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Pre-visit Activities

Pre-visit activities are designed to help students enjoy the *Replant* exhibition and assist them interpret and understand what they will see.

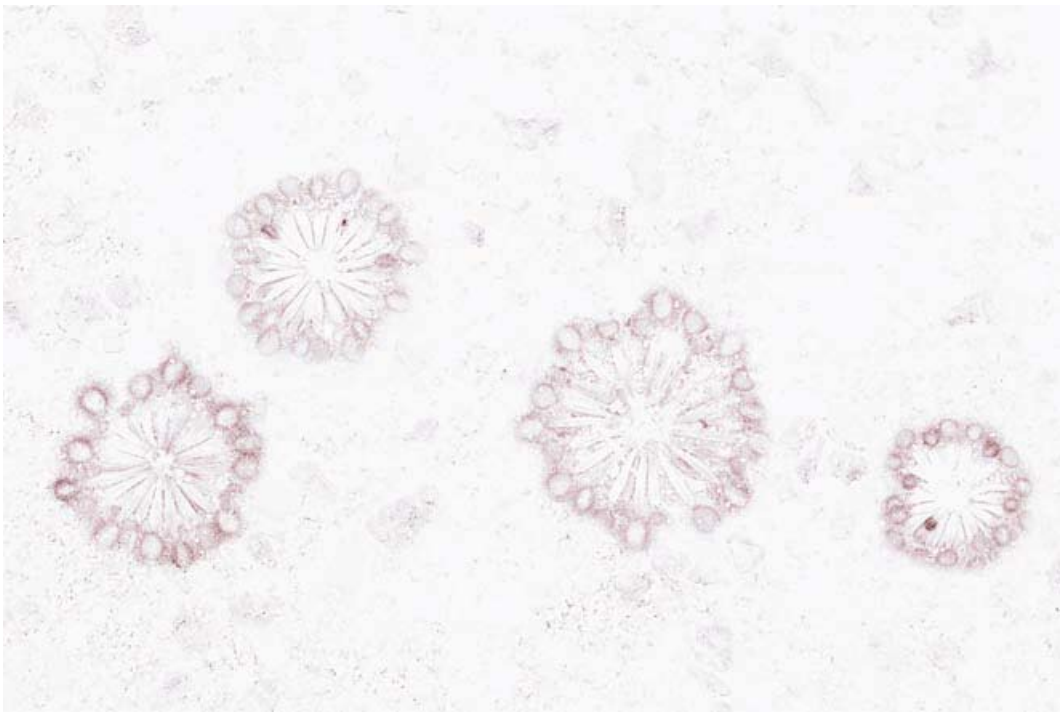
The Replant Catalogue and Project Notes can provide information to help students learn about the exhibition. Additional print and electronic resources can be used to research different aspects of the exhibition, (see resources section in Project Notes).

At the Exhibition

Activity sheets are designed to engage students at the exhibition. The sheet can either be used as the basis of a written report or a group discussion.

Post visit Activities

These are suggested activities for the classroom that can be adapted for students of various ages and abilities and can be undertaken individually or as an ongoing unit of work.



Web search

Divide into small groups and research following subjects in a computer lab. Use the following website as a stating point for your research. Expand on your information by finding other relevant sites and making notes. Report back to the class with your findings.

1. What is printmaking?

Find out about different kinds of printmaking. How are they done? Find out about the etching (or intaglio) process. Describe the different types of intaglio printing.

- Australian Print Workshop
http://www.australianprintworkshop.com/default.asp
- Crown Point Press – About printmaking
http://www.crownpoint.com/printmaking
- MoMa the Museum of Modern Art, New York
http://www.moma.org/exhibitions/2001/whatisaprint/print.html

2. Find out about the Replant artists.

Use a map to locate the regions and communities. Use the internet to find examples of art from each of these places or each of the artists. The following is a good portal website to Aboriginal art centres.
(http://www.aboriginal art.org)

In addition Google the names of the *Replant* artists: Irene Mungatopi from Melville Island, Deborah Wurrkidj from Maningrida in north central Arnhem Land, Marita Sambono from Daly River, Winsome Jobling from Darwin, Fiona Hall from Adelaide and Judy Watson from Brisbane.

3. Find out about the 'Top End' of Australia.

What is the climate like? What is the landscape like? Who lives there? As a starting point visit the following websites

- Travel NT
http://en.travelnt.com/assets_static/seasons-of-kakadu/kakaduSeasons.swf
- Bureau of Meteorology
http://www.bom.gov.au/iwk/climate_culture/Indig_seasons.shtml
- Wetland Habitats Of The Top End - Michael Michie
http://members.ozemail.com.au/~mmichie/habitat1.htm

4. Choose a region of Australia and find out about plants and foods which are native to the region.

Make a list of plants and their uses. The following websites can be used as a starting point.

- Centre for Plant Biodiversity Research
http://www.anbg.gov.au/cpbr/herbarium/collecting/index.html
- Australian National Botanic Gardens
www.anbg.gov.au

5. Find out about the Replant Project and the people involved.

What is the project about? Visit the following websites as a starting point.

- Nomad Art Productions
http://www.nomadart.com.au
- Basil Hall Editions
http://www.basilhalleditions.com.au/

6. Find out how a botanist goes about collecting plants.

Find out what a herbarium is. What do people do there? Use the following website as a starting point.

- Northern Territory Herbarium
http://www.nt.gov.au/nreta/wildlife/plants/index.html

7. Find out about Indigenous protocols.

What kind of things should people be aware of when working with Indigenous Australian people. Use the following as a starting point for your investigation.

- ABC National Broadcaster
http://www.abc.net.au/message/proper/ethics.htm
- NSW Board of Studies
http://ab-ed.boardofstudies.nsw.edu.au/
- Australia Council for the Arts http://www.australiacouncil.gov.au/publications/indigenous/visual_arts_protocols_for_producing_indigenous_australian_visual_arts

Welcome to Replant

Activity Sheet 1

Imagine you are a reporter.

You have been asked to write a review about the *Replant* exhibition for your local newspaper. Look around the exhibition; spend time reading, looking and making notes.

Use the following as a guide for your report:

What is the title of the exhibition and where did you see it?

What is the exhibition about?

Who are the artists?

Where do the artists come from?

Describe the printmaking technique that has been used?

List the different kinds of plants shown in the exhibition

Would you recommend a visit to your readers?

Pick two art works you like best

Describe them in detail.

Can you work out how they have been made?

What special knowledge does the artist have?

Why do you like the work?

Make a drawing of one of the art works to illustrate your report.
What did you like most about the exhibition?

Discuss with the group

Sit down as a group and discuss your findings with your teacher or the gallery curator.

Welcome to Replant

Activity Sheet 2

Choose an artwork in the exhibition that relates to one of the following descriptions. Look at the art work, read the description and read the artist's statement on the wall panel. Discuss with the class.

Deborah Wurrkidj
Pandanus Weaving

The Spring Pandanus or Screw Palm) *Pandanus spiralis*, is one of the most common and useful plants in north Australia. The Kunwinjku name for Pandanus is kundayarr.

Pandanus is an important food resource and provides different types of food from the seed, fruit, cabbage and peduncle. It is also used for a range of medicinal purposes including treating headaches, toothache, infected wounds, diarrhoea, mouth and throat sores, ulcers, back pain and many other afflictions. It is also used as fish poison, to make rafts, toys, didgeridoos, ropes, as a dye, to light fires, to carry fires, and as a totem for some clans.

Deborah has shown the Pandanus as a plant used for fibrecrafts. Deborah's grandfather father was a famous weaver of fish traps, his works are displayed in many museums and galleries in Australia and overseas. Glenn Wightman

Irene Mungatopi
Pink Beach Apple

The Red Bush Apple, *Syzygium suborbiculare*, is a common bush tucker in north Australia, however, a rare form occurs in coastal areas on the Tiwi Islands. It has pink fruit that are particularly tasty, it is called pinyama, the Pink Beach Apple. The fruit are produced during Jamutakari, the wet season, and sometimes they are produced in profusion. They are one of the most important Tiwi bush foods.

Irene has drawn the shape of the pinyama fruit like a Tiwi fighting club which is made by senior Tiwi men. In the past these clubs were deadly weapons used in hand-to-hand combat by Tiwi warriors, but now they are mainly prepared for sale to tourists visiting the Tiwi Islands. Glenn Wightman

Marita Sambono
Water-lilies

Two of the most important aquatic plants for Aboriginal people in north Australia are the Red Lotus Lily, *Nelumbo nucifera*, and the floating leaves and flowers of the Water-lily, Nymphaea macrosperma.

The Red Lotus Lily is called miwulngini, it has a number of uses. The large green 'seeds' (actually fruit) are eaten raw or lightly roasted; they are very good to eat and occur in large numbers in the mid dry season. The roots are also eaten after roasting and they are used as medicine to treat constipation. The new leaf shoots are eaten raw. The large concave leaves can be used as a hat, as camouflage when hunting in the billabong or to carry water and to wrap food when cooking.

This species is considered sacred in India, Tibet and China being the padma devoted to Brahma (sacred red colour), cultivated throughout south east Asia for food; 'seeds' remain viable for several hundred years in river mud.

The Water-lily is called minimindi, it also has a number of uses. The fruit contain many small oily seeds that can be eaten raw or lightly roasted, they are very tasty. The flower stems called mintyangari, are also excellent bush tucker and taste like celery. The tubers are used as food and are also used to treat constipation. The flowers can also be eaten.

Collecting Water-lily fruits is one of the favorite activities of senior women at the Daly River. The fruit are found on the bottom of billabongs, as the fruit swell with seeds they get heavy and fall to the bottom. The fruit are located with the feet while slowly walking through the water.
Glenn Wightman

Judy Watson
bat-wing coral tree

The twin leaves shown in Judy's work are from the Bat-wing Coral Tree, *Erythrina vespertilio*. The leaf was from the tree growing near the entrance to the Merrepen Art Centre at Nauiyu. This tree produces red flowers and bright, hard, kidney-shaped, red seeds. The seeds are used in drier parts of Australia to make long, heavy necklaces; these have special significance for Aboriginal women. In the past the black fine ash from the burnt corky bark was rubbed onto the skin of pale-skinned babies to darken it, so that welfare officers would not take them away. This plant also has a number of other uses, including the wood for woomera shafts and the large taproot as food.

The small dark round dots on the print are formed using the seed of the Red Bean Tree, *Adenanthera pavonina*. The hard, red seeds from this species are also used to make necklaces by some coastal Aboriginal groups in north Australia. The seed can be eaten, though the hard red shell is considered toxic and is difficult to break.
Glenn Wightman

Fiona Hall
Green Ant Nest

The leaves of Ghost Gum, *Corymbia bella* have been formed into a Green Ant nest.

The Ghost Gum is an important plant, it is called yerrik by MalakMalak speakers. It is used for firewood as it burns slowly and evenly, the bark is burnt and applied to swellings on knees and legs to reduce the swelling, sugarbag (native beehives) are often found in hollows and water can be found in swellings on the trunk. Many other Aboriginal groups use the burnt bark as an additive for chewing tobacco, where it improves the flavour and potentiates the tobacco.

Green Ants, *Oecophylla smaragdina*, are used as medicine by MalakMalak people and are called pirrinykam. The nest is crushed in the hands and the

Green Ant Nest (continued)

juice is rubbed over the skin; this also stops the skin from feeling itchy. The large mother or queen ants are eaten to treat colds and influenza; they have a sharp taste. Many other Aboriginal groups also use these ants as medicine and food. The green abdomen of workers can be eaten; it has a pleasant tangy taste caused by the formic acid they contain, which has medicinal properties as a mild expectorant and antimicrobial.
Glenn Wightman

Winsome Jobling
Spear Grass

Spear Grass or *Sarga intrans*, is one of the most common and important grasses in the western Top End of the Northern Territory.

During the mid to late wet season Spear Grass is the main feature of the landscape, when it can grow up to 2 metres high. Later in the wet season, the stems began to dry out.

Spear Grass is important for Aboriginal people as the stems provide a grass that can be burnt early in the dry season. Burning grass is an important tool for traditional custodians and is likened to 'cleaning up' or providing medicine or fertiliser for country after the heavy rains.

Spear Grass seeds and stems also provide a large amount of organic matter every season and it is one of the most efficient and important energy converters in the savanna habitat. The seeds and stems provide food and shelter for many animals, mainly invertebrates, in savanna habitats.
Glenn Wightman

Creating an Herbarium

The activity involves gathering, identifying, researching and pressing local plants and creating scientific-style herbarium pages, bound into booklets or designing a field guide to your local area. Visit your local herbarium. Find out about the role of herbaria around Australia.

Collecting Plants

First decide on rules for collecting plants, these may include the following:

- Never collect an endangered plant
- Respect other people's property when you are collecting
- Do not pick a plant until 6 are seen, and never pull one up for the roots until 10 are found

Go on a bush walk or walk in the garden. Look at the plants that are growing in the area, compare flowers, leaves and other plant parts from different species. Note plants that are similar and plants that are different to each other. Use field guides to identify plants and species.

Make collection plan. A herbarium collection usually features plants that grow naturally in a region. Decide on your purpose for collecting and pressing plants, then discuss what types of plant parts to gather and where to do go. You can form a thematic study by focusing on specific plant categories such as bush foods and medicines, native trees or plants pollinated by bees for example.

If you want to create a field guide of the local environment or collect flowers for an art project, you need not be limited to native plants. Flattened flowers and interesting leaves can be used for art projects.

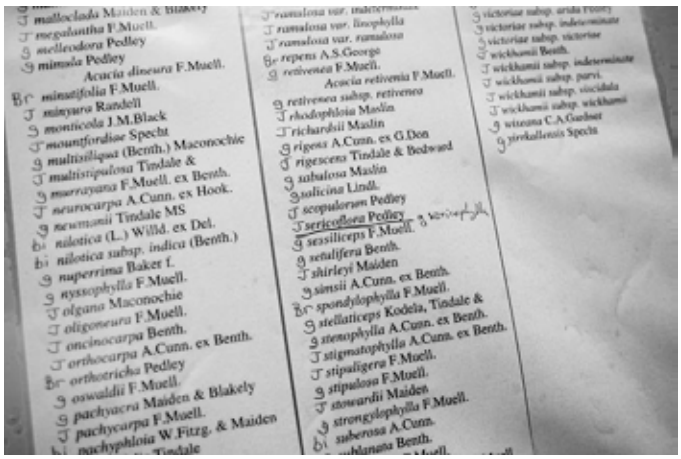
Collect the plants. Use scissors to snip flowers, leaves, or entire plants. If you are creating a scientific herbaria, you may also want to collect some roots.

Flat flowers tend to press better than bulky ones. You may like to experiment with different types of flowers and plant parts (by removing and pressing petals of larger flowers, for instance). If plants are abundant, collect several flowers from a species so they can display front, back, and side views. Collecting flowers at different stages of bloom can also make a more interesting display.

To keep collected plants fresh in the field, put them in sealed plastic bags out of the sun. It is best to get plants in the press as soon as possible. If you need to keep them overnight, a wet paper towel in the bag will keep them from wilting too much. Alternatively press and protect plants in a phonebook or catalogue until you get back to the classroom.

Plant specimin storage at the NT Herbarium

Make field notes. If you are planning to create an herbarium or field guide, you will need to take notes. Each journal or field notebook entry may include such information as date, location, environment (e.g., amount of sun), type of growth, (herb, vine, and so on), description of seeds and/or fruits, and collector's name. You might also want to include information that may not be apparent once the plant is dried, such as original color or aroma. Students may also make sketches and take photographs of plants in their habitats.



A list of plant varieties at the NT Herbarium

Pressing the Plants

Materials for a plant press

- Corrugated cardboard, sheets of newspaper, plywood or other boards, all cut to the same size
- Something to bind the stack (belt, cord, or strap)
- Weights (heavy books or bricks)

For mounting collections

- Sheets of white paper
- PVA glue
- Clear contact paper (optional)

Miscellaneous

- Scissors, field guides, binders or folders for students' collections, journals, or field notebooks. If you plan to make pressed wildflower cards, you'll need card stock paper and clear contact paper, plastic bags.

A plant press sandwiches the plants between layers of absorbent material so they will dry quickly. This is the best way to preserve specimens and color. Although you can press plants in old phone books or catalogues, a method that enables air movement speeds up the drying process.

Arrange plants on a folded sheet or two of absorbent paper, like paper towel or newspaper. You can lay numerous flowers or plants of the same thickness on the same piece of paper, as long as they don't touch. Try to arrange flowers and other plant parts in a natural way, so their parts will be visible when pressed.

Then place the absorbent paper onto cardboard. The cardboard enables air circulation so the plants dry more quickly. Finally, place wooden boards on either side of your layered pile. Next, you'll need to bind or weight the stack to create pressure that will help the plants dry. You can tighten straps or belts around it or simply put something heavy on the stack. Some presses have screws and nuts in each corner that can be tightened to create pressure. Leave your press in a ventilated location.

Although many plants will dry adequately in a week, some may take longer. Check them each day or two and change at least the outer layer of newspaper, (delicate plants, when moist, may stick to the paper they're touching.)

Identification Classification and Display

Unless your pressed plants are solely intended for an art project, you may want to identify what plants you have gathered using online or printed field guides. You may want to extend initial observations to find specific characteristics listed in the field guide keys. (For instance, does the plant have opposite or alternate leaves?)

Botanical illustration at the NT Herbarium

The following websites may be helpful in this process.

- Field Guide to Australian Wildflowers

http://www.shop.nsw.gov.au/

- Plant Science and Botany Identification

http://www.publish.csiro.au/nid/20/bcid/49.htm

- Field guide to eucalypts

http://www.weedinfo.com.au/bk_fldgeuc.html

- Botanical Field Guide - Stefan Mager

http://www.byronshop.com.au/prod108.htm

- Field guides & gardening resources specific to the ACT

http://www.lifeinthesuburbs.net.au/content.php?id=120

Before mounting the pressed collections, consider the end goal. If creating classic herbaria pages, give each plant its own sheet of paper. If creating field guides, organise pages by plant families or characteristics such as color or leaf type.

To mount the plants use PVA glue, a hot glue gun or archival tape to attach plant parts to a heavy paper.

Finding the Key

Most field guides use dichotomous keys, which include a series of questions with only two possible answers to choose from for each question. If you want to try creating a dichotomous key, begin by dividing the plant collection into two groups based on observable characteristics (e.g., flowers or no flowers). Next take each group and choose two new alternatives. If subjective qualities are selected, such as small or large, try to be specific (e.g. leaves smaller than 10cm and leaves larger than 10cm).

The group should continue in this fashion until there is only one plant left in each category. Once these keys have been created use your categories to write a series of questions for the beginning of the field guide (Does the plant have flowers? No flowers?) to help the user identify the plants.

Top and bottom - Dr Greg Leach showing the Replant artists Fiona Hall and Judy Watson pressed specimens from the Herbarium collection. Left Glenn Wightman with Irene Mungatopi and Deborah Wurrkidj.

Making a Plant Database

You may like to create a computer database to catalogue the herbaria or field guide information. The database might include the following: common name, scientific name, family, student discoverer, habitat, unusual features etc. You can also scan sketches or import digital photos of the subjects into the computer. Add information based on observations made over time, such as how a plant moves from flower bud through seed and fruit.

Once the material is in the database, you can sort it in different ways, such as by plant family or native and exotic plants. Information from the database can be printed and bound and/or featured along with pressed specimens.

Botanical Illustration

Botanical illustration is an exacting art form that emulates the anatomy of plants to illustrate scientific descriptions and is an artistic composition as well.

Materials

- Sketch paper, hard pencils, and eraser
- Tracing paper
- Painting paper and watercolours and brushes
- Tissue knife or razor blade to dissect plant material
- Fresh plant material

Discuss how accurate scientific drawings need to be. How can an artist achieve accuracy when drawing from live plant materials? Discuss how tools, such as rulers, compass, grids, photocopier and scanner can be used to help make an accurate drawing.

Collect plant materials and choose a plant for the illustration. Lay the plant or parts of the plant to form a composition. Measure and plan an arrangement of the plant material so all the parts fit on the paper while maintaining a pleasing arrangement. Pay attention to the number and type of leaves, petals, length and girth of stems (internodes) and colours. Consult leaf type diagrams and anatomy graphics. It will not be possible to show all phases of the plant simultaneously (bud, bloom, fruit). It may not be possible to show roots if plant has been cut or is in the ground.

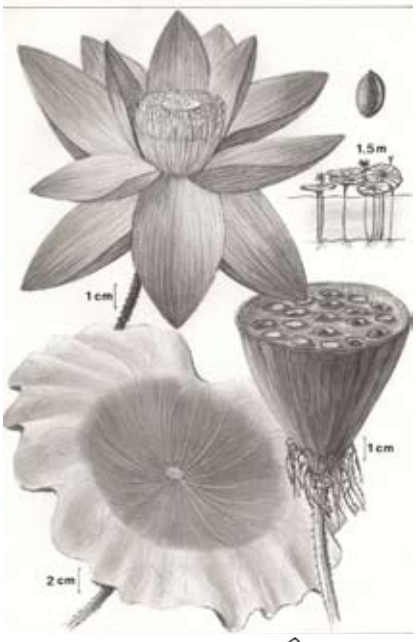
Begin the drawing process with a hard-lead pencil onto paper. Try different drawing with methods to refine the drawing. Use botanical sources for examples. Make all the necessary changes on this sheet until the drawing is satisfactory in scale, proportion, shape, and accuracy.

Use tracing paper to lightly transfer the drawing onto watercolour paper. Begin painting with light washes of watercolour with small brushes. Experiment with techniques for creating washes, shading, and textures. Consult botanical drawing references sources for examples.

Between the sketch and final drawing phases, compare the drawing of the plant to a written description, found either online or in a field guide. Check for accuracy, scale, and proportion. This written description can be used as label copy for a display. Display them with labels telling the name of the artist, name of plant (common and Latin names), medium, date, and text description.

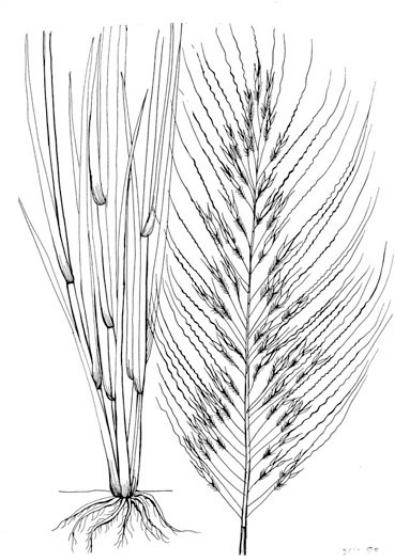
Try a second version of the drawing using pen and black ink. Use lines, dots to create textures and tones. Try "blowing up" a section of the illustration as a separate drawing. Use a grid to enlarge the drawing to scale.

Following are scientific illustrations of some of the plants featured in the Replant etchings.

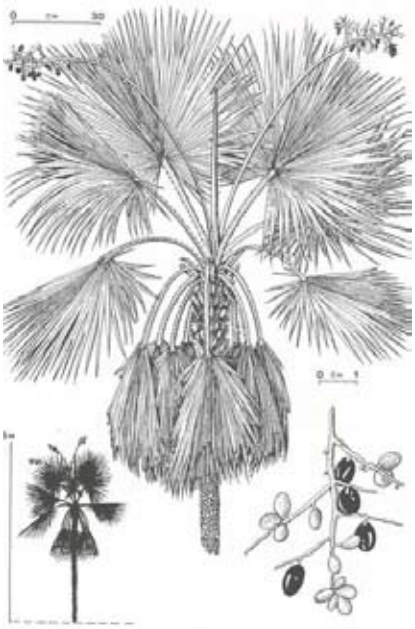


Nelumbo Nucifera
Featured in *Water lilies*
by Marita Sambono

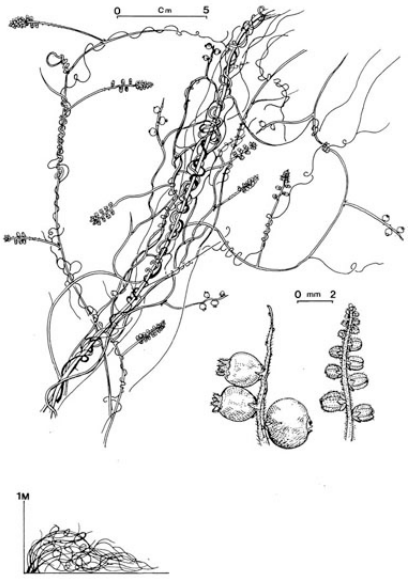
Nelumbo Nuciferal
Featured in *Water lilies* by
Marita Sambono



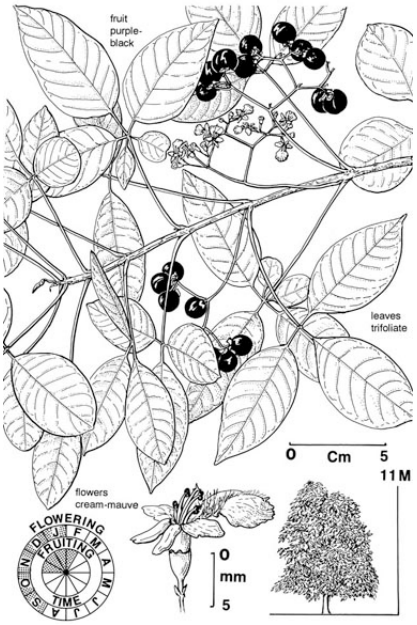
Sarga Intrans
Spear Grass is featured in three works by Winsome Jobling



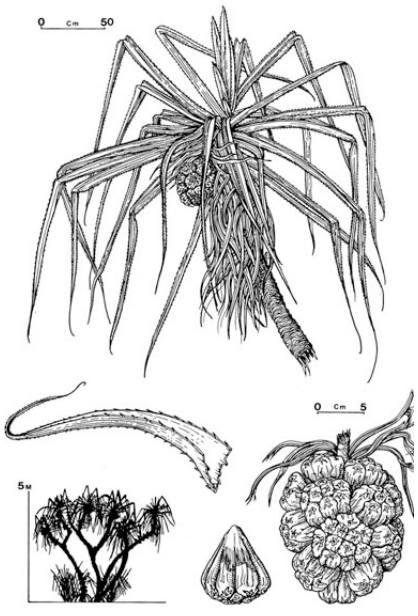
Livistona Humilis
Sand Palm is featured in three works by Judy Watson.



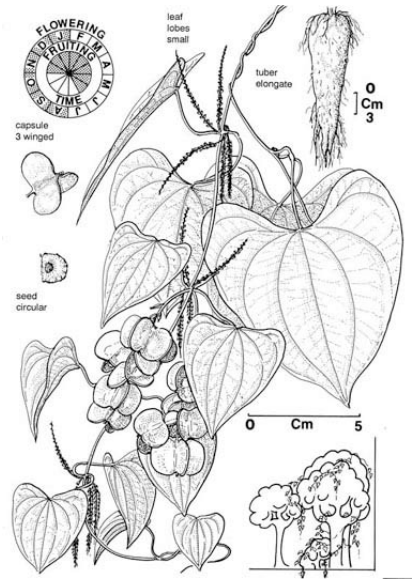
Cassytha Filiformis
Dodder Laurel is featured in *sand palm, dodder laurel, flat leaf plant* by Judy Watson



Vitex Glabrata
Featured in *Black Plum* by Deborah Wurrkidj



Pandanus Spiralis
Shown in its woven form in *Pandanas Weaving* by Deborah Wurrkidj



Dioscorea Transversa
Featured in *Long Yam by* Deborah Wurrkidj

Art Projects
Botanical art

Botanical art can vary according to fashion and the intention of the drawings. At times they are purely scientific depictions of plants with little consideration of aesthetics. At other times the emphasis has been on the artistic or cultural merit of the illustration. Artists can also combine these elements by balancing attention to detail with beauty of form and composition.

Discuss the difference between an artistic work and a botanical illustration. What makes a botanical illustration? What is the difference between a scientific drawing and a work of art?

Using a plant specimen paint or draw two different representations of the same plant. Draw a botanical illustration, focusing on the flowering and sexual parts of the plant (you may even want to dissect the plant to record it in greater detail). Using the same specimen, complete a more creative interpretation thinking about the beauty, geographic, historical or cultural associations of the plant.

Fiona Hall Wattle and Mantid

Fiona Hall has drawn this image so accurately experienced botanists are able to identify it by its recently described latin name - *Acacia tolmerensis.* Fiona also inorporates insect nests into her work, exploring the reationship of host and tenant.

Judy Watson sand palm/ resilience

The fruit of the Sand Palm is used for the grey dyes for the merrepen weavings of dilly bags. We ate some of the cabbage from the stalk of the Sand Palm which was delicious, 'good tucker' and is apparently good for coughs and colds.

Catherine Bamul and Christina Yambeing showed us how to pull the merrepen or central part out of the Sand Palm. You take the second one and pull it out with a hard tug. It needs to have part of the trunk showing to be the right age. You shake it out like a fan. The edges of each leaf are peeled down both sides to get the fibre, then this is rolled up and down the leg to get a two ply roll. The edge of the stalk of the Sand Palm is used as a breadknife. The bases of the young ones are sometimes dug up and cooked'.

Recently I read Marcia Langton's accounts of Aboriginal people in North Queensland hiding in the long grass evading white authorities and the massacres of their people in the early years of contact.
Judy Watson 2006

Printmaking

There are many different ways to make prints including etching, screen prints and linocuts. Following is a simple method which can be applied in the classroom and does not need specialist equipment (although a printing press will result in better quality images).

Collograph

A collograph is a print made from a collage of items glued to a sheet of cardboard, metal or similar flat material. Pablo Picasso, Juan Gris and Georges Braque were famous for the collagraphs they made.

Materials Needed:

- Masonite, plywood, mat board or any thin and durable material that can have items glued to its surface
- Acrylic wood glue or craft glue
- Water based varnish
- Printers ink
- Cloth
- Print press alternatively use a spoon or rolling pin
- Paper suitable for etching

Each student will need a piece of pre-cut masonite, ply wood or stiff cardboard that will be used for the plate. Make the plates around 30 cm x 25 cm or smaller to facilitate ease of printing and to be in proportion to the plant material.

The collograph plates can be printed in relief (the ink is placed on the highest parts), or intaglio (the ink is placed in the lowest parts) or both. The collagraphs will work best if the materials used are an even thickness.

Making the collograph

Arrange the leaf and plant material on a sheet of paper the same size as the plate. Paint or pour a film of PVA glue onto the printing plate. Transfer the objects onto the glued surface. Sand or other textured material can also be adhered to the surface of the collograph plate. Press down firmly to make sure the materials are permanently and firmly pressed onto the glued surface and wait for it to dry. Once the plate is dry, brush or roll a coat of shellac or PVA glue over the material you pasted on the plate to make a waterproof surface.

To print the image apply ink to the top surface with a roller or wipe on with a soft cloth or stiff brush. Wipe the edges and remove any excess ink.

Take the inked and wiped plate and place your printing paper on top of your printing plate. Or if using a press place it on the bed of the etching press face up. A sheet of clean newsprint under the plate will keep the bed of the printing press clean and help deter the spread of unwanted ink onto the print.

Apply pressure with a roller or spoon or run through the printing press. Remove the paper, by slowly peeling it from one side. You may need to adjust the printing pressure to achieve the desired result.

If you like your design, you can re-ink the collograph plate and make another print. You can add further detail to your print by hand painting or drawing designs.

Number the prints as described in the *Printmaking* section of the *Project Notes*.

Basil Hall and Judy Watson running plant material through the press during the Replant Project.

Nature Poems

Visit a botanical garden or go to a national park or bush land. Find a place on your own to just sit and quietly observe the environment.

1 Make two lists. One: external observations and use the senses. Two internal feelings and reactions. Combine the two lists into a poem about the experience. Illustrate the poem by making a drawing of one of the external observations.

2 Imagine yourself as something in the garden/bush: an ant, a butterfly, a creeper, a tree. Write what it's like to be that thing. What do you see? What do you do? What do you feel? What are the threats? Make an artwork from the same point of view.

Paper Making

The art of papermaking has a long and interesting history. The following procedures are simplified versions of traditional methods. Once basic papermaking is understood, you can make many beautiful papers using plant materials and flowers.

Papermaking kits can be purchased from art supplies or a simple version of a mould and deckle can easily be made at home.

Making New Paper from Old

Materials

- Scrap paper (office paper is good)
- Mould and deckle
- Plastic tub (large enough to immerse frame when flat)
- Blender (for making pulp)
- Old blanket, loose weave fabric such as curtain netting or 'chux', thin polystyrene foam curtain netting
- Sponge

Collect paper scraps. Many kinds of paper can be used. Keep in mind that each will have different qualities that can affect your final product.

1 Making the pulp

Tear the paper into pieces about two cm square. Consider separating different types and colours of paper at this stage so you can have more control when it's time to blend them. If you want a product light enough to write on, consider using mostly light coloured paper. You may want to limit paper with black ink which can impart a greyish hue.

2 Soak the paper

Put the torn paper in a tub or bucket of warm water with two drops of detergent and let it soak overnight. This begins to break down the fibres so the mixture is easier to mash in your blender.

3 Blend the paper

Add soaked paper and water to your blender in a ratio of one cup of paper to two or three cups of water. It's good to start with a light colour and add other colours bit by bit, so you can see the emerging hue. Blend the mixture on medium high until it has the consistency of thin oatmeal.

If you want to write or paint on the paper, you can blend in a tablespoon or so of white glue, cornstarch, or gelatine (dissolved in hot water). These additives, which are called "sizing," will make the paper less porous to ink and paint.

3 Make a mould

A mould is simply a screen-covered frame. A homemade frame or old picture frame is fine. Cut the screen five cm larger than the frame on all sides, hold it taut, and staple it to the back of the frame. The deckle is a frame (without mesh). The deckle sits on top of the frame (like a fence) so the pulp does not run off the edges.

4 Making a sheet of paper

Fill the plastic tub with 5 - 15 cm of water. The aim is to put the pulp in a watery suspension so it can be evenly distributed on the screen. Add about one blender full of pulp for every 5 cm of water. The amount of the pulp in the water will determine the thickness of the paper, so you may have to experiment with different ratios once you see how the sheets turn out.

Stirring the mixture well and gently lower the mould at an angle, screen side up, into the tub. Starting with one edge slide it to a horizontal position near the bottom. If you're using a second frame (deckle), place it on top of the screened frame. Lift the screen straight up, allowing fibres to cover it and the water to drain through. Drain excess water back into the tub.

5 Couching

Have two boards, a thin piece of foam and an old blanket, slightly larger than the mould (all should be wet). Place a piece of curtain netting or 'chux' on the blanket. Gently tip the mould over the mesh. By pressing and rocking the mould you will transfer the wet sheet onto the chux. Cover the wet sheet with another chux. Repeat the process to form a post of about 10 sheets.

6 Drying

Place a board on top of the post and press using bricks or other weight for about 10 minutes. Then either hang the paper (still on the chux) to dry or transfer the damp paper to a clean smooth wet surface like glass where is will peel off once dry.

Making paper from plants (cellulose fibre)

All plants have fibre, but some have enough to provide strength and elasticity to paper and other items such as cloth, rope, and baskets. Leaves and shoots of many common garden plants including rice and grass have been used to make paper. Cotton fibres are used in some of the highest quality papers.

The process of turning plants into paper is similar to the method described above, but there are additional challenges. Live plant materials need to be cooked in an alkali solution for three to twenty hours, depending on the variety. The safest solution to use in a classroom is washing soda. After cooking, the fibres must be thoroughly rinsed to a neutral pH - the process takes quite a bit of time and water.

Next you will need to beat the fibres into a pulp. Beating or blending the fibres enables them to intertwine and water to penetrate them. The fibres are then floated in a vat of water and scooped up onto a papermaking mould in a thin layer as described previously.

Papermaking Investigations

Reduce, Reuse, Recycle

Hundreds of acres of timber are cut to produce just one edition of a newspaper. Consider using your papermaking project as a way investigating and/or promoting recycling and the potential it holds for reducing the loss of valuable forests.

Older students can find out about efforts to use sources other than trees, such as hemp, for making paper. They can also research some of the environmental issues associated with the paper industry and learn about some of the "environmentally friendly" measures that have been instituted. These include a decrease in the use of chlorinated bleaching agents and an increase in the amount of recycled paper used to make new products.

Techniques Skills and Processes

A variety of techniques are used across the world to make paper. There are also many different kinds of plants used in the process. Japanese and Western Styles of papermaking are very different.

1. Collect and prepare plant material for cooking, cut into 5cm lengths, and soak dry fibre overnight.

2.

2. Boil fibre in caustic solution for about 2 hours, use a stainless steel pot, add 1/4 cup of caustic soda per 10 litres.

3. Beat fibre in small batches in a blender or by pounding with mallets or use a mortar and pestle.

3.

4. Rinse cooked fibre in water until the water runs clear. It should be neutral pH.

4.

5.

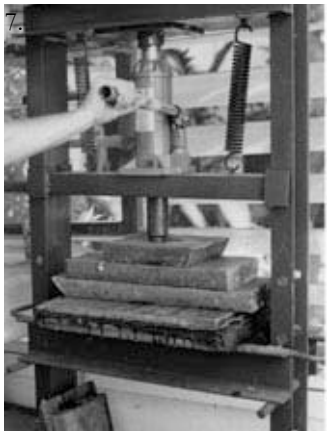
5. Add pulp to the vat and form sheets with a mould and deckle add about 20% pulp to 80% water.

6.

6. Transfer each wet sheet onto pieces of fabric in a stack this is called couching. Paper can also be dried on the moulds.

7. Press the stack of sheets (called a post) to remove excess water.

7.



8. Hang the sheets of paper to dry on a flat surface or they can be left to dry on the felts or mould.

Images and captions courtesy Winsome Jobling