.
   - Trees help clean the air.
   - Healthy, mature trees around a house make the property more valuable.
   - Hospital patients have been shown to recover from surgery more quickly and require less pain medication when their room had a window that provided a view of trees.
   - Research studies suggest that housing areas with trees and other green plants have less violence and crime.
   - Trees help slow the force of rain water, which helps control storm **run-off**. This results in improved water quality, protected soil, and money savings.
   - Trees help prevent soil **erosion**, flooding, and landslides.
   - The overall cooling effect of a healthy, mature tree is equivalent to ten room-

sized air conditioners operating 20 hours a day.
- Getting outside and connecting with trees and nature has been shown to improve children's concentration and attention span.

3. Divide the participants into small groups. Tell them to imagine they just received some trees to celebrate the International Day of Forests (held each year on March 21) and are going to have an opportunity to plant them in a neighborhood that might be similar to the one where they live. The participants are to draw in (plant) 8 trees in different locations on the 'community neighborhood' where they feel the trees might be of the most value to themselves, to the community, or both. Ask them to number each tree that they plant, #1-8.
   *Remind your group that it is always important to plant the right kind of tree in the right location, but for this activity they should imagine that they have already selected the appropriate tree **species** for each location they might choose.
4. Then, ask them to discuss about the environmental, economic, or social benefit each tree might provide in the location they selected:
   - *Environmental benefit:* does it benefit the **ecosystem**/**environment** in which people live?
   - *Economic benefit:* does it help people, or their town, save money by lowering expenses or increasing property value?
   - *Social benefit:* does it improve the health or quality of life for individuals in some way?

   Give the participants the following example:
   If they planted Tree #1 by a stream it might have:
   - an environmental benefit of holding the soil in place;
   - an economic benefit of saving the city money by reduction of storm water **run-off**;
   - and a social benefit of adding beauty to the area.
5. Allow the participants to share their community tree planting decisions and predict the social, environmental and economic impact of the trees they planted:
   - Why did you select this location for this tree?
   - Which benefit was most important to you when planting this particular tree?
6. If time permits, take the participants on a walk around the neighborhood and look at community trees. Predict what benefit each tree might provide in the location in which it is planted. Have the participants imagine they get to plant a single tree. Where would they plant it? What benefits will this tree provide in the future?

Discussion

Why are trees important to our community?
Which is your favorite 'tree benefit'? Why?
What can you do to encourage tree planting in your community?

Source: National Arbor Day Foundation, benefits of Trees, www.arborday.org/kids/graphics/poster-contest/activity-guide09.pdf

Forest Silvicultural Systems

Level 2 3

Aim

To learn about **silviculture** and its practices.

Materials

Copies of the information page, an outdoor area.

Time

40 minutes.

Background

Silviculture is the art and practice of managing and regenerating a forest to best meet the objectives of the owner. Forest owners apply silvicultural techniques to maintain and enhance their forestland. In doing so, they can influence forest composition, structure, and growth. Through various techniques that include harvesting (cutting and thinning), planting, and vegetation control (herbicide use and prescribed burning), a forest owner can manipulate the variety and age of tree **species** within a forest, the density of trees, the arrangement of different layers or stories of vegetation, and lighting and shading. Even before a forest matures, owners must consider how the next forest will be **regenerated** and managed. The management techniques a forest owner applies to his or her land not only affect the present forest but also influence its future characteristics.

How to do it

1. Explain to your group that today you will be talking about **silviculture**. Divide the participants into **forest management** teams of three or four. Give each team a copy of the '***Forest Silvicultural Systems***' page.
2. Review this information with your group to make sure they understand the forestry terms.
3. Give the teams about 20 minutes to plan a strategy for managing a forest in which the other participants are the trees. They can choose one of the silvicultural systems described on the information page, can use a combination of systems, or can make up their own system. They must be prepared to explain each action they take.
4. Allow time for each team to lead the entire group through a simulation of its strategy.

Discussion

If you were a forest owner, what would be your main interest?
How can applying the correct management techniques help forest owners obtain long-term gains?
What can happen to a forest **ecosystem** if it is not correctly managed?

Adapted from: American Forest Foundation, Project Learning Tree, Forest for the Trees, www.plt.org/stuff/contentmgr/files/1/7d107c9eeff935991a82355fb8f22640/files/plt_lorax_activities.pdf, page 11.

Forest Silvicultural Systems

Silviculture is the art and science of managing and regenerating forests to control their composition, structure, and growth. Forests are frequently managed in smaller units called stands. A stand is a group of trees similar enough in species composition, condition, and age distribution to be considered a unit. Stands may be even-aged (trees are of relatively the same age) or uneven-aged.

A forest manager can choose among several systems of silviculture to harvest and grow new trees within a forest stand. These include the clear-cutting, seed-tree, shelterwood, single tree and group selection systems.

In the ***clear-cutting system***, most trees in a stand are harvested at once, with the expectation that a new, even-aged stand becomes established. The clear-cut system works well for establishing trees that grow best in full sunlight. The new stand is most commonly developed by planting seedlings. In other cases, a clear-cut area is regenerated by seeds from nearby stands, from seeds stored in the **forest floor**, or from stump or root sprouts of cut trees.

The ***seed-tree system*** requires leaving a few good seed producing trees on each stand when the mature stand is harvested. These trees provide the seeds needed to regenerate a new, even-aged stand. The seed trees are sometimes harvested after a crop of new, young trees has become established.

The ***shelterwood system*** involves a series of partial cuttings over a period of years in the mature stand. Early cuttings improve the vigour and seed production of the remaining trees and prepare the site for new seedlings. The remaining trees produce seeds and shelter young seedlings. Later, cuttings will harvest shelterwood trees and allow regeneration to develop as an even-aged stand.

The ***single-tree selection system*** differs from the other systems because it creates and maintains an uneven-aged stand. Foresters examine a stand and judge each tree on its individual merit. Trees are harvested as they mature. Seedlings or sprouts grow in the spaces created. Periodic thinning and harvesting results in a stand that contains trees of many ages and sizes. Because relatively few trees are harvested at any one time, and because the **forest floor** is generally shaded, this system favours species that thrive in low light.

The ***group selection system*** requires harvest of small groups rather than individual trees. The openings created resemble miniature clear-cuts, or gaps, with the major difference being that the resulting regeneration occupies too small an area to be considered an even-aged stand. As in the single-tree system, both thinning and harvest cuttings are done at the same time. The new trees that grow in these small openings are regarded as parts of a larger stand containing trees of many ages. In either single tree or group selection systems, frequent harvests are needed to maintain a balance of tree ages, classes, and sizes.

How Much Carbon is in a Tree?

Level 2 3

Aim

To learn about tree's capacity to store **carbon dioxide**.

Materials

Computer with internet access, an open area with trees.

Time

40 minutes.

Background

Trees absorb **carbon dioxide** (CO_2) from the **atmosphere** during **photosynthesis** and store carbon in their stems, branches and roots, which can also transfer carbon to the soil. By removing CO_2 from the **atmosphere** in this way, forests help to reduce (or mitigate) the severity of **climate change**.

Forests play a vital role in combating **climate change**. Tropical forests cover about 15 percent of the world's land surface and contain about 25 percent of the carbon on the planet's surface. The loss and **degradation** of forests accounts for 15 - 20 percent of global carbon emissions. The majority of these emissions are the result of **deforestation** in the tropics, largely due to conversion of the forest to more lucrative economic activities such as agriculture and mining.

There are plenty of other major sources of emissions, such as industry, energy consumption and transport. However, only forestry activities also have the potential to remove (or sequester) carbon from the **atmosphere**. This sequestration creates carbon 'sinks'. As well as being potential sources of emissions, forests can also help to mitigate **climate change** through the creation of additional sinks. Uniquely, forestry practices are a serious part of the **climate change** problem, but also, potentially, a key part of the solution. FAO experts estimated that the total amount of carbon being held by the world's forests in 2005 was 638 Gt (1 Gt is equal to 1 billion tonnes). This is more than the total amount of carbon in the entire **atmosphere**! This data includes all forest vegetation, roots, dead wood, and the carbon contained in the soil.

Source: FAO, Forests and Climate Change, www.fao.org/docrep/016/i3033e/i3033e01.pdf; FAO, How much carbon is held by the world's forests?, ftp://ftp.fao.org/docrep/fao/010/i0105e/i0105e04.pdf

How to do it

1. Remind your group about trees' capacity to absorb **carbon dioxide** when they grow and how avoiding **deforestation** can help reduce the amount of **carbon dioxide** being released to the **atmosphere**.
2. Take your group outside and explain that you are going to try and estimate how much carbon is in a tree, to do this you can use the following table that can be downloaded from this Project Learning Tree webpage:

   www.plt.org/stuff/contentmgr/files/1/64fd16c38a134fa78502f3538a6ca2f4/files/focus_on_forests_activity_8_sp_tree.pdf

3. On a sunny day, show the participants how to measure shadows and use a ratio comparison to determine tree height. The mathematical proportions are the following:

$$\frac{\text{Tree's height}}{\text{Tree's shadow}} = \frac{\text{Person's height}}{\text{Person's shadow}} \quad \textbf{or} \quad \text{Tree's height} = \frac{\text{Person's height} \times \text{Tree's shadow}}{\text{Person's shadow}}$$

For example:

- Tree's height: x
- Tree's shadow: 63 feet
- Person's height: 4 feet
- Person's shadow: 6 feet

Source: Project Learning Tree, Connecting kids to Nature, How Big is Your Tree?, http://www.forestfoundation.org/stuff/contentmgr/files/1/bbe555c43200c43c99d07e7d5d22b0dd/pdf/plt_activity_67_howbigisyourtree_7_30.pdf

Discussion

What everyday activities can contribute to the release of **greenhouse gases** such as **carbon dioxide**?
How important do you think is forests' capacity to store carbon?
What changes can you make in your live to protect forests?

Good Old Fire

Level 2 3

Aim

To understand that fire plays a vital role in maintaining the health of many natural areas.

Materials

Copies of the case study page, internet access (optional).

Time

1 hour.

Background

For millions of years, fire has been part of the Earth's natural cycle and has influenced natural selection and plant evolution. Over time, plants have adapted to periodic fires, thus developing various mechanisms that enabled them to survive and reproduce in fire-prone **environments**. As a result, many types of forests and other natural **ecosystems** (**grasslands**, deserts, prairies, and so forth) now depend on fire as part of their life cycles.

Forest fires and prairie fires are both powerful change agents that shape **ecosystems**. The specific pattern of fire – including how frequently it burns, how hot it burns, and during which season – helps dictate the types of plants and animals found in a given area. This affects the goods and services that these places provide to people, and can have implications for human safety.

Around the world, fires are behaving differently now than they have throughout history, primarily as a result of human actions. In many places, for example, **climate change** is causing more frequent and more intense wildfires.

Generally speaking, any actions that change the fuel on a landscape will change how fire behaves in that landscape. Grazing, fire suppression, the spread of fire-loving, non-native plants and timber harvesting are some factors that affect fuels.

Many fires are set by people (often in order to help secure their livelihoods), and so addressing fire problems almost always requires both socioeconomic and ecological solutions.

Land managers directly affect how and where fires are allowed to burn by managing wildfires and also by setting controlled burns. In places with fire-adapted plants and animals, managers are increasingly using fire as a tool to increase **ecosystems'** resilience to the impacts of **climate change** and other threats, ensuring that natural areas continue to provide clean air and water for people.

Fire promotes a healthy forest **ecosystem** consisting of mixed-aged trees, which allows for a self-sustaining cycle of life and death. Fire clears dead trees and dry leaf litter, thereby opening up the **forest floor** for new growth. Fire also helps in recycling **nutrients**. Fire's mineral-rich ash nourishes the soil and provides an ideal **environment** for the **germination** of many seeds and the regeneration of certain plants.

Fire supports the process of natural selection as it improves growth opportunities for stronger, healthier trees by thinning small trees and removing weak and insect-infected or disease-ridden trees. Certain **species** of conifers that produce closed cones rely on heat from fire to open the cones and to release the seeds, thereby helping to reseed the area. After a fire, a natural process of **forest succession** occurs. Within a few days after a fire, grasses may begin to grow and 'green up' the recently burned **forest floor**. Wildflowers often flourish after a fire as a result of the high **nutrient** levels and **germination** of new seeds. Over time, the seedlings and other plants will form a young forest.

Sources: Project Learning Tree, Fire Ecology, www.plt.org/stuff/contentmgr/files/1/058cfcaa8bfd6fdf1e9ae884e958e109/files/focus_on_forests_activity_5_sp_fire_ecology.pdf; The Nature Conservancy, Maintaining Fire's Natural Role, www.nature.org/ourinitiatives/habitats/forests/howwework/maintaining-fires-natural-role.xml

How to do it

1. Explain to your group that you are discussing about controlled fires and their role in a natural **ecosystem**, like forests. Why are fires part of the natural cycle of the Earth?
2. Divide the participants into small teams and hand them a copy of the case study (p. 93). Ask them to read it and to have a small discussion.
3. As a group, reach some general conclusions. You can also ask the participants to think about other examples of plants and animals that might benefit from controlled forest fires. They can use the internet to look for this information.

Discussion

Why do forest fires help shape an **ecosystem**?
What are the benefits of controlled forest fires?

Case Study: Fire and the Gopher Tortoise

The gopher tortoise provides a clear example of the relationships between forest species and fire. This **native** species of the southeastern United States – including Alabama, Florida, Georgia, Louisiana, Mississippi, and South Carolina – has been on the decline in recent years. One way in which scientists are hoping to save the gopher tortoise is through the use of prescribed or planned fires in the forests they inhabit.

A descendant of North American tortoises that roamed the continent for millions of years, the gopher tortoise gets its name from its burrowing habits. This tortoise uses its shovel-shaped front legs to dig extensive underground burrows, often 10 feet (3.05 meters) deep and 25–35 feet (7.6– 10.7 meters) long. The burrows provide protection from extreme heat, cold winters, drought, fire, and predators. The burrows also provide shelter to more than 350 other animal species, including gopher frogs, burrowing owls, indigo snakes, and small invertebrates. Because so many animals depend on the burrows to survive, the gopher tortoise is considered a **keystone species**. Declines in the numbers of gopher tortoises and their burrows affect many other populations.

Gopher tortoises prefer the open **understory** forest ecosystem of the longleaf pine forest, which for millennia has been maintained through periodic fires. There the tortoises primarily occupy dry sand hills that allow for easier excavation of their burrows. In longleaf pine forests, abundant sunlight can reach the floor, thus providing sunny spots for the tortoises to lay eggs and to regulate their body temperature through basking. The sunlight also promotes the grazing plants the tortoises eat. Longleaf pine forests once covered some 90 million acres in the Southeastern United States, but more than 97 percent of the original forest has now been lost. Most of the forest has been converted to agriculture, to housing and human development, or to tree plantations.

Much of the remaining forest has not been allowed to burn as it would naturally do. Before people settled the area, surface fires were frequent across this landscape and would burn over thousands of acres every 2 to 10 years. Without fire, longleaf pines are gradually choked out by other species, causing woody shrubs and densely spaced trees to take over. This overgrowth reduces the amount of sunlight that can reach the ground and diminishes gopher tortoises' ability to control their body temperature and to find suitable nesting spots. The overgrowth also decreases the grasses and vegetation relied on by tortoises for food. The loss and degradation of longleaf pine forests have led to a major decline in gopher tortoises throughout their range. In fact, the current tortoise population is estimated to be just 20 percent of what it was 100 years ago. The lack of fire has changed the forests so that they are no longer suitable habitats for gopher tortoises.

Using prescribed fires

In Florida and other states, forest managers and owners are now using prescribed fires to prevent further declines in the numbers of gopher tortoises. Fire opens up the **canopy** and controls the growth of woody shrubs. Fire allows more sunlight to reach the **forest floor**, thus encouraging the growth of grasses, forbs, and other food plants, as well as increasing areas for basking and nesting. People are often concerned about the dangers of prescribed fires to the animal inhabitants of an ecosystem, especially dangers to the gopher tortoise. It is important to remember that gopher tortoises and other animals have survived for millennia with frequent fires and, in fact, rely on the fires to endure. Their deep burrows shelter the tortoise, along with many other species, from fire. At times, however, young hatchlings and tortoises far away from their burrows may be vulnerable to fire. For this reason, the timing of prescribed fires is very important. It is best to avoid the times of year when gopher tortoises are most active, when young hatchlings are emerging from their nests, and when the tortoises need food to prepare for their winter dormancy. Groups such as the American Forest Foundation provide education and assistance to landowners on how to increase longleaf pine habitat for gopher tortoises through prescribed burns. In addition to teaching prescribed burning techniques, the groups also encourage landowners to replant longleaf pine trees where they once existed.

Source: Project Learning Tree, Exploring Environmental Issues: Focus on Forests, Case Study: Fire and the Gopher Tortoise, www.plt.org/stuff/contentmgr/files/1/058cfcaa8bfd6fdf1e9ae884e958e109/files/focus_on_forests_activity_5_sp_fire_and_tortoise.pdf

Forest Experts

Level 1 2 3

Aim

To learn that different people work in the forest and that each one depends on it in different ways.

Materials

Notebooks, pencils.

Time

A 10 minutes session to explain the activity and to prepare some questions for the guest speakers, and a 1 hour session to meet with the speakers.

How to do it

1. Invite two or three people whose jobs are related to the forest to come and speak to your group; for example, a forest technician, a wildlife biologist, a soil scientist, an environmental lawyer, a logger or a sawmill worker.
2. Before that day, make sure you encourage your group to think about the things they might want to know and help them prepare some questions. Here are some examples:
   - What kind of education/training do you need?
   - Can you describe a typical day at work?
   - What other kinds of people do you depend on to do your job?
   - How many people do you work with?
   - What kinds of clothes do you wear to work?
   - What special equipment do you use on the job and what does this equipment enable you to do?
   - What are the most rewarding things about your job?
   - What aspects of your job pose the biggest challenges?

Discussion

How does each of the guest speakers depend on the forest?
How do you and your family depend on forests?
Is it important to encourage young people to work in the forestry sector? Why?

Adapted from: Prince William Network's America's Rain Forests, Who Works in This Forest?
http://rainforests.pwnet.org/pdf/Who_works.pdf

Useful resources

Discover the Forest
www.discovertheforest.org

EcoKids
www.ecokids.ca/pub/homework_help/forests/index.cfm

Idaho Forest Products Commission – Forests are for Kids
www.idahoforests.org/kids1.htm

PennState College of Agricultural Sciences Youth
http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/9-12

Rainforest Alliance
www.rainforest-alliance.org

Real Trees for Kids
www.realtrees4kids.org/index.htm

The Forest Academy
www.theforestacademy.com

Forests and Culture

Introduction

Isn't it great that when you think about a forest you think about a magical place! Throughout time people have described forests as places of fantasy and enchantment, this is because forests are seen as mysterious, yet wonderful places. Different movies, novels and poems have found their inspiration in forests and have used forests as a setting for a never ending adventure or a nerve-racking battle.

Forests are also considered to be sacred spiritual or religious sites for many groups of people. These people have developed a special relationship with the forest and they have used and protected their resources over generations. About 60 million ***indigenous*** people are almost wholly dependent on forests and they use forests for cultural, recreational and religious activities. These sacred sites are managed through the ***stewardship*** of community elders and often contain some of the richest ***biodiversity*** in the world.

And, of course, forests are also important because of the recreational activities they offer. Many people visit forests to go camping, bird watching, hiking, sight-seeing or simply to find a cool escape from a sunny day. These activities not only offer health benefits to people, but they also help them gain a greater appreciation for the ***environment***. So hurry up, an amazing forest is waiting for you!

Activities

Magical Forest

Level 1

Aim

To learn about and appreciate forests and its components.

Materials

An open space.

Time

20 minutes.

How to do it

1. Write each of the following phrases in small pieces of paper and ask each participant to choose one.
2. Have your group sit in a circle and close their eyes. Tell them to imagine they are in a forest and that each one will have to look for an object that fits the description they have.
3. Tell the participants to open their eyes and say what they thought about. Ask them to look around to see if they can find something similar to what they thought.

Something dry	Something light
Something wet	Something huge
Something hard	Something tiny
Something soft	Something flat
Something hairy	Something round
Something pointy	Something slippery
Something heavy	Something rough

Discussion

Would you say a forest is a magical place? Why or why not?
Was it easy or hard finding something that fitted your description?
Can you name some benefits of protecting forests?

Forest Adventure

Level 1 2 3

Aim

To discover the variety of fun activities that can be enjoyed in a forest.

Materials

A wooded area.

Time

2 hours.

How to do it

1. Remind your group that forests are magical places where everyone can enjoy all sorts of fun activities; explain that today they are trying some of the

following:

a) Look for animal tracks, see if you can spot the paw, foot or hoof prints of some forests friends. Muddy or damp ground and the banks of streams and creeks are especially good.
b) Think about what animals eat, look around to see if you can find any type of food some animals might like. You might even find an animal enjoying a delicious meal.
c) Collect different objects that can be found in the ground: pebbles, leaves, twigs, seeds or flowers. Be careful not to pick anything dangerous and not to put anything in your mouth!
d) Tell stories about magical creatures that inhabit the forest – you can fire your imagination and bring forest elements to life.
e) Follow an insect to see where it goes, maybe it is looking for some food or heading back home. Be sure not to touch it!
f) Take some cool pictures of different trees and wildflowers, you can then print your favorites and put them in your class or youth group meeting room.
g) Go bird-watching; forests are home to many different and wonderful birds. Observe how they fly, how they eat, where they live and what they look like.

2. Gather your group in a circle and discuss with them why it is good to spend some time outdoors. Here are some ideas:
   - Being in the sun raises your levels of vitamin D and helps you develop strong and healthy bones. Be careful not to get sunburnt though!
   - Playing outdoors helps you improve your eyesight and reduces the need for eye glasses.
   - Outdoor play increases fitness levels and builds active, healthy bodies.
   - Enjoying fresh air and sharing with the natural world makes you more patient, calm and happy.
   - Nature makes you nicer as it enhances your social interactions and, therefore, makes you better at making friends.
   - Playing in fresh air helps you think better and develop your imagination and creativity.
   - Having a healthy body and mind thanks to fresh air and nature helps you do better at school.
   - Breathing clean air while you grow helps you be healthier during your adult life.
   - Being outdoors helps you learn about the wonders of nature and develop a bigger awareness about the need to protect it.

Discussion

What is the best part of visiting a forest?
What does the forest do for you?
What can you do for the forest?

Leaf Rubbings

Level 1 2 3

Aim

To discover the different forms of leaves and create art with them.

Materials

A forested area, paper, crayons or coloured pencils, leaves, hard surface, punch, ribbon.

Time

1 hour.

How to do it

1. Remind your group how leaf rubbings are a cool way to make art and to document your forest discoveries. Start by asking your group to collect some leaves.
2. Explain how to make a leaf rubbing: place the leaf on a smooth, hard surface vein side up, and cover it with a piece of paper. Then, rub a crayon or coloured pencil back and forth across the paper, directly above the leaf, and you will see how the leaf's outline and veins will appear on the paper as your rub. Tell the participants they can try different leaves and colours to make some real pieces of art.
3. Make a leaf collection booklet using all your leaf rubbings and share it with other groups or classes!
   *The elder groups can, for example, make a booklet that contains leaves from different **species** of trees, and which includes the following information: common and scientific name of the leaf, leaf type and location where it was found.

Discussion

Why are leaves important for a tree?
What can leaves tell you about a tree?
How do human beings and other animals use leaves?

Animal Sounds

Level 1 2

Aim

To distinguish different forest animal sounds.

Materials

A wooded area, notebook, pencils.

Time

30 minutes.

Background

Nature can be very noisy, but in a different way than the sounds of humans. Animals use their calls to communicate with one another. Forests serve as a home to millions of animals around the world, just think about bears, raccoons, snakes, monkeys, butterflies, spiders, birds, and many, many more.

How to do it

1. Ask your group to sit quietly for 5 to 10 minutes and listen for the sounds of forest animals. Tell them to keep notes on what they hear and to try to identify what makes each sound.

2. Gather in a circle and have each participant share their experience. How do you think these noises would be different if you were in another location? Why is this?

Discussion

How difficult was it to identify the animal sounds?
Why are animals important for the forest **environment**?
Can you do something to protect these animals and their homes?

My Relationship with the Forest

Level 1 2 3

Aim

To realize the value different groups of people give to forests.

Materials

Papers; colouring pencils; encyclopedias, books or internet to do research (optional).

Time

1 hour (more time might be needed if the group chooses to do research).

Background

Many local communities, including a significant number of **indigenous** groups, live in and around forest areas. They are primary users of forest products and they often create a special relationship with this natural **environment**; about 60 million **indigenous** people are almost wholly dependent on forests. Moreover, these groups often create their own, locally adapted and accepted rules for how to use the forest, part of what is often referred to as local institutions, and they can really be recognized as responsible forest managers.

How to do it

1. Start by asking the participants the following questions: What do you think about the **environment**? How would you describe the natural **environment** of our city? What **natural resources** are found in our forests?
2. Next, remind the group that "a culture is more than artifacts, pictures, and inventions; it's a lens through which people see the world". Ask the following question: What importance does our culture place on the natural **environment** and, specifically, our forests?
3. Have them think about **indigenous** peoples that live in and around forests, how might their relationship with forests be different from ours? What importance do **indigenous** cultures place on the **environment**?
4. Have the younger groups make a drawing which represents the close relationship between indigenous cultures and forests. It might also be useful if you can tell them some information about a **native indigenous** group.
   The elder groups can conduct interviews with **indigenous** people (if possible) or research about a **native indigenous** group and its relationship to the forest.
5. Have the participants share and explain their drawings/ research.

Discussion

Is the **environment** less important to us than to **indigenous** cultures?
Why do these cultures place such importance on the **environment**?
How does their **traditional knowledge** help them maximize their use of the forest resources?
How important are our forest resources to us? How could we maximize the use of these resources?

Adapted from: PennState University College of Agricultural Sciences, Lesson Plans, Forestry, Who Cares About the Forest?, http://ecosystems.psu.edu/youth/sftrc/lesson-plans/forestry/6-8/who-cares

Trees for Life

Level 1 2 3

Aim

To remind everyone about the importance of trees.

Materials

A **native** tree, shovel, rake (optional), big garden, brown poster board, scissors, adhesive tape, paper, colouring pencils, photo camera (optional).

Time

A 30 minutes lesson to explain the activity and another 20 minutes lesson to discuss about the participant's experiences. The participants will need some extra time with their families to develop this activity.

How to do it

1. Remind your group how trees can be a wonderful addition to your garden, they provide wildlife habitat, create shady areas and, of course, they help keep our planet healthy.
2. Explain to them that each one will be planting a tree with their families (they might want to plant a flower if they do not have access to a big garden). Tell them to take into account the following ideas:
   - *Dig a shallow hole.* Make it a diameter that is at least three times the diameter of the root ball. The hole should be no deeper than the height of the root ball, otherwise the tree roots will not be able to get enough oxygen and will have difficulty developing. Be sure to slope the sides and scrape them with a rake to allow better root penetration.
   - *Plant the tree.* Place the tree in the hole, making sure to lift it by the root ball and not by the trunk. Before back-filling the hole with dirt, have someone view the tree in its hole from all sides to confirm that the tree is straight. Begin filling the hole with the original soil that was removed until it is about one-third full, and then gently pack the soil around the base of the root ball. Continue back-filling the hole by adding a few inches of soil at a time followed by water to eliminate drying air pockets until the hole is filled and the tree is firmly planted.
   - *Follow up care.* Remove all tags and labels to prevent girdling of branches or trunks. New trees need to be routinely watered for at least two years after planting. Watering sessions should be determined by the natural rainfall level to avoid over watering, which can be just as damaging as not watering enough. Trees should be watered very deeply in the root zone area.
3. After the participants plant their tree, ask them to make a nice drawing of it or to take a picture.
4. On the next lesson, ask your group to help you make the trunk and the branches of a tree and to put their drawings as the tree's leaves. Stick the tree in a wall where they can see it every day and remember the importance of trees and forests.
5. Discuss about their experiences.

Discussion

How did you feel sharing this experience with your family?
Can you name some of the benefits you will receive from your tree in the future?
How do you feel when you know you are contributing to protect the planet?

Adapted from: National Wildlife Federation, Get Outside, Outdoor Activities, Garden for Wildlife, Gardening Tips, Planting Trees, www.nwf.org/Get-Outside/Outdoor-Activities/Garden-for-Wildlife/Gardening-Tips/Planting-Trees.aspx

Welcome to...

Level 1 2 3

Aim

To think about forests and wildlife in an imaginative way.

Materials

Notebooks, pencils.

Time

40 minutes.

How to do it

1. To begin, ask your group to close their eyes and remember how many wonderful forests we have in our planet, and how each place is full of an amazing variety of plants and animals.
2. Explain to them that they will transform themselves into tourist guides and that they are planning a short journey for their friends to a very special place, a recently discovered and magical forest!
3. Encourage your group to be creative! Ask the participants to describe what the **climate** and landscape are like, which trees, plants and animals they might see, what is special about the local culture, what clothing and gear they will need, and how they will get there. Have the participants write an itinerary and a packing list.
4. Ask each participant to present their work.

Discussion

Which of the places described by your classmates would you enjoy visiting? Why?
Do you think there might be a place similar to the one you imagined?
Do you believe we still have lots of incredible animals, plants and trees to discover?

Adopt a Tree

Level 1 2 3

Aim

To discover different kinds of trees through the senses.

Materials

A wooded area, blindfolds, paper, crayons.

Time

40 minutes.

How to do it

1. Take your group to a wooded area and ask them to pair up at a starting point. One partner in each pair should be blindfolded.
2. Explain to your group that the blindfolded players must be led by their partners to a tree, where they must 'get to know' the tree by touching it, smelling it, measuring it with their arms, noticing what the bark feels like, how the tree trunk is shaped, etc.
3. The blindfolded players must then lead back to the starting point where the blindfolds must be removed and the players must identify which tree is theirs. Several different trees may have to be felt before the right one is found. The partners must then switch roles and play the activity again using a different tree.
4. Next, give the participants a large piece of paper to fold into quarters. Have them choose their favorite tree, grab a crayon and brush up on their artistic

abilities:
- In the first quarter they must draw their favorite tree's shape.
- In the second quarter they must do a bark rubbing of the tree's trunk.
- In the third quarter they must draw a picture of one of their tree's leaves.
- In the fourth quarter they must sketch the tree's fruit or cone, if present, or write a poem about their special tree!

5. Have the participants present their work and share their findings with each other to discover similarities and differences among the trees. Are these trees alive? How do you know? How do these trees help the **environment** around them?
6. For elder participants you can turn this sensory activity into a more interpretive one. Ask them to look at their surroundings for evidence of birds or other animals; can they see any sky when they stand underneath their tree; how much shade does the tree throw; how tall is the tree; what type of soil is the tree growing in; if they were an animal, what would they look for in a tree? Tell them to collect some leaves, twigs, bark, flowers and seeds so they can try to identify different kinds of trees by using their parts.

Discussion

Which are the trees that are most commonly found in your area?
Does it have any special meaning for your community?
How important is it to maintain wooded areas in your community?

Source: EcoKids Canada, Teachers, Resources, Activities, Adopt a Tree, www.ecokids.ca/pub/teachers/resources/activities/adopt_a_tree.pdf

Forests for People

Level 2 3

Aim

To understand that people go to forests for a variety of purposes.

Materials

Questionnaires devised by the participants, pencils, computer (optional).

Time

Three 1 hour sessions.

How to do it

1. Discuss techniques of surveying groups of people to gather information.
2. Introduce the idea of creating a survey about forest use and discuss the merits of such a survey. People spend time in forests for a variety of reasons and place a value on forests. Explain that the group will make a survey about a local forest use to determine how students and their families use the forest.
3. Explain the difference between open-ended and close-ended questions. The class assignment is to gather information on how students, teachers or leaders, and school or youth group staff spend time in the forest. Questions could include:
   a) Do you go to any forest areas? If so, which ones?
   b) If you go to forest areas, did you go in the past year? If so, how often?
   c) What kind of activities do you do in a forest area?
   d) Do you pay any fees to participate?
   e) How do you get to the areas you use?
   f) What is your favorite forest area? Why?
   g) Do you know who 'owns' the forest?
   h) What do you think are the most valuable things in forests?
   i) Do you think forests have other important values, and if so what are they?
4. As a class, construct a questionnaire using the questions that the participants

want answered.

5. Work with the group to create a data log or organizational chart that will lend itself to easy information gathering and later tabulation.
   *Using a computer to create the log or chart is an excellent practice. The chart may include a choice of responses and/or levels of agreement and disagreement.
6. Practice asking the questions and recording the data in class before going out into the school or youth group community to gather the actual data.
7. Working in small groups or pairs, conduct the survey to school or youth group staff and students. Assign a minimum number of interviews per team.
8. Ask each team to make a table or graph to show the kinds of answers obtained.
9. Discuss the answers obtained. Were the people interviewed from a variety of backgrounds? How might the answers change if the respondents were from other parts of the country? What kinds of values do people have about forests? What kinds of activities do people do most frequently? How important do forests appear to be to the community surveyed?

Discussion

What value do you give to local forests?
What are your favorite activities when you visit a forest?
How can human activities affect the forest **environment**? What can you do to prevent this?

Source: Prince William Network's America's Rain Forests, Forests for People, http://rainforests.pwnet.org/4teachers/ecosystem_studies.php

Tree-rrific Picnic

Level 1 2

Aim

To reflect about the many foods that we get from trees.

Materials

An outdoor setting or wooded area, a picnic blanket, backpack or picnic basket, different tree foods such as apples, pears, almonds, and olives, whiteboard.

Time

A 30 minutes session to plan the activity and another 1 hour session to enjoy it!

How to do it

1. Explain to your group that you are enjoying a ***Tree-rrific Picnic*** and that you need their help to organize it.
2. Have your group brainstorm different food items that grow on trees. Make a list on the whiteboard, and organize the participants so each one can bring a 'tree food' to share with the rest of the group.
3. Bring your picnic to a shady spot under a tree and enjoy your snack. While you do that, you can ask the participants to say why trees and forests are so cool!

Discussion

Which is your favorite tree food? Why?
What other cool activities can you enjoy in a forest?
What measures should you take when visiting a forest to avoid disturbing the natural **environment**?

Adapted from: National Wildlife Federation, Tree Time: A Kid's Guide to Tree Facts and Fun, Terrific Picnic, http://blog.nwf.org/2013/03/tree-time-a-kids-guide-to-tree-facts-and-fun/

Cultural Groups & Forests

Level 2 3

Aim

To analyze the importance of tropical forests for the world community.

Materials

Notebooks, pencils, world map, copies of the cultural groups sheet.

Time

45 minutes.

Background

An estimated 300 million people live in today's world forests. Some are sedentary farmers that live permanently in the same place, others are collectors and nomadic hunters that do not have a permanent residence, and others are semi-nomadic farmers who cultivate the land for short periods of time and then move on. In Latin America, Africa, Asia, and Australia, whole societies have lived exclusively in forests and **grasslands** for centuries, adopting various modes of satisfying their needs through a diverse combination of hunting, farming and gathering activities. Their systems have one thing in common: it is lasting as long as there is low population density and cultural stability. Many of these groups live in **poverty** conditions and their cultures are in danger of disappearing from the face of the Earth due to the impact that modern societies have on them. Demographic pressure diminishes the land available for farming and the cultural impact has altered their values; therefore modifying their vision of, and the relationship with the forest.

Trees help feed the world. Food that comes from forests and orchards are consumed everywhere; these products are often the main staple food of the world's poor. The loss of forests and the destruction of natural habitats are undermining the supply of food coming from the forest. Among the main food items that come from the forest are leaves, seeds, fruits, roots, tubercles, and a myriad of animals. These food items usually provide the indispensable dietetic variety and the nutritional supplements that directly relate to benefits in people's physical health.

Wood is the principal energy source of poor populations. More than 2 billion people depend on wood and **charcoal** for cooking and preserving food. Human health frequently depends on its accessibility. Wood is necessary for the proper boiling of water, which is indispensable for avoiding some types of illnesses such as diarrhea, caused mainly by waterborne bacteria and viruses. Cooking food adequately avoids illnesses, and often, food poisoning. As wood becomes **scarce**, people eat fewer cooked foods or cut down on cooking time. In addition, wood is necessary for many commercial activities such as tea drying, tobacco curing, and brick production.

At present, the vast majority of the world's population depends on the great variety of medicines that are obtained from trees and plants. More than 6 000 **species** of plants are used for medicinal purposes, from the treatment of stomachaches and diarrhea to remedies for fungus infections and tonic preparations for heart ailments. Between 75-90 percent of the inhabitants of poor countries depend solely on natural remedies for their ailments. On the other hand, 25 percent of the active ingredients in prescription drugs come from medicinal plants.

Throughout history, trees have figured prominently in religion, **folklore** and mythology. Myths and legends describe the tree as a gift to man and beasts from various Gods, as a tie between heaven and earth, or as a resting-place for the soul. The tree, as creator of life, represents fertility in various symbols, male as well as female. Wooden masks that symbolize gods or important spirits are utilized in religious rites around the world. All statutes, religious and musical instruments are usually made out of wood. Traditionally, trees have been protected in small sacred forests, conserving them for the benefit of the community.

Trees are the backbone of large and small industries around the world, providing employment to millions of people. The income generated from trees and forest products are vital to poor populations, especially those that have little or no land of their own. Often this represents the only source of income in cash, which is frequently the only way to buy food.

Trees help protect the Earth's **environment**. They are the essential element of the most important **ecosystems** for humanity: those that provide us with our food. We can use them to increase the fertility of the soil and to assure a better quality of life to all the populations of the world. The tree was, is, and always will be, the foundation of life.

How to do it

1. Divide your group into teams of four and explain that you are going to learn about cultural groups that live in tropical forests. Where are tropical forests located? You can use a world map to help you.
2. Hand out the Cultural Groups sheet to each team (p.108). Ask them to read the information about the different cultural groups and to discuss about it. The participants should also decide, as a group, which one of the cultures they found most interesting.
3. Foment a group discussion based on the following questions:
   - Why did they find that particular culture interesting?
   - What use do they have for the forest?
   - What is the importance of the forest for these people?
   - What is the predominant vision of the forest?
   - How do you think the daily life of the group is?
   - Do we, the modern world, have any responsibility towards these groups?
4. With the participants, elaborate forest **conservation** measures that could help the groups that live in extreme **poverty** so as to better their quality of life, without affecting their identity as a people.

Discussion

How would you describe your relationship with forests?
How is it different to the relationship of the cultural groups you just learned about?
How do forests contribute to the wellbeing of people everywhere?

Source: Prince William Network's America's Rainforests, Trees of Life, http://rainforests.pwnet.org/4teachers/value_challenges.php

Cultural Groups that Live in Tropical Forests

Ubangui

In the Central African Republic, the Ubangui plant a tree for each newborn. If it is a girl, a fast growing, plentiful fruit-bearing tree is planted. If the tree is not healthy, the shaman is called upon to protect the child, and if the child is ill, it is taken to the tree for a cure. When the tree begins to bear fruit, the child is ready for marriage. When someone dies, the person's spirit moves into the tree that once was planted for her/him.

Asmat

According to Asmat mythology, during the creation of the founders of the Saowa and Erna regions of New Guinea, one of its heroes decided to populate the Samat region. He walked alongside the river building communal houses and filing their interior with wooden figurines, male and female. He then beat a ceremonial drum and gave them life. To this day, this warrior tribe constructs their communal homes atop wooden posts that they cover with metal sheeting. With their doors and windows facing the sea, all these houses on stilts together look like a group of spiders ready to pounce upon their prey. Other than being known for the ancient custom of head hunting of enemy warriors, the Asmat are characterized today for their hospitality; those who are not are called "person with a rotten hand".

Mbotogotes

The Mbotogotes, also known as the Namba, live in Malekula, the second largest island in size of the New Hebrides archipelago. Their clothing is **scarce** since the **climate** is very hot. Men wear a belt made out of tree bark and cover their sexual organs with a banana leaf. Women wear skirts of woven fibers. The walls of their round huts are made out of wood and fern trunks, which are then roofed with palm leaves. The back of the house is reserved for pigs. The pigs, similar to wild boars, are very important socially; they are used to honor the dead and to secure a wife. This tribe is known for their funerary rites, which sometimes last up to a year. The heads of the deceased are reconstructed using clay, spider webs, bamboo, and vegetable fibers.

Kraho

Near the Tocantis River in Brasilia, in rectangular huts covered with straw, live the Kraho, one of the many tribes of Central Brazil. Trunk races are their daily sport. Two teams of young men get together outside the village and each team cuts down a Buriti palm trunk weighing at least thirty pounds. One of the men starts the race with the trunk on his shoulders and later passes it to another participant in a relay towards the village. The men then run around the village "square". The villagers watch, and applaud the winner. Traditionally, to look attractive and romantic, the men pierce their ears and place ever larger pieces of their arrows in the hole, until achieving the diameter of a cup; the larger the circumference, the better the chances of impressing the girls.

Tasaday

It was not until 1971 that the Philippine government became aware of the Tasaday that live deep in the Philippine jungle. With a population of barely 26 people, this group lives in caves, collects fruit, fish, and hunt. Their lifestyle is very much like the humans in the Stone Age, since their instruments are made out of stone, and they do not use agriculture. They do not have words for "guns", "war", "enemy" nor "hate". They live together in harmony with nature. The forest is their entire world.

Toda

Between the Nilgiri mountains of India live the social caste of buffalo breeders, the Toda. According to Hindu custom, each person is born within a caste or social class, and must fulfill the duties that are required by that class. These people live in rectangular wood and straw huts. Towards the west of the village is the sacred temple site where the cattle are milked. This task is only done by the priest. The buffalo are considered sacred; therefore, they are not used for food. Their milk, however, is used in many ways, for drinking, for making cheese and butter, and even for adding sheen to the curls of the women's hairdos.

Australian Aborigines

Australian aborigines are a varied group; they live in different climates and settings, and their lifestyles, language and legends also differ. Those living in the north are nomads that hunt and fish. For them the land's characteristics denote sacred sites. These reference points have been transmitted through generations in the form of songs that signal the way along thousands of kilometers of desert, and point to hidden water sources. Their trees are protected in small sacred forests that are used on special occasions for religious purposes and as a meeting place for the village elders. All living things are connected and have a special meaning for the tribe. For this reason, they make small statues of animals and plants.

Campfire Safety

Level 1 2 3

Aim

To learn about wildfires and how to prevent them.

Materials

A trip to a camping site, marshmallows, wood sticks, shovel, bucket with water.

Time

2 hours.

Background

Although most of us have no intention of setting in motion the forces which could burn hundreds of homes, millions of acres of forest and affect thousands of lives, each year we learn of devastating wildfires caused by careless behavior.

Some common ways you could unintentionally start a wildfire are:

- unattended burning debris
- equipment fires such as from lawnmowers, ATVs, power equipment
- smoking
- unattended campfires
- fireworks
- carelessly discarding fireplace or BBQ ashes

Nevertheless, there are also good fires. A prescribed fire, also known as a controlled burn, refers to the controlled application of fire by a team of fire experts under specified **weather** conditions that help restore health to fire-adapted **environments**. By safely reducing excessive amounts of brush, shrubs, and trees, encouraging the new growth of **native** vegetation, and maintaining the many plant and animal **species** whose **habitats** depend on periodic fire, prescribed burning helps reduce the catastrophic damage of wildfire on our lands and surrounding communities.

Prescribed fire is one of the most effective tools we have in preventing the outbreak and spread of wildfires. But because prescribed fire is fire, fire management experts are extremely careful in planning and executing a prescribed fire.

How to do it

1. Take your group on a trip to a nearby camping site and explain that you are going to enjoy a campfire.

   Make sure you have enough adult supervision when near the fire!

2. First, discuss with your group how forest fires might affect the forest **environment**. But, don't forget to also mention that some fires, prescribed fires, play a vital role in maintaining certain **ecosystems**. For example, some seeds will only germinate after hot temperatures during a forest fire, which cracks their seed coats.
3. Next discuss about campfire safety while you start your fire:
   - *Pick your spot*
     - DO NOT build a fire at a site in hazardous, dry conditions. DO NOT build a fire if the campground, area, or event rules prohibit campfires.
     - FIND OUT if the campground has an existing fire ring or fire pit.
     - If there is not an existing fire pit, and pits are allowed, look for a site that is at least fifteen feet away from tent walls, shrubs, trees or other flammable objects. Also beware of low-hanging branches overhead.

- *Build and prepare your campfire pit*

  If campsites have unsuitable pits or don't offer pre-made pits at all:
  - Choose a spot that is downwind and protected from wind gusts, and at least 15 feet from your tent and gear.
  - Clear a 10-foot diameter area around the site. Remove any grass, twigs, leaves and firewood. Also make sure there aren't any tree limbs or flammable objects hanging overhead.
  - Dig a pit in the dirt, about a foot deep.
  - Circle the pit with rocks.
  - Fill the pit with small pieces of dry wood; never rip or cut branches from living trees.
  - Place your unused firewood upwind and away from the fire.
  - Keep a bucket of water and a shovel nearby.

- *Build your campfire*
  - Gather three types of wood: tinder (small twigs, dry leaves or grass, dry needles), kindling (sticks smaller than 1" around) and fuel (larger pieces of wood).
  - Loosely pile a few handfuls of tinder in the center of the fire ring/pit.
  - Add kindling in one of these methods:
    Tipi (good for cooking): lay the kindling over the tinder like you're building a tent.
    Cross (perfect for a long-lasting campfire):crisscross the kindling over the tinder.
    Lean-to (good for cooking): drive a long piece of kindling into the ground at an angle over the tinder. Lean smaller pieces of kindling against the longer piece.
    Log Cabin (longest lasting campfire): surround your pile of tinder with kindling, stacking pieces at right angles. Top the 'cabin' with the smallest kindling.
  - Ignite the tinder with a match or lighter.
  - Wait until the match is cold, and discard it in the fire.
  - Add more tinder as the fire grows.
  - Blow lightly at the base of the fire.
  - Add kindling and firewood to keep the fire going.
  - Keep the fire small and under control.

- *Maintain and extinguish your campfire*

A roaring fire is both a success, and a responsibility.
- Once you have a strong fire going, add larger pieces of dry wood to keep it burning steadily.
- Keep your fire to a manageable size.
- Never leave your campfire unattended.
- Never cut live trees or branches from live trees.

When you're ready to put out your fire, follow these guidelines:
- Allow the wood to burn completely to ash, if possible.
- Pour lots of water on the fire; drown ALL embers, not just the red ones.
- Pour until hissing sound stops.
- Stir the campfire ashes and embers with a shovel.
- Scrape the sticks and logs to remove any embers.

- Stir and make sure everything is wet and cold to the touch.
- If you do not have water, use dirt. Mix enough dirt or sand with the embers. Continue adding and stirring until all material is cool. Remember: do NOT bury the fire as the fire will continue to smolder and could catch roots on fire that will eventually get to the surface and start a wildfire.
- Be sure to pack out your trash. It is your responsibility to pack out everything you packed in.

Source: Smokey Bear, Be Smart Outdoors, Campfire Safety, www.smokeybear.com/campfire-safety.asp

4. While you enjoy your campfire, you can roast some marshmallows. You can also have the participants share some cool moments they spent in a forest.

Discussion

What negative effects might a forest fire have on the **environment** and on people?
Have you heard about sad stories regarding forest fires? What happened?
What can you do to protect your forest?
Can you name at least five benefits we receive from forests?

Three Cheers for Trees

Level 1 2

Aim

To describe the benefits of trees in the local community.

Materials

Whiteboard, drawing paper, crayons or markers, adhesive tape.

Time

1 hour.

Background

Most people plant trees to provide fruit, beauty, or shade. But the benefits of trees, especially in urban settings, go far beyond those things. Trees provide social, environmental, and economic benefits as well.

Social benefits

Trees enhance the quality of life for residents of a community. They provide privacy, emphasize views, or screen out unpleasant sights. They reduce glare and reflection. They provide the urban landscape with natural elements and wildlife **habitats**.

Environmental Benefits

Trees provide environmental benefits by moderating temperatures and improving water and air quality. Tree leaves absorb and deflect the sun's radiant energy, reducing the 'heat island' effect of buildings and paved areas in city centers. Trees also intercept rain and hail, reducing the amount of water that falls onto the ground below. Leaves absorb **carbon dioxide** from the air, and in the process also absorb other air pollutants – such as ozone, carbon monoxide, and sulfur dioxide – and give off oxygen.

Economic Benefits

Some trees provide wood, fruit, and nuts. Beyond these obvious economic benefits, trees also reduce energy costs. A 25-foot tree may reduce the heating and cooling costs of a typical residence by 8 to 12 percent. Trees also enhance property values,

offering another economic benefit to residential property owners.

How to do it

1. Write the following list where everyone can see it:
   - playground
   - school grounds
   - city street
   - neighborhood
   - park
   - zoo
   - highway
   - picnic area
   - backyard
   - farm
2. Have each person or team choose and draw one of the areas on the list. Explain that the participants can draw the area any way they like, with one exception: they must leave trees out of the picture. (You might work on one big mural with each team drawing a different section).
3. When the participants have finished their drawings, have them draw the same scene again, but this time using as many trees as they wish.
4. Display the drawings (or murals) where everyone can see them. Ask the participants in which **environment** they would rather spend their time, and if trees have anything to do with their preferences.
5. Discuss the benefits of trees in public places. Have the participants brainstorm a list of benefits. For example, trees not only look nice; they also provide shade, protection from wind, and a **habitat** for wildlife. Trees help to improve the quality of air and to reduce noise.

Discussion

Do you think your house or neighborhood needs more trees and bushes? What can you do about that?
Would you say that forests make your life happier? Why?
Do you affect forests with your everyday choices? How?

Source: American Forest Foundation, Project Learning Tree, Pre K-8 Environmental Education Activity Guide, Three Cheer for Trees, www.plt.org/stuff/contentmgr/files/1/7d107c9eeff935991a82355fb8f22640/files/plt_lorax_activities.pdf, page 7.

Story Time

Level 1 2

Aim

To reflect about good memories involving forests and trees.

Materials

An outdoor setting with trees.

Time

1 hour.

How to do it

1. Have your group sit in a circle. Explain to them that today they are going to tell stories about their experiences with forests and trees.
2. Ask them to close their eyes for a moment and think about a good memory involving a forest or a tree. What made that trip or walk so special?

3. Have each participant tell his/her story to the rest of the group. You will sure enjoy a great time together listening to stories about how cool trees and forests are!

Discussion

What made your tree/forest so special? What type of tree/forest was it?
How was this tree similar to or different from other trees around it?
How do you think this tree will help other people?

Bird Feeder

Level 1 2 3

Aim

To make a bird feeder and to identify the birds using it.

Materials

- A wooded area, paper, pencils.
- For the bird mix: ¼ cup lard or suet, ¾ cup birdseed, ¼ cup peanut butter, 1 ½ cups cornmeal, ½ cup dried fruit (such as raisins or currants), sunflower seeds, pine cones, string.

Time

A 30 minutes session to make the bird feeder and another 1 hour session to watch the birds.

Background

Feeding and watching birds is enjoyed all around the world. All birds need water and shelter, but they all have different needs regarding food. Some of the foods that birds enjoy include berries, fruits, nuts, seeds, flower nectar, buds of trees and shrubs, insects, worms, fish, small animals, among others. Some birds even scavenge dead animals.

A great way to attract birds is by having bird feeders, and of course you will be a great help to them, especially through winter when they have a harder time finding the food they like. Also, one thing that birds cannot resist is water, so you can also have a shallow birdbath where they can splash in and drink.

How to do it

1. Start by reminding your group that bird watching is one of the coolest things you can do in a forest! Have them think about some birds they have seen in a wooded area.
2. Make your bird feeder. To make the bird mix, melt the lard and the peanut butter together. Stir in the seeds and enough cornmeal to soak up the melted lard. Let cool. Spread the mix under the scales of the pine cones. Decorate the pine cones with bits of dried fruit and sunflower seeds. Chill the feeders in the refrigerator to harden the mixture.
3. Next, go on a small trip to a wooded area and locate the bird feeder where you can see it well enough to identify the birds using it without troubling them.
4. Ask the participants to use their notebook to record all the kinds of birds you see, the duration of their visit and the amount of food they eat.
5. Discuss with your group about your findings.

Discussion

How do birds find their food?
Why do different types of birds like different types of food?
Why do you think birds enjoy living in forests?

Adapted from: National Wildlife Federation, Family Fun, Pine Cone Bird Feeder, www.nwf.org/kids/family-fun/crafts/pine-cone-bird-feeder.aspx

The Lorax Poem

Level 1 2

Aim

To reflect about forests and the importance of protecting them.

Materials

Paper, pencils, whiteboard.

Time

1 hour.

Background

Dr. Seuss' *The Lorax* is an animated musical film based on Dr. Seuss' children's book of the same name. In this movie, a boy searches for the one thing that will enable him to win the affection of the girl of his dreams, a real tree. To find it he must discover the story of the Lorax, the grumpy yet charming creature who fights to protect his world, the Truffula Tree forest.

How to do it

1. Ask your group to think about forests and how cool they are: forests help us keep our soil, water and air clean and, of course, it is a wonderful home to many plants and animals. Tell them to think about adjectives to describe forests and write them on the board.
2. Either individually, or as a group, ask the participants to read the following poem from *The Lorax*:

Speak for the Trees!

"The Once-ler discovered too late, I must say
That cutting down all of the Truffula Trees was a way
To damage the woods and the water and soil
and create a place where everything spoiled.

He ended up clogging the air with his smoke
And silencing Swomee-Swans, who couldn't sing a note
Because no one can sing who has smog in their throat.

He glumped up the pond where the Humming Fish hummed
And could no longer hum with their gills all gummed.

So foresters know to sustain forest health,
They must carefully tend to the whole forest wealth.
They have practices for how they can harvest the wood
and keep forests healthy for all of our good".

Source: Discover the Forest, Lorax Activity Guide, Speak for the Trees, www.discovertheforest.org/files/LoraxActivityGuide.pdf

3. Next, explain that each participant will create a poem about forests; ask some questions that might help them to reflect about a forest and its many benefits. How do we use forests? How would your life be different if forests didn't exist? Why do we need to care about forests?
4. Give the participants enough time to write their poems, tell them to read the words on the board for inspiration. If the participants have trouble creating a poem they may want to try writing the word 'forest' and assigning an adjective for each letter of the word.
5. Ask each participant to share his/her poem. You could even organize a poem afternoon and invite other friends and family!

Discussion

What did you want to transmit through your poem?
Was it easy or hard to think about the benefits we receive from forests? Why?
What can we do to keep the forests healthy while using the trees for human needs?

Create a Critter

Level 1 2

Aim

To think about the magic of forests and create an imaginary creature.

Materials

Paper, pencils, colouring pencils, colour markers.

Time

1 hour.

How to do it

1. Explain to your group that they will have to create a forest creature from their imagination. Ask the participants to consider these questions: What does it need? How does it fit in? Does it live in the water or soil or air? What will you call it and why should we care?
2. Give the participants enough time to create their new friends and explain that each one will have to include the following information:
   - **What is its name?**
   - **Can you describe its personality?**
   - **Where does it live?**
   - **What does it eat?**
   - **Where and how does it raise its young?**
   - **What else does it need to live and be happy?**
   - **What is your favorite thing about your critter?**
3. Ask each participant to present his/her critter.

Discussion

Was it easy or hard to imagine a creature from the forest? Why or why not?
What inspired you to create it the way you did?
Does this creature care about the forest? Why?

Source: Discover the Forest, Lorax Activity Guide, Create a Critter, www.discovertheforest.org/files/LoraxActivityGuide.pdf

Tree Pictionary

Level 1 2

Aim

To become familiar with the many products we can get from trees.

Materials

Whiteboard, whiteboard markers, cardboard, pencils, scissors.

Time

1 hour.

How to do it

1. Explain to your group that you are playing a ***Tree Pictionary*** game.
2. Divide your group into two teams. Ask each team to prepare some words for the other group to guess, they must write different words related to products we obtain from trees. Each word must be written in a small card. Here are some examples: maple syrup, rubber, chewing gum, cherry, toothpaste, baseball bat, egg carton, etc.
3. Once they are ready, put the cards on a desk. Ask each team to assign a 'picturist'; this participant will have to select a card from the group of cards that the other team prepared for his/her team and draw the product he/she reads on the card. Explain that the picturist cannot draw any words, letters or numbers.
4. See which team can guess more words in 5 minutes. The teams can use the same picturist for the entire game or they can change the picturist every time they guess a word, but they must be quick so they don't lose time!
   *You can have both teams play at the same time or you can have them play one at a time.

Discussion

How important are the products we obtain from forests?
What services do we receive from our forests?
How do trees and forests contribute to our happiness and well-being?

Forest Stewardship Play

Level 2 3

Aim

To learn and reflect about forest **stewardship**.

Materials

The participants might need to wear different clothes or costumes, and might need some cardboards and water colours to draw some parts of the scenario.

Time

Two or three 1 hour sessions to prepare the play and a 1 hour session to present it.

Background

Many people think that a forest is just a piece of land covered with trees, but a forest is more than just trees. A forest has many parts, and each part is important. Soil is the foundation of life in the forest. Soil holds **nutrients** and water. Add some sunshine and you can grow plants, like grasses, weeds, bushes, and trees! Wildlife needs these plants to have places to live and things to eat. Finally, **decomposers** break down dead plants and animals in the forest. Over time, **decomposed** plants and animals become part of the soil, and the circle is complete! The parts of a

forest join together to make a smooth-running system. A forest needs all its parts to work right. Forests provide us with many things we often don't think of, such as clean air and water, and beautiful places to camp, fish, hunt, hike, or just relax.

Much of what we use and enjoy from the forest requires us to take something out of the forest. Usually that 'something' is trees. That might not sound like a good thing to do, but we can do it in ways that do not hurt the forest overall. If loggers, foresters, and landowners work in the woods carefully, more trees will grow where others have been cut. Trees are a 'renewable' resource.

Forest Stewardship

Stewardship means being responsible for something and taking good care of it - like protecting your belongings and using them carefully without harming or wasting them. So whether we use a forest for hiking, hunting, or getting wood, we need to be good forest '**steward**s' so that other people can use the forest today, tomorrow, and for many years to come.

What does a forest **steward** do? The first thing a forest **steward** does is plan. For example, many people like their forest for the wildlife that live in it and the wood it produces. A forest plan can help them know what to do to make their forest a better place for the things they value. How do forest **stewards** do all this planning? They take time to learn about their forest, and they seek help from forest resource professionals.

Forest **stewards** care about what affects the plants and animals in their forest, now and in the future. Some animals need big, old trees and others need small, young trees or open areas. By planning, a forest **steward** can help provide wildlife **species** with the kinds of food, shelter, water, and hiding places they need.

Forest **stewards** also care about the soil. If roads and trails are planned, they must be designed and built carefully. These should not be too steep or built where it is too wet. Poorly placed or designed roads can damage forest soils.

Doing your part

Even though you may not own a forest, you can still be a forest **steward**. You are a forest **steward** when you choose to use products from **renewable resources**. You are a forest **steward** when you recycle wood and paper products. You are a forest **steward** when you keep the forest beautiful by not littering. You are a forest **steward** when you don't damage plants and trees unnecessarily. Someday you might have a forest of your own. You will be a forest **steward** when you plan for and choose to do things in your forest that keep it healthy and productive for plants, wildlife, and people.

Source: Penn State College of Agricultural Sciences, From the Woods, Forest Stewardship, http://pubs.cas.psu.edu/FreePubs/pdfs/uh133.pdf

How to do it

1. Explain to your group that you are organizing a small ***Forest Stewardship Play***. Ask them to help you define what forest **stewardship** means before organizing the play.
2. Ask the participants to think what their play will be about. Where will it be developed? What is the message they want to transmit? Who will be their

audience?

3. Help the participants organize their ideas and assign the different roles. Guide them during the rehearsals so they can create a fun and appealing play.
4. Invite other groups and classes to watch the play.
5. The day of the event, make sure you take some cool photos so you can remember that great day!

Discussion

Who should care about forests? Why?
What is the importance of forests to local citizens?
What can you do locally to become a forest **steward**?

Leaves Artist

Level 1 2

Aim

To use leaves to create works of art.

Materials

An outdoor space, newly fallen leaves of different colours, shapes, and sizes, construction paper, newspapers, heavy books, such as telephone books, water-based glue, scissors.

Time

A 40 minutes session to collect the leaves and another 1 hour session to make your works of art.

How to do it

1. Remind your group how nature and forests are found in many works of art. Tell them that this time they will use leaves to make some nice figures of plants, animals or sceneries.
2. Take your group to an outdoor setting and ask them to gather some leaves and put them between layers of newspapers. Pile heavy books on top.
3. In a week, the leaves will be flat and dry. Instruct the participants to begin arranging the leaves on construction paper. Tell them to think about different animals or plants and try to create their shapes. Tear or cut off leaf pieces to make eyes or other small features.

4. Once the participants are happy with their leafy creation, tell them to glue the leaves to the paper.
5. Have each one share their work of art!

Discussion

Which different figures were you able to recreate with your leafy art?
How important are forests when talking about art?
What recreational benefits do forests give us?

Source: National Wildlife Federation, Get Outside, Be Out There, Activities, Cook and Craft, Make a Leafy Creature, www.nwf.org/Get-Outside/Be-Out-There/Activities/Cook-and-Craft/Make-a-Leafy-Creature.aspx

Tree Folktales

Level 2 3

Aim

To enjoy and reflect about different folktales related to trees and forests.

Materials

Internet access, paper, pencils.

Time

1 hour.

How to do it

1. Remind your group that people can learn a great deal about other cultures by studying their folktales, many of which focus on aspects of nature.
2. Talk about folktales and discuss with the group folktales that they know and those that are part of their culture or are meaningful to them.
3. Explain to your group that you are visiting the ***Spirit of Trees*** Web site (http://spiritoftrees.org) to look for a collection of folktales related to forests and trees (the Web site includes folktales searchable according to category, county of origin and tree type).
4. Read aloud with the group one or more of the folktales you selected. After reading the folktale, talk about the deeper meaning behind the story and how it may relate to today.
5. Have each participant create their own folktale with a theme about forests. What experiences will the characters have? How will the characters react?
6. Ask the participants to share their folktales with the group.

Discussion

Which was your favorite folktale? Why?
Why do you think the setting of many folktales are forests?
How are forests important for our cultural activities?

Source: National Wildlife Federation, National Wildlife Week, My Personal Folktale, www.nwf.org/~/media/PDFs/Be%20Out%20There/National-Wildlife-Week/2013/Lessons-Activities/My-Personal-Folktale_9-12.pdf

Forest Fun Drawing Competition

Level 1 2 3

Aim

To reflect about the many ways in which people enjoy forests.

Materials

Poster boards, pencils, colouring pencils, markers, adhesive tape.

Time

A 1 hour session to organize the activity and another 1 hour session to review the results.

How to do it

1. Explain to your group that you are organizing a ***Forest Fun Drawing Competition*** to remind everyone about all the fun activities we can carry out when we visit a forest, maybe watching butterflies, going for a hike, swimming in a river, collecting leaves, among many others.
2. Divide the participants into small groups and have each one make a poster to

publicize your event. Don't forget to include all the necessary information:

- Theme of the competition;
- Participants' age range;
- Size of the drawing paper;
- Drawing materials accepted.

And of course don't forget to say that the drawing should also reflect why it is important to take care of forests. Encourage the participants to draw different types of forests and from different countries!

3. Place the posters all around your school or youth group. Make sure everyone hears about it!
4. Tell your group that they will be in charge of selecting the winner and awarding him/her with a cool certificate (or maybe you could even give him/her a prize of your choice). You can also ask some teachers or leaders to be the judges; maybe an art teacher can help you.
5. You can also make an award ceremony with the entire school or youth group to congratulate everyone for participating and encourage them to continue making a change.

Discussion

Which was your favorite drawing? Why?
Why is it important for people who visit forests to be conscious about the need to take care of them?
What happens when people act carelessly regarding the use of the resources we receive from nature?

Holy Forest

Level 2 3

Aim

To learn that forests are also considered spiritual or religious places.

Materials

Computer with internet access.

Time

1 hour.

How to do it

1. Remind your group how many **indigenous** or religious groups value forests as a sacred spiritual or religious site.
2. Explain to them that you will watch a short video about a Buddhist monk who started replanting a forest that had been destroyed: ***Holy Forest***, a UNEP video.

   www.youtube.com/watch?v=fNYJgS2FAOQ
3. Encourage discussion. You can also use the internet to look for other groups who consider forests are such special places.

Discussion

How are forests used by these groups? How is this use different from yours?
What does the forest mean to them?
Why do you think these people chose forests as their sacred place? What makes a forest so special?

Useful resources

50 Things to Do
www.50things.org.uk

Children and Nature Network
www.childrenandnature.org

National Wildlife Federation Kids
www.nwf.org/kids.aspx

PBS Africa Rainforest
www.pbs.org/wnet/africa/explore/rainforest/rainforest_overview_lo.html

Smokey Bear
www.smokeybear.com

Woodland Trust Children
www.woodlandtrust.org.uk/en/learning-kids/Pages/children.aspx#.UdWsmNiOmOg

Forests at Risk

Introduction

Human beings have been managing forests since prehistoric times to fill a variety of needs. But, unfortunately, the high demands that people have placed on forest resources and the failure to use them in a **sustainable** way have led to the loss of forests worldwide. Around 13 million hectares of forests were converted for other uses or lost through natural causes each year between 2000 and 2010.

Today there are many factors threatening our forests and these are not only affecting all the plants and animals found in them, but they are also jeopardizing people's livelihoods. **Deforestation**, forest **degradation**, fire, **erosion**, **climate change** and **invasive species** are among the most pressing issues that our forests face. Moreover, the frequency and intensity of natural hazards are shifting as a result of these human activities and global **climate change**, making forest **ecosystems** even more prone to damage.

The good news is that the large-scale planting of trees is significantly reducing the net loss of forest area globally. Forests are still facing significant challenges that threaten their existence and their ability to provide resources and important **ecosystem** services, but, as scientific and technological advances increase and as our knowledge about the ways forests work and the benefits they provide grows, we can be more prepared to ensure the long-term health and protection of forests. We can all help!

Interesting fact: "Tropical forests, where deforestation is most prevalent, hold more than 210 gigatonnes of carbon."

Source: WWF, Problems, http://wwf.panda.org/about_our_earth/about_forests/deforestation

Activities

Dying Trees

Level 1 2

Aim

To learn about **acid rain** and its effects.

Materials

Brown and green kite paper, scissors, cardboard, water.

Time

30 minutes.

Background

Acid rain is a term used to describe a **precipitation**, such as rain, snow, sleet of fog, that contains harmful amounts of acid-forming chemicals (such as nitric acid and sulfuric acids) formed primarily by the pollutants that are released into the **atmosphere** when **fossil fuels** are burnt. Rain water is naturally slightly acidic but increased levels can cause damage to nature, buildings, cars, and is often indirectly damaging to humans. **Acid rain** is a problem that affects us all.

In the 1970s scientists discovered that some forests in Europe and North America were dying; some tests revealed that **pollution** from power plants, cars and trucks was to blame. The smokestacks from industries and chimneys were releasing chemicals that were rising with the smoke into the **atmosphere**, combining with other molecules and falling to the ground as **precipitation** which was ten times more acidic than normal, sometimes as strong as vinegar.

This **acid rain** was dissolving important **nutrients** from the soil and allowing in others substances that harmed the roots. Weak trees lost their leaves and were attacked by insects and disease; it was like an epidemic in which whole forests died due to this kind of **pollution**.

Source: United Nations Environment Programme, Tunza, A Trip With Drip, http://unep.org/tunza/children/images/flash/a_trip_with_drip/start.swf

How to do it

1. Start by explaining what **acid rain** is and how it is produced. Remind them that **acid rain** can affect us all, damaging ours car, deface historic statues, harm trees in a once-beautiful forest, or destroy the fish population in a lake.
2. Explain to them that they are creating a forest using some cardboard and some kite paper (especially for the branches and leaves).
3. Once they are finished, have children sprinkle some '**acid rain**' (use water) over their forest to 'imitate' the effect of real **acid rain**.
4. Have the participants discuss how they can change their everyday activities in order to reduce the amount of gases that are released by the burning of **fossil fuels**.

Discussion

Why is it important to protect forests?
What can you do to prevent **pollution** and help reduce the presence of **acid rain**?
Where is **deforestation** occurring? What can happen to the soil when trees no longer shade it, provide it with leaves and bind it together with roots?

Recycle for Trees!

Level 1 2

Aim

To understand the importance of recycling.

Materials

Cardboard (from boxes found at home), colour pencils, colour markers, scissors, lollypop sticks, glue, other desired craft materials.

Time

40 minutes.

How to do it

1. Remind your group that recycling and reusing are great ways to help preserve resources like wood from trees. Therefore, ask them to bring from their houses some pieces of cardboard that can be reused (for example, a shoe box or a TV box).
2. Ask each participant to choose an animal from the forest to create a mask. Remind them they can use all kinds of materials. When they are finished, glue the lollypop stick to the mask, so they can hold it.
3. Then ask them to read the following facts about paper recycling so they can learn more about the importance of doing so.

   Facts:

   - 75 percent of a tree harvested for paper does not wind up as paper product.
   - Paper made from recycled paper instead of virgin fibers requires 70 percent less energy to produce.
   - Making paper from recycled paper reduces contributions to air **pollution** by 95 percent.
   - If all the newspaper in a big country like the United States was recycled, we could save about 250 000 000 trees each year.
   - Recycling a stack of newspapers just 3 feet tall saves one tree.
   - If you had a 15-year-old tree and made it into paper grocery bags, you'd get about 700 of them. A busy supermarket could use all of them under an hour. This means in one year, one supermarket can go through over 6 million paper bags. Imagine how many supermarkets there are around the world!
   - Each ton of recycled paper can save 17 trees, 380 gallons of oil, three cubic yards of landfill space, 4 000 kilowatts of energy, and 7 000 gallons of water.
   - The 17 trees saved before can absorb a total of 250 pounds of **carbon dioxide** from the air each year. Burning that same ton of paper would create 1500 pounds of **carbon dioxide**.

Discussion

How important are trees and forests in our lives?
What do you think is your role in the protection of forests?
How important is it to recycle and reuse wood products?

Forest Snakes and Ladders

Level 1 2 3

Aim

To reflect about the goods and services we receive from forests.

Materials

40x40 piece of cardboard, colour markers, markers and dice.

Time

40 minutes.

How to do it

1. Explain to your group that they are going to play a ***Forest Snakes and Ladders*** game where they will be able to discuss about the goods and services all living beings obtain from forests, especially humans, and to identify ideas how they can contribute to the protection of these amazing **environments**.
2. Take a 40 x 40cm piece of cardboard and divide it into a 10 x 10 grid of squares. Number the squares from the bottom left square (as 1) and going backwards and forwards up the board to the top left square.
3. Draw seven ladders and seven snakes which connect different squares to each other. On some other squares, write the following instructions:
   - The forests of Central Africa are home to more than 8 000 different **species** of plants. Move forward 3 spaces.
   - **Deforestation** and forest **degradation** are responsible for around 17.4 percent of all man-made greenhouse gas emissions. Go back 3 spaces.
   - The carbon in forests exceeds the amount of carbon currently in the **atmosphere**. Forests and forest soils store more than one trillion tonnes of carbon. Move forward 2 spaces.
   - About 13 million hectares of forests continue to be lost every year, and we are losing about 200 square kilometers of forest each day. Go back 2 spaces.
   - A single front-yard tree can intercept 760 gallons of rainwater in its crown, reducing **run-off** and flooding on your property. Move forward 1 space.
   - **Deforestation** of **tropical rainforests** could account for the loss of as many as 100 **species** a day. Go back 1 space.

   Ask your group to help you make it look colourful and fun!

Facts sources: International Union for Conservation of Nature, Forest Facts and Figures, www.iucn.org/about/work/programmes/forest/iyf/facts_and_figure/;
American Forests, forest Facts, www.americanforests.org/discover-forests/forest-facts/

4. Explain the game. You will need one marker for each player and a dice. The participants must roll the dice and move the marker that number of spaces. If they land on a ladder, they can climb up it if they give a reason how forests contribute towards maintaining a healthy **environment**. If they land on a snake, they must slide down it unless they can give a reason how they can contribute to preserve forests through their everyday choices. The first participant to reach the space 100 is the winner! Have fun!

Discussion

What consequences does **deforestation** bring to people's wellbeing?
How might **deforestation** affect people's livelihoods?
How does forest loss and **fragmentation** affect **biodiversity**?

Adapted from: Practical Action, Snakes and Ladders, http://cdn1.practicalaction.org/s/n/4d8a552d-51f8-45ee-85d3-30a72e33baf9.pdf

Forests Under Threat

Level 1 2

Aim

To learn about the main threats forests are facing around the world.

Materials

Whiteboard, whiteboard markers, photographs that reflect the different forest threats, cardboards, colour markers, colouring pencils.

Time

1 hour.

How to do it

1. Explain to your group that there are many factors threatening our forests and, therefore, all the plants and animals found in them. Forests have always changed in size and shape due to natural hazards, **climate** and water availability, but, unfortunately, today forests are disappearing at an alarming rate because of human activities which cause **deforestation** and forest **degradation**. Moreover, the frequency, intensity and timing of fires, hurricanes, **floods**, **droughts**, ice storms and insect outbreaks are shifting as a result of these human activities and global **climate change**, making forest **ecosystems** even more prone to damage.
2. Write the following threats to forests on the whiteboard and discuss each one with your group. Use the pictures to help the participants understand the effects of each one.
   - *Deforestation:* the permanent removal of a forest to clear land for other purposes, such as farms or urban development.
   - *Degradation:* a forest is degraded when some of its specific aspects or characteristics are damaged or removed. For example, forest **degradation** happens when there is a decrease in the number of **species** that can be found there.
   - *Climate change:* **weather** is getting more extreme around the world; some places are receiving heavier rains and even flooding, while stronger hurricanes and more severe **droughts** are hitting other areas. Changes in temperature are causing some forests **species** to find new areas to live in and others might disappear completely. **Climate change** can also lead to more frequent and intense attacks by pests and diseases, as well as the arrival of new **invasive species**.
   - *Erosion:* the wearing away of the land surface by rain, running water, wind, glaciers or other natural or human agents. Bare ground erodes more easily than one covered with vegetation.
   - *Water:* the quantity and quality of water can have a huge impact on a forest and its inhabitants. On one hand, too much water, caused by flooding or heavy rainfall can destroy vegetation and cause landslides. On the other hand, water scarcity due to dry **weather** conditions also hurts plants, causing them to wither and eventually die. Dry conditions also make plants more vulnerable to other threats, such as diseases, pests, fires or strong winds. In addition, water quality around the world is deteriorating mostly because of human activities, such as discharging sewage, chemicals, and radioactive waste into lakes and rivers.

- *Fire:* forest fires can be set deliberately, for example to clear land for agriculture, or accidentally. These fires damage forest plants and animals and can also hurt people and communities.
- *Insects, fungi and wild animals:* pests and fungi can kill or injure trees, grazing animals can hinder the growth of new seedlings, and diseases caused by **microorganisms** can kill many trees.
- *Invasive species:* **species** which have been introduced to a new forest area where they previously did not exist, either accidentally or on purpose. **Invasive species** can become harmful to the **environment** and its **biodiversity** because they tend to out-compete **native species** for resources, reproduce quickly and lack natural predators.

3. Ask the participants to make a drawing of one of the forest threats you just discussed.
4. Have each participant present their drawing.
5. Using the participants' works of art, set up a drawing exhibition in a place where the entire school or youth group can see, so that you can raise awareness about the threats our forests are facing.

Discussion

What message did you want to transmit through your drawing?
Which forest threat do you believe is the hardest one to fight against? Why?
What can you do to help slow down the rate of forest loss?

Amazing Rainforest

Level 2 3

Aim

To learn about **rainforests** and understand that our choices can affect them.

Materials

Green and brown poster boards, markers, adhesive tape, scissors.

Time

40 minutes.

Background

Tropical rainforests are warm, humid, wet forests. In most **tropical rainforests** it rains every day. **Tropical rainforests** grow in a narrow zone near the equator. The largest **rainforest** in the world is the Amazon **rainforest** in South America. **Rainforests** contain over half of the planet's wildlife and are home to many people. **Rainforests** are precious and amazing, but we are losing them fast. Everyone must start to make changes now!

How to do it

1. Explain to your group that they are producing a ***Fact and Solution Rainforest Tree***.
2. Ask each participant to draw around their left hand on a piece of brown poster board and tell them to write a fact about the **rainforest** on it. Here are some ideas:
   - **Tropical rainforests** have the greatest **biodiversity** of any other **ecosystem** on earth; they contain over half of all wild plants and animals on the planet.
   - It is estimated that 31 million hectares of **tropical rainforest** are destroyed each year. That is an area larger than Poland.
   - People have lived in the **rainforests** for thousands of years, and many different tribes still live there, but they have learnt how to take all that they need

without destroying the **environment**.

- **Tropical rainforests** once covered 14 percent of the Earth's land surface, but now they only cover 6 percent.
- **Rainforests** have 170 000 of the world's 400 000 known plant **species**.
- **Tropical rainforests** are quickly disappearing as a result of logging and clearing for timber, livestock grazing, agriculture, and the harvest of other **natural resources**.
- Many of our favorite foods first came from the **rainforests** and about one-quarter of all the medicines we use come from **rainforest** plants.
- Destroying **rainforests** harms wildlife. The orangutan, the spider monkey and the scarlet macaw are now all endangered creatures.

3. Then, have the participants draw around their right hand on a piece of green poster board and ask them to write a solution to help prevent **rainforest** destruction on it. Here are some ideas:
   - Learn about **rainforests** and how amazing they are so you can be conscious about the need to protect them.
   - Recycling and reusing items as many times as you can will help protect the **environment**. This is because companies will not need to collect as much of the world's precious wood, metals and other materials to make new things.
   - Support the creation of protected areas and rehabilitation centers in **tropical rainforests**, many plants and animals do not survive when forests are destroyed.
   - Use less paper at home and at school or youth group and try to choose recycled paper. Write on both sides of the paper.
   - Ask your family to recycle unwanted wood. If your local council does not run a recycling scheme, ask for one to be set up!
   - Shop wisely, when buying something new, especially wooden products, choose recycled or buy second hand. Avoid buying throw-away paper products such as paper cups, plates, etc.
   - Save energy at home and at school or youth group, greenhouse gas emissions from the burning of **fossil fuels** are contributing to **climate change** and our entire **environment** is being affected.
   - Buy wooden goods only if they have the Forest Stewardship Council (FSC) logo, it will tell you that the wood used is from a well-managed forest.
4. Next, tell them to help you put all the 'fact hands' together to form the trunk of the tree and all the 'solution hands' together to form the branches of the tree.
5. Finally, tell the participants to invite other groups to learn from their **rainforest** tree! Or you could even put it in a place where your entire school or youth group can see it.

Discussion

What do you think the world would be like if **rainforests** were all destroyed?
How does a **tropical rainforest** compare to another forest you have been to?
Would you like to live in a **rainforest** or in a different **environment**? Why?
How can you help people understand the value of **tropical rainforests**?

Facts Source: Friends of the Earth, Resources, Factsheets, Mad About Rainforests, www.foe.co.uk/resource/factsheets/rainforest_mad_about.pdf
Globio, Glossopedia, Tropical Rainforest, www.globio.org/glossopedia/article.aspx?art_id=6&art_nm=Tropical+Rainforest#

Protected Forests Around the World

Level 2 3

Aim

To learn about protected forests around the world.

Materials

Internet access, notebooks, pencils.

Time

1 hour.

Background

A protected area is a clearly defined geographical space set aside to achieve the long term **conservation** of nature and **biodiversity**, as well as the associated **ecosystem** services and cultural values. Therefore, protected areas are a major tool for the management of **species** and **ecosystems** which provide a wide range of goods and services that are essential for the maintenance of a healthy planet. For example, well-planned and well-managed protected areas can help to safeguard **freshwater** and food supplies, reduce **poverty** as they contribute to the livelihoods and well-being of local communities, and reduce the impacts of natural disasters.

Every country in the world has designated protected areas and the purpose of them is to limit the levels of human use and occupation and restricting the exploitation of **natural resources**.

Source: Protected Planet Initiative, Our Work, Protected Areas, About Protected Areas, www.unep-wcmc.org/about-protected-areas_163.html

How to do it

1. Divide the participants into groups of two or three people. Explain to them that they will be researching about protected forests around the world. To do this, they will use the ***Protected Planet Initiative*** from the United Nations Environment Programme and the World Conservation Monitoring Centre:

   www.protectedplanet.net

2. Have each group select any protected forest from around the world; encourage them to choose forests from all continents. Ask each group to make a small presentation for the rest of the groups.

Discussion

Why are protected areas considered to be one of the most effective tools for conserving **species** and natural **habitats**?
What benefits do human beings obtain from protected forest areas?
Can you identify any protected forest in your country? How has this contributed towards stopping **habitat** destruction?

Party in the Forest

Level 1 2

Aim

To encourage young people to protect forests and its wildlife.

Materials

3 or 4 poster boards, adhesive tape, colour cardboards, colour markers, colour pencils, scissors, string.

Time

A 40 minutes session to explain the activity and prepare the materials and another 15 minutes session to review the outcomes.

How to do it

1. Explain to your group that you are going to organize a **'Party in the Forest'** day when you will invite everyone to wear a distinctive that makes them look like their favorite animal from the forest.
2. Ask your group to make some cool posters to advertise your activity, invite everyone to participate. Make sure you say what the purpose of your activity is – to encourage everyone to protect forests and its wildlife – and remember to state the day and the time when you will carry it out.
   *You can develop your activity during recess or break, so everyone can see the great variety of animals that visited your school or youth group during that day. Make sure you play some cool music so you can put all the animals to dance!
3. Prepare some interesting facts you can share with your guests the day of the event, here are some ideas:
   - Forests cover 31 percent of the Earth's land.
   - 1.6 billion people depend on forests for their livelihoods.
   - Forests play a key role in our battle against **climate change** as they can absorb and store CO_2.
   - Global **deforestation** continues at an alarming rate, 13 million hectares of forest are destroyed annually, equal to the size of Portugal.
   - Forests are the most biologically-diverse **ecosystems** on land, they are home to more than half of the terrestrial **species** of animals, plants and insects.
   - Forests are home to 300 million people around the world.

   Facts source: UNEP, Forests, About Forests, www.unep.org/forests/Home/tabid/7152/Default.aspx
4. Give your group some time to choose an animal and elaborate their distinctive: maybe some paws, some ears, a tail, some whiskers, a mane, some spots, some wings, etc.
5. On a second session review the outcomes of your activity. How did everyone feel?

Discussion

What comments did you hear about the activity?
What would happen to all those animals if forests continue to be destroyed?
Can you name some ways how we can contribute to protect forests?

I Depend on You, You Depend on Me

Level 1 2

Aim

To understand that there is a close interdependency between humans and **ecosystems**.

Materials

- Cardboard signs for circle 1: child (2), 'Yagrumo' tree, birds (2), seeds (2), trees (2), river, shrimp (2), fish, worm, fungi, recycling (2), rain, breeze.
- Cardboard signs for circle 2: road, housing development, dam, trash, cats, dogs, heat.

Time

45 minutes.

Background

All forests' components are intimately interrelated. This relationship is called interdependency. Every element of a forest (plants, animals, air, rivers, soil) contributes with important functions to the system, some still unknown to humans. Let us take soil as an example, it is filled with hundreds of fungi, some not easily seen. Each one of them with the important function of restoring the soil's **nutrients** by processing the leaf litter on the ground. Another example is the many birds and bats that are responsible for dispersing seeds.

These relationships maintain the integrity of the forest, which is indispensable for our quality of life. Forests provide us with clean air and medicinal plants, they moderate temperatures, and they protect our mountains and planes from **erosion**. They also lower ambient temperature promoting the formation of rain.

Still, our forests are under constant threat of human development. These developments not only affect the forests, but in the long run the effect is also felt on our society. A good example of this is the **drought** felt in Puerto Rico in 1994; thousands of people were without water. One of the reasons for this was the sedimentation of the rivers caused by the intense **deforestation** around them. This is one of the many examples we see in our daily lives. It is of utmost importance to note that we are responsible for protecting our forests and ensuring that they keep providing us with their indispensable services.

The effects of humans on forests and themselves:

- *Dam construction*

  Dams are necessary for storing and providing water for communities. The problem is the amount of dams built. It is necessary to maintain in optimal conditions the existing dams before we consider building new ones. **Organisms** are affected in various ways when rivers are dammed. If the dam is too tall, it becomes an insurmountable obstacle to salt water **species** that need to go upriver to spawn, and also to **species** that need to go down river to complete their lifecycles. Dams also diminish the flow of water down river, negatively affecting aquatic, as well as other, **organisms**. Also, dams trap **sediments** that would normally go down river to the valleys affecting the fertility of the soils.

- *Road construction*

  Roads are necessary to keep us in touch with others. But, in our forests, road construction leads to a breach in the continuity of the forest causing the interruption of movement of some **organisms** from one area to another. These

roads also open a ready path to the incursion of exotic **species** such as dogs and cats that attack **native species**. Another factor that affects the forest is the air **pollution** brought in by the vehicles that transit the road.

- *Housing development*

  The construction of housing developments usually presupposes the **deforestation** of great extensions of land. The exposed soil is then vulnerable to strong rains that move **sediments** into our bodies of water. These **sediments** affect not only the **organisms** in the aquatic **habitat**, but also reduce the capacity to store water in our dams. **Deforestation** means the **habitat** of the **organisms** living in the trees is destroyed. Among the affected **species** are birds, who are responsible for dispersing the seeds necessary to grow new trees. Another consequence is that the ambient temperature rises since there are no trees to provide the shade and humidity needed for cooler temperatures.

- *Generation of solid waste*

  Our lifestyles generate an excessive amount of solid waste. Many of these solid wastes can be reused or recycled, but it is our habit to just throw them away. Our landfills cannot keep up with us. When we toss our waste into the **environment**, we pollute and endanger the lives of the **species** that live there, including ourselves.

How to do it

1. Give each participant a role and the corresponding sign that identifies the role. Only 26 students participate; the rest will be the audience.
2. Ask the participants that represent the roles of the first circle to form a circle holding hands in the following order: child-'yagrumo'-birds-seeds-trees-river-shrimp-fish-worms-fungi-recycling-rain-breeze-child.
3. Ask the participants to imagine that they are part of the story you are about to read (find the story on p.134). Each time an element is mentioned (elements appear in bold in the story), the participants who play that element should squeeze the hands of the participants next to them. This makes the interaction physical.

   Narrate the second part of the story slowly; change the tone of your voice accordingly. As you narrate the second part, the elements represented in the first circle will be replaced by new elements. These new elements are part of the circle but they do not hold hands with the other participants. When the story is over, a break in the circle will be evident. This break symbolizes what happens in an **ecosystem**.
5. Order: roads and housing development go in – trees go out; dogs and cats go in – birds and seeds go out; dam goes in – shrimp and 'yagrumos' go out; trash goes in – fungi, worms, and fish go out; heat goes in – breeze goes out.
6. Ask the participants to observe the structure and composition of the final circle, and discuss their feeling about the activity:
   - How does the first circle compare to the second circle?
   - How did you feel when the story was being read?
   - Do you believe the human impact on the forest only affects the forest?

Discussion

In which ways do you depend on forests?
Which can be the effects of uncontrolled development on our **natural resources**?
How do you think development can be in harmony with forest **conservation**?

Adapted from: Prince William Network's America's Rain Forests, I Depend on You, You Depend on Me, http://rainforests.pwnet.org/4teachers/value_challenges.php

Return to My Beloved Forest

By Arlene Flecha

Translated & adapted by Betsy Payne

I remember when I was a **child** I used to visit a marvelous forest. My family and I used to spend Sundays in the *Espiritu Santo* River. The variety of trees and medicinal plants that covered the trails was impressive. I remember when my grandfather used to tell us that one time he alleviated his asthma inhaling the vapors of the **yagrumo** leaves.

Wow! We really enjoyed the sounds of the **birds**. Dozens of these would flutter on the **tree** branches taking **seeds** from one place to another. The **river** water was so crystalline that sometimes you could see some **shrimp** and **fish** resting on the bottom.

After swimming in the river we used to go exploring for creatures that live in the forest soil: worms, **fungus**, and **insects**. Each one of them with their unique role of **recycling** the leaf litter with the help of the **rain** and the sun's energy; therefore returning the nutrients to the soil. My grandfather used to say that these organisms sustain the forest's life. I was impressed on how wise the forest was. All who lived there were part of one great team, and I felt part of it.

The air was so pure that I could feel my lungs expanding happily every time I breathed. My siblings and I were so mesmerized watching the **trees** dance to the rhythm of the **breeze** and to the melodious sound of the raindrops. Being there truly was paradise!

Ten years later I returned to my beloved forest with my child. Oh my! Nothing was the same. Someone decided to build a **housing development** in my precious forest. The **trees** that protected the river were cut down for the sake of an **urbanization** and a great road; a **road** through which **cats** and **dogs** reached the forest thereby eating the **birds** that used to live there. The birds no longer had a place to live and the trees did not have anyone to transport their **seeds**. The water was no longer clear, it was muddy from the sediment that once was held by the tree roots. Also, a **dam** was built to provide water to the new residents. This was an impossible obstacle for the **shrimp** that would deposit their eggs on the pools. Gone were the **yagrumo**. I wonder how much money is being spent curing asthma.

The residents had thrown **trash**, soapy water and oil on the ground and wiped out the **worms** and **fungi** that were so helpful in **recycling** the leaf litter. Eventually, all the pollutants would reach the river where they killed all the **fish**.

As I looked at what once was my dear forest, I felt an intense **heat**. There was no longer that fresh **breeze** the trees provided. Sadly, I looked into my child's eyes and thought...what are we leaving our children?

Insects and Diseases

Level 2 3

Aim

To learn about insects and diseases and their effects on forests.

Materials

Computers with internet access.

Time

2 hours.

How to do it

1. Remind your group that insects and **microorganisms** are part of a forest and that they play an important role, for example, when they consume old trees and other plant material and help speed up their decay and **nutrient** recycling process. Nevertheless, insects can also be harmful when infestations are so severe that they kill or injure trees.
2. Explain to your group that you are visiting the ***Natural Resources Canada*** web page to learn about insects and diseases and their effects on Canada's forests. You can also find a really interesting video about the role fire and mountain pine beetle play in the forest:

   http://cfs.nrcan.gc.ca/pages/48
3. Divide the participants into small groups and ask each one to review the information and to prepare a small summary about the most interesting ideas. The groups should present their summary as a news report.
4. Have each group present their work.

Discussion

Why are insects important for the forest **ecosystem**? When can they become harmful?
Which was your favorite news report? Why?
Who must participate in the protection and restoration of the forest **ecosystem**?

Forest Fragmentation

Level 1 2 3

Aim

To describe the consequences of shrinking **habitats**.

Materials

- One name tag for each child.
- Enough food, water and shelter cards to satisfy the following guidelines, use a different colour for each group of cards. You will be playing four rounds of this game. For the first round, make enough of each card for each child to get one of each. For each of the next three rounds, subtract six from the original number of cards. (If you start out with 30 of each colour for Round One, make 24 for Round Two, 18 for Round Three, and 12 for Round Four, giving a total of 84 cards of each colour.)
- At least fifteen yards of string or twine.
- A large open area or playing field.
- A bucket or cardboard box for collecting cards in between each game round.
- Masking tape.

Time

1 hour.

Background

As more and more land becomes **habitat** for humans, there is less and less room for wild plants and animals. National forests and other public lands become increasingly important, not only for wild animals, but also for us – as living laboratories, as recreation spots and as sanctuaries from our own busy **habitats**.

Around the world, forests and rangelands are being broken up into smaller parcels, leading to the loss of **habitat** and affecting air and water quality. In many countries people are moving to rural areas in search of peaceful country settings. The phenomenon of people moving out of congested urban **environments** to settle in rural areas is known as urban sprawl. Urban sprawl is characterized by wasteful, inefficient land-use practices because development takes place horizontally instead of vertically. Urban sprawl leads to the parcelization of land as people buy, subdivide, and sell land. These land transfers divide forest resources into more numerous, smaller-sized parcels. Parcelization is often a precursor to **forest fragmentation**, the breaking up of large tracts of forest into smaller fragments through land conversion. As a result of human development, many forestlands are converted to long-term or permanent non-forest use.

Since it disrupts many ecological processes, **forest fragmentation** threatens the health and **sustainability** of forests. It endangers wildlife **habitats**, both plant and wildlife diversity, and water quality. Additionally, **fragmentation** destroys irreplaceable, pristine forests that enhance the natural beauty of many regions.

How to do it

5. Before going outside, have each participant choose a forest animal that they'd like to be. Have them write the name of their animal on a name tag and tape it onto themselves.

Round 1

6. Find the center of your play area. Have the participants stand in a large circle. Explain to them that they are forest animals, constantly searching for food, water and shelter for survival. Life is good though, and they have plenty of space in which to wander and find what they need.
7. Randomly scatter the Round One cards over a large area and tell the participants they need to gather at least one of each colour card in order to survive. Make sure they know that they must walk, not run.
8. After the participants have gathered up all the cards, find out who has enough cards and who does not. Have the 'have nots' become spectators, explaining that every animal in the forest needs to work to find its food and must compete with other animals to find enough.

Round 2

9. Give the rope to the 'have nots' of Round One and have them form a large circle with it. The participants who 'survived' Round One should stand inside the circle.
10. Scatter the Round Two cards within the circle and repeat Round One's procedure.
11. During the discussion, use the children's name tags to point out the animals that no longer live in the forest. Make the point that as the size of a **habitat**

decreases, the available food, water and shelter also declines, making survival more of a challenge.

Round 3

12. Tighten the rope circle now, making the '**habitat** Area' smaller, barely large enough for the remaining participants to stand in. (There will only be room for a few rope-holders, so have the remaining spectators stand to one side where they can still see).
13. Repeat the procedure, using the Round Three set of cards. Again briefly point out that as the **habitat** area decreases, so does the number and the variety of animals.

Round 4

14. Make the circle even smaller, too small for all the remaining participants to fit.
15. Using the Round Four set of cards, play the game one more time.
16. Have a final discussion. Point out that animals need **habitat** to survive. If there is not enough land to supply food, water and shelter for animals, their numbers will decline or disappear. And as illustrated in Round Four, **habitat** can be reduced to a point where there is not even enough space left for wildlife. One of the reasons that public lands are set aside is to provide **habitat** for wildlife. As development expands along public land boundaries, the remaining **habitat** within National Forests, Parks or Wildlife Refuges becomes more and more valuable.

Discussion

Can you name some of the negative effects of **forest fragmentation**?
Have you ever been to a national park or wildlife refuge? How was it?
How can you help preserve wildlife **habitats** outside national parks or refugees?

Adapted from: Prince William Network's America's Rain Forests, What if We Run Out?, http://rainforests.pwnet.org/4teachers/value_challenges.php

Change in Forest Area

Level 2 3

Aim

To learn about the changes in forest areas in the world.

Materials

Copies of the chart and graph below, poster board, markers.

Time

1 hour.

Background

It is important to learn about the state of forests worldwide so we can be conscious about the need to take action, here are some key facts:

- In 2010, forests covered about 31 percent of the world's total land area – about 4 033 million hectares.
- About 93 percent of the world's forest cover is natural forest and 7 percent is planted.
- **Deforestation** affected an estimated 13 million hectares per year between 2000 and 2010; net forest loss was 5.2 million hectares per year, due to **afforestation** and natural expansion.
- Most **deforestation** takes place in tropical countries, whereas most developed

countries with temperate and **boreal forest ecosystem**s – and more recently, countries in the Near East and Asia – are experiencing stable or increasing forest areas.

- Between 1990 and 2010, the amount of forest land designated primarily for the **conservation** of biological diversity increased by 35 percent, indicating a political commitment to conserve forests. These forests now account for 12 percent of the world's forests.
- Approximately 14 million people worldwide are formally employed in the forestry sector. Many more depend directly on forests and forests products for their livelihood.
- In **developing countries**, wood based fuels are the dominant source of energy for more than 2 billion poor people. In Africa, over 90 percent of harvested wood is used for energy.
- Wood is not the only resource taken from forests. About 80 percent of people in the developing world use **non-wood forest products** for health and nutritional needs and for income.

Source: FAO, Forestry, Key Facts, www.fao.org/docrep/014/am859e/am859e08.pdf

How to do it

1. Divide the participants into six teams and explain that each one will have to use the information from the **'Annual Change in Forest Area by Region and Subregion'** chart to complete the following information:
   - Region:
   - Annual change rate:
     - Forest area gained or lost in 2005-2010 (in 1000 hectares):
     - Percentage change in 2005-2010 (%):
     - Which subregion presents the highest lost/gain?
   - How does this compare to what the map below shows?
2. Assign a region to each team and give them enough time to complete their task.
3. Have each team present their work.
   *You can also have the participants check out other charts and graphs that contain interesting information about the forests of the world! You can find them at FAO's Global Forest Resources Assessment 2010 Maps and Figures webpage:

   www.fao.org/forestry/41775/en

Discussion

What are the negative effects of forest losses?
Who can act in order to promote forest protection? What is the role of the government?
What can you do?

Adapted from: Project Learning Tree, Change in Forest Area by Country, www.plt.org/stuff/contentmgr/files/1/95bfffb65a29af81e3b7151d06808726/files/activity_4__change_in_forest_area_by_country.pdf

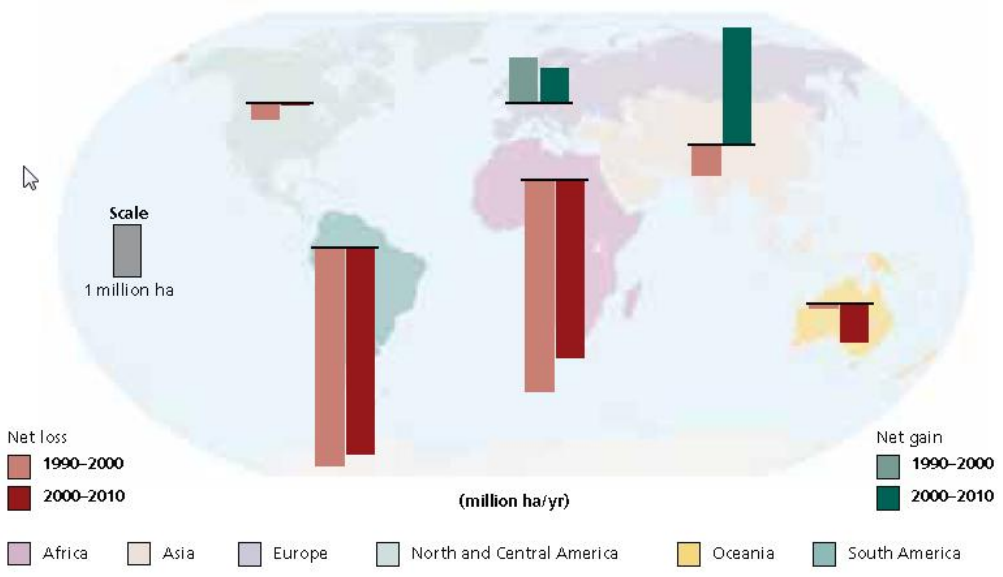
Annual change in forest area by region and subregion, 1990–2010

Region/subregion	1990–2000		2000–2010	
	1 000 ha/yr	%	1 000 ha/yr	%
Eastern and Southern Africa	-1 841	-0.62	-1 839	-0.66
Northern Africa	-590	-0.72	-41	-0.05
Western and Central Africa	-1 637	-0.46	-1 535	-0.46
Total Africa	**-4 067**	**-0.56**	**-3 414**	**-0.49**
East Asia	1 762	0.81	2 781	1.16
South and Southeast Asia	-2 428	-0.77	-677	-0.23
Western and Central Asia	72	0.17	131	0.31
Total Asia	**-595**	**-0.10**	**2 235**	**0.39**
Russian Federation	32	n.s.	-18	n.s.
Europe excl. Russian Federation	845	0.46	694	0.36
Total Europe	**877**	**0.09**	**676**	**0.07**
Caribbean	53	0.87	50	0.75
Central America	-374	-1.56	-248	-1.19
North America	32	n.s.	188	0.03
North and Central America	**-289**	**-0.04**	**-10**	**-0.00**
Total Oceania	**-41**	**-0.02**	**-700**	**-0.36**
Total South America	**-4 213**	**-0.45**	**-3 997**	**-0.45**
World	**-8 327**	**-0.20**	**-5 211**	**-0.13**

Source: Global Forest Resources Assessment 2010

Annual change in forest area by region, 1990–2010

FIGURE 2.5
Annual change in forest area by region, 1990–2010



Source: Global Forest Resources Assessment 2010

Analyzing an Environmental Issue

Level 2 3

Aim

To recognize the different components of an environmental issue.

Materials

Notebooks, pencils, an indoor meeting area, newspapers or internet access to look for information.

Time

A 1 hour session to organize the activity and another 2 hours session to develop it.

Background

Environmental issues occur because people have differing views about the **environment**. If everyone had the same viewpoint, there would be no controversy and there would be no issues. One way to analyze an **environment**al issue is to look for the following components:

- *Issue:* an issue is a problem for which people have differing values or opinions. The issue usually involves two or more parties who don't agree.
- *Facts:* a fact is a piece of information that is true and can be verified. As one analyzes an environmental issue, it is helpful to tease out the facts of the situation.
- *Players:* they are the individuals and groups involved in an issue.
- *Positions:* the players' positions refer to where they stand on the issue.
- *Values:* a value is something that an individual or group finds desirable or important. Many environmental issues become controversial because different players value different things, such as the following examples:
  - Aesthetics: beauty or appearance
  - Community: shared relationships
  - Culture: the history or practices of a societal unit
  - Ecology: the natural **ecosystems**
  - Economics: the exchange of goods or services for money
  - Education: learning and instruction
  - Laws: rules and regulations
  - Personal rights: individual freedoms
  - Recreation: leisure time activities
- *Opinions:* an opinion is an idea or judgment about the issue – whether true or false – that is held by one of the players.
- *Solutions:* these are the various strategies proposed to resolve the issue. A successful solution involves all the players in the decision-making process, takes into consideration what the different players value, and reaches a compromise outcome where the players are not seen as 'winners' or 'losers.'

Source: Project Learning Tree, Exploring Environmental Issues: Focus on Forests, What Makes Up an Environmental Issue?, www.plt.org/stuff/contentmgr/files/1/14a35ea3cb07f63119ea31afa07eee39/files/focus_on_forests_activity_4_sp_environmental_issue.pdf

How to do it

1. Remind your group about the many environmental issues that occur because different people have different views and interests about the **environment**. For example: when proposing the installation of a new wind farm, the creation of

new housing developments into forested lands, or the establishment of a new closed botanical area.

2. Explain to your group that in this activity they will have to analyze a local or national environmental issue related to forests. To select the issue they can use some newspapers or look for information on the internet.
3. Once they have chosen an issue, they should identify its different components:
   - What is the issue?
   - What are the facts?

	Player:	Player:	Player:	Player:
Positions				
Values				
Opinions				

   - What are the possible solutions?

4. Finally, ask the participants to organize a 'Community Meeting' where they will make a role play to represent each player and try to find a viable solution.
   *It is a good idea to invite other groups or classes to participate in the activity, and then organize the community meeting; each player can be represented by a different group.

Discussion

Why do you think environmental issues cause conflicts that attract the attention of the national and international community?
Why should all players be involved when looking for a permanent solution for a certain issue? How hard is it to achieve a viable solution for all?

Loss of Forest Biodiversity

Level 2 3

Aim

To learn about the direct causes of forest **biodiversity** loss.

Materials

Paper; pencils; books, encyclopedias or internet access for research.

Time

Two 1 hour sessions.

Background

The direct cause of forest **biodiversity** loss is forest decline, in particular the human-caused destruction and/or **degradation** of forest **ecosystems**. In general, all forest types are affected by **deforestation** and **degradation**. However, at a global level the forestlands which have already disappeared, or are at most risk in the future, are those occupying sites most suited to agricultural development. Human actions are the most important direct causes of forest loss; these actions include: adverse agriculture practices (conversion to agricultural land and industrial agriculture, overgrazing and dismantling of agro-forestry systems); unsustainable **forest management** (such as poor logging practices, **over-exploitation** of wood for fuel

and **charcoal** manufacture and over collection of non-timber forest resources); introduction of exotic and/or invasive plant and animal **species**; infrastructure development (road building, hydro-electrical development or improperly planned residential and cities development); mining and oil exploitation and **climate change**. In addition, humans can cause forest fires, pollution and **climate change**, all of which can lead to forest loss.

Natural hazards, such as storms and hurricanes, forest fires, **floods** and pests are natural disturbance regimes in forests. They can often have a positive impact on biological diversity. These disturbances, on a small or large scale, can create specific **habitats** that are important for the survival of flora and fauna; they should, therefore, be mimicked or maintained in **forest management**. However, many human induced activities exacerbate these disturbances in a way that makes them an increasing threat to forest **biodiversity**.

Experts are concerned over the rates of loss of biological diversity as a consequence of human population growth and resource use. The main direct causes of **species extinction** are **habitat** loss and **degradation**, **fragmentation**, overexploitation, secondary **extinction**, introduction of exotic **species** and **climate change**.

Source: Convention on Biological Diversity, Review of the Status and Trends of, and Major threats to, the Forest Biological Diversity, www.cbd.int/doc/publications/cbd-ts-07.pdf

How to do it

1. Remind your group how biological diversity is affected when the forests of the world are destroyed. How can this affect the balance of these natural **ecosystems**?
2. Divide the participants into seven teams and explain that each one will have to do some research about one of the main causes of forest loss and make a newspaper article to present to the entire group or class:
   - Agriculture
   - Unsustainable **forest management**
   - Introduction of **invasive species**
   - Infrastructure development
   - Mining and oil exploitation
   - **Climate change** and atmospheric **pollution**
   - Natural hazards and forest fires
3. Have each group read their article! You can share these articles with other groups or classes or you can even send the best ones to the local newspaper.

Discussion

How does **biodiversity** loss affect our world?
Who can act in order to combat against the main causes of **biodiversity** loss? What can you do?
Do you know about a forestland that has been negatively affected by human actions? Can you do something to prevent this?

Writing About Forests

Level 2 3

Aim

To reflect about different issues regarding forests use.

Materials

Paper, pencils, internet access (optional).

Time

Two 1 hour sessions to allow the participants to write their articles and another 1 hour session to present them.

How to do it

1. Explain to your group that they will have to write a newspaper article about different topics related to forest use. Here are some ideas:
   - In what ways are forests and forest products important to people throughout the world?
   - Why are there conflicts between logging companies and environmentalists? Include recommendations for reducing these conflicts.
   - Explain at least four reasons why it is important for us to limit our increasing demands for forest products.
   - What conflicts can arise between people's use of forests and animal **habitat** protection? Provide examples.
   - What is the relationship between a nation's economy and forests?
2. Remind them that if they need further information they can look on the internet or in the library. Explain that they will have to present their work as a newspaper article in order to inform others in the community about this issue.
3. Give the participants enough time to write their articles (if you prefer they could do this as homework).
4. Once they are done, ask each participant to read their article to the rest of the group.
5. Then, publish the articles in your school, youth group or library. You can even send the articles to the local media!

Discussion

How much forest do you think human beings need?
Can this need be satisfied in a **sustainable** way?
What can you do to help?

Adapted from: Action Bioscience, Deforestation: Can We See the Forests for the Trees?, www.actionbioscience.org/environment/lessons/nilssonlessons.pdf

Sustainable Forest Management

Level 3

Aim

To learn about the relevant aspects of **sustainable forest management**.

Materials

Internet access, poster boards, colour markers.

Time

Two 1 hour sessions to allow the participants to prepare their posters and another 1 hour session to make the presentations.

Background

The Collaborative Partnership on Forests (CPF) is an informal, voluntary arrangement among 14 international organizations and secretariats with substantial programmes on forests. These agencies share their experiences and build on them to produce new benefits for their respective constituencies. They collaborate to streamline and align their work and to find ways of improving **forest management** and **conservation** and the production and trade of forest products.

Some of the organizations that participate in this partnership are: the Food and Agriculture Organization of the United Nations, the Convention on Biological Diversity, the International Union for Conservation of Nature, the United Nations Environment Programme, the United Nations Forum on Forests, among others.

How to do it

1. Explain to your group what the Collaborative Partnership on Forests is, it is a good idea to visit their web site to learn more about their work: www.cpfweb.org/en
2. Divide the participants into 8 groups and tell them they will be learning about **sustainable forest management**. Some interesting fact sheets have been prepared by the CPF Working Group on Sustainable Forest Management; assign one of the 8 different fact sheets to each group and ask them to prepare a small presentation for the rest of the group:

   www.cpfweb.org/76228/en
3. Have each group present their work.

Discussion

Can you define what **sustainable forest management** is? Why is it important?
What are some of the **ecosystem goods and services** that forests provide? How can we maintain these services over time?

Endangered Species

Level 1 2 3

Aim

To learn about endangered forest **species**.

Materials

Internet access optional, cardboard, colour markers, colouring pencils.

Time

1 hour.

Background

Habitat loss is posing the greatest threat to the variety of life on our planet today, it is identified as a main threat to 85 percent of all **species** described in the International Union for Conservation of Nature Red List (those **species** officially classified as "Threatened" and "Endangered"). The world's forests continue to disappear as they are used and cleared for human consumption. Forest loss and **degradation** is mostly caused by the expansion of agricultural land, intensive harvesting of timber, wood for fuel and other forest products, as well as overgrazing.

Source: WWF, Impact of Habitat Loss on Species,
http://wwf.panda.org/about_our_earth/species/problems/habitat_loss_degradation

How to do it

1. Remind your group that due to **habitat** loss many **species** of plants and animals are in danger of disappearing forever. Can you name an example?
2. Explain to your group that they are going to make a small research about a **species** of plant or animal that is in danger of **extinction** due to forest destruction. You can help the younger groups look for some endangered animals and they can make some nice drawings of them. The elder groups can use the ***IUCN Red List of Threatened Species*** to guide their search:

   www.iucnredlist.org/search
3. Have each participant present his/her work.

Discussion

What are the negative consequences of **species extinction**?
Why do we all need to act in order to prevent **habitat** loss?
Are forest **habitats** being lost in your country? What can you do to promote their protection?

Useful resources

Centre for International Forestry Research
www.cifor.org

Collaborative Partnership on Forests
www.cpfweb.org

Forest Trends
www.forest-trends.org

IUCN Red List of Threatened Species
www.iucnredlist.org

Rainforest Action Network
http://ran.org

United Nations Forum on Forests
www.un.org/esa/forests

US Environmental Protection Agency Student's Guide to Global Climate Change
http://epa.gov/climatechange/kids/impacts/effects/forests.html

UNESCO World Heritage Forest Programme
http://whc.unesco.org/en/forests

Take Action

Introduction

Conserving forests means conserving life! Forests provide an incredible array of services and **natural resources** to our planet and, therefore, they make our lives healthier and happier. Forests are also home to two-thirds of all plants and animals. Protecting and conserving forests is in our own best interest and essential to the health of the entire world.

Many governments, organizations and societies have realized about the need to find a balance between our demands for forest products and the need to preserve forests. The **conservation** of these amazing **habitats** is vital for all those who share this beautiful world. We are all connected and each one of our actions has a reaction that impacts all of us. A lot of great work is being done to protect our forests, but there is still a long way to go.

Sometimes we are overwhelmed by the threats that forests are facing and we might not be sure if an individual can make any impact. Well, you can be sure that there are thousands of young people like you who are learning about the issue and taking little steps to help. You can make small changes through your everyday choices, you can contact government representatives and private corporations working with forests, you can join different forest-preservation organizations and you can raise awareness starting from your local community. So, raise your voice, put your hands to work and start making a change!

Activities

Forest Pledge!

Level 1 2 3

Aim

To commit to caring for our amazing forests.

Materials

Paper, pencils.

Time

A 40 minutes session to organize the activity and another 30 minutes session to review the outcomes.

How to do it

1. Explain to your group that they are going to have their families, their school or youth group friends, and members of their community sign a ***Forest Pledge***.
2. To start, ask your group to write a fun and appealing pledge. Here is an idea:

Forest Pledge

I pledge to:
• Reduce the amount of products I buy and use so that fewer trees are cut down to make new products. • Save energy and use it wisely to help prevent air pollution and climate change. • Recycle products like paper and carton to prevent new trees from being destroyed. • Help reduce pollution by being wise about waste and toxic materials. • Protect forests to guarantee a healthy habitat for wildlife.
I promise to:
• Visit and explore the beautiful forests around me. • Learn about the importance of trees in my community. • Plant trees whenever I can. • Encourage and help others to do the same.

Name	Signature
…… …… ……	…… …… ……

3. Give some copies of the pledge to each participant. As homework, ask them to have everyone sign their pledge.
4. Discuss about your experience.

Discussion

How did people feel about your initiative?
How do you feel knowing that you are making a difference?
How important is it to inform and involve others in different activities that might help them become aware of the need to respect our forests?

Protect the Forests Contest

Level 1 2 3

Aim

To understand the important role of forests in our lives.

Materials

4 poster boards, colour markers, colour pencils, non-toxic paints or watercolours.

Time

1 hour.

Background

Forests cover about 30 percent of the land area on Earth. But a forest is more than just a group of trees. Forests play a vital role in the **environment**.

The world's forests provide many different goods and services, for example:

- Home for plants and animals, which help to maintain the diversity of life on Earth;
- Food for people and animals;
- Valuable materials for different industries, for example, to obtain medicines or wood for building or energy;
- Filter **pollution** from the air as they soak up CO_2;
- Protect the quality of water and prevent soil loss;
- Create shade;
- Give people nice places to live, relax and have fun;

And much, much more!

How to do it

1. Divide your group into four teams. Explain to them that they are going to create a poster to show everyone why forests are so important and should not be destroyed. Tell them to use their imagination to get their message across. Remind them they can use all kinds of materials!
2. When the teams are done, display the posters in your school or youth group.
3. Have other young people vote to see which poster they believe transmits a clear message and encourages people to make a change.

Discussion

What do you think the world would be like without the goods and services provided by forests?
What would life be like without products made from wood, wood fiber or wood chemicals?
How have attitudes towards forest protection changed over time?

Speak Up for Trees!

Level 1 2 3

Aim

To learn how individual actions can help preserve forests.

Materials

Paper, pens.

Time

40 minutes.

How to do it

1. Explain to your group that one way to protect forests is to write letters to the companies responsible for **deforestation**. The people in these companies are not bad, but often don't understand how vital forests are. Therefore, it is really important to speak up for trees and forests.
2. Divide your group in couples. Ask each couple to write a letter to a company to explain why it is necessary to protect forests and to encourage them to maintain a philosophy that respects nature and its living beings.
3. Choose a company from your city or country that works with forest products and send all the letters to them in a big bundle so it makes a really big impression!

Discussion

What are the advantages and disadvantages of using forest products?
How can people change their everyday habits to help promote forests' protection?
What can you do to communicate the importance of forests?

Forest Jingle

Level 1 2

Aim

To create a jingle that encourages young people to make a change.

Materials

Paper, pencils.

Time

40 minutes.

How to do it

1. Ask your group to sit in a circle and to brainstorm different words related to trees and forests.
2. Using the words, ask the participants to create a jingle that encourages people to lead environmentally friendly lives and to guarantee the maintenance of a healthy world by contributing to protecting forests.
3. Sing your jingle to other classes or groups, you will have a blast! You can even accompany your jingle with different musical instruments.

Discussion

What was the reaction of the people that heard your jingle?
Do you think they received the message you wanted to transmit?
What does it mean when people say that small actions can make a big difference?

Let's Talk About Landscape

Level 2 3

Aim

To learn about landscape architecture and how it relates to environmental protection.

Materials

Notebooks, pencils, guest speaker.

Time

A 10 minutes session to explain the activity and to prepare some questions for the expert's visit, and another 40 minutes session to receive him/her.

Background

Landscape architects deal with the increasingly complex relationships between the built and natural **environments**. They plan and design traditional places such as parks, residential developments, campuses, cemeteries, commercial centers, resorts, corporate and institutional centers, water front developments, among others. They also design and plan the restoration of natural places disturbed by humans, such as **wetlands**, stream corridors, mined areas and forested land. Their appreciation for historic landscapes and cultural resources enables landscape architects to undertake preservation planning projects for national, regional and local historic sites and areas.

Working with architects, city planners, civil engineers and other professionals, landscape architects play an important role in environmental protection by designing and implementing projects that respect both the needs of people and of our **environment**.

Source: American Society of Landscape Architects, Landscape Architecture Education and Career Development, www.asla.org/ContentDetail.aspx?id=12206&PageTitle=Education&RMenuId=54

How to do it

1. Explain to your group that you are inviting a landscape architect – a professional that designs, plan and manages our land – to come to your school or youth group to talk to you about the importance of his/her profession in order to combine infrastructure development, landscape planning and environmental awareness.
2. Before that day, make sure you encourage your group to think about the things they might want to know and help them prepare some questions.
3. Don't forget to invite other groups and classes to your conference.
4. Discuss about the new knowledge you acquired.

Discussion

Would you prefer to live in places which include natural **environments**? Why?
How can natural areas such as forests and parks help a local community to stay healthy?
What changes can you make to respect trees and forests with your everyday actions?

Let's Join Our Hands for Forests

Level 1 2 3

Aim

To encourage action regarding forest **conservation**.

Materials

Poster boards, colour markers, adhesive tape, your group might need additional materials if they choose to make their own activity.

Time

40 minutes. Your group might need some extra time if they choose to make their own activity.

Background

The United Nations General Assembly proclaimed 21 March the International Day of Forests with the aim of raising awareness about the importance of all types of forests. On each International Day of Forests, countries are encouraged to undertake local, national and international efforts to organize activities involving forests and trees, such as tree planting campaigns.

How to do it

1. Remind your group that many events are organized to celebrate the International Day of Forests and that now it is their turn!
2. Explain to them that they are organizing a ***Let's Join Our Hands for Forests*** campaign to invite everyone at their school or youth group to host an event regarding forest protection and **conservation**.
3. Have your group make some cool posters to advertise your activity. Make sure you include all the necessary information:
   - Theme of the campaign
   - Date of the event
   - Objective of the event

   And you could also include some ideas and facts to encourage participation:
   - Forests cover 31 percent of our total land area.
   - Forests are among the most biologically rich terrestrial **ecosystems**, they are home to 80 percent of our terrestrial **biodiversity**.
   - 30 percent of forests are used for production of wood and **non-wood products**.
   - Forests are home to 300 million people around the world.
   - The livelihoods of 1.6 billion people around the world depend on forests.

   Source: United Nations International Year of Forests 2011, Events, www.un.org/en/events/iyof2011/

4. Also, ask them to include in their posters a space for the other classes or groups to write down their planned activities for the day of the event.
5. Review the ideas everyone has written down and analyze how creative and caring everyone was! Your group can also organize its own activity! Here are some ideas:
   - Tree planting.
   - Park clean-up.
   - Round tables regarding forest use and **conservation**.
   - Invited guests.

- Role plays.
- Songs or story writing.

Be creative!

6. Place the posters and papers all around your school or youth group. Make sure everyone hears about it!

Discussion

How did your school or youth group feel about this activity?
How important do you think it is for people to motivate others to make a change and encourage action?
How do you think your campaign contributed to do this?

Forest Mascot

Level 1 2 3

Aim

To create your school or youth group's forest mascot.

Materials

Poster boards, colour markers, adhesive tape.

Time

Two 1 hour sessions, 1 hour to organize the activity and 1 hour to review the results.

How to do it

1. Explain to your group that you are organizing a drawing competition to find your school or youth group's ***Forest Mascot***!
2. Divide the participants into small groups and have each one make a poster to publicize your event. Don't forget to include all the necessary information:
   - Theme
   - Participants' age range
   - Size of the drawing paper
   - Drawing materials accepted
   - Deadline

And of course don't forget to say that the new mascot will be used in all the publications, documents and activities your school or youth group might organize in favor of forest protection and **conservation**!

3. Place the posters all around your school or youth group. Make sure everyone hears about it!
4. Tell your group that they will be in charge of selecting the winner and awarding him/her with a cool certificate (or maybe you could even give him/her a prize of your choice).
5. You can also make an award ceremony with the entire school or youth group to congratulate everyone for participating and encourage them to continue caring for our forests.
6. Now that you have your mascot, you can talk to your school or youth group's director to encourage him/her to organize an activity where your mascot can invite everyone to make a change!

Discussion

What is the message your mascot wants to transmit?
How important do you think it is to develop awareness about forest **conservation** starting at a young age?
How might your mascot encourage children and youth to act?

Get Involved

Level 2 3

Aim

To get involved in forest **conservation**.

Materials

Paper, pencil; different materials might be needed if the group chooses to collaborate with a forest **conservation** organization.

Time

1 hour initially. Depending on the activity, you might need different sessions to develop it.

How to do it

1. Explain to your group that you are going to investigate about an organization in your community that is concerned about forest **conservation** or management, and that you will contact them in order to find out how you can get involved in their work. You can use the internet to look for such organizations.
2. Have your group write a letter to the organization you choose in order to express their interest about working with them in a forest **conservation** activity; you could even include an idea about an activity you might want to develop, for example, learning about invasive weeds and helping to eliminate some from a forested area.
3. Once you receive their reply, make sure you all get to work!

Discussion

In what type of topics do these organizations work? Which one do you think is the most important one?
Why is it important to participate in forest **conservation** activities? Who can participate?

Clean-up Time

Level 1 2 3

Aim

To encourage everyone to keep forests clean.

Materials

Poster boards, colour markers, adhesive tape (to publicize the event). You might need different materials for the forest clean-up: rubber gloves, plastic bags, shovels, car or truck to take away all the garbage, photo camera (optional).

Time

A 1 hour session to organize the activity, and a whole morning to develop it.

How to do it

1. Remind your group that litter spoils the woods and can hurt the animals and visitors, and that, just like at home, everyone can help to clean-up. Explain to them that, as a special project, you are organizing a ***Forest Clean-up*** and that you are going to invite everyone at your school or youth group and neighborhood to help; the more the better!
2. Divide the participants into small groups and have each one make a poster to publicize your event. Don't forget to include all the necessary information:
   - Theme

- Date, place and time
- Needed materials
- Safety issues

Place the posters all around your school or youth group, in your local library, community center or supermarket. Make sure everyone hears about it!

3. You can also contact the media to do a story on your group's concern for their **environment**.

For the forest clean-up:

1. Make sure you have any required permits to access your adopted forest before the day of your event.
2. Arrange in advance for the ultimate destination of all the debris collected and means to get it there.
3. The day of the event, make sure everyone knows where the garbage will be placed, and of course how it will be recycled.
4. List the tasks to be accomplished, hold meetings and assign tasks to different people. The idea is to clean up all the garbage and weeds around the forest area you choose.
5. Make a map of where people will be working and keep track of everyone.
6. Make sure everyone is aware of the safety issues: wear rubber gloves, don't pick up anything hazardous, work in pairs, call if you need help, etc.
7. When you are finished, record the amount and type of debris collected. Take pictures!

Make sure to take the necessary safety precautions!

Discussion

Where there a lot of people willing to help? Why do you think this is?
How did you feel knowing that you were doing something to improve your **environment**?
How do you think the forest clean-up will help the **environment** and the life that it supports?

Carbon Footprint Challenge

Level 2 3

Aim

To realize about the need to combat **climate change**.

Materials

Computer and internet access.

Time

1 hour. You might need several sessions if you choose to participate in the challenge.

Background

Trees absorb **carbon dioxide** (CO_2) from the **atmosphere** during **photosynthesis** and store carbon in their stems, branches and roots, which can also transfer carbon to the soil. By removing CO_2 from the **atmosphere** in this way, forests help to reduce (or mitigate) the severity of **climate change**.

Forests play a vital role in combating **climate change**. Tropical forests cover about

15 percent of the world's land surface and contain about 25 percent of the carbon on the planet's surface. The loss and **degradation** of forests accounts for 15-20 percent of global carbon emissions. The majority of these emissions are the result of **deforestation** in the tropics, largely due to conversion of the forest to more lucrative economic activities such as agriculture and mining.

There are plenty of other major sources of emissions, such as industry, energy consumption and transport. However, only forestry activities also have the potential to remove (or sequester) carbon from the **atmosphere**. This sequestration creates carbon 'sinks'. As well as being potential sources of emissions, forests can also help to mitigate **climate change** through the creation of additional sinks. Uniquely, forestry practices are a serious part of the **climate change** problem, but also, potentially, a key part of the solution. FAO experts estimated that the total amount of carbon being held by the world's forests in 2005 was 638 Gt (1 Gt is equal to 1 billion tonnes). This is more than the total amount of carbon in the entire **atmosphere**! This data includes all forest vegetation, roots, dead wood, and the carbon contained in the soil.

Source: FAO, Forests and Climate Change, www.fao.org/docrep/016/i3033e/i3033e01.pdf; FAO, How much carbon is held by the world's forests?, ftp://ftp.fao.org/docrep/fao/010/i0105e/i0105e04.pdf

How to do it

1. Remind your group how our everyday activities, like turning on a light, travelling by car or preparing a meal can release **greenhouse gases** that cause **climate change**. Ask your group how **climate change** is related to forests.
2. Explain to your group that you are going to participate in the ***International Student Carbon Footprint Challenge***; the challenge involves understanding the causes of **climate change** and then envisioning and embodying effective solutions so we, as a planet, can avoid the worst potential consequences.
3. Visit the following Web site to participate, you can calculate your personal carbon footprint and you can also get in touch with students and teachers around the globe:

   http://footprint.stanford.edu/index.html

Discussion

How do forests contribute to combating **climate change**?
What can you do personally to lower your carbon footprint?
What can you do at a local level to help maintain the vital services forests give to us?

Save Paper and Forests

Level 1 2 3

Aim

To reflect about paper use and how it affects forests.

Materials

Cardboards, colouring pencils, colour markers.

Time

1 hour.

Background

Paper products are crucial to society, they have enabled communication, literacy and cultural development. However, if we do not change our current paper production and consumption practices, our growing demand for paper will continue to threat the Earth's natural forests and their precious wildlife.

World consumption of paper has grown 400 percent in the last 40 years. Now nearly 4 billion trees or 35 percent of the total trees cut around the world are used in paper industries on every continent. Besides what you can see around you, paper comes in many forms, from tissue paper to cardboard packaging to stereo speakers to home insulation to the sole inserts in your tennis shoes. In short, paper is everywhere.

A tonne of paper consumes approximately 20 full-grown trees, over 90 000 litres of water, over 1.2 tonnes of coal and an assortment of chemicals. The greenhouse gas emissions of this tonne of paper are approximately 8 tonnes (a tonne of recycled paper emitts approximately 2 tonnes of **greenhouse gases**). As you can see, using paper wisely and cutting your paper use can really help our world forests!

Facts sources: Ecology Global network, Paper Chase, www.ecology.com/2011/09/10/paper-chase/; City of Stirling, Save Paper and Forests, http://sustainability.stirling.wa.gov.au/categories/work/actions/save-paper-and-forests/

How to do it

1. Remind your group how important it is to use paper wisely as this can help protect our forests.
2. Explain to your group that they are going to make some signs related to paper use – tips to reduce paper consumption or interesting facts about paper. These signs will be placed all around your school or youth group.
3. Have all the participants give ideas and write them down.
4. Divide your group into three of four teams and have each group use the cardboards to create some really cool and appealing sings.
5. Put the signs around your school or youth group to encourage everyone to make a change. Here are some ideas:
   - Reduce the amount you print, and if you need to print, use a smaller font size.
   - Ensure all prints are double sided.
   - Work on and distribute electronic documents.
   - Re-use scrap paper.
   - Re-use paper for notepads.
   - Recycle paper.
   - Use thinner paper, the thickness of paper we use makes a big difference both in terms of cost as well as the amount of paper used.
   - Purchase 100 percent post-consumer recycled waste paper.
   - Buy paper with the Forest Stewardship Council (FSC) logo.

Discussion

Whose job is it to use paper wisely?
Why is it important to help raise awareness about paper use?
Do you think your family should be more paper conscious? What can you do about it?

Tree Planting

Level 1 2 3

Aim

To encourage tree planting.

Materials

Preparation: paper, pencils, internet access, photo camera (optional).
To plant the trees: visit to a nursery, tree seedlings, shovels, gloves, trip to the planting site.

Time

Preparation: 1 hour.
Activity: two to five 50 minute sessions.

Background

Trees are invaluable assets to our communities. They give us flowers, fall colours, and lovely scents. They provide homes for birds, squirrels, butterflies, and other wildlife. Their branches create beautiful shapes that soften the urban landscape and even hold tree houses. They shade and cool our streets and buildings and insulate homes from cold winds.

Trees, particularly those planted in urban or residential areas:

- Help settle out, trap, and hold small particles (dust, ash, smoke) that can damage our lungs.
- Absorb sulfur dioxide and other pollutants.
- Store carbon, helping to reduce atmospheric **carbon dioxide**.
- Hold soil with their roots, preventing **erosion**.
- Provide homes and food for birds and other animals.
- Serve as a windbreak, keeping buildings warmer.
- Provide shade, keeping buildings cooler.
- Muffle traffic noise.
- Provide beauty and enjoyment.

How to do it

1. To begin, find out which agencies or organizations are responsible for tree planting and maintenance in your community. Park departments, urban forestry departments and independent garden clubs are possibilities. Your group can write to those agencies or organizations for tree-planting information.
2. Ask the participants to name some areas in the community (such as along city streets and in other public areas, including the school or youth group grounds) where trees have been planted. Then have them work in small groups to list the benefits trees provide to people and wildlife in those areas.
3. Tell the participants that planting trees is a great way to do something good for the community – and for the planet as a whole. Have them work in small groups to identify areas in the community (or on the school or youth group grounds) that would be improved by the presence of one or more trees. Remind the participants to refer to their lists of tree benefits as they consider different planting sites. If you're working with younger groups, take them on a walk around the

school or youth group to locate an area or areas that would be improved by adding a tree.

4. After the participants have identified possible sites, have a group discussion about the feasibility of each site. Have them decide which site (or sites) should be the focus for their tree-planting campaign.
5. If you are working with older groups, ask them whom they think they should contact to get permission to plant in the area(s) they have chosen. Help them learn about tree planting in your community, finding answers to questions such as:
   - How much money is spent annually on tree care in the community? How many trees are planted, and where?
   - Which **species** are most often chosen for planting?
   - Do any criteria exist for selecting the **species** that will be planted? If so, what are they? Whether or not such criteria exist, you may want to suggest to the participants that they consider many different factors before deciding on which trees to plant. For example, depending on where they will be planting, they may want to consider **native species** and **species** that are resistant to air **pollution**, **drought**, and so forth.
   - What are some hardships that urban trees face? What is the average life span of a city tree?
   - How can citizens become involved in planting and maintaining trees on public property?

   Help your group use this information to compose a letter to the appropriate people, agencies, or organizations for permission to plant.

6. After the participants have received permission to plant, help them detail plans for their tree-planting project. For instance, they may decide to raise money to buy trees from a local nursery, or they might ask people to donate trees. You may contact local foresters or nurseries to get help with planning and carrying out the planting.
7. Have the participants plant trees and take care of them. You can get directions from the nursery on how to plant and care for the particular **species** of tree.
8. Tell your group to take digital pictures before and after planting the trees so they can see how the place changes.

Discussion

How will the trees you planted today contribute to the well-being of future generations?

What other activities can you do to promote a 'greener community'?

Source: Project Learning Tree, Prek8 Activity Guide, Plant a Tree, www.plt.org/stuff/contentmgr/files/1/7d107c9eeff935991a82355fb8f22640/files/plt_lorax_activities.pdf

Recycling Campaign

Level 1 2 3

Aim

To encourage paper recycling.

Materials

Cardboard, colouring pencils, colour markers, cardboard boxes or bags to collect the paper.

Time

Preparation: 1 hour.
Activity: 2 hours.

How to do it

1. Remind your group how much paper products are used every day and how each individual can help our forests and our **environment** through paper recycling:
   - Every ton of recycled paper saves more than 3.3 cubic yards of landfill space.
   - About 1/3 of the wood from trees that are cut down is used to make paper and paper board. That's about 300 000 hectares of land each year.
2. Explain to your group that they will be in charge of organizing a ***Recycling Campaign*** in their school or youth group. They will have to choose a day when they will encourage everyone to bring to school or youth group all the paper they want to recycle!
3. Have your group make some cool posters to advertise your activity. Make sure you include all the necessary information:
   - Theme of the campaign
   - Date of the event
   - Objective of the event
   - Where you will collect the recycled paper.
4. Place the posters all around your school or youth group. Make sure everyone hears about it!
   *Make sure you arrange in advance for the ultimate destination of all the paper collected and the means to get it there.

Discussion

What where the results of your campaign? Where you able to raise awareness about paper recycling?
What can recycled paper be used for?
What else can you do to promote forests protection?

Facts source: Ecokids, Forests, What We Can Do, www.ecokids.ca/pub/eco_info/topics/forests/what_we_can_do.cfm; Paper Recycles, Fun Facts, www.paperrecycles.org/

Back to Forests!

Level 1 2 3

Aim

To encourage young people to spend time in nature.

Materials

Poster boards, colour markers, paper, pencils.

Time

Preparation: 1 hour.
Activity: 2 hours.

How to do it

1. Ask your group to think about a cool wooded area nearby where they would like to go. Search for a local park, **conservation** area, or outdoor education center near you!
2. Explain to your group that you are starting a nature habit. Now that you've found some places to go, you need to make the time to go there often! Make a pledge to spend a few hours a week outdoors reconnecting with forests.
3. Remind the participants that there is nothing better than sharing some time in nature with others. Start a **'Back to Forests'** group or club at your school or youth group. If you prefer, you can create a **'Family Forests Club'** so you can enjoy visiting forests with your family members.
4. Invite other groups or classes to join your group. Plan a small trip to a wooded area and enjoy some cool activities: climb a tree, take a look inside a tree, hunt for bugs, track wild animals, find your way with a map and a compass, go for a nature walk, go bird watching, find different types of vegetation, etc.

Discussion

Why do healthy people need healthy forests?
What are the benefits of visiting and enjoying some time in nature?
What other activities can you carry out so people don't lose touch with forests?

Source: EcoKids, Earth Day Canada, Reconnect with Nature, www.ecokids.ca/pub/take_action/campaigns/en/act_for_the_planet/assets/pdfs/nature-individual.pdf

Journaling Ideas

Level 2 3

Aim

To encourage young people to reflect about issues affecting forests.

Materials

Video camera (a digital camera, a mobile phone with a camera or voice recorder could work if you do not have access to a video camera); the groups might need some additional materials for their videos/recordings.

Time

Preparation: 40 minutes.
Activity: 2 hours.

How to do it

1. Explain to the participants that they are going to record some videos about an issue affecting forests.
2. Divide your group into small teams and tell them that they must make a cool and

appealing video/recording about a topic of their choice. Tell them to be creative. Here are some ideas:

- Pretend you are an endangered animal that lives in a forest, maybe an orangutan or a pygmy elephant. You have just learned that the forest you call home is going to be cut down. Talk about how this is going to affect your life and the lives of the animals around you. What can people do to help?
- Pretend you are a young scientist visiting a **mangrove forest**. Explain why mangroves are so important to the global **ecosystem**. What might be some implications if the mangroves were to someday be destroyed?

3. On the first session give the teams some time to organize their ideas and think about any extra materials they might need.
4. On the next session, help them make their videos/recordings.
5. Finally, share the videos/recordings with other classes or groups. You could even send the best ones to a local radio or TV station!

Discussion

What message did you want to transmit through your video/recording?
Which was your favorite video/recording? Why?
Why is it important to learn about the state of forests worldwide?

Let's Save Forests

Level 1 2 3

Aim

To learn that everyone can help raise money to support different projects that promote forest restoration and **conservation**.

Materials

Paper, pencils, internet access, the participants might need different materials to carry out the fundraising activities.

Time

You might need different sessions according to the activity you choose.

How to do it

1. Explain to your group that experts agree people can help save forests from around the world by doing some of the following things:
   - Be informed and educate others.
   - Shop carefully and consciously, such as buying products made with certified wood.
   - Volunteer in different organizations working on forests issues.
   - Donate or support any of the various organizations working to protect forests and their wildlife.
2. Tell your group that you are organizing a fundraising activity to make a donation to a project of your choice. You could look for an interesting project using the internet. Here is one example: Forests of Hope from Birdlife International, a programme that promotes forest **conservation** throughout the tropics (www.birdlife.org/forests).
3. Ask your group to sit in a circle and to think about fun fundraising activities they can carry out to help a local forest or a forest from a faraway country. Make sure you write them all down!
4. Choose a fundraising activity you want to develop and have fun! You can invite others to join your initiative. Below you will find some suggestions:

- Design fun and attractive greeting cards according to the season of the year (such as Valentine's Day, Easter, Halloween, Thanks Giving Day, Christmas, birthdays, etc.) and sell them to your family, neighbors, friends, teachers, youth leaders, etc.
- Organize a walkathon and invite all your family, friends, teachers and youth leaders to sponsor your walk. Explain to them that for every meter you walk they will have to contribute with a determined sum of money, so the longer you walk, the more money you can raise. Invite all the children and young people from your school or youth group to join your activity.
- Count the trees in an area of your local park and have people guess the exact number. Charge for every guess, so the more people guess, the more money you will raise. The person who gets the closest to the exact number can win a tree seedling!
- Organize a Sports Day. Choose a sport you like (volleyball, basketball, football, etc.) and invite the rest of the school or youth group to participate. Invite the parents and friends to watch and cheer. Sell tickets or charge admission at the door. Make sure you explain that all the money will go towards a special cause.
- Organize a Forest Cinema day where you will present a movie related to forests. Sell the tickets to other groups and classes.

And don't forget to ask permission to your school or youth group's authorities to develop this activity!

Discussion

How did your event turn out? How did you feel knowing you were working for a good cause?
How important do you think are fundraising activities to obtain the resources needed to carry out a project?
What are the advantages of working together to achieve an objective?

Green Habits Tree

Level 1 2

Aim

To encourage young people to adopt a **stewardship** attitude.

Materials

Brown, green and white poster boards, scissors, adhesive tape.

Time

1 hour.

How to do it

1. Remind your group how protecting our forests and our **environment** in general is everyone's task. Explain that you are building a ***Green Habits Tree*** to encourage everyone at your school or youth group to 'think green' and adopt practices that protect our natural **environment**.
2. Cut the brown poster board in the form of a trunk. Cut the green poster board to form the leaves. Put the tree in a place where everyone can see it.
3. Have the participants write on the leaves some good habits/practices that help protect forests and keep our natural **environment** healthy, for example:
   - Save energy. Switch off lights you don't need.

- Save paper. Do not accept junk mail at your home.
- Plant and nurture trees in your community.
- By biodegradable cleaning products, these have fewer negative impacts on the soil and water system.
- When shopping, use reusable bags instead of paper ones.
- Recycle, reduce goods consumption, and be wise about garbage disposal.
- When possible, choose sustainably produced foods.
- Avoid the use of toxic pesticides in your garden as these contain hazardous pollutants that affect wildlife.
- Use water wisely and help to reduce water **pollution** that can affect nature.
- Buy energy-efficient appliances and equipment.

Place a poster board next to the tree explaining what the activity is about and inviting everyone to write some other green habits! Make sure you leave some empty leaves.

Discussion

Did your tree 'grow' many green habits?
What did other young people think about your activity?
Can everyone do something every day to help protect forests?

Forest Stewardship Council

Level 2 3

Aim

To learn about the initiative of the Forest Stewardship Council.

Materials

Poster boards, colour markers, internet access, paper, pencils.

Time

Two 1 hour sessions.

How to do it

1. Explain to your group that they are learning about the ***Forest Stewardship Council*** and their objective to create a system that could credibly identify well-managed forests as the sources of responsibly produced wood products.
2. Divide the participants into small groups. Tell them that each one will have to make a small presentation about an interesting topic they find in the Forest Stewardship Council webpage in order to learn about their history and their work:

   https://ic.fsc.org

3. Have each group present their work.
4. Finally, remind the participants that a great way to help forests is to look for the FSC logo on products! Therefore, tell the participants they will be writing letters to their local retailers to let them now that you are interested in certified products! If they already have them, you can encourage them to keep up the good work! By asking for FSC certified products, you show that there is a demand. This is an important and simple way how you can help make a difference.

Discussion

How can being a wise consumer help create a bond between the forest and the user?
In what other ways can consumers influence how forests worldwide are managed?
Can you describe the long-term benefits of managing forests in a responsible way, for human beings and for nature as a whole?

Finding Balance

Level 1 2 3

Aim

To reflect about forests, their vital role in our lives and the need to protect them.

Materials

Poster boards, colour markers, adhesive tape, computer with internet access, school or youth group theatre or meeting room with all the necessary equipment to project a video.

Time

A 30 minutes session to prepare the activity and another 1 hour session to develop it.

How to do it

1. Explain to your group that you are inviting other groups or classes to watch Finding Balance: Our Future, Our Forests, a United Nations Forum on Forests movie, in order to raise awareness about the vital role forests play in our world.

   www.un.org/esa/forests/movies/index.html

2. Have the participants create some cool posters to publicize their activity, tell them not to forget to include all the necessary information:
   - Day of the event
   - Objective
   - Place and time

   And don't forget to ask permission to your school or youth group's authorities to develop this activity!

3. Have a discussion session, encourage the participants to make questions! It is a great idea to invite an expert on the topic to join you that day.

Discussion

What do you think is the main message of the video?
What would you say is the most important role of a forest?
What can you do at a local level to help protect forests?

Useful resources

Birdlife International
www.birdlife.org

Defenders of Wildlife
www.defenders.org

Forestinfo
www.forestinfo.org

Global Forest Coalition
www.globalforestcoalition.net

Great Apes Survival Partnership
www.un-grasp.org

Kids Saving the Rainforest
http://kidssavingtherainforest.org

Rainforest Heroes
http://rainforestheroes.com

The Green Wave
greenwave.cbd.int

The Nature Conservancy Forests
www.nature.org/ourinitiatives/habitats/forests/index.htm

Glossary

Adaptation: adjustment to environmental conditions.

Acid rain: rain or any other form of **precipitation** that is unusually acidic, that is, it contains chemicals that can have harmful effects on plants, aquatic animals, and infrastructure. Acid rain is caused by the high emission of **greenhouse gases** due to human activities.

Afforestation: to plant trees on an area of land in order to make a forest.

Angiosperms: vascular land plants whose seeds develop in fruits. Flowers are the reproductive structure in angiosperms.

Atmosphere: it describes the air or gases that surround the Earth.

Biodiversity: the variety of plant and animal life in the world, and the relationships between them.

Biomass: plant material and animal waste that is used as a fuel or energy source.

Biosphere: it is made up of all the parts of the Earth where life exists. It is the global sum of all **ecosystems**.

Boreal forest: forests growing in the Northern part of the world. These forests are made up mainly of **coniferous** trees. The leaves of these trees are either small and needle-like or scale-like and most stay green all year around (**evergreen**). **Coniferous** trees thrive where summers are short and cool and winters are long and harsh. Boreal forests cover vast areas of North America, and range across northern Europe, Scandinavia, Russia and across Asia.

Canopy: the top layer of a forest, including treetops and the plant **species** that reach above the canopy.

Carbon dioxide (CO_2): a colourless, odorless, tasteless gas made up of carbon and oxygen. It is produced when animals exhale and when fuels burn, and it is used by plants to make food. CO_2 is a greenhouse gas and can speed up **climate change**. CO_2 makes up less than one percent of the air.

Carbon sink: a reservoir for carbon to be stored in a harmless solid form, instead of in the harmful gaseous form that can speed up **climate change**. A tree is an example of a carbon

sink. Forests absorb large amounts of **carbon dioxide** from the Earth's **atmosphere** and, therefore, help to reduce the effect of global warming.

Charcoal: a dark or black absorbent carbon made by heating animal or vegetable material in the absence of air.

Chlorophyll: a green substance in plants that enables the leaves to use solar energy, **carbon dioxide**, water and organic **nutrients** from the soil to make the sugars and starches they use as food.

Climate: the average **weather** conditions for a particular place and time period. This is not the same as **weather**; **weather** may change from day to day, but climate changes over hundreds or thousands of years.

Climate change: a significant change in the overall state of the Earth's **climate** (such as temperature and rainfall) caused both by natural and human causes. This may present harmful effects for all living beings as many animals and plants need one kind of **climate** to survive.

Commensalism: a relation between two **organisms** in which one **organism** obtains food or other benefits from the other without either harming or benefiting the latter.

Coniferous: tree **species** that bear cones as their seed source. Coniferous trees are mainly found in the Northern hemisphere. Coniferous trees are also called **evergreen** trees because they remain green all year round.

Conservation: preserving, protecting or restoring natural **environments** along with the plants and animals they support.

Deciduous: a type of forest associated with a humid **climate** that includes tree **species** such as oak, beech, birch, hickory, walnut, maple, elm and ash. Said of plants whose leaves are shed annually.

Decompose, decomposition: to separate or break down something into its smaller parts or into simpler compounds.

Deforestation: the action or process of clearing an area of forest.

Degradation: the process of damaging and/or removing part of a forest, at least temporarily, in which the character of the forest remains conserved. A damaged forest can grow back into a healthy forest over time.

Developing country: a poor country that is trying to become more economically advanced. Developing countries tend to rely heavily on subsistence farming or fishing (where farmers or

fishers grow, raise or catch enough food only to feed their families, and rarely produce enough to sell on to earn a living).

Drought: a long period of unusually low rainfall, leading to a shortage of water.

Ecosystem: a community of living **organisms** (plants and animals) and non-living things (water, air, soil, rocks, etc.) interacting in a certain area.

Ecosystem goods and services: the benefits that humans and the natural **environment** can obtain from natural, healthy ecosystems. There are four types of ecosystem services: provisioning (providing food and water), regulating (e.g. healthy tree roots in the ground help with **flood** control), cultural (people enjoy spending time in nature; some cultures worship nature or parts of it) and supporting (e.g. the natural **water cycle** helps maintain life on Earth).

Ecotourism: a form of tourism involving visiting fragile, pristine, and relatively undisturbed natural areas; it is intended as a low-impact and often small scale alternative to standard commercial or mass tourism. Its purpose is to support local livelihoods.

Endangered species: plants and animals that are threatened with **extinction**.

Environment: the air, water, soil, minerals, living **organisms**, and all other things that act upon a creature or a community. The circumstances that surround each one of us.

Erosion: the wearing away of the land surface by rain, running water, wind, glaciers or other natural or human agents. Bare ground erodes more easily than one covered with vegetation.

Evergreen: describes a plant, bush or tree that has leaves for the whole year.

Extinct, extinction: a plant or animal that no longer exists anywhere on Earth.

Flood: when an area of land becomes covered by water due to, for example, heavy rain.

Folklore: the traditional stories and culture of a group of people.

Food chain: shows how each living being gets its food. A food chain always starts with plant life and ends with an animal.

Forest management: the study of the administration, direction, and organization of a wooded area.

Forest floor: the bottommost layer of a forest.

Forest fragmentation: when a forest is divided into smaller parts due to agriculture, road construction and/or human development. Forest fragmentation can harm **biodiversity** by altering the **habitat** of plants and animals.

Forest succession: the progress of plant communities in an orderly and predictable manner. If undisturbed, an open field over time will be invaded by shrubs, which in turn will be replaced by saplings, young trees, and eventually a mature forest.

Fossil fuels: a general term used to refer to coal, natural gas and oil (petroleum), which are substances that where formed during millions of years from plant or animal remains.

Freshwater: naturally occurring water that is not salty, like water from rivers, lakes or groundwater.

Geology: the study of the rocks and similar substances that make up the Earth's surface.

Germination: the process by which seeds start growing into plants.

Grassland: large flat areas of land where the vegetation is dominated by grasses and forbs rather than large shrubs or trees.

Greenhouse gases: the gases that occur naturally on the Earth's **atmosphere** that absorb and trap heat to keep our world warm. Some examples are water vapor, **carbon dioxide**, methane, nitrous oxide and others. Some human actions also produce these gases, such as the burning of **fossil fuels**.

Gymnosperms: a group of woody nonflowering vascular plants (such as pines, yews, and gingkos) that produce naked seeds not enclosed in a true fruit.

H_2O: the scientific name for water. It is an abbreviation for the fact that a water molecule is made up of two hydrogen atoms (H – so H_2) and one oxygen atom (O).

Habitat: the natural home or **environment** of an **organism**.

Hardwood: the wood from **angiosperm** trees. The maple, lilac, and oak are examples of hardwood trees.

Humus: the top layer of soil made of **decomposed** animals and plants. Humus is very rich in **nutrients**.

Indigenous the people who were the original or oldest known inhabitants of a particular area. Also known as native peoples, first peoples or aboriginals. These communities often have a strong cultural, and sometime spiritual connection, to the forests in which they live.

Invasive species: **species** which have been introduced to a new area where they previously did not exist, either accidentally or on purpose. Invasive species can become harmful to the **environment** and its **biodiversity** because they tend to out-compete **native species** for resources, reproduce quickly and lack natural predators.

Keystone species: a plant or animal that plays a unique and crucial role in the way an **ecosystem** functions. In an **ecosystem**, all living things rely on each other and work together to be healthy, but some **species** are crucial to the way all the **species** interrelate. Sea otters are an example of a keystone species in a kelp forest. They eat many invertebrates, but especially sea urchins; if there were too many sea urchins, they would eat too much of the kelp and destroy it.

Mangrove forests: are formed by specialized types of trees and shrubs that grow at the intersection of land and sea. Mangrove plants require a number of adaptations to overcome the problems of low oxygen conditions, high salinity and frequent tidal inundation. The unique **ecosystem** found in the intricate mesh of mangrove roots offers a quiet marine region for young **organisms** to thrive. Mangrove swamps are found in tropical and subtropical coastlines. Some of the largest areas of mangroves are found in Indonesia, Brazil and the Sundarbans of India and Bangladesh.

Mediterranean forest: also known as sub-tropical dry forest, it is characterized by hot and dry summers, while winters tend to be cool and moist; most **precipitation** arrives during these months. Only five regions in the world experience these conditions: the Mediterranean, south-central and south-western Australia, southern Africa, central Chile, and coastal and southern California. These forests feature an extraordinary **biodiversity** of uniquely adapted animal and plant **species**, which can adapt to the stressful conditions of long, hot summers with little rain.

Microorganisms: a creature too small to be seen with the human eye alone, but that can be seen through a microscope. In **ecosystems**, they help in recycling **nutrients**.

Montane forest: also known as cloud forests because they receive most of their **precipitation** from the mist or fog that comes up from the lowlands. They are found in high-elevation tropical, subtropical, and temperate zones. The plants and animals in these forests display striking adaptations to cool, wet conditions and intense sunlight.

Mutualism: a relationship between **organisms** of two different **species** in which each is benefited.

Native: a **species** that is naturally found in an area or **ecosystem**.

Natural resources: materials or substances that can be found in nature and that can be used by and are of great benefit to humans. Some examples include water, soil, wood, plants and rocks.

Non-wood products: all forest products except timber; including resins, oils, leaves, bark, plants other than trees, fungi, and animals or animal products.

Nutrient: a chemical which animals and plants need to live and grow.

Organism: a living creature, like a plant, animal or **microorganism**.

Over-exploitation: the excessive use of a **species** or **ecosystem** that can lead to the inability of a natural area to renew itself.

Parasitism: a relationship between two **species** of plants or animals in which one benefits at the expense of the other, sometimes without killing it.

Photosynthesis: the biological process whereby plants use the energy of sunlight to change **carbon dioxide** and water into food (sugars) for themselves.

Pollution: the introduction of harmful or poisonous substances into the natural **environment**.

Poverty: not having enough money or resources for basic needs: clothing, shelter and food.

Precipitation: the process whereby water vapor in the **atmosphere** condenses and falls in the form of rain, sleet, snow or hail.

Rainforest: see **tropical rainforest**.

Regenerate: the renewal of a forest; to make trees to grow again.

Renewable resource: a resource that can be replaced or replenished, either by the Earth's natural processes or by human action. Air, water, and forests are often considered to be examples of renewable resources. However, due to local geographic conditions and costs involved, many argue that water may not be a completely renewable resource in some parts of the world, especially in areas which rely on limited groundwater supplies.

Riparian zone: the interface between land and a river or stream.

Run-off: the flow of water that occurs when the soil is saturated and excess water from rain, snow, etc. runs over the surface of the land and flows downhill into rivers, streams, lakes or the ocean.

Sediment: soil that ends up in streams, rivers and other water bodies. It makes the water muddy looking and blocks out the light that water plants need to grow.

Scarce: not easy to find or get.

Silviculture: the process if managing, developing and caring for a forest.

Softwood: the wood from **gymnosperm** trees. Softwood trees are found in northern areas of the Earth and their wood tends to be light, both in colour and weight. The pine, spruce and fir are examples of softwood trees.

Species: a group of similar **organisms** which are able to breed together and produce healthy offspring that are able to produce young themselves.

Steward, stewardship: one who takes the responsibility of making decisions that will allow resources to be maintained for future generations.

Stoma, stomata: microscopic pores in the plant's leaves (located in the underside of the leave) through which gases are exchanged. Plants breathe through their stoma.

Sustainable, sustainability: The state in which we humans use the natural environment to meet our needs without damaging it so that it can no longer be productive (i.e. can no longer support plant, animal or human life). Making sure that our actions are sustainable means that future generations will be able to live well, too.

Symbiosis: the process where two different kinds of **organisms** live together and benefit each other.

Temperate deciduous forest: found in such places as eastern North America, Western Europe, Eastern Asia and parts of Patagonia, **temperate deciduous forests** are associated with a humid **climate** and include tree **species** such as oak, beech, birch, hickory, walnut, maple, elm and ash. Many of these **hardwood species** are highly valued for their wood qualities, and most remaining forests are intensively managed. The forests have well-defined seasons with a distinct winter and sufficient rainfall. These animals have special adaptations suited for seasonal life.

Traditional knowledge: local knowledge that is passed from generation to generation, usually orally.

Transpiration: a process where moisture is released from tiny holes called '**stomata**' (meaning 'little mouths' in Greek!) on the underside of plant leaves.

Tree nursery: a place where trees are propagated and grown to usable size. A place where trees can be bought to be replanted.

Tropical dry forest: it occurs in tropical regions with very distinct dry seasons, most rain falls during a (usually) brief wet season. Plants and animals possess specific adaptations to survive the dry season. Most of these forests are in eastern and southern Africa, where woodlands stretch over large areas. The vegetation is relatively open and is typically made up of a type of tree known as a **deciduous** tree. Because of frequent fires and tree cutting, many of these woodlands have turned into areas called savannahs, where grass and shrubs dominate.

Tropical rainforest: dense, lush forest with tall trees, warm climates, and lots of rain. In some **rainforests** it rains more than one inch nearly every day of the year. These forests are found near the equator, in Africa, Asia, Australia, and Central and South America.

Understory: the layer of vegetation beneath the main **canopy** of a forest.

Urbanization: the process by which people move from the countryside to go and live in towns and cities, often in search of better jobs and living conditions. This process makes cities become larger and larger.

Water cycle: the continuous movement of our planet's water on, above and below the surface of the Earth. This process restores and recycles water, allowing all living beings to access clean water.

Weather: it describes what the day looks like outdoors in a specific place at a specific time. Weather can change a lot in a very short time; it refers to what happens from minute to minute. For example, it may rain during the morning, but you may have a sunny afternoon.

Wetland: low-lying areas (including bogs, deltas, marshes, swamps, ponds, or lakes) that are saturated with moisture and provide food-rich habitats for a wide variety of plants and animals.

Wood forest product: all material produced from the stems and branches of trees and other woody plants.

Resources and additional information

Join us!

Additional resources and information will be developed in collaboration with our partners for you to use when helping children and young people to learn about the different issues that affect our world. If you would like to be automatically informed about the new materials that become available please write to us at: yunga@fao.org and we will register you to the free YUNGA newsletter.

We encourage everyone, especially young people, to stay connected with YUNGA by following us on:

Facebook		Twitter
www.facebook.com/yunga.un	and	@UN_YUNGA

Share with us!

It would be great to receive your comments and information about your own experiences, activities and stories, and we always want to improve our resources so contact us at yunga@fao.org

Take the challenge!

Children and young people need to understand the environmental and social realities of our time and of their future. We need to support them to become empowered and responsible citizens of the world, able to adapt and to respond to future challenges.

The **Forests Challenge Badge** is a tool to allow teachers and youth leaders to guide young people in learning about the value of forests and their crucial role for life on Earth. The booklet includes basic background information on the types of forests, the many goods and services we receive from forests, the threats to forests, as well as ideas to promote forest protection and restoration.

The badge includes age-appropriate activities which help young people to gain knowledge, skills and values to preserve and improve our forest resources. The badge will also help them realize they can make a difference and that they are capable of finding innovative and lasting solutions to our world's challenges. Encourage your group to take the challenge!

www.yunga-un.org

Organizing events and activities

Interested in making a difference through your own initiatives but not sure where to begin? Here are some ideas to get you started!

Find out!

You can find out more about forests in your country by getting in touch with the people that work on this issue. Encourage them to share their knowledge and information on their projects with you. Find out what they are doing and try to join their activities. For example:

* Representatives of UN agencies: FAO, UNEP, CBD, UNFF, UNESCO, UNCCD
* Ministry of Forests
* Ministry of Natural Resources
* Ministry of the Environment
* Ministry of Agriculture
* Ministry of Education
* Non-governmental organizations and international non-governmental organizations
* Universities and other schools
* Community groups
* Religious groups

Think!

You can organize many lively activities: competitions, fairs, sports, conferences, debates, round-tables, workshops, concerts, drama, painting, photography, posters, collages, songs, poems, essays, slogans, letters, and many, many more!

Raise your voice!

Invite families and the community to contribute to and participate in your activities. Encourage the media to help you publicize your event and promote public awareness. Contact local news reporters to write stories about your activities, and local and community radio stations to broadcast information and messages.

Sponsor and partners

This resource and activity guide has been developed with the kind financial support of the

Swedish International Development Agency (Sida).

www.sida.se

The Forests Resource and Activity Guide was developed in collaboration with:

Food and Agriculture Organization of the United Nations (FAO)

FAO leads international efforts to enhance global agricultural performance while promoting the sustainability of water use for food production. Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information, helping countries to modernize and improve agricultural policies in relation to land and water management.

www.fao.org/climatechange/youth

Convention on Biological Diversity (CBD)

Convention on Biological Diversity

The Convention on Biological Diversity is an international agreement that commits governments to maintaining the world's ecological sustainability through conservation of biodiversity, sustainable use of its components, and the fair and equitable sharing of the benefits arising from the use of genetic resources.

www.cbd.int

The Green Wave

THE GREEN WAVE

The Green Wave is a global campaign to educate children and youth about biodiversity. The main activity centres around local tree-planting celebrations held each year at 10am local time on the International Day for Biological Diversity on 22 May. Collectively, all of these Green Wave celebrations create a 'green wave' that starts in the far east and travels west around the planet.

greenwave.cbd.int

United Nations Educational, Scientific and Cultural Organization (UNESCO)

United Nations
Educational, Scientific and
Cultural Organization

UNESCO was founded on November 16, 1945 in order to respond to the firm belief of nations, forged by two world wars in less than a generation, that political and economic agreements are not enough to build a lasting peace. Peace must be established on the basis of humanity's moral and intellectual solidarity. The Organization strives to build networks among nations that enable this kind of solidarity, by mobilizing for education, building intercultural understanding, pursuing

scientific cooperation, and protecting freedom of expression. This specialized United Nations agency has set itself an ambitious goal: to build peace in the minds of men and women through education, science, culture and communication.

www.unesco.org

The World Association of Girl Guides and Girl Scouts (WAGGGS)

WAGGGS is a worldwide movement providing non-formal education where girls and young women develop leadership and life skills through self-development, challenge and adventure. Girl Guides and Girl Scouts learn by doing. The Association brings together Girl Guiding and Girl Scouting Associations from 145 countries reaching 10 million members around the globe.

www.wagggsworld.org

The World Organization of the Scout Movement (WOSM)

The World Organization of the Scout Movement (WOSM) is an independent, worldwide, non-profit and non-partisan organization which serves the Scout Movement. Its purpose is to promote unity and the understanding of Scouting's purpose and principles; while facilitating its expansion and development.

www.scout.org

WWF

WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global Network active in more than 100 countries. WWFs mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

wwf.panda.org

Youth and United Nations Global Alliance (YUNGA)

YUNGA was created to allow children and young people to be involved in important issues and make a difference. Numerous partners, including UN agencies and civil society organizations, collaborate in developing initiatives, resources and opportunities for children and young people. YUNGA also acts as a gateway to allow children and youth to be involved in UN related activities such as the Millennium Development Goals (MDGs), food security, climate change and biodiversity.

www.yunga-un.org