# SEP Teachers' Manual

## Senior Schools

### Grades 7-11

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ACKNOWLEDGEMENTS

The Schools Environment Programme gratefully acknowledges the contribution made towards the production of this manual by the following individuals and organisations:

Phyllis Reynolds, Sherrill Gardener, Herma Meade, Erma Hutton, Jennivie Tracey and Lorna Thompson of the Ministry of Education, Youth and Culture, for the invaluable support given in training teachers in infusion methodology and guiding teachers in infusing the SEP manual into the various school curricula and syllabuses.

Marjorie Vassell, Consultant, who guided teachers throughout the process of writing material for the manual.

The following teachers for the contributions made by them in providing information for this manual:

Jean Brown        Negril All Age
Claudette Forbes   Hampton School
Marolyn Gentles    Ardenne High
Tanya Lue          Happy Grove High
Beverly McKenzie    Glenmuir High
Norrev Nelson       Brimmervale High
Christopher Sill    Sydney Pagon Agricultural High
Monica Tabanor     Happy Grove High
Ovnelle Smith      Donald Quarrie High
Godfrey Williams   Vere Technical High
Monacia Williams   Glenmuir High
Sherene Williams   St. James High

The Programme also thanks the following organisations for providing background resources for teachers:

The Forestry Department
The Institute of Jamaica
Jamaica Information Service
The National Environment and Planning Agency
The National Solid Waste Authority
The Pesticides Control Authority
Urban Development Corporation
HOW TO USE THIS MANUAL:

This manual has been divided into sections so that activities can be easily referred to and distributed amongst teachers working on different aspects of the Programme.

Please note the Action Plan (Pages 14-15) and the Keys to Success (Page 16) which will help you to structure your implementation of the Programme. The manual has been revised to provide linkages to the Primary and ROSE curricula. Teachers are therefore encouraged to infuse environmental activities into their regular lessons using these linkages. This will make it easier and less time consuming to implement the programme. Curriculum infusion ideas are found following the activities to which they relate. For some activities there are no direct opportunities for infusion. These can be done as stand alone or environment club activities.

The last section of the manual provides background information on various environmental topics. Background information is also provided in the form of booklets and pamphlets. These can be used to enrich your activities. Links to the background information topics are provided on the activity pages.
MISSION STATEMENT
The Schools Environment Programme is a joint project of the Jamaica Environment Trust (JET) and Jamaica 4H Clubs to promote environmental awareness, ethics and action in students and to encourage the development of environmentally friendly schools and communities in Jamaica through environmental activities.

OBJECTIVES
The Schools Environment Programme seeks to involve schools in activities which improve the school environment, increase student environmental knowledge and enable schools to serve as examples of sound environmental management within the local community. The Programme seeks to help students understand environmental concepts and facts, acquire skills, form helpful attitudes and behave positively towards the natural environment. The Programme also aims to train teachers in the delivery of environmental education in and out of the classroom and to increase their knowledge of environmental issues.

The Programme is divided into four main categories:

- Solid waste Management
- Greening Your School
- Establishing or Strengthening an Environment Club
- Environmental Research

These categories include the following kinds of activities:

- Management of waste through waste audits, waste reduction and recycling programmes, litter control and composting.
- Greening (beautifying) the school grounds using organic gardening methods; planting trees.
- Establishing or strengthening of an environment club; advocacy.
- Research on topics such as Jamaican wildlife, deforestation, energy, water conservation, and pollution. This may involve community outreach, working with parish environmental groups and sharing lessons learned with the local community.

INCENTIVE TO JOIN
As an incentive for teachers and students, the programme is run as a competition. There will be opportunities to be recognized regionally as well as nationally. Schools will be expected to achieve certain goals throughout the year in order to be eligible for judging, which will be done in April/May each year. Even though there are prizes to be won, the main reward for being involved is increased environmental awareness and action.

Each school must do at least one activity from each category to be eligible for judging
**SCOPE OF THE PROGRAMME**
All Preparatory, Primary, All-Age, High and Junior High schools island-wide are eligible to enter.

**SUPERVISION**
A local Non-Governmental Organization (NGO) or a member of the Programme staff will visit each school several times between September and June (see Action Plan pages 12-13) to assist with implementation.

**WORKSHOPS FOR TEACHERS**
Teacher workshops are held each year to explore various environmental topics as well as to train teachers in the delivery of environmental education in general and the Programme specifically.

**PLANNING OF PROJECTS**
Schools should use the schools’ action plan form provided to plan their projects, with the assistance of Programme staff. Call your NGO or Programme supervisor if you need assistance in completing your school’s action plan. The school’s action plan for the entire year must be completed and presented to the supervisor by January. All projects must be approved by Programme staff. Certain activities (e.g. compost heap) must be started by the date specified. Blank forms are provided for schools at the beginning of each school year.

**IMPLEMENTATION OF PROJECTS**
Most classrooms and school-wide activities run from October to March. Staff from JET, Ja 4H Clubs, or a local NGO will visit your school several times during the year to offer support and answer questions. The action plan gives dates for activities to be implemented. Sustainability is a very important part of the Schools Environment Programme so it is important to show evidence that projects will continue during holidays and after judging.

**REGIONAL OR ZONE ASSESSMENT**
Supervisors will assess your progress as the months go by. If your school is having problems implementing the Programme, the supervisors may decide that you need more time and the school will not be recommended for judging.

If you have managed to implement the Programme successfully, regional judges will visit your school in April/May to assess the activities carried out in the four areas. The judges will use the information provided on the first school visit form and reports from supervisors to assess the progress your school has made.

Schools will then be selected for national judging based on a points system. There will also be an opportunity to win category prizes for Programme activities. Category prizes are awarded entirely at the discretion of the judges.

Attendance by at least 1 person from each school at both sets of workshops is required to be eligible for judging.
PROGRAMME LEVELS
Schools are divided into senior and junior levels. Junior schools are Primary, Preparatory All-Age and Junior High schools. Senior schools are High and Technical High schools.

Schools may be involved in SEP at one of three levels:
1. Enrolled Schools
2. Affiliated Schools
3. Advanced Schools

1. As an Enrolled School you will:
   - Be given two (2) copies of the teachers’ manual to guide the school in implementing the programme.
   - Receive at least four (4) supervisory visits each year.
   - Attend all teacher training workshops.
   - Receive newsletters.
   - Be assessed to see what the school has achieved.
   - Be eligible for prizes based on successful implementation of the programme.

Please Note:
Each enrolled schools must develop a feasible action plan to be presented to the supervisor on the January visit. At least two (2) activities required by the programme must be started in the Christmas term. If this is not achieved, the school will no longer receive regular supervisory visits and will be moved from the enrolled group to the affiliated group.

2. As an Affiliated School you will:
   - Be given one copy of the teachers’ manual.
   - Receive two supervisory visits (one at the beginning and one at the end of the school year).
   - Attend at least one (1) teacher training workshop each year.
   - Receive newsletters.
   - Not be eligible for prizes.

3. As an Advanced School you will:
   - Have participated in the Programme as an enrolled school for at least two (2) years.
   - Have been recommended by Programme staff and applied for advanced status.
   - Be awarded a sign and citation for your school.
   - Be required to have an environmental notice board informing the school of SEP activities and environmental issues.
   - Continue all categories of SEP.
   - Receive updates of the teachers’ manual.
   - Receive newsletters.
   - Attend all advanced schools workshops.
   - Receive at least one supervisory visit each year.
   - Not be eligible for prizes.
   - Become a demonstration school, i.e., be able to accommodate visits from other schools.
   - Develop and implement an action plan for making your school a sustainable institution.
JUDGING AND PRIZES
Teachers will be responsible for organizing the presentation of the school's work for the judges, helping to set up exhibits, scheduling drama presentations and selecting students to act as guides and answer questions.

It is very important that students are able to say what was done and why. The work presented must clearly be done by students. **One hour is allotted for judging each school**, so activities planned must not take longer than about 45 minutes.

The assessment for each zone or region will take place in April. Supervisors will assess each school's performance and select regional winners to go on to national judging.

National judging will take in May. Judges chosen by JET will visit the regional winners in order to select the national winners, as well as winners for category prizes and the overall prize for the most environmentally aware school in Jamaica.

Certificates will be awarded to the zone/region winners for both junior and senior schools. At the national level, first, second and third place winners will be chosen and prizes awarded. Category prizes **MAY** be awarded for projects such as: the best organic garden, best solid waste management, best community outreach or school showing most improvement. Category prizes are awarded at the discretion of the judges.

NATIONAL AWARDS CEREMONY
A few students and teachers from each of the winning schools in each zone/region will be asked to attend the National Awards Ceremony in June each year, where the national winners will be announced and the prizes will be presented. Students from selected schools will be asked to present skits, songs or poems which were created as part of their environmental projects. An exhibition of various elements of the programme will also be on display.

SUPPORT TO SCHOOLS
Two copies of the manual will be given to each enrolled school: one copy to be kept in the principal's office for reference and one copy for participating teachers to read and use.

The manual will provide guidelines for activities under each category, indicate judging criteria and include various items of background information to assist teachers.

Please Use The Manual.

IT IS DESIGNED TO INFORM AND HELP YOU.
B. PROGRAMME SUMMARY

Category 1: Solid Waste Management

Category 2: Greening Your School

Category 3: Establishing/Strengthening an Environment Club
CATEGORY 1: SOLID WASTE MANAGEMENT

Each school will be assessed on the cleanliness and neatness of the school environment. Points will be awarded for adequacy and use of waste containers, absence of litter, waste reduction, proper handling and disposal of waste, composting, recycling and/or reuse programmes and neatness of classrooms.

Schools must choose at least one activity from the list below. Each activity is explained more fully under the Implementation Section of this Manual.

ACTIVITY IDEAS

- Compost heap
- Vermicomposting
- Solid waste reduction campaign using waste audits and Reuse, Recycle projects
- Storing, handling and disposing of waste properly
- Evaluate current methods of solid waste disposal
- “Cradle to grave” study on selected item of solid waste
- Litterless Lunch Campaign
- Field trip to a garbage dump
- Any other related activity approved by Programme staff or your supervising NGO
CATEGOR Y 2: GREENING YOUR SCHOOL

Each school will be expected to improve the natural beauty of their school yard with trees, gardens or other plantings. Students should know the principles of organic gardening, composting, why trees are important, the scientific names of trees on the school grounds and how plants grow. Keeping records is a particularly important aspect in this category, as plants sometimes die or vegetables are reaped before judging.

Schools must choose at least one activity from the list below. Each activity is explained more fully under the Implementation Section of this Manual.

ACTIVITY IDEAS

- Tree nursery
- Organic garden with compost heap or vermicomposting
- Design and organize a nature walk
- Plant flowers and shrubs to beautify areas of the school
- Project on the importance and processes of maintaining fertile soil and the hazards of improper use of synthetic fertilizers and pesticides in all types of gardening/farming
- Tree planting project in the community or at another school
- Adopt-a-watershed project
- Field trip to learn about trees
- Any other related activity approved by Programme staff or NGO
CATEGORY 3: ESTABLISHING/STRENGTHENING AN ENVIRONMENT CLUB

Each school must form or strengthen an environment club, or select an existing club to carry out environmental activities. The club must show evidence of regular meetings and have a slate of officers (e.g. President, Vice President, Secretary, Treasurer).

The club will be expected to undertake at least two small projects or one year-long project within the school and may also participate in a community outreach activity.

Each activity is explained more fully under the Implementation section of this Manual.

ACTIVITY IDEAS

First, you must form or revive an environment club, elect officers, and establish regular meeting dates, preferably a minimum of one per month, and keep records of decisions taken at meetings. Suggested activities for the club are:

- Make environmental presentations to the school
- Collaborate or join with other clubs, such as 4H, Science and Key Clubs
- Undertake an advocacy campaign on an issue of importance to the community
- Make posters to put around the school
- Do a campus, beach, roadside or gully clean-up
- Have an Environmental Awareness day for parents and community members
- Organize an essay or poetry competition with an environmental theme
- Develop and perform environmental skits, songs, poetry, drama and dance
- Do bee-keeping in collaboration with a 4H Club
- Organize an environmental field trip
- Organise a trash-a-thon
- Develop an environmental pledge for the school
- Any other suitable activity approved by Programme staff or your supervising NGO
CATEGORY 4: ENVIRONMENTAL RESEARCH

Each school will be required to do research on one topic which is of interest to students and teachers. Each activity is explained more fully under the Implementation Section of this Manual.

SUGGESTED RESEARCH TOPICS

- Investigate an ecosystem
- Endangered or extinct Jamaican animals
- Environmental effects of fossil fuel based energy
- Alternative sources of energy (solar, wind, etc)
- Energy conservation
- Air, land or water pollution
- Deforestation
- Water conservation
- Soil erosion
- Coral reefs
- Water pollution
- Wetlands
- Biodiversity
- Tourism and the environment
- Environment and health
- Population and the environment
- Conservation of resources
- Watersheds and rivers of Jamaica
- Any other suitable topic approved by Programme staff or your supervising NGO

Research should show an understanding of the issue, including environmental and health effects. Students should identify possible solutions and must show evidence of thought and discussion on effective alternatives. Obstacles to successful solutions should be identified as well as ways these obstacles might be overcome. Students could hold discussions with the community to seek solutions.

The expected depth of research will depend on the age level of students.
### C. ACTION PLAN

If your action plan is not submitted at the January visit your school will automatically be placed in the “Affiliated” group.

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<th>TERM/MONTH</th>
<th>ACTIVITIES</th>
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<td><strong>CHRISTMAS TERM</strong></td>
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<tr>
<td><strong>AUGUST 25</strong></td>
<td>Application form deadline</td>
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<td>(Schools which send in application forms after the deadline date cannot be guaranteed a space in the Programme)</td>
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<td><strong>SEPTEMBER-OCTOBER</strong></td>
<td>First supervisor visit</td>
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<td>(Discuss the Action Plan)</td>
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<td><strong>BY THIRD WEEK IN OCTOBER</strong></td>
<td>Tasks to be completed by school are:</td>
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<td></td>
<td>• Action Plan for the Christmas term developed with focus on:</td>
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<td></td>
<td>⇒ Garbage Management activities decided, time-table developed</td>
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<td></td>
<td>⇒ Greening activities decided, time-table developed</td>
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<td></td>
<td>⇒ Area for compost heap identified</td>
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<td></td>
<td>⇒ Formation of the environment club and election of officers</td>
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<tr>
<td></td>
<td>⇒ Environmental research project chosen</td>
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<td></td>
<td>⇒ Areas of curriculum infusion identified and recorded</td>
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<tr>
<td><strong>OCTOBER</strong></td>
<td>• One-day teacher training workshops (for each region)</td>
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<td><strong>NOVEMBER-DECEMBER</strong></td>
<td>Optional supervisor visit</td>
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<td></td>
<td>• Fund raising options should be explored</td>
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<td></td>
<td>• You should have started at least 2 (two) activities in any of the four categories. For example:</td>
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<td><strong>Waste Management</strong></td>
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<td>⇒ Activities such as audits, litter control, recycling programme should be started in November and be well under way by the close of term</td>
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<td></td>
<td><strong>Greening Your School</strong></td>
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<td></td>
<td>⇒ Garden and/or tree nursery - areas should be identified and prepared:</td>
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<td></td>
<td>problems such as lack of fencing, water or soil erosion should be identified and planned for</td>
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<td></td>
<td>⇒ Tree planting - venue decided on; seedlings sourced</td>
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<td></td>
<td>⇒ Compost heap must be started</td>
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<td></td>
<td><strong>Environment Club</strong></td>
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<td>⇒ One club activity should be completed or you should be working on a year-long activity. Records and minutes for the entire project period must be kept</td>
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<td>⇒ Plans for the next term in progress</td>
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<td></td>
<td><strong>Environmental research</strong></td>
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<tr>
<td></td>
<td>⇒ Project should be started</td>
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<td></td>
<td>• Areas of Curriculum infusion identified, implemented and recorded</td>
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</table>
- Action plan for Easter and Summer terms developed

### EASTER TERM

| JANUARY | 2nd Supervisor visit (Continuous Assessment)  
Advanced schools workshop |
|---------|-------------------------------------------------------------------|
| **DURING JANUARY YOU SHOULD** | - Continue activities from first term  
- Begin additional activities. Make sure you have now started an activity from each of the four categories. For example:  
  ⇒ Fully functional waste management programme  
  ⇒ Planting and caring for garden or trees or doing other greening activities  
  ⇒ Second club activity or working on ongoing project  
  ⇒ Working on research project  
- Present your Action Plan to your supervisor (Remember to infuse environmental education activities into the school curriculum) |
| **FEBRUARY/MARCH** | - Second round of teacher training workshops (for each region) |
| **BY THE END OF FEBRUARY YOU SHOULD** | - Be continuing and developing activities. For example:  
  ⇒ Working on second club activity or working on year-long activity  
  ⇒ Working on research project |
| **MARCH** | 3rd supervisor visit (Continuous Assessment)  
You should be nearly ready for assessment:  
  ⇒ Main club activities completed (clubs should still meet and develop and implement activities for after judging)  
  ⇒ Well-maintained, productive garden or nursery or tree planting project  
  ⇒ Other greening activities ready for presentation  
  ⇒ Finished research project  
  ⇒ Sustainability plan completed for Easter holiday for all programme areas, especially greening  
  ⇒ Records and displays being prepared for assessment by judges on all programme areas |
| **APRIL** | Regional judging  
Beginning of summer term. Activities must be sustained during this period |

### SUMMER TERM

| MAY | National Judging |
| MAY/JUNE | 4th supervisor visit to:  
⇒ Evaluate the programme  
⇒ Complete application form for next school year  
⇒ Continue Programme activities  
⇒ Plan and implement a summer sustainability plan |
| JUNE | Awards Ceremony |
1. PRINCIPAL AND TEACHER COMMITMENT
SEP works best when the principal is committed to the Programme, and it is supported by teachers at all grade levels.

2. EVIDENCE OF STUDENTS’ LEARNING AND INVOLVEMENT
Various learning skills will be encouraged during the Programme. For example, students will be asked to observe closely, describe accurately, identify and analyze problems, brainstorm possible solutions, prioritize alternatives and select the best solutions.

When judges visit the school, they will ask students questions about their work and project activities. The quality of student response, their enthusiasm, the detailed reasons WHY certain things have been done, the degree to which they know and can explain what they did, what happened and why, the thoroughness of their record-keeping - all these will be central to the judges’ opinions about the success of the particular programme activities.

The teacher’s role is to organize projects and activities that will promote this learning.

3. INFUSION INTO THE CURRICULUM
Please take note of the infusion ideas which have been provided for various grades/subject areas on the activity pages. These will help you to infuse the Programme into your regular day-to-day activities.

Each school will be asked to show evidence that teachers have infused environmental activities into the regular school curriculum. Teachers are encouraged to find appropriate and effective ways to utilize environmental content in mathematics, language arts, art and craft, drama, music, social studies, biology, geography, agricultural science, chemistry integrated science, environmental science and other appropriate subject areas.

4. DEGREE OF CHANGE AND IMPROVEMENT
The degree of change and improvement in the school and/or community environment will be assessed by judges. They will be helped to make such judgments by the “first school visit form” completed for each school at the outset of the project as well as from supervisor reports submitted during the year.

5. PARTICIPATION
Activities should involve a wide cross-section of the school so that all students are aware of the importance of maintaining a clean school environment and of protecting natural resources. The degree of involvement of community groups, parents, the PTA or local vendors and businesses in environmental awareness and action will be assessed. Schools will focus mainly on parents, the PTA and immediate community. Schools can also adopt a nearby river/pond/forest/beach/gully/area of open land.

THE MORE WAYS A SUBJECT IS TACKLED THE GREATER THE UNDERSTANDING.

Teachers are not expected to make signs or posters, write words for songs or keep records of waste reduction.

D. KEYS TO SUCCESS

1. PRINCIPAL AND TEACHER COMMITMENT
2. EVIDENCE OF STUDENTS’ LEARNING AND INVOLVEMENT
3. INFUSION INTO THE CURRICULUM
4. DEGREE OF CHANGE AND IMPROVEMENT
5. PARTICIPATION
6. RECORD KEEPING
Students at all grade levels will be expected to keep an accurate log of their activities in garbage management, recycling, tree planting, organic gardening and field trips. Records will include planning processes, activities undertaken and the results. Environment Clubs will keep records of their meetings, activities and accomplishments. Project purchases and sales (for example, of recycled items or of produce from the garden) should be recorded. It is often useful to document projects with photographs, particularly for the gardens, as drought, vandalism or animals can destroy a lot of work overnight.

It is vital to keep records so new people at the school can see how things were done and know immediately what was successful. Good records will enable judges to assess school effort and achievement even after an unanticipated event, such as a flood.

7. CREATIVE PROJECT ACTIVITIES AND PRESENTATIONS
Various methods of carrying out projects or making the students' work 'visible' are encouraged. For example, students are encouraged to create environmental drama presentations, newsletters or magazines, posters, songs, reports, models, art and craft products or to organize events and Open Day exhibitions or other public presentations.

8. SUSTAINABILITY
Evidence of the school's commitment to continue important elements of the Programme will be assessed. It is particularly important to have a plan to handle school holidays, so schools do not have to re-implement programmes each year.
E. IMPLEMENTATION SECTION
CATEGORY 1
SOLID WASTE MANAGEMENT
Category 1: Solid Waste Management

CATEGORY 1: SOLID WASTE MANAGEMENT

Overall objective:
To improve the management of solid waste in schools, to educate students and teachers about solid waste issues, including the importance of reducing the amount of waste each person generates.

Schools in Jamaica generate large amounts of solid waste each day. Much of it is packaging, especially for food and drinks. Because garbage is unclean and unhealthy, as well as expensive to dispose of and a burden to the environment, it is important for us to reduce the amount of items we throw away. We must reuse or recycle whatever we can and limit the amount of packaging we purchase. How can schools manage their waste better? The questions that need to be asked are: Are all types of waste equally harmful? What are the consequences for human health of poor waste management? Whose problem is it? What role do students and community members have to play in creating a cleaner, healthier community?

SCHOOLS MUST CHOOSE AT LEAST ONE ACTIVITY FROM THIS CATEGORY

CASE STUDY: FAIR PROSPECT HIGH

In recognition of the importance of proper solid waste management at school, the students and teachers at Fair Prospect High School in Portland have developed an effective solid waste management programme.

Separation of garbage
Drums are labeled so that items of garbage can be separated. Those that can be reused or recycled are taken out before final disposal.

Recycling and reuse
The school recycles and reuses many items of garbage:
- PET bottles are collected by Recycle For Life for recycling;
- grass cuttings and organic waste from the school canteen are used to make compost for use in school gardens;
- waste from the Industrial Arts Department is used to make solids for math classes and signs for labeling plots and plants;
- caps from plastic bottles are sent to their adopted school (Windsor Forest Primary) to be used as counters.

Environmentally friendly products
The school no longer uses styrofoam boxes for lunch. Paper boxes are used in the canteen as well as provided for vendors outside the school.

The school uses litter wardens and prefects to ensure that all students comply with waste management rules. Students are also reminded at general assembly to dispose of waste properly.
Category 1: Solid Waste Management

ACTIVITY: COMPOST HEAP

Objectives:
Students will:
1. Explain how natural systems work
2. Define the term “biodegradable”
3. Explain the process by which compost material breaks down
4. State the advantages of using compost
5. Make compost for use in gardens
6. Reduce waste on school grounds

Starting your compost heap is one of the very first activities you should do because it takes time for waste to break down and you will need the compost as fertilizer for your garden. You do not need a big hole to make a compost heap; in fact, a hole makes it difficult to reap and turn compost. If possible, build your compost heap in a shaded spot. If you put it in direct sunlight, it will dry out quickly and need more care.

Start collecting your compost materials. Many schools do not generate enough organic materials so students may bring waste from home.

Here’s what can go into a compost heap:
- Fruit and vegetable peelings (e.g. banana peel, orange skins, yam skins, potato peel)
- seaweed
- coffee grounds, tea bags
- garden cuttings (e.g. grass, small leaves)
- animal manure, chicken, horse or cow is best. Not dog or cat!
- a little dirt
- small amounts of wet, torn up newspaper

Don’t put food scraps like left over lunch, cheese, meat or oil into your compost, as these will attract pests and cause odours.

Although you can build a container for the compost heap with wood and chicken wire, it is not absolutely necessary.

1. Start by digging up the ground where you plan to put the compost heap. Then put some cut grass and bigger leaves on the bottom.
2. Layer all the other materials until you have a pile; the best size is about 3-4 feet square and 3-4 feet high. (A bucket is much too small, but a 45-gallon drum can work for a small garden.)
3. Add some dirt and water. Don’t make it too wet. The compost should be damp but not rotting.
4. Keep adding layers until your compost heap is the right size.
5. Cover the final layer with grass cuttings, which will reduce the number of fruit flies.
6. Check the compost heap every day or two and make sure it doesn’t dry out. Take a fork and turn the heap every week or two.

If you cover the compost heap with a black garbage bag, it will heat up and work faster. After a while stop adding new stuff and leave the compost heap to break down, still turning it occasionally, making sure it doesn’t dry out. When it has formed a rich crumbly soil it is ready to be added to your garden.

BACKGROUND INFORMATION LINKS
∞ How does a leaf turn to soil?
∞ How long does it take garbage to biodegrade?
ACTIVITY: VERMICOMPOSTING

Vermicomposting refers to using earthworms to process waste. Earthworms are nature’s own recyclers, they are cultivators of the soil and improve aeration, drainage and fertility. The composting or mature earthworms (*Eisenia fetida*) eat and digest the waste then excrete a fertile soil-type material rich in calcium, nitrogen, phosphorous and potassium.

Objectives:
Students will:
1. Explain how natural systems work
2. Define the term “biodegradable”
3. Explain the process by which compost material breaks down
4. State the advantages of using compost
5. Make compost for use in gardens
6. Reduce waste on school grounds

TO MAKE THE WORM COMPOST YOU WILL NEED:
- A container for the worms to live in
- Waste materials for the worms to feed on (as with a regular compost)
- A supply of mature worms

THE WORM CONTAINER
Boxes can be provided with the worms inside by persons who set up worm composts. Students then put cut up organic waste into the boxes. This may be the best option for most schools. A regular dustbin with a tight-fitting lid and ventilation/drainage holes also makes a good worm container. The container must provide moist but ventilated and drained surroundings as the worms dislike too much water.

THE WORMS
The worms must be mature worms and are best sought from persons with an already established worm composting system. These sources can often provide bins, worms and the compost that comes with them should therefore have hundreds of worm eggs to get you started. If the supply has no eggs, 100-150 worms will be needed to get the compost going.

MAKING THE COMPOST
1. Place a thin layer (3 inches) of rich soil on the boards in the bin.
2. Put worm compost or pile of worms on top of the soil.
3. Add a 4 inch layer of organic scraps. No more food should be added until the worms have begun to break this down. Layers up to 6 inches thick can be added after this (usually after 1-2 weeks).
4. Stir when putting in additional layers of food to distribute worms.

Decton Hylton at the International School of Jamaica will come to your school and help you set up your vermicomposting project. Contact JET and we will put him in touch with you.

Ja 4H Clubs also does vermicomposting.
ACTIVITY: SOLID WASTE REDUCTION CAMPAIGN

Objectives:
Students will:
1. Estimate the quantity and note the type of waste produced by the school through sampling and observation
2. Describe what happens to waste when it is thrown away
3. Explain the benefits of waste reduction and reduce the amount of waste produced by the school
4. Assess the financial and other costs of waste disposal
5. State the consequences to human health of large amounts of waste which are not handled properly
6. Explain why the only ultimate solution to solid waste problems is reduction
7. Demonstrate a sense of responsibility for the environment
8. Discuss the topic "Garbage is everybody's problem"
9. Define the terms "reuse" and "recycle"
10. State the benefits of recycling

It is easiest to do a waste reduction programme in conjunction with some kind of garbage audit. Students must have some knowledge of the amount and type of waste the school generates before they can fully appreciate the effects of reduction.

GARBAGE AUDIT
It may be difficult to do an audit of the waste produced by the entire school so you may use one class as a sample of the whole school.

- Decide on the period of time over which the exercise is to be carried out, e.g. weekly, fortnightly.
- Provide separate containers for the collection of each type of garbage (plastic bottles, food wrappers, juice boxes etc.) Ensure that containers are provided for the collection of all waste produced.
- At the end of each day, record the amount of waste produced in each category. This should be done over the entire period of the survey. The final results can be used to estimate the amount of waste generated by all students in the school.

An audit should also be done at the end of the project to determine the level of reduction in the amount of waste generated.

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<th>Sample Audit Chart</th>
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Category 1: Solid Waste Management

WASTE DISPOSAL
Discuss with students how waste is handled once it is thrown away. Some questions they could answer are:
- Is waste burnt on school grounds?
- What are the health effects of this?
- Is waste transported to a dump?
- Is the waste at the dump burnt?
- What are the community health effects of this?
- What are the costs of managing the dump?

Students can consider the hidden costs, such as air and water pollution and the threats to the health of those people who work on the dump.

Research can be done into how much waste disposal costs the school and the community - include the cost of a groundsman, if applicable. Discuss with students who should pay these costs. Should it be the people who buy the packaging? The companies who produce it? All taxpayers, whether or not they buy the packaging?

Ask students to consider how the waste could be reduced. Some ideas could be:
- An outright ban of packaging such as juice boxes, plastic bottles, etc.
- Reuse and recycling projects.

REUSE, RECYCLE PROJECTS
Recycling/reuse projects are very good ways to reduce the amount of waste thrown away. A product is recycled when it is collected after consumer use and reprocessed into the same or other items.

A product is reused when it is used more than once before it is discarded, either for the same or different things.

Most of us reuse some things every day without really thinking about it. For example, we share the newspaper with other people or we pass on children's outgrown clothes to younger children. However, the recycling industry in Jamaica is just beginning.

Students are asked to choose one item of garbage that can be recycled or reused and to think of innovative and creative ways to ensure it is not used only once and thrown away.

- Can it be used to make craft products?
- Can it be sold to an industry that will reprocess it into another usable product?
- Can the students think of a way for their recycled/reused item to generate income?

The items you choose for recycling/reuse should be volume items and should be easily identified through a waste audit or through observations. Examples might be glass bottles, plastic PET bottles or tin cans. Paper can be reused in all kinds of projects. Juice boxes can be used for craft items or planting seedlings. See how creative you can be.

If you select a recycle/reuse item, have students label two or three waste bins around the school which will be used for this item only. You can paint the drums creatively.

Remember the 5R's - Reject, Reduce, Reuse, Recycle and Repair
Category 1: Solid Waste Management

SEPARATING THE RECYCLABLE/REUSABLE ITEM
After the drums have been labeled “Plastic Bottles” or “Juice Boxes” or whatever you decide to reuse, students must be told that only those items go into the labeled drums. A system has to be put in place to prevent students from putting other items into these drums.

The Judges will inspect how the items have been reused or recycled. Making a craft display of reused ideas will gain high marks. You can also reuse materials to make your display for your research project. Students must be encouraged to bring items from home as well as to collect some on the school grounds.

COMPACTING AND STORING
If you are collecting an item to take to a recycling company, depending on the item, you may need to flatten it as much as possible to maximize storage space. When the collection drum is full, the items can be removed and stored in old feed bags until they are sold or transported to the recycling company.

RECORDING
Students should count and record the recycle/reuse item during the collection period. This task can be undertaken by the Environment Club and/or different grades.

RECYCLING AND REUSING
The meaning and importance of recycling and reusing should be discussed so that the students understand why it is important to reduce their garbage and to put all litter and trash into garbage cans. Make sure there are trash bins in each classroom and at various other points on the school grounds. Ask students to brainstorm all the ways garbage can be reduced and make a list of their ideas.

Why recycle and reuse? Some reasons are:
- Burning can cause asthma attacks and other respiratory illnesses
- Waste dumps are already too full
- Waste blocks gullies and causes flooding
- Waste creates an unhealthy environment
- It cuts down on the use of natural resources, especially those which are non-renewable
- Students can brainstorm other reasons

Measure the results of your efforts. Has the school produced less solid waste? If yes, how has this benefitted the school and community?

MEASURING RESULTS
The judges will measure the effectiveness of your project by success in recycling, reuse, repair and reduction, e.g. in the amount of packaging purchased.
Category 1: Solid Waste Management

BACKGROUND INFORMATION LINKS
∞ Environment and Health
∞ How long does it take garbage to biodegrade?
∞ How to recycle paper
∞ Polystyrene fact sheet
∞ Zero waste lunch

This activity can be infused into the following areas of the ROSE curriculum

Grade 8 Resource and Technology
Module: Design Arts
General objective 4: To protect and conserve in the environment
4.3 (Page 134)
Topic/content outline
-Utilizing discarded/waste materials
-Types of waste/scrap materials—recyclable, biodegradable, re-workable, reusable
Expected outcomes and skills
The student should:
-Demonstrate an understanding of the potential environmental and economic viability of reuse and recycling
Suggested activities
- Have students collect packaging from products they buy during a week. Sort them into categories, e.g. paper, plastics, then make a display on recycling

4.4 (Pages 134-135)
Topic/content outline
Designing for conservation
Expected outcomes and skills
The student should:
- Explore the design potential of a range of reusable materials
Suggested activities
- Choose a re-workable material and develop use for it

Module: Home and Family
General objective 4: Protecting and conserving resources in the environment
4.4 (Page 174)
Topic/Content outline
-Utilizing discarded materials
Expected outcomes and skills
- Design and make articles from discarded materials
Suggested activities
- Use the design process to plan and make articles from discarded materials
ACTIVITY: STORING, HANDLING AND DISPOSING OF SOLID WASTE PROPERLY

Objectives:
Students will:
1. State the health consequences of poor solid waste handling
2. Outline correct ways to store, handle and dispose of solid waste

Students will observe or interview school staff to learn:
• how and where waste is stored on the school grounds, in what kinds of containers, and for how long;
• how waste is disposed of, how often, where it goes and whether it is burned or buried on the school grounds.

Students will discuss the advantages and disadvantages of different methods. Problems of solid waste collection, storage and disposal should be outlined and students should understand the environmental and health effects of burning as a method of waste disposal. Students should brainstorm to find alternatives to burning waste and to display knowledge of the environmental and health effects of burning.

BACKGROUND INFORMATION LINKS
- Environment and Health
- How long does it take garbage to biodegrade?
- Valuing trash to secure cash
- How to recycle paper
- Polystyrene fact sheet
- Earth Facts-Why Burning is a Bad Idea

Garbage reduction and efficient garbage management are needed to decrease the strain on the earth.

Ensure safe waste handling at all times!
**Category 1: Solid Waste Management**

This activity can be infused into the following areas of the ROSE curriculum and CXC syllabuses

**Grade 7 Social Studies**
**Unit 3: Social and Environmental Issues**
**Subtopic A: Good health practices (Pages 36-39)**

Specific learning outcomes:

**Knowledge**
Students should be able to:
4. Explain the importance of keeping healthy

**Attitude**
Students should:
2. Demonstrate a willingness to keep themselves and the environment clean and safe

**Content**
9. Some common health problems, their symptoms, causes, effects and treatment: typhoid, asthma, gastroenteritis, malnutrition, hepatitis

Learning activities
6. Matching causes and effects of health issues
10. Making suggestions re classroom health rules and sanctions

**Grade 8 Resource and Technology**
**Module: Industrial Techniques**

**General objective 4:** Protecting and conserving resources in the environment
4.1 (Pages 209-211)

**Topics/Content outline**
- Definition of waste
- Safe disposal of waste
- Pollution control

**Expected outcomes and skills**
Students should:
- Understand the effects of waste on the environment
- Appreciate the importance of safe disposal of waste
- Recognise the importance of pollution control

**Suggested activities**
- Compile list of harmful effects of waste
- List methods of safely disposing of waste
- Compose songs and poems on waste disposal
- Field trip to an industrial plant to observe pollution control measures

**Grade 9 Language Arts**
**Unit 1; Theme: The environment/the community**
**Module 1: Understanding the environment**
3. Brainstorm problems facing the environment and how to solve them

**Tasks and activities (Page 90)**
4. Discuss pictures illustrating environmental hazards - fire, water, garbage, destruction of trees. Get students to discuss
**CXC Chemistry**

**Section C 2 Chemistry in the Environment**

**Pollutants**

*Specific objectives and content/explanatory notes*

Students should be able to:

3.6 Distinguish among biodegradable, recyclable and toxic solid household waste

*Content/explanatory notes (Page 51)*

Plastic, glass, metal, paper, asbestos, wood, paint, food

**Section C 2 Chemistry in the Environment**

**Pollutants**

*Specific objectives and content/explanatory notes*

3.11 Discuss the need for managing and preserving the environment

*Content/explanatory notes (Page 52)*

Reference to health benefits, economic benefits (recycling), reduction in the amount of solid waste and maintenance of finite resources

3.12 Discuss ways of managing and preserving the environment

*Content/explanatory notes (Page 52)*

Reduction, proper disposal of waste, conservation, recycling
ACTIVITY: EVALUATE CURRENT METHODS OF SOLID WASTE DISPOSAL:

Objectives:
Students will:
1. Identify current methods of solid waste disposal
2. Evaluate each method
3. Recommend solutions for Jamaica's solid waste problems
4. Discuss the topic “The ultimate solution to solid waste problems is reduction”

Students should identify current methods of solid waste disposal both locally and internationally. For example, landfills, incineration, recycling and sewage treatment and evaluate the advantages and disadvantages to the environment and human health of each method.

Students can then do research on the different methods of solid waste disposal that are currently being used in Jamaica and the level of effectiveness of each method in dealing with the country's solid waste issues. This could include a field trip to a garbage dump to see how waste is handled on the dump.

Questions that could be asked are:
• What type of waste goes to the dump, especially volume items?
• Are there chemical and hospital waste on the dump?
• Is the dump located near to a river or the sea?
• Are there families living on or close to the dump?
• Are there any children playing on the dump?
• What sort of protective gear do persons who work on the dump wear?
• Is garbage at the dump burnt? If yes, how has this affected surrounding communities?
• Is the dump lined? If no, what are the likely environmental and health consequences of this?

Students could also visit a sewage treatment plant. Research should be done on the effects of dumping raw sewage into the sea when sewage plants do not work.

Students could investigate the other methods of sewage disposal, e.g. soak away pits.

Using this information, recommendations should be made as to what should be done to address Jamaica's solid waste problems. A debate could be held or a presentation made to the school population and community on the theme “The ultimate solution to Jamaica's solid waste problems is reduction”.

FOLLOW UP ACTIVITIES
• Reuse/recycle projects
• Banning certain items of packaging from the school grounds
Category 1: Solid Waste Management

BACKGROUND INFORMATION LINKS
- Environment and Health
- How long does it take garbage to biodegrade?
- Valuing trash to secure cash
- How to recycle paper
- Polystyrene fact sheet
- Earth Facts—Why Burning is a Bad Idea

This activity can be infused into the following area of the CXC syllabus

CXC Chemistry
Section C 2 Chemistry in the Environment
Pollutants
**Specific objectives and content/explanatory notes**
3.7 Evaluate the current methods used for solid waste disposal
**Content/explanatory notes (Page 51)**
Chemical treatment plants, sewage treatment, landfills, incineration, recycling, dumping
ACTIVITY: CRADLE TO GRAVE STUDY ON SELECTED ITEMS OF SOLID WASTE

Objective:

Students will:
1. Identify what items of packaging are made from and their effects on the environment through “cradle to grave” studies

A “Cradle to Grave” study involves looking at the lifespan of a selected item of garbage from its raw material state to when it is disposed of.

Students can therefore undertake research about one item of garbage in order to learn:

• what natural resources the item is made of
• the industrial processes used to make it
• what other raw materials are used
• what the product is used for
• how it is disposed of
• what are its recycling or reuse possibilities
• how long the item takes to biodegrade
• what happens if it is burnt, etc.

An education campaign about the item should be undertaken for other students in the school and posters displayed. This should be focused on the positive and negative characteristics of the item.

It would be a good idea to do the study on items that you are having difficulty banning from the school compound, e.g. styrofoam. Suggest alternatives to using this product.

BACKGROUND INFORMATION LINKS
∞ Environment fact sheet—Paper
∞ How long does it take garbage to biodegrade?
∞ Polystyrene fact sheet
Category 1: Solid Waste Management

ACTIVITY: LITTERLESS LUNCH CAMPAIGN

Objectives:
Students will:
1. Explain how making informed choices about packaging can reduce solid waste
2. State the benefits of reducing solid waste

Help students brainstorm all the ways they can avoid having waste left over from their lunches. For example:

- Bring all food in reusable containers and lunch boxes.
- Take any used packaging or napkins back home in lunch boxes.
- Ban juice box containers and plastic bottles from school grounds.
- Put fruit and vegetable scraps in a bin marked for compost.
- Work cooperatively with canteen staff or vendors on school property to avoid food packaging.
- Award prizes to students who consistently bring litterless lunches.
- Discuss nutritional value of different foods (e.g. a banana vs. sandwich biscuits). Show how even the packaging of the banana is better.

If it is too difficult to have the entire school do this activity, it can be done as a class pro-

BACKGROUND INFORMATION LINKS
∞ How long does it take garbage to biodegrade?
∞ A zero waste lunch
ACTIVITY: FIELD TRIP TO A GARBAGE DUMP

Objectives:
Students will:
1. Explain what happens to garbage when it is thrown away
2. Describe the problems created by improperly managed dumps
3. Discuss basic ideas for landfill management and proper siting of dumps

Find out where the garbage dump in your area is and visit it without students. You should make sure it is safe for them to go there.

If it is safe, take students to the dump possibly with some parents. Ask students to observe and record their impressions of their visit as follows:

• What was the most common item of garbage?
• What health problems did the dump pose?
• Were there animals on the dump? People?
• What did they think about the conditions the people worked in? Were there any children?
• Where was the dump located? Near to a river or the sea? Near to houses?
• What were the effects of having the dump there?

Ask students to think up ideas as to where dumps should be located and how they should be managed.

BACKGROUND INFORMATION LINKS
∞ How long does it take garbage to biodegrade?
∞ Valuing trash to secure cash
∞ How to recycle paper
∞ Polystyrene fact sheet

MANAGE YOUR WASTE PROPERLY FOR A CLEAN, SAFE, HEALTHY, ENVIRONMENTALLY FRIENDLY SCHOOL
CATEGORY 2
GREENING YOUR SCHOOL
Category 2: Greening your school

CATEGORY 2: GREENING YOUR SCHOOL

Overall Objective: To create pleasant school environments and to promote respect for nature and care of living things.

Trees, plants, gardens and natural green areas all help to create a pleasant and healthy environment for learning and recreation. They provide essential food and shelter (habitat) for insects, birds and other animals.

Trees and other plants can also help to foster education about the environment.

Trees can reduce heat in buildings by providing shade. They maintain the water cycle, maintain atmospheric balance and prevent soil erosion.

Students need to learn the value of trees and other plants as well as the importance of proper farming practices.

SCHOOLS MUST DO AT LEAST ONE ACTIVITY FROM THIS CATEGORY

CASE STUDY: SLIGOVILLE ALL AGE

Sligoville All Age has a student population of about 300 and the school has a small farm. Many of the students come from farming families and have seen their parents struggle with high prices for chemicals and low prices of produce. Through the organic farm, students have shared a more cost-effective way of farming with their families.

Students built their own compost heap to produce a rich fertilizer, which is added to the soil. Many families in Sligoville now have compost heaps as well. Students have also learned about inter-cropping and companion plants to keep away pests.

Before being involved in an environmental programme, there was low student attendance at school, particularly on Fridays. However, attendance improved as students looked forward to seeing how their crops were growing and spending part of their day learning outside of the classroom.
ACTIVITY: TREE NURSERY

Objectives:
Students will:
1. Explain why trees are important
2. Plant trees either at school or in the community

A good place to start is with a tree nursery, followed by a tree-planting project. The first step is to learn about trees:

- What are the functions of trees in nature?
- How do people use trees?
- What are some of the most common trees that grow in Jamaica and what trees grow in or near the school yard? (use common names and Latin names)

The next step is to consider what will happen to the young trees that grow in your tree nursery:

- Will they be planted on the school property, in an area of the community, or at each student’s home?
- Will the seedlings be sold as part of a fundraising project?

COLLECTING TREE SEEDS
Ask students to save seeds from the fruits that they eat both at home and at school. Each student is required to grow a seedling.

Seeds that grow easily are ackee, otaheiti apple, guava, tamarind, naseberry, avocado pear and mango (common mango).

Collect USED box juice containers, plastic cups or plastic bottles (with the tops cut off) or you may use old newspaper shaped into a cup for planting the seedlings. This could be part of your recycle/reuse programme. To prepare the container:

- Make three or four small holes in the bottom of each container (to help with drainage).
- Label each container with the type of seed planted, the date and the student’s name. This student is to be responsible for the watering and caring of this seedling.

PLANTING THE SEEDS
Designate a morning lesson (perhaps Science class) for each class to plant their seeds.

- Put some gravel or small stones in the containers already labeled.
- Fill with a mixture of dirt, sand and/or compost.
- Plant one seed in each container, about the same distance under the earth as the diameter of the seed.
- Water.

COLLECTING CONTAINERS FOR SEEDS
CARING FOR THE YOUNG TREES
An area for the storage of the young trees should be identified. The area should be:
- Cool but well lit, e.g. under a big tree is a good place. The young trees will need some sunlight but should not be baked in the direct sun.
- Well protected from livestock.
- Close to a water supply.
Watering should usually be done once every three days.

To decide if the seeding needs water, feel the soil. If it is hard and dry, it needs water; if it is soft and moist, it does not need water.

When seedlings get to 30-50 cm in height or stems get to 1.5 cm thick, they should be transplanted.

PROTECTING THE YOUNG TREES
Young trees need to be protected from goats and from being trampled by students. Build a platform to raise them off the ground or a strong fence around them.

PLANTING OR SELLING YOUNG TREES
At the end of the project, you should have quite a lot of small trees. When they have become strong seedlings, you may choose to plant some of them around your school to provide fruit or shade. You may also ask students to take their seedlings home to plant in their yard, or you may plant them in the community or you may decide to sell them as a fund-raising project.

BACKGROUND INFORMATION LINKS
- Booklet: Tree planting for schools
- Trees—Trees are our friends
- Forest connections—The forest in your classroom
- Notes on the natural history of Jamaica
- Neem—A tree for sustainable development
ADDITIONAL TIPS ON TREE PLANTING

SEEDS

- Seeds should be cleaned and planted as soon as possible after collecting.

- Very hard seeds (those that cannot be crushed by hand) should be soaked in cold water for 24 hours before being sowed. Some species may require a small hole in the seed coat (just a little 'nick') to allow them to grow.

- Some trees can be grown by direct seeding, where the seeds are planted directly where the trees are needed. Seeds should be soaked and the ground worked in advance. Seeds should be planted by hand, covered lightly with soil and mulched with grass. Mark the spots where the trees are planted.

GROWING SEEDS FROM CUTTINGS

- This is done by cutting sticks or branches and planting these in the desired spot.

- Branches 1 inch in diameter of 2nd year growth of the parent tree can be cut at 12 inch lengths and planted at a slight angle, with 2/3 of their length in the soil. Top ends should be cut diagonally.

- Trees such as immortelle, quickstick and breadfruit can be planted in this manner.

PLANTING FROM CONTAINER STOCKS (seedlings in bags or boxes)

- Any roots which have gone through the bag or box should be carefully cut with sharp knife or scissors when lifted out of container for planting.

- If seedlings start to wilt, the leaves should be pruned by removing 50-80% of the leaves with sharp scissors or shears – be careful to leave the terminal bud (base of leaf) intact.

PLANTING THE SEEDLINGS

- The ground should be prepared as new seedlings will compete for light, water and nutrients. Plant seedlings on 3’x3’ area that has already been cleared of weeds and ploughed.

- Dig a pit in the center of this (12” wide by 15” deep) just before planting to prevent drying of the soil.

- The bottom of the pit should have loose soil and then the seedling with roots and soil intact should be carefully placed in the hole, loose soil filled around the seedling and pressed tight.
This activity can be infused into the following area of the ROSE curriculum

**Grade 7 Science**
**Unit 3: Living Things and How They Reproduce**
**3.5 Seed Structure and Germination**

**Specific objectives**
Students should be able to:
5. Perform experiments to determine the conditions necessary for a seed to germinate and grow into a seedling
6. Record observations of germinating seed each day after planting
7. Measure the seedlings growing under different conditions and compare their growth

**Suggested student activity (Page 46)**
2a. Plan and design an experiment to find out the conditions necessary for germination
3. Have students set up an activity to observe the germination and growth of a seed over a one week period
ACTIVITY: ORGANIC GARDENING WITH COMPOST HEAP OR VERMICOMPOSTING

Objectives:
Students will:
1. Define the concept 'organic gardening'
2. Explain the harmful effects of synthetic pesticides fertilizers
3. Carry out an on the ground activity to provide income for the school or nutritious produce for school lunches

Begin discussion with students on the principles of organic gardening, that is:

- gardening/farming without synthetic fertilizers, insecticides or herbicides.

Organic gardeners believe that a balanced soil ecosystem will produce healthy plants with few pest or disease problems. Some ways to build healthy soil include:

- adding composted earth and animal manures
- using mulch around plants
- adding nitrogen fixing plants such as legumes (red peas, gungo peas)
- rotating crops
- using liquid fertilizers (from plants, fish, seaweed)

Organic gardeners control pests and plant diseases without synthetic or harmful chemical insecticides or herbicides. They do this through crop rotation, companion planting, polyculture (planting different crops close together so that no pest or disease can wipe out everything at once), integrated pest management and the use of sprays made from garlic, peppers or pyrethrum (a plant) or insecticidal soap.

GUIDELINES FOR AN ORGANIC GARDEN
Discuss with your students where the garden will be located and what you will plant.
- Ask the students to interview family and community members about ways to grow gardens and what vegetables or flowers grow well in your area.
- Decide what you will plant.

PREPARE THE SOIL
When you decide where the garden will be located, prepare the soil:
- Using a hoe, the soil must be loosened and turned over.
- Make sure that rocks, grass and weeds are removed.
- Work the soil with tools or hands, to a depth of 5-6 inches, so that it is crumbly and without hard lumps.

A good way to prepare the garden plot is to pile the soil into rows of small ridges and valleys.

PLANT THE SEEDS.
Plant the seeds in rows along the tops of the ridges about an inch below the surface:
- Scatter the seeds thinly so that they are not too close together.
- Water the seeds promptly.

- Mark each row with the name of the seeds planted in it.
Category 2: Greening your school

This activity is not limited to the use of seeds. Other methods can also be used. For example, some plants can be reproduced using leaves and cut stems.

CARE FOR THE GARDEN
Watch the small shoots and leaves as they begin to grow. Water and weed your seed rows frequently. If the seeds are too close together, the extra ones can be “thinned out”. The students will need to learn to distinguish the seedlings from weeds.

DEALING WITH PESTS
Have students make written observations of what happens in the garden:
- Encourage them to remove visible pests (e.g. caterpillars) by hand.
- Have students investigate what plants repel insects.
- Have students learn about and make organic pesticides.

INTEGRATED PEST MANAGEMENT
Gardeners can control pests or plant diseases through Integrated Pest Management (IPM). IPM is a method of managing pests that uses least toxic methods. It identifies and eliminates the source of pest problems rather than treating the symptoms (e.g. spraying is a method of treating symptoms). This involves careful monitoring of the area and using knowledge of natural predators to provide the type of garden which is relatively free from pests (see background information). It should be noted that IPM is not necessarily a totally non-chemical approach, but generally results in a reduction in the use of toxic chemicals.

IPM can be described in the following 4 steps:

1. Inspect
Take a look at the insects/weeds in your garden. Study their habits and life cycles, and do research on them so that you can determine the best course of action.

2. Monitor
Keep examining plants and establish when the number of insects is intolerable.

3. Determine Treatment
Begin with the least toxic methods first. Select and time the treatments to be most effective and least disruptive to human health and the environment.

4. Evaluate
Determine how successful the IPM programme has been

Source: Blueprint for a green school

RECORD KEEPING
Recording what is grown in the garden is very important because you have to reap your produce before judging. Make sure students keep accurate records of vegetables reaped and sold. Take pictures of your garden if possible.

[Images of insects and plants]
HARVEST THE GARDEN
Students will need to learn what the fully grown flower, fruit or vegetable looks like, when it should be harvested, and how best to pick and store it. You will need to discuss with your students what to do with the flowers or vegetables you grow. Some of the produce might be used for school lunches, a school or local community event, sent home with students, or sold during a fund-raising activity.

STARTING A COMPOST HEAP
Vegetable and fruit waste from the school and from home, as well as garden clippings and cuttings, can be used to build a compost heap. You will need the cooperation of canteen and ground staff. Students are amazed to see waste turn into a rich crumbly earth after about three months. Have students document the different steps in the decomposition process and the importance of soil organisms to the healthy growth of plants.

BACKGROUND INFORMATION LINKS
∞ How does a leaf turn to soil?
∞ Herbs and their insect repellant properties
∞ Neem—A tree for sustainable development

HAVING A COMPOST HEAP IS ESSENTIAL TO HAVING A SUCCESSFUL ORGANIC GARDEN
This activity can be infused into the following areas of the ROSE curriculum and CXC syllabuses

**Grade 7 Science**

**Unit 3: Living Things and How They Reproduce**

3.4 Reproduction without seeds

**Specific objectives**

Students should be able to:
1. Describe some ways in which new plants can be grown without seeds
2. Perform a simple activity to illustrate reproduction without seeds

**Suggested student activities (Pages 43-44)**

1. Have students grow new plants from a variety of plant parts (e.g. pieces of leaves and cut stems) and write a report on the experiment.
2. Encourage students to transfer the young plants to the school garden and to water them as they grow

**Grade 8 Resource and Technology**

**Module: Agriculture and the Environment**

**General objective 4** Protecting and conserving resources in the environment

4.1 (Page 54)

**Topics/Content outline**

B Methods of plant protection
   (i) biological (ii) chemical

**Expected outcomes and skills**

Students should:
- Understand the importance of crop rotation and the use of resistant varieties in pest and disease control
- Know some common plants used in biological control of pests
- Appreciate the importance of biological control of pests and diseases

**Suggested activities**
- Identify and collect insects
- Practice mulching and crop rotation

**CXC Biology**

**Section B Life Processes**

**General objective**

Students should demonstrate:
8. Understanding that organisms increase in mass, size and complexity during their lives

**Specific objective**

Students should be able to:
8.1 Perform and make deductions from simple investigations designed to demonstrate growth in living organisms

**Content/explanatory notes (Page 22)**

Examples could involve measuring changes in length, mass or surface area using roots, leaves or other suitable material or counting the number of leaves in a named plant from seedling to fruiting plant
**CXC Agricultural Science**

**Section 4 Crop Science**

**Knowledge objectives**

The student will be able to:

4. Describe the conditions necessary for production of seedlings in a nursery

5. Describe the principles and techniques of propagation

**Class (Pages 22—23)**

C 2 Germination and germination conditions

C 3 Nursery management and seedling production

D 3 Land preparation: clearing, tillage etc, effects on the environment

D 4 Cropping systems: monoculture, rotation, intercropping, multiple cropping, organic farming

D 6 Cultural practices—moulding, mulching, staking, pruning, etc

E 1 (v) Integrated pest management (IPM)

E 3 Management of pests and diseases

(i) cultural (manual and mechanical)

(ii) biological (parasites, resistant varieties)
This activity can be used to study food chains.

Have students take their notebooks and lead the nature walk into the school grounds or other area where nature can be studied. You could start with a map of the school, showing all the trees and shrubbery. Have students note where animals are found as well, including insects, birds, butterflies, lizards, stray animals, etc.

Students could:

- Collect specimens like leaves and grasses and take them back to the classroom for identification.
- Name trees, describe the value of each tree, and observe what kind of animals live there.
- Take a long piece of string and lay it on the ground in a natural way. Have students identify the different types of plants and animals which appear along the length of the string.
- Look for animals feeding:
  - on leaves (caterpillars)
  - in mounds of earth (ants and earthworms)
  - under rotting leaves (woodlice and cockroaches)
  - in tree crevices (ants and termites)
  - in tall grass (grasshoppers)
  - on flowers (insects and birds)
  - on shrubs (bugs).
- Make a table of your findings in your notebook under the headings: name of organism; where found; what it is eating; what eats it.
- Add to your list any organisms that you may have seen at another time.
- Using all the information you have gathered make a big chart showing the feeding relationships between organisms that you have identified.
- Identify the producers, consumers and decomposers.

Students can design and implement a programme for protecting an ecosystem by making an area of the school a nature walk or garden.

Encourage students to find pleasure in being outside. Help them to observe and describe what they see. Ask them to notice how they feel, how pleasant it is under a tree compared to inside a building.

Take a field trip to a garden/forested area, e.g. Holywell or Castleton Gardens.
This activity can be infused into the following areas of the ROSE curriculum and CXC syllabuses

**Grade 7 Science**

**Unit 2: Grouping Things**

2.2 Grouping Things Into Living and Non-living Things

**Specific objectives**

Students should be able to:

1. Observe living things and list their characteristics
2. Identify ways for caring for living and non-living things in the school environment

**Suggested student activities (Page 29)**

1. Working in groups of five carefully collect a variety of both living and non-living objects showing due concern for the environment. Each student should make a table to show the living things, non-living things and reasons for grouping
2. Project: Working in groups students should identify and care for a particular part of their school environment for one week and present a group report of what was done. Each group should be responsible for planning the project. Provide each group with a list of activities to be done, e.g. they should keep a record of the living and non-living things in the environment they choose to study. They could also keep a record of the changes that take place in these things and how they were able to care for the environment

**Grade 8 Science**

**Unit 9: Energy Flow Through Living Systems**

9.2 Food and Energy Chains and Webs

**Specific objectives**

Students should be able to:

1. State that plants are the ultimate source of energy for animals
2. Illustrate examples of food chains and food webs
3. Record observations made from field trip activity

**Suggested student activities (Page 88)**

1. Organise a visit to a nearby thriving habitat and have groups of students record observations of a section of the habitat. Students should be asked to comment on: types of animals, types of plants, which types of organisms are numerous, probable reasons for the organisms being numerous, feeding relationships
5. Illustrate with diagrams examples of food and energy chains or webs seen in the environment
6. Prepare work cards with the following information for groups of students. Each student should make notes on the discussion

**REMOVING ORGANISMS FROM THE COMMUNITY**

People often change the environment to fit their needs. This can alter the community. What are some possible changes that people could make in the food chain or food web? How do you think this would affect the energy flow? Work with four other persons and discuss the implications of removing any of the organisms from the community. Report on your conclusions
CXC Biology

Section A  Living Organisms in the Environment

General objective
Students should demonstrate:
3. An understanding that there is a flow of energy through living organisms within an ecosystem

Specific objectives
Students should be able to:
2.2 Identify from a selected habitat a food chain containing at least four organisms

Content/explanatory notes (Page 10)
Terrestrial and aquatic (marine and fresh water) habitats
2.4 Identify, from the selected habitats, predator/prey relationships
2.6 Explain the role of decomposers

Content/explanatory notes (Page 10)
Role of fungi and bacteria in converting complex compounds to simple substances
2.8 Discuss the interdependence of organisms within a food web
3.1 Explain energy flow within a food chain or web
Many school grounds are very unattractive with large, dusty or concrete areas. Have students plan where, and how they are going to plant flowers or shrubs. If there is not enough soil for a proper garden, consider a container garden. Old tyres can be used, or half-drums, or even smaller containers such as paint cans or plastic bottles.

Consider areas where there might be soil erosion. Would plantings help to retain the soil? Khus khus grass is effective in preventing soil erosion. If there is soil erosion, discuss with students why this is happening. What other soil conservation techniques could be applied?

Ask students to create a plan based on how they would like the school to look.

- If the garden is going to be a container garden, decide where it is to be placed and what containers will be used.
- Try to use items available at school which would normally be thrown away.
- If the garden is going to use beds, have students fork up the beds and add compost.
- Seek seedlings or cuttings from parents or nearby plant nurseries.
- Have students learn which plants grow from cuttings and which from seeds.
- Students must know the names of plants.

Consider drip irrigation for your flowers:

- Punch small holes in large plastic bottles and hang them over the plantings.
- Put the cover on the plastic bottles and tighten.
- You will find very little water comes out of the holes.
- Have the students loosen the cap once per day and the water will drip out onto the plants.

If you have goats, cows or chickens on your school grounds, you will need to protect plantings.

When the plants grow, ask students how they feel about the school grounds. Take before and after pictures so that students and judges can clearly see the improvements that have been made.
This activity can be infused into the following area of the ROSE curriculum

**Grade 7 Resource and Technology**

**Module:** Agriculture and the Environment

**General objective 3** Identifying and harnessing non-human resources for the improvement of the quality of life

3.2 (Page 43)

**Topics/Content outline**

C Plants

- Classification of plants
  - flowering and non-flowering
  - monocotyledonous and dicotyledonous

**Expected outcomes and skills**

Students should:

- Be able to classify plants as flowering and non-flowering
- Understand the concepts involved in classifying flowering plants into monocotyledonous and dicotyledonous

**Suggested activities**

- Plant collection
- Seed collection
- Show growth and movement in plants
- Show difference in germination of monocotyledonous and dicotyledonous seeds
ACTIVITY: PROJECT ON THE IMPORTANCE AND PROCESSES OF MAINTAINING FERTILE SOIL & THE HAZARDS OF IMPROPER USE OF SYNTHETIC FERTILIZERS AND PESTCIDES IN ALL TYPES OF GARDENING/FARMING

Objectives:
Students will:
1. Explain why soil fertility is important
2. Explain the dangers of using synthetic fertilizers and pesticides
3. Describe the kinds of natural measures that can be put in place to maintain soil fertility and prevent soil loss through erosion
4. Describe natural methods of dealing with pests

STUDENTS CAN:
• Do research on the composition of healthy soil and the different types of soil.
• Make a model with the different types of soil in containers.
• Learn about the qualities and structure of different types of soil and how they act differently.
• Examine the soil on the school grounds and say what kind of soil it is.

LEARNING OUTCOMES FOR STUDENTS
• What conditions are necessary for growing healthy plants and what happens if you grow the same plants on the same piece of land for a long time.
• The necessity for nitrogen, potassium and phosphorous for healthy plant growth.
• Knowledge on terracing and other methods of soil conservation for farmers. Students could build models showing the effects of planting on steep slopes without terracing.

Students should then research the effects of using synthetic fertilizers versus organic fertilizers. What happens when fertilizers run off into water bodies? Research can be done on common agricultural pests and students can learn about the effects of pesticides, such as:
• Insects becoming resistant.
• The proper way to handle chemicals and the harmful effects for agricultural workers of improper handling of pesticides.
• The effects of improper use and disposal of pesticides and their containers, and pesticide run-off on rivers and the sea
• Health hazards involved in eating foods with chemical residues.

Students should experiment with their own natural pesticides (see Booklet, Organic Gardening for Schools) and see how well they work. Students should know the effects of pesticide use on animals such as birds, and their effects on beneficial insects, such as bees and ladybugs. Information on safe use of pesticides can be obtained from the Pesticides Control Authority.

BACKGROUND INFORMATION LINKS
∞ How does a leaf turn to soil?
∞ Forest Connections—The forest in your classroom (Composting at school and at home)
∞ Booklet: Organic gardening for schools
This activity can be infused into the following areas of the ROSE and CXC syllabuses

Grade 8 Social Studies
Unit 3: Using Our Resources and Related Environmental Matters
Subtopic A  Farming
Specific learning outcomes:
Knowledge
Students should be able to:
8. Critically assess farming practices in Jamaica
Attitudes
Students should:
2. Demonstrate commitment to preservation of the physical environment
Content
4. Problems faced by farmers e.g. pests, diseases, disasters, praedial larceny and solutions to the problems
Advanced learning activity (Page 73)
2. Carrying out research on the environmental impact of such agricultural practices as the use of pesticides, burning trash when clearing land, monoculture, introduction of hi-tech methods in agriculture

Grade 8 Resource & Technology
Module: Agriculture and the Environment
General objective 1  Exploring and utilizing resources
Topics/Content outline
1.3 (Page 50)
Soil and its role in agriculture
B Soil composition
-organic
-inorganic
-air, water, soil organisms
C Soil conditions necessary for plant growth
Expected outcomes and skills
Students should:
- Know the importance of soil to agriculture and the environment
- Know the basic components of soil
- Develop an understanding of the soil conditions necessary for optimum plant growth
- Understand the relationship between the size of soil particles and the ability of soil to retain moisture
- Appreciate the importance of humus on soil fertility and plant growth
Suggested activities
- Examine the different soil samples for moisture and particle size
- Examine the composition of soil
- Composting
- Collect and display soil samples
- Collect data and plot graph showing growth rate of plants under different conditions
Grade 9 Resource and Technology
Module: Agriculture and the Environment

General objective 1 Understanding the structure and classification of resources

1.1 (Page 59)

Topic/Content outline
B Major components of soil:
Soil composition—water, air, organic and inorganic matter

Expected outcomes and skills
Students should:
- Understand the major components of soil and the effect on soil fertility

Suggested activity
- Response of crops to different combinations of fertilizers
- Collecting samples
- Analysing samples

1.2 (Page 60)

Topics/Content outline
Methods of maintaining soil fertility—fertilizer, mulch, green manure, legumes, crop rotation, erosion control

Expected outcomes and skills
Students should:
- Differentiate between organic and inorganic fertilizer and soil amendments
- Appreciate the importance of mulch in maintaining soil fertility
- Understand the importance of green manures and legumes in maintaining soil fertility
- Understand the importance of crop rotation in maintaining soil fertility and the factors which influence the sequence of rotation
- List the effects of using organic versus inorganic fertilizers

Suggested activities
- Compare the effects of organic and inorganic fertilizers
- Composting
- Demonstrating the concept of green manure
- Developing a crop rotation system for vegetables grown on the school farm

CXC Chemistry
Section C 2 Chemistry in the Environment

The chemistry of gardening
Specific objectives and content/explanatory notes
Students should be able to:

6.1 List at least 6 important elements that are essential for plant growth

Content/explanatory notes (Page 60)
Consideration that manganese, copper and zinc are required in very small amounts

6.2 Identify sources of the essential elements needed for plant growth

Content/explanatory notes (Page 60)
Sources—from soil and fertilizers
Category 2: Greening your school

6.4 Relate the importance of nitrogen compounds in home gardening

Use of organic manure versus commercial fertilizers in terms of cost, effect on the soil

6.5 Discuss the importance of humus in the soil

6.8 Compare the use of chemical and biological control of pests

Emphasis on the effects of pesticides on the environment

6.9 Discuss the use of herbicides

Emphasis on both advantages and disadvantages of the use of herbicides on the environment

CXC Agricultural Science

Section 3 Soil Science

Knowledge objectives

The student will be able to:

4. Name the major components of each type of soil
5. Describe the physical and chemical properties of soil
8. Explain the role of the major nutrients supplied by soil in crop and animal production
11. Describe the methods of improving soil fertility
13. Explain the causes and effects of water loss and soil erosion
14. Describe methods of conserving soil water

Content (Pages 16-17)

B 1 Physical properties

Soil types, soil texture and soil structure, soil porosity and soil aeration, soil organic and mineral matter, soil temperature and soil organisms, soil water, soil profile

B 2 Chemical properties

Soil nutrients, soil particle-soil nutrient relationship

B 3 Soil and plant relationship

How the soil holds nutrients, uptake of nutrients

B 4 Soil microbiology

Soil environment: the role of bacteria, actinomycete, fungi, algae, protozoa, viruses, etc the carbon cycle, the nitrogen cycle

C 7 Cover crops

C 8 Cropping systems to maintain fertility

C 9 Composting

C 10 Addition of organic matter

Section 4 Crop Science

Knowledge objectives

The student will be able to:

11. State appropriate control measures for the control of pests and diseases

Class (Page 24)

E 3 management of pests and diseases

(i) cultural (manual and mechanical), (ii) biological (parasites, resistant varieties), (iii) chemical (insecticides, Nematicides, etc.)

E 7 Safe handling, storage and disposal of chemicals and containers
ACTIVITY: TREE PLANTING PROJECT IN THE COMMUNITY OR AT ANOTHER SCHOOL

Objectives:
Students will:
1. Conduct community outreach activities
2. Disseminate information to others about the importance of trees
3. Take steps to protect the environment by planting trees

This is a particularly good project to do if your school has done a tree nursery. All too often schools who have done a lot of work in collecting seeds and growing seedlings, let the seedlings die over the summer holiday. Make every effort to plant and care for your young trees.

If there is not enough space on your school grounds, consider planting trees in another school or common area in the community. Good places to plant trees are:
• around playing fields
• on median strips
• on the side of the road
• in areas of open land
• in a nearby area which has been deforested

Make sure you do not plant trees under power lines, as if it is too close to a power line, it will be cut down by JPSCo. When you have selected the place to plant your trees, make sure they will be safe from animals such as cows or goats. This is where most tree-planting projects fail. If the land is not fenced, you will have to protect the seedlings with mesh wire or bamboo sticks. Plant trees before the rainy season. If you plant trees in June, the chances of them surviving the summer months without a lot of care are very slim.

If you plant in another school:
• Encourage classes to adopt a young tree, to look after it and water it until it is at least two years old.
• Students should inform other students about the types of trees and why it is important to plant trees.

If you plant in a common area, try to work with a community group to look after the trees:
• Involve the PTA and parents.
• Take photographs of the trees when they are just planted and monitor their progress.
• Have students check on the progress of the trees every month.

BACKGROUND INFORMATION LINKS
∞ Trees—Trees are our friends
∞ Forest Connections—the forest in your classroom
∞ How to take environmental action
∞ Neem—a tree for sustainable development
∞ Booklet: Tree planting for schools
Watersheds are very important environmental systems. They act as catchment and storage areas for fresh water, support terrestrial and aquatic ecosystems, play a significant role in many natural cycles, provide opportunities for enjoyment of nature, etc. They provide freshwater resources not only for communities located within the watersheds but also for use by households and businesses in the lower mountain regions and on the plains.

Students should select a watershed, preferably in their parish/region and conduct a study on it. Areas that could be explored include:

- **The name of the watershed**
- **Its principal rivers**
- **History of the watershed (community members can be interviewed)**
- **Uses of the watershed**
- **Ecosystems/biodiversity in the watershed**
- **Environmental degradation in the watershed**

Where possible, take pictures of your findings. For example, soil erosion, deforestation, biodiversity. These can be included in your display for the judges and would also be useful in your presentation to the school.

Having done their research, students could conduct an advocacy campaign to share their findings with the general school population and to seek their assistance in carrying out improvement projects within the watershed. These could be done as Labour Day and Earth Day projects and could include:

- **Tree planting activities.**
- **Planting grasses to prevent erosion of river banks.**
- **River and open land cleanups.**
- **Education campaign to a community located within the watershed which highlights the importance of the watershed and how its resources can be used in a sustainable way.** This community should be asked to assist with any improvement work done, e.g. tree planting.

Make sure to keep an accurate log of all your activities within and concerning the watershed, including dates. Take pictures after improvement work has been done to show your efforts.

**ACTIVITY: ADOPT-A-WATERSHED PROJECT**

**Objectives:**
**Students will:**
1. Explain the value of watersheds to humans and the environment
2. Investigate a watershed, preferably in their region/parish
3. Take steps to protect a watershed

**BACKGROUND INFORMATION LINKS**
- Trees—Trees are our friends
- Forest Connections—The forest in your classroom
- How to take environmental action
- Neem—A tree for sustainable development
- Booklet: Tree planting for schools
This activity can be infused into the following area of the ROSE curriculum

**Grade 9 Resource and Technology**

**Module:** Agriculture and the Environment

**General objective 7** Developing positive attitudes and habits

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<th>Page Range</th>
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<td>70-71</td>
<td>General objective 7</td>
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**Topics/content outline**

**The environment**

**B Importance of flora and fauna**

(i) **Plants**

Wind breaks, habitat and food for animals, erosion control, preserve watersheds, maintain atmospheric balance, beautification, control temperature, others

**Expected outcomes and skills**

Students should:

- Develop an awareness of the role of the environment in sustaining various life forms
- Develop an awareness of the aesthetic value of the environment
- Appreciate the different methods of preserving the environment

**Suggested activities**

- Carry out various conservation measures
- Tree planting

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ACTIVITY: FIELD TRIP TO LEARN ABOUT TREES

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<th>Objectives:</th>
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<tr>
<td>Students will:</td>
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<tr>
<td>1. Explain how trees are grown in a commercial nursery</td>
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<tr>
<td>2. Identify various types of trees and which ones grow well in their area</td>
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<td>3. Discuss and explain the importance of trees</td>
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<td>4. Learn about and label trees on the school compound</td>
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Before going on your field trip it would be good to conduct a discussion with the students on the importance of trees. Students should record the main points in their notebooks.

TRIP TO THE ARBORETUM AT MONEAGUE, ST. ANN
Telephone the arboretum at 973-0190 to make an appointment for your visit.

Ask if someone can tell students about the history of the arboretum and the research aspects. Discuss the possibility of each student taking home a tree to be planted in the school or community. This may be possible for a modest charge or even free.

Investigate the possibility of visiting Moneague Lakes as well. This is a good place to show students a ground water lake and talk to them about underground water.

VISITS TO OTHER NURSERIES:
Wherever you make your visits, explain that you would like students to speak to one of the foresters about:
- The trees themselves
- Why they grow the ones they do, where they are planted
- Who looks after them

- What students can do to help with reforestation
- Where the main areas of deforestation are in Jamaica

Have students take a picnic lunch and blankets or ground sheets to sit on and eat their lunch under the trees. Talk to them how eating outside feels.

Other Forestry Department nurseries at Twickenham Park (St. Catherine), Clydesdale (St. Andrew), Cinchona (St. Andrew) and Williamsfield (Manchester) can be visited:
Contact: Forestry Department
173 Constant Spring Road
Kingston 8
Tel. 924-2667-8

OTHER CONTACTS:
Rural Agricultural Development Authority (RADA)
Address: Hope Gardens, Kingston 6
Tel. 977-1158-9

The Caribbean Agricultural Research and Development Institute (CARDI)
Address: P.O. Box 113
Mona Campus
Kingston 7
Tel. 927-1231/977-1222

FOLLOW UP ACTIVITY
A good follow up activity to this field trip would be to learn about and label trees on the school grounds.

For this activity students will need a notepad,
Category 2: Greening your school

pencil, a list of the common and scientific names of trees/resource person.

- Have students go on a walk around the school compound.
- Make a list of the common names of all the trees that are known. For those that are not known you may take samples of the leaves and flowers and have a the tree identified by either the Forestry Department or Institute of Jamaica.
- Make a table consisting of two columns: common names and scientific names. Fill in this table using the information you have gathered. Information on the common and scientific names of trees is also provided in the background information.
- Students can also do research on the uses of the tree, e.g. the type of wood and whether it can be used for making furniture, fruits produced by the tree or the types of animals that live in the tree.
- Have students estimate the age of the tree. If it a very old tree they can imagine the events that have taken place during the tree’s life.

BACKGROUND INFORMATION LINKS
- Trees—Trees are our friends
- Forest Connections—The forest in your classroom
- Trees—Common and scientific names
CATEGORY 3
ESTABLISHING/STRENGTHENING AN ENVIRONMENT CLUB
ESTABLISHING/STRENGTHENING AN ENVIRONMENT CLUB - CATEGORY 3

**Overall Objective:** To ensure a student group is started or strengthened to continue working with students on environmental issues.

While you want to have the whole school involved in your environment programme, one of the most effective ways to get activities done is to have a core of student leaders. Forming an Environment Club in your school is a useful way to do this. This group can be the voice of environmental concerns in your school and community and can take the lead in implementing some activities. If starting a new club is not feasible, environmental activities can be carried out by other clubs, e.g. 4H, science and key clubs.

Schools that want to adopt a whole school approach rather than start an environment club may do so. However, you will be required to show evidence of student leadership and records of activities.

**THE CLUB WILL BE EXPECTED TO UNDERTAKE AT LEAST TWO SMALL PROJECTS OR ONE YEAR- LONG PROJECT WITHIN THE SCHOOL AND MAY ALSO PARTICIPATE IN A COMMUNITY OUT-REACH ACTIVITY**

**CASE STUDY: PEP CLUBS**

The Portland Environment Protection Association (PEPA) is a strong parish-based NGO. PEPA has encouraged the formation of student environment clubs called PEP Clubs at several schools in Portland. The Clubs have elected officers, a motto, pledge, song, hand-sign and club manual. PEPA holds training workshops for principals and teacher co-ordinators to increase their level of environmental awareness and also to teach specific skills, such as gardening and composting.

PEP Clubs have established school gardens, implemented litter control programmes, conducted research projects and developed drama presentations and skits.

“Finding solutions to everyday environmental problems is just one of the reasons why I enjoy being a member of the PEP club,” says Darren Thompson of Fair Prospect High.
FORM AN ENVIRONMENT CLUB AND ELECT OFFICERS

Objectives:
Students will:
1. Demonstrate leadership skills
2. Take action to address environmental issues
3. Plan and implement environmental projects in and outside the school
4. Inform the general school population about environmental issues

LEADERSHIP AND PARTICIPATION
The environment club will be expected to be organized by students, with student leadership. However, each club should have at least one faculty advisor. The role of the faculty advisor is very important. Care must be taken that projects are not too ambitious, especially at first.

Students should nominate and then vote on a slate of officers (President, Vice-President, Secretary, Treasurer). The Secretary will keep minutes of all the meetings held by the club reflecting decisions taken. The group will also decide how often they plan to meet (at least once per month). The role of the club leaders is to help the group stay on track by asking questions and helping the group to think clearly and make good choices.

SELECTING A FOCUS AND PROJECTS
The Club needs to select a name to reflect its activities and focus. The first two or three meetings should discuss the type of projects the Club would like to undertake. Students should be encouraged to decide what kind of Club they want:
- Will it be an advocacy group?
- Will the group do on-the-ground activities?
- It could be a mixture of all these.

IN-SCHOOL EFFORTS
Club efforts should be focused mainly in the school and with PTAs, school vendors, or 4H clubs and other clubs. Clubs could undertake any of the activities listed in the other categories of this programme.

EFFORTS OUTSIDE THE SCHOOL
Clubs should undertake at least 2 projects each year, one of which could be targeted to a community outside of the school. Clubs are also encouraged to find ways to share environmental information with another school, especially one which is not part of any environmental education programme.

FUND RAISING
Environment Clubs sometimes need funding for special project activities and field trips. After the group has decided on what it wants to do, students must:
- Quantify the costs involved and decide how funds are to be raised.
- Identify cash or in-kind contributions that can be obtained. Parents or the PTA can be asked to help.

The Club should be encouraged to develop income-generating activities, such as cake sales or walk-a-thons. Some schools have done trash-a-thons as well. (See background information on fund-raising for schools.)

INFORMING THE ENVIRONMENT CLUB
The Club needs to make sure its members are informed on environmental issues, seek out
guest speakers and encourage projects and field trips. The main difficulty with maintaining a strong environment club is continuity. As students move through the school, it may get harder for them to find the time for student clubs.

SUSTAINABILITY
The Club needs to devise a membership policy to ensure a constant inflow of students from lower grades. However, leadership is often more effective if students are older. There needs to be a clear mechanism for hand-over to younger leaders.

Club leaders can also discuss ways to include other non-member students in environmental activities.

SUCCESSFUL PROJECTS
Encourage the students in the environment club to consider the following issues when deciding on the type of projects to be undertaken:

- Will the project survive the summer holiday? Environment clubs often do tree planting without planning how the trees will survive the long summer holiday.
- Is the project sustainable? Again, clubs often do short-term clean-ups which have to be repeated over and over. Challenge the club to think of ways to ensure their project will be sustainable over the long term.
- Are club meetings interesting? Often meetings become boring and membership falls off.
- Are the chosen activities fun as well as educational? Activities such as field trips boost morale.
- Are projects too ambitious. Keep in mind your capabilities when planning projects and be moderate about your expectations. Most environmental projects have to be looked at over the long term.

COMMUNITY OUTREACH ACTIVITIES
The club members can be effective advocates for environmental issues. Community outreach programmes also bring students a greater appreciation of obstacles to good environmental practices, such as improper waste disposal, illegal sand mining, deforestation, water contamination by factories, etc.

Students must document the steps they take in doing community outreach. Photographs may be useful to help the judges understand what the club has done.

PRESENTATIONS
Club members should consider making presentations at assembly, PTA meetings and to community groups. Club leaders may also organize activities that will involve the vendors on or around the school compound.

RECORD KEEPING
Students will be expected to keep records of meeting dates, agendas, decisions made, and activities undertaken. Faculty advisors can help club members brainstorm things that should be recorded and help choose appropriate recording forms (lists, graphs, reports).

ORGANIZING EFFECTIVE MEETINGS
The club is encouraged to spend time learning how to organize effective meetings, where the purpose and outcome of the meeting is clear and everyone can participate fully. Students can practice having a written agenda (posted for all to see) listing each topic to be discussed at the meeting. Each meeting should conclude with an action plan which includes a completion date and list of the persons who are responsible for each task to be accomplished.
ACTIVITY: ENVIRONMENTAL PRESENTATIONS TO THE SCHOOL

Objectives:
Students will
1. Explore environmental issues
2. Inform the wider school community about those issues

The environment club could identify an issue of importance to the school and surrounding area. Examples are: a land use issue (such as deforestation, industrial development, large scale agriculture), a pollution issue (such as bauxite processing, a factory operation, a burning dump), a marine issue (such as dying coral reefs, beach erosion, over-fishing), a human health issue (such as solid waste disposal, sewage treatment), a water issue (such as flooding, water shortage, water conservation, the water cycle), an energy issue (such as solar or wind energy, the environmental effects of fossil fuel energy). You are not limited to these examples. The students should research the issue, and perhaps consider a field trip, if appropriate. They should thoroughly understand the issue and consider solutions. Environment club students could also ask an informed speaker to make a presentation to the club.

Having gathered the necessary information, students should brainstorm some possible solutions.

Students should then design their presentation to the assembly meeting. Bear in mind that one person speaking is the least interesting way of presenting information. Students should consider a visual presentation using slides or a video if possible, or they could write skits, songs, poetry or short drama presentations and perform them for the school.
If your school has other clubs, such as a 4H Club, a Key Club, a Science Club or Guides, meet with their members to inform them of planned environment club activities. Try to get them involved with your plans. Ask for their input into the activities you intend to carry out.

- 4H clubs may already be doing a gardening project or keeping animals. It is easier for the environment club to try to influence them to address environmental concerns rather than start a new garden. Students should consider issues such as soil conservation, water conservation, organic gardening and safe use of fertilizers and pesticides.
- If the 4H club is resistant to doing the whole garden organically, suggest a small plot. Compare the results.
- If the 4H club is keeping animals, you need to discuss with them how the animals are going to be kept away from your garden.
- You can use animal manure for your compost heap and as fertilizer for your garden.
- Key clubs can be involved in clean-ups, poster competitions, tree planting, walk-a-thons, trash-a-thons, and recycling.
- Science clubs can be involved in research.
- Guides can work for environmental badges and be involved in a range of activities.
ACTIVITY: ADVOCACY CAMPAIGN ON AN ISSUE OF IMPORTANCE TO THE COMMUNITY

Objectives:
Students will:
1. Describe and explain the environmental issues which affect their community
2. Take steps to deal with such issues
3. State the functions of government in dealing with environmental issues

Select the issue that students are interested in. This can be done after the first few meetings as it is often already a concern. Some possible ideas are:

- **Deforestation:** caused by coal burning, housing, logging, agriculture, forest fires.
- **Marine issues:** such as dying coral reefs, water pollution, over-fishing, beach erosion, effects of tourism on local people.
- **Pollution issues:** such as bauxite processing, burning, factory operations, garbage dump management, sewage treatment, gully cleaning.
- **Land use issues:** such as squatting, large scale agriculture, housing.
- **Solid waste management:** particularly relating to vendors near the school or other local issues.
- **Water issues:** such as flooding, water shortages, water quality, declining rainfall, streams drying up, pollution of sources of underground water.

This list is not exhaustive. You can select any other issue of concern to students and the community at large.

Student should research the issue they have chosen. Divide students into groups.

- those who will do library research
- those who will talk to community members affected by the issue
- those who will talk to those causing the problem
- those who will find out the relevant government department which should deal with the particular issue

Consider a field trip for students to see the problem themselves, if that is applicable. Then have a meeting for students to share their findings.

DESIGN AN ADVOCACY CAMPAIGN

- Decide what kind of media will be used: press, radio or TV.
- Consider a petition or letter-writing campaign, or possibly calling a talk show.
- Write directly to the government agency involved and the factory or farm or housing development office.
- Follow up with letters.

A meeting with a key person may also be possible. Private sector leaders can be influenced by a group of well-informed students. Doing your homework is very important, though, because polluters often have their own information to show that they are not polluting. It is not necessary to be confrontational, just firm. If the company or government agency has a solution in progress, ask for the time frame for completion and follow them up.

Document your advocacy programme. Keep your research and your campaign plan. Keep copies

BACKGROUND INFORMATION LINK
∞ How to conduct an advocacy campaign
Category 3: Establishing/Strengthening an Environment Club

This activity can be infused into the following area of the ROSE curriculum

Grade 8 Social Studies
Unit 3: Using Our Resources and Related Environmental Matters
Subtopic C: Mining & Manufacturing
Specific learning outcomes
Knowledge
Students should be able to:
8. Assess the impact of mining and manufacturing on the environment
9. Discuss attempts at conservation/preservation by mining and manufacturing industries in Jamaica

Attitudes
Students should:
3. Show commitment to preservation of the physical environment

Content
5. Pollution inherent in these activities and measures for environmental protection
6. Sources of energy used for these industries and how these impact on the environment

Learning activities (Page 80)
8. Inviting a resource person from NEPA or a local environmental group to discuss pollution occasioned by industrialisation
9. Collecting newspaper articles/cartoons on the subject of pollution and discussing in groups some solutions to the problems associated with pollution
10. Designing a poster to alert residents in a community of the dangers of industrial pollution

Advanced learning activity
1. Writing letters to the editor of a newspaper to suggest possible solutions to the pollution problem
ACTIVITY: MAKE POSTERS TO PUT AROUND SCHOOL

Objectives:
Students will:
1. Visualize the problem or issue
2. Inform the general school population about the environmental issue
3. Make posters to disseminate environmental information

Consider involving the art and craft teacher in this activity. You could have a main focus for the posters or you could have groups making posters on different environmental issues.

Students from all grades can participate in this activity. Members of the environment club could visit all classrooms and encourage students to make posters.

Some students could work on posters showing the problems. Others could do posters showing solutions. It is very important not to remain completely focused on the problem. We do have to understand the problem before we can take corrective action, but we must also visualize how we would like things to be. Have students dream about how they would like their school and community to look.

Consider reusing waste materials in the posters. If this is a popular activity, do new ones often. Consider mounting a display of the best posters on an open day or in the library.
ACTIVITY: CAMPUS, BEACH, ROAD-SIDE OR GULLY CLEAN-UP

Objectives:
Students will:
1. Estimate the scale of the solid waste problem in Jamaica
2. Describe solutions to the problem
3. Discuss/Explain why solid waste disposal is a community issue
4. Carry out hands-on activities
5. Involve other members of the community in problem solving and environmental activities

CAMPUS CLEAN-UPS
First, assess the nature of the problem.
- Why is the school campus dirty?
- Is garbage thrown on the ground only in certain areas, such as the canteen?
- Is there waste left over from a construction activity?
- Is there a pile of broken school furniture?
- Is the area to be cleaned an old garbage dump?
- Is there a problem because there are not enough garbage drums, or are the drums not put in the right place, or not emptied regularly enough?
- Is garbage collection from the school regular?
- Is the school simply producing too much garbage to be handled effectively?
- Are students aware of how to dispose of their waste properly?

Involve ground staff in your discussion of the problem.

You should make plans to address whatever problems are discovered before your clean-up. If you don’t do this, you will do a lot of hard work, clean up the campus and then in a few weeks, it will be dirty again. The only exception to this is a pile of construction or other waste which has been around for a long time.

When you have decided what is to be done about the problem and identified the solution, then you can tackle your campus clean-up.

- You will need garbage bags, gloves and masks for student volunteers. See if a parent can donate these.
- If the waste is not suitable for garbage bags, such as construction waste, you will need a front-end loader and a truck to take it away.
- You may need a truck or open back van to take away your garbage in any case. You could also call the local Parks and Markets organization in your area and ask them to send a truck to collect your waste at the end of the clean-up day.
- You will need to ensure that the school has enough garbage drums. Punch holes in the bottom to prevent them from being stolen.
- Part of your clean up should be providing information on how and why to dispose of garbage properly.
Category 3: Establishing/Strengthening an Environment Club

Invite parents and community members to participate. Think about providing food and drink as picking up garbage is hot, thirsty, tiring work!

Consider transforming an old garbage dump into a garden. There is nothing more satisfying. You can also consider having some students paint the garbage drums with designs or environmental messages to make them attractive.

End your campus clean-up with a little celebration. Try to take photographs, showing “before” and "after". Make sure students wash their hands after they have finished picking up garbage and before eating and drinking.

BEACH CLEAN UP
This is more of a challenge than a campus clean-up because typically, many other people use our beaches.

- Start with a visit to the beach to assess the size of the problem.
- Where is the garbage coming from?
- Is it brought by those who use the beach? You will have to consider ways of educating them and involving them in your clean up.
- Is it washed up by the sea? This is a long-term international, public education issue, and the most you can do is probably pick up this kind of beach debris.
- Is the beach a working beach, such as a fishing beach? You will have to talk to the fishermen and vendors on the beach.
- Is there large-scale illegal dumping taking place? Rather than try to clean up such a beach, you might want to consider using the illegal dumping as your advocacy issue.

The cardinal rule about a beach clean-up is to speak to and involve those who use the beach.

If the beach clean-up seems manageable, proceed as with the campus clean-up.

- You will need garbage drums (preventing them from being stolen is a real challenge), garbage bags, gloves, gravel rakes (not fan rakes), and dust masks.

A beach clean-up is more of a challenge than a campus clean-up because typically, many other people use our beaches.
Category 3: Establishing/Strengthening an Environment Club

- Arrange for collection of the garbage from a reputable firm, such as the Parks and Markets organizations.

Consider joining one of the organized beach clean ups on International Coastal Clean-Up Day which is the third Saturday in September each year.

Again, involve parents and community leaders. Take photographs “before” and “after”. Celebrate your efforts!

GULLY CLEAN UPS
This is the most difficult of all clean ups because gullies are often not very accessible. Also, the type of garbage in a gully is often very noxious, and may not be possible for students to handle. (Dead dogs, for example.)

- Students can visit a gully, observe and record the health and other effects of disposal of garbage in gullies.
- A gully clean-up may be possible in a very small gully, or if your school has significant resources at its disposal.

However, gully clean-ups can be depressing because the next rain will almost certainly bring more garbage from another community. You can use this as an opportunity to raise awareness of waste disposal issues.

OPEN LAND CLEAN UPS
Often there are areas of open land in communities which are used as garbage dumps. You could plan your clean up in such an area.

- Collaborate with people who live in the area.
- Consider turning the land into a pocket park, something very simple with grass, a few trees and a bench or two. This is a very satisfying project to do, which could transform our communities without expending a lot of resources.

RIVER AND CANAL CLEAN UPS
Schools are sometimes located along river banks or canals. Again, study the river or canal to see what the problem is.

- Sometimes vendors are throwing waste into the river, sometimes households along the river are putting their sewage into the water, sometimes the waste is washed down into the river or canal from other sources.
- Because a river or canal is a moving source of water, it is not very easy to clean up, as more waste keeps arriving.

Consider a public education campaign for the people along the banks of the river or canal. Students can also clean up the river banks, if the garbage has washed high up.

Talk to community members about the consequences of washing clothes in rivers.

Some detergents contain phosphates which encourage plant growth in the river. This can lead to the river becoming choked with vegetation and the oxygen in the river being depleted. If this happens, fish and other forms of aquatic life will die.
Encourage people who wash in the river to collect water from the river in a wash basin and then throw the dirty water on plants away from the river.

Talk to community members about how pollution in the river affects everyone downstream.

For a canal, consider whether there is a health risk from stagnant water, mosquitoes, etc.

BACKGROUND INFORMATION LINKS
∞ How to take environmental action
∞ Action oriented environmental education
∞ How long does it take garbage to biodegrade?
∞ Environment and Health
OTHER ACTIVITY IDEAS

ENVIRONMENTAL AWARENESS DAY

Objectives:
Students will:
1. Showcase their work
2. Discuss environmental issues with other members of the school population, parents and community members

Schools are often experienced at having Open Days which can be done in a variety of ways. An Environmental Awareness (EA) day is like a mini expo where all the activities and displays will have an environmental theme. Clubs and classes can be asked to set up booths which will be toured by other students, teachers, administrative staff, ancillary staff, parents and community members. Displays on EA days can include posters, models, recycling displays, tours of the garden and nature walks, presentation of skits, songs, poems and drama. EA day can be scheduled for the day of the judge’s visit as well. Make sure that displays include things that parents and community members can do when they leave. Always explain why you are doing what you are doing to the visitors to your booths.

You could also ask a speaker from a local NGO or other environmental agency to be the guest speaker at the event.

ESSAY AND POETRY COMPETITION WITH AN ENVIRONMENTAL THEME

Objectives:
Students will:
1. Write about environmental issues
2. Inform the school community about environmental issues
3. Demonstrate creativity in making posters

Select the environmental theme and make posters announcing the poetry or essay competition. It would be a good idea to involve the Language Arts teacher. Develop the guidelines, such as the length of the entries. Decide on a deadline date for entries and prizes. Choose judges. Announce the competition at assembly.

After the winners have been selected, have a prize-giving ceremony at assembly. Have the winning entries read out. Submit the winning entries to a newspaper.
DEVELOP AND PERFORM ENVIRONMENTAL SKITS, SONGS, POETRY, DRAMA, AND DANCE

Objectives:
Students will:
1. Create audio-visual demonstrations on environmental issues
2. Inform the school and wider community about environmental issues
3. Present environmental issues in a way that is relevant and exciting to them

This is an activity that can work well with a drama or music club.

Have students pick the issue they want to highlight. Divide students into groups to do research and then report to the entire group.

Have the students write the dialogue for skits as well as the lyrics for songs and the poems. Poetry can be done in Language Arts classes. Consider having costumes, which could be made from waste material, such as paper, scandal bags, scraps of cloth, etc. Use music as much as possible.

It is best not to make your presentations too long. Remember, if your school goes through to regional and or national judging, the judges will only have one hour to see everything. Try to keep presentations for the judges under 20 minutes. Presentations can also be performed at assembly or open days.

This activity can be infused into the following area of the ROSE curriculum

Grade 7 Science
Unit 3: Living Things and How They Reproduce
3.1 Gross Structure of Flowering Plants
Specific objectives
Students should be able to:
6. Suggest ways in which plants are important to the environment
Suggested student activity
3. Following a discussion on the importance of plants to the environment and various industrial sectors, ask students to write a poem, song or essay on this topic
BEE KEEPING IN COLLABORATION WITH A 4H CLUB OR AGRICULTURAL PROGRAMME

Objectives:
Students will:
1. Explain the importance of bees
2. Set up bee hives to generate income for the school
3. Plan and implement an income generating programme

For information on bee-keeping contact Decton Hylton at International School of Jamaica or the Jamaica Bee Keepers Association

This activity can be infused into the following area of the CXC syllabus

CXC Agricultural Science
Section 5 Animal Science
Knowledge objectives
The student will be able to:
30. State the function of each type of bee in a hive
31. Explain the factors to be considered in selecting a suitable site for a hive
32. Describe the process of honey production—wax, bee-bread and royal jelly

Class (Page 32)
L. Apiculture
(ii) importance of bees to agriculture
(iii) siting of hive
(iv) structure and function of parts of the hive
(v) honey, wax, bee-bread and royal jelly production
(vi) foraging, storage, honey flow and extraction
ORGANISE A TRASH-A-THON

Objectives:
Students will:
1. Organise and implement a fundraising activity for the school or environment club
2. Clean up an area
3. Explain/Discuss why garbage is a community issue

Select the area to be cleaned up. It could be on the campus or in the community. Decide how the amount of trash collected is to be measured. An easy way is number of garbage bags. Make up sponsorship sheets and give to students who will seek sponsors for the number of garbage bags they fill.

Schools could increase the amount of money earned from the activity by sending the (PET) bottles collected for recycling

BACKGROUND INFORMATION LINKS
∞ How to take environmental action
∞ Valuing trash to secure cash

ORGANIZE AN ENVIRONMENTAL FIELD TRIP

Objectives:
Students will:
1. Identify and describe an on-the-ground environmental problem
2. Explain the effects of the environmental problem
3. Plan and undertake a field trip to get an up close look at the problem
4. Identify and explain actions that they can take to address the problem

Plan where your field trip will take place. Some suggestions:
• A local garbage dump
• A local industry that is causing an environmental problem
• A local protected area, river, wetland, forest, beach
• Mason River Reserve, Clarendon (Contact the Institute of Jamaica)
• Montego Bay Marine Park (Contact Montego Bay Marine Park)
• Negril Marine Park (Contact Negril Coral Reef Preservation Society)
• Blue and John Crow Mountains (contact Jamaica Conservation and Development Trust-JCDT)
• Hollywell and Oatley Mountain Trail (contact JCDT)
• Rio Grande Valley Hikes (contact Valley Hikes)

This list is not exhaustive.
Category 3: Establishing/Strengthening an Environment Club

DEVELOP AN ENVIRONMENTAL PLEDGE FOR THE SCHOOL

Objectives:
Students will:
1. Identify the elements of good environmental citizenship
2. Inform the wider school community about environmental issues
3. Identify methods of gaining the commitment of students and teachers in the school to be good environmental citizens

Decide what elements are to go into the pledge.
• How do people affect the environment?
• How can they make their effects on the environment less harmful?
• Divide the pledge into commitments from students, teachers and parents.
• Ask students to write the kind of pledge they would like and then pick the best one, or you may combine elements of more than one.

Get the pledge typed on a computer, or put on posters. Encourage teachers, students and parents to sign it. Ask that the environmental pledge be read at assembly.
CATEGORY 4
ENVIRONMENTAL RESEARCH
Objective: To provide students with opportunities to learn about environmental issues relevant to Jamaica, particularly local issues. To introduce students to the techniques of conducting research.

Students must develop an understanding of the nature of the problem and identify environmental and health risks. They must establish whether the harmful consequences occur in the short or long term. They must consider effective alternatives, identify obstacles to implementing successful solutions, and suggest ways in which these obstacles can be overcome.

It would be a good idea for CXC students to infuse their SEP research with their School Based Assessment projects where possible.

CASE STUDY: GLENMUIR HIGH SCHOOL

Carlington Burrell, a lower sixth form student at Glenmuir High School in Clarendon carried out experiments to test the effectiveness of amber in plants as a natural pesticide.

He had noticed that all the trees around his yard, except the grapefruit tree, were infected with duck ants and decided to find out why this was so.

He used the sap from the grapefruit tree to set up experiments.

He placed some of the duck ants in water only and some in a solution of water and amber. He noticed that those placed in water only died in twenty minutes. In contrast, those placed in the amber solution died within five minutes.

On making this observation he decided to take the experiment further.

He coated a piece of wood with the amber solution and placed it in the area where the duck ants were, along with a piece of uncoated wood.

The coated wood was not eaten by duck ants whereas the uncoated wood was. He also noted that there were dead duck ants around the coated wood.

Carlington concluded that amber is toxic to duck ants and can therefore be used as a natural pesticide.
Ecological communities are dynamic and display complex relationships. The complexity results from the interactions between plants, animals and their physical surroundings (both living and non-living). All these interactions ultimately flow from the energy captured from the sun by green plants during the process of photosynthesis.

Your ecosystem study could take place on the school grounds or you can take a field trip to a marine or forested area. An example of a study is given below (Marine-coastal habitat) to assist teachers.

As far as possible, plants and animals should be studied in their natural habitat. Never uproot plants and only collect specimens which live in places where they cannot be studied. Never collect more than one of each species, and if possible, return them to the place where you found them when the study is complete.

It is easiest to do your research using a line or belt transect. Students can be divided into groups of four. Two students could be responsible for placing the line transect, one can be the recorder and one can collect specimens.

Places that you can place your line transect are:
- Down the banks of a stream or pond to show the transition from land to freshwater.
- From the upper seashore down to low tide level seashores to show transition into sea water.
- From a shaded to an unshaded area
- Across a path to show the effects of trampling.

Factors to note:
- How plants are adapted to live in wet, dry, windy, sheltered, shaded or unshaded habitats.
- Does animal life change as vegetation changes? If so, why?
- Plant-animal interactions.
- Plant-plant interactions.
- What plant and animal species are most abundant.
- What type of ground cover is present in the different areas.
- How does the ground slope? Could this be important?
- Did you observe any predators? Prey?
- What defense mechanisms do prey have?

INVESTIGATING A MARINE (COASTAL) HABITAT
- Make the arrangements to visit your chosen habitat. Arrange the timing of your visit so that you arrive when the tide is out as the animals will be exposed.
- Describe the habitat, include in your description the slope and the type of materials which make up the habitat.
Category 4: Environmental Research

- Make note of any variations in the surface, e.g. crab holes, rock pools, algal covering on rocks, plants
- Use a ground string as a line transect and identify the plants and animals that fall along the transect.
- Observe the organisms along the transect and make notes of their activities.
- Collect organisms for further investigation. Some creatures may sting, so be careful in deciding which ones to collect.
- Use your findings to map the ecosystem you have studied and to describe the key relationships and adaptations.

This activity can be infused into the following area of the CXC syllabus

**CXC Biology**

**Section E  Environment and Human Activities**

**General objectives**

Students should demonstrate:
1. Understanding of the importance of the physical environment to living organisms
2. Ability to undertake a simple ecological study

**Specific objectives**

Students should be able to:
1.2 Discuss the importance of the physical environment to living organisms

**Content/explanatory notes (Page 31)**

Consider terrestrial and aquatic habitats; importance of soil in providing water, mineral nutrients and oxygen. Importance of air in providing various raw materials, oxygen, carbon dioxide, nitrogen. Role of microorganisms

2.1 carry out a simple ecological study

**Content/explanatory notes (Page 31)**

Habitats may include a tree, wall or small pond

2.2 Choose the most appropriate sampling methods for a particular study

**Content/explanatory notes (Page 31)**

Consider the use of quadrats, transects, bottles, jars, nets

**BACKGROUND INFORMATION LINKS**

- Birds of J amaica
- Backyard naturalist
- Everything in life is connected (the web of life)
Students’ research could focus on the following:-

• Researching one endangered Jamaican animal, such as the coney, swallowtail butterfly, or manatee.
• Observing birds and animals around the school, and recording their habitats, their habits, food sources, predators, and what it is that threatens them.

• Choosing an endangered animal for your school to “adopt” and learn everything you can about it.
• Researching the importance of habitats to the survival of this animal, the reasons for the destruction of the habitats and possible solutions.
• Designing an educational campaign to persuade other people to protect this animal.

BACKGROUND INFORMATION LINKS
∞ Birds of Jamaica
∞ Notes on the Natural History of Jamaica
ENVIRONMENTAL EFFECTS OF FOSSIL FUEL BASED ENERGY

Objectives:
Students will:
1. State what are fossil fuels
2. Explain the importance of fossil fuels in development
3. Identify and explain the environmental costs of using them
4. Identify ways the environmental effects can be reduced
5. Describe the relationship between fossil fuel use and climate change

Students' research should focus on the following:-

• What fossil fuels are.
• How and when they were created.
• How we use them as fuel.
• Which ones we use in Jamaica.
• What the environmental effects are on air, water, soil, the sea and humans.
• How harmful environmental effects can be prevented.
• Which harmful environmental effects are being experienced in Jamaica.
• The links between fossil fuel use and climate change.
• Recommendations for solutions.

ALTERNATIVE SOURCES OF ENERGY

Objectives:
Students will:
1. Define the term "alternative energy"
2. Explain its importance to a developing country such as Jamaica and to the world
3. Describe the environmental benefits of alternative sources of energy as well as the disadvantages

Students' research should focus on the following:-

• Sources of energy (renewable and non-renewable).
• What is meant by alternative sources of energy.
• Places in Jamaica where wind and solar energy are being used.
• Benefits of using wind and solar energy.
• Advantages and disadvantages of using current sources of energy such as fossil fuels and charcoal.
• Ways in which Jamaica could use more alternative sources of energy.
Category 4: Environmental Research

This activity can be infused into the following areas of the ROSE curriculum

Grade 7 Science
Unit 5: Energy
5.1 Forms of Energy and Energy Conversions
Specific objectives
Students should be able to:
1. State what is meant by energy
Describe complex systems in which energy conversions occur, e.g. windmill, waterwheel, biogas generator and electricity generator (fuel fired, solar or running water)
6. Distinguish between different types of energy sources and classify these as renewable and non-renewable
Suggested student activities (Page 56)
5. Have students classify a given list of energy sources as renewable and non-renewable following a discussion on the terms: renewable and non-renewable

5.2 The Sun as the Source of Energy
Specific objectives
Students should be able to:
1. List and discuss some other uses of the sun's energy
Suggested student activities
1. Make a collage to illustrate some uses of solar energy, for example, a solar water heating panel on a roof and drying coffee, fish or tobacco and make suitable notes
Science and technology project:
Make a model to demonstrate a use of solar energy, e.g. for heating, drying, cooking. Try to design a biogas generator for your school and make a proposal to your principal
Category 4: Environmental Research

ENERGY CONSERVATION

Objective:
Students will:
1. Discuss why it is important to conserve energy and how energy conservation can be done

Students’ research should focus on the following:

- What is energy?
- Sources of energy (renewable and non-renewable).
- Why energy conservation is important.

- The situation in Jamaica, attitudes to energy.
- How energy can be conserved.
- Research could be divided into the home, school and business.
- Students could do research on how proper building design can reduce demand for energy.

BACKGROUND INFORMATION LINKS
∞ Booklet: Energy, Water and the Environment

- Turn lights off when not in use
- Replace incandescent light bulbs with fluorescent bulbs
- Install low-flow shower heads
- Plan trips wisely—conserve on gas
This activity can be infused into the following areas of the ROSE curriculum

**Grade 7 Science**

**Unit 5: Energy**

**5.4 Energy Conservation in the Home and Community**

**Specific objective**

Students should be able to identify several ways in which energy use can be reduced in the home, e.g. in the kitchen, and bathroom.

**Suggested student activities (Page 60)**

2. Engage students in a discussion on the energy savings that could be made by more efficient use of appliances related to cooking, washing, ironing, lighting and cooling. Allow students to record the main ideas in their notebooks.

3. Working in groups, challenge students to produce an advertisement for television or radio promoting energy savings in the home.

4. Encourage students to log individual activities at home for a week to indicate if they are practising responsible energy conservation measures, e.g. turning off lights, reducing unnecessary opening of the refrigerator.

**Grade 8 Resource and Technology**

**Module: Industrial Techniques**

**General objective 1** Exploring and utilizing resources

1.1 (Page 206)

**Topics/Content outline**

E Energy

(iii) Energy conservation

**Expected outcomes and skills**

- Identifying ways of conserving energy

**Suggested activity**

- Research conservation measures
Two options are given for conducting this research. The option chosen should depend on the age level of students.

Option 1 is geared towards grades 7 to 9
Option 2 is geared towards CXC students. The information can be used when conducting a School Based Assessment project

OPTION 1 — Grades 7-9
Students' research should focus on the following:-

• the importance of trees
• the relationship between trees and rainfall patterns and the importance of trees to climate, watershed protection and animals
• the causes and consequences of deforestation
• possible solutions
• steps to improve the situation in Jamaica

OPTION 2 — Grades 10-11

For this option students will conduct their deforestation research by means of a field study.

PRE FIELDWORK
Teachers should ideally visit the location/s before taking the students there or at least have sound knowledge of the location. A field work book must be prepared to give students a guideline to follow. Where students are conducting non-guided research, the teacher should help by giving guidelines for conducting as to how to carry out effective field work.

PROBLEM
Deforestation

POSSIBLE LOCATIONS:
Manchester: Christiana Bottom, Spalding
Clarendon: Mocho
St. Catherine: Troja, Sligoville
St. Andrew: Jack's Hill, Craig Hill, Content Gap, Guava Ridge, Lawrence Tavern
St. Thomas: Sea Forth, Airy Castle, Beacon Hill, Cedar Valley
Portland: Bangor Ridge, Shirley Castle
St. Mary: Heywood Hall, Gayle, Highgate, Richmond, Hamstead
St. James: Mount Hareb, Cambridge
St. Elizabeth: Aberdeen, Maggoty, Thorton
CHOOSING A TITLE
The title should identify a problem and ideally be posed as a question. Students’ research should seek to answer the question in order to solve the problem.

Possible Titles for Deforestation
1. What factors have contributed to the removal of the natural vegetation in Content Gap, St. Andrew (or an area of your choice or from list)?
2. Why do the people of Guava Ridge, St. Andrew continually clear forest vegetation (or an area of your choice or from list)?
3. What are the effects of deforestation in Heywood Hall, St. Mary (or an area of your choice or from list)?
4. What effect will the removal of the natural vegetation from areas around the Hunts Bay and surrounding swamps have on the environment (or an area of your choice or from list)?
5. What role does the natural vegetation play in the climatic and ecological balance of the Hollywell Recreational Area?

Students should be encouraged to research the topic, choose a title question and study the map extract before embarking on the field trip. Knowledge of the area and subject matter will make investigation and analysis easier.

FIELDWORK
Students will need the following: Ordinance survey (OS) map of area (usually may be had from the Survey Department), tape measure (for marking a transect), sketchpad or worksheet, camera, questionnaire (a set of guided questions).

Mark the transect by measuring about 100 metres (may be less but not less than 50 metres). This will represent a sample of the entire area, which may be several kilometers wide. In the field workbook students will fill in the following: name of trees within transect, distance apart, size of each tree, classification of tree.

The table in the workbook should give students a guideline for classifying trees. The table will be used to help present the data. It supports students’ evidence on what was observed and forms the basis for interpretation or analysis.

The questionnaire should not be too long and should investigate issues such as: local use of forest wood, land use, conservation methods and history of area. Locals will be able to give a description of the area (try to find out if the area changed over the past 10 years).

Students should observe and note activities such as land use and sudden changes in consistency of tree density within and around the transect.

TABLE OF CLASSIFICATION

<table>
<thead>
<tr>
<th>Point on transect</th>
<th>Distance apart</th>
<th>Name of tree</th>
<th>Size (height x width)</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. A</td>
<td>10 M</td>
<td>Caliandra</td>
<td>1 M x .3 M</td>
<td>Calothyrsus</td>
</tr>
</tbody>
</table>
Note dominant tree if any.

Take pictures and sketch an outline of the area.

Other agencies that may provide information (secondary data):
Forestry Department
Rural Agricultural Development Agency (RADA)
National Environment and Planning Agency (NEPA)

POST-FIELDWORK—OUTLINE OF STUDY
1. Table of Contents: The table of contents could have a particular layout based upon the SBA mark scheme and required work.

2. State Aim: An example of an aim corresponding to the title could be "To identify and describe the effects of deforestation in Heywood Hall, St. Mary.

3. Method of data Collection: Clearly state the date the area of study was visited and location visited, (using map references under the location of data section). The location should be clearly described with reference to parish, geographical features such as drainage, landforms, height above sea level and distance from nearest urban and rural settlements. Give compass direction where appropriate. State clearly how the data was collected. Data should be collected using at least two different methods of investigation (excluding observation). Doing and environmental research such as deforestation lends itself to mapping, measuring, interviewing and use of a questionnaire. Students are required to state clearly how they used these methods to gather the information needed for interpretation.

4. Location of data: This should have two or three scaled maps showing the study area. Map 1 can be a map of Jamaica showing the study area in relation to the rest of the island. The map may show forests of Jamaica and parishes. Map 2 should be a parish map showing the study area in relation to the rest of the parish. It should show features such as rivers, main towns and communities in the study area, roads, forested areas and major landmarks. The study area must be clearly marked and placed in key. Map 3 may be a scaled or sketch map of the actual study area or community in which the study area is located.

5. Presentation and Interpretation of Data: The information collected (both primary and secondary data) goes here. First define the general topic and show the relationship to the location of study. In presenting and interpreting the data, keep the aim of the title in mind. The reader should be able to follow and see your aim. For example, state the causes identified and present the information gathered. Describe each cause identified, using illustrations. Draw a scaled diagram transect. Interpret this by showing the relationship between the diagram and what the area should be like, given the characteristic nature of Jamaican forests. Use graphs and tables to describe land use and uses of lumber and show how these activities cause deforestation. Draw diagrams to illustrate effects. Where photographs are used they must be listed as plates, properly explained and integrated or referred to in the text. Use secondary information from textbooks and agencies to help to interpret data.
6. **Conclusion:** The conclusion must relate to the aim and provide an answer to the question asked in the title. For example, in a study on "What are the causes of deforestation (in a named area)?", a statement of conclusion on the main causes of deforestation mentioned in the study must be made. Students at this point may give their opinion and make suggestions for improving or solving the problem.

7. **Bibliography:** A list of all written and electronic information (web sites/URL) used. Books must be listed in alphabetic order of authors’ names, followed by magazine and newspaper articles and URL. Place dates after authors’ names followed by the name of the book. Underline titles of books and articles followed by the name of the publication. There are several ways of writing a bibliography. One commonly used style is the MLA method:


8. **Appendix:** Copies of any worksheet, questionnaire, interview or tally sheet may be put here.

**FOLLOW-UP ACTIVITY**

Students should consider sharing their findings with the local community. Community members should be made aware of the consequences of deforestation, especially possible local issues. Organise a workday for planting trees in the area and include community members in this activity. Plans must be put in place for caring for the young trees or they may die.
This activity can be infused into the following areas of the ROSE curriculum and CXC syllabuses

**Grade 8 Social studies**

**Unit 1: Jamaica: Physical Resources**

**Subtopic B: Climate and Vegetation**

**Specific learning outcomes**

**Knowledge**

Students should be able to:

5. Describe how human activity has modified the natural vegetation cover in specific areas in Jamaica

**Attitude**

Students should:

1. Appreciate what they need to do to protect the environment

**Content**

4. Vegetation types associated with different physical regions in Jamaica

5. Changes and disasters brought about in the Jamaican physical environment through natural causes and the activities of man

6. Preventative relief measures and institutions to cope with natural disaster and environmental degradation

**Advanced learning activity (Page 65)**

Conduct research in an area close to the school on how human activity has led to or has worsened the effects of a natural disaster

**Grade 8 Resource and Technology**

**Module: Agriculture and the Environment**

**General objective 4**  Protecting and conserving resources in the environment

4.2 (Page 55)

**Topic/Content outline**

Conservation of forests

(a) watershed protection

(b) Habitat for wildlife

(c) Soil conservation

(d) Food production

(e) Timber production

**Expected outcomes and skills**

Students should:

- Develop an appreciation of the benefits of preserving forests
- Understand the importance of forests in maintaining ecological balance
- Know some common forest trees and their main uses

**Suggested activities**

- Research trees in the community and their various uses
- Develop plans for reducing the cutting of trees in the community
Grade 9 Science

Unit 18: More About the Earth’s Resources

18.3 Forests and Wildlife and Their Conservation

Specific objectives
Students should be able to:
2. Explain the interdependence of forests and wildlife
3. Explain the importance of forests in maintaining watersheds
4. Explain the importance of preserving the indigenous species of plants and animals

Suggested student activities (Page 184):

Foundation
(2) Make a poster/chart showing the forest types and where they are found in Jamaica—dry limestone, wet limestone, lower montane, tropical/Caribbean rain forest and also pictures/diagrams showing some of the wildlife in each type of forest
(3) Discuss in small groups and report on why it is important to preserve the forests and the wildlife. If a film is available it would be good to show it also
(4) Identify some of the indigenous species found in Jamaica and give reasons why they should be conserved
(5) List conservation practices which help to preserve forests and their wildlife

Normative
Do research on protected forests in Jamaica and report to the class on the practices being carried out in these cases

CXC Geography

3. Biotic System

Content (Page 13)

Vegetation types:
(a) Forests: Equatorial, coniferous

Specific objectives
The student should be able to:
3.12 Name the types of natural vegetation found in the Caribbean and account for the variety
3.13 Explain why the natural vegetation has been removed from one area in the Caribbean
3.14 Describe and explain the effects on the environment of the removal of the natural vegetation from the Caribbean area chosen in 3.13
3.15 Describe methods of conserving the natural vegetation in one area in the Caribbean
Students' research should focus on the following:

- The processes at each stage of the water cycle.
- Sources of fresh water and the percentage of fresh water on earth.
- The importance of ground water.
- The importance of the water cycle and the importance of trees to rainfall.
- Different uses of water and the importance of water conservation.
- How water is polluted and the effects of pollution on humans and other life forms.
- Fresh water supply issues in Jamaica.
- Possible solutions to water issues.

Objectives:

Students will:
1. Illustrate the water cycle
2. State how water can be wasted and/or polluted
3. State ways in which water can be conserved
4. Describe the water supply situation in Jamaica
5. Identify solutions to water problems

This activity can be infused into the following area of the ROSE curriculum

Grade 8 Science

Unit 12: The Resources—Air and Water

12.4 Conservation of Water

Specific objective

Students should list ways in which water can be conserved in the environment

Suggested student activities (Page 124)

1. Show students pictures of arid areas. Recall everyday uses of water and talk about how the lack of it could affect us
2. Discuss what could happen if water ran out in an area which now has enough of it
3. Talk about and record ways in which we could conserve water in the home and in the wider environment
4. Make a poster telling how to conserve water
SOIL EROSION

Objectives:

Students will:

1. Describe ways in which soils are formed
2. Explain the importance of soil and soil conservation
3. Identify and describe the different types of soil
4. Explain the causes and effects of soil erosion
5. Describe the situation in Jamaica
6. Identify and explain the solutions to soil erosion

- The importance of soil.
- The types of soil, how they are formed and which ones are easily eroded.
- The types of soil in Jamaica.
- The causes of erosion.
- The agents of erosion.
- Different types of erosion.
- How soil erosion can be prevented.
- Places in Jamaica where soil erosion is happening.

Students' research should focus on the following:-

BACKGROUND INFORMATION LINKS

∞ Forest connections—the forest in your classroom—Soil Protection
∞ Notes on the Natural History of Jamaica—Soil Protection

This activity can be infused into the following areas of the ROSE curriculum and CXC syllabuses

Grade 9 Science

Unit 18: More About the Earth's Resources

18.2 Soil and Soil Conservation

Specific objectives

Students should:

2. Describe ways in which soil is lost
3. List the ways in which soil may be conserved
4. Explain the importance of conserving soil

Suggested student activities (Page 182)

4. Provide groups of students with literature on different aspects of soil erosion. Have them list all the agents of erosion and say how they erode soil. Discuss erosion as a soil-forming process

6. Discuss soil as a non-renewable resource. Explain why soil should be conserved. Compare this with rocks and minerals. Let students come up with the fact that soil should be conserved because it is formed from rocks and minerals which are non-renewable
**CXC Geography**

3. Biotic System

Content (Page 13)

Soils:
(a) Characteristics
(d) Erosion and conservation

Specific objectives

The student should be able to:
3.1 Define soils and describe the main components
3.6 Name and locate one area in the Caribbean where soil erosion is a problem
3.7 Describe and explain the causes of soil erosion in the Caribbean
3.8 Describe the methods of soil conservation used in the area identified in 3.6

**CXC Agricultural Science**

Section 3 Soil Science

Knowledge objectives

The student will be able to:
13. Explain the causes and effects of water loss and soil erosion
16. Explain the role of forests in soil and water management

Class (Pages 16-17)

D 1 Causes and effects of soil erosion: water, wind, etc.
   Effects of burning
D 2 Erosion control measures:
   Tillage, vegetative, mechanical (contours, terracing, gully control, water control)
AIR, LAND AND WATER POLLUTION

Objectives:
Students will:
1. Identify the different forms of air, land and water pollution
2. State how they affect people
3. Describe the solutions to pollution
4. Describe the situation in Jamaica

Students’ research should focus on the following:
- The major causes of pollution of land, freshwater, air, and oceans, both in general and in Jamaica.
- The impact of pollution on humans and other life forms.
- Possible solutions.
- Obstacles to solutions.
- Possible ways of overcoming these obstacles.

BACKGROUND INFORMATION LINKS
∞ The water game
∞ Environment and Health
∞ Everything is connected (the web of life)
This activity can be infused into the following areas of the ROSE curriculum and CXC syllabuses

**Grade 8 Science**

**Unit 12  The Resources—Air and Water**

**12.5 Water and Air Pollution**

**Specific objectives**

Students should be able to:

1. List ways in which man's activities contribute to the pollution of water and air
2. State the ways in which pollution of water and air can be minimised

**Suggested student activities (Page 127)**

1. Brainstorm ways in which the atmosphere and water may be polluted. List ideas on the board. Add any important ones which are left out. Have students record the information in their books
2. Talk about the consequences of each type of pollution
3. Try an air pollution investigation using an air particles collector (cardboard smeared with vaseline suspended outside)
4. Make charts on how smog or acid rain is produced
5. Discuss ways in which pollution may be reduced
6. Have students write an essay or poem on water or air pollution
7. Have students make a game on pollution

**Science & technology project**

Identify a source of pollution in the environment. Plan and design some method of controlling the pollution and try it out

**Grade 8 Resource and Technology**

**Module:  Home and Family**

4.3 (Page 174)

**Topics/Content outline**

Effects of pollution on the environment
(a) Improper disposal of garbage
   (i) homes (ii) factories
(b) burning of trees and garbage
(c) washing in rivers and streams
(d) improper disposal of insecticides/chemicals and aerosol cans

**Expected outcomes and skills**

-Consider alternatives which will act as solutions towards preserving the environment

**Suggested activities**

-Group work and reporting on the effects of improper garbage disposal
CXC Chemistry

Section B.2 Inorganic Chemistry

Impact of Metals and Non-metals on Living Systems

Specific objectives and contents/explanatory notes

Students should be able to:

8.3 Discuss the harmful effects of non-metal and metal compounds on living systems in the environment

Content/Explanatory notes (Page 40)

Pollution and the role played by sulphur dioxide, carbon monoxide, hydrogen sulphide, oxide of nitrogen, carbon dioxide, chlorofluoro carbons, lead compounds from car exhaust fumes, soaps and soapless detergents.

Section C 2 Chemistry in the Environment

Pollutants

Specific objectives and contents/explanatory notes

Students should be able to:

3.1 Define the term environment

Content/explanatory notes (page 49)

Conceptualize in terms of both physical and biotic factors

3.2 Define the terms pollution and pollutant

3.3 Identify common sources of pollution

3.4 Relate pollutants to their sources

Content/explanatory notes (Page 50)

1. Carbon dioxide from complete combustion of fossil fuel
2. Carbon monoxide from incomplete combustion of fossil fuel
3. Oxides of nitrogen from car exhaust fumes
4. Carbon particles from burning fossil fuels
5. Lead from batteries
6. Lead compounds in car exhaust fumes
7. CFCs from aerosol sprays and refrigerants
8. Nitrates and phosphates from fertilizers
9. Pesticides and herbicides

3.5 Describe the effects of pollutants on the environment

Content/explanatory notes (Page 51)

Carbon dioxide, carbon monoxide, oxides of nitrogen (acid rain), lead.

4.11 Discuss the use of pesticide sprays in the home

Content/explanatory notes (Page 54)

Advantages and disadvantages. Exploration of the use of relatively harmless methods of pest control
**CXC Biology**

**Section E  Environment and Human Activities**

*General objective*

Students should demonstrate an:

5. Understanding of the effects of human activities on the environment

*Specific Objectives*

Students should be able to:

5.1 Discuss the negative impact of human activities on the environment

*Content/explanatory notes (Page 32)*

Consider pollution by agricultural practices such as the use of chemical fertilizers, products of industrialisation and improper garbage disposal

5.2 Discuss the implications of pollution of marine and wetland environments

*Content/explanatory notes (Page 32)*

Refer specifically to small island states

5.3 Discuss means by which the environment could be preserved and restored

*Content/explanatory notes (Page 32)*

Consider effects of changes in practice. For example, use of natural fertilizers in agriculture, conservation methods, education and monitoring strategies

**CXC Social Studies**

**Section B  Development and Use of Resources**

*Specific objective*

The student should be able to:

12. Relate the abuse of physical resources to pollution

*Content (Page 16)*

10. Environment as a resource

(a) Pollution of the environment—land, water, air, noise

**CXC Geography**

5. Industrial System

*Content (Page 15)*

Environmental pollution

*Specific objective*

The student should be able to:

5.8 Identify and describe the causes and effects of and possible solutions to industrial pollution
CORAL REEFS

Objectives:

Students will:
1. Explain the importance of coral reefs
2. Identify the location of coral reefs in Jamaica
3. Identify the threats to our coral reefs
4. Explain the results of destruction of coral reefs
5. Describe the situation in Jamaica
6. Identify the ways in which coral reefs can be protected

Students' research could focus on the following:

- What reefs are and how they are formed.
- Name, locate and describe the types of coral reefs found in Jamaica.
- Why they are important. For example, their roles as homes for fish, feeding grounds for other fish, protection from storms, medical uses and tourism.
- The threats to coral reefs. For example, oil spills, heat pollution, coastal development, soil erosion, improper fishing practices and untreated sewage.
- The status of Jamaica's reefs.
- How coral reefs can be protected.
- A threatened coral reef in Jamaica.

This activity can be infused into the following areas of the ROSE curriculum and CXC syllabuses

Grade 8 Social Studies
Unit 3: Using Our Resources and Related Environmental Matters
Subtopic B: Fishing

Specific learning outcomes

Knowledge
Students should be able to:
2. Describe the conditions which contribute to rich marine life
4. Discuss the exploitation and destruction of marine life and steps that must be taken to alleviate these
5. Discuss a practice inimical to the fishing industry

Attitude
Students should:
2. Show commitment to the preservation of the marine environment

Content
4. Methods of fishing
5. Factors affecting fishing and the main fishing grounds
8. Problems of pollution of rivers and seas
9. Methods of conservation practised

Learning activities (Page 76)
(6) Preparing posters for public displays which publicize important conservation rules, e.g. closed seasons, limit on size of fish caught, use of chemicals, spear guns, dynamite

100
Category 4: Environmental Research

Advanced learning activity
2. Writing articles to the newspaper protesting a practice inimical to the fishing industry which is taking place in the district/parish

CXC Geography
1 Geomorphic System
Content (Page 9)
Coral reefs
Specific objectives
The student should be able to:
1.26 Name, locate and describe the types of coral reefs found within the Caribbean
1.27 Describe the conditions necessary for successful coral reef formation
1.28 Identify and describe the causes and effects of and the possible solutions to coastal pollution
Students may use either of the following options for conducting their research.

**OPTION 1 — Grades 7-9**
Students' research should focus on the following:
- Uses of fresh water.
- Estimate of the level of demand for freshwater in Jamaica.
- The percentage of fresh water on earth.
- Estimate of the supply of fresh water in Jamaica and factors which affect the stability of supply.
- How surface and ground water are polluted.
- The effects of pollution of fresh water resources.
- Methods that can be used to overcome the problem of pollution of fresh water resources.
- Obstacles to the solutions.
- How these obstacles can be overcome.

**OPTION 2 — Grades 10-11**
This option will be useful for students conducting School Based Assessment projects.

**PRE FIELDWORK**
See guidelines under the Deforestation research. Teachers must remember that large bodies of water may pose a danger to students, so plans should be made for their safety.

**PROBLEM: Water pollution**

**POSSIBLE LOCATIONS**
These are some possible fieldwork sites. However, teachers and students should seek to identify problems of water pollution in their local environment.

- **Manchester:** Alligator Pond fishing beach
- **Clarendon:** Rocky Point fishing village
  Portland Bight
- **St. Catherine:** Rio Cobre (Bog Walk)
  Dawkins Pond
- **Kingston:** Kingston Harbour
- **St. Thomas:** Hector's River
  Holland Bay Beach
  Yallahs Pond
- **St. Ann:** Ocho Rios Bay
  Pear Tree
  White River
- **Westmoreland:** Negril
  Blue Fields Bay
- **Hanover:** Orange Cove
  Samuel Bay
- **St. Andrew:** Hope River (Kintyre)
  Hog Hole (Gordon Town)
- **St. Mary:** Otramar River (Port Maria)
  Pagee Beach
  Wag Water-mouth
  (Annotto Bay)
- **St. James:** Montego River
CHOOSING A TITLE
The title should identify a problem and ideally be posed as a question in order to solve the problem.
Possible titles:
1. What factors have contributed to the pollution of the Kingston Harbour?
2. What negative effects will dredging and land reclamation activities in the Kingston Harbour have on sections of the surrounding environment?
3. What are the effects of rapid tourism development on a section of the Negril coastline?
4. What effect is tourism having on coral reefs in Ocho Rios?
5. How are people in Maggotty, St. Elizabeth using the nearby Maggotty River?

Students should be encouraged to research the topic, choose a title question and study a map extract before embarking on their field trip. Knowledge of the area and subject matter makes investigation analysis easier.

FIELDWORK
Students will need the following: Ordinance-Survey (OS) map of the area (these can usually be had from the Survey Department), tape measure for making a transect, bottles for water samples, thermometer, sketch pad, worksheet, camera, questionnaire and tally sheet for solid waste count.

Mark a transect by measuring about 100 metres (may be less but not less than 50 metres). This will represent your sample of the area. A field workbook may be used to collect data. A table of measurements of water quality is to be used. Possible headings for your table are: temperature, turbidity, faecal coliform, nitrates, phosphates, solid waste and life forms. The table will be used to help present the data.

Your questionnaire should not be too long and should be used to investigate issues such as local use of the river/beach/pond, waste disposal and clean-up attempts. Observe and note activities such as land use, sudden changes in water colour, turbidity and temperature. These factors can help you to determine the level of pollution.

POST FIELDWORK
Use the post fieldwork guidelines provided for the deforestation research to present your research.

FOLLOW-UP ACTIVITIES
It would be a good idea share your findings with the community. Make sure to highlight the environmental and health effects of the types of pollutants found in the water. Organise a clean-up with members of the community.

You could also write letters to the agencies responsible for water quality, e.g. the National Environment and Planning Agency (NEPA), the Parish Council for the area or the Public Health Department to share your findings with them and to request that action be taken to solve the problem.
This activity can be infused into the following area of the CXC syllabus

**CXC Geography**

1 Geomorphic System

**Content (page 9)**

- Surface water and underground water

**Specific objectives**

1.14 Describe and explain the relationship between surface water and underground water within the hydrological cycle

1.16 Describe the value of underground water as a direct source of water supply and locate areas in the Caribbean where underground water is utilised

1.17 Describe and explain ways in which surface and underground water are polluted and the methods used to preserve the quality and supply with specific reference to the Caribbean
Students' research should focus on the following:

- What wetlands are and where they are found.
- Why they are important, e.g. their roles as land builders, land protectors, nurseries for marine life and habitat for birds.
- The threats to wetlands, particularly in Jamaica.
- How wetlands can be protected.
- Reference to a threatened wetland in Jamaica.
- Field trip to a wetland to study its features and ecosystem.

**Objectives:**

**Students will:**

1. Explain the importance of wetlands
2. Identify the location of major wetland areas in Jamaica
3. Identify threats to wetlands
4. Explain the results of wetland destruction
5. Describe the situation in Jamaica
6. Identify ways wetlands can be protected

This activity can be infused into the following area of the ROSE curriculum

**Grade 8 Social Studies**

**Unit 1: Jamaica: Physical Resources**

**Subtopic B: Climate and Vegetation**

Specific Learning Outcomes

Knowledge

Students should be able to:

4. Describe how climate and physical features interact to determine the natural vegetation cover

Content

4. Vegetation types associated with different physical regions of Jamaica
6. Preventative relief measures and institutions to cope with natural disaster and environmental degradation
Category 4: Environmental Research

**BIODIVERSITY**

**Objectives:**
**Students will:**
1. Define the term “Biological Diversity”
2. Explain the importance of biodiversity
3. Describe the situation in Jamaica
4. Explain how loss of biodiversity affects humans
5. State how biodiversity can be protected

Students’ research should focus on the following:

- What is meant by the term “biological diversity”.
- Importance of biodiversity to maintaining ecological balance.
- Examples of how protection of biodiversity benefits humans.
- Places where biodiversity is particularly rich, such as rainforests, coral reefs, tropical islands.
- Biodiversity in Jamaica.
- Threats to biodiversity.
- How biodiversity can be protected.

**BACKGROUND INFORMATION LINKS**
- Forest connections—the forest in your classroom
- Biodiversity—a natural treasure
- Biodiversity finger printing activity
- Biodiversity basics

**This activity may be infused into the following areas of the CXC syllabus**

**CXC Biology**

**Section A  Living Organisms in the Environment**

**General objective**
Students should demonstrate:
1. An understanding that there is both diversity and similarity of form in living organisms

**Specific objective**
Students should be able to:
1.1 Group living organisms according to observed similarities and differences

**Content/explanatory notes (Page 9)**
Visible characteristics, such as hairiness, colour, shape, venation, number of legs and wings. Common names of organisms and groups are accepted

**Section C  Continuity and Variation**

**General objective**
Students should demonstrate:
4. An understanding of the importance of genetic variation in species and how these traits can be altered

**Specific objective**
Students should be able to:
4.2 Explain why genetic variation is important
TOURISM AND THE ENVIRONMENT

Objectives:
Students will:
1. Explain how tourism is dependent on the environment
2. State and assess the benefits of tourism to Jamaica's economy
3. State and assess the impact that tourism has on Jamaica's natural environment
4. Explain ways in which Jamaica's tourism product can be developed without causing further damage to its natural resources

Suggestions for students' focus are:
- Tourism's impact on the environment
- Tourism's dependence on the environment
- Tourism and urbanisation
- Jamaica's protected areas/Jamaica's national parks
- Ecotourism

This activity can be infused into the following areas of the ROSE curriculum and CXC syllabuses

Grade 8 Social Studies
Unit 3: Using our Resources and Related Environmental Matters
Subtopic D: Tourism
Specific learning outcomes
Knowledge
Students should be able to:
5. Discuss the economic linkages which emanate from the tourist trade
6. Discuss the advantages and disadvantages of the tourist trade to Jamaica
8. Identify and discuss future developments in tourism, e.g. ecotourism
Attitudes
Students should:
2. Demonstrate commitment to the preservation of the cultural and physical environment
Content
6. Impact of tourism on the country economically and culturally
7. Impact of tourism on the environment
9. Future of tourism in Jamaica—new resorts, new trends, e.g. ecotourism, geriatric tourism and heritage tourism
Learning activities (Page 84)
10. (ii) the advantages and disadvantages of tourism (iii) tourism of the future, e.g. ecotourism, heritage tourism
Advanced learning activity
1. Organising a discussion on the advantages of tourism to Jamaica and/or the impact of tourism on the environment
Category 4: Environmental Research

CXC Social Studies
Section C3  Tourism

Specific objectives
The student should be able to:

4. Identify and critically analyse the contribution of tourism to the economy of the Commonwealth Caribbean

Content (Page 24)

4. Tourism and the Commonwealth Caribbean economy
- foreign exchange earnings, income and expenditure
- direct employment, such as hotel workers
- indirect employment through linkages with other sectors of the economy (agriculture, craft, transportation and ancillary services)

5. Examine the impact of the tourism industry on the physical environment of the Commonwealth Caribbean

Content (Page 24)

5. Tourism and the physical environment of the Commonwealth Caribbean
- Changes in ecology, reefs and tidal patterns caused by land reclamation, sewage disposal and pollution of water bodies—ocean, rivers
ENVIRONMENT AND HEALTH

Objectives:
Students will:
1. State the harmful effects that many poor environmental practices can have on human health.
2. Explore measures that can be taken to improve environmental care and prevent illness and disease.

Students’ research should focus on the following:
- People’s dependence on the environment for all necessary resources.
- The effects of air, land and water pollution on human health.
- Disease vectors and conditions in which they thrive.
- Diseases associated with pollution.
- Possible solutions to current pollution and health related problems in Jamaica.
- The government agencies responsible for pollution control and public health and their roles.
- Existing laws which are intended to protect public health and how well they are enforced.
- Obstacles to the solutions.
- How these obstacles might be overcome.
- The role of the environment in sustaining agriculture, supporting healthy eating and a lasting food supply.

This activity can be infused into the following area of the CXC syllabus

CXC Biology
Section D Disease and Its Impact On Humans
General objective
Students should demonstrate:
2. An understanding of the principles of disease control
Specific objective
Students should be able to:
2.1 Explain the role of vectors in the transmission of disease
POULATION AND THE ENVIRONMENT

Objectives:
Students will:
1. Discuss migration patterns
2. Explain the process of urbanization
3. Explain the effects of large scale agriculture on the environment
4. Define the term “carrying capacity”
5. Discuss and explain solutions to the problem of overpopulation

Students’ research should focus on the following areas:

- Migration patterns and urbanization.
- Population statistics locally and globally.
- Population growth and resource depletion.
- The environmental consequences of population growth and urbanization.
- Environmental effects of consumption oriented lifestyles.
- The need for resource conservation.
- Sustainable development.
- Suggest solutions to the problems.
- Obstacles to the solutions.
- How these obstacles might be overcome.

This activity can be infused into the following areas of CXC syllabuses

CXC Biology
Section E Environment and Human Activities
General objectives
Students should demonstrate an:
3. Understanding of the factors that affect the growth of populations
4. Appreciation of the finite nature of the world’s resources
Specific objectives
Students should be able to:
3.2 Illustrate using examples that human populations are subject to the same constraints as other natural populations
Content/explanatory notes (Page 31)
Effects of population growth on food, resources, prevalence of disease
4.1 Describe various resources and their limits
Energy and mineral resources

CXC Geography
6. Settlement Systems
Content (Page 17)
Urban growth and urbanization
Specific objective
The student should be able to:
6.6 Define and give reasons for urbanization in the Caribbean
6.7 Explain the benefits and problems of urbanization in the Caribbean
6.8 Suggest ways of controlling urbanization
CONSERVATION OF RESOURCES

Objectives

Students will:
1. Explain the terms “renewable resource” and “non-renewable resource”
2. Define the term “carrying capacity”
3. Explain why conservation of resources is necessary
4. Suggest solutions to the problem of resource depletion

Students’ research should focus on the following areas:
- What is conservation?
- Resource Depletion.
- Nature’s carrying capacity both nationally and globally.
- Local trends in resource depletion.
- Reasons for resource conservation.
- Endangered species and protected areas.
- Agencies responsible for the conservation of resources, their role and power.
- The role of non-government organisations and community based organisations.
- Local systems for conserving resources, e.g. watershed management.
- Suggest solutions to the problem of resource depletion.
- Obstacles to the solutions.
- How these obstacles might be overcome.

This activity can be infused into the following areas of CXC syllabuses

CXC Social Studies

Section B Development and Use of Resources

Specific objective

The student should be able to:
11. Relate the use of physical resources to the practice of conservation

Content (Page 16)

10. Environment as a resource
(b) Conservation of resources in the environment

CXC Geography

5. Industrial System

Content (Page 15)

Primary industries:
Lumbering, fishing, mining of oil or bauxite

Specific objectives

The student should be able to:
5.1 Distinguish between renewable and non-renewable resources
5.2 Explain the need for and the importance of conserving natural resources
Student’s research should focus on the following:

- Identify the watersheds in Jamaica and their principal rivers.
- The roles watersheds and rivers play in supporting life.
- Biodiversity in watersheds.
- Threats to watersheds and rivers in Jamaica.
- Possible solutions to these threats.
- The management systems and laws which exist in Jamaica to protect watersheds and rivers.
- Obstacles to these solutions.
- How these obstacles can be overcome.

Objectives:
Students will:
1. Define the term “watershed”
2. Explain how watersheds work
3. Name the watersheds in Jamaica and their principal rivers
4. Identify threats to watersheds and rivers
5. Identify solutions to these threats
6. Illustrate the water/hydrologic cycle

BACKGROUND INFORMATION LINK
∞ Forest Connections—the forest in your classroom (Jamaica’s forests—Providers and protectors; The web of life game; Watershed weather watch)

This activity can be infused into the following areas of CXC syllabuses

CXC Chemistry
Section B2 Inorganic Chemistry
Impact of Metals and Non-metals on Living Systems
Specific objective and content/explanatory notes
Students should be able to:
8.2 State the importance of the carbon, nitrogen and water cycles to living systems
Content/explanatory notes (Page 40)
The need for recycling and the importance of cycles in nature. Promotion of social awareness
**CXC Geography**

1 Geomorphic System

Content (Page 9)

Surface Water

Specific objectives

The student should be able to:

1.21 Describe and explain the causes and consequences of river flooding and describe the methods of preventing it

1.22 Describe and explain the use and potential of rivers and their basins in the Caribbean
F. BACKGROUND INFORMATION
## BACKGROUND INFORMATION LIST

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## RESOURCE LIST

### NON GOVERNMENT ORGANIZATIONS

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<th>Address</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association of Science Teachers of Jamaica</td>
<td>C/o Dr. Errol Miller, Knox Community College</td>
<td>Spauldings P.O. Clarendon Tel: 987-8047/9 Fax: 987-8048</td>
</tr>
<tr>
<td>Birdlife Jamaica</td>
<td>2 Starlight Avenue, Kingston 6</td>
<td>Tel: 927-1864 Fax: 927-1864 Email: <a href="mailto:birdlifeja@yahoo.com">birdlifeja@yahoo.com</a> Website: <a href="http://www.birdlifejamaica.com">www.birdlifejamaica.com</a></td>
</tr>
<tr>
<td>Blue and John Crow Mountain National Park</td>
<td>C/o Jamaica Conservation &amp; Development Trust</td>
<td>Tel: 920-8278-9, 960-2848-9, 960-3708 Fax: 960-2850 Email: <a href="mailto:jcdt@kasnet.com">jcdt@kasnet.com</a> Website: <a href="http://www.greenjamaica.org">www.greenjamaica.org</a></td>
</tr>
<tr>
<td>Children First</td>
<td>9 Monk Street, Spanish Town, St. Catherine</td>
<td>Tel: 984-0367 Fax: 984-2839 Email: <a href="mailto:kidz@cwjamaica.com">kidz@cwjamaica.com</a> Website: <a href="http://www.jamaica-kidz.com">www.jamaica-kidz.com</a></td>
</tr>
<tr>
<td>International School of Jamaica</td>
<td>P.O. Box 36, Oracabessa, St. Mary</td>
<td>Tel: 725-0933 Fax: 725-0060 Email: <a href="mailto:isja1@yahoo.com">isja1@yahoo.com</a></td>
</tr>
<tr>
<td>Jamaica Conservation &amp; Development Trust</td>
<td>29 Dumbarton Avenue, Kingston 10</td>
<td>Tel: 960-2848-9, 920-8278-9 Fax: 960-2850 Email: <a href="mailto:jcdt@kasnet.com">jcdt@kasnet.com</a> Website: <a href="http://www.greenjamaica.org">www.greenjamaica.org</a></td>
</tr>
<tr>
<td>Jamaica 4H Clubs</td>
<td>95 Old Hope Road, Kingston 6</td>
<td>Tel: 927-4050-2 Fax: 978-3209 Email: <a href="mailto:jamaica.4h@cwj.com">jamaica.4h@cwj.com</a> Website: <a href="http://www.jamaica4h.com">www.jamaica4h.com</a></td>
</tr>
<tr>
<td>Jamaica Organic Agricultural Movement</td>
<td>Ministry of Agriculture</td>
<td>Tel: 927-1731-50, 983-2267 Email: <a href="mailto:joam@mail.com">joam@mail.com</a> Website: <a href="http://www.joam@freewebsitehosting/index.asap">www.joam@freewebsitehosting/index.asap</a></td>
</tr>
<tr>
<td>Jamaica Environment Trust</td>
<td>11 Waterloo Road, Kingston 10</td>
<td>Tel: 960-3693 Fax: 926-0212 Email: <a href="mailto:jet@infochan.com">jet@infochan.com</a> Website: <a href="http://www.jamentrust.org">www.jamentrust.org</a></td>
</tr>
<tr>
<td>Friends of The Sea</td>
<td>Mahogany Beach, Ocho Rios</td>
<td>Tel: 974-4428 Fax: 974-7811 Email: <a href="mailto:info@friendsofthesea.org">info@friendsofthesea.org</a> Website: <a href="http://www.friendsofthesea.org">www.friendsofthesea.org</a></td>
</tr>
<tr>
<td>Dolphin Head Trust</td>
<td>Hanover Museum</td>
<td>Tel: 956-3549 Email: <a href="mailto:paulahurlock@hotmail.com">paulahurlock@hotmail.com</a></td>
</tr>
<tr>
<td>Montego Bay Marine Park</td>
<td>Pier1, Howard Cooke Boulevard</td>
<td>Tel: 979-5127/ 952-5619 Fax: 940-0659 Email: <a href="mailto:mbmp@n5.com.jm">mbmp@n5.com.jm</a> Website: <a href="http://www.montegobayjamaica.com/mbmp">www.montegobayjamaica.com/mbmp</a></td>
</tr>
</tbody>
</table>
National Environmental Societies Trust  
173 Constant Spring Road, Kingston 8  
Tel: 969-6502  
Fax: 969-7987  
Email: nest@mail.infochan.com  
Website: www.jsdnp.org.jm/nestjamaica

National Wildlife Foundation  
Hope Gardens, Kingston 6  
Tel: 927-1085  
Fax: 970-2459  
Email: nwfhopezoo@yahoo.com

Natural History Society of Jamaica  
C/o Dept. of Life Sciences,  
UWI, Mona, Kingston 7  
Tel: 977-6938  
Fax: 977-1075

Negril Coral Reef Protection Society  
P.O. Box 27, Norman Manley Boulevard  
Negril, Westmoreland  
Tel: 957-3735  
Fax: 957-4626  
Email: coralreef@cwjamaica.com

Negril Area Environmental Protection Trust  
P.O. Box 2599, Negril Community Centre,  
Norman Manley Blvd., Negril, Westmoreland  
Tel: 957-3736  
Fax: 957-3115  
Email: nept@n5.com.jm  
Website: www.preservenegril.com

Portland Environment Protection Association  
6 Allan Avenue, Pt. Antonio, Portland  
Tel: 993-9632  
Fax: 715-3705  
Email: pepa@cwjamaica.com

St. Ann Environment Protection Association  
P.O. Box 212, Runaway Bay, St. Ann  
Tel/Fax: 973-4305  
Email: ee@cwjamaica.com or staepa@anngel.com.jm

St. Thomas Environmental Protection Association  
C/o The RADA office  
Belfast, Morant Bay, St. Thomas  
Tel: 982-2205  
Email: s_t_e_p_a@hotmail.com

Southern Trelawny Environmental Agency  
#3 Grants Office Complex  
Albert Town P.O., Trelawny  
Tel: 610-0818  
Fax: 610-0819  
Email: stea@cwjamaica.com

Western Society for the Upliftment of Children  
26 Miriam Way,  
Filandy Centre,  
Shop #18 & 19  
Montego Bay #2 P.O., St. James  
Tel: 952-3377  
Fax: 979-9879  
Email: westkidz@cwjamaica.com

GOVERNMENT AGENCIES

Environmental Foundation of Jamaica  
1B Norwood Avenue, Kingston 5  
Tel: 960-6744, 960-7954  
Fax: 920-8999  
Email: ef.ja@cwjamaica.com  
Website: www.efj.org.jm

Environmental Warden Services  
38 South Camp Road  
Kingston 4  
Tel: 928-0082 / 930-0662-3
Public Health Authority
1 Marescaux Road
Kingston 5
Tel: 926-1550-2
Email: kshad@n5.com.jm
Website: www.serha.gov.jm

Rural Agricultural Development Authority
Hope Gardens, Kingston 6
Tel: 977-1158-62
Fax: 970-4660
Email: rada@cwjamaica.com
Website: www.radajamaica.com.jm

Water Resources Authority
Hope Gardens, Kingston 7
Tel: 977-3608/4194/7565
Email: wra@colis.com
Website: www.wra-ja.org

MARINE INFORMATION

Discovery Bay Marine Lab
P.O. Box 35, Discovery Bay, St. Ann
Tel: 973-2241
Fax: 973-3091

Friends of The Sea
Mahogany Beach, Ocho Rios
Tel: 974-4428
Fax: 974-7811
Email: info@friendsofthesea.org
Website: www.friendsofthesea.org

Montego Bay Marine Park
Pier 1, Howard Cooke Boulevard
Montego Bay, St. James
Tel: 979-5127/ 952-5619
Fax: 940-0659
Email: mbmp@n5.com.jm
Website: www.montegobayjamaica.com/mbmp

Negril Coral Reef Preservation Society
P.O. Box 27, Norman Manley Boulevard
Negril, Westmoreland
Tel: 957-3735
Fax: 957-4626
Email: coralreef@cwjamaica.com

RECYCLING POSSIBILITIES

Note: Be sure to call ahead to see if the company will serve your school

Plastic bottles

Recycle for Life
Southern Region/Kingston
Tel: 960-1138/926-2043
Fax: 929-0540
Email: rflkgn@cwjamaica.com
Northern Region (Portland-Trelawny)
Tel: 974-2578
Email: rflocho@cwjamaica.com
Western Region (Manchester-St. James)
Tel: 974-2578 / 831-0156

REQUESTS FOR SEEDS

Coconut Industry Board
18 Waterloo Road, Kingston 10
Tel: 926-1770
Fax: 968-1360
Email: cocindbrd@cwjamaica.com

Forestry Department
173 Constant Spring Road, Kingston 8
Tel: 924-2667/8, 931-4136
Fax: 924-2626
Email: forestrydepartment@forestry.gov.jm
Website: www.forestry.gov.jm
Rural Agricultural Development Authority  
Hope Gardens, Kingston 6  
Tel: 977-1158-62  
Fax: 970-4660  
Email: rada@cwjamaica.com  
Website: www.radajamaica.com.jm

**TALKS AND PRESENTATIONS**

Public Education Department, NEPA  
10 Caledonia Avenue, Kingston 5  
Tel: 906-1394, 929-7481  
Email: pubed@nepa.gov.jm  
Website: www.nepa.gov.jm

Birdlife Jamaica  
2 Starlight Avenue, Kingston 6  
Tel/Fax: 927-1864  
Email: birdlifeja@yahoo.com  
Website: www.birdlifejamaica.com

National Water Commission Public Relations  
28-48 Barbados Avenue, Kingston 5  
Tel: 929-5430  
Fax: 926-1329  
Email: cbuchnan@nwc.com.jm  
Website: www.nwcjamaica.com

Trees for Tomorrow  
Forestry Department  
173 Constant Spring Road, Kingston 8  
Tel: 924-2667/8, 931-4136  
Fax: 924-2626  
Email: forestrydepartment@forestry.gov.jm  
Website: www.forestry.gov.jm

Jamaica Environment Trust  
11 Waterloo Road, Kingston 10  
Tel: 960-3693  
Fax: 926-0212  
Email: jet@infochan.com  
Website: www.jamentrust.org

**TRIPS AND PROGRAMMES**

Cranbrook Flower Forest  
St. Ann's Bay  
Tel: 995-3097

Hollywell Park, Oatley Nature Trail and Blue Mountains  
Blue and John Crow Mountain National Park  
Jamaica Conservation & Development Trust  
29 Dumbarton Avenue, Kingston 10  
Tel: 960-2848-9, 920-8278-9  
Fax: 960-2850  
Email: jcdt@kasnet.com  
Website: www.greenjamaica.com

Hope Zoo and Botanical Gardens  
Hope Gardens, Kingston 6  
Tel: 927-1085  
Fax: 970-2459  
Email: nwfhopezoo@yahoo.com

Institute of Jamaica  
10-16 East Street, Kingston  
Tel: 922-0620-6  
Fax: 922-1147  
Email: ioj.jam@mail.infochan.com  
Website: www.instituteofjamaica.org.jm

Guanaboa Vale Community Tour  
C/o Guanaboa Vale All Age School Community Management Group  
Tel: 943-0141  
Email: sewell@infochan.com

Mason River Nature Reserve  
Mason River, Clarendon  
C/o Institute of Jamaica  
10-16 East Street, Kingston  
Tel: 922-0620-6  
Fax: 922-1147  
Email: ioj.jam@mail.infochan.com  
Website: www.instituteofjamaica.org.jm
Moneague Arboretum
Moneague, St. Ann
Tel/Fax: 973-0190

Montego Bay  Marine Park
Pier 1, Howard Cooke Boulevard
Montego Bay, St. James
Tel: 979-5127/ 952-5619
Fax: 940-0659
Email: mbmp@n5.com.jm
Website: www.montegobayjamaica.com/mbmp

Serenity Farms, Guardsman Serenity
Bushy Park P.O., Spring Village, St. Catherine
Tel: 983-8758

Highgate Park
Sligoville , St. Catherine
Tel: 749-1845
Voicemail: 802-8758

Cockpit Country Tours
Southern Trelawny Environmental Agency
#3 Grants Office Complex
Albert Town P.O., Trelawny
Tel: 610-0818
Fax: 610-0819
Email: stea@cwjamaica.com

Knox Educational Study Tours (KEST)
C/o Knox Community College
P.O. Box 52, Spauldings, Clarendon
Tel: 791-0854, 987-8047/9 ext. 2145
Fax: 987-8048

Valley Hikes
Portland
Tel: 993-3881

VERMICOMPOSTING

Decton Hylton
International School of Jamaica
P.O. Box 36, Oracabessa, St. Mary
Tel: 725-0933
Fax: 725-0060
Email: isja1@yahoo.com

Jamaica 4H Clubs
95 Old Hope Road, Kingston 6
Tel: 927-4050-2
Fax: 978-3209
Email: jamaica.4h@cwj.com
Website: www.jamaica4h.com

WILDLIFE INFORMATION

Birdlife Jamaica
2 Starlight Avenue, Kingston 6
Tel/Fax: 927-1864
Email: birdlifeja@yahoo.com
Website: www.birdlifejamaica.com

Natural History Society of Jamaica
C/o Dept. of Life Sciences,
UWI, Mona, Kingston 7
Tel: 977-6938
Fax: 977-1075
GENERAL ENVIRONMENTAL INFORMATION