

DOCUMENT RESUME

ED 082 977

SE 016 633

AUTHOR Jadan, Doris; Galiber, Rosemary
 TITLE The Environmental Studies Program of the Virgin Islands Department of Education.
 INSTITUTION Virgin Islands Government Dept. of Education, Charlotte Amalie.
 PUB DATE Mar 73
 NOTE 81p.
 EDRS PRICE MF-\$0.65 HC-\$3.29
 DESCRIPTORS Ecology; *Elementary Grades; *Environmental Education; Instructional Materials; Lesson Plans; Natural Resources; *Resource Units; *Teaching Guides
 IDENTIFIERS Environmental Study Areas (National); ESA

ABSTRACT

A variety of lesson notes and materials prepared for use in the Environmental Studies Program of the Virgin Islands Department of Education are assembled in this handbook. The overall objective of the program is direct exposure of young Virgin Islanders to a unique cultural and natural heritage in order to increase awareness of and sensitivity to the changes that threaten the total Virgin Islands environment. Designed for elementary classes, grades three through six, and special education classes on St. Thomas-St. John and St. Croix, the materials detail information and ideas applicable to activities conducted in (National) Environmental Study Areas (ESA) on the islands. Information includes a description of the program; handbook for parents; review of Virgin Islands ecology and economy; teacher checklist for ESA visits; selected lesson plans, particularly for the Mangrove Lagoon; English-Creole word comparisons; "The Adventures of Ivan Environman," a fictitious, young character concerned with his environment; post-site lesson notes for specific ESAs; ideas for geology in the language arts curriculum; description of a cooperative community project on growing fruit trees; history of St. John; list of resource materials available; and a program evaluation sheet for teachers. (BL)

FILMED FROM BEST AVAILABLE COPY

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

INTRODUCTION

These lesson notes and special materials have been prepared for use in the Department of Education Environmental Studies Program for elementary classes on St. Thomas-St. John and St. Croix and also for use by educators in other Westindian communities visiting the Environmental Study Areas provided for the Environmental Studies Program (ESP) by the V.I. National Park.

These materials are designed for use with A Guide to the Natural History of St. John, copies of which are provided by Title II, ESEA, to teachers, teacher trainees and parents participating in the ESP.

Teachers in the Environmental Studies Program develop their own specific lesson plans, adapting these materials to meet specific needs and interests of pupils in grades 3-6 and Special Education classes.

Doris Jadan, Environmental Education Teacher
Rosemary Galiber, Environmental Education Teacher
March, 1973

ED 082977

SE 016 633



September, 1972

THE ENVIRONMENTAL STUDIES PROGRAM OF THE VIRGIN ISLANDS DEPARTMENT
OF EDUCATION

The Environmental Studies Program (ESP) is now in its third year of operation for public, private and parochial schools on St. Thomas and St. John. Approximately 1,500 pupils in grades 3-6 comprise the target group, including ten elementary classes in a pilot ESP on St. Croix.

The overall objective of the Environmental Studies Program is direct exposure of young Virgin Islanders to a unique Westindian cultural and natural heritage in order to increase awareness of and sensitivity to the changes that threaten the total V.I. environment.

The ESP operates as an interagency program. The Department of Education draws on the resources of the Department of Conservation and Cultural Affairs, the National Park Service, the Virgin Islands Conservation Society as well as private individuals and community service organizations. The ESP is now incorporated as a non-profit organization in order that the program may more readily apply for federal and foundation grants.

Teachers participating in the program do so on a volunteer basis. The ESP has been a teacher-developed program from its inception in 1970. Teachers develop new materials for their classes following the guidelines established in seminars and on-site workshops prior to each group's participation in an intensive ten-week program. Pupils, parents and teachers evaluate materials supplied by the ESP office. Emphasis is laid on the participation of parents in visits with classes to the Environmental Study Areas used by each grade level. The Outdoor Education Teachers and classroom teachers work together as team teachers in workshops and on-site activities. Older Virgin Islanders serve as resource

persons for pre and post site lessons.

Workshops

Four teacher Inservice Workshops are scheduled for 1972-73, for grades 6, 5 and 4 respectively. Adult workshops are also planned for staff members of those agencies whose operations have environmental impact, including Department of Conservation and Cultural Affairs, Commerce, Health, Water and Power Authority, Port Authority, Public Works and Public Safety.

Materials Used

The ESP is an interdisciplinary program. Special local materials are provided in the Language Arts, Social Studies, Science, Health and Art curriculum including the following: Hardbound copies for teachers, parents and classroom libraries of the 72 page illustrated Guide to the Natural History of St. John; keyed color slides of the Environmental Study areas to be visited; color films on local birds, plants, marine life, pollution problems and resource management relevant to the Virgin Islands environment; lesson notes for pre and post site classroom use; copies of Adventures in Environment for grade six classes; The Adventures of Ivan Environman published weekly in The Daily News are being used in the language arts curriculum. Pupils and teachers assist in the production of an Ivan Environman calendar using events of local natural and cultural importance. The ESP Library is open daily for reference use by interested members of the community.

Study Areas

Environmental Study Areas used by the ESP include:

St. John

Reef Bay - Grade 6
Annaberg - Leinster Bay - Grade 5
Salt Pond Bay - Grade 4
Cinnamon Bay Trail - Grade 3 and Special Education classes

St. Thomas

Historic Government Buildings
Historic Churches
Urban-Suburban development problem areas (to be selected within walking distance of school involved)
Benner Bay-Mangrove Lagoon

St. Croix Pilot Program

Christiansted Historic Site
Buck Island
Whim Great House
Creque Dam
Harvey-Hess Industrial Complex

Pupil transportation to the Environmental Study Areas is covered by a special appropriation of \$20,000 made by the Ninth Legislature to insure a continuation of the ESP environmental encounters.

For further information on the V.I. Environmental Studies Program, phone or visit the ESP offices in the Lutheran Hall, Cruz Bay, St. John, tel. 776-6278, or write:

Mrs. Doris Jadan
ESP, Box 84
Cruz Bay, V.I. 00830

Handbook for Parents
Environmental Studies Program
Grades 4-5-6

The overall goal of the Environmental Studies Program is to provide the 8-12 year old Virgin Island child with live experience of his environment. This environment includes everything surrounding him - and also everything that he, in turn, surrounds. Through education, which has always meant "a leading out into life with understanding," environmental education can help lead your child into a better life as a Virgin Islander. The indoor and outdoor classroom activities of ESP are designed to help your child fit himself into a fit environment by providing him the opportunity to learn first-hand some of the beautiful facts of life about his V.I. cultural and natural surroundings in classrooms without walls on St. John, St. Thomas and St. Croix. Your child will also observe changes threatening his heritage, and he will learn what effective steps he can take to promote what he likes and change what he doesn't like.

VIP -- VERY IMPORTANT PARENTS!

Your child needs your active interest and support in this program. Do you remember these Islands when you were your child's age? Do you ever ask yourself what kind of place these Islands will be when your child is your age? Perhaps you remember places that have disappeared since you were a child and you wish now these areas had been protected as historic or recreational sites for you and your child to enjoy today!

Environmental Studies was not a part of any school curriculum in years past, but thanks now to the concern of teachers and parents like you, thanks to the efforts of community leaders in the Department of Education, Conservation and Cultural Affairs, the Virgin Islands Conservation Society, the V.I. National Park, and other groups, the Environmental Studies Program which began in 1970 has been strengthened.

We know that changes in island environment will continue to take place. However, the direction of these changes and the quality of life undergoing change can be controlled by concerned and educated decision-makers. Starting now, with your help in this program, your child along with you, can become one of these concerned and educated decision makers as he learns about zoning and planning, sewage treatment, soil erosion, free access to all beaches, protection of marine resources, control of water and air pollution. The list of problems and changes is growing fast--as fast as our population grows. That population has more than doubled since your child was born!

We urge you to accompany your child's class to the Environmental Study Area he will visit. We invite you to attend a pre or post-site classroom lesson using slides and other materials correlated with the outdoor classroom activities in this program to see how ESP is fitted into the regular curriculum.

HOME PREPARATION FOR VISITS TO ENVIRONMENTAL STUDY AREAS

1. What should your child wear? Comfortable, flat heeled, rubber-soled shoes, or sneakers are best.
2. What should be taken for lunch? WATER - at least 1 pint in a canteen or plastic bottle. If water in a plastic bottle is frozen the night before, it will still be cool at lunch time. AVOID WRAPPING CANS OR SANDWICHES IN ALUMINUM FOIL, because this is an expensive material two and a half times more expensive than wax paper and because it is the wrapping most difficult to dispose of. Children must carry all leftovers with them and should, therefore, plan to take nothing but essential items. DO NOT send glass bottles or jars. Tomato juice, fruit juice and limeades are good beverages. No sodas, please. (Learning to choose appropriate foods for the outdoor lunchroom is a part of ESP.) Do NOT include candies and cakes since these sweet foods will increase thirst and may cause sea-sickness. Fresh fruits ARE recommended. Boiled eggs, carrots, and one or two sandwiches make a good lunch. All food should be carried in plastic, canvas or straw bags. Paper bags break. One of the lessons learned in Outdoor Classrooms is what to eat and how to eat as conveniently as possible. Students are not on a picnic, but rather in a new learning situation. Too much food is a nuisance to carry.

DETACH AND RETURN TO TEACHER

This is to certify that my child _____ has permission to participate in the 1972-73 Environmental Studies Program for _____ School. I understand that the visits to Environmental Study Areas are outside the school grounds; furthermore, I understand that while students will be closely supervised during each outdoor classroom activity, the Department of Education cannot be responsible for any medical or hospital services that may arise from accidents or injuries incurred.

IMPORTANT -- Please note in the space below any health problems your child has, such as allergy to bee stings, asthma, or other physical problems:

AGREED TO AND ACCEPTED:

Parent's or Guardian Signature _____ Date _____

I WILL BE ABLE TO ACCOMPANY THE CLASS TO _____
on _____ (date).

NO VISITS ARE MADE WITHOUT PARTICIPATING OF AT LEAST TWO FAMILY ADULTS IN ADDITION TO THE ENVIRONMENTAL EDUCATION TEACHER, CLASSROOM TEACHER, AND OTHER STAFF.

Environmental Studies Program
Box 84, Cruz Bay, V.I. 00830

V.I. Ecology and the V.I. Economy

New Economic Uses of Native Products

Encourage students to think of ways native natural products that they have seen, tasted, touched, smelled, and studied in the Model Environmental Study Areas on St. John and elsewhere can be used in new V.I. small businesses.

1. Cassava Bread - Cassava (*Manihot utilissima*) makes a delicious bread that does not spoil - cassava bread, as Columbus knew, will outlast hardtack. But what many Virgin Islanders are re-discovering is that cassava bread is a gourmet item when toasted in a 350 degree oven for 15 minutes until it is crisp. Moreover, cassava bread could readily be marketed in mainland health food stores as an allergy-free bread.

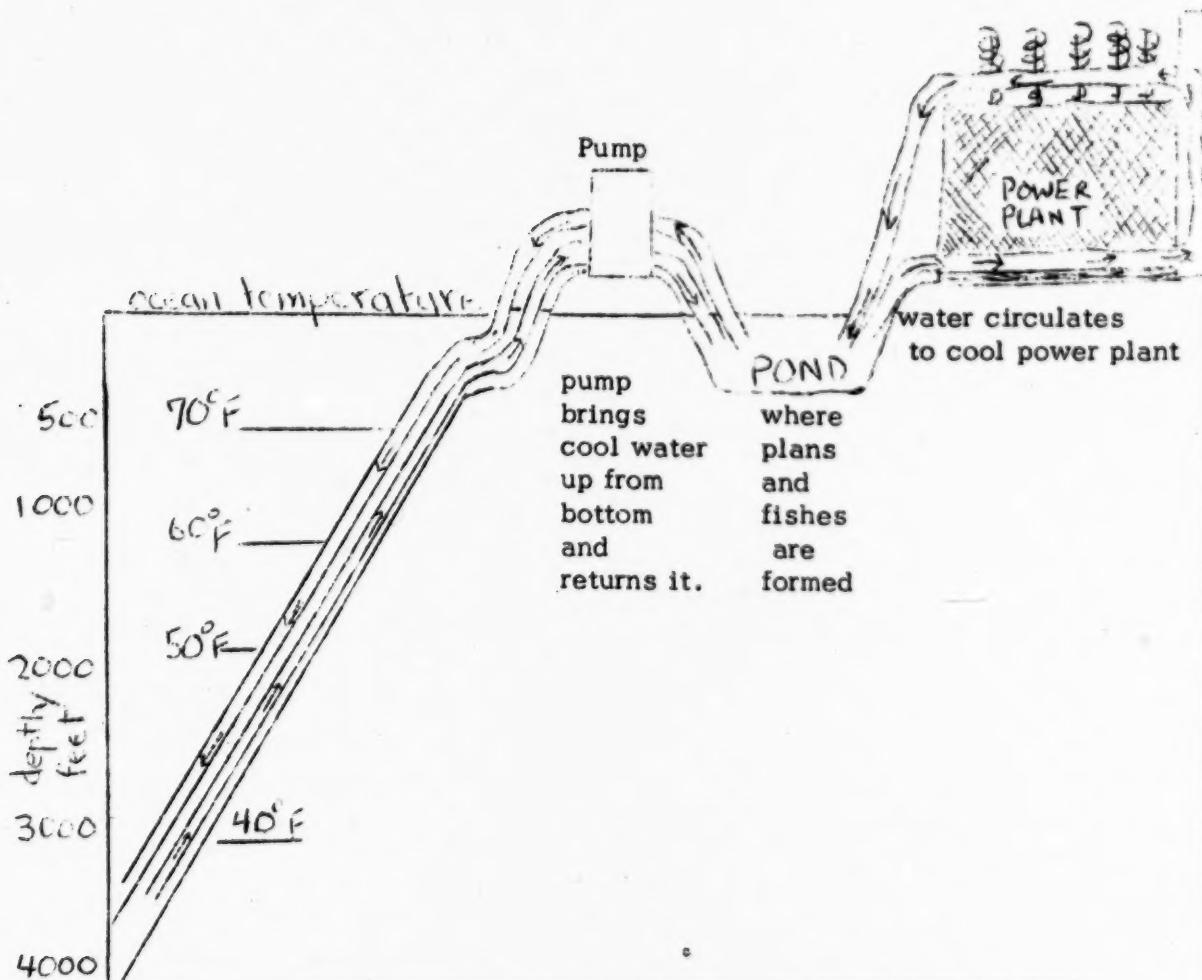
In 1968 Dr. Arnold Krochmal conducted extensive feasibility studies on St. Croix to determine what crops could be profitably raised. Cassava is one of three with economic potential. Five hundred acres could be placed under cultivation now for local supermarket, hotel and restaurant consumption, plus mainland gourmet and health food stores. Local commercial bakeries are interested in preparing cassava bread in biscuit sizes for commercial packaging - IF cassava itself is available! (Note - in 1970 Harvey Aluminum imported some \$25,000 worth of cassava flour from Thailand for use in bauxite refining. Would it not be profitable to produce this locally?)

2. Sea Salt - like that seen forming at Salt Pond might be packaged in pound or half-pound containers. In New York City sea salt sells for \$1.98 per pound. It could be sold for \$1.00 per pound here perhaps?
3. Maran bush - The Biodegradable Brillo, can be used as a pot cleaner (better and safer than detergents for hands and utensils, especially teflon); use maran on a coal pot as sandfly repellent instead of Cobras when camping at Cinnamon Bay or elsewhere.
4. Aloes lotion - for sunburn, cosmetics, treatment of sore throat, minor burns and insect bites.
5. Local almonds and also the seeds of the Geiger Tree (*Cordia*) for crunchy sugar cake; other muscavado sugar items.
6. Further study to see what marine life can be farmed: soft corals for medicinal products; wilks, turtles, lobsters, fish, mangrove oysters and fresh water shrimp for local and tourist consumption. Dams will need to be built for the cultivation of fresh water shrimp since natural guts have been polluted or destroyed by "development". (Consult the Island Resources Foundation on Mariculture.)

Freshwater Shrimp
(Kribishee)



Note on Marine Farming: In St. Croix, scientists from the Geological Observatory of Columbia University "have installed...a 3½ inch plastic pipe that extends nearly a mile into the Caribbean, enabling them to pump' deep water with a temperature of 40° F. into small ponds on shore. They find that selected plant life...grows 27 times faster...From the standpoint of practical economics artificial upwelling (name of this new technique) may be too expensive to be feasible exclusively for fish farming at the present time. The system seems entirely practical, however, if its cost can be shared with some additional service such as air conditioning or the cooling of power plants...Advances in technology frequently generate further threats to the quality of our already overburdened environment. It is encouraging to realize that the use of deep water from the sea... is a pollution-free process. The deep water returns to the sea at the same temperature and with about the same nutrient concentration as the waters that receive it, without having an adverse effect on either the atmosphere or the ocean." (Scientific American, December 1970, Marine Farming by Gifford B. Pinchot)



"Artificial Upwelling" might be contrived in an atoll setting, as this diagram suggests. The atoll's steep drop to seaward means that the wanted water would be pumped the least distance. The central lagoon would provide a catchment basin for the pumped water, retaining its nutrients at or near the surface. The water would be constantly circulated between the ocean, the pond, and around the power plant. The difference in temperature between the surface and the deep water might be used to generate more power than is required for the pumps. A pilot version of this experiment is being conducted by workers in the Virgin Islands, who are pumping deep-sea water ashore and accelerating the growth of phytoplankton in ponds." (Scientific American, same article)

7. Arts and Crafts Projects - Odd shaped coral pieces and shells can be used to decorate picture frames; teyer palm can make fish traps or brooms; necklaces can be made by stringing jumble beads - the non-poisonous all red beads, not the lethal jumble bead with a black eye - wild tamarind seeds, tamarind seeds, sugar apple and soursop seeds.
8. Bush Teas - Why not try a Bush Tea Room also serving fruit tarts?
9. Package local "wild" seasoning in bio-degradable containers - wild thyme, wild sage, bay rum leaf (use bay rum to flavor oats, soups and stews). Papaya leaves for tenderizing and banana leaves instead of foil for roasting meat could also be demonstrated.
10. "Gum" from the gum tree (Turpentine tree or Bursera simarouba) is repellent to bugs which attack books. This gum can be used to bind scrapbooks or other books.
11. Sandbox Tree Seed Pods - make attractive earrings; Locust Tree pods make small sturdy coin banks.
12. Calabashes - ESP students at home and school should plant seeds now of both the regular and the Black Calabash (small, egg-sized gobi) for home and commercial use as mixing bowls (the inside surface provides just the right amount of traction for creaming butter), salad bowls, and as pans for baking bread. The calabash or gobi has great appeal for the tourist as a V.I. grown ornamental bowl.
13. Cactus shampoo - Smooth pads of the local spineless cactus (Opuntia) can be split lengthwise and held in the palms of the hands to massage and cleanse the scalp for an effective shampoo with no soap in the eye. This spineless cactus grows readily from bulbs at the tips of the pads and is an ornamental plant. A family of 6 or 8 can save well over \$100. per annum using home-grown shampoo in place of commercial shampoos. This product also has potential for the tourist curio market. The pads keep well for several weeks and are insect free.

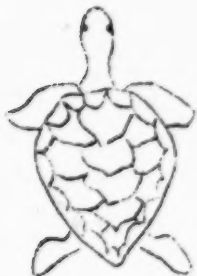
page four

14. Love Leaf Greeting Cards - Large Bryophyllum leaves are presently gathered and sold at Caneel Bay wrapped in saran. Why not grow and use these leaves for special V.I. valentines (the first valentine was a green leaf with a message); also for birthday cards to pin up where they will grow on nothing but air for another year.

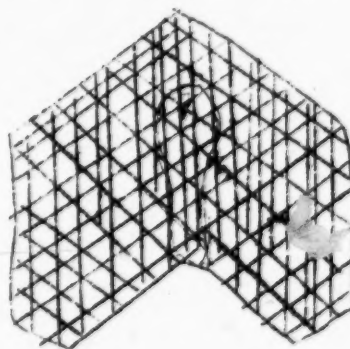
Students can develop these ideas and think of others. Please let the ESP Office know what your class thinks up so we can share ideas for classroom activities with other classes in ESP.



Aloes or Semperviv



turtle



Miniature fish trap souvenir

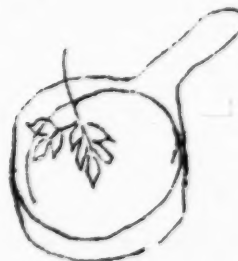


shell-decorated
picture frame

sandbox earrings
nicker seed
necklace



teyer palm broom



Maran Bush



TEACHER CHECKLIST FOR ESP-NPS VISIT

(Hereinafter referred to as a visit to an Environmental Study Area! (ESA))

1. Do you have the signed parental permission slip for each child from the Parent Handbook? (Did you pick up and send home to each parent a copy of the Parent Handbook?)
2. Do you have at least one parent, grandparent or other non-school adult who will accompany the class? Consider active senior citizens and arrange for them to visit at least one pre-site lesson.
3. Copy from your lesson plans or give brief notes listing those plans, ideas, materials that worked best. List any materials or information that ESP can provide to help you further. Please bring these notes on your ESA visit so we can file them under your name for reference notes to be prepared in the future. Be sure to list anything you did that was your own innovation! Include this pre-site preparation on your evaluation of the ESP.
4. Check students out before you leave school. Lunches **MUST** be in a sturdy bag or basket. **NO** paper bags must be used as outside containers. (Paper bags break open on the hike.) Have pupils remove all excess wrappings before they leave school such as foil around cans or fruits or other double wrappings. Note quantity. Praise those who have followed your recommendations on appropriate menu -- this is **NOT** a picnic--and use strong bags or baskets. Be sure each child has at least one pint liquid. **REMOVE** from any lunches any candy and salted nuts. Explain again **WHY** these are not good to take on ESA visits. Return later or save for a party. Leave transistor radios at school. Keep ears open for wind, waves, birds, and other sounds never broadcast on radio.
5. Let pupils go to toilet and drink water before leaving school.
6. The classroom teacher should take along several fresh limes for use in case of seasickness. If no one gets sick, a few squirts of the lime will enliven the cold water or drinks at lunch.
7. **REVIEW THESE SAFETY MEASURES IN CLASS THE DAY BEFORE YOUR TRIP.**
 - 1) Pupils will operate in pairs. Assign pairs to sit, lunch, walk and learn together. (Neat name tags pinned securely so they don't drop and litter the path will help pupils and OET talk to each other more easily.) The pupil-pairs can check notes and observations after visit; they will look after each other.

page two

2) DON'T ROCK THE BOAT!!

Remember to keep the boat balanced by remaining on the side of the boat where you are assigned a seat. If everyone goes to one side at once, the boat will tilt. Students stow their baskets under seats. When standing in the front of the boat, students remain on same side where they were seated aft.

3) Remain SEATED in the dinghy when you go ashore. Keep your shoes on even if they get wet -- they will dry. A cut foot needs stitches and OET doesn't sew. Captain Sewer is Captain of the boat. He gives directions to us all for our safety. Listen!!

4) Remind pupils when they use the binoculars to a) keep the strap around their neck and b) not to touch the lenses with fingers or let salt water wet the lenses. Fingers smear and salt scratches lenses.

8. Encourage students to use common sense and all their senses in this learning adventure. Think of the bus and the boat as classrooms without walls. LOOK, NOTICE AND THINK all the way to the ESA.

9. Use the convenient STRAND approach as often as possible so students will use it themselves to show you what they observe. The STRANDS to use are:

LIKENESSES & DIFFERENCES
PATTERNS
INTERACTION & INTERDEPENDENCY
CONTINUITY & CHANGE
ADAPTATION & EVOLUTION

10. Use your GUIDE to the Natural History of St. John and invite your parents to use it before and after the trip.

INTRODUCTORY LESSON FOR THE ENVIRONMENTAL STUDIES PROGRAM
Grade 4

THE WEB OF LIFE

What did you have for breakfast? Fruit or juice? Eggs? Toast? Tea? Milk? Where do these things come from? Orange juice comes from a tree that grows oranges. Pineapple juice comes from pines that grow in Hawaii, Puerto Rico. Papayas and bananas could grow in your yard. Eggs come from a fowl. Toast is bread made from flour that comes from the wheat plant. (Did you ever taste Cassava bread? Try that sometime!) Milk, of course, comes from a cow. Your breakfast comes from plants and animals. Man needs plants and animals to live.

What other things do man, plants and animals need to live? All living things need water, air, sun, and soil. People need water to drink, air to breathe; we need sun and soil for plants to grow. Without these we could not live.

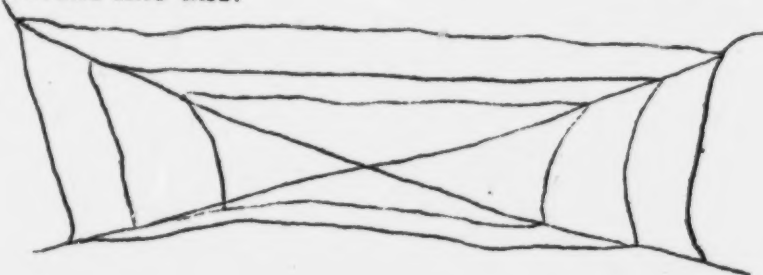
1. Everything we eat comes from (plants) and (animals).
2. Man and all other living things must have these four things so they can live: (water), (air), (sun) (soil).

Water, air, sun, and soil are all around us. We know that all the things around us are part of our environment. Healthy living things need a healthy environment. We cannot buy these things in a shop or make them ourselves; we depend on our natural environment for the plants, animals, water, air, sun and soil we need to survive.

Man, plants, animals, water, air, sun and soil are interdependent - ~~the~~ ^{they} need each other to survive.

3. Every living thing has to get water, air, sun and soil from his (environment).
4. The word that means need each other is (interdependent).

Have you ever studied a spider's web? The web hangs from the sides the spider spins to hold it up. If you break a strand the web wouldn't hang any more. A spider's web looks like this:



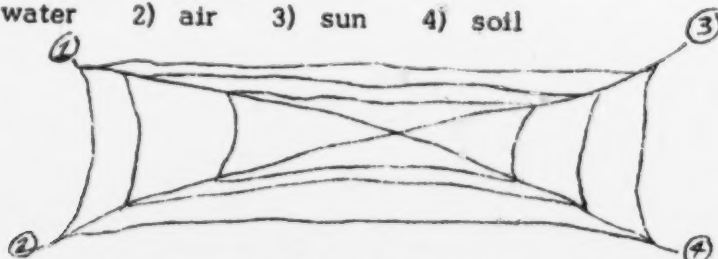
page two

The Web of Life

The spider web needs the sides to hold it up, or support it. We can use this web to show the interdependency of man, plants, animals, air, sun and soil.

5. Fill in the four elements:

1) water 2) air 3) sun 4) soil

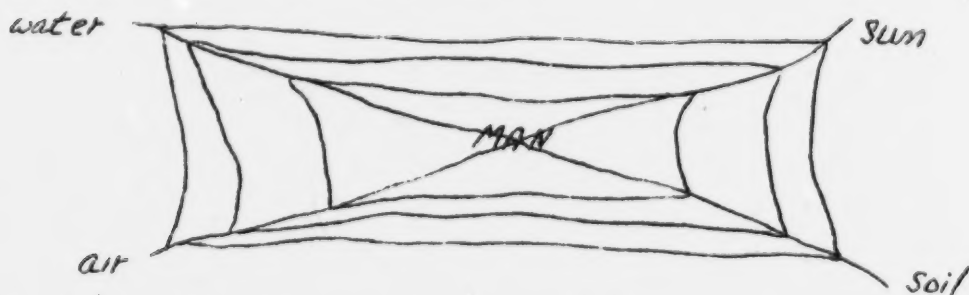


6. This is a picture of a (web). We will call it the Web of Life, since it shows how water, air, sun and soil work together to give life on earth.
7. If any of the four strands are damaged or lost, the web will (fall).
8. The word that explains how man, plants, and animals depend on water, air, sun and soil to live is (interdependent).

Water, air, sun and soil do not breathe, eat, or grow; they are not living. Man, plants and animals are living things; they breathe, eat and grow.

Since the living things (man, plants, animals) need the non-living things, (Water, air, sun, soil) to survive and support themselves, we will put MAN in the middle of the web. He is supported by the other living and non-living things.

9. Put MAN in the middle of the web.

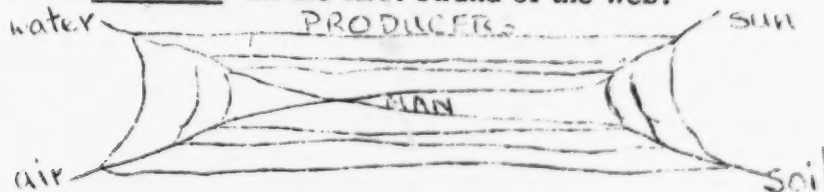


10. Man, plants and animals are (living) things.
11. Water, air, sun and soil are (non-living) things.
12. The living things need (non-living) things in order to survive.
13. This need for each other is called (interdependency).
14. (Man) is in the middle of the web.
15. This picture is called the (Web of Life).

There are billions of living things in this world of every size, shape and color you can imagine. Some of these plants and animals make food, some consume food or use it up, and some break up waste products so that they can be used again. This re-cycling needs to happen so life can go on and on. Producers, consumers and decomposers make up the rest of the Web of Life. What do these words mean?

Things that make other things are called Producers. Plants are producers - they make more plants and food for all living things. Man needs plants to live. The Producers use all the non-living things to make food -- water, air, sun, soil. We will put the Producers on the first strand of the web.

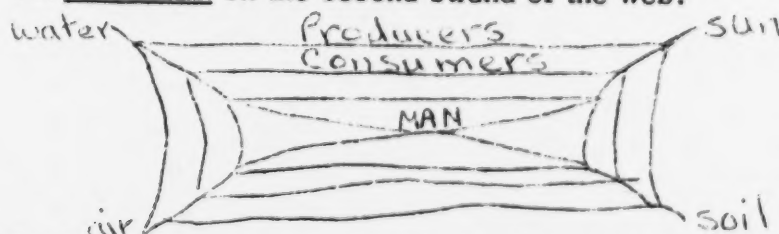
16. Put Producers on the first strand of the web.



17. Now fill in water, air, sun, soil
18. Producers make (food) for living things.
19. (Plants) are producers.
20. Producers use (water), (air), (sun), (soil) to make food.
21. Man needs the (producers) ~~(produce)~~ and the food they produce to live.

When the food is made, who needs it? All animals including man need this food. Another word for someone who uses something is consumer. Man is a big consumer! Consumers consume what producers produce. We will put consumers on the second strand of the web.

22. A (consumer) is someone who uses something.
23. Man is a (consumer).
24. Put consumers on the second strand of the web.



25. Producers and consumers hold up the (web) of (life).

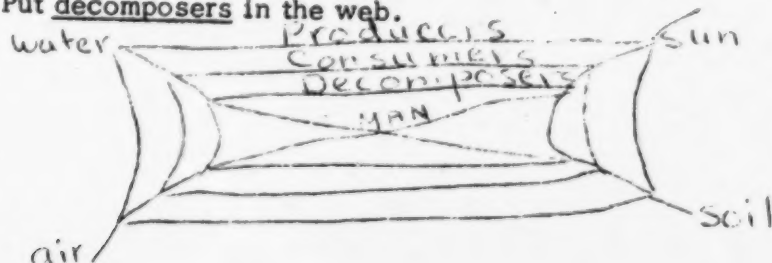
Living things make and use (produce and consume) materials from non-living things. Living things also must get rid of what they don't need. Nature provides many ways to get rid of what-is-no-longer needed.

Have you ever seen termites or wood-lice destroying a piece of wood? They take the sick or dead wood apart, and let it go back to the soil. We say termites decompose the wood. The wood goes back into the soil to help make the soil richer. Termites recycle deadwood.

The world needs decomposers to recycle dead and unwanted things. Living things go back to what they were made from -- water, air, sun, soil. Then new things can live.

We will put decomposers on the third strand of the web.

26. Put decomposers in the web.



27. Now add Man in the middle of the web.
28. Write in the non-living things - (water, air, sun, soil).
29. This is the (web) of (life).
30. The living things in the web are (man), (plants), (animals).
31. (Man) is the center of the web.
32. Producers, consumers and decomposers are (living) things.
33. Water, air, sun, soil are (non-living) things.
34. Plants make food - they are called (producers).
35. Man uses and eats plants and animals; man is a (consumer).
36. Termites break up living things; termites are (decomposers).
37. Every living thing depends on its environment to (survive - live).
38. Man, plants, animals, water, air, sun, soil are (interdependent).

ENVIRONMENTAL STUDIES PROGRAM
PRE-SITE LESSON PLAN
HEALTH AND NUTRITION

Purpose: To help students select food and beverages wisely for a day in an Environmental Study Area.

Method: Multiple choice by students.

Directions:

Circle the foods below that you like and that are suitable to carry and eat at Annaberg, Reef Bay, or Salt Pond Bay.

Draw a line through foods and beverages that are not good for such trips:

WATER
SODAS
RAW CARROTS
HARD BOILED EGGS
MEAT, CHEESE, TUNA FISH SANDWICHES
APPLES
ORANGES
CHOCOLATE BARS
SALTED NUTS
POTATO CHIPS
FRUIT JUICE

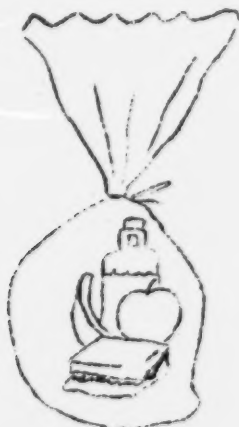
Why are salty foods not so good for a long trip like this?

Why is water better than sodas on a long hike when you are thirsty?

Why are fresh fruits better than candy?

Remember to bring your lunch in one plastic bag. Bring another plastic bag for collecting garbage.

The less you bring the easier it will be to travel. See how you can plan your trip so you will carry home only a few ounces of garbage. (We will weigh your class load to check this!)



INTRODUCTION TO VIRGIN ISLANDS ENGLISH CREOLE

This paper by Elroy Sprauve is based on observations made in St. John, U.S. Virgin Islands. In the Virgin Islands, like other Caribbean Islands where English is spoken, and where many of the inhabitants are descendants of African slaves, a great variety of spoken English exists. He has chosen some examples of words and constructions that might be of interest to a non-native. Actually, these were chosen on the basis that they are not familiar to non-natives.

- Tea - The word tea is used for breakfast, even if the speaker drinks chocolate or coffee with a full course breakfast.
- Goose - An electric iron is still referred to as a goose.
- Sweet - Sweet is nominalized to mean candy. One frequently hears a child saying, "I want a sweet."
- Bony - Someone who is rather thin is said to be bony--for example, "She is bony."
- Meleé This French word meaning confusion and which is so used in English, means gossip. One often hears the expression, "She likes meleé". A lady who likes to gossip is called a "meleé queen."
- Pepé - (Vowel sounds like those of Spanish) A person, especially a child, refers to his godfather as Pepé. This is usually used with the person's first name, for example: Pepé John, Pepé Robert.
- Nen - In like manner, children refer to their godmother as Nen or Nenny.
- Which part - Which part is used for where as in "which part is it?" Seldom is "where" used in asking questions.
- Froth - Froth is used to mean nonsense as in "you are speaking froth".
- Tan - Tan is still used for aunt but only with a proper name. A native would say "Tan Alice", but he would not say, "Alice is my tan". This is probably from the French Tante.
- Compádu (Vowel sounds like those of Spanish) A parent refers to the godparents of his child as his compádu. Likewise, the godparents refer to him as their compádu. This is probably a corruption of the Spanish word, compadre.
- Ground - A vegetable garden is called a ground. One often hears, "Mr. Smith is working ground," which means he is cultivating a vegetable garden.

Old Year's Day - Many people from the United States find it strange that natives say Old Year's Day and Old Year's Night rather than New Year's Day and New Year's Eve.

Them - Them is used as a plural marker with both singular and plural nouns, for example: the boy them, the children them, the goats them.

Fowl - Even though the word chicken is used to denote the meat, it is not used for the live animal. Fowl is always used. Both hens and roosters are called fowls.

One major characteristic of the spoken dialect is the use of contractions. Contractions are not only made with verbs, but to a great extent with pronouns. For example, he'n do't (he didn't do it); I'n see't (I haven't seen it); hear'm (hear him) ..

The present tense of the verb to be, the modals do and did, and the auxiliary verb have is very seldom used in conversation. For example, He here (He is here); They gone (They have gone); He went? (Did he go?).

Vowel sounds are very short especially in non-standard words. Students have little difficulty pronouncing Spanish vowel sounds. There is also a tendency to place little emphasis on final consonants.

Initial th is usually pronounced as d; that (dat) this (dis) or t; thanks (tanks) three (tree). Final th takes the t sound; Ruth (Root), truth (troot).

Word order for interrogative sentences is the same as those for declarative sentences. Only voice inflection changes. He here. He here? You want it. You want it?

In his speech the voice of the native speaker rises and falls in a very rhythmical pattern. This gives his speech a sing-song effect.

She is used for her; he for his; they for their; we's own for our. For example, John lost he pencil; It is we's own.

For reasons which I don't know, I have found that very seldom will an adult answer "fine" or "I am well" in response to "How are you?" The usual answers seem to reflect an obsession with sickness. For example, not too good, not bad, so-so, trying to live, I wouldn't complain, nothing worse, waiting for the hour.

I have also observed among educated and non-educated speakers that in asking about blood relationship a question and answer will be stated in this way: "What is John to you?" "John has to call me uncle." (John is my nephew).

THE ADVENTURES OF IVAN ENVIRONMAN

Chapter I

WHO is Ivan Environman? He is a young Virgin Islander who loves his natural and human environment, and because he does love, he is a Virgin Islander whose unique environment makes him a happier human, a real EnvironMAN.

Ivan Environman is eleven years old. Ivan and most of his friends were born on St. John but Ivan has family on St. Thomas, St. Croix, Tortola, and other islands, including Manhattan. But St. John is Ivan's home and school where he learns and lives and loves the life he leads.

THE PORPOISE RIDE

One July morning, Ivan, Elroy, and Philip were making plans to sail their boat to St. Croix. Louis wanted to go also, but the other boys did not want Louis to go along because he would not assist them with the boat as they wanted.

"Philip, what time all of you leave in the morning?" Louis asked. "Fore-day, morning." "Thanks Philip. Hope all of you enjoy yourselves."

At twelve o'clock midnight, without moonlight, Louis swam out to the sailboat named The Flea. He slept aboard The Flea the balance of the night. At four o'clock in the morning, Ivan, Elroy, and Philip rowed out to The Flea.

"Good thing we got rid of Louis, Philip," Ivan said as he crawled up the ladder from the dinghy. "I'm not so sure we got rid of him, Ivan." Sure enough, when The Flea sailed past Frenchman's Cay, Louis appeared on deck. The boys were all surprised except Philip. Even Philip was surprised to see how Louis took a bucket to start mopping up the deck..... Suddenly Ivan looked up and pointed east. "Elroy, look! Jackie Gleason smoking a big cigar!" "It's a WHALE, Ivan!" "I don't want to be no Jonah!" Philip wailed. "Take it easy, Philip."

All of a sudden the whale disappeared under a wave. Five minutes later The Flea was floating toward St. Croix upside down. The boys were floating, too. "Ivan, I can't swim," bawled Philip.



page two

"Philip, no time like now to learn!"

Philip was hanging on Ivan's four foot long big toe. The boys saw a porpoise.
"Ivan, that porpoise can save our lives, can't she? Philip asked.

"I wouldn't depend on that if I were you, Philip." "We got nothing better to depend on, Ivan."

.....

So the four boys climbed aboard the porpoise. Ivan sat on the Porpoise upper lip, Philip on the tail, Elroy in the middle, and Louis on Elroy's head where he could look out for land. The porpoise started kissing Ivan's four foot long big toe, and the boys almost kill themselves with the laugh.

Meanwhile, the whale was gaining speed. The porpoise pick up speed too, but still she was kissing Ivan's toe.

The whale was hungry. You could hear his tail thumping the waves. But the whale was also getting tired and at last he turned off to find another lunch.
"Those whales, when they are hungry, they don't give up easy," Louis said, mopping his salty sweat and the salty sea spray from his forehead with Elroy's shirtail.

The porpoise carried the four boys safely home to St. John. The boys fed the porpoise a huge calabash full of fish and fungie, and she went back to sea smiling.

THE FLEA

I am going to tell you a story anon
Of a fishing trip that was full of fun.
It happened far out in the Caribbean Sea
Aboard a boat that was named The Flea.

We set out one morning, early at dawn,
When dew was falling on the lawn.
The mate and the captain strolled ahead to the dock
Where they picked up a tourist named Dr. Rock.

Soon everyone was aboard the boat,
We sailed past the rock which is called the Goat.
We sailed further and further out to sea
Aboard our vessel named The Flea.



And then it happened very quick
A storm blew out from a cloud that was sick
It happened so far out in the Caribbean Sea
No help could reach to save our Flea.

Forty foot waves began to roll
The dark sea looked like an angry soul
But wait! We ain't quite licked!
Doc-Rock just hooked a Mopey Dick!

This Mopey Dick was very fast
In any race, he never ran last.
He swam so fast, he towed us up on the dock
At the stern steering was old Dock Rock.

It all happened so far out to sea
Aboard our vessel named The Flea.

THE ADVENTURES OF IVAN ENVIRONMAN

Chapter II

The Lobster and the Turtle

One day Elroy, Terence, Louis and Ivan had in mind to dive for lobster and catch a turtle. Philip had to stay on the rocks because he could not dive.

Elroy said, " I know where we can get some turtle and lobster--at Moravian Point!"

"Let's catch the lobster first, out on the reef," said Louis. Every boy except Ivan caught two male lobsters. Ivan went down again to catch his second lobster. As he dived, the one lobster he had caught slapped him in the face with his tail.

As soon as Ivan came up for air, Elroy shouted, "What a face, Goose Egg!"

"Your face shape just like a goose egg for true," said Louis.

Terence asked, "Where did you get that face?" "Down there from that lobster" and the lobster flapped his tail again.

The four boys swam around Moravian Point and came ashore at Pond Mouth. Philip, who could not swim, stayed behind. He had a pot of sea-water on the fire to cook the lobsters. The boys dropped their lobsters in the pond and climbed along the rocks to drop their turtle net in Great Cruz Bay.* Then they sat down on the beach stones to watch the water in the coal pot boil. The water out to sea foamed like the water in the pot.

Ivan was on the lookout. Soon he sang out, "Turtle -- see him there!" When the boys hauled up their net, Ivan announced, "I will eat the turtle. All of you eat lobster."

Since Philip did not know how to make sauce for lobsters, he called Terence to make a hot pepper sauce. How did it taste? It tasted so good that Elroy even ate the lobster shell as well. "It taste like potato chip without potato," Elroy said.

Ivan did not cook his turtle. He was so raven** he just ate it raw, even the liver. When he finished Ivan noticed his belly was going in and out. The turtle meat was not dead; it was still twitching inside Ivan***.

Ivan complained of a bellyache. Elroy started an operation. He did not have the tools to do it, but he got most of the turtle out of Ivan's belly anyhow. Never mind how.

When he was able to speak, Ivan said he would not eat turtle again, whether it was cooked or raw. He would always eat pure Kallaloo.

QUESTIONS

If the boys caught lobsters off Moravian Point, at the place where they dived, there are reefs _____, there is only sand _____.

Why did the boys catch only two male lobsters?

Why does turtle meat continue to twitch even after the turtle has been butchered?

Why didn't Philip need to add salt to the seawater for boiling the lobsters?

How much salt does seawater have?

What activities have reduced the lobster and turtle populations in many areas where fishermen used to catch them?

* In those days before dredging killed the living things in Great Cruz Bay, people used to catch any amount of lobster, turtle and fish.

** "Raven" means ravenous.

*** Turtle meat does twitch for many, many hours after the turtle has been cut up. Bush medicine, home remedies and resourcefulness of their parents and grandparents is behind the comic explanation of Elroy's operation. Note also why the boys ate the lobster shell and turtle liver: lobster shell when broiled is tasty and turtle liver, like the liver of young goat kids, is a great delicacy.



THE ADVENTURES OF IVAN ENVIRONMAN

Chapter III

A Trip to the Beach

It was a Thursday afternoon after school at the Beanery in Cruz Bay. Elroy, Malcolm, Ivan and Philip were licking their ice cream cones silently. Elroy spoke first, with a slightly numb tongue and a mouthful of melting strawberry ice cream, "let's go to the beach Saturday."

Ivan asked, "What beach are we going to?" "Trunk Bay!"*

"My favorite beach!" said Ivan. Malcolm and Philip said nothing. They nodded and tried to lick up their melting ice cream.

.....

Saturday morning the four boys headed for Trunk Bay on foot. Along the top of Caneel Hill, a tourist picked them up in his jeep. The four boys reached Trunk Bay at ten o'clock, and at 10:01 they were in the sea.

"Let's play like we have a war," Malcolm proposed. "Elroy, you be a sub of the Japanese, and we be some soldiers." Elroy asked, "What do we use for weapons?"

"Sand," said Philip, "but I am not playing."

Elroy jumped in the water and started diving like a sub. Malcolm picked up some wet sand and rolled it neatly in dry sand. As Elroy raised his head, Malcolm loosed the sand-ball on Elroy's head. (This did not hurt a hard-headed boy like Elroy).

While Elroy and Malcolm were playing, Philip and Ivan were further down the beach, in the shade of a seagrape tree, relaxing. They watched Elroy return Malcolm's attack. When Elroy drove him the last sand-ball, Malcolm gave up, and he said so.

"Elroy, I give up! Let's go eat." Now Ivan and Philip had eaten up all the food the boys had brought along for lunch, and they had no money to buy a hot dog. As Malcolm and Elroy approached, Ivan suggested with a smile, "Let's look for coconut."

Elroy had an angry, hungry look on his face. "If you were a pig, I would barbecue you!"

The four boys headed down the path where the coconut palms grow. They borrowed a machete from one of their friends who worked for the Park Service. Ivan volunteered "I will climb." Elroy threatened, "You better move up that tree fast, Ivan. I am hungry as a cannibal!"

Behind the coconut palm that Ivan climbed was a pool of water. Elroy was standing still, gazing in that pool of rain water. He could see Ivan's reflection in the pool as he climbed up toward the coconuts. Halfway up, Ivan screamed out, "Don't let me drop!" But Elroy, Malcolm and Philip jumped back from the tree and took cover. Ivan splashed into the pool of muddy water and mumbled, "Fine set of friends you are!"

They all set off toward the beach again. Ivan was in front. Elroy, Philip and Malcolm strolled behind, laughing. Straight ahead Ivan happened to notice three Jackspaniard** nests, and he said to himself, "One nest for each". To the others, out loud, Ivan sang out, "I am going up ahead for coconut, and I will meet all of you out on the beach."

Philip, Malcolm and Elroy came along, still laughing over Ivan's fall, when they bumped into the nests. One Jackspaniard nest clanged on each of those three backs, and in one miserable moment, the three boys were in the sand, rolling over and over to ease the stings on their skins. Ivan appeared and spoke softly, "What a fine set of rollers you make!" And then he started to laugh. Elroy stopped rolling long enough to say, "You saw those nests!" Ivan replied in a soft voice, "Yes." Elroy asked, "Why didn't you tell us." Ivan asked, "Why didn't you catch me?" Philip groaned, "Do unto others as you would have them do unto you."

*St. John, unlike St. Thomas and St. Croix has more than a dozen fine free beaches open to the public, inside the National Park. Ivan's cousins on St. Thomas and St. Croix believe that all Virgin Island beaches should be open to Virgin Islanders. Which beaches do you and your family like to visit?

** Jackspaniards are wasps.

Environmental Studies Program
Box 84, Cruz Bay, V.I. 00830

SALT POND

Post-Site Lesson Notes

First, discuss the underlined questions, and then use the questions below these for an objective quiz.

1. How are you like Columbus when you come to an Environmental Study Area like the one at Salt Pond Bay?

Name something you or a classmate really did discover in this Environmental Study Area.

2. How do your senses provide data for your environmental computer?

Name two plants that you can identify by their scent. (Wild sage, Bay Bean blossom, Frangipani, Jacquinia, Maran.)

What plant did you touch that has a fuzzy leaf? (Maran bush.)

Where do the waves speak in the loudest voice - at Salt Pond Bay, the Salt Pond or Drunk Bay? (Drunk Bay) Why?

What flavor did you taste when you licked the backside of the Black Mangrove leaf? (Salty flavor)

How can you "see" which way the wind blows at Drunk Bay? (You can see how the trees bend away from the strong southeast wind. The seagrasses and other trees bend northwest.)

3. How did Virgin Islanders "shop" in the bush before the days of Pueblo and Grand Union?

Name four ways Maran Bush has been used for good housekeeping. (To scrub pots, to sweep floors, to heal cuts, to drive off sandflies.)

How is Maran Bush better than Erillo?

What "seasoning" grows on bush at Salt Pond Bay? (Wild Sage)

How can a cook use these materials?

1. Dildo cactus (Kadushi soup)
2. Sea purslane (egg salad, macaroni salad, chicken soup)
3. Pope's Head cactus (the fruit is great in Jello)

What seafood did you notice at Drunk Bay and Salt Pond Bay? (Wilks, periwinkles.)

What do St. Johnians still gather at the Salt Pond? (Salt)

4. How do plants adapt to a dry, salty, windy environment?

Name three plants you saw that have adapted to a dry environment by developing very small leaves. (Dildo cactus, calabash, Inkberry tree.)

What plant has a big leaf because it can remove some of the salt from seawater? (Sea grape).

What plant can "perspire" salt through its leaves? (Black Mangrove)

Why are there no tall trees on Ram Head? (Too much wind; almost no rain.)

Why don't the coconuts, manchineel seeds, almond seeds, hogplum seeds washed up on Drunk Bay take root and grow? (No soil, too much wind, salt spray and sun.)

page two

Salt Pond Post Site Lesson Notes

5. What evidence did you discover at Drunk Bay that many people are using the sea as a giant garbage pan?

Where is the tar you saw on the rocks coming from? (Aruba oil refinery and from all kinds of boats, large and small.)

Which Drunk junk did you see that is not biodegradable? (Tar, plastic, bottles, styrofoam, aluminum foil.)

6. *If you took your family or friends to Drunk Bay, what would you want to show them first?
7. * Make believe you are one of the objects (a baby shoe, a bed post, a copper nail, a rope, a fish pot buoy, etc.) that wash up on Drunk Bay and tell where you came from, what happened to you on the way to Drunk (drowned) Bay, who found you, and what the child who found you did with you.

8. Review Strands of

PATTERNS - What radial patterns do you find at this ESA? (Sun beams, sea egg, thorns on cacti and trees.)

LIKENESSES & DIFFERENCES - How is a nerite different from a wilk? (Nerite never grows larger; the lip is like a tooth.)

INTERACTION - How do wind and sun interact with salt water at the Pond to produce salt?

CONTINUITY AND CHANGE - Man is changing the amount of wilks in this area and elsewhere by taking them faster than they can grow (it takes 4-5 years for a wilk to grow big enough to eat); what can man do to continue the wilk supply? (Limit amount of wilks a person collects; study mariculture techniques for farming wilks on cays like Steven Cay.

- * Use these ideas as basis for a composition for Language Arts.

SALT POND BAY ENVIRONMENTAL STUDY AREA-NOTES

1. Adaptation and Evolution

- a. The Cactus (Dildo, Pope's Nose, Opuntias, Suckers) are the camels of the plant world. How has the cactus evolved so that it can get along without as much water as other plants require?
 1. The cacti store all the water they can. (The Dildo Cactus is full of water good enough to drink.)
 2. Cactus roots spread out close to the surface of the ground in a fine hairy mesh to catch every little drop of rain better than most plants.
 3. The leaves of a cactus have shrunk up in the course of evolution until they are only needles or prickles. In this manner minimal moisture is lost. Large leaves lose larger amounts of moisture (transpiration).
- b. The Black Mangrove has adapted to a salty environment so well it even excretes salt. (Taste the salt on the underside of the leaf.)
- c. What other small leafed plants do you see near Salt Pond Bay and the Salt Pond? (Wild sage, Maran, Buttonwood, Gum, Wild Nutmeg, Jacquinia, Nicker Bush.)
- d. What other salt-tolerant plants do you see?
Seagrape - Note that this large leaf plant can grow in a dry area because seagrape roots are able to "distill" a certain amount of salt water and thereby increase their fresh water supply. Sea purslane. This beach cover has a succulent, nutritious leaf rich in iron and other minerals. Sea purslane can be used in salads and soups.

2. Patterns

- a. Coral - Do you see the different patterns or designs in these corals tossed on the beach at Drunk Bay?
 1. Brain coral
 2. Elkhorn coral
 3. Finger coral
 4. Star coral
- b. What patterns do you see in the leaves, flowers at Salt Pond Bay?

3. Likenesses and Differences

- a. How are whelks (wilks) different from and also like nerites?
- b. How are sand dollars and sea urchins (sea eggs) alike and how are they different?

page two

4. Attitudes

- a. What good is a sea egg? Should you destroy all sea eggs or walk around them?
- b. What good is a cactus?
- c. What good is a sandfly?

(See A Guide to the Natural History of St. John, p. 10-19)

5. Economic Value (Untapped) of Native Products Found at Salt Pond Bay

While you may not collect and sell food or materials from any Park area, you may and should collect good ideas. All of these plant materials are found on St. Thomas in arid shoreline areas. ESP students can go gather, package, label and describe these native materials to sell to visitors eager to have something from the V.I. rather than Paris or Hong Kong.

- a. Maran bush is marketable! Consider these uses:
 1. Biodegradable pot cleaner
 2. Floor scrubber
 3. A bed of maran drives fleas from dogs, but not ticks.
 4. Maran oil heals cuts.
 5. Maran leaves thrown on a fire will drive off sandflies.
 6. Chewing Maran stalk will ease toothache.
 7. White maran makes a tasty bush tea.
- b. Pond Salt or Sea Salt
 1. Tastes better (sells for \$1.99/lb. in New York City)
 2. Pond salt is better for you (it has traces of all earth's minerals)
 3. Available (From Salt Island, Anguilla, other BWI)
 4. Coarse pond salt can be used in recipes where no other salt will do. ESP can supply some of these recipes.
- c. Wild Sage leaves (sometimes called wild thyme) makes a fine tea; also excellent for flavoring soups, stews, spaghetti sauce.
- d. Pistarcle. This plant, like Maran bush, makes a fine broom to clean the yard.

6. Continuity and Change

- a. Notice how some St. Johnians in this area continue to live in harmony with their natural surroundings. Good fishermen haul their pots regularly so that fish don't die in the pot; they do not set turtle nets out of season or in Park waters.
- b. Notice also signs of discord caused by the way some roads are being cut and shorelines changed as you approach Salt Pond Bay, especially the Great Cruz Bay dredging damage. The new Earth Change Law prohibits further damage of this kind, but citizens must help monitor developments.
- c. Stress need for observation education, legislation to keep land and water fit for all to use and enjoy.

PELICAN IN A RED BELLY TREE

Leinster Bay-Annaberg Environmental Study Area

Parent Pupil Teacher Questions

- I. From Red Hook, St. Thomas to Leinster Bay, St. John aboard a "Floating Classroom". Why is the water in Pillsbury Sound usually rough? (The Atlantic and Caribbean meet in Pillsbury Sound; they shake waves and bump shoulders.)
1. What are the names of the four large cays that you see on the north side of Pillsbury Sound as you head towards St. John? (Thatch Cay, Grass Cay, Mingo Cay, Loyango Cay. Do you know how each cay got its name?)
2. How does the north shore of St. John look different from the north shore of St. Thomas? (Green vegetation and absence of development; point out that almost all of St. John's north shore belongs to everyone on the boat and his family as part of the V.I. National Park, whereas most of the north shore of St. Thomas belongs to private individuals.)
3. Who owns the beaches and hillsides in the National Park? (YOU do!) At current prices for such land, this means you own at least 225 hundred million dollars worth of land along this north shore. (With older pupils discuss why price is not, in this case, the best way to estimate value of land. Some natural and human resources cannot be tagged in dollars and cents.)
4. Ask pupils, Why do you think St. Thomians and Crucians as well as tourists like to come to St. John? (Consider both the natural and human resources that make St. John a pleasant place. Would an oil refinery on St. John improve the Island? Why or why not?)
5. What makes the rocks at Mary Point red? (Not blood, although the legend reflects accurately the feelings of St. Johnians, then and now, that men would prefer to jump to their death than give up freedom. The red on the rocks at Mary Point and Red Hook is due to the presence of hematite, which, like hemoglobin in the blood, makes us see the thing as red.)
6. Why did the Danes in the 1840's build a Customs House at Whistling Cay? (To check on contraband from Tortola and the English Islands coming into the Danish West Indies. Note the restoration of the customs house ruins.)
7. What large birds do you see around Mary Point and in what kinds of trees do they roost? (Pelicans on the mainland are threatened with extinction due to DDT in the food chain. DDT prevents a proper shell from forming around embryos. Pelicans still breed in the Virgin Islands successfully! The trees they seem to prefer are the Red-Belly trees.)

II. The Leinster Bay "Lunchroom"

1. How is the lunchroom on the shoreline rocks at Leinster Bay different from your regular school lunchroom?
2. Did you eat anything at all for lunch at Leinster Bay that a Virgin Islander might have eaten for lunch 50 years ago at this same spot? (Bananas, pines, fish, chicken -- note the things you eat and drink, the containers and wrappers that were not used by Virgin Islanders 30 or 40 or 200 years ago.)

III. Social Studies by the Garbage Can

1. What kinds of garbage can be recycled? (Look in magazines for ads that show how metal, glass, aluminum, paper are being recycled in the U.S. Discuss why it is presently impractical to recycle many of these materials in the Virgin Islands. Discuss the proposed auto reef for Pillsbury Sound using concrete rubble, old tires, and junk vehicles to form coral reefs and help improve fish breeding.) How can we recycle most food garbage at home?)
2. How can we shrink the amount of un-recycled garbage in V.I. trash cans from more than three tons of garbage per family each year to half that amount or less? See Ivan Environman Calendar for August, 1973. Discuss how a compost heap can be made in a small space, with coffee and tea grounds, egg shells, and all fruit and vegetable parts. Citrus rinds disintegrate very slowly but shredding helps. Explain that animal parts of any kind must not go into the compost pile since dogs and rats will dig up meat. Collect daily vegetable garbage in a gallon plastic container with cover. The compost can be covered in the yard with dirt and/or green cuttings.
3. How can the compost heap help you grow better fruits and vegetables in your yard? (Compost heaps release nitrogen and other organic materials that enrich our soil and make the plants healthier.)
4. How will it help reduce garbage if we use and re-use foil, plastic, and paper wrappings and containers? (The volume of solid waste will be greatly reduced.)

IV. Under the Red-Belly Tree!

1. What other names do you know for the Red Belly tree? What do these names tell you about this tree? (West Indian Birch, Gum Tree, Fence-post tree, Turpentine Tree, Naked Indian Tree, Tourist Nose Tree, Gumbo-Limbo Tree.)
2. Why is it necessary to have one official name for every plant and animal? (Eskimos, Danes, Virgin Islanders and anyone else, need one formal name to identify any plant or animal, just as you have

page three

one name on your birth certificate. Learn the official name of the Red Belly Tree -- *Bursera simaruba*.)

3. What animals have their "territory" on the *Bursera simaruba*? Aoles lizards, bananaquits, hummingbirds, yellowbreasts, doctorbirds)
4. Why do you think pelicans may choose the Gum Tree for nesting? (Possibly because the slippery bark prevents rats from climbing to the nests to take the young or the pelican eggs.)
- V. What Makes the Seeds from the Monkey Pistol Tree Shoot? Heat from the sun expands the pod to release the seed and disperse it.)
 1. How are the seeds used to make jewelry?
 2. How were the pod sections of the tree used to sprinkle sand on ink in the days before blotters and ball point pens? Try this out!
- VI. Step Back Through the Looking Glass of History 250 Years!
 1. How did Annaberg get its name? (In 1721, Christopher William Gottschalk named his new estate on St. John for his infant daughter Anna. Berg is Danish for hill. (See Random Notes on History of St. John by Anderson.)
 2. What does the slave house by Marker I tell us about hard life and a freedom fight on St. John in 1733-34?
 3. What foods did the people grow in the small gardens in the slave village? (Pumpkin, papaya, cassava, sweet potato, pigeon peas, okra, tannia, etc.)
 4. What medicinal plants do you find at Annaberg which were used here much as they had been used in Africa? (Maiden apple, soap bush or maran, crab prickly, conkaberry)
- VII. Danish Recycling Made Operation of the Sugar Factory More Efficient
 1. How did the Danes use the magas or bagasse (crushed cane) after all the sweet juice was squeezed out? (Magas was used as fuel to keep the coppers boiling; if it soured it was used as mulch.)
 2. How was the scum that was skimmed off the coppers used to help build walls? (Wherever you see a pinkish mortar at Annaberg, that mortar was made with crushed burnt coral, or lime, plus scum from the coppers and plus a little red clay, the clay that is red because of hematite like the rocks at Mary Point.
 3. How were all the drippings used? (All the drippings, even the sweetish water left over from washing the coppers, were saved and dumped in a tank, left to ferment, and be used in making Kill-Devil Rum. The sugar factory made one-third of its money from rum.)

page four

VIII. Explain How Each of These Words Fits Into the Story of Sugarmaking

1. Horse mill - (First, cheapest and easiest way for most factories to crush cane.)
2. Wind mill - (Windmills were expensive. The one at Annaberg wasn't built until some time after 1844. When the wind didn't blow, a horse or mule mill was the only way to get the cane crushed before it soured.)
3. Coppers - (The big pots were often lined with copper to conduct heat better as Revereware does.)
4. Hogshead - (The barrel that held wet, raw sugar was bigger than a pig, hence hog.)
5. Worm cistern (The metal coils from the tank where the alcohol boiled twisted like worms as they passed through the cool water of the cistern and the raw rum condensed to trickle out of the worm into a barrel. This operation can still be observed at the Callwood Distillery near Canegarden Bay on Tortola. Classes which raise part of the money for a visit to Tortola may be able to visit Canegarden Bay and Sage Mountain with assistance from ESP, Inc.

IX. What Good is a Wetland? (Take a walk along the marsh near the bonefish flats and notice the many kinds of life that depend on this wet, marshy, environment.)

1. What kinds of birds can you expect to see in this cool shady area? (Green heron, yellow-crowned night heron, gallinule, lesser yellowlegs.)
2. What other life do you see in the intertidal pools? (Notice how crabs shed their skins the way lizards do.)
3. Why is it important to leave the wetlands undisturbed? (Even if you don't eat crabs or birds and even if you don't like watching them, why is it still important to human beings that we leave wetlands alone?)

X. Questions for Students to Try Out at Home. (Underline the best answer.)

1. An Environmental Study Area is an outdoor classroom where parents, students, and teachers learn more about (social studies, science, art, language, arts, all of these subjects.)
2. "Lamajoe" is a down-island name for a (bad boy, roast lamb, red mangrove.)
3. The walls of the sugar factory at Annaberg were built from these three materials: _____, _____, _____.
4. Although slave labor was abolished in the Danish West Indies in 1848, slave labor is still used as political punishment in (France, The Soviet Union, Denmark).

Environmental Studies Program
Box 84 Cruz Bay, V.I. 00830

ANNABERG POST-SITE LESSON PLAN SOCIAL STUDIES

NAME _____ GRADE _____ SCHOOL _____ DATE _____

How can we find out more about how Annaberg was built, when it was built, how the sugar factory operated, how the slaves lived, how the workers lived after 1848, how the owners and overseers lived, what effects raising cane had on the ecology of St. John?

Can you think of some more questions besides these that you want to ask? Write your questions here: _____

To learn more about the history of a place like Annaberg, we need to study records, if we can find those records! Public records such as deeds to property, maps, census figures, tax records are called ARCHIVES. We study the archives of the times from 1721, when the first deed granting the land we call Annaberg was made out to Christopher William Gottschalk. What other kinds of records help the historians dig up facts? How would old letters, family Bibles, and newspapers help? (Talk about this.)

We need to set up space for archives at our Public Library in St. Thomas. Miss Enid Baa, Director of Libraries for the Department of Conservation and Cultural Affairs, is interested in this project. Copies of old records from the archives in Copenhagen, Denmark are put on MICROFILM. Why is this done? The microfilms are then stored for scholars to use. You can use them! Putting information we can still get first hand from older family members and taping it will help us and others later to learn about Virgin Islands life 40 or 50 years ago. What other clues to the past help us learn about the way people lived besides the written records we find in archives? Arawaks, Caribs and early African groups left other kinds of clues to their history. ARCHEOLOGISTS study these unwritten clues.

ARCHEOLOGISTS dig things up carefully, things like bones, pottery, garbage. These are clues that tell what kind of food African families ate in the slave village at Annaberg, how the food was cooked, what kinds of tools were used, etc.

MARINE ARCHEOLOGISTS dive on reefs and in old wrecks. Marine archaeologists can tell us where the coral in the walls at Annaberg may have come from. Archives show that some coral came as ballast in boats from the Bahamas, but now it is thought that perhaps also some of the coral was carved from the reef at Cinnamon Bay, because the reef is no longer there to protect it. There are many maybes, but the history of these islands is just beginning to be written. Maybe you will be one of the students to find some of the answers!

page two

Annaberg Post-Site Lesson Plan

ARCHITECTS study the ruins at Annaberg to tell us how old different parts of different buildings are. It's like telling the age of a horse by its teeth. Architects can tell that the windmill isn't very old. They can tell that the horse mill and slave house are very old. If you are a good detective, YOU may find some of the clues that will explain more about life on St. John than any books now can tell us.

The more we understand about our Virgin Islands, the better we can understand ourselves. Go home tonight and use your new words.: ARCHIVES...
ARCHAEOLOGIST...ARCHITECT...

Environmental Studies Program

ANNABERG POST-SITE LESSON NOTES
QUIZ

Underline the best answers in the parentheses below. Fill in blank spaces with the correct nouns.

1. An Environmental Study Area is an outdoor classroom where students and teachers together can study (social studies, science, language arts, art).
2. The Island of St. John lies 4 miles (east, west) of St. Thomas.
- 3-6. The four large cays between St. Thomas and St. John, to the north, are _____, _____, _____, _____.
7. Annaberg is located on the (north, south) side of St. John.
8. The only remnants of any virgin forest on any Virgin Island is found on the top of _____ Mountain in Tortola, BVI.
9. A "red shenk" is a (bird, crab, fish).
10. Conkerberries are used as bait to attract (mice, lobsters, doves).
11. "Lamajoe" is a down-island name for (a bad boy, roast lamb, red mangrove).
12. Annaberg was named in 1721 for (the sweetheart of Sir Francis Drake, the infant daughter of Christopher William Gottschalk).
13. Most of the ruins we see standing at Annaberg are walls built in the late (17th, 18th, 19th) century.
14. The walls of one slave house and the horse mill represent the (oldest, newest) construction at Annaberg.
15. On the boiling bench in the sugar factory were (3, 4, 5) big coppers, and
16. the first copper was the (largest, smallest).
- 17-19 Nothing in the sugar factory operation was wasted; everything was re-cycled. The _____ was used as fuel, the scum from the molasses was used for _____, the drippings and washings from the sugar-making were allowed to ferment and make _____.
20. Since most of St. John is very (hilly, flat), it was more difficult to grow cane profitably at a place like Annaberg than it was at a place like Whim on St. Croix.
21. A hogshead of sugar holds about (16 lbs., 160 lbs., 1600 lbs.)
22. From a gallon of cane juice, you might get about (one lb., two lbs., $2\frac{1}{2}$ lbs.) Brown sugar.

Page two Annaberg Lesson Notes

23. The owners of the Virgin Islands National Park area (the Rangers, the tourists, you and me plus all of them).
24. The walls of the windmill and sugar factory at Annaberg were built with native stone, bricks from Denmark, and _____ cut from the reef.
25. Although slave labor was abolished in the Virgin Islands in 1848, slave labor is still used for political reasons (in France, the Soviet Union, Denmark).

(1) Underline all subjects: (2) east (3)-(6) Thatch, Grass, Mingo, Lovango
(7) north (8) Sage (9) crab (10) doves (11) red mangrove (12) the infant daughter
of Christopher William Gottschalk (13) 19th Century (14) oldest (15) S
(16) largest (17) magas or bagasse (18) mortar (19) rum (20) hilliy (21) 1600 lbs.
(22) one pound (23) you and me plus all of them (24) coral (25) the Soviet Union

ANSWERS:

Environmental Studies Program

Geology in the Language Arts Curriculum

THE TALE OF A ROCK

We are the caretakers of our Earth. What we don't know can kill life on earth. This is why it is so important to study the whole earth. Nature is our teacher. With knowledge, we can help control changes on our Earth that will benefit all forms of life and being, including people.

Take a stone for instance. Any rockstone on a beach or on land. Astronauts brought home moon rocks to help us "read" the history of the moon. How can earthnauts like you and me "read" this stone? You can weigh it. You can measure it. You can -- in words -- describe it. As a junior scientist, you can come to know this rock as well as you know the back of your own hand. You can compare the rock with other rocks. You can study its colors, its texture, its weight.

What does your rock weigh? _____ Describe its color and shape _____
_____ . Test its hardness. Is it
harder than chalk? _____ Can you scratch it with your fingernail? _____
Can you cut it with a knife? _____ Scratch it with a penny? _____
_____ Scratch it with a knife with difficulty? _____ Will it
scratch glass easily? _____ .

Describe the texture of the rock. (smooth, grainy, etc.) _____
_____ Can you see any crystals in the
rock? _____ Does your rock shine or glitter or give off a soft glow? _____
_____ Can you see through it? _____ When you tap the rock, does it shatter
into bits or does it break off into smooth-surfaced planes? _____ Does
this rock look like tightly packed grains of sand? _____ or very fine
dust? _____ Does it look like a sponge? or does it seem to be a rock of
tightly packed minerals? _____ Now you have gathered some
facts about this rock, but these are only a few of the things that you can notice.
Write down other things you have observed about this rock.

What do you say if someone asks you about yourself? Something like this? "Well, my name is Bill Smith. I am eleven years old. I live at Tutu with my parents. I have an older brother and a younger sister." Do you tell only the facts about yourself? Or do you answer something like this: "My name is Bill Smith and I'm very happy right now because I just got an A in my math test. Mom will be very happy too, when I go home to tell her." ? You often tell about your feelings.

Let's turn again to your rock. It has -- in it's way -- told you many facts about itself. Let's look now at your feelings about the rock. Do you like it? _____
Is it a rock that you will treasure? _____ Are you amazed that you can learn so
much about it? _____ Has it started you thinking about setting up a rock
collection in your room at home? _____

page two

Let's take this journey into our feelings one more step. Let's try to imagine how it would feel to be this rock. If the rock had feelings, what kinds of things would it say? Look closely and listen. Would your rock say something like this:

"I am a rock, a very hard rock. You have tried to break me, but you could not get it do. I am so hard. I have been around on this earth a long, long time. I am far older than you could ever dream of being. But I feel just as young as the day I was born! I hope someday to meet a moon rock even older than I! How about you?"

Look for a rock that has a pretty color - red, from hematite, green from copper or perhaps a black rock telling a story of volcanoes. Black rocks at Annaberg have pretty white designs. What do they look like to you? Collect a set of different rocks and let them "talk" to you. Write down the story of your rockstones.

ENVIRONMENTAL STUDIES PROGRAM

Reef Bay Post-Site Class Review

1. What is an ESA? _____ What are classrooms without walls? _____ How do you read the "leaves" of the books of trees? _____ What do you learn about your environment through your nose? _____
2. What evidence do you see at Reef Bay that this is a moist forest area? (Big leaves, many tall trees, five species of ferns, mosses, fresh water in Yoshi Gut and the pool at the petroglyphs.)
3. Discuss how the resources of the Reef Bay Area have been used by
 - a. Indians
 - b. Danes
 - c. St. Johnians
 - d. Tourists
 - e. V.I. students
4. What uses have St. Johnians in years past made of these natural resources at Reef Bay?
 - a. Scrub Brush (Anthurium) - a biodegradable Brillo.
 - b. Bay Rum leaves - as flavoring in cereal, and in stew meat. People collected the leaves to make bay rum until the 1950's. What about operating a Bay Rum Distillery again? Would you like to see this done?
 - c. Locust - the "Candy Bar Tree" provided free snacks for St. John school children years ago.
 - d. Yellow Prickle - Dye for hoop baskets comes from the blunt thorns on the tree.
 - e. Hoop - Strong, beautiful baskets are made from the giant hoop you see in loops along the trail up to the Petroglyphs.
 - f. Sand Box Tree - The pod served as a scoop for sand sprinkled to dry ink on letters in the days before blotters or ball point pens like we use now.
 - g. Kapok or Silk Cotton Tree - Fibers from the seed pod are used to stuff pillows or life preservers because they are so light and buoyant.
 - h. Lime Trees - For limeade - lime trees growing at Reef Bay grew where charcoal-makers spit out seeds.
 - i. Guana Tail - (Sanseveria) - Rope was made from the tough fibers of Guana tail. Clowns at Carnival use the leaves for whips. Boiled Sanseveria will whiten clothes like Clorox.
 - j. Casha Tree - The wood was used for making charcoal, one of the few ways St. Johnians could earn money years ago.
 - k. Turpentine Tree - (Bursera simaruba) a branch stuck in the ground makes a living fence post, leaves can be used in bath-water for babies.
 - l. Pitch Apple Tree - (Clusia Rosea) Fruits are boiled to make a caulking material for repairing boats. Squeeze the fruit to see how sticky it really is.
 - m. Black Wattle Bush (Sook Sook) - Makes a delicious tea used also for

page two

treatment of a cold.

- n. Maiden Apple - Leaves are boiled for medicine to treat diabetes; this use is under study.
 - o. Wandering Jew - Infusion used to alleviate high blood pressure.
 - p. Fresh water in gut below the trail - before the days of washing machines mothers came here on laundry day.
 - q. Congo Root - (Strong Man Bush) Another bush medicine of value? **Leaves** crushed in palms of hands are mildly anesthetized. Note oniony smell of this weed.
5. Why has the Reef Bay Road lasted so well for more than 200 years?
- a. The road respects the shape of the land. It follows a land contour design. It does not go abruptly straight up and down like many roads in Cruz Bay that cause erosion and auto accidents.
 - b. The Reef Bay Road provides stone culverts for rain to drain. The culverts follow the natural drainage pattern of the guts in the area. The men who made the Reef Bay Road by hand used their heads and did the job better than we do today building with bulldozers in most places.
6. What are petroglyphs?
- Petro = Peter = Rock
Glyph = marking or carving
Petroglyphs are rock carvings.
7. What clues do you find to help solve the History-Mystery of the Reef Bay petroglyphs? Who do you think made the carvings? These clues will help you.
- a. The markings closely resemble certain West and Central African Art. (The markings differ from Amer-Indian art in that there are no prominent mouths.)
 - b. The petroglyph cross may have been made by African artists who were Lutherans by 1733. Arawaks definitely were not Christians, the cross is not an Indian symbol.
 - c. Some anthropologists say these carvings do not resemble other Caribbean Indian art.
 - d. Ghanaian teachers feel the  is the old state sword symbol of Ghana meaning "Except God."
8. How can we encourage the farming of fresh water shrimp (aquaculture). These shrimps (*macrobrachium carcinus*) are quite delicious and also, now quite rare?
- a. We can protect areas where these shrimp still breed on St. Thomas, St. John and St. Croix.
 - b. We can study ways to cultivate them and help them grow faster the way farmers raise turkeys or pigs.

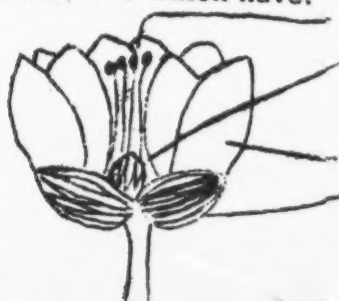
Environmental Studies Program

LESSON NOTES ON PLANTS

(Adapt to your Language Arts and Science Curriculum)

I. Vocabulary and Word Study

- A. Plant - What is the difference between a plant and an animal? (use dictionaries, discuss.) How are plants and animals alike?
- B. Genus - In classifying plant names, the genus or family name is capitalized.
- C. Species - The species, or particular variety of plant within the big family, is written with a common letter, e.g. Malphigia punicifolia. Malphigia is the genus classification, punicifolia is the species classification (and it's the name of the West Indian Cherry Tree!)
- D. Indigenous - Indigenous plants are those native to a region, e.g. the pineapple, genip, papaya are all indigenous to the Virgin Islands.
- E. Exotic - Mangoes and tamarinds are exotic. They were introduced from India. However, many exotic plants have become naturalized and thrive like natives.
- F. Grafted - To improve certain species of flowers and fruits, they are grafted. Certain hibiscus, mangoes and limes are grafted. Ask a nursery man (at Winberg Gardens) to show and explain how the grafting is done.
- G. Botany - The science that deals with plants.
Botanist - A student of botany.
Botanical - (adj.) Concerning plants.
Botanical - (noun) A drug prepared from the roots, bark, or leaves of plants. Tropical botanicals are soursop and maiden apple.
- H. Chlorophyll - The green coloring matter of plants. In the presence of sunlight, chlorophyll converts carbon dioxide, CO_2 , and water, H_2O , into carbohydrates.
- I. Photosynthesis - This is the name of the process described above. Plants make their food by photosynthesis.
- J. Every plant has all of these parts. Learn the names and recognize the parts, and you will be a botanist!
1. Stem or trunk or stalk
 2. Roots
 3. Leaves (with chlorophyll)
 4. Flowers which have:



- a. Stamens
- b. Pistils- the seed-bearing part of the flower containing the ovary. Plants are classified and identified by their ovaries.
- c. Petals
- d. Sepals - the lower outer leaves right at the base of the flower.

5. Fruits - After the flowers bloom, the fruits with the seeds are formed. (Remember that "fruits" are not all so good to eat as mangoes or genips, but they are still fruits.

II. Environmental Strands

- A. Patterns - Notice the designs of petals and leaves. Look at the design or pattern of a seed cut in half, of a fern, of the roots of a weed.
- B. Varieties and Similarities - Compare the various different patterns you have noted in petals, leaves and seed designs. Can you see similarities in certain plant leaves? The leaf designs of sugar apple and soursops are similar. Can you find other similarities?
- C. Interaction and Interdependence - All plants give out oxygen, O_2 , and take up carbon dioxide, CO_2 , in the process of photosynthesis; plants interact with the sunlight, air, water, and soil around them.

Man is dependent on plants. Plants depend on animal wastes. Plants and animals are interdependent, although plants can survive without animals, whereas animals, including man, cannot survive without plants.

Plants not only provide food for animals; plants remove pollutants from the air we breathe. For example, plants filter out dust. (If you have a green screen of trees or even grass between your house and the road, you have less dirt and dust in your house than people who have concrete or dirt between their homes and the road).

Most important of all, plants give us oxygen to keep us alive! In a yard only 50x50 feet, or less than a quarter acre, growing grass releases enough oxygen for a family of four every day. The Virgin Islands need more green space, grass and tree space, to provide fresh air with oxygen for us to breathe.* When you walk in the country, away from automobiles, trucks, the air smells fresh. Do you know why?

III. Questions for Students to Ask

- A. Do all plants grow well anywhere you plant them? _____
Why not? _____
Find out what kind of soil is best for mangoes, for avocados, for limes, for West Indian Cherries, sugar apple, soursop, mammee apple, banana, guavaberry?
- B. What kinds of plants grow best in dry or semi-arid locations? _____

*Write to Scott, Marysville, Ohio 43040, for free copies of the "Oxygen Giver" advertisement (picturing a blade of grass with an informative caption) as appearing in the New Yorker, April, May and June, 1970. A good item for children's scrapbooks or bulletin boards on environment.

page three

C. Tropical botanical or medicinal plants.

Ask student to name bush teas or plants they know about. There are over 200 local medicinal plants, but only about 15 are commonly used.

D. What kind of fruit trees do you think would do best at your school? _____

Consider soil, rainfall, amount of shade or sunlight, and protection your class could provide for a young tree. The fruit tree could be grown in a planter, if there is no yard space.

E. Ask for advice on setting up an herb garden, a vegetable garden, or a medicinal plant box at your school. A few herbs and vegetables add much flavor and many vitamins to a school lunch.

F. Ask students:

Name or list everything you ate today. _____

Did anything you ate come from the ground, the tree, or the seas of the Virgin Islands? _____

What fruits and vegetables and spices might be grown in a school garden?

At home? _____

Would you be willing to care for a native fruit tree in your own home yard? _____ If so, you can arrange to receive a free tree from the Agricultural Station.

Environmental Studies Program
Box 84, Cruz Bay, V.I. 00830

Improve Quality and Quantity of Fruits Grown in the Virgin Islands

"A fruit tree in every yard" is one of the goals of a special project sponsored by the V.I. TB & Health Committee. The Environmental Studies Program would like to join in this important project. The real hope of the Committee is to improve the quality and quantity of fruits grown in the Virgin Islands, primarily through the efforts of children.

- Step 1: Plant the fruit seeds or slips in cans (quart size is preferred) filled with good soil and sand, with a drainage hole punched in the bottom.
Suggested fruits to plant: limes (seeds), papaya (seeds), genips (seeds or young plants), cashew (slips), hogplum (slips), guavas (seeds), soursops (seeds), sugar apple (seeds), custard apple (seeds).
- Step 2: Care for plants until they are about 9 inches in height.
- Step 3: Plant distribution and awards. Children in the program should plan how these plants will be used to best advantage at home and in other areas of their community. The Committee and ESP offer prizes for (a) the largest number and (b) the greatest variety of plants grown. These prizes will be grafted fruit trees from the Department of Agriculture, including mango and West Indian cherry.

Who may participate: Class or individual child. Let this be one of your ESP projects this year.

Environmental Studies Program
Box 84, Cruz Bay, V.I. 00930

Introductory Lesson on Mangrove Lagoons and Wetlands

OBJECTIVE: To introduce the NEED strand of environmental Interaction and Interdependence in all ecosystems and specifically at the Mangrove Lagoon and similar wetlands.

Vocabulary for discussion: Environment - Ecology - Mangrove Lagoon

1. ENVIRONMENT - What IS your environment! Your environment is EVERYTHING that surrounds you, and also everything that you surround! (If you start making a list of the nouns that name everything surrounding you, be sure you have plenty of paper in your environment to write on. Remember that you wouldn't have paper in your environment if we didn't have trees in other environments from which the paper is made. We are dependent on the products of OTHER environments.) We all live in one natural world, on one great Island Earth. We (billions of us) all depend on each other and other things to live.
2. ECOLOGY - Ecology is the study of the relationships in our environment between living organisms and non-living matter. John Muir, the naturalist, observed that he had never found anything in nature that was not connected to everything else. The first of Barry Commoner's three laws of Ecology is "Everything is connected with everything else." We call this ecological interaction and interdependence of all living and non-living things in our environment the Web of Life. Everything really IS connected to everything else and everybody too!

Ecology and social studies overlap here. We study national, political and geographical boundaries. But in fact, all these boundaries and private boundaries are artificial arrangements made for man's convenience. Nature's boundaries - rivers, mountains, oceans - all serve to join the areas of this Island Earth more than they serve to separate. Air, for example, is a great environmental joiner. So is water. Water in a mangrove lagoon has many effects on fish, lobsters, corals, people, birds, and any other animals that interact with it. When man pollutes a mangrove lagoon, he is making a bad connection.

What does an ecologist do? An ecologist is a biologist and sociologist who studies the relationships (the interactions and interdependencies) that make life for plants, animals (and the special animal we call Man) possible or impossible.

You and I learn about ecology as if our lives depended on it, because they do! We can, through carelessness and indifference, continue to pollute the Virgin Islands and Island Earth itself so that life will be unpleasant and finally impossible.

page two

Introductory Lesson on Mangrove Lagoon

We study the ecology of our environment so that life will be possible, healthy, and good to live. The Mangrove Lagoon is a good place to begin learning what a Virgin Islander can do.

3. MANGROVE - Mangrove comes from the Spanish word "mangle" which comes from the Taino (Arawak) name for the red mangrove. Grove is an English suffix to the Arawak root. (Even words, as you can see, are interdependent, and language has always been a means for allowing the interaction of ideas that we surround and ideas surrounding us that we may not understand.)
4. LAGOON - A lagoon (from the Latin word "Lacuna" for a lake or hole) is an area of shallow salt water enclosed by a coral reef. So a Mangrove Lagoon, like the one we are going to study, is an area of shallow salt water partly enclosed on one side by a coral reef and on the other side by mangroves. The reef, the mangroves, the turtle grass, the birds, lobsters, fishes and man himself are all interacting, interdependent parts of the Mangrove Lagoon ecosystem.

Before and after the class visits the Mangrove Lagoon, discuss the question: WHAT GOOD IS A MANGROVE LAGOON? Most of the class won't have much to say unless you guide the discussion with information we add here from Rachel Carson, The Edge of the Sea and from the report, The U.S. Virgin Islands and the Sea, October 30, 1970, Teytaud's paper on the Mangrove Lagoon, and the four lesson notes included in this folder.

Some Basic Information About the Mangrove Lagoon

The Mangrove Lagoon area you will visit consists of 109 acres of mangrove swamp owned by the local government. It has been recommended that this mangrove lagoon, which is the last large mangrove area left in the Virgin Islands, be made a Virgin Islands Park and ecological study area to be strictly protected from over-development and supervised by the Department of Conservation. This recommendation has been made by the V.I. Conservation Society, June 25, 1970, by the National Wildlife Federation and the Audubon Society during testimony before the Port Authority in September, 1970, as well as by the Sub-Committee on Living and Non-Living Resources in the Virgin Islands and the Sea Report of October 30, 1970. The reasons for this recommendation are that the area is unique and beautiful and also because the area is of great value to the local economy. (The root word, oikos or ekos, is the same for both ecology and economics, something that is often overlooked. Our oikos is our home - economically and ecologically.)

Here are some of the reasons for protecting the Mangrove Lagoon and preventing any large-scale construction in the area:

- 1) 75% of all West Indian fauna and flora occur in this area;
- 2) 18 species of sea birds breed on Cas and Patricia Cay;
- 3) 60 species of fishes breed, swim and depend on the coral reefs protected by the mangroves. (And the mangroves in turn protect the reef from siltation from

page three

Introductory Lesson on Mangrove Lagoon

the surrounding hillsides);

- 4) Turtle grass in the area makes turtle farming, like that in the Caymans, a good possibility for the V.I. economy. Nutritionally important also;
- 5) Soft corals in the area are a source of useful drugs and anti-biotics;
- 6) If the mangroves are removed and/or if construction of an airport begins, the siltation could have even more distant and disastrous effects on the marine environment than we already anticipate;
- 7) The Mangrove Lagoon is an important undersea laboratory for Virgin Islanders to use now and for years to come. It cannot be replaced or set up elsewhere;
- 8) The Mangrove Lagoon is a good site for mariculture, growing plankton to feed mangrove oysters, a delicious seafood though presently available only in small amounts.

Rachel Carson, The Edge of the Sea

"Mangroves are among the far migrants of the plant kingdom, forever sending their young stages off to establish pioneer colonies, twenty, a hundred, or a thousand miles from the parent stock." (That's a long way.)

"Mangroves of the same species are found on the tropical coasts of America and the West Coast of Africa. Probably the American mangroves crossed from Africa eons ago via the Equatorial Current."

"As soon as mangrove seedlings are anchored, they begin growing, 10 or more inches a year. Their roots are prop roots. The roots trap all kinds of debris. From such simple beginnings an island may be born."

"In 20-30 years, mangroves are trees. Few are killed, even in hurricanes. In fact, mangroves are a great protection to coastlines during storms. If the Mangrove Lagoon is destroyed for an airport, a hurricane would very likely destroy the marinas north of the Lagoon."

On the site and post-site discussions, let students point out as many examples of interaction and interdependency as they can, stressing the unexpected interconnections between all aspects of the Lagoon environment (sandflies included!)

Mangrove
Lagoon



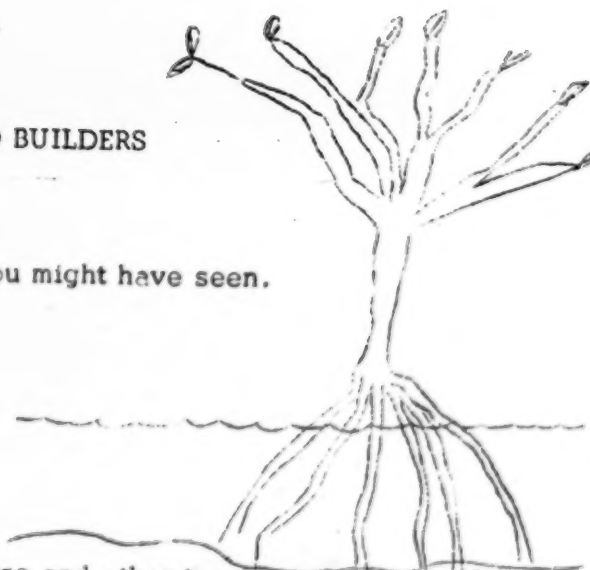
Lesson No. 1

MANGROVES: ISLAND BUILDERS

1. Do you know what a mangrove is?

It's a tree!

Here is a drawing of a mangrove tree you might have seen.



2. What is different about the mangrove tree and other trees you have seen?

Look at the drawing again. The mangrove tree has "prop roots".

Most trees have roots which grow underground, but the mangrove is different. It has roots that also grow above ground.

3. What else is different about the mangrove?

Notice that it is standing with its feet in water or damp mud. That is why we say a mangrove likes to have "wet feet".

A mangrove with prop roots only grows along the shore where there is water from the sea to wash its "feet."

4. There is another important thing about the mangrove with prop roots.

It has a seedling which can grow to be a foot long! You can see these seedlings hanging from the branches. They look like this:



5. The mangrove seedling is different from other seeds we know. It grows and grows, right out of the fruit, still on the tree.

When the seedling becomes long and heavy, it drops like a pointed spear into the water or mud.

When it touches the bottom it sticks there and begins to grow a new little mangrove tree.

Vocabulary words we have used with Lesson No. 1:

spear
pointed
important

different
bottom
prop roots

underground
mangrove
seedling

Lesson No. 2

MANGROVES: ISLAND BUILDERS

1. In our first lesson we learned what a mangrove is.
Let's review:

A mangrove is a tree.

A mangrove has prop roots.

A mangrove has long seedlings like spears which plant themselves into the ground beneath the water.

And let's add one new thing:

The mangrove we studied about is called Red Mangrove because the wood is reddish-brown.

2. Why are Red Mangroves important?

Red Mangroves are important because they help to build islands and keep island shores from washing away. Mangroves are also important because fishes and other animals and plants make their home in mangrove lagoons.

3. How do Red Mangroves build islands?

Remember the prop roots we mentioned in our first study of mangroves? These roots act as a trap for all kinds of debris and mud and sand. As water flows through them, the material begins to build up around the roots. This material becomes compacted and eventually can be called land.

4. How do Red Mangroves protect the islands?

Mangroves are like guards for our shores. When storms with big waves crash against the shoreline, the mangroves stand solid and firm, their prop roots holding the land in place.

Next time you are at an open beach during a storm, watch how the waves and wind move the sand away when there are no roots like mangrove prop roots to help hold it in place.

Vocabulary words we have used with Lesson No. 2:

build
Red Mangrove
Seedling
prop roots
spears

studied
reddish
important
trap
protect

guards
solid
watch
debris

Lesson No. 3

MANGROVES: ISLAND BUILDERS

Mangroves as Protectors

Red Mangroves grow along the shore and protect our islands from the heavy seas by their strong prop roots which hold the sand and soil in place.

Mangroves as Builders

These same roots serve as island builders by trapping debris, mud, and sand as the tidal waters flow through them.

1. Did you know that there is another kind of mangrove beside the Red Mangrove?

Living inland from the Red Mangrove is the Black Mangrove.

The Black Mangrove is different in several ways.

- a) It lives in the mud flats behind the Red Mangroves. It is further away from the sea.
 - b) It does not have long seedlings or prop roots.
 - c) You can tell a Black Mangrove by the salty taste of the leaf.
 - d) You can tell a Black Mangrove by the peculiar little rubbery spears which poke up through the mud at the base of the trees. These spears are called "pneumataphores".
2. "Pneumataphores, or "breathing roots", are used by the tree to take in oxygen. This is because the tree grows in such thick muck that it cannot breathe otherwise.
 3. So now we can see that there are two types of mangroves we will know when we go to a mangrove lagoon.

1) Red Mangrove -- Prop roots,
Long seedling which grows from the fruit until
it drops to make a new tree
Nearest the sea

2) Black Mangrove -- Salty leaves
Dark bark
Breathing roots (pneumataphores)

Vocabulary words we have used with Lesson 3:

mangroves	debris	salty	spears
protect	tidal	flavor	pneumataphore
prop roots	further	peculiar	oxygen
builders	seedlings	rubbery	breathe

Lesson No. 4

MANGROVE : ISLAND BUILDERS

Who Lives There?

There are many living creatures who are a part of the mangrove swamp. They live there because the mangroves provide food and shelter for them.

Who Lives There?

In the treetops look for:

nesting herons
resting egrets

Among the upper branches look for:

mangrove cuckoos
spiders, such as the golden orb spinner

On the prop roots above water look for:

different snails
flat tree oyster
crabs

Under the water around the prop roots look for:

shrimp
sponges
sea squirts
fan worms
tube worms
anemones
mangrove oysters

Living in the water around the mangroves look for:

mangrove snapper
sea cucumber
brittle star
spiny urchin
lobster
shrimp
eels
rays

Vocabulary words we have learned with Lesson No. 2 are so numerous, let's just pick out ten we might use often.

snail	urchin	spider
worm	oyster	mangrove
cucumber	sponges	
shrimp	br anches	

AN INTRODUCTION TO THE MANGROVE LAGOON

by
A.R. Teytaud

Prepared for use
in

The Environmental Studies Program

V.I. Department of Education

Since October, 1970, when the Environmental Studies Program began, more than 1500 elementary pupils have visited the Mangrove Lagoon Environmental Study Area in cooperation with the Caribbean Research Institute.

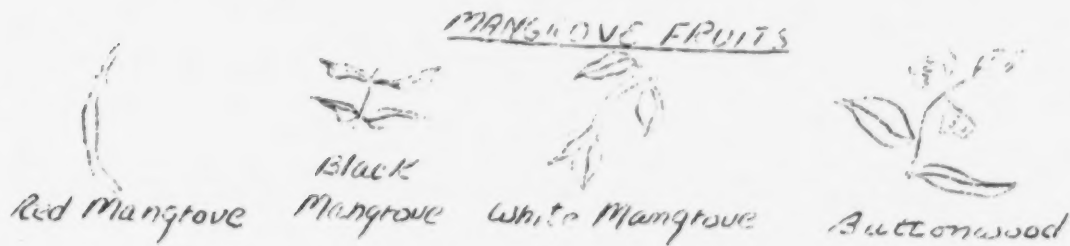
The 118 acre Mangrove Lagoon is a registered NESA (National Environmental Study Area) and eligible to become a National Environmental Education Landmark.

AN INTRODUCTION TO THE MANGROVE LAGOON

by A. R. Teytaud

I. The Mangroves

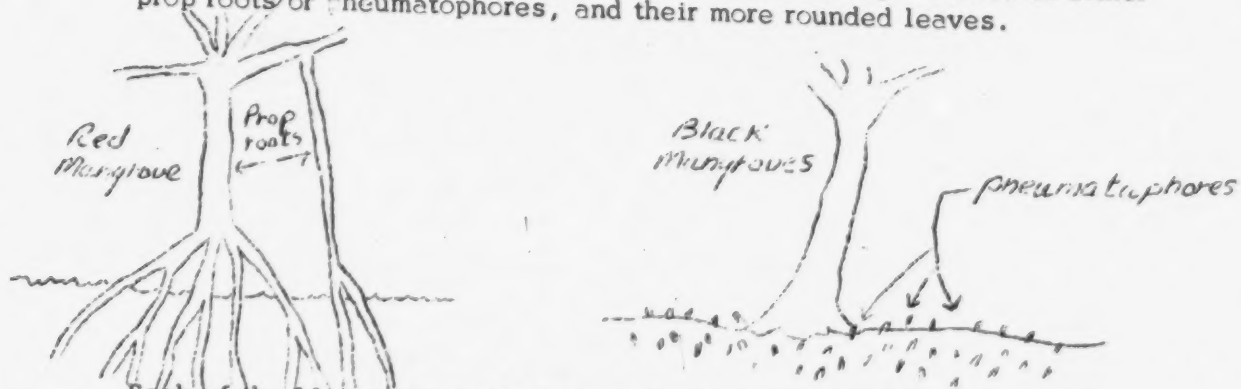
"Mangrove" is a loose term covering about 30 kinds of plants which grow in coastal areas throughout the tropics. The four most common species in the West Indies are the Red, Black, White and Button Mangroves. Each has a distinctive type of fruit, inedible to man, but eaten by birds, insects and the *Cyclura pinguis* Iguana who eats the Buttonwood fruits.



The seeds of the Mangrove float, and they may be carried out to sea and drift for several months before taking root on some faraway shore.

Red Mangroves have distinctive "prop roots" which extend out from the trunk and branches of the tree. These roots help to keep the tree from being blown over by high winds -- this is necessary because of the soft muddy bottoms in which the trees grow.

Black Mangroves produce many thin, finger-like "pneumatophores" from their underground roots. Projecting above the ground, they enable the roots to obtain oxygen, which is very scarce in the mud covering the roots. White Mangroves can usually be identified by absence of either prop roots or pneumatophores, and their more rounded leaves.



Each of the Mangroves tends to grow best in a particular environment. This tendency produces a zonation of the trees within the lagoon. In general, only Red Mangroves grow in the zone between high and low, i.e., where their roots are periodically submerged in seawater.

Behind the fringe of Red Mangroves we sometimes find a mixture of White and Black Mangroves and Button Mangroves, with the Whites tending to grow in drier, less marshy conditions than the Blacks. Black Mangroves at the Salt Pond on St. John are a good example of adaptation to a salty environment since pupils can taste the salt the leaves excrete. The zone of White Mangroves grades into the typical terrestrial vegetation of the island. Though they don't commonly occur there, Red Mangroves can be grown in fresh water.

11. The Mangrove Community of Plants and Animals -- A Tour

The following numbered entries are intended to be used in conjunction with the map of the lagoon (see Fig. 5) which shows correspondingly numbered stations; these site descriptions are merely background material to orient teachers not familiar with the lagoon and its creatures. Please feel free to innovate: Add or delete materials as you see fit, or make up your own tour -- you're running the show! Underlining indicates what I consider particularly relevant bits of information.

- 1) Board the Sea Slug at Benner Bay Lab -- this is presently the most developed part of the lagoon area, and consequently also the most polluted. Most of the mangroves here have been destroyed directly by bulldozing and filling to obtain more land. Where the Red Mangrove fringe has been left, you will see that the community of plants and animals growing on the roots of the mangroves is much less diverse compared to the roots in less disturbed parts of the lagoon. Note the dirty, grayish-green color of the water, due to dense growth of microscopic plants (plankton) and silt from soil erosion and dredging. Oil and gasoline spills are frequent. Circulation in Benner Bay is very slow so that pollutants tend to persist rather than be flushed out. The water becomes progressively clearer as you proceed towards Cas Cay.
- 2) Seagrass Meadows -- Seagrass beds are among the most productive and heavily populated environments in the sea. Many kinds of shrimp, crabs, sea stars, urchins (sea eggs), sponges, snails, clams, worms, fishes and algae live on and among the leaves of the grass. The sand beneath the surface is inhabited by vast numbers of burrowing animals. Grass beds and Mangrove Lagoons provide shelter and food for the young of many kinds of food and game fishes, as well as spiny lobsters. The value of such "nursery areas" to local fisheries is incalculable, and once destroyed they cannot be replaced. Like all green plants, seagrasses need light in order to grow--dirty water cuts off the light and kills the grass, destroying the home of the innumerable animals which live in the beds. Additionally, as the grass dies and decays, much fine mud once held firmly by its roots may then be suspended by wave motion to further muddy the water and decrease the light available to surviving organisms. Conchs and sea

turtles use the grass as food; they in turn are eaten by man. Sea turtles are being wiped out by excessive hunting and destruction of nests. Two kinds of sea turtles which live in the Virgin Islands -- the hawksbill and the leatherback or trunk turtle -- are on the Federal Endangered Species list because they are in danger of extinction. Though they are completely protected by this law, people in the Virgin Islands continue to hunt them -- probably mostly in ignorance of the law.

- 3) Coral Reef area between Patricia and Cas Cays -- we will not consider the reef in any detail, except to note in passing that it constitutes a completely different life zone, one which cannot survive without clean water. Notice how much clearer the water is here. Water passing over the reef circulates through the lagoon and exits through the Benner Bay area.
- 4) Channel between Patricia and Bovoni Cays (Short Stop) -- in the clear water here you may see many kinds of fishes. Large schools of "sprat", small barracudas, and Big Eagle or Leopard rays swim by. Notice how each type of fish has its own habits; sprat are always found in schools, never alone; barracudas and rays usually swim out in the open, by themselves; while back in the shadows among the mangrove roots hide a variety of brightly-colored fishes. Mangrove roots are a fascinating place to explore with face mask and snorkel. In looking there you will find that tiny barracuda (a couple of inches or so long) have somewhat different habits than the adults. They can be seen hiding motionless among the mangrove roots, sometime hanging vertically and looking like tiny, mottled brown twigs. Very often several jelly-fish can be seen on the bottom, lying on their backs with the tentacles turned up to the light. Within these tentacles live thousands of microscopic plants -- an example of symbiosis or living together. (Caution-- most jelly fish sting.)

Thick clumps of dark green algae grow among the roots on the right-hand side of the channel. These algae are unusual because they have a limey "skeleton." When the algae die their ground-up skeletons form a large percentage of the sand which makes up the floor of the lagoon. In time, this skeletal material will be re-used by other plants and animals. Everything in nature is part of a cycle.

- 5) Cove (Stop, turn off engine) -- this little cove is one of the prettiest parts of the lagoon. Even so, it is a pale shadow of the beauty that was Krause Lagoon in St. Croix -- now buried under the Hess and Harvey industrial complex. Sit motionless awhile and absorb the essence of the place, listen with your inner ear to its quiet harmonies--meditate on them...



"Be empty
Watch quietly while the ten
thousand forms swim into life
and return to the source...."
(T. L. from Tao Te Ching)

"With names, one should know where to stop" -- Lao-Tse

- 6) As you move away from the cove, reflect for a moment on the shriek of a jet's engines; where you are now is approximately where the planes will be landing if the jetport is built.

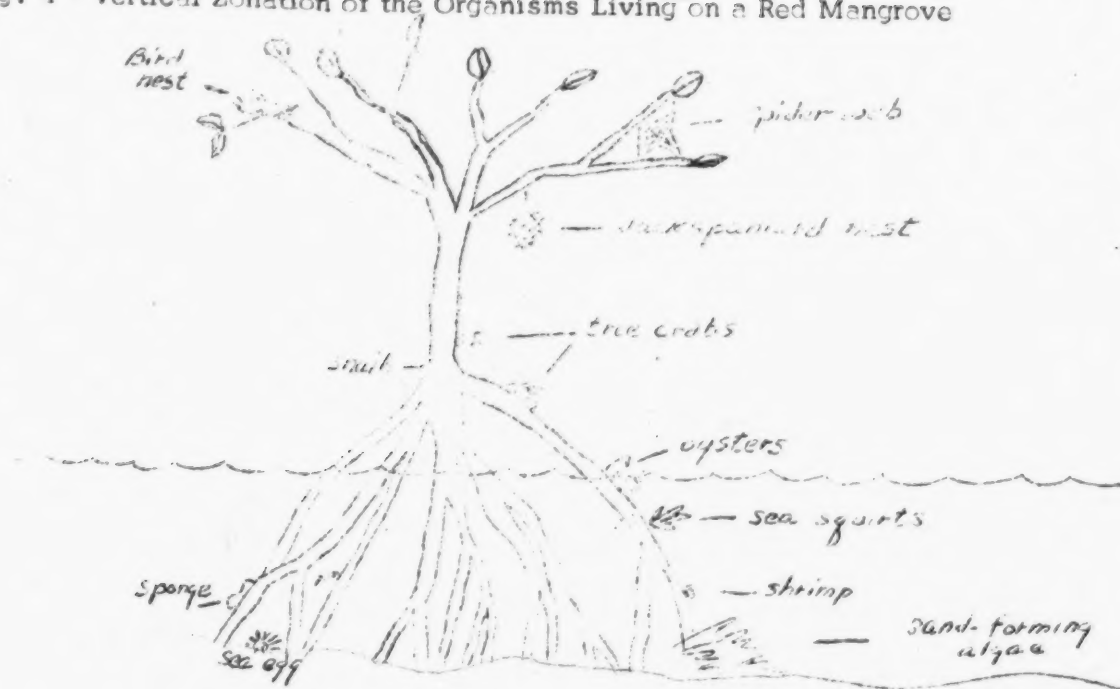
Next, stop along the mangroves on the right-hand side of the channel to take a closer look at what lives there. Every type of environment is inhabited by a characteristic association of living things. At first glance, the lagoon may seem to be populated only by the mangrove trees themselves, but further inspection reveals a host of animal and plant life, much of which depends upon the mangroves for shelter, concealment, or food. The majority of the creatures are either tiny or well camouflaged, and one must look closely in order to see them.

The bottom portion of the roots (the part under water) is usually covered by a furry mass of algae, sponges, sea squirts, etc. Take a root on board and examine it. It is probably alive with tiny shrimp, crabs, snails, and worms. Look closely, then please return the animals to the water. Near the surface of the water you may see oysters growing on the roots, and just above these, but out of water, large brown snails which are not found in any other habitat on the island. Running along the roots and branches you may see several, small, quick crabs -- there are two kinds, and they are both plant feeders.

Several kinds of birds nest and roost in the branches of the mangroves. Most of these are out foraging during the day, and only return to roost at night. However, you may see some pelicans and one or two kinds of herons. The pelicans dive for small schooling fish and the herons hunt individual fish by wading in the shallows of the lagoon.

Notice that there is a definite zonation of life forms from the bottom to the top of a mangrove tree with each animal or plant occupying its own specific niche (see Fig. 4). Most of the animals live underwater, but there are many others that live in the branches of the trees. Insects are common (uncomfortably so, in the case of mosquitos and sandflies), wasps (Jackspaniards) build nests, dragonflies chase each other and court among the branches. Spiders (not an insect) build webs in the trees to catch flies.

Fig. 4 - Vertical Zonation of the Organisms Living on a Red Mangrove



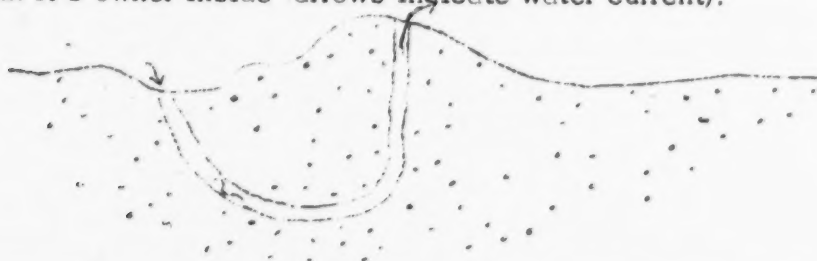
At night, insect-eating bats come out to hunt, while their fish-eating relatives skim low over the water in search of a meal.

Not so long ago, the iguana ('guana) was a common and fascinating denizen of these swamps, but it has become virtually extinct because of the destruction of its habitat by man, and wanton slaughter of the animals themselves. Ask your children how many of them have ever seen one, explain why it is worthwhile not to kill those that may be seen.

- 7) Group of Small Islands -- what you see here is the process of island building. Each of these small islands probably started out as a single mangrove tree. As time went on, silt and other debris accumulated among the roots, affording a place for other seedlings to take root, and the process continued. Eventually an island was born. Given enough time, all of these small islands may consolidate to form a much larger one, such as Patricia Cay.

Notice how the channels between the islands are carpeted with turtle grass and algae. On the bottom are also numerous mounds

of sand, like little volcanoes, and also many depressions or hollows. These are the signs that burrowing animals are present beneath the surface of the sand. Such "sand castles" may be inhabited by various kinds of worms, crabs, shrimp, or sea cucumbers. Here is a cut-away view of a worm's dwelling, with it's owner inside (arrows indicate water current):



- 8) Here you can see a good example of horizontal zonation. Look at the hill on your right and notice that it is covered by typical land plants -- frangipani (with white flowers), cactus, and low scrubby bushes. Mangroves do not grow in such an environment. Only near the water's edge do we find the mangroves--they are adapted to live in this habitat and not as successfully elsewhere.

The open expanse of water to your left is the largest bay within the lagoon. The bottom here is covered by turtle grass. This area is being polluted by effluent from the Nadir sewage plant, which dumps partially treated sewage into the water. The lagoon is also threatened by rapidly expanding housing development in the Bovoni area, and by a proposed racetrack at Nadir. This area is the exit of Turpentine Run into the lagoon and collects runoff from a large section of St. Thomas and with intermittent rains funnels a great deal of fresh water into the lagoon. The water in the gut behind Madison School feeds into the lagoon.

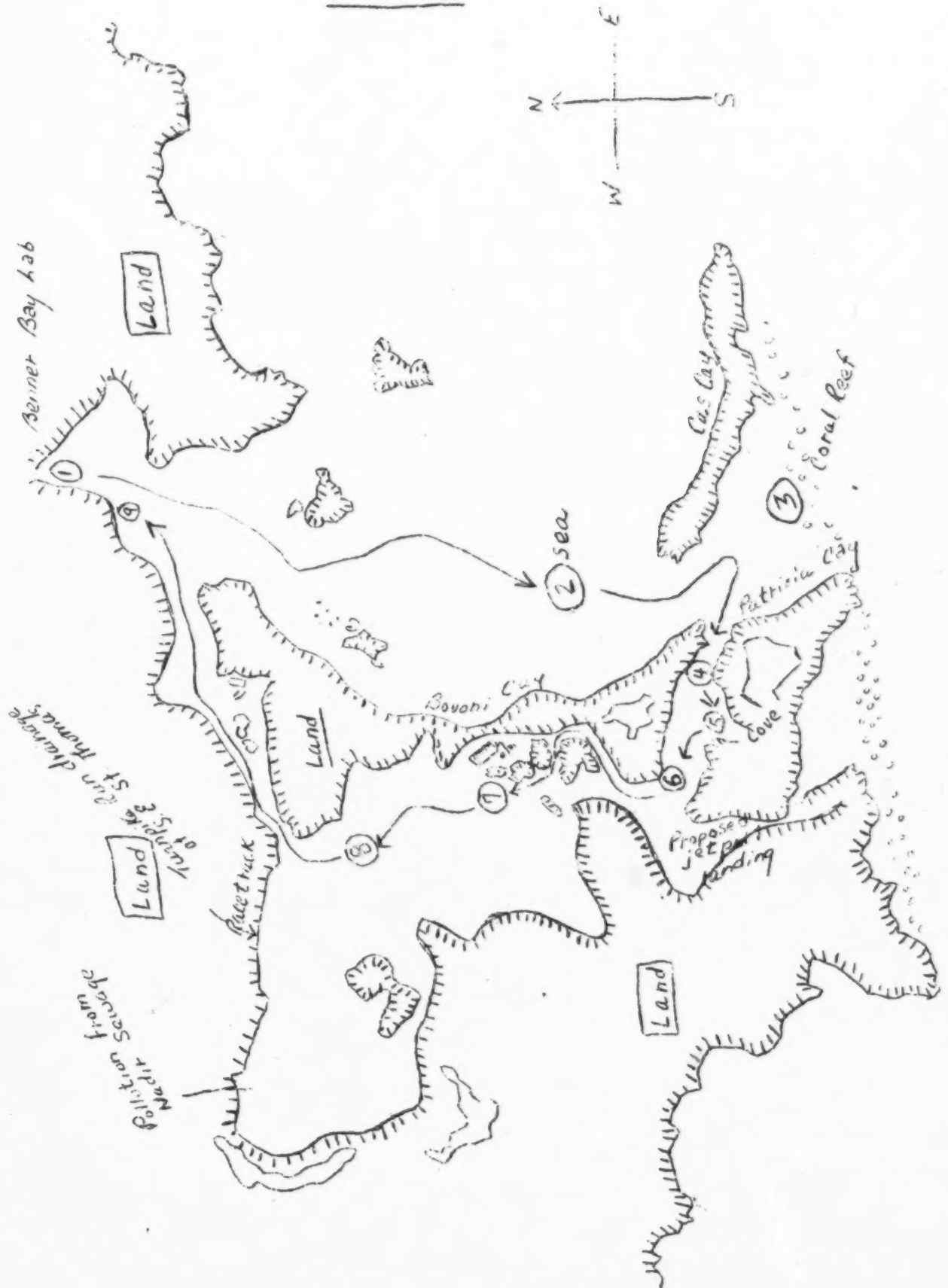
The water carries varying amounts of mud and other debris, the load depending these days on how much construction is going on upstream.

- 9) Back to civilization, noise, and dirty water ...

Figure 5 -- Map of Mangrove Lagoon showing Tour Route and Station Numbers--
See Next Page

On St. John, students may visit a smaller mangrove area at Lameshur and a larger Mangrove area at Fish Bay. All four types of Mangroves grow along the shore at Annaberg.

FIGURE 5



RANDOM NOTES ON THE HISTORY OF ST. JOHN

Copyright John Lonzo Anderson, 1970



In 1694, twenty-two years, apparently, after the beginning of the Danish settlement of St. Thomas, May 23, 1672, the Danes took formal possession of St. John. By "the Danes" is not meant the Danish government, but the Danish West India and Guinea Company operating on a charter from the King (Christian V); not until 1754, when the Danish government took over sovereignty from the Company, was any of these islands anything but private property.

Before 1694 St. John never really belonged to anyone but, intermittently, the Carib and Arawak Indians. The Arawaks, planters by nature, apparently came in the rainy years and went in the dry; the Caribs, warriors by nature, apparently came to enslave, or kill and eat the male Arawaks and purloin their women.

An occasional Spaniard and an occasional Englishman would make a landing on St. John and stick up a flag, and both Spain and England, whenever they thought about the matter, felt that the islands ought to be considered their property; but the Danes finally -- 1754-- convinced the world that it belonged to them.

However, until St. Thomas was fully settled, even the Danes did nothing serious about settling St. John. Every now and then, when it looked as if non-Danish interests might be thinking of taking over, the Danes would go through ceremonious motions of starting settlement, but then they would forget about St. John again in their preoccupation with St. Thomas.

But by 1716 it had become necessary to take really meaningful action to try to establish beyond a doubt the Danish Company's claim to St. John, for most of the desirable north side and high interior - the best watered and agriculturally richest parts of the island - had been taken for subsidiary plantations by wealthy St. Thomians, or settled by maverick Englishmen and by Caribbean Dutchmen who had been pushed off nearby Tortola when the English wrested control of that island from Dutch squatters.

Coral Bay, less desirable agriculturally than the north side, but possessed of one of the finest harbors in the West Indies, had for at least a century been used as a cattle ranch, first by an Englishman, then by Dutchmen, then again by Englishmen. It had natural fences formed by the mountains and, along the sea, impenetrable bush; and it had a flowing spring gushing in the gut below the summit of what is now called Bordeaux Mountain, for the water table had not been lowered by cutting down the ancient forest.

'The name "Coral Bay", which sounds so romantic, had nothing to do with coral, but was a corruption of the Dutch word "Kraal", meaning the corral that was maintained for at least a century near the inner harbor for collecting cattle to be loaded onto ships and transported to market on other islands. The English tended to call it "Crawl Bay", which is even less romantic than Kraal')

In 1716, Coral Bay happened to have been abandoned by the latest Englishman holding it, and the Danish West India and Guinea Company took it over firmly for its St. John plantation and for the harbor, with the intention of establishing a town like the one (then called Tappus, meaning "taphouse") adjacent to Christian's Fort on St. Thomas. They took over also the Englishman's little

redoubt atop the hill overlooking the harbor, intending to build a real fort there to protect the Company plantation and projected town.

Because of the threatening proximity of the English on Tortola, the fort was not fully built for nearly a hundred years. It had to be -- or at least was -- finally completed by the English during their occupation of the Danish islands in the course of the Napoleonic Wars in the early 1800's. Throughout its first century or so it was nothing much more than a pile of rocks enclosing a barracks and powder room, with a heavy door across the access-path through thick surrounding cactus, and firing-platforms, north, east, south and west for the cannons.

Upon this taking-over of Croal Bay in 1716, the Company threw the rest of St. John open to colonization, in order to get the wheels of business going. It offered a seven-year tax exemption to settlers, to help them get started.

However, the desirable sites had long since been settled by squatters. These squatters were forced either to apply for land grants to their property and start paying taxes like everybody else in seven years, or vacate. Most of these chose to apply for land grants, although a number of them later moved on when the time came to start paying taxes.

The majority of the settlers who responded to the Company's invitation, taking up the less desirable land, were hand-to-mouth poor people who would farm a piece of land until time to start paying taxes and then either sell their property, if possible, or simply desert it and move on to the next tax-free situation if they could find one.

It gradually turned out that most of the good non-Company plantations on St. John were owned by wealthy St. Thomas Dutchmen. They made the St. John holdings secondary to their St. Thomas plantations, using them for training, by tough, "mesterknegts", of the slaves newly imported from Africa. When the new slaves were considered good enough and safe enough to be permitted on St. Thomas, they were promoted to the home plantation there. Meanwhile, they were forced to raise whatever crops they could on St. John to pay for their keep and enrich their absentee owners.

By 1733, the year of the revolt on St. John, the island was almost entirely taken up. The land that was not too rocky to plant or was not needed for grass for cattle and mules and horses (horses were not much used in those days) was planted to cane, cotton, tobacco, indigo, and vegetable gardens.

(Here is something that is entirely contrary to popular belief: Throughout the agricultural history of these islands, more than twice as much land, on St. Thomas as well as on St. John, was devoted to cotton as to cane! This was not because growing conditions were better for cotton than for cane - they were less good by far - but because the land grants stipulated that anyone proposing to raise sugar cane must, by the end of the seven-year tax freedom, have an operating horse or wind-powered sugar mill, a sugarboiling house, and all the necessary appurtenances to these built and in operation. Now, a sugar plant was expensive, and only the wealthier planters could afford to construct them. Most, by far, of the

St. Jan (John) settlers were poor, and these chose to raise cotton, for almost anyone could make a little hand-operated cotton gin).

The recorded population of St. John at the time of the revolt was 1295, of which number 1087 were slaves, but this figure did not include the people living and working on the Company plantation in Coral Bay, for the only census was the tax list. Taxes were paid not only on land but on people, slave or free, above the age of twelve. Therefore, because of the many slave children and the population of Coral Bay, the number of people on St. John in 1733 was far greater than 1295.

About nine out of ten of the independent planters on both islands were Dutch. Furthermore, the prevailing language was Dutch, and eventually Dutch Creole. Danish was used only inside the Company, in the courts, and in such official documents as concerned only Danes.

After the revolt, contrary to the popular notion, St. John did not waste away. It was not until after slavery was abolished (1848) and the planters could no longer make money from their plantations that the island started to decline. After 1848, the population dwindled to just about what it was in the 1950's (between 700 and 1,000) before the present boom began.

About 1875, sugar-raising became profitable again. A new type of cane which was easier to grow, yielded more sugar, and resisted cane diseases was imported from Java. About this time, the world was going crazy over refined white sugar which was a novelty over the old-fashioned raw sugar; prices were booming. A number of wealthy people apparently became convinced that they could make fat profits from raising and processing sugar on St. John. Many of the greatest of the old estates - K.C. or Klein Caneel, now called Caneel Bay, Hawks Nest, Denis Bay, Trunk Bay, Frederiksdal, Annaberg, Hermitage, Carolina, Lameshur, Reef Bay, Enighed, Beverhoutsberg, Rustenberg-Adventure, Adrian, Susannaberg, Hammer Farm, etc. were rebuilt on a big scale and put to work growing and processing sugar. Windmills were added to Annaberg, Denis Bay, and Jochumsdahl (by then a part of Hammer Farm). Steam power was added to Adrian and Reef Bay.

St. John had a brief boom after which, apparently, the investors found they couldn't make so much money after all-probably because of the development of beet sugar, which could be raised in colder climates, and because of the competition of Saint Croix and Puerto Rico whose cane fields were much more productive and easier to work, thanks to the level terrain. So the island slowly went back to bush again.

Some of the estates, like Cinnamon Bay, K.C. Bay, Reef Bay and Adrian were still producing within the memory of some St. Johnians now living. Carolina Estate was kept going longer than any of the others by bay oil and cattle.

Now as to points of interest: Let's start with Cruz Bay. The Battery, so called (it hasn't been a Battery since God-knows-when) is a recent building constructed

on top of the dungeons of the old "Christiansfort of St. Jan" (as distinguished from Christiansfort of St. Thomas). The rest of the old fort is pretty well obliterated, except the outer walls. The construction of the original fort was begun in 1734, immediately after the St. John revolt of 1733-34 was finally put down. It was not primarily intended as a protection against outside attack, but was built chiefly for the purpose of (1) terrorizing the slaves of St. John so that they would never again dare to revolt (they never did, contrary to what many people believe) and (2) fighting them off in case they ever did get out of hand again. As a result, it was not a conventional fort at all, since (like the one in Coral Bay) in effect it faced inland and was aimed primarily at the population of the island itself. Therefore, the accent was more on the courthouse and prison type of thing, with a courtroom for putting on trial any slave with too much spirit, intelligence and self-respect to take his slavery lying down, dungeons for imprisoning him; torture chamber, "justice post" (that's actually what they called the post to which a slave was tied for whipping and other tortures) and equipment for execution.

The reason why this establishment was located in Cruz Bay instead of Coral Bay (Cruz Bay until that time was of no importance in the island's affairs, but was merely the port for the plantations in that particular section; Coral Bay was the administrative center of the island) was that the seat of government was, as now, in St. Thomas, and Cruz Bay was much easier to reach from St. Thomas than Coral Bay, when the judges and other officials had duties to perform on St. John.

Actual executions and the more important floggings and "pinchings with red-hot tongs" were held outside the fort, because the authorities wanted as many slaves as possible to witness them as an object lesson, but did not dare admit any great number of slaves into the fort at one time, for fear they might get control. Therefore, the executions were held on the point across from the Battery where the cemetery now is, where there was much more room for spectators; so that point became known by the grim name of Galge (meaning "gallows") Point; the part of the bay between the Battery and Galge Point became known as Galge Bay.

The dungeons of the Battery are the only ruins standing in the Cruz Bay section that I am sure go back as far as 1734, but many of the various old foundations scattered about probably go back farther than that.

The story of the so-called "English fort" (which was actually never a fort at all, but merely a half-moon gun platform) overlooking the entrance to the bay on the north, seems to be approximately as follows:

In the Napoleonic Wars, Denmark-Norway became practically an ally of France—in other words, an enemy of England. It didn't come to real war between England and Denmark-Norway, but the British fleet bombarded Copenhagen a couple of times, and British privateers had a lot of fun and profit grabbing Danish ships on the high seas; also there were a few brushes between British and Danish naval vessels in these waters. But the Danes were naturally no match for the British on the high seas, and consequently these islands were at the mercy of

British sea power. The British on Tortola and Gorda were rather jealous of the importance which St. Thomas and St. John, islands which the British had passed up when they colonized Tortola and Gorda, had attained under the Danes; so it was one of the side-glances of a more or less comic-opera war that the British twice seized the Danish islands on the pretext that they were dangerous to Tortola and Gorda; the matter really had very little connection with the truly serious Napoleonic Wars raging in Europe.

The first seizure of the islands was in 1801; the British held them only ten months that time. The second seizure was in 1807, and this time the British occupied the islands for eight years, until Napoleon's final defeat in 1815, at which time the British, a little embarrassed about the whole thing, handed them back to the Danes.

Now, to get to the point, I don't know which of the seizures was responsible for the gun platform overlooking Cruz Bay. You may take your choice. But the story is that when the British decided to seize St. John, they landed a whole mess of men at night in John Solomon Bay, over the ridge from Cruz Bay, and so quietly that the few people then living in Cruz Bay never heard them, worked like beavers all night constructing the emplacement and dragging their cannons up the steep hill and setting them up, and when morning came the people of Cruz Bay looked up in astonishment to see a newly-constructed gun emplacement, with British guns mounted and pointed down their throats and toward St. Thomas to stop any Danish forces that might be disposed to come and argue the matter.

Whether this overnight construction, in silence, was possible or not, your guess is as good as mine. If it really happened, I'm sure there must have been a horse-mill, such as the one in "Caneel" Bay, already built into the hillside, so that all the British had to do was perhaps replace a few stones and haul up their cannons. Ever since 1721 the owners of this land, starting with Lazar Zigereth and John Solomon, had been too poor to build for production of sugar, which would have grown there, and had tried to eke out a living with cotton, which would not grow profitably there. But the owner, at the turn of that century, had, I believe, been able to go so far as to construct a horse-mill, in an effort to prepare for sugar; the Company was having a heart and not charging him any taxes.

What is left there now looks so recent that I wonder if perhaps the American Marines didn't do some touching-up in 1917 in case the emplacement should be needed in World War I.

So much for that. As for the other visible ruins in that neighborhood:

The present ruins of Enighed are not old at all, were built by the grandfather of the Boynes brothers, a stone mason (named Boygne) who immigrated to St. John from Haiti, as also did recent ancestors of the Sprauve (Spreuve) and Sewer (de la Soeur) families. The ruins behind Miss Elaine Sprauve's house on the beach are also of a building constructed in the late 19th Century by Monsieur Boygne.

Underneath the new Virgin Islands National Bank building are the remains of the

house of Jean Papillaut, a French "leech" (doctor of sorts) who in the 1720's and 30's lived there with a Danish wife and a little daughter. He made part of his living bleeding people when they felt ill, and trimming the hair and shaving the face of anyone who felt like paying for such services. (I am indebted to Al Brodeur for calling me up when he came upon these remains in preparing to build the bank.)

The little stone buildings south of Miss Elaine Sprauve's (one of them in 1970 being used as the St. John Corporation Office) are apparently reconstructions of the buildings of Francis Gonsel, a "French Spaniard" (1720's and 30's).

The ruins to the east of the Boyneses are what is left of a spread built in the early 18th Century by Engel van Beverhout, given by his widow to the overseers of her Great Cruz Bay Estate in the 1730's and reverting later to the van Beverhouts, whose family cemetery is walled-in on the hillside above Helen Payne's cottages.

The Enighed Estate, established by the Moravians and named "Enighed" because that means "unity" and the official name of the Moravian Church is "Unitas Fratrum", is much older than the Enighed-also called Enigheit-Ruins. The first missions were set up in 1783.

The church at Bethany is built on the location of the rum distillery that originally served the whole island, where needed. The more important sugar estates had their own distilleries, using by-products, leftovers, and dirty cane juice from the sugaring to make refreshments for their own plantations. The lesser planters, depending on the big neighbors to process their cane for a percentage of the results, used to take a portion of their cane to the "kill-devil widows", who would convert it into rum (kill-devil) on a percentage basis. The kill-devil widows were two sisters, Mme. Claudius (Gloudi) van Beverhout and Mme. Isaac Matheusen (now Mathias), who lived and had their joint distillery on the line between their two plantations where Bethany now is. On their separate plantations, using many slaves, they raised cane for the distillery, selling rum to any and all who had not enough cane to trade for it. Does this progression from kill-devil to church seem somehow fitting?

Sundry items about the rest of the island:

On Susannaberg Estate, in Mr. Neptune Richard's pasture, between Centerline Road and Beverhoutsberg ruins, stand the ruins of a 19th century Lutheran Church on what St. Johnians call "Danish Church Hill."

"Caneel" Bay is not Caneel Bay at all. It is Klein Caneel (Little Cinnamon), or K.C. Bay. Cinnamon Bay is the real Caneel Bay. K.C. Bay has also the name of Durloe's Bay, because the most important of the early plantations there belonged to Pietter Durloe (Duurloo, Deurlo, etc.) The ruins in K.C. Bay are not those of

the original buildings. Mostly they appear to have been built during the aforementioned boom of the late 19th century. As a matter of fact, the sugar cook-house had a date-stone on one of its archways until, in recent years, someone stole it. I forgot exactly what the date was, but it was shortly after 1875. Some of the buildings were doubtless built on the ruins of older ones -- in some cases you can actually see the line of demarcation between the old construction and the new. The earlier materials were used again, and you can see pieces of the original Danish yellow brick, brought from Denmark. Thanks to bulldozers, there is no vestige left of Duurloo's original house, which was located just under the brow of the ridge, north of the sugar works, far enough away and sufficiently to windward to protect the residents from the stink of the "magas" (crushed cane, used to fire the boilers) and the swarms of jackspaniards (yellowjackets, they are called in the States) and other insects that loved to attend the sugaring process.

In Denis Bay is what is left of the only "justice post" that I know of on the island. It is over near the slave quarters and is merely a somewhat elevated piece of masonry; the post itself was set in masonry, and has, of course, long since rotted away. The reason for elevating the post was to give all of the slave spectators an unobstructed view of the suffering of the victim.

In Denis Bay, too, are the remains of an exceptionally long cane-juice conduit, running all the way from the windmill andarsemill at the top of the hill down to the sugar factory beside Denis Bay.

The ruins along the North Shore Road past Trunk Bay, Cinnamon Bay and Maho Bay are not old, although some of the foundations are very old. Some St. Johnians can still recall when modern machinery was in operation in what are now the ruins at Cinnamon Bay.

The most fascinating of all the 19th century reconstructions buried in bush are Beverhoutsberg, L'Esperance, Brown's Bay, and Rustenburg. However, since no trails are maintained to these ruins, it is necessary to cut one's way through the obstructing vegetation, (which is permitted). Whenever you come across penguin in large numbers in the bush, you can be sure that at one time, during perilous days on St. John, someone lived in the area. Masses of penguin were planted around all habitations that were unguarded at night to prevent marauders from approaching windows. (From past experience in other areas where vegetation has overgrown historic ruins, the Park Service has learned that, until the walls of the ruins can be "stabilized", cutting away the bush and exposing the ruins to wind, rain and sun tends to hasten their collapse.)

You have heard the story of Mary Point - how the defeated slaves in 1734 joined hands and jumped down the steep gut to their death in the whirlpool below. The rocks on the cliff at Mary Point are said to be red with the blood of the proud freedom fighters. It happens not to be historically true, but it makes a good story.

What most people don't know is that the word which is generally pronounced "Minnie" in the Dutch Creole name "Minnie Neger Gut" is not "many" but "Mina", in reference to the members of the original Amina tribe in Africa, one of the three tribes that led the fight against their enslavement.

The ruins on the beach of Whistling Key, just across Fungi Passage from "Mina Neger Gut, " are mid-18th Century - the exact date is scratched in the plaster of one of the interior walls. This was once a toll house built when the Danes were making a determined effort to stop smuggling between Tortola and St. Thomas.

Everything now visible at Annaberg, except the remnants of slave quarters and parts of the horse-mill and boiling-house-storage complex, dates back only to the late 19th Century rebuilding effort.

All of the well-known estates - Adrian, Susannaberg, Hammer Farm along Kinge Vej (King's Road) - go back to the early days, but the present buildings except maybe the foundations and parts of the walls of some, are fairly recent.

The same is true along the South Side at Reef Bay and Lameshur. The sugar factory at Reef Bay still has a steam engine and other modern machinery. Many people, including me, can recall when all this was still in operation.

Incidentally, in almost every case where there are so-called slave quarters still standing, like those in the bush west of Mrs. Bishop's house at Catherineberg (Katrinaberg, Hammer Farm), and on many of the other reconstructed estates, these are not slave quarters at all but huts erected for the hired labor on the reconstructed plantations long after slavery ended.

One of the more amusing historical errors on St. John is the Park sign on Centerline Road near Camelberg announcing that this is the road called Kinge Vej in the old days. This sign happens to be located on one of the three stretches of Centerline Road that were never part of Kinge Vej in the old days. The old Danish road went around the other side of the hill near that spot and passed between the two old Magens estates, Rustenburg and Adventure. The other points of Centerline's departure from Kinge Vej are (1) at Old Works, where Kinge Vej zig-zags up through the bush and ruins of the old Vlack estate buildings, and (2) at King Hill, where it zig zags down into Coral Bay from the point where King Hill Road, coming up from Maho Bay, joins Centerline.

And speaking of Camelberg, its old African name was Makombi. The flashing of lightning and crashing of thunder there used to strike terror into many a heart.

To return to Coral Bay: -- This is of course, historically, the most important part of the island. The Bay itself, as you know, is superior to St. Thomas Harbor.

One thing that makes it superior is Hurricane Hole. The disadvantage that Coral Bay has as compared with St. Thomas harbor is that guns mounted on Sage Mountain, Tortola, would command the vital parts of Coral Harbor, and that is the chief reason why the Danes never developed Coral Bay as a trade port.

Carolina Estate, originally the Danish West India and Guinea Company's sugar plantation and the center of the island's business and government, as presently owned by the Marshes, had precisely the same boundaries and acreage as the original estate. The old estate house on the hill and the windmill tower and sugar works have all been rebuilt, perhaps several times, the last time within the memory of some living persons.

Emmaus mission dates back to the mid-1700's. Originally, it was located on the east side of the road in the Palestina area. Later it was moved to its present location, which was originally the home of Johannes Reimert Sødtnann (Soetman, in many of the records), the island's chief magistrate, who, along with his step-daughter Helena, was slaughtered by the rebels in the pre-dawn of November 23, 1733. The present Emmaus buildings were constructed a little at a time, utilizing some of the ruins of Sødtnann's relatively (in its day) palatial residence.

On the cone-shaped hill (Fortbert), on the peninsular forming the north side of Coral Harbor, is the previously mentioned fort (Frederiksfort of St. Jan). It is well worth going up to see-after first getting permission from one of the owners, the Samuels family. It has long been supposed that treasure was buried there and many are the holes that have been dug in efforts to find it. The cannons which at present remain in the battery below (all but one of them are still there, rusting away, with their snouts pointed toward the gun ports) I believed were put there by the English, for they seem a bit too modern to be the old Danish guns, although the Danes did have a water-battery there in the early days.

Norman's Island (British) off East End, St. John is the only place (besides Bluebeard's Castle on St. Thomas, and I can't swear to that story) hereabouts where treasure was obviously found. A square hand-hewn vault high in the wall of the water-level cave there on Norman Island is where the treasure was hidden.

The Carib inscriptions at Reef Bay, at Congo Cay and on Carval Rock - you know all about them. Maybe what you know is not true. I believe they are African, not Carib.

The North Side Road was originally just a bush path throughout most of its length. In the old days, all land traffic to the north side went along King Vej (Centerline Road) and down into the various bays from the top. There are, buried deep in the bush and completely forgotten by even the oldest of the old-timers,

beautiful engineered wagon roads running up from Hawksnest, Trunk Bay, Cinnamon Bay and Maho to Centerline. The retaining walls are good, except where they have occasionally been washed out by a gut-buster. (A supervised crew and bulldozer operator like those who engineered the road for the TEKTITE II Command Van could easily put these trails back into use, if it were desirable to do so.) The roads are not quite wide enough for passing, but there are occasional turn-outs and what must have been loading platforms and turning space for wagons carrying cane or cotton from the fields to the bays. The terraces of the old fields stretch away into the bush on either side, especially in Trunk Bay.

There are many such forgotten roads buried in the bush on St. John. They were built in the mid-18th Century. They all show on Oxholm's 1780 map, which by now everyone has seen, if not bought. These roads are endlessly fascinating, if you feel like chopping your way through them!

I have mentioned the origins of some of the St. John names such as Coral Bay. Many others have equally interesting origins.

Reef Bay's name has nothing to do with the reef that nearly blocks entrance to it; it is really Rif's Bay, because Rif Paret, ancestor of the present Parrot family of St. Thomas, lived there before the Danes took over.

Lameshur Bay got its name, long before the Danes, in the days when British seamen, having learned that limes prevented scurvy, used to stop to pick the limes that grew wild there. They called it "Lime Shore", and when the Danes came along and wrote down what they heard, without knowing what the English sounds meant, it somehow came out "Lameshur".

The word "rendevous" in Rendevous Bay apparently goes back to the pirate-and-privateer days, although it is difficult to see any great value in that bay, compared to many others, as a rendevous for sea-rovers.

The unlovely name of Blasbalg Point outside Great Cruz Bay refers to a blow-hole in the stone at water level that makes weird noises heard by passing sailors when the sea swells in and forces air rapidly through the hole. Bla sbalg is the old Dutch word for "bellows."

English sailors, in the 17th Century, long before the Danes came, named Chocolate Hole for the color of the rocks outside. Hawksnest Point and Bay was named for a hawk's nest full of eggs, some of which were fresh enough to eat.

About Trunk Bay, I don't believe any of the theories advanced - Trunkfish, Trunk turtle, Trunk full of treasure. I believe that both Drunk and Trunk Bays refer to a Dutchman named Dronck who squatted for a generation or so on St. John in the late 17th Century when the English started getting rough with the Dutch squatters who had taken over Tortola. (But it has also been suggested that the "drunk" in Drunk Bay, located on the southeastern tip of St. John near Ram Head, may come from the Dutch Creole word "drunk" which means "drowned". Since this wild, rocky shore is a likely place for shipwrecks and drownings, the Dutch Creole word would seem an appropriate name.)

Denis Bay was named for an Irishman named Dennis Sullivan, known as Sylvan among people who spelled by ear. He was a charming rascal who lived there before the Danes came, and then when the Runnels family of St. Thomas took out papers on the place, he became the overseer. Then he got into the trouble he deserved and had to skip to Tortola for a long time.

Another early Irishman was Tim Turner. Turner Point on the East End peninsula was the location of his plantation. After the 1733 rebellion, he moved to the West End of St. John. Turner Bay (or Pond Mouth as it is often called now) was named after Tim Turner.

Cruz Bay (Bahia Pequena de la Santa Cruz) and Great Cruz Bay (Bahia Grande de la Santa Cruz) were named in the 16th or 17th Century by Spanish settlers who didn't stay.

Francis Bay and Brown's Bay were named for (by) Englishmen who lived there long before the days of taxes on St. John.

Mary's Point: Mary was the sweetheart back home of an English sailor in the late 16th or early 17th Century.

Some estate names are interesting: -

"Contant" means "cash money", and I can only surmise that Contant estate was so named because of the shock received when its purchaser paid cash money on the barrel-head for it.

Hammer Farm is so called from the days of its earliest owner, Andreas Hammer, a St. Thomian who took out the original land grant on it in 1724, but never lived there, except on vacations when St. Thomas was hot and humid. It is curiously interesting that this name has survived through a number of attempts to change it, as, for instance, to Katrineberg. It is as if the sound of the words "Hammer Farm" satisfied something in human nature that does not respond so strongly to the more charming "Katrinaberg".

"Adrian" of Estate Adrian is Adrian Runnels, a St. Thomian who started the St. John plantation before the Danes took over and made him pay taxes.

Susanne of Susannaberg was the daughter of Jannis Van Beverhout, the leader of the planters against the rebels in 1733-4. Her adoring husband, Isaac Runnels, named it for her as he built it, when she was still a child too young to wed.

Annaberg was named for the baby daughter of absentee (St. Thomas) owner Christopher William Gottschalk when he took out the land grant for it in 1721.

John's Folly - ah, there is an interesting one! John Eno, or possibly it was Enos, paid a visit to the normally arid and relatively unproductive southwesternmost shore of Coral Bay around the year 1800. It happened to be a rainy year, and everything was growing just fine. John fell in love with the area and particularly with the part of it belonging to a Dutchman named Vanderpool who had just about

starved through the unproductive years he had spent there. Well, John Eno proposed to buy Vanderpool's place which was naturally for sale. "But, John!" his friends protested. "You'll lost your shirt. You'll never be able to farm that place with profit."

"You're crazy, John said. "Look at the land. It's producing like crazy!"

"But John, it's raining this year. Next year may be as dry as a bone." "Ah," said John, "You don't know me. I'm a good farmer." His friends nicknamed the place "John's Folly." John later ratified the name and made it legal by putting it on the signpost. After a drought?

August 19, 1970

Environmental Studies Program
Box 84, Cruz Bay, V.I. 00830

SLIDE GUIDE FOR PRE-POST-SITE VISITS TO ENVIRONMENTAL STUDY AREAS

There are 160 numbered slides in the 2 carousels assigned to one teacher at each school. This teacher is responsible for returning the ESP carousels at the end of the 10 week ESP. Please put slides in correct order!

The numbered slides listed below are suggested for use in pre and post-site lessons built around Environmental Study Area visits.

Animal, bird and plant slides in the carousel but not listed here should also be shown as these animals, birds and plants are seen at ESA's and elsewhere on the Islands.

I - Slides to use before and after Annaberg ESA visit

- 29 Marble intrusion, like an Oreo cookie, at Mary Point, en route to Annaberg
- 33 Granodiorite boulders -- what a picnic table!
- 34 More granodiorite at Virgin Gorda.
- 61 Whistling Cay Customs House built by Danes in 1840's to control smuggling from Tortola, BVI, now restored. Whistling Cay is a V.I. Government owned cay under jurisdiction of Department of Conservation.
- 70a Air view of Leinster Bay and Annaberg showing windmill. This is almost like the first view pupils on Jolly Roger will have of this area.
- 1a Horsemill diagram. Shows the roof and the cane crushing gears. Cane juice flowed down a pipe to the hole in the wall above the first big copper on the right side. The men who stirred the cane juice pot were highly skilled. If the juice got too hot it might burn; if it didn't cook long enough the sugar would not crystallize.
- 3a Windmill. We know now that this mill was built after 1844, probably in the 1870's. An 1844 Annaberg drawing by the Episcopal Reverend Henry Morton shows no windmill. (Rev. Morton's St. John drawings can be seen at Caneel Bay.) A windmill was expensive to build and operate and required wind which did not always blow. Although almost 100 plantations produced cane on St. John, windmills were built at only 5: Annaberg, Susannaberg, Carolina, Denis Bay and Jochumsdahl.
- 4a Sugar factory walls. It would not be possible to restore Annaberg since different buildings were built at different times and no plans show how original buildings looked. (The Reef Bay Steam-run mill could be restored accurately.)

page two
Slide Guide

- 28a Natural history at Annaberg deserves close attention. Plants, birds and marine life can be observed on these bonefish flats at Leinster Bay below Annaberg. Larval lobsters, different kinds of sea eggs (urchin) can all be seen. Children must wade carefully, however, so as not to injure what they observe.
- 19a Land crab on the dried mud flats at Leinster Bay. Crabs belong in Kallaloo. When crabs are caught they are penned and purged on cornmeal for several days since they are scavengers.
- 45a Manchineel apples can be seen at Leinster Bay. Children should recognize the poisonous fruits and avoid the leaves also. Water rolling off a manchineel leaf will blister skin badly.
- 20a Slipper lobster. This is the sweetest and tastiest of all lobsters, but it's rare. Mariculture might increase the supply.
- 17a The coral reef here, at Salt Pond Bay and Reef Bay is home for millions of fish. Reefs are destroyed by dredging and pollution which Virgin Islanders can legally prevent in cooperation with Bureau of Fisheries and Wildlife in the Department of Conservation.
- 25a The coral exposed here at low tide will soon be underwater again. Coral reefs grow best in warm, clear, shallow waters.

Mangrove Lagoon

62a-63a-64a-Red mangrove can be observed at Annaberg as well as Mangrove Lagoon. See special lesson notes on Mangrove Lagoon.

79a Shows Mangrove Lagoon (also slide 4 and slide 62)

II- Slides to use before and after Salt Pond Bay ESA visit

- 36a Hello, Dildo! The Dildo cactus in the left corner is a home for nesting sparrows (grassquits) yellow breasts (bananaquits) and ground doves. The cactus is also used as bait in fish traps. The other cactus, *Opuntia horribilis* is horrible to people, but even this cactus has a blossom. How have cacti adapted to a very dry environment?
- 49 The Yellowbreast or Bananaquit is our official V.I. bird.
- 37a The fruit of the prickly pear is used in making a tasty rum or fruit drink known as Miss Blyden. The prickles are used to bore ear lobes for golden earrings. The blossom of the prickly pear is cooked with conch and rice for Buds and Rice.
- 38a The Barrel Cactus or Pope's Head produces delicious smooth fuchsia (new word to most students) fruits.

page three
slide guide

- 44a Nickers or "scorchers" or wari beads when rubbed on stone will scorch! Nickers can be roasted with seeds of Stinking Weed to make a caffeine-free coffee. Ask children and parents to tell you about any bush teas they know or use.
- 9a Large salt crystals from the Salt Pond. Encourage pupils with relatives
- 10a in the British Islands (Tortola, Anguilla, etc.) to import this sea salt
- 11a which tastes better (\$1.98/pound in New York City!) and provides traces of all the minerals on earth.
- 10 Mending a net to catch more fish.
- 13a Two young fishermen - V.I. fishing needs more fishermen and more fish (Compare with film "The Following Sea")
- 29a A four-eyed butterfly at Salt Pond Bay has "eyes" in the back of her head. How does this camouflage protect her from enemies?
- 21a Blue-headed wrasse will pick parasites off mouth and gills of other fish like a nurse helping you in the clinic. Note elkhorn and antler coral. You will find pieces of broken, dead coral on beaches.
- 24a Squids for kids! Frigate birds (scissor-tails), some whales, some people (Italians) eat squid.
- 25 Starfish - watch how starfish move. They are in same family (Echinoderms) as sea urchins. To preserve starfish for Christmas, coat it heavily (Inches of salt) with salt and it will dry and keep its shape after several weeks time.
- 30a Sea whip is one of many soft corals scientists study to find new medicines. One coral medicine is being used in cancer research.
- 31a "Madam" (French Angelfish) is beautiful with gold stripes as a baby. A favorite fish.
- 33a Trunkfish has no bones inside, only an exo-skeleton. He is one of the most ancient versions of fish life.
- 34a Box Crab. You may find these and other crabs on the beach at Salt Pond Bay. Remind children to be gentle giants and not harm these crabs.
- 80a Sunset. On the way home in a boat or on the shore, or on a hilltop, or anywhere facing west, watch the colored pictures colored by the setting sun. Do you ever see faces and figures in the sunset clouds? Do you ever get up early enough to see the sunrise?
- 32a Sea cucumber contains vanadium. In emergencies he voluntarily eviscerates himself and grows new guts later.

page four
slide guide

Slides for Reef Bay - ESA Pre-post site lessons

On the way by bus from Cruz Bay to the head of the Reef Bay Trail --

- 7 Cruz Bay in 1946 -- how is it different now?
- 25 Enighed Ruins in Cruz Bay.
- 9 Estate Susannaberg Sugar Mill
- 39 Golden Orb Spinner -- her web is 18 carat gold. The spider eats Jack-spaniards and also her husband.
- 42 Jumble Horse or Walking Stick is one of many helpful local insects.
- 38 Ground spider is so tough he will live in 190 proof alcohol over 8 hrs.
- 43 Termites are important decomposers in the Web of Life. We have no forest fires to destroy dead wood. Termites only attack sick or dead wood.
- 73 Reef Bay Petroglyphs. Review evidence that these are the work of African artists and not Indians. (Guide to the Natural History of St. John p. 32.)
- 74 Arawak Village - How do artists paint what they have never seen?
- 75 Arawak pottery (none like this has been found at Reef Bay. This pottery was found at Cinnamon Bay. Arawak and Amerindian faces and designs show mouths. Petroglyph faces do not.)
- 76 Close up of petroglyph. (ESP Logo)
- 77-80 Sugar making machinery at Reef Bay (cf. Annaberg)

Environmental Studies Program
Box 84, Cruz Bay, V.I. 00830

AUDIOVISUAL MATERIALS AVAILABLE FOR SCHEDULED USE

All ESP AV materials are available at LSIM, Department of Education. A card on each film and set of slides indicates teacher, school and date scheduled for use. Please use the AV materials and take care of them!

1. YOU ARE COLUMBUS! A 9 minute color documentary filmed by Walter Lewisohn for the ESP shows fifth graders at Salt Pond Bay ESA.
2. BOOMSVILLE- Excellent color cartoon showing the historical problems of over-growth and how all of us are affected by development.
3. NOISE - Noise pollution for young Virgin Islanders is serious. This film is worth hearing.
4. THE LITTER MONSTER - Solid waste in the V.I. is now up to the mainland rate of over 5 lbs. per person per day.
5. THE FOLLOWING SEA - Bureau of Mental Health has done a fine job in this film showing one aspect of the generation gap that our children can grasp.
6. LIVES OF THEIR OWN (color)-Black necked stilt, Osprey, Gallinul
7. BIRDS OF THE SANDY BEACH - (color)
8. ADAPTATION TO OCEAN ENVIRONMENTS (color)
9. BEACH AND SEA ANIMALS
10. MARINE LIFE
11. THE GARBAGE EXPLOSION
12. BUMA-AFRICAN SCULPTURE SPEAKS
13. LIFE BETWEEN TIDES
14. THE FISH IN A CHANGING ENVIRONMENT
15. LIVING THINGS DEPEND ON EACH OTHER
16. TURN OFF POLLUTION
17. PLANKTON: PASTURES OF THE OCEAN
18. THE MARSH COMMUNITY
19. SEASHORE LIFE
20. ANIMAL HOMES
21. THREE RECORDS AND FILMSTRIPS
Environmental Crisis and What You Can Do
Man and His Environment-A New Approach to Environmental Education
Our Environment-Aesthetics
22. SONGS OF THE HUMPBACK WHALE - Record. These whales pass our way each February and March.

SLIDES - ESP NATURAL HISTORY. Please check out a complete set of 2 carousel trays. Please place any slides you remove from carousel back in the proper slot.

TRAY NO. 1: 1-80
" " 1A: 1A-80A
" " 2: 1-80
" " 2A: 1A-80A
" " 3: 1-80
" " 3A: 1A-80A

TRAY NO. 4: 1-80
" " 4A: 1A-80A
" " 5: 1-80
" " 5A: 1A-80A

TRAY NO. 6: 1-80
" " 6A: 1A-80A

PLEASE SIGN OUT ON FILE CARDS YOUR NAME, ITEM LOANED AND DATE.

January, 1973

ENVIRONMENTAL STUDIES PROGRAM EVALUATION BY PARTICIPATING TEACHERS
Return to ESP, Box 84, Cruz Bay, V.I. 00830 within two weeks of your
St. John visit, please.

Teacher's Name _____ School _____ Grade _____

Is this your (first, second, third) year in the ESP? _____

Please list names of parents accompanying your class: _____

Names of CVI teacher trainees accompanying your class _____

ESP Materials

1. A/V Materials
Films Shown: _____

Please rate film: Poor, Good
Excellent, Other _____

(Please note if your school does not have a 16 mm. projector)

Keyed color slides

Did you show selected slides before -- and after--- ESA visit?

Was the revised keyed slide guide helpful?

2. A Guide to the Natural History of St. John Hardcover copies of the Guide are
provided for school libraries and teachers by Title II, LSIM.

Does the Guide facilitate your use of the Environmental Study Areas?

Comments: _____

3. Parent Handbooks Did you distribute a handbook to each parent at least one week prior to ESA visit? Should the handbook be revised, simplified, expanded?

Other comments: _____

4. Ivan Environman and the Language Arts Program

Do you use the Ivan stories published every Monday or Tuesday in the Daily News with your pupils? A teacher's handbook to accompany an edited text presenting 50-60 of these stories will possibly be published for use in the ESP. Please note pupil reactions and make suggestions about this proposed publication.

5. Social Studies - Mapmaking. Make an ESA map of the area your class visited and let pupils diagram and plot ESA's at home they might "set up." (An ESA can be set up anywhere.)
Guide - let pupils prepare a small guide or handbook, drawings, maps, questions, answers, stories that they would use to guide cousins, friends or family to Salt Pond, Annaberg or Reef Bay. (Attach samples of this and other pupil work.) Walking tours - to nearby areas where housing patterns, traffic, water or air pollution, litter, erosion, are problems. Let pupils discuss and carry out at least one activity coping with an environmental problem where they can see some measurable result. (Always present problems with options!)
Please attach your notes on such projects to this sheet. Free Beaches - Discuss this and other environmental resource issues of local interest. Interviews - Invite senior citizens who can tell it like it was in the Virgin Islands from 1900 to 1950. Tape such interviews where questions are well prepared for possible radio program use. Mrs. Wilhelmina Lewis, Bluebeard Apts, is a volunteer senior consultant if transportation is provided for her.
6. Science - Describe one project or experiment you carry on with your class such as rates of evaporation from seawater; amount of salt from a gallon of seawater; try to build a bird nest with fingers; keep a rain gauge record for 6 weeks; native fruit tree cultivation from seed or slips; vines and hedges from native materials at school or nearby park area.
7. Art - Use seeds, shells, other native materials (without gilding the lily!)
8. Your suggestions on ESP operation for 1973-74 are needed: - Do you feel the program should be continued? _____ What changes or additions do you feel would benefit the program? _____

