TEACHERS' HANDBOOK

SANDFLY ISLAND

NATIONAL ENVIRONMENTAL STUDY AREA

EVERGLADES NATIONAL PARK

For additional information about the Sandfly Island Environmental study area or about the National Park Service Environmental Education Program please contact:

Environmental Education Specialist
Everglades National Park
Box 279
Homestead, Florida 33030

Tele: 305 247-6211

or

District Naturalist
Gulf Coast Ranger Station
Everglades National Park
Box 237
Everglades, Florida 33929

If you wish to have your name placed on a mailing list for further Environmental Education materials or if you wish to be notified of future Teacher Workshops, contact the Environmental Education Specialist.

WHAT'S IN THE HANDBOOK

Section I Introduction to the National Environmental Study Area Program

A. How to use this Handbook

B. To Begin With . . .

C. So . . . Why the Problem

D. Basic Concepts for Teaching Guide (Themes)

E. National Environmental Study Area Use

1. Pre-site activities
2. On-site activities
3. Post-site activities

Section II Basic Environmental Study Area Inventory

A. Natural Resources

1. Topography and Physical Features
2. Vegetative cover
3. Terrestrial Faunal System
4. Aquatic Life System
5. Water Resources
6. Geological Survey
7. Climatology

B. Man's Influence

1. Archeological Resources
2. Historic Patterns of Development and Use
3. Suggested Archeological and Historical Publications

Section III Suggested Activities for Students on Sandfly Island ESA

Section IV Reference Materials

I. Introduction to the National Environmental Study Area Program

A. How to use this Handbook

The purpose of this handbook is to assist the teachers in the use of Sandfly Island National Environmental Study Area. The first section provides details on how study areas have been used successfully and why National Environmental Study Areas are being established. The second section of the handbook provides a description and interpretation of what will be found at the site.

This handbook can best be used by incorporating the information in the handbook into pre-site and post-site class studies, as well as using it for an on-site reference. It is the responsibility of the teacher to adapt the material to the appropriate grade level and the topic to be covered.

We have emphasized the importance of the interdependence of all organisms of the environment in our look at the "Web of Life." The teacher is offered suggestions on how to involve students in learning these relationships.

How can we improve this handbook? The last page has been added for your comments and suggestions. Please tear the last suggestion page out and send to:

Superintendent
Attn: Interpretive Specialist
Everglades National Park
P. O. Box 279
Homestead, Florida 33030

B. To Begin With

Early man undoubtedly felt a personal identity with the environment. He derived directly from it his requirements for existence. he was keenly attuned and responded vitally to its influences. He perceived its intricate workings and perhaps sensed an order of things. In acknowledging his own dependence on the environment, he reached a balance with it. He became an integral part of the natural web of life, taking from the environment only those resources to meet his daily needs and returning his energies to it. His survival rested on his sensitivity to the environmental scheme and his place in it.

Civilization and technology have profoundly changed man's behavior. Civilized man has traditionally found ways to take more from the earth than he was willing to give in return. While enacting laws to govern his societies, he exempted

himself from the more basic laws of nature. With no concern for the environment or his own future, he depleted resources, then moved on to conquer again. Civilizations flourished where the earth was bountiful - and perished in response to irreparable damage inflicted on the environment. Man, the conquering animal, no longer considered himself a part of nature, but rather apart from it, free to manipulate and control its elements at will.

This attitude toward man's role in the environment has persisted, and modern civilizations are now faced with sobering alternatives. Nature is in revolt, and we can no longer take the environment for granted. The earth's population is already beyond its carrying capacity. No country on the face of the earth is innocent of resource abuse and exploitation. Mismanagement and improper land uses have resulted in loss of soil productivity and heavy erosion. Much of our arable land is gone. Our water and air are incredibly polluted. We have effectively insulated ourselves from the natural world. We rarely appreciate esthetic values when they conflict with economics, and we continue to lower the overall quality of our existence.

The time has come when we must make a choice - we can continue to destroy the environment that sustains us, thereby destroying ourselves, or we can begin an intelligent management program.

To insure man's survival, we must recognize that we are dependent upon the natural environment and as subject to nature's laws as any other creature. We must understand our relationship to the ecological scheme and be able to apply ecological principles to ourselves.' We must learn that we are part and parcel of the environment, merely components of the web and not weavers of it. In short, we must concede the necessity of environmental unity and strive to reach a state of harmony with the environment.

The National Park Service is concerned about man's future. In recognizing man's plight, we have implemented a program of environmental education. We don't pretend to have all the answers, but, through this program, we hope to arouse in the young people of today, an environmental awareness - a perception of man's profound relationship to the only environment we have and a realization that we must cooperate with nature to assure our ultimate survival.

To help meet the objectives of this program, Everglades National Park has established National Environmental Study Areas at Long Pine Key, located six miles inside the Park entrance, and on Sandfly Island, located in the Ten Thousand Islands about

two miles from Everglades, Florida. Sandfly Island can be reached only by boat. Arrangements have been made with the manager, Everglades National Park Boat Tours, to transport groups to and from the Study Area.

Sandfly Island, like most of the Ten Thousand Islands, is a mangrove island, but is also different from most by having large shell mounds. The elevation of these three shell mounds influences noticeable vegetation differences which are clearly observed. On the higher ridges, above tidal flows, tropical hardwood vegetation is evident. High ground is at a premium in these islands, so it was probably the elevation that led first aboriginal, then European man to settle on the island where he would be protected from the storm tides.

Taking advantage of these higher shell mounds, a loop trail has been built on the island. This trail passes through both mangrove and tropical hardwood forests and past interesting exotic plants introduced by early man. It passes through dry areas where cactus now grows on abandoned tomato fields originally cleared from the tropical vegetation. A boardwalk section of the trail passes over a tidal creek where aquatic life can be observed. All along the trail there is evidence of man's existence on the island - rusted farm machinery scattered under the trees, and deposits of shells in apparent feeding areas of the early Calusa Indians. Here is history, archeology, and natural history combined to show the evidence of man's influence on the environment and its influence on him.

While the environmental education program is centered in the out-of-doors, it also has important classroom applications. An Environmental Study Area should be used as an outdoor classroom. Though the natural and social sciences most obviously apply to the relationship between man and the natural environment, other subjects can be environmentally oriented. What patterns in nature, for example, can be expressed in mathematical terms?

Our initial efforts will be geared primarily to the students in the middle school grades, 6th, 7th, and 8th. The program will be expanded later as refined instruction methods are developed. As a teacher, you are the essential link in this program, for your interest and influence will determine its success. The National Park Service offers the resource for your use. You, the teacher, will be wholly responsible for teaching the concepts of this handbook to the class on-site. With your imagination, this approach can illustrate existing curricula with minimal disruption. We hope that together we can develop a program that will provide youngsters with a personal outdoor experience and a recognition of environ-

mental dependence and spawn in them a healthy land use ethnic. A responsible attitude toward the environment, must be instilled in them now because it is vital to their future.

C. So . . . Why the Problem?

All forms of life, including man, have slowly developed over the passage of millions of years. This slow development has actually been a continuous adjustment to all the other elements of the environment, both living and non-living; an adjustment that has created a situation where each form of life has grown to depend on the existence - the presence - of all the other elements. This interdependency or relationship must be maintained. . . or something dies.

This relationship has been called the "web of life," an arrangement where all the strands may be gently stretched with changes constantly taking place. The changes, however, for thousands of years have been so gradual that most forms of life have been able to adapt. But we know some cases in the past where the changes have been so great or a form of life has become so specialized that it has disappeared; witness the dinosaur.

The strands of life depend on the sun, air, water, and the soil for food for survival. As any form of life increases in numbers beyond the capacity of these elements of the environment, the web begins to break down. Starvation, fighting and disrupted communities resulting from population explosions, crowded living conditions, and social disorders are as real to the rat as they are to man. One of the few differences that separates man from the rest of the animal world is that he may choose to control himself and his environment. This has been called an "ethic" or standard behavior; in this case, an environmental ethic. One person's selection to adopt the ethic will benefit the entire population. Our failure to develop an environmental awareness and understanding has been a failure of our society. Now we are faced with some of the results of our failure. Never before has the environment been changed so much, so rapidly. Never before have so many life forms disappeared in so short a time. Never before has the world been in such a state of unrest. Never before have the air, water, and soil been so foul. And never before has the environment been challenged by any form of life as powerful, as destructive, as man. This is why two out of every three children alive today go to bed hungry every night. This is why twenty starved to death while you read this short paper.

So what? This is what we should seek to answer. Can we show the environmental themes to the students in such a way that

the students understand them? Can we help the students relate the themes to their lives back home?

Some people are aware. Some people are concerned. When enough become so, when enough people recognize that man is but a part of the web of life, that his survival depends on his realization that he needs more than himself, then there is not only hope for survival, but a life worth living.

D. Basic Concepts for Teaching Guide (Themes)

One of the best ways to observe current and past occurrences on Sandfly Island is by using a thematic approach. In this way, everything on the island can be related to one central theme. The themes,are universal environmental concepts such as interdependence, interaction, continuity, change, similarity, variety, patterns, adaptation and evolution.

This thematic approach is also an easy way for the observer to relate to what he is observing. Without being an expert on the history of Sandfly Island or on tropical botany, he can relate all the elements on the island to one another with the use of one central theme, and this technique can be used in any other natural or man-altered area. The four major themes are as follows:

Variety and Pattern: The vastness of the environment is reflected by the diversity of things in nature. Many likenesses and differences occur among the variety and patterns of living and non-living things. A variety of function, size, and structure exists in plants, and stars, rocks and animals, processes and people. However, there are sufficient similarities among things to permit man to classify them into orderly patterns. These classifications enhance man's understanding of the universe; conversely, increased understanding often modifies man's scheme of classification.

Continuity and Change: All things are in a state of constant change yet in this change is a pattern of continuity and consistency. Continual change occurs with living and non-living things. Multitudes of changes of energy and materials occur among living things and among each other -- among galaxies and stars, cells and systems. Some changes seem to occur in cycles and some do not. Throughout all these changes there run patterns of continuity and constancy. Identities often continue in spite of changes; for example, matter and energy may be changed in form, or from one to the other, but they can be neither created nor destroyed.

Interactions and Interdependence: Nothing exists in isolation, because each element of nature interacts and is interdependent

on each other. Interactions occur among living and non-living things due to their relationships in time, position and energy. Cause and effect interactions, including interdependence and interchange of energy and materials among living things, among non-living things, and among all things and their environment, occur everywhere.

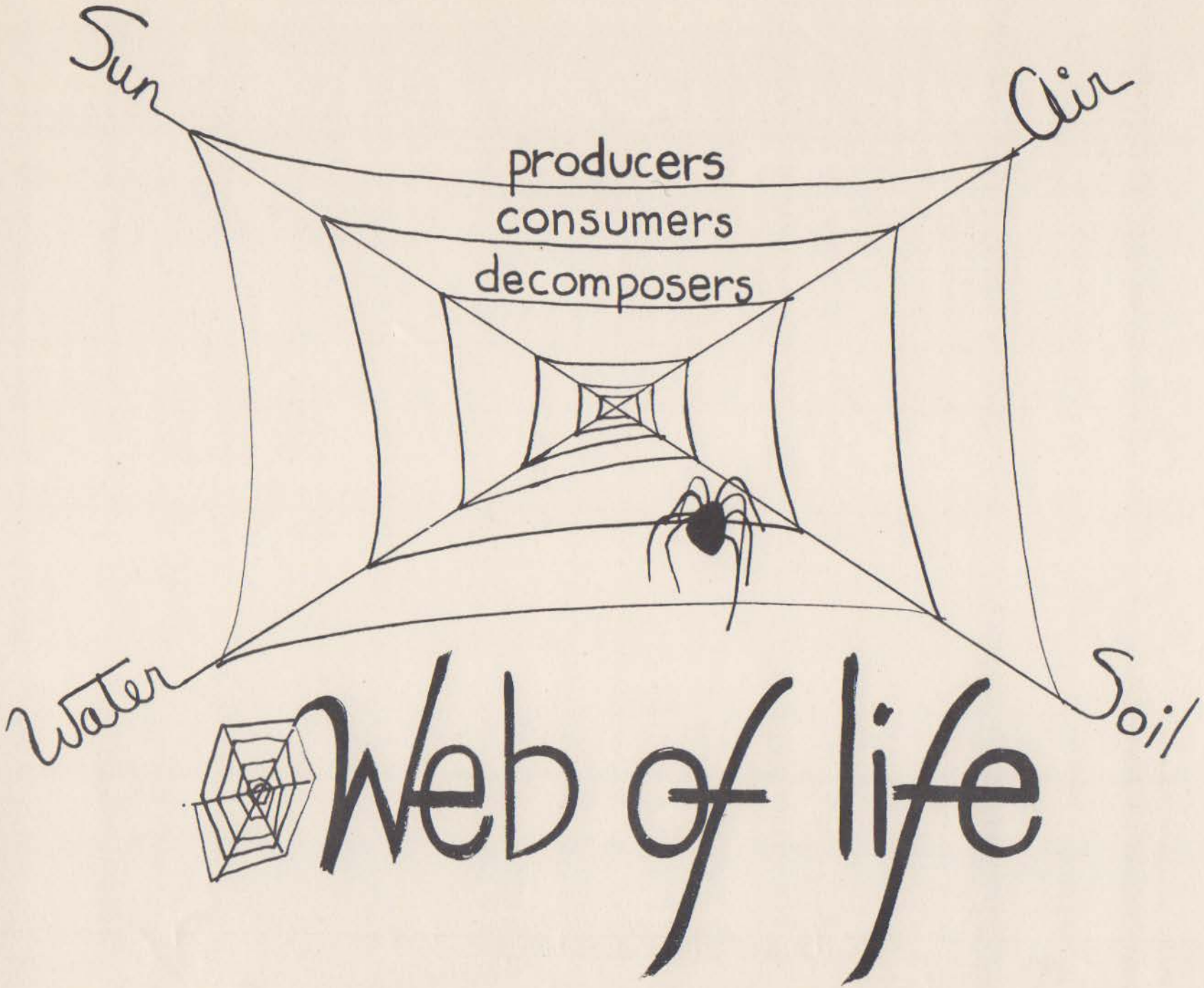
Evolution and Adaptation: Organisms evolve adaptations for survival in the environment. Throughout time living and non-living things undergo evolutionary development. Long-range developments have occurred and continue to occur among living and non-living things. These developments occur relatively slowly as compared to the life span of organisms. Organisms modify and are modified by their environment; heredity preserves elements of continuity. Such processes include the development of galaxies and planetary systems, the evolution of the planet Earth into its modern state and its future states, and the development of life from non-living entities, to simple forms, to complex forms.

E. National Environmental Study Area Use

Sandfly Island National Environmental Study Area has many stories to tell. One can learn about the formation of a mangrove island; study natural plant succession, as one plant community takes over where a previous plant community existed; discover soil formations and learn about island geology; observe animal life, both aquatic and terrestrial; learn the history of man on the island, from the time of the early Calusa Indians to modern day man's occupancy and perhaps even the effects the National Park Service has had on the Island. Above all, in the Environmental Study Area students can learn how the environment has affected man's development and how man in turn has affected his environment.

You may be thinking that some of these stories can be told as one - that there is a relationship between several features of the island, such as man's dependence on the animals (fish especially) and plants for food and shelter and the plants' dependence on the soil. If you think this, you are correct. There is a relationship between all elements on Sandfly Island. All plants, animals (including man), water, air, and the earth are interrelated and interdependent. They are a part of what we call the web of life.

A close look at the "web" shows us that its main supports are air, sun, water, and soil. These are the non-living elements. The rest of the web is made up of living things that produce, consume, or decompose food. We can basically describe producers as green plants, consumers as animals that eat plants (or animals


Sun
Air
producers
consumers
decomposers
Water
Soil
Web of life

that eat other animals that eat plants) and the decomposers as the fungi, bacteria, and other organisms that help break down plant and animal material into raw material for re-use.

All too often we forget that man is a part of this "web of life." He is a consumer, the biggest consumer on earth, but in his attempts to produce his own foods he does not always consider the other elements in the web.

Herein lies the purpose of the Sandfly Island Environmental Study Area. We are offering an opportunity for students to see man in relation to the other elements of the web of life.

1. Suggested Pre-Site Activities

From the experience of past classes using the Environmental Study Area, we have found that a convenient way to use the area is to build a study unit around the area. This unit could include a week of classroom work followed by a trip to the site, and then post-site classroom work. Or it could be arranged anyway the teacher feels it should. After deciding where in the unit the trip would best fit, contact the Gulf Coast Ranger Station to schedule your trip.

Reference materials should be made available to the students prior to their visit. Helpful readings on ecology and outdoor study can be obtained now for all grade levels. Specific materials for older students and for teacher references, such as - The History of Collier County, Chokoloskee Bay Country, and Man In The Everglades by Charlton Tebeau should be made available. The classes should also become familiar with materials such as plant and animal check lists. Any articles relating to environmental studies or environmental problems should be kept for reference material. Students should be instructed in how to keep intelligent field notes. Let the class list things to look for in the study area. Prepare the class for listing and recording observations while at the study area.

Suggested studies before visiting Sandfly Island

A. The Land

1. Geology of Southern Florida
2. Formation of the Ten Thousand Islands
3. Formation of Shell islands

B. The Plants

1. Mangrove forest
2. Tropical hardwood forest

3. Xerophytic plant communities
4. Plant succession

C. The People

1. Calusa Indians
2. European Settlers
3. Man's influence on the natural environment

How to Get to the Environmental Study Area

Teachers planning a trip to Sandfly Island NESA should notify the District Naturalist at Everglades City and the Everglades National Park Boat Tour operator for transportation to the Island. Contact the District Naturalist by phone at 695-3311 and the Boat Tours at 695-2591.

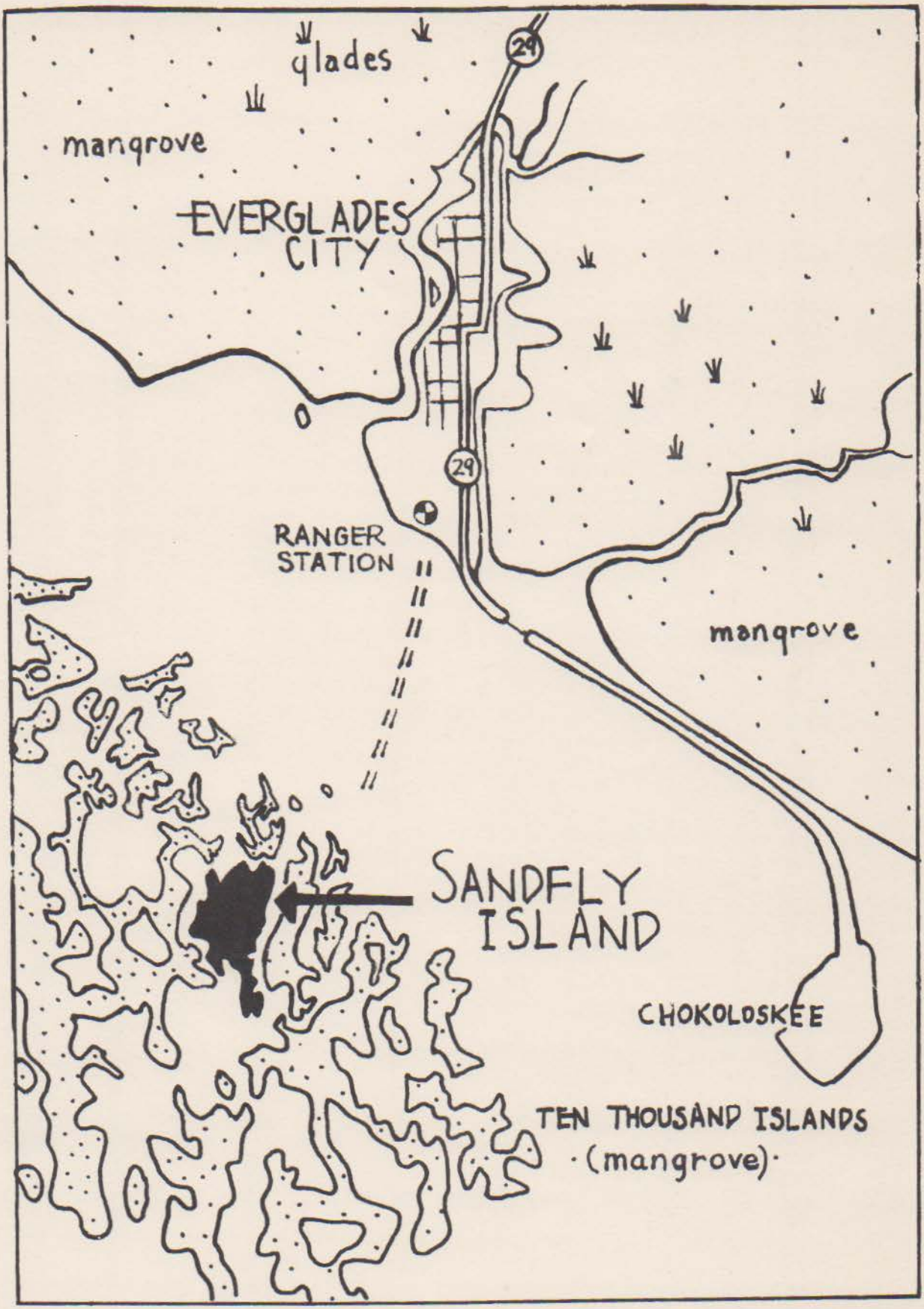
The National Environmental Study Area is on an island about 2 miles from the mainland. The boat tour operator will take students to the NESA in the morning around 8:30 am and pick them up about 12:30 pm after their lunch on the island. The charge will be fifty cents per student for the boat transportation.

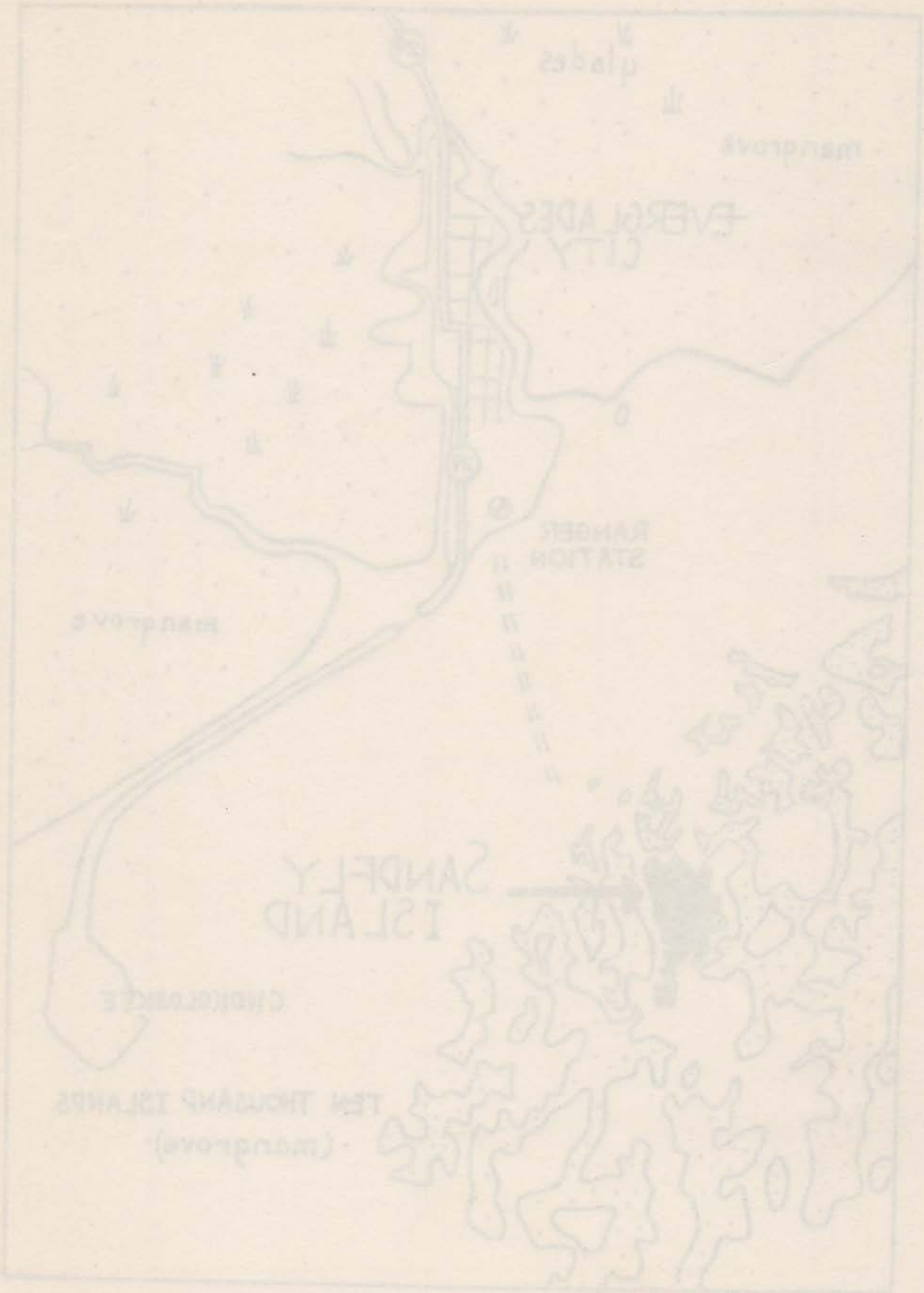
2. On-site Activities

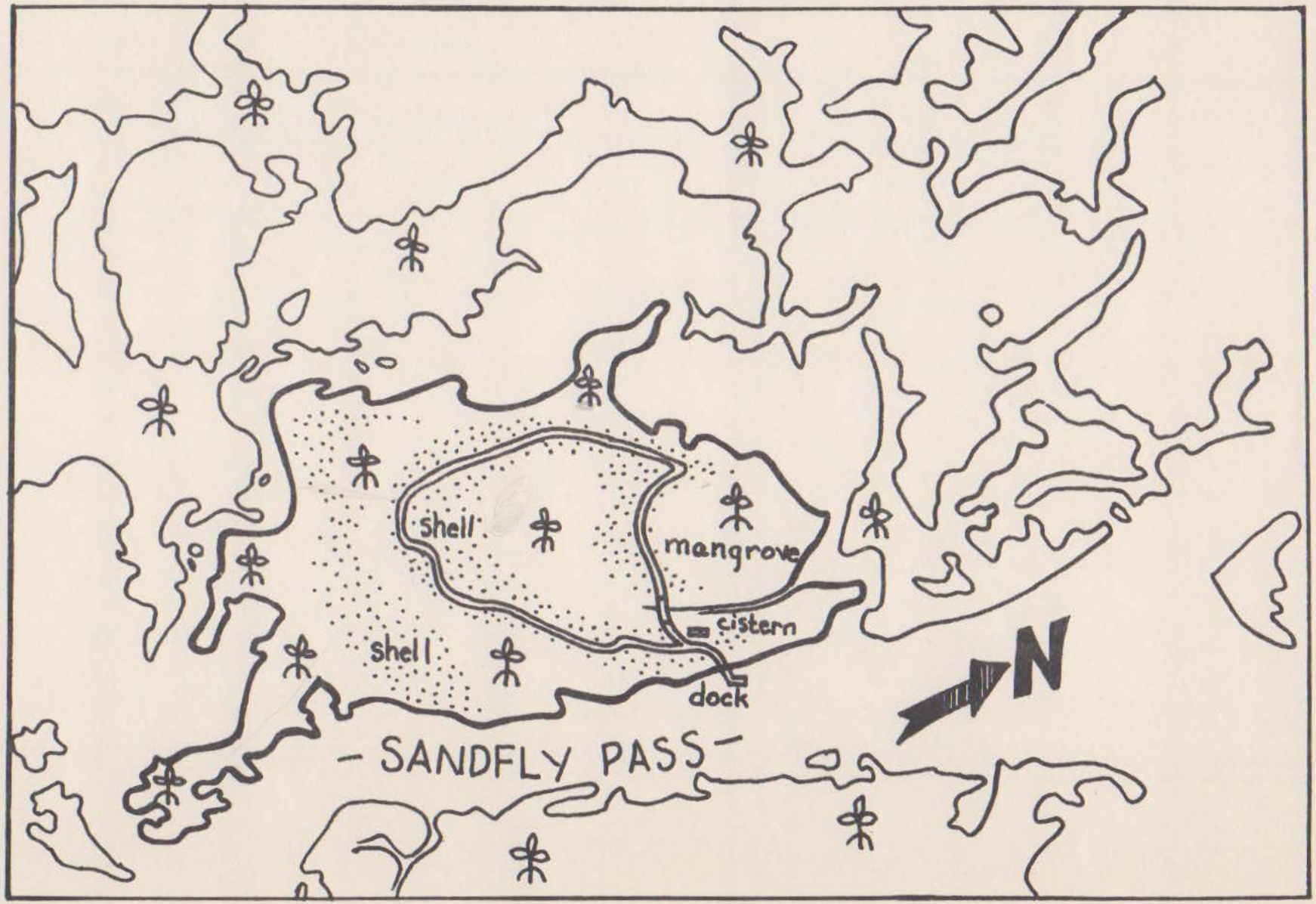
The Sandfly Island NESA is to be used as a day use area. Of course groups may visit as often as they like, but no overnight facilities are available. The best way to see the area is to walk the one mile loop trail, taking lots of time to observe the natural and man altered conditions along the way. You may use the Self-Guiding Trail leaflet to assist in explaining the features of the area.

Whenever it is possible, a Park Service representative will meet and introduce the class to the site. The teachers should then take the class around the study area getting them acquainted with the entire area. Then the students should be given the opportunity to explore on their own. This depends on the grade level of the class. Students should look for the impact of man. They should be challenged to seek out the answers to numerous questions.

If the teacher has chosen to use one of the universal themes to assist in tying the whole area together, such as the adaptations of all organisms, then students should be looking for adaptations of organisms that enable them to live in this particular habitat. Examples might be long legs and bills of wading birds, enabling them to feed in the shallow waters surrounding the islands. Or another example would be the ability of the mangrove trees to adapt to living in a salt water environment. If the teacher is using the theme


glades
29
mangrove
EVERGLADES CITY
29
RANGER STATION
mangrove
SANDFLY ISLAND
CHOKOLOSKEE
TEN THOUSAND ISLANDS
(mangrove)




shell
mangrove
cistern
shell
dock
N
- SANDFLY PASS -

similarities, students could be looking for features of the trees that are similar such as the thick textured leaves and heavy clusters of fruit that are common to most of the tropical hardwoods on the island. They could be asking themselves how these features benefit the trees. They could be asking themselves what similarities were shared by the Calusa Indians and the early settlers. Didn't both groups come to the island because it was probably one of the few elevated areas? And didn't they both take fish from surrounding waters for their food? It is easy to see how the whole area can be looked at with all organisms interrelated when a broad concept approach is used.

It should also be pointed out that the Environmental Study Area is not just an outdoor natural laboratory. The study area can be used by any type of class. A math class could be brought to the site. All kinds of measurements can be made; a group could be assigned to measure the cistern, calculate the amount of water it would hold, how much rain it would take to fill it, or how much more water it holds now since Charlie Boggess enlarged it from the smaller size that Joe Wiggins had. Another group could measure the flow of water from the well. Other groups could measure the circumference of trees and calculate their diameters. Also tree heights could be measured and forest density - the number of trees per a certain area. This could be used to compare differences between mangrove forests and tropical hardwood forests.

An art class using the study area could concentrate on patterns and similarities in nature. Or differences might be stressed with students attempting to draw as many different types of leaves on trees or different types of bills on birds.

A social studies or history class would have a tremendous opportunity to study aboriginal and anglo-American history in an on-site situation.

There are many different courses that could be taught on this NESA and several different approaches to teaching them. The teacher is left with the final decision.

3. Post-site Activities

Back in the classroom, after the field trip to the NESA, the teacher will have the opportunity to evaluate how much was observed while the students were at the NESA. If the project was designed as a complete unit, it will not end after the field trip. An art class can bring back their sketches and put them all together in a mural or composite of the study area. Additional tracings, paintings, or sketches can be made of things observed in the field. The math class can bring some of its calculations back to the classroom.

Throughout the remainder of the semester, the class can take measurements that can be compared to ones taken on the NESA. History classes using the area should complete a report on the history of man in the area: reporting on the differences or similarities between the Indians and European settlers. Social Studies classes should discuss and report on the current problems related to man, such as pollution, littering, overpopulation, etc. It shouldn't be forgotten after the trip. Finally, any class using the NESA should discuss the value of the study area itself, and if they have any suggestions or comments, forward them to the Environmental Education Specialist for the area.

II. BASIC ENVIRONMENTAL STUDY AREA INVENTORY SANDFLY ISLAND ENVIRONMENTAL STUDY AREA

A. Natural Resources

1. Basic topography and physical features

The Sandfly Island Environmental Study Area in Everglades National Park occupies a 100 acre mangrove island which lies about two miles west of Everglades, Florida, in the Ten Thousand Islands. The island contains the natural mangrove vegetation in the lower swampy regions and several higher shell ridges, reaching about six to eight feet in elevation. Like all the islands in the Ten Thousand Islands, Sandfly Island is affected by the changing tides. During periods of low tide, the mud banks and oyster bars around the island are exposed. During periods of high tide, the water comes right up to the edge of the vegetation on the outside of the island and in several areas, tide water flows into more central low lying areas of the island by way of tidal creeks.

The rise and fall of water due to changing tides average about three feet in the Sandfly area.

2. Basic Vegetative Cover

a. The Mangrove Forest

Influenced by a tropical climate, the southern tip of Florida has some of the most unusal plant communities to be found in the world. One of these plant communities is the mangrove forest. In the United States, mangrove forests grow only on the southern coast of Florida. In Everglades National Park, a wide belt of mangrove swamp

borders the shore line of Florida Bay and the Gulf of Mexico and extends inland to meet the sawgrass of the everglades. In Florida Bay and along the Gulf Coast are numerous small islands, which are predominantly covered by mangrove forest vegetation. This consists primarily of four dominate woody species: the red, black, and white mangroves, and the buttonwood.

Mangroves do not compete well with other trees on higher land, and tend to be crowded out; however, their ability to tolerate salt water conditions enable them to grow where other plants cannot survive. All types of mangroves have been grown experimentally in fresh water and on dry land, and the red mangrove can often be seen lining the creeks flowing out of the glades in an almost pure fresh water situation.

The red mangrove is perhaps the tree first noticed because of its many stilt-like roots that support the tree on all sides, arching out and down like the legs of a giant crab. Also noticeable are the cigar-shaped seedlings that begin growing while still on the parent plant. When these seedlings drop off, they may float for great distances before they ground and take root; later, perhaps being joined by others and eventually forming another island.

You will recognize the black mangrove by the many pneumatophores sticking up out of the mud. Looking like asparagus, these stalks are thought to act as "breathing tubes." Another unusual feature of the black mangrove is its ability to excrete salt from the leaves. Where the white and red mangroves exclude salt when absorbing water, the black mangrove takes in and then excretes the salt. If you check the undersides of black mangrove leaves, you will find them heavily coated with crystals. One lick will confirm that it is salt.

The white mangrove is harder to identify, but may be recognized by its thick, rounded leaves, and by the lack of the distinguishing features of the other mangroves. The leaves are located opposite each other on the stem, similar to the red mangrove, but are usually two to three inches long (smaller than the red mangrove) and more rounded. The petiole, or leaf stem, is often reddish in color.

b. Tropical Vegetation

The plant life occupying the higher shell ridges on the interior of Sandfly Island is mostly tropical in origin. The greatest percentage of the plants are from the West Indies or Caribbean area. The elevated shell ridges enable these plants to grow on the island free from tidal inundation. Seeds of these tropical plants were probably carried to southern Florida by ocean currents, hurricane winds, or by migrating birds. Once deposited on a mangrove island where a buildup of peat soil occurred, the plant life spread rapidly. Tropical plants are heavy fruit bearers which helps bring about the thick vegetation. Mangroves, which may have once occupied all of the island, were probably crowded out by the spreading tropical hardwoods. That tropical vegetation grows in South Florida is easily explained if one understands the climate. There are only two seasons, a wet season from about May through November, and a dry season from about December through April. During the rainy season we are likely to get as much as sixty inches of rain. Normally, the temperatures are mild all year round, except for some periodic cold weather when norther fronts intrude far into Florida. The southern tip of Florida is warmed on three sides by tropical ocean currents, and by the shallow warm waters of the interior glades and cypress swamps. Tropical vegetation cannot tolerate frost, and is, therefore, limited to Southern Florida. Typical hardwoods are restricted to areas largely free from fire, and flooding. Surrounded by water, Sandfly Island is protected from any fires that originate off the island and the shell ridges are above the high tide line and largely free from salt water flooding.

On Sandfly Island, there are about 50 different woody plants that have their origin in the tropics. A list of the common plants to be encountered will be included in this material.

There are several orchids and other airplants (epiphytes) to be found among the trees. The seeds of airplants may be carried by wind or birds, and is deposited on the limb of a tree, they sometimes will germinate and the plant will grow from there. Taking no nourishment from the host tree, the airplant collects dirt particles

and moisture from the air for its "soil" and sustenance. They use the host plant only for support.

Many tropical plants share certain design features and adaptations. The most notable is leaf adaptation. The streamlined leaves are designed to shed from the heavy rains of the wet season. The waxy surface and thick texture of the leaves help to retain moisture during the dry season.

c. Desert-like vegetation

Sandfly Island, like many of the Ten Thousand Islands, contains some cactus and agave plants. Prickly Pear cactus are common and well adapted for the long dry winter season. Several species are found in the Park. Two species of Agave are found on Sandfly. These were probably carried to the island from Mexico or the West Indies. These plants were at one time introduced to southern Florida in an attempt to use them as a source of fiber for rope.

3. Basic Terrestrial Faunal System

The inaccessibility and remoteness of the Ten Thousand Islands make these islands refuges for many animals. Bobcats and raccoons are often seen;on rare occasions, one might see a panther or a deer. The brackish water supports an immense quantity and variety of aquatic life. Fish, especially mullet, redfish, snook and tarpon abound. Blue crabs, stone crabs, and fiddler crabs are among the many island crustaceans.

Many birds have established rookeries here because the area meets their nesting requirements. Here they are close to a constant food supply and the mangrove islands, are, for the most part, free from predators. Tens of thousands of white ibises, herons, egrets, and other birds roost at night on certain of the islands in Chokoloskee Bay, particularly during the summer. Many of these birds can be seen feeding on shallow mud banks at low tide. This remote area also provides protection for breeding populations of ospreys, bald eagles, and swallow tailed kites. Ospreys have, on occassions, occupied a nest across from the dock at Sandfly Island and can usually be seen overhead while on the island. Numerous small birds are on the island throughout the year. Cardinals, white-eyed vireos,

red-bellied woodpeckers, and pileated woodpeckers occupy the island year round. During migrations they are joined by many others.

4. Basic Aquatic Life System

The Ten Thousand Islands are surrounded by the salt water of the Gulf of Mexico. However, during the rainy season the fresh water pouring out of the glades mixes with the salt water in this coastal area. This brackish water zone may be as much as twelve miles wide depending on the quantity of fresh water flowing out of the glades, and it is the most productive life zone of the Park. Collecting land derived nutrients and converting them to organic material, this life zone provides an abundant food supply for many small aquatic organisms, that are in turn fed on by larger ones. Killifish are the dominant fish of the brackish marshes. In shallow waters these fish are fed upon by herons, egrets and other wading birds. In deeper waters they are the food for many large fish such as snook and tarpon.

When normal flows of water pour out of the glades the abundance of aquatic life is great. However, when the water flow is interrupted, the production of aquatic life in the brackish water zone is reduced. This, in turn, reduces the amount of food for the larger fishes that are a part of Florida's fishing industry and results in reduced numbers of nesting birds in the Ten Thousand Islands area.

5. Water Resources

a. Major Sources of Water

1. Surface: Most of the surface water comes from rainfall which averages about 60 inches a year.

2. Ground Water: One well was drilled on the island in 1923 by the Collier Corporation. The depth of the well is 385 feet and it is an artesian well with a steady flow.

3. Salt Water: Sandfly Island is surrounded by salt water which is brackish during periods of heavy fresh water runoff from the everglades. The Baron River, Turner River, Lopez River and Halfway Creek carry most of the fresh water into this area of the Ten Thousand Islands.

6. Basic Geological Survey

a. Basic Landforms and Geomorphic History

The Sandfly Island Study Area lies among the Ten Thousand Islands on the Gulf Coast of Florida. Florida itself is part of a flat-topped plateau about 300 miles wide which extends south from the continental United States. Over half of the plateau lies just under water. The lower layers of this plateau were volcanic in origin. Volcanic activity in the area occurred over several million years ago and Florida is quite stable now. On top of this base rock is a layer of sedimentary rock about two miles thick. This sedimentary rock was deposited when shallow seas covered the land. About five times during the ice ages the land was alternately covered by the sea and then re-exposed. For the last 5,000 years Florida has remained out of the water. The water is rising again at a rate of about 1/2 inch every 100 years.

The actual formation of the Ten Thousand Islands followed the formation of an outer reef, the Vermetid reef, which occurred between 3,000 and 5,000 years ago. This reef was formed by the build up of colonies of a small gastropod (mollusc), Vermetus nigricans. Once the reef formed it created a lagoon between the reef and the mainland. Offshore sands from the shoals around Cape Romano were washed into this lagoon building up sand banks, added to by river mud from the mainland. Oyster bars built up on the banks. Mangrove seedlings swept down the rivers and attached to the banks. Small clumps of mangroves formed and debris trapped by their roots helped build up small islands, later enlarged by additional mangrove development. Storm tides washed in masses of shells which were deposited on and around these small islands. Once a little bit of elevation was built up, additional "high ground" plants became established and further modified their own environment by adding their plant debris to the soil and building it even higher.

7. Basic Climatology

Everglades National Park lies at the southern tip of Florida. Here the climate is more like that of the tropics than that of the temperate zone. A rainy

season from May through November deposits an average of 60 inches of rain over the landscape. The dry season from December through April may be as dry as that of a desert. The climate makes it possible for tropical plant life to grow abundantly in certain areas, while in others it is mixed with temperate zone plants. Normal temperatures range to 85 or 90 degrees during the summer months with overnight lows in the 70's. Winter temperatures average between 65 to 75 degrees at night. Frost may occur on rare occassions.

B. Man's Influence

1. Archeologic Resources

Perhaps ten or twenty thousand years ago Indians were making their way southward across the North American continent. About 3,000 years ago, descendants of these Indians made their way into the area now called Florida. Calusa was the name given to the Indians who first settled along the Gulf Coast of Florida. Their main village centered around the Caloosatachee River; however, as many as fifty known encampments were spread throughout the Ten Thousand Islands, along the banks of the large rivers draining the glades, and as far south as Cape Sable. These Indians were fishermen and hunters who took advantage of the abundant shellfish, fish and wildlife in the Everglades. They cooked over fires, made pottery, and used shells for tools and utensils. Throughout the mangrove wilderness, shell mounds mark the sites of former Indian encampments. At the time of the arrival of Spanish explorers in Florida, these Indians were still living along the Gulf Coast. For a time they resisted the pressure of Spanish exploration and the movement southward of the Indians from the north, but by the end of the eithteenth century no Calusa Indians were to be found in Florida. Whether they died of European man's diseases, were all sold into slavery, or escaped to the islands to the south is unknown.

Early European settlers along the Gulf Coast took advantage of the Calusa Indian mounds, since often they represented the only high ground available. They built homes and planted fields of sugarcane and vegetables. Sandfly Island is an example of one of those sites which is now protected in Everglades National Park. Other historic sites in this area include Chokoloskee Island, Russell Key and the Turner River mounds.

2. Historic Patterns of Development and Use

a. Pristine Conditions

The Ten Thousand Islands are, and have been, changing. As one red mangrove seedling is deposited further out in the water, so spreads the island. As a strong storm tide washes away a sandy spit on one side of an island and piles it up on another, so changes the shape. This pattern has gone on for centuries. The general appearance of Sandfly Island when the early Calusa Indians arrived in the area, would be hard to guess. Undoubtedly, some of the present shell ridges were there at that time or the Indians would have sought high, sheltered ground elsewhere. Shells deposited by the Calusa Indians are found on top of these natural shell ridges.

The type of vegetation that formerly occupied the interior of the island would be hard to determine. Just what state of plant succession the Calusas found on those still forming islands two or three thousand years ago is unknown.

Why did the Calusa Indians come to islands like Sandfly, Chokoloskee and Russell Key, all of them well away from the mainland? You must remember that most of the mainland in this area was swamp-land. Everglades City is built mostly on man-made, dredged-up land. Land which remained out of water all year was hard to find. Parts of Sandfly island were high and dry. Another factor which undoubtedly played an important part was the availability of food. The Calusa Indians were apparently attracted to the seacoast by the abundance of fish and the large beds of oysters, clams and conch shells. These Indians, living in accord with their natural surroundings, took only food enough to feed themselves. They did not strip the clam beds as later European settlers did. They fed also on the wildlife on the islands and the fruits of the tropical trees. They did not clear and cultivate the land but lived in harmony with their natural food supply. Wildlife was present in balanced numbers - no overabundant species and no drastic reductions of predators that might upset natural food chains. It is known that the Indians used the lightweight wood of the Gumbo Limbo tree for net floats and they undoubtedly had uses for many other tropical trees, but their use did not

disturb the forest's natural condition.

During the occupation by the Calusa Indians, the shell mounds grew because of the deposit of food shells left by the Indians. Some archeologists believe these Indians also carried in baskets full of shells for the purpose of building up the land so they would be better protected from hurricane tides.

b. Arrival of Anglo-American Man

Settlers began occupying Sandfly Island in the 1870's. Captain Richard Turner, Seminole War scout, spent one year on the island prior to settling on the Turner River in 1874, where he lived until 1885. Joe Wiggins built the first permanent house on Sandfly Island in 1885. He later built a grocery store on the island and traded with the Seminole Indians as well as settlers from Halfway Creek, Chokoloskee Island and Everglades. Because travel in this area was primarily by boat, Sandfly Island was a logical place for a store. The island actually lies on one of the few deep water channels between Chokoloskee Bay and the Gulf of Mexico.

In 1912, "Uncle Charlie" Boggess built his home on the island. It was a two-story, nine-room structure with three porches. In addition to the house, "Uncle Charlie" built a concrete cistern to collect water. The concrete was made on the island using one part cement, two parts sand and four parts shell. Charlie Boggess had about 30 acres in cultivation on Sandfly and grew tomatoes. He was in continuous competition with his environment. Raccoons and bobcats raided his flocks of chickens. Insects invaded his tomato crops and reduced the yield and droughts and hurricanes could ruin the entire crop. When Charlie Boggess came to Sandfly Island he found the higher shell ridges covered with century plants (Agave), guava trees and the natural vegetation of the tropics, such as Gumbo Limbo and pigeon plum. Charlie Boggess had to clear hundreds of the Agave plants from the land before planting his crops and undoubtedly had a very rough time without modern machinery such as a tractor.

In 1922 while the Collier Corporation was dredging land in the Everglades City area they also dug a well on Sandfly Island. It is an artesian

well, still flowing, approximately 384 feet deep. The water, although slightly saline, is fresh enough to drink. The Boggess family perferred drinking cistern collected water, but used the well water for irrigation.

In 1923 Charlie Boggess sold his place on Sandfly to Barron Collier and moved to Everglades to become one of the best known charter boat captains there. Later Charlie retired to Chokoloskee island to live in a trailer on still another Indian shell mound. Three of Charlie Boggess' children were born on Sandfly Island and still live in the Everglades City-Chokoloskee area.

Sandfly Island was intermittently occupied until the early 1940's after which time the island began the long process of returning to a natural condition. In 1958 Sandfly Island, along with other islands in the Ten Thousand Island chain, became a part of Everglades National Park.

The same features of the natural environment which brought the Calusa Indians to Sandfly Island several thousand years ago - natural abundance of fish and wildlife coupled with the warm year round tropical climate - still bring man to the Ten Thousands.

3. Suggested reading for further archeological and historical information:

Tebeau - Man in the Everglades
Tebeau - Chokoloskee Bay Country
Tebeau - The Long Frontier - History of Collier County.
Schell - 1000 Years on Mound Key

III. SUGGESTED ACTIVITIES FOR STUDENTS ON SANDFLY ISLAND

Examine elements of the "Web of Life"

1. Look at the soil:

The soil on the ridges of Sandfly Island is a combination of organic material from decomposed plant life and broken particles of shells that underlie the top soil. Notice the absence of rock. How does the dirt under your feet differ from the soil of the mangrove swamp? The soil in the low mangrove areas is a muddy,

peat soil made up of decomposed vegetation, very fine particles of sand and rock from the off shore shoals and the mainland fine particles of shells. How did we get this soil from shells, sand, and rock? On the mainland, erosion has been taking place for years. Water flowing across the surface of the rock loosens particles, plants, such as lichens growing on the surface of rocks, roots of trees or other large plants, splits rocks, allowing the other forces to work. These same forces are working on shells. Washing back and forth in tidal currents they are crushed and broken down. Marine plants and organisms, growing on shells, loosen, break and drill them, aiding in the decomposing process.

This crushed shell or rock material by itself, however, is not capable of supporting the lush plant life we see all around us on Sandfly Island. The ability to support life comes to the soil through the slow accumulation of humus - the rotted remains of fallen leaves, twigs, and trunks of earlier generations of plants. In some cases this rotting vegetation may be carried off the mainland in the rivers to be deposited on an oyster bay or sand bank. The chemical ingredients of soil, such as carbonates, phosphates, and nitrates, found in the decaying or dead plants are vital for the living organisms. These compounds drawn into the living plants through their roots are needed for plant growth.

It is easy to see the relationship between the plant life and the soil. Dig down into the soil on the island. Check several different areas: the grassy field, under some tropical hardwoods, in the mangrove swamp, and on top of a shell ridge. Check the layers in these areas. How far down does the "top soil" extend? The top soil is the fine particles of organic material mixed with shell or rock that we would commonly call "dirt". How deep a layer of leaves and twigs is on the surface? Can you recognize rotting leaves?

A closer look shows that there is also life in the soil. Small organisms, such as bacteria and fungi, are at work aiding in the decomposition of the organic material. There are also larger animals living in the soil. Look for the holes of the fiddler crabs in the mangrove area, or holes of wasps and other insects. All of these organisms, and their activities, contribute to the vitality of the soil. As you are digging in the soil, look for the white strands of fungi.

Let the class look for and list the animals (including

worms, insects, etc.) they find living in the different soils of the island.

2. Look at the Water:

Water is another of the major elements of the "web of life." It is literally a part of all life. Without water the earth would be dry and lifeless. Our own bodies are about 85% water.

There are basically two kinds of water, one with little or no dissolved minerals, which we drink and call fresh; and the other with more dissolved minerals than our bodies can tolerate, which we call saltwater. Both of these can be observed clearly on Sandfly Island. The old cistern was used to collect rain water, a fresh water artesian well flows steadily and salt water completely surrounds the island. The vegetation on the island is divided into those plants that can and those that cannot tolerate salt water. Distinct changes in vegetation can be observed because of the presence or lack of salt water. A third type of water exists in our environment today, but is is not as noticeable on Sandfly Island. This is polluted water, burdened with chemical and organic waste - the direct result of man overloading the water with his waste.

Water falls on Sandfly Island as rain, as much as sixty inches a year. It falls uniformly on the mangrove swamp, the tropical hardwood community, and the cactus (xerophytic) plant community, but it finds a different reception in each area. The fresh water mixes with the salt water in the mangrove community and it runs off the steep shell ridges rapidly. It is absorbed and held in the humus soil under the moist tropical hardwood plant community soil - soil held by millions of small plant roots so it does not wash away. The cactus areas have very little top soil and rain falls directly on shell particles. This water filters rapidly through the shell or runs off carrying what little top soil there might have been with it.

But what about the water that is absorbed into the soil? There are million of roots of trees and plants that absorb that water and carry it up to their leaves along with the food and minerals in the water. The leaves transpire and the sun evaporates the moisture from the leaves into the air where it will condense and fall again later as rain. Only a portion of the water is used by plants. The major portion of the rain

falling on Sandfly seeps steadily down into the earth until it reaches the saturated zone called the water table. The well on Sandfly Island was drilled down into a water holding layer of rock about 304 feet below the surface.

There are no natural fresh water aquatic communities on Sandfly Island; however, man has created two artificial fresh water communities. Look around the flowing well for organisms that are not found in other areas on the island. The other artificial fresh water community is in the cistern. You can see small plants such as algae growing in the cistern, producing oxygen in the water which will support other life which would be abundant if this were a natural pond or stream. Look close and you may observe numerous small organisms. Often during the warm day these two man-made aquatic communities are visited by birds, insects and other larger animals such as raccoons.

How might the Calusa Indians have collected water when they were on Sandfly Island?

The salt water aquatic community is one of the major communities on Sandfly Island. Not only does salt water surround the island, but is also flows inland in tidal creeks during high tide. These tidal zones exhibit the same types of organisms, both plant and animal, as the exterior rim of the island - namely the mangrove plant community. Knowing that water is absorbed through the roots of plants, it is understood then that salt water must be taken into plants in a salt water zone. This is not necessarily the case in all plants. The plants in the mangrove region exclude salt of the minerals in the water when taking in the water, or, as in the case of the black mangrove, take in the water and excrete the salt crystals through their leaves. Taste the grayish underside of a black mangrove leaf. It will be salty. The plants seen living in the mangrove swamp have adapted to a salt water environment.

All the animals in the mangrove swamp are similarly adapted and find in the water all of their needs for food, oxygen, and shelter. Look into the tidal creek off the boardwalk. Identify the elements of the "web of life" - producers, consumers and decomposers. You can put yourself in the web as a consumer of the fish in the creek. Look in your lunch bag. What else do you consume? Notice the green water plants which receive nourishment from the sun and water, and, in

turn, produce dissolved oxygen in the water. These plants are eaten by herbivorous animals, such as water beetles and some crustaceans and fish. One of the most popular food fish, the mullet, is a plant eater. Herbivores, in turn, are the food for the flesh-eaters (carnivores) such as minnows or larger fish. Plants and animals not eaten as food eventually die and decompose and their nutrients are returned to the water and soil. Here you can again see the dependency of plants and animals on each other and their interrelationships with all elements of the environment. The process of eating and in turn being eaten is what is called a "food chain." Many "food chains" can be identified on Sandfly Island.

The water world on Sandfly and around any of the islands is a delicate world which can be easily upset. What happens when the people of south Florida allow the natural estuaries along the coast to be dredged and filled? Mangroves, which supply nutrients to the life system are lost. Aquatic organisms are destroyed thus interrupting many food chains. What happens when streams carry excessive loads of fertilizers or pesticides? Throughout the world, natural life systems are beginning to die and disappear because of concentrations of pesticides. South Florida waters contain many organisms contaminated by pesticides such as DDT. Fish along the Gulf Coast eat these organisms and concentrate these poisons at increasingly unsafe levels. Larger animals such as birds, raccoons, and man eat those contaminated fish.

3. Air as an element of "Web of Life"

We know that air contains the element oxygen that is vital to all life. Normally we can't see air unless it is transporting something like an abundance of moisture in the form of clouds or fog, or unless it is contaminated by smoke or dust. Air as we know contains more than just oxygen. It is a mixture of gases, primarily nitrogen, carbon dioxide and oxygen. All animals from man down to some of the smallest organisms breathe oxygen and exhale carbon dioxide. A tremendous amount of oxygen is taken from the air daily and must be replaced. Land and water plants take in the carbon dioxide exhaled by animals and through the process known as photosynthesis put the oxygen back into the atmosphere. Thus there is a continuous recycling of the elements and the interrelationship between the plants and animals is clearly evident. Also as photosysthesis is taking place plant sugars and carbohydrates are produced in the plants. These are the principal

food products that animals need.

Thus the relationship between plants and animals and the importance of air to them is clearly evident. It is also easy to see that the despoiling of the air by filling it with smoke, dust and noxious fumes could have a drastic effect on all plants and animals. By continuing to burn the fossil fuels and continued industrial smoke being put in the atmosphere, the balance between carbon dioxide and oxygen is being upset. No longer can the plant life keep up with the amount of carbon dioxide being put in the atmosphere. There is also the possibility of the increase in smoke and other particles in the air preventing sunlight from penetrating the atmosphere as readily, thus having a cooling effect on the earth.

4. The Sun as an Element of the "Web of Life"

The sun plays an important role in the production of food in the plants and in the conversion of carbon dioxide to oxygen which is released by the plants. The sunlight is the stimulus that starts the processes of photosynthesis. We also know that the sun plays an important role in the climatic conditions of a particular area. The lack of sunlight and warmth are often factors governing what kinds of plants and animals exist in any given area.

5. Green Plants - the Producers in the "Web of Life":

Green Plants may vary in size and shape from a one-celled, microscopic organism to a large tree but they all have one similarity - they contain the green pigment, chlorophyll. In the process of photosynthesis, chlorophyll in the presence of sunlight produces the oxygen which is necessary for all life. Not only do plants produce oxygen but they also are the basic element of most natural food chains. If there were no green plants on the earth, there would be no animals or non-green plants, such as mushrooms and fungi. Animals and non-green plants unable to manufacture their own food are dependent on green plants for nourishment. In the process of photosynthesis green plants make their own food. They make sugar and store energy which is passed on to animals eating plants.

Photosynthesis should be thoroughly explained in the classroom before visiting the study area.

The green plants are eaten by insects, fish, and mammals - organisms called "consumers" in the "Web of

Life." An example of a simple food chain might be the following: an aquatic plant eaten by a fish which is eaten by a man.

Food chains may be longer. Students should be given the opportunity to identify elements in the environment and construct food chains with the elements.

The importance of plants in food chains is clearly illustrated. Without plants some organisms would starve and die. Man, however, continues to cut down trees, plow up fields, and dredge out creeks - all the time destroying the producers of food. We have found other ways to destroy plants. Chemicals are used to kill weeds and exotic plants. But what happens when we use chemicals on plants? Those compounds some of which are poisonous, follow right up the food chain until they're consumed by us.

Man found out a long time ago that some plants were edible and he cultivated many plants for his use. On the NESA there are many plants that are natural food for the animals, including man, and several plants that man introduced onto the island. Students should learn to identify some of the natural and introduced producers.

The tomato plants that Charlie Boggess grew on the island are "producers" of food we're all familiar with, but gumbo limbo, pigeon plum, marlberry and many others are producers found only in areas of tropical influence. The students should enjoy learning about these unusual plants.

6. Look at Animals - the Consumers in the "Web of Life"

Students examining the elements of the "web of life" should learn to recognize where all organisms fit. Most important, they should learn to recognize man as a consumer - an element in the web. From the smallest consumer to the largest, all consumers have one thing in common. They cannot produce their own food to provide them with energy. They must eat another organism to benefit from the stored energy of that organism. They either eat the abundant plant life or they eat other animals or both. Students should learn to identify the plant eaters (herbivores), animal eaters (carnivores) and the organisms that eat both plants and other animals (omnivores).

Most species of animals are plant eaters because plants are the most abundant source of food. A smaller

number of animals eat only other animals, and an even lesser number eat both plants and animals. Man falls into the latter category.

What foods must the Calusa Indians have eaten? Plants included the berries off the tropical trees, animals included fish, shellfish, and probably the larger land mammals. Teachers should explain relationships between all animals, as consumers, and their environment. Whenever a student can be should attempt to trace an organism through a food chain that would eventually include man, thus relating himself to the organism.

7. Look at the Decomposers in the "Web of Life".

Of all the elements in the "web of life", the decomposers are given the least attention. They are, however, just as important as any of the other elements. During life every organism stores nutrients. If each organism died and these nutrients remained stored, there would be no way they could be reused. This reuse of materials is what makes the "web of life" self perpetuating. The decomposing organisms break down the dead bodies and the waste material produced by all living organisms. The chemical elements, such as calcium, that all organisms incorporate into their bodies are thus released to go back into the soil and be taken up again by another organism.

We often think of decomposers as being only microscopic organisms; however, students should be shown that many larger mammals or birds help in the decomposition of other organisms. The pileated woodpecker who cuts large holes in dead tree trunks is helping in the decomposition of the tree. Worms, beetles, and other small insects burrow into both living and dead organisms. They may further the breakdown started by the woodpecker. If we look closer at leaves and twigs on the ground, we can see a definite progression of decomposition as we sift down through this material. In areas where there is a thick carpet of leaves, dig down through the layers and try and identify the white strands of fungi which are busy further breaking down organic materials. The final breakdown of organic materials into the basic elements is accomplished by microscopic animals called soil bacteria. The waste products from these organisms contain the nutrients that will be taken out of the

soil by plants thus they return to the cycle in the form of food.

Students should be looking for evidence of decomposing organic materials all around the Environmental Study Area. Look for bones of dead animals and relate the importance of the decay of the bones to put calcium and other elements back into the cycle. See if the bones have been chewed upon by rodents seeking calcium for their own bodies.

Students should also be asked to examine what man is doing today that is tying up chemicals and preventing their reuse. We are producing waste products such as aluminum cans and automobiles that decomposers cannot break down and put back into circulation.

Reference Materials

for

Sandfly Island NESA

Checklist of Trees on Sandfly Island
(See Trees of Everglades National Park - George Stevenson)

Cabbage palm	(Sabal palmetto)
Strangler fig	(Ficus aurea)
Pigeon plum	(Coccoloba diversifolia)
Seagrape	(Coccoloba uvifera)
Sweet acacia	(Acacus farnessina)
Catclaw	(Pithecellobium unguis-cati)
Coral bean	(Erythrina herbacea)
Jamaica dogwood	(Piscidia piscipula)
Wild lime	(Zanthoxylum fagara)
Gumbo Limbo	(Bursera simarouba)
Wingleaf soapberry	(Sapindus saponaria)
Papaya	(Carica papaya)
Red mangrove	(Rhizophora mangle)
White mangrove	(Laguncularia racemosa)
Buttonwood	(Conocarpus erectus)
Spanish stopper	(Eugenia myrtoides)
White stopper	(Eugenia axillaris)
Joewood	(Jaquinia keyensis)
Marlberry	(Ardisia excallonoides)
Myrsine	(Rapanea guianensis)
Wild dilly	(Manilkara emorginate)
Florida privet	(Forestiera segregata)
Black mangrove	(Avicennia nitada)
Wild coffee	(Psychotria undata)
Eastern baccharis	(Baccharis halimifolia)
Jamaica caper	(Capparis cynophallophora)
Randia	(Randia aculeata)

Introduced Trees on Sandfly Island

Tamarind	(Tamarindus indica)
Guava	(Psidium guajava)
Mango	(Mangifera indica)

Checklist of Fish of Sandfly Island MESA

It would be almost impossible to list all the fish that may possibly come into the waters surrounding Sandfly Island. The following is a list of fish commonly caught in and around the Ten Thousand Islands. Students may want to add to the list and this could be an interesting project particularly for science classes.

Tarpon
Snook
Sheephead
Red grouper
Jewfish
Redfish
Spotted Sea Trout
Mangrove snapper
Sail catfish
Florida pompano
Permit
Crevelle jack
Blue runners
Key West grunt
Red snapper

Checklist of Shellfish commonly found on Ten Thousand Islands.

This list will contain shellfish, the shells of which may be found on Sandfly Island NESA. Many of these shells were the food of the Calusa Indians. Students should be asked to compile a list of additional species, especially considering shellfish which are edible.

Eastern oyster
Coon oyster
Lightening Whelk
Clam
King crown conch
Pear whelk
Fig shell
Horse conch
Fighting conch

Checklist of Mammals of Sandfly Island

The following mammals have been seen either on or around Sandfly Island. There are several other mammals that could occur on the island, but have not been recorded. Known to range in this one are several bats, shrews, rats, and the Florida panther. Students should look for evidence of mammals on the Island.

Marsh rabbit	(Sylvidagus palustris)
Fox squirrel	(Sciurus niger)
Atlantic Bottle-nose dolphin	(Tursiops truncatus)
Raccoon	(Procyon lotor marinus)
Bobcat	(Lynx rufus floridanus)
Manatee	(Trichechus manatus latirostris)

Checklist of Birds on Sandfly Island NESA

For further reference see Birds of Everglades National Park - John C. Ogden. Only the more common birds have been listed. By no means does this represent a complete list. The check list of birds known to occur in Everglades National Park lists over 300 birds.

This list represents birds commonly seen on or near the NESA.

Key to symbols used:

C - commonly occurring
UC - uncommon
FC - fairly common
W - winter
S - summer
T - transient (migration periods)
P - permanent

Brown Pelican	C-P
Double Crested Cormorant	C-P
Magnificent Frigate-bird	FC-S
Great Blue Heron	C-P
Green Heron	C-P
Little Blue Heron	C-P
Cattle Egret	FC-P
Common Egret	C-P
Snowy Egret	C-P
Louisiana Heron	C-P
Black-crowned Night Heron	FC-P
Yellow-crowned Night Heron	FC-P
Wood Ibis	FC-S
White Ibis	C-P
Roseate Spoonbill	FC-S
Turkey Vulture	C-P
Black Vulture	C-P
Swallow-tailed Kite	C-S
Red-shouldered Hawk	C-P
Bald Eagle	C-P
Osprey	C-P
Sparrow Hawk	C-W
Laughing Gull	C-P
Least Tern	C-S
Sandwich Tern	UC-P
Royal Tern	C-W, FC-S
Black Skimmer	C-W
Ground Dove	C-P
Mangrove Cuckoo	FC-P
Yellow-billed Cuckoo	C-S, R-W

Checklist of Birds (Cont.)

Barreds Owl	FC-P
Chuck-wills-widow	C-S
Belted Kingfisher	C-W
Pileated Woodpecker	C-P
Red-bellied Woodpecker	C-P
Yellow-bellied Sapsucker	FC-W
Eastern Kingbird	FC-S
Gray Kingbird	C-S
Crested Flycatcher	C-P
Eastern Phoboe	C-W
Purple Martin	FC-T
Common Crow	C-P
House Wren	C-W
Carolina Wren	FC-P
Mockingbird	C-P
Catbird	C-W
Brown Thrasher	C-W
Hermit Thrush	UC-W
Veery	UC-T
Blue Gray Gnatcatcher	C-W
Ruby-crowned Kinglet	FC-W
Cedar Waxwing	FC-W
White-eyed Vireo	C-P
Red-eyed Vireo	FC-T
Solitary Vireo	UC-W
Black-whiskered Vireo	C-S
Black-and-white Warbler	FC-W & T
Orange-crowned Warbler	C-W
Parula Warbler	C-T & W
Yellow Warbler	FC-T
Black-throated blue Warbler	C-T
Yellow-throated Warbler	C-T & W
Black-poll Warbler	C-T
Prairie Warbler	C-P
Palm Warbler	FC-W
Ovenbird	FC-T, UC-W
American Redstart	C-T
Cardinal	C-P
Indigo Bunting	FC-T
American Goldfinch	FC-W

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NOTES:

NOTES:

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Everglades National Park, P. O. Box 279, Homestead, Fla. 33030.