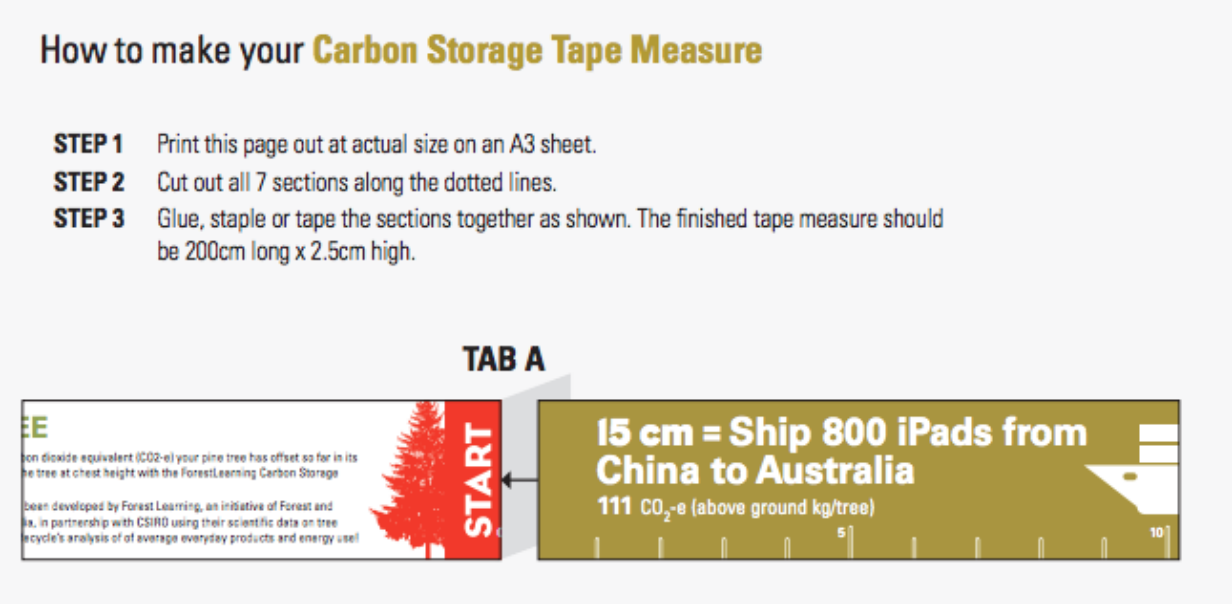
Teacher

ForestLearning Tree Carbon Storage Tape Measure Activities for the classroom



Instructions for making your carbon storage tape measure → http://forestlearning.edu.au/find-a-resource/article/82/forestlearning-tree-carbon-storage-tape-measure.html

Resource Overview

This resource suggests classroom and practical activities that utilise the ForestLearning Tree Carbon Tape Measure that has been developed by ForestLearning in partnership with CSIRO, using their scientific data on tree carbon storage, and Lifecycle's analysis of average everyday products and energy use.

Activity One provides a lesson plan incorporating the Tape Measure's use within the classroom/field and a sample table for data collection during the lesson. The other suggested activities contain brief ideas for using the Tape Measure within lessons related to tree growth and carbon storage and can be adapted for use across several year levels.

ForestLearning Carbon Tape Measure Activities

Activity One

Activity Title: Tree Sampling

Year: 2 - Senior Syllabus

Outcomes: ACHASSK090, ACSSU116, ACSSU176, ACSSU189, ACHGK070, ACHGK075, ACSES076, ACMMG197.

Activity Overview:

Teachers can use the ForestLearning Carbon Tape Measure to sample trees within a chosen area to determine the amount of carbon dioxide equivalent (CO_2^{-e}) trees of varying circumferences have offset. The activity is suitable for a range of year groups and ability levels.

Explore how much carbon dioxide equivalent (CO2-e) your eucalypt and pine trees have offset so far in their lifetime by measuring the circumference of a tree at chest height with the ForestLearning Carbon Storage Tape Measure.

This tape measure has been developed by ForestLearning in partnership with CSIRO using their scientific research data on tree carbon storage*, and Lifecycles carbon analysis of average everyday products and energy use**.

*For further information on CSIRO's above ground carbon sequestration of trees research, head to: https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.13201
** For further information on Lifecycles Life Cycle Assessment tools analysing the impacts of products and services on carbon emission and sequestration head to: https://www.lifecycles.com.au/

N.B: Teachers may wish to present theory on photosynthesis and the role of carbon in this process, to allow students to make a connection between trees and their ability to sequester/store carbon. Additionally, as the tape's data was assessed for *Pinus radiata* (pine tree) species and hardwood eucalypts, teachers may choose to briefly introduce the characteristics of these species and their economic importance to Australia. Suggested URL links to this data can be found below.

Useful Video Link as background to the tape measure activities
- Going Bush 3 - Episode 2 - Carbon storage in buildings (and lifecycle analysis of carbon) – watch until 4:42mins - https://www.youtube.com/watch?v=f5ANUD0cN0o

URL Links to Learning Resources:

Carbon Storage and Sequestration.
URL: http://forestlearning.edu.au/find-a-resource/article/2/carbon-and-its-storage-in-forest-and-wood-products.html
Source: Carbon and its storage in forest and wood products

URL: http://forestlearning.edu.au/find-a-resource/article/11/how-is-carbon-stored-in-wood-products.html
Source: How is carbon stored in wood products

URL: http://forestlearning.edu.au/find-a-resource/article/63/forestry-and-carbon-sequestration.html
Source: Forestry and carbon sequestration

URL: http://forestlearning.edu.au/find-a-resource/article/27/wood-as-a-renewable-and-energy-efficient-resource.html
Source: Wood as a renewable and energy efficient resource

Pinus radiata
URL: http://forestlearning.edu.au/find-a-resource/article/65/consumer-requirements-for-commercial-plant-products.html
Source: Consumer requirements for commercial plant products

URL: http://forestlearning.edu.au/find-a-resource/article/62/calendar-of-operations-for-an-enterprise-production-cycle.html
Source: Calendar of operations for an enterprise production cycle

Hardwood and softwood trees
URL: https://forestlearning.edu.au/find-a-resource/article/28/going-bush-various-demand-for-plantation-and-native-forests.html
Source: Going Bush – Various demands for plantation and native forestry

URL: https://forestlearning.edu.au/find-a-resource/article/14/plantation-vs-natural-and-softwoods-vs-hardwoods.html
Source: Plantation vs natural and softwoods vs hardwoods

URL: https://forestlearning.edu.au/find-a-resource/article/49/various-demands-for-plantation-and-native-forests.html
Source: Various demands for plantation and native forests

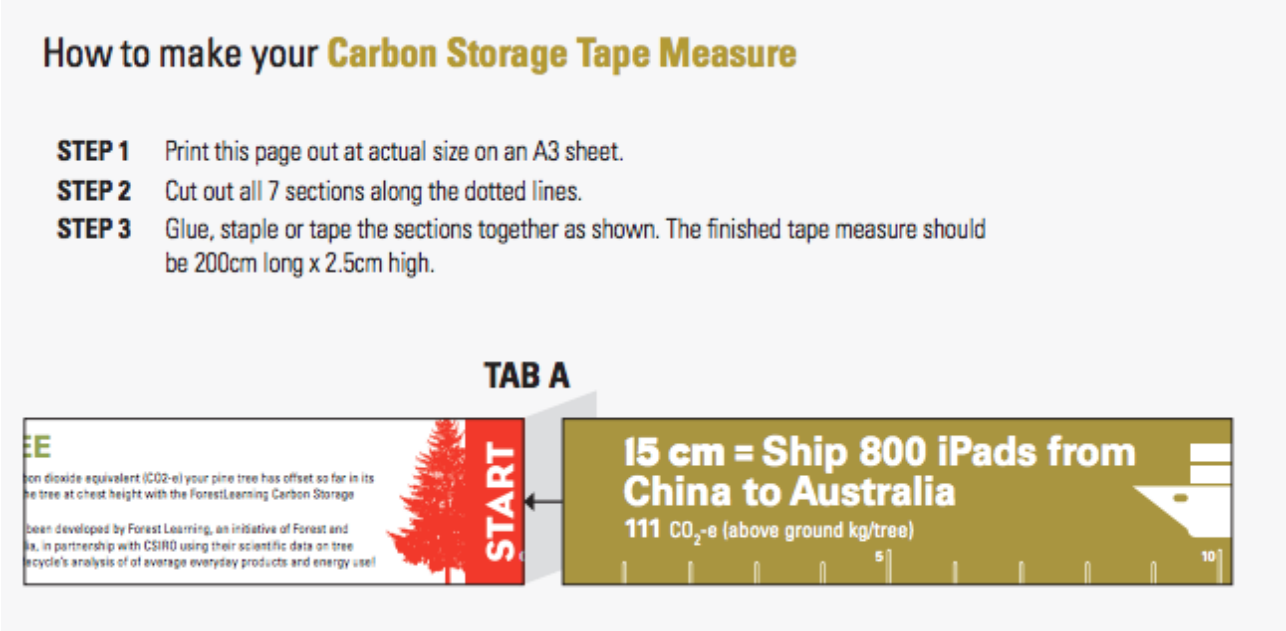
Individual Carbon Calculator
URL: ABC Education Carbon Cops - https://www.abc.net.au/tv/carboncops/calculator.htm

Activity One Method

a) Teachers should print a copy of the ForestLearning Carbon Tape Measure using either the A4 or A3 template for individual students or small groups as per the instructions on the following link, and assemble the tape using the instructions provided.

URL: http://forestlearning.edu.au/find-a-resource/article/82/forestlearning-tree-carbon-storage-tape-measure.html

Source: ForestLearning, ForestLearning Tree Carbon Storage Tape Measure



b) Individually, or in small groups, select and using the ForestLearning tape measure record the circumferences of approximately 10 trees (that range in their chest height circumferences) around the school/home/excursion area. For this activity, you will imagine that the trees you are sampling are either *Pinus radiata* (pine tree) or eucalypt trees.

Further notes: CSIRO research has demonstrated that the amount of carbon each of these groups of trees sequesters from the atmosphere varies, so it is important to group like trees together and use the correct side of the measuring tape for each group of trees.

c) Data can be recorded in a table (such as the one below) and students will be able to complete the "Lifecycle's analysis of average everyday products and energy use" using the tape measure.

Results: Tree Carbon Storage

Tree Number	Circumference at chest height (cms)	Carbon dioxide equivalent ($CO_2{}^{-e}$)	Average everyday product and energy use that is offset from this tree's carbon sequestration.
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total carbon offset			

d) Teachers could provide a follow up lesson/activity discussing ideas about the importance of trees in ecosystems and their role in addressing issues with climate change. See for example ideas - https://forestlearning.edu.au/find-a-resource/article/8/forests-timber-and-climate-change-worksheet.html

Activity Two

Activity Title: I See a Tree

Year: 1- 10

Outcomes: ACSSU017, ACSSU032, ACHASSI020, ACHASSI036, ACSSU044, ACSSU072, ACHASSK088, ACHASSK090, ACSSU043, ACSSU094, ACTDEK019, ACTDEK012, ACSSU116, ACSSU176, ACSSU189, ACHGK070, ACHGK075, ACMMG197, ACMMG223, ACMMG224, ACMMG245

Activity Overview:

Students of all ages can record qualitative and quantitative observations and measurements of tree/s in their environment using different sampling techniques.

Suggested Lesson Ideas:

- Teachers could begin the activity by conducting a brainstorming session with their class and make of list of tree characteristics. For example:
    - *What characteristics can be observed on the **outside** of a tree?*
    - *What structures are on the **inside** of a tree?*
    - *What features can be **measured/counted** on a tree?*
    - *Why do we need to make observations about tree growth?*
    - *Why are trees important to the **environment, animals and people**?*

- Teachers can select activities from the list below to explore features of trees within their school or home environment. A method of recording data will need to be chosen that is appropriate to the class and outcomes of their unit of work (journal, scientific report etc.).

Possible Tree Observations and Activities

- Observe the shapes, patterns and presence of the leaves, bark, canopy, flowers, fruit, cones etc. of selected tree/s and collect samples if feasible.

- Brainstorm and discuss the roles of each of the features that have been observed and collected.

- During the collection and observation phase, ask students questions such as;
    - What are the patterns within the leaves?
    - Are the patterns different in the young and old leaves?
    - What is the role of these structures?
    - How are the leaves arranged on the tree? Is the bark rough or smooth?
    - How are the flowers arranged?

    - Would any of these characteristics change throughout the different seasons/lifespan of the tree? How and why?
    - How are some tree species similar and different?

- Students could record their observations by creating a series of diagrams and sketches (e.g. of the bark and leaves). Diagrams should be annotated with observable features.

- If students have access to cameras, iPad's or other recording devices, they may also be able to improve their observations of tree patterns using photography. Additionally, samples could be returned to class for observation and discussion (e.g. through the use microscopes), or a PowerPoint presentation created for submission.

- After the initial observation phase, students should be encouraged to observe a tree more scientifically, and where possible, collect quantitative data. For example, students could generate a record of characteristics that can be counted on a tree. For example -
    - *Is it possible to count the number of leaves, branches, seeds, fruit, cones?*
    - *Are there any animals present? What types?*

Possible Tree Calculations and Activities

- Prior to investigating the features of **circumference** and **carbon storage**, **height** and **age**, students could conduct their own research activity, to find out the different methodologies of how each of these factors can be calculated and report back to their class.

- Discuss how the **circumference** of a tree could be measured (string and ruler, tape measure etc.). and identify why this measurement is important.

- Using the methodology from the link below, students can use the ForestLearning Carbon Storage Tape Measure to measure the circumference of a tree and associate its **carbon storage** to everyday examples.

URL: http://forestlearning.edu.au/find-a-resource/article/82/forestlearning-tree-carbon-storage-tape-measure.html
Source: ForestLearning, ForestLearning Tree Carbon Storage Tape Measure

- Discuss how the **height** of a tree could be measured e.g. estimates (for younger students "How tall is person X? How many X's could you stack on top of each other to reach the top of the tree?"), clinometers and trigonometry calculation. Classes could choose to perform an investigation to measure the height of a selected tree.
    - For further reference and a lesson plan on measuring heights of trees, head to "Measurement and Trees" ForestLearning resource. Download here – https://forestlearning.edu.au/find-a-resource/article/43/measurement-and-trees.html

- Watch for additional measurement ideas and activities: https://www.youtube.com/watch?v=F6fltSqImFM

- Discuss how the **age** of a tree could be measured and why some methods of measurement are more optimal that others (circumferences and formulas versus core samples versus harvesting the entire tree to gain cross sections?)

Activity Three

Lesson Title: Building a Model Pine Plantation – how much area of pine plantation do I need to offset my carbon?

Year: 3- Senior Syllabus

Outcomes: ACHASSK090, ACSSU116, ACSSU176, ACSSU189, ACHGK070, ACHGK075, ACSES076, ACMMG197

Activity Overview:

Using the ForestLearning Carbon Tape Measure and other materials, students can design, conduct, and display a model *Pinus radiata* plantation that would offset their carbon emissions for a year. This activity is designed to highlight the importance of trees in carbon sequestration and storage and relate this data to relevant and everyday examples that students can identify with.

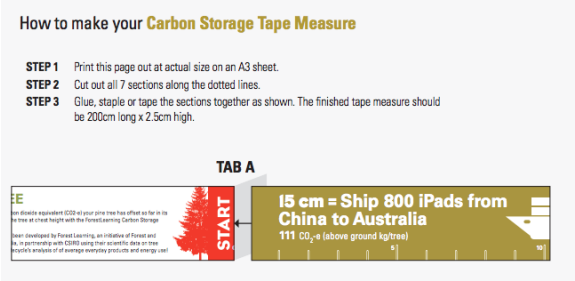
Suggested Lesson Activity:

Teachers should print a copy of the ForestLearning Carbon Tape Measure for individual students or small groups as per the instructions on the link below.

**Teachers may choose to conduct Activity One "Tree Sampling" prior to this task.*

URL: http://forestlearning.edu.au/find-a-resource/article/82/forestlearning-tree-carbon-storage-tape-measure.html

Source: ForestLearning, ForestLearning Tree Carbon Storage Tape Measure



- In small groups, students can brainstorm what materials they could potentially use to create model trees of different circumferences. Classes may choose to represent the whole tree for the display, or just the stem circumference at chest height.

- Groups should then present their modelling ideas to the class, and in collaboration, select materials, a design and allocate specific tree circumferences to different groups.

- Groups should build models of pine tree plantations with circumferences listed in the table below and estimate the area that would be required to plant these trees, assuming a minimum distance of 4m between trees.

Circumference at chest height (cms)	Carbon dioxide equivalent ($CO_2{}^{-e}$)	Lifecycle's analysis of average everyday products and energy use.
15	111	Ship 800 iPads from China to Australia
30	612	2 families commute to and from school each day for 1 year in an electric car
45	1660	Manufacture 2 Apple iPads
60	2521	Wash household clothes for 1 year
75	4408	Heat and cool a single Sydney home for 1 year
90	6958	Run a refrigerator for 5 years
105	10236	Manufacture a small passenger car
120	14300	Drive a petrol car 2.5 times around Australia on National Highway 1
135	19205	Produce nylon carpet to cover 9.5 sized house floor areas
150	25003	Electricity used to watch an average amount of TV by 250 students for 1 year
165	31743	Fly 60 students from Perth to Port Headland, WA one way
180	39470	Manufacture 500 smart phones

- When the models are completed an area should be selected to display the works.

- Other classes from the school could be invited to use the ForestLearning Carbon Tape Measure to sample to the model forest and learn about the importance of trees within the environment.

Activity Four

Activity Title: Tree Trends

Year: 9- Senior Syllabus

Outcomes: ACSSU176, ACSSU189, ACHGK070, ACHGK075, ACHGE076, ACSES076, ACMNA193, ACMMG197

Activity Overview:

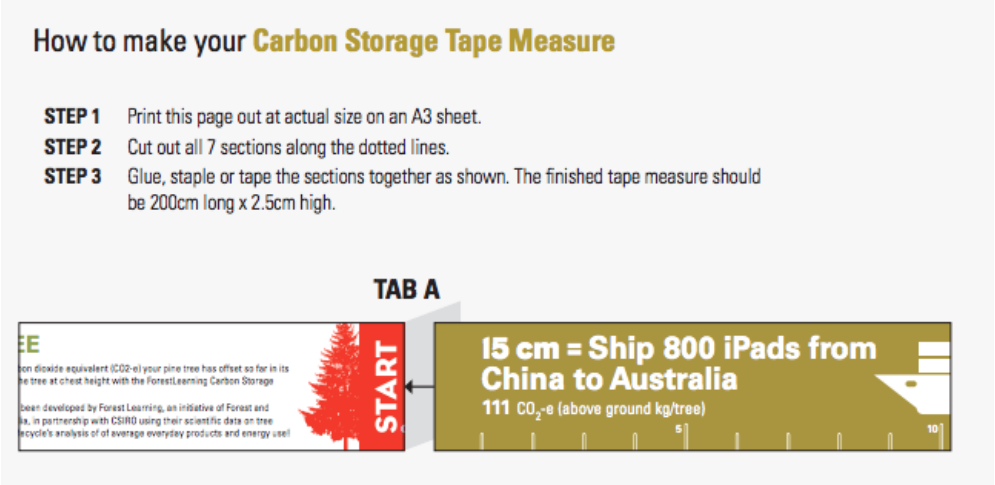
Students will graphically represent the change in circumference of a *Pinus radiata* tree with the corresponding levels of carbon dioxide equivalent that have been offset over a period of time.

Suggested Lesson Activity:

Teachers should print a copy of the ForestLearning Carbon Tape Measure for individual students or small groups as per the instructions on the link below.

**Teachers may choose to conduct Activity One "Tree Sampling" prior to this task.*

URL: http://forestlearning.edu.au/find-a-resource/article/82/forestlearning-tree-carbon-storage-tape-measure.html
Source: ForestLearning, ForestLearning Tree Carbon Storage Tape Measure



As a class, discuss what information is contained on the ForestLearning Carbon Tape Measure and examine questions, such as -

- Why is it important to measure this information?
- What is the use of the Tape Measure?
- Why do you think the Tape Measure was designed / created?

- Who would want to know this information?
- What trends do you see in the data on the tape measure?
- Are you surprised by the values? Why? Why not?

- Using your desired graphing method (paper, Excel etc.), allow students to graph the information below and discuss the trend in the data that can be observed.

Circumference at chest height (cms)	Carbon dioxide equivalent ($CO_2{}^{-e}$)	Lifecycle's analysis of average everyday products and energy use.
15	111	Ship 800 iPads from China to Australia
30	612	2 families commute to and from school each day for 1 year in an electric car
45	1660	Manufacture 2 Apple iPads
60	2521	Wash household clothes for 1 year
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Sample Answer: