

Acknowledgements

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Native Plant Garden Manual for Schools

Promoting Native Plant Biodiversity and Environmental Sustainability



Eco-Schools Bahamas

Making environmental awareness and action an intrinsic part of life in schools and communities.



Eco-Schools

About Eco-Schools

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The Eco-Schools programme is a student-led, international initiative of the Foundation for Environmental Education. It is designed to encourage whole school action for the environment by actively engaging students in investigating and solving issues in their schools and surrounding communities. The Eco-Schools Bahamas programme is managed by the Bahamas Reef Environment Educational Foundation (BREEF) in partnership with the Ministry of Tourism and with the support of the Ministry of Education.

Land and sea are closely linked. In The Bahamas, we all live on or near the coast, and therefore, actions on land impact the health of our oceans. This 'Native Plant Garden Manual for Schools' has been developed by BREEF for the Eco-Schools Bahamas programme. It provides a blueprint for schools to take action to promote sustainable development and native plant biodiversity conservation in The Bahamas.

Schools throughout the country are invited to participate in the Eco-Schools Bahamas programme. For more information, visit the programme website at www.ecoschoolsbahamas.org or contact BREEF at (242)-327-9000. BREEF is a non-profit Bahamian foundation established in 1993 that promotes a sustainable relationship between Bahamians visitors and the marine environment.

Your Native Plant Garden



School grounds can offer a safe exciting place for outdoor education. Establishing a native plant garden is an ideal way to enhance your campus while protecting native plants. It will create a stimulating learning environment and encourage students to appreciate the outdoors and things Bahamian.

Native plants are being lost due to land clearing for development and competition with invasive species. Your school can help to conserve our native plant species which are of ecological, social and cultural importance.

This manual is designed to help schools and the wider community to plan, implement and maintain a native plant garden. It includes planning ideas, plant selection and planting tips, and suggestions for lesson activities that tie in with the national curriculum at both the primary and secondary levels.

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Brazilian Pepper: *Schinus terebinthifolius*

Common Names: Bahamian/Florida Holly, Christmas Berry Tree

Impacts

- Grows in dense patches that displace native wetland and terrestrial vegetation.
- May cause allergic reactions.

Brazilian pepper is native to South America. It produces many bright red fruit during the winter months.



Melaleuca: *Melaleuca quinquenervia*

Common Names: Paper Bark Tree

Impact

- Establishes in wet areas and has a high transpiration rate which poses a threat to wetlands.



Melaleuca is native to Australia. It can be easily identified by its whitish, papery, peeling bark. Its white flowers resemble a bottle brush, its tiny brown seed capsules contain numerous seeds.

Wedelia: *Wedelia trilobata*

Common Names: Carpet Daisy, Creeping Oxeye

Impact

- This low growing vine forms a thick carpet that displaces native plants.

Wedelia is native to Central America. It is easily identified by its yellow flowers and leaves with serrated edges.



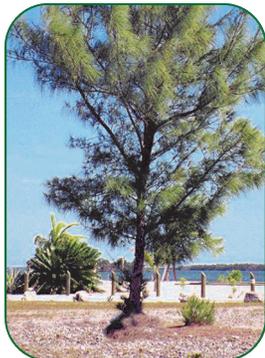
The following are invasive plant species that are commonly found in The Bahamas. These plants should NOT be included in your native garden, and where feasible, should be removed from your campus.

Casuarina: *Casuarina equisetifolia*
Common Names: Cedar, Australian Pine

Impacts

- Promotes beach and dune erosion.
- Can establish quickly on degraded sites and in poor soil conditions so that they out compete native plants and dominate the landscape.
- Needles inhibit the growth of nearby native vegetation.

Casuarinas are native to Australia. They are easily identified by their small cone-like fruit and needle shaped leaves. They should be removed from an area as saplings as they are costly and difficult to remove as trees.



Scaevola: *Scaevola taccada*
Common Names: Sea lettuce, Hawaiian sea grape, White Fruited Inkberry

Impact

- Establishes and spreads quickly competing with native beach plants.

The invasive Scaevola is native to the Indo-Pacific region. It has bright green leaves, a white half-flower and white berries/fruit. The native Scaevola (*Scaevola plumieri*) has dark purple berries, smaller but thicker leaves, and are important beach plants to protect.



Planning Steps

1. **Form a Committee and Involve the Community** – draw on the expertise of parents, local businesses and other resource persons at all stages of the process.
2. **Conduct a Site Assessment and Plant Inventory**—use the tools on pages 4-5 to assess your site. The site map and species checklist will help you to identify a site for your garden and determine which plants you already have, would like to plant, or need to remove (if feasible).
3. **Develop an Action Plan**— the committee should be able to answer the following questions—How will we use the site? What do we want to do? How will the garden be maintained? How will we raise funds? Who is responsible? When should it be completed? How will we know when we have achieved our goals?
4. **Create a Budget**—include all of the costs associated with establishing and maintaining your native plant garden.
5. **Plant and Maintain the Garden** — newly planted native trees require regular watering, but once established will thrive with little maintenance.

Planning Tips

- Complete a site inventory
- Draw a site map/plan
- **Involve the community**
- Fundraise
- Acquire plants
- Plant your garden
- Take lots of photographs before, during and after your activities
- Publicize your activities
- Maintain your garden
- Include signage



Biodiversity

Establishing a native plant garden at your school can be a lot of fun. It involves many facets. Therefore, for it to be most successful, your committee should represent both the school and the wider community.

Your committee members should include: Students—from all grade levels, teachers, the principal, parents or other family members, maintenance/grounds staff and representatives from your local community such as:

- | | |
|-------------------------|--------------------------------|
| Landscape professionals | Gardening hobbyists |
| Neighbours | Public relations professionals |
| Media professionals | Photographers |

The skills and expertise that you require is available in your local community. Many persons would volunteer to serve on your committee, if you ask them.



Once the committee has been formed, it should be divided into groups to carry out different tasks based on the interests and expertise of members. Some of these tasks include:

- Site inventory and mapping
- Plant selection and acquisition
- Fundraising
- Publicity
- Photography
- Maintenance
- Garden enhancements

My Garden, My Plan

Students can assess existing vegetation in the native plant garden or in a natural area to identify the types of plants present and determine potential stewardship activities.

*Materials—Native plant ID book, online and print plant ID resources

Students should

- Draw a scaled plot map of their selected area.
- Note the location of existing plants using color-coded shapes to represent the layers of plants in the area: Trees (canopy layer), shrubs (understory), ground cover.
- Label the shapes with the names of the plants that are present.
- Indicate whether each plant is native (N), non-native (NN) or non-native-invasive (NNI).
- Count or estimate and record the total number of each plant species present within the plot.
- Analyze the labeled plot drawing and develop recommendations for stewardship activities that will result in improvements to the native plant garden or area. **Consider the following:** *Are all of the plant types represented? What percentage of the plants are native? Does the plot include any invasive species? Does the plot include plants that will encourage wildlife?*

Native Plant ID & Uses

*Materials—Digital camera/drawing tools, plant ID guides,

- Provide the students with a list of native plants found on campus.
- Challenge each student to create an ID card (electronic or print) for a native plant that will be used for peer teaching. Each card should include:
 - a photograph or student drawing of the leaf, fruit and or flower (if present)
 - its identification features
 - traditional uses of the plant
- Students should use the cards to teach their classmates about their chosen species.
- Display cards in the classroom.
- Challenge students to identify at least 6 native plants. Assess their ability to identify plants in the native garden.
- Students may research scientific names of native plants, e.g. Gum Elemi—*Bursera simarouba*, Seagrape—*Coccoloba uvifera*.

My Native Plant Garden—Lesson Activities

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Nature Walk: Students explore the native plant garden or a natural area to learn about native plants through observation by using their five senses: touch, sight, smell, hearing. Taste must be utilized with caution because some plants may be toxic. It must be restricted to plants that are commonly eaten by humans. Students should be encouraged to use adjectives to describe the plants that they are observing. Use a native plant guide or signage so that students can learn the names of plants in the area. Students should be able to describe: **leaves** — shape, texture, color, scent; **flowers** —color, scent; **fruit** — shape, color, texture.

Students should

- Use scientific equipment such as a magnifying glass to observe details and then describe, compare/contrast plant features.
- Measure leaf dimensions and use the data collected along with their observations to make a scaled annotated drawing of a chosen leaf.
- Use their observations to create/use dichotomous plant ID keys.

Leaf Discovery: Students can increase their knowledge of leaf characteristics by making rubbing of an identified native plant leaf. * Materials—clip board/ firm cardboard, blank paper, crayon (dark color), rubber bands

Take students to the native plant garden or outdoor area. Have the students place the clipboard under a named leaf while it is still attached to the plant. The leaf should be oriented so that the underside is facing upwards (this side usually has more definition). Place a sheet of paper on top of the leaf so that it is sandwiched between the clipboard and the paper. Secure the paper to the clipboard with a rubber band. Gently rub over the leaf surface with the crayon paying special attention to the veins and leaf margin (edge). Gently remove the paper so that the leaf remains attached to the plant.

Students should use the observable characteristics of their rubbings to create imaginary names for their drawings and explain to the class why the names were chosen. Characteristics include:

- **Leaf shape** — oval, heart shaped, triangle, arrowhead, lance shaped, palmate (hand shaped), needle, pinnate.
- **Leaf margin** (edge) - smooth, serrated, toothed, scalloped.
- **Texture**—smooth, scaly, hairy, thick, papery, thin, thorny.

Students may construct a graphic organizer to show the features of their leaf and/or use grid paper to calculate its surface area.

Step 2— Conduct a Site Assessment and Plant Inventory

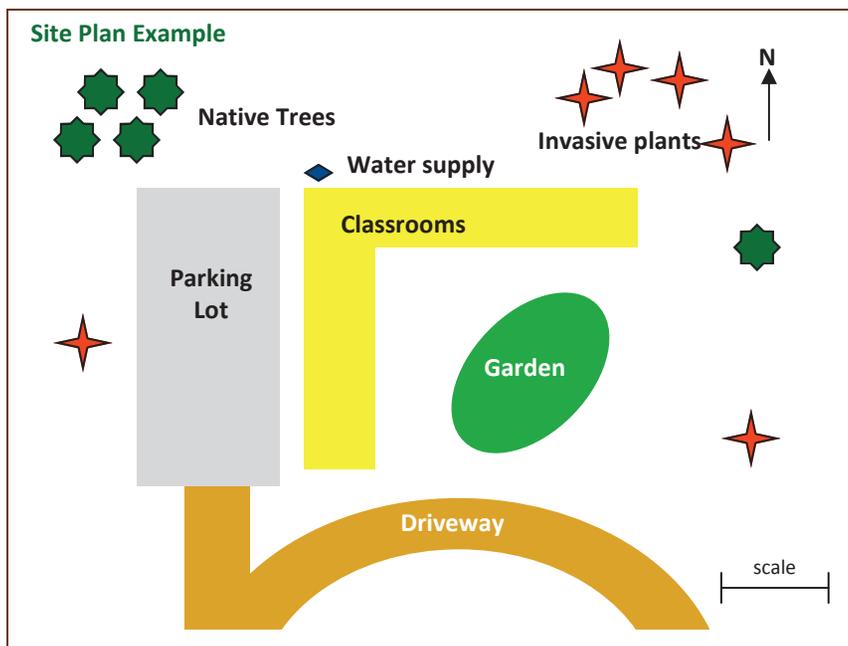
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Site Mapping

One of the first tasks of the committee will be to develop a simple site map (sketch) to depict the campus. This map will help to determine where the native plant garden should be located. This is also an excellent time to engage the help of knowledgeable persons in your community.

The site map should include the location of: plants, buildings, pathways, sidewalks, driveways, parking lots, the water supply, landscape features (natural areas, ponds, slopes, agriculture plots, gardens, P.E. field, etc), sporting courts, seating areas, waste containment area, areas set aside for future development etc. Refer to the site plan diagram below as an example.

The map that has been created will serve as the 'BEFORE' map. After the action plan has been completed, the map should be updated to show the changes that will be made. Publicize your plans and share it with the community. Both site maps should be posted in a prominent location on campus for easy viewing.



Species Checklist

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Use this checklist to conduct a plant inventory for the site. Using a tally system, record the number of each plant species. The completed list will help with selecting plants to put in the garden and identifying plants for removal. The invasive plants of greatest concern are denoted with an asterisk (*).

Native Plants	Number	Non-Native	Number
Buttonwood		Almond	
Blolly		Banyan/Ficus	
Caribbean Pine		Poor Man's Orchid	
Cinnecord		Bottle Brush	
Cocoplum		Bougainvillea	
Five Finger		*Brazilian Pepper	
Geiger Tree		*Casuarina	
Gum Elemi		Cork/Mahoe	
Horseflesh		Frangipani	
Lignum Vitae		Hibiscus	
Mahogany		Jujube	
Pigeon Plum		*Melaleuca	
Ram's Horn		*Monkey Tamarind	
Saffron		Oleander	
Seagrape		Poinciana	
Strong Back		Poui	
Thatch Palm		Royal Palm	
White Mangrove		*Scaveola	
Others—use additional paper as needed		Silk Cotton	
		Tamarind	
		*Wedelia	
		Woman's Tongue	
		Yellow Elder	

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D. Garden Maintenance

This is crucial to the success of the native plant garden. Native plants are adapted to local conditions, so once they become established, they need very little maintenance. However, until that time comes, the garden requires special care.

Watering

- Water the new plants daily: fill up the moat, let it drain and repeat for each plant.
- Water daily until a flush of new leaves appear. Plants do not need additional watering on days with heavy rainfall.
- Make plans for the plants to be watered during school breaks, if needed.
- Once the plants have become established and there is obvious new growth, there should be no need to water unless there is an extended dry period.

Other Care

- Replenish mulch as needed to help control water loss by evaporation from the soil and to reduce weed growth.
- Weed as needed to remove unwanted species that will compete with your plants for resources—light, nutrients, water.
- Very rarely, light pruning may be required. In this case, seek the assistance of a professional in your community.

E. Enhance your Garden



Hardscape features will enhance the look of the garden, attract wildlife and create an inspiring outdoor learning space. These features can be both natural and man-made. They may include:

- **Signage** — informative signs and plant labels add educational value.
- **Pathways** - at least 3' wide will allow easy access. These can be mulched or graveled to reduce weeding frequency.
- **Logs** and **tree stumps** can encourage moss, fungi and other organisms. Drilling holes in them will speed up the process.
- **Rock piles** will provide habitats for small animals.
- A **trellis** will provide support for climbing plants.
- **Seating** will provide places for people to sit and enjoy the garden.
- **Bird baths** and a variety of **bird feeders** will attract nectar feeders (humming birds), seed eaters and fruit eaters to the garden.

Take Pictures, Celebrate, Enjoy your Native Garden!

Step 5— Planting and Maintenance of a Successful Garden

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A. Design your layout

Visit a natural area close to the school to observe how plants grow in the natural environment. There are 3 layers of plants in forest ecosystems: trees, smaller shrubs and low growing plants (ground cover).

Refer to the updated site plan to design the layout. Think about the types of plants that have been selected, pay attention to the spacing between plants. Remember to allot space for growth of the trees. Ensure that there is enough space for other elements that are to be included in the landscape: paths, benches, bird baths, gazebos etc.



B. Prepare the site

- Clear the site of debris.
- Remove undesirable species from the selected garden area by hand. All invasives should be removed from the campus where feasible.
- Mark the location where each plant will be placed. Assess the soil conditions to determine if special tools are required for digging, especially if the soil has been heavily compacted.
- Obtain plants and keep them well watered until planting.



C. Plant

- Trees should be planted at least 6' away from buildings or walls and spaced at least 3' apart.
- Dig a hole that is twice the diameter and approximately 2" shallower than the plant pot to avoid sinking after watering.
- Spread a thin layer of compost in the bottom of the hole to hold water and provide nutrients.
- Water the plant and then release the plant from its pot by knocking or kneading the side of the pot.
- Carefully spread the roots, place the plant in the hole and backfill with the native soil.
- Pack the soil around the roots, press gently to retain the air spaces.
- Add a ring of compost approximately 12" away from the trunk to form a moat that will channel water towards the root ball.
- Surround the plant with a layer of mulch 6" thick. The mulch should just cover the compost ring. Water well.
- **Update the species checklist for your campus.**

Step 3 — Create an Action Plan

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The Committee should use the information collected from the site map and species checklist to develop an action plan for the native garden. A template has been provided in the Eco-Schools Handbook.

For each action that will be taken to establish the garden, decide who will be responsible, how long it should take and how to determine when goals have been achieved. Also consider how the garden will be maintained.

Remember: When the action plan is complete, update the site map and display it in a prominent location.



Plant Selection

Native plants are adapted for local conditions. This means that once they are established, they need very little care. This makes them an ideal choice for a school garden.

Most native plants should thrive in all areas of The Bahamas. Observe the plants that grow in your area, to get a good idea of the plants that will grow best on your school grounds. If the site that you have selected is located near the beach or adjacent to a wetland you should select plants that are best suited to these conditions. Use the plant list on page 7, local nurseries, and resource persons in your community as a guide. Remember to include trees, shrubs and ground cover. Include plants that will attract pollinators to the garden. **Be sure to retain the native plants that are already in the landscape.**

Plants to Avoid—see invasive species descriptions on pages 13-14.

Do **NOT** plant **invasive species** at school or at home. Invasive species are non-native species that are harmful to the environment, economy or to human health and welfare.

Invasive species:

- Threaten the survival of native plants and animals
- Threaten biodiversity by dominating habitats and altering ecosystems
- May introduce new diseases into our environment

Where feasible, remove invasive species from your campus. If you wish to remove large trees you **MUST** seek the assistance of professionals.

Native Plant List

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Native plant gardens can be designed to mimic the natural environment. The plants that should be selected for your garden will depend on local environmental conditions, the available space, and plant availability. The plant list below, provides the common names of some native plants that should be accessible locally.



As a rule, plants should not be harvested from the wild. However, plants may be 'rescued' from areas where land is being cleared. It should be noted that 'rescuing' plants requires special skills and such plants often have low survival rates.

Your garden should include plants that grow at different levels: trees, bushes/shrubs, ground cover.

Species List— Native Trees

- **Blolly
- **Brasilletto
- * Buttonwood (Silver or Green)
- **Caribbean Pine
- Cinnecord
- Five Finger
- Geiger Tree
- Gum Elemi
- Horseflesh
- Lignum Vitae
- Mahogany (Madeira)
- Pigeon Plum
- **Ram's Horn
- **Saffron
- * Sea Grape
- **Strongback
- Thatch Palm
- * *White Mangrove

Native Shrubs

- Bahama Buttercup
- * Bay Geranium
- * Bay Lily
- Cocoplum
- **Pigeon Berry
- Sage
- * Sea Oats
- * Sea Ox-Eye Daisy

Others – Epiphytes and Ground Cover

- * Bay Geranium
- Native Orchids & Bromeliads
- *Railroad Vine
- *Sea Purslane

Key: * salt tolerant/coastal plants ** may be more difficult to locate

Step 4— Create a Project Budget

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Once the action plan is complete, begin work on the budget. A budget will help determine financial needs. The line items in the budget will depend on the types of activities outlined in the action plan.

When the budget is complete, reach out to your community. Many of the items or skills that are needed can be donated by stakeholders and resource persons in your local community.

** During the 2012-13 academic year, registered Eco-Schools participating in the GEFSGP funded Eco-Schools Project: Promoting Native Plant Biodiversity and Environmental Sustainability in Schools and in the Wider Community, may apply to BREEF (National Operator— Eco-Schools Bahamas) for funding.*

Budget Example

Item	Source	Quantity	Item cost	Total Cost	Date needed
Design	parent		\$0		Oct 2012
Site Preparation	students, parents, agriculture students		\$0		Nov 2012
Tools	Hardware store				Nov 2012
Plants	Local nursery	20	\$20	\$400	Nov 2012
Mulch					
Soil					
Compost					
Other e.g. benches, bird feeders, fencing etc					
Total					