SWAMP WATER AND ME PROGRAM

Collier County Schools – 6th Grade Program

Teacher's Guide

Revision Date: July 2009

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Big Cypress National Preserve

Big Cypress National Preserve is a National Park! It is one of over 390 National Parks in our country administered by the Department of the Interior and one of four National Park Service units in South Florida.

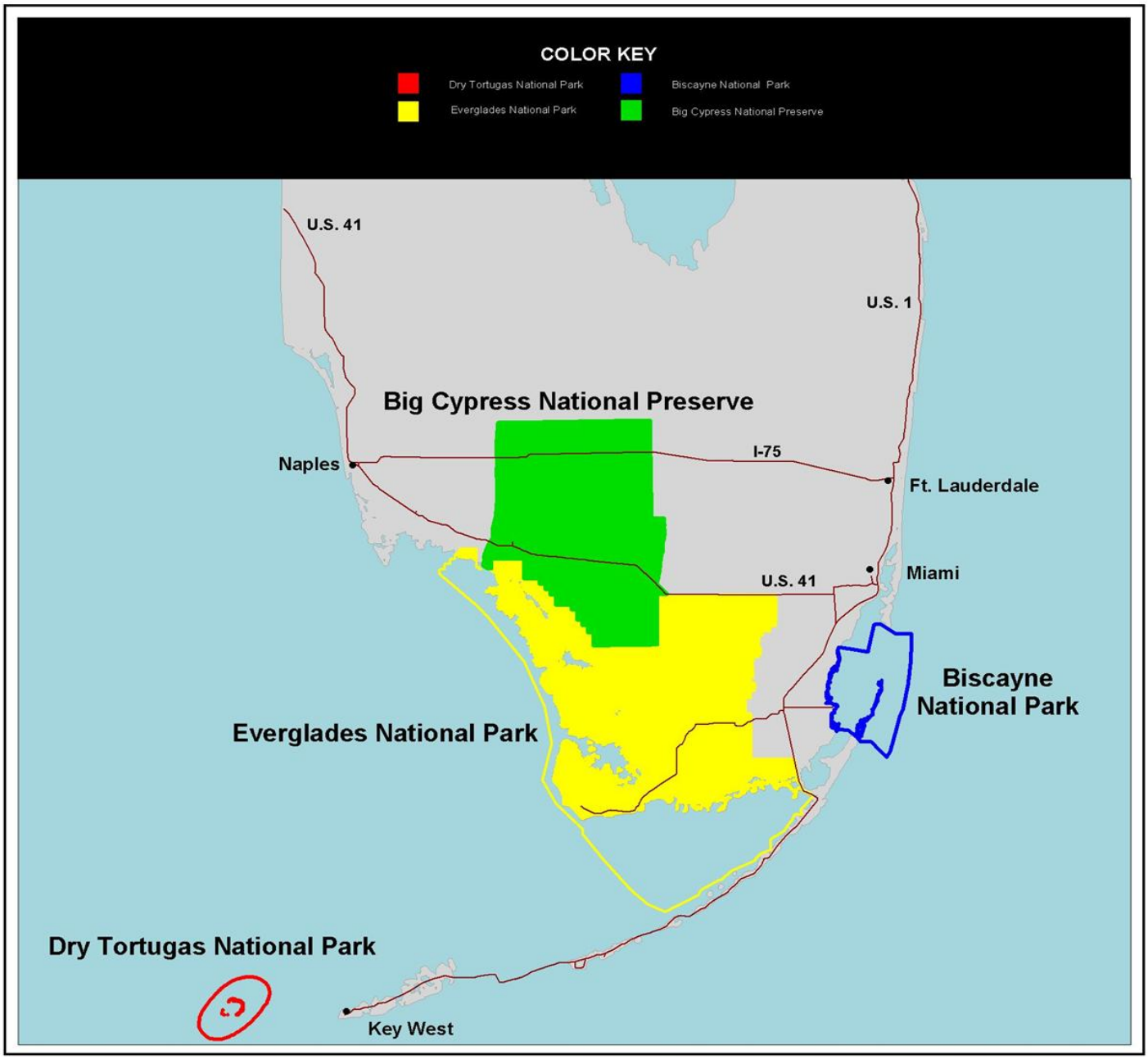
National Parks are places that are so important to our country either historically, culturally, naturally or recreationally that they must be preserved, protected and maintained. That's what the National Park Service does, so that these magnificent places will always be here for you and future generations to explore and enjoy.

Big Cypress was established as a National Preserve in 1974 to preserve the very important *watershed* in eastern Collier County. This water flows southward and empties into the Ten Thousand Islands and Everglades National Park. It is a very diverse and magical place covering 729,000 acres of cypress strands, pinelands, prairies, hardwood hammocks and mangrove forests. Its name comes from the vast amount of cypress trees growing within its boundaries and it is home to many *threatened* and *endangered species* of plants and animals including the Florida panther.

Big Cypress is very unique in that there are many activities that take place there which aren't allowed in other National Park areas, for example, hunting, off road vehicle use, oil and gas exploration, cattle leases and private land ownership. These activities are why it was called a preserve and not a park. Visitors can enjoy many activities in the Preserve such as canoeing, hiking, fishing, bird watching, biking or taking a class field trip.

By taking part in the S.W.A.M.P. program you and your classmates can learn about and teach others how special Big Cypress National Preserve and all of our National Parks are and how you can help to protect them.

South Florida's National Parks



Acknowledgements

In 1998 Big Cypress National Preserve was selected to receive a grant for science education made possible by an innovative partnership between the National Park Service, Exxon Corporation, the National Park Foundation (NPF), and the National Science Teachers Association (NSTA). Big Cypress National Preserve was one of 36 National Parks chosen from a competitive process that was open to all National Parks.

The Parks as Resources for Knowledge in Science (P.A.R.K.S.) program was created to encourage collaboration in science education between National Parks, schools and local communities. The framework of the P.A.R.K.S. program builds on NSTA's "Building a Presence for Science" initiative, which aims to improve science education by helping implement the National Science Education Standards.

The $25,000 grant awarded to 32 parks will fund a partnership between Big Cypress National Preserve and the Collier County School District that will implement an environmental education/outreach program that utilizes the American alligator and the Florida panther to highlight the importance of habitats to plants and animals in the South Florida ecosystem and enhance the awareness of endangered species. Four additional National Parks received $10,000 grants to host a 2½ day training session where park officials and their partner teachers were trained in the NSTA standards.

In addition to the grant from Exxon Mobile, S.W.A.M.P has received generous donations for equipment, supplies, staffing, and transportation from: South Florida Water Management District – Big Cypress Basin, Collier County Public School District, South Florida National Parks Trust, and Friends of the Big Cypress Swamp.

We would like to extend a very special thank you to the many volunteers and employees of Big Cypress National Preserve and teachers who contributed their time and creative efforts in the development and facilitation of this program.

Vision and Goals

The Swamp Water and Me Program (S.W.A.M.P) is an Environmental Education Program for the 6th grade science classes in the Collier County School District. The program focuses on the Big Cypress Watershed, its major habitats, flora, fauna, while highlighting the Florida panther and American alligator. S.W.A.M.P. is a four part program which includes a teacher and student guide, a mandatory teacher workshop, a pre-site visit by a ranger to the classroom and a field trip to the Preserve. A variety of hands-on, inquiry-based activities are performed by the students during their field trip. This includes tracking a panther radio transmitter using radio telemetry, collecting data by performing water quality, soil and weather testing, and vegetation and animal identification.

The goals of the Program are thus:

I. To provide students with hands on, interdisciplinary, and curriculum based field experience that aligns to Florida Sunshine State Standards.
II. To give students a clearer understanding of their connection and responsibilities to the natural world so that they may become better informed citizens, community leaders, and stewards of the fragile and unique environment of South Florida.

Teacher Workshop

Before any class can come!

The teacher must have attended the teacher workshop. Teachers cannot send their class with another teacher.

The workshop will be held in Big Cypress National Preserve beginning at the S.W.A.M.P. Environmental Education Center on Birdon Road (CR 841), in Ochopee, FL.
Contact Lisa Andrews at 239-695-1164 to sign up, receive directions and important information.

All teachers will be expected to assist in leading a group on the field trip so this is the time to learn and ask questions!

What to wear:

- We will be walking in the swamp! You will get wet!! It will be fun!
- Wear comfortable and cool clothing.
- Long pants and old tennis shoes that lace up and can get wet and muddy.

What to bring:

- Lunch
- Water
- Bug Spray
- Sun protection – hat, sunglasses, sunscreen
- Long sleeve shirt
- Rain jacket just in case
- Are you allergic to insect stings? Bring what you need.
- That's all!

Notebooks, pencils, teacher/student workbook, lots of good information and soft drinks will be provided.

Pre-Site Ranger Visit

A ranger will visit the classroom before each field trip.
Schedule this visit by calling Lisa Andrews, Education Specialist at Big Cypress National Preserve at 239-695-1164 or through e-mail at: lisa_andrews@nps.gov

The visit will include discussion on:

What is the National Park Service?

What is the Big Cypress National Preserve?

- When it was established
- Why

Slide presentation

- Introduction to the habitats in Big Cypress National Preserve
- Cypress Strand
- Hardwood Hammock
- Pineland
- Prairie
- Mangrove estuary
- Wildlife in the Preserve
- How to track a Panther
- Students from previous year doing activities

Discuss upcoming field trip

- Fears about field trip
- Safety
- What to and not to wear/bring
- Rules and regulations of the Preserve

Contents of Backpacks

In the backpacks you will find the materials your students need to successfully collect data at their field site in Big Cypress National Preserve. You will be provided with a backpack to take to your classroom to complete the Pre-Site Lessons and Labs with your students. It is essential that your students are familiar with the contents of the backpack in terms of both the procedure for use of the instruments and what information can be discovered by the correct use of the instrument in the field. The Pre-Site Lessons and Labs provide all of the information you'll need to help your students to gain the knowledge and experience necessary to be successful with the field site data collection and experimentation on the day of the field trip.

- Pencils
- Clipboards
- Data Booklets
- **Rubbermaid containers containing the following:**

Animals

Laminated Track ID Rings – Aquatic Animals

Vegetation

Vegetation I.D. cards

Water

Water/Soil Depth measuring stick
Thermometers
D.O. kits
pH dipsticks
Clear water collecting bottles

Weather

Anemometer
Compass
Sling Psychrometer
Orange flagging
Relative humidity chart
Cloud ID card

Soil

Water/Soil Depth Measuring Stick
Color chart

Field Trip Logistics and Supply Checklist

45 students with one chaperone to every ten students

10:00 – meet at the S.W.A.M.P. Environmental Education Center in Big Cypress National Preserve

2:30 – leave the Preserve

Directions to the S.W.A.M.P. Center located on Birdon Road (CR 841)

From North Naples:

From the intersection of CR 951 and Hwy 41, travel east on 41 approximately 28 miles. Pass the Preserve Headquarters and continue on 0.7 miles, turn left onto CR 841 or Birdon Road. Travel north on Birdon Rd. about 2.5 miles to the S.W.A.M.P. Education Center on the left.

**Along HWY 41 watch for these landmarks:

HWY 29, Wooten's airboat tours, the Big Cypress National Preserve Headquarters, RVs on Dona Drive, turn left there onto Birdon Rd

From South Naples

From the intersection of CR 951 and Hwy 75: pay $2.50 toll and travel east. Exit right at #80 onto hwy 29. Travel south 12.6 miles on 29 to CR 837 or Wagon Wheel Rd. and turn left. Travel approximately 1 mile to the "T" and turn right onto Birdon Rd. Travel south on Birdon Rd. about 2.5 miles to the S.W.A.M.P. Education Center on right.

From Immokalee:

Travel south on HWY 29 toward HWY 41. After passing hwy 75 travel 12.6 miles and turn left onto CR837 (Wagon Wheel Rd). At the "T" turn right and travel 2.5 miles south to the S.W.A.M.P. Education Center.

Check List for Field Trip

What to Bring	What Not To Bring
Sun protection – hat, sunscreen, sunglasses Water – plenty of it Bug repellant – not spray Lunch – Something that does not need to be kept cold Suitable clothing for the weather Comfortable clothing Long pants Extra long sleeve shirt Closed toed shoes that lace on tight Shoes and pants that **can get wet and muddy** White socks and t-shirts will never be white again!!	MP3 and IPods Cell phones Backpacks Cameras Money No change of clothes Do not bring anything that will be damaged if gotten wet or could get lost

Safety Concerns and Precautions

Teacher Workshop

The safety discussion during the Teacher Workshop includes:

- If they don't feel comfortable about this trip then this is not the trip for them
- What to wear and bring - Long pants, closed toed lace on shoes, sun protection – hat, sunscreen, sunglasses, long sleeve shirt, water, insect repellent
- Things to be aware of:
- Paper wasps and other stinging insects – make sure they are aware of student's allergies to these and if they come to bring the proper medication
- Fire ants
- Snakes – went over the 4 poisonous snakes found here, where they are likely to be found, how students and teachers should react to them and how to avoid them
- Alligators – where they are found, when they are more dangerous – fed, have young, threatened
- Spiders
- Respect for the wildlife – do not feed, or touch or harm any wildlife
- Footing – walking in the muck, twisting ankles on rocks, submerged things to trip on and bang shins on – branches, stumps, logs, cypress knees, limestone, solution holes
- Poisonous vegetation – Poison Ivy, Poison wood, Brazilian pepper
- Safe use of the walking sticks
- Alternate program at E.E. center in case of inclement weather
- If lightning or other threatening weather occurs we will leave the field immediately
- All students, teachers and chaperones will wear orange safety vests
- Fears they might have
- What happens in the event of an emergency
- First aid kits for each ranger and teacher
- Rangers and teacher will each have a hand-held walky-talky to communicate between each group.
- Rangers will have a park radio and a cell phone with direct contact to EVER dispatch, EMT, Park Rangers, Collier County Sheriff
- A Park Service Volunteer will also accompany each group

Ranger pre-site school visits

A large part of the pre-site visit is devoted to discussing the upcoming field trip including safety. All of the safety information that has been discussed with the teachers above will be discussed again in the classroom with the students.

Student/Teacher Workbook

This will also contain all of the safety information discussed above and is available to the students, teachers, other school employees and parents.

Checklists of what to bring, how to dress, etc. is included

Safety discussion at teacher workshop
Safety discussion with students at pre-site classroom visit
Safety information included in Teacher/ Student Workbook
Safety briefing at field trip site

The rangers and volunteers will be certified in:

- CPR
- Basic First Aid
- Basic Water Safety

Rangers will have park radios and cell phones and have been trained in the proper procedure for using the radios in case of a medical emergency.

On the field trip - each leader will be carrying a first aid kit.

A first aid kit will also be available at the E.E. Center.

Orange safety vests are required to be worn by all students, chaperones and teachers.

A schedule of field trip dates and locations has been supplied to Law enforcement.

The rangers and teacher will carry small walky-talky type radios to communicate between groups without causing disturbance on the park radios – to use in case of emergency, however, the three groups will never be out of shouting distance from each other.

Radio procedures:
First, call 784 and notify them of a medical emergency. They will notify park rangers and Collier County depending on the type of emergency. Med-Flight will be called in if necessary and can reach us within 15 minutes.

Teacher and rangers will each have a 2-way radio to communicate between groups.
The lead ranger will have a park radio and cell phone with direct contact to Law Enforcement Rangers.
Teacher and rangers will have first aid kits with them at all times.
Rangers and volunteers hold current certifications in Basic First Aid, C.P.R. and Basic Water Rescue training.

Please inform the ranger of any students with allergies to medications or insect stings, or other medical problems prior to the trip.

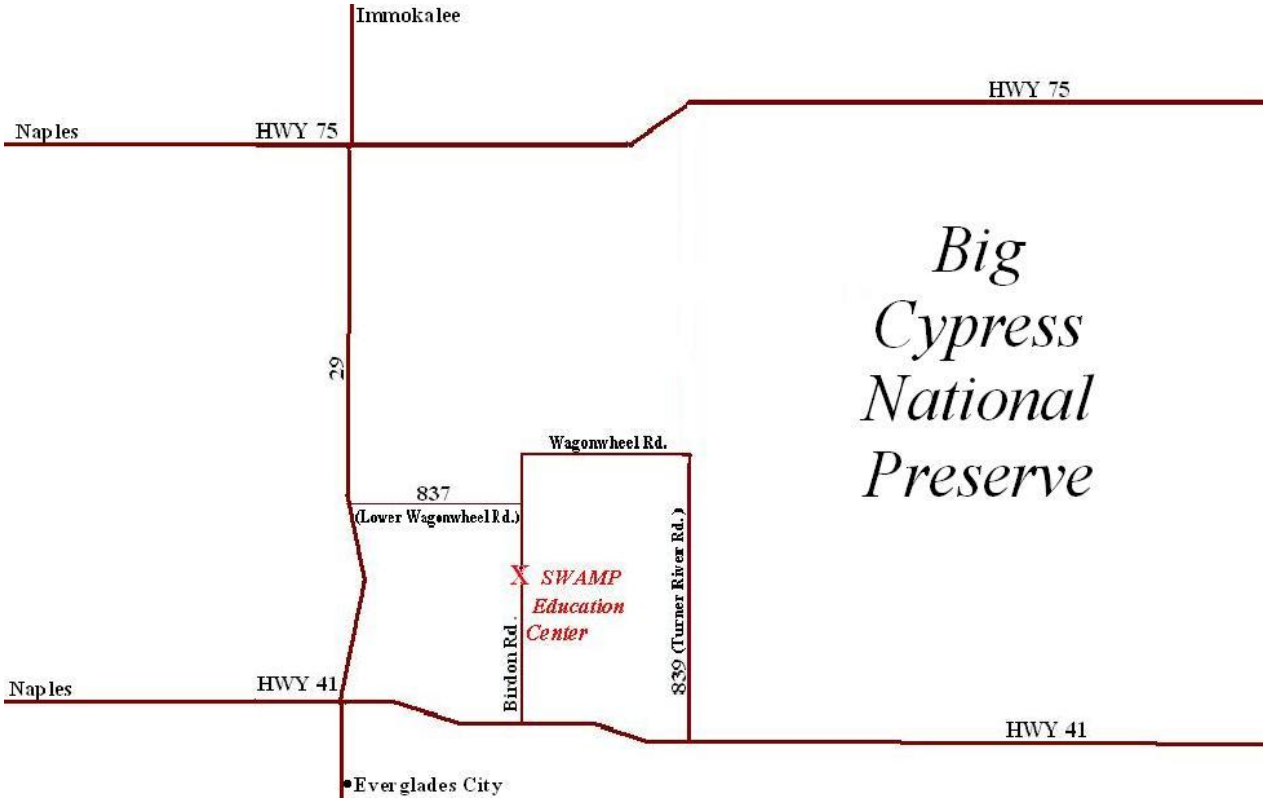
Field Trip Agenda

(Subject to change due to late bus – adjust times as needed)

10:00	Arrive at SWAMP Center
10:00 – 10:20	Restrooms and Nametags
10:30 – 10:50	Travel up Birdon Road to picnic area
11:00 – 11:30	Lunch
11:40 – 12:00	Go to field site, divide into groups, hand out walking sticks, backpacks, safety briefing
12:00 – 2:15	The three groups will rotate through three different habitats: Cypress Strand, Prairie, and Pineland performing tests, identification activities and recording data in each habitat.
2:30	Back on bus to leave for school

Map to S.W.A.M.P Environmental Education Center

Big Cypress National Preserve



Swamp **W**ater **A**nd **M**e **P**rogram

Pre-Site Information

Why Should I Care About Swamp Water?

Do you like to swim, fish, go boating, or go to the beach? Do you like to eat fruit, vegetables, fish and sugar? Do you like to have clean water to drink, wash your cloths, and take a bath in? Do you like to see wildlife living in their natural habitat undisturbed? Then water is very important to all of us!

The water in the Big Cypress Swamp is very important in many ways to people living in Collier County. This huge swamp or *wetland* acts like a filter, straining out impurities and pollutants as the water flows over it making the water cleaner downstream and as it percolates into the *aquifers*. It also acts like a sponge, absorbing the water as it flows. Without this sponge effect the water would run off the land quickly and flood some areas. People need fresh, clean water to drink, to bathe in, to wash clothes in, grow food with and for recreation. The water you use for these things comes from the Shallow Aquifer of Southwest Florida which lies deep beneath Collier County and the Big Cypress Swamp.

Water is also important to all wildlife. From the tiniest microscopic plant or animal right on up to the panther and alligator, their lives depend on the water to be clean and just the right levels to thrive and reproduce. Many animals and plants live in the water, and others depend on water creatures for their food. Different elevations and water levels determine what kind of *habitats* will exist in a place and in turn different habitats determine which animals and plants will be found living there. So you see, water is vitally important to all living creatures and because of that, we are all connected.

Big Cypress National *Preserve* is a part of the Big Cypress Swamp. The Preserve gets its water mostly through rainfall, but also from the wetlands to the North and West. The water flows through the Preserve southward through the eastern portion of Collier County. Along its journey it passes through many habitats that are used by wildlife and people in many ways.

Throughout this program we will be exploring three habitats in the Big Cypress National Preserve and determining if these are healthy habitats for the Florida panther, the American alligator, and people to exist.

Why should you be concerned? Every day more and more people are moving to South Florida. That means that more houses and buildings are being constructed in important habitats, more people are using your water, more water is being polluted, and thus more impacts are being placed upon this fragile ecosystem. In order for us all (wildlife included) to live together, be able to go to the beach, eat fish and see the panther and alligator in their natural habitats, we all have to know what we can do to help.

Habitats in Big Cypress National Preserve

The five basic habitats of Big Cypress National Preserve include hardwood hammocks, pinelands, prairies, cypress swamps, and mangrove forests. Each is unique in the type of plants, soils and animals it contains depending on the elevation, which can range from sea level to 17 feet. During the field trip to the preserve you will be exploring at least three of these habitats.

Hardwood Hammocks are found on slightly elevated bedrock areas or on the remains of Calusa shell mounds. Hammocks look a bit like a tropical forest due to the rich diversity of ferns, epiphytes, lichens and vines that grow in their sheltered interior. Oaks, wild tamarind, cabbage palms, maple and saw palmetto are often found in these tree islands. Hammocks have a hydroperiod of about 10-45 days. The plants in the hammock provide food and shelter to many different organisms including the Florida panther which likes to lounge in the tall trees during the day. The Ligguus Tree Snail can also be found in many hammocks.

Pinelands come in two types, one with an understory made up mostly of saw palmetto and the other with a mixed grass understory. South Florida Slash Pine is the dominant overstory species. This slash pine has developed longer taproots and smaller needle size than its northern cousin. These adaptations allow the South Florida Slash Pine to survive the spring droughts and summer floods. This pine is also very tolerant of fire. Its seeds may be eaten by many types of rodents, insects and birds.

The slash pine is a very hard wood, extremely resistant to termites. This has made it a very desirable wood for building houses resulting in the logging of the old growth trees in Florida. The term Slash comes from the once widespread practice of extracting its sap by cutting diagonal slash marks in the trunk, draining the sap from the cuts and using it to make turpentine and other products.

A pine forest has a hydroperiod of about 20 – 60 days annually. Prairies are called wet or dry based more on what plant species grow there than on the actual amount of water present. Wet prairies occur on mineral soils that are covered with water about 50-150 days per year. The water rarely gets any deeper than about 20 cm even in the wettest of seasons. Wet prairies usually burn at least once during a five year period. Without fire, woody plants would push out the prairie plant species. This would in turn cause prairie mammals and birds to lose their habitat.

Periphyton is a common part of the vegetation in wet prairies and is an important link in the wet prairie food chain. Periphyton is made up of many species of blue-green and green algae. It may form a blanket over the prairie floor that is 4 cm thick or more. Periphyton is eaten by a variety of flies, snails, fish, tadpoles and zooplankton. During the rainy season, tadpoles and insect larvae hatch in prairies providing many wading birds, reptiles and amphibians with a good meal.

Cypress Swamps are magical places with most of the overstory made up of cypress trees. In the understory however, swamp fern, spikerush and marsh fleabane abound. Bladderwort, a carnivorous

plant that consumes many types of small water organisms including mosquito larvae, can often be found here. Buttonbush, cocoplum, willow and wax myrtle are among the woody understory plants you might find in the Big Cypress.

You may also see many bromeliads and orchids in a cypress swamp. These plants are called epiphytes. Epiphytes live on trees in the forest but cause no harm to trees. Some bromeliads get water and minerals directly from rain. Others funnel rain into a rosette of broad overlapping leaves. These "storage tanks" collect debris from the host plant, wind and insects, which in turn provides a rich nutrient liquid for the bromeliad. These bromeliads also provide a safe shelter to many small organisms such as frogs and insects. Whole food chains can be found on one plant. A few species of bromeliad, like the catopsis, have become insectivorous.

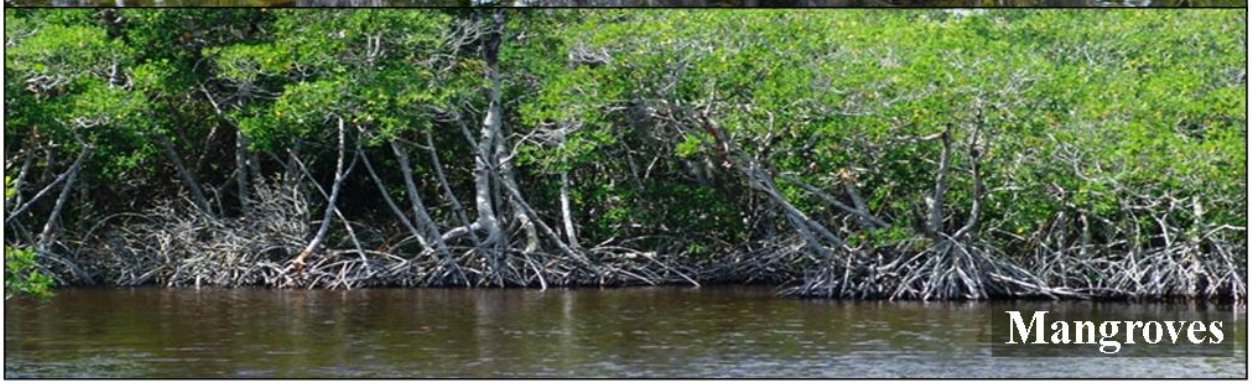
Squirrels, sandhill cranes and several species of ducks have been seen eating cypress seeds. Rabbits may eat branches, bark and roots of cypress seedlings.

Cypress trees grow in water. The tallest trees grow in the deepest water where the collection of peat is greatest and the smallest trees occupy the edge. Cypress domes and strands have a long hydroperiod. The deeper areas stay wet throughout the year especially in the center of the domes and in the sloughs. On the perimeter of the domes and strands, and in sparsely populated areas of cypress, the water levels may drop considerably during the very driest time of the year, but the ground will usually remain moist and soggy.

Mangrove forests are another habitat found in Big Cypress. Mangroves are remarkable trees. They not only grow in the fresh water areas of the Preserve, but can also survive in the saltwater! There are three types of mangrove trees, red, black and white. The red will usually be found standing in water up to three feet deep and can keep salt from entering its root system. It can survive in water that has up to 35 p.p.m. (parts per million) which is the average amount of salt found in normal sea water. The Black and White Mangroves will allow some salt in and can extrude it or get rid of it through special cells in its leaves. The Black Mangrove is found in the saltiest environment, up to 100 p.p.m. This is the area where tides and storm surges reach, but then recede for a period of time. The water evaporates leaving high concentrations of salt in the soil.

Mangroves add many benefits to the environment. Red Mangroves have strange, arching, exposed roots that help to trap and hold soil and debris, adding to existing land and keeping it from eroding with the waves and tides. This entangled root system also provides a safe haven for all kinds of tiny marine creatures including shrimp, crabs and small fish. Many types of fish that are caught and sold commercially, like grouper and snapper, spend a part of their lives hiding among the mangrove roots. Birds like egrets, herons and pelicans roost and nest in the mangrove trees. The mangrove leaves that die and fall into the water become covered with a slimy film that is broken down by decomposers. This detritus becomes food for all kinds of tiny organisms. They are eaten by larger organisms and so on right on up the food chain!

The Habitats of Big Cypress



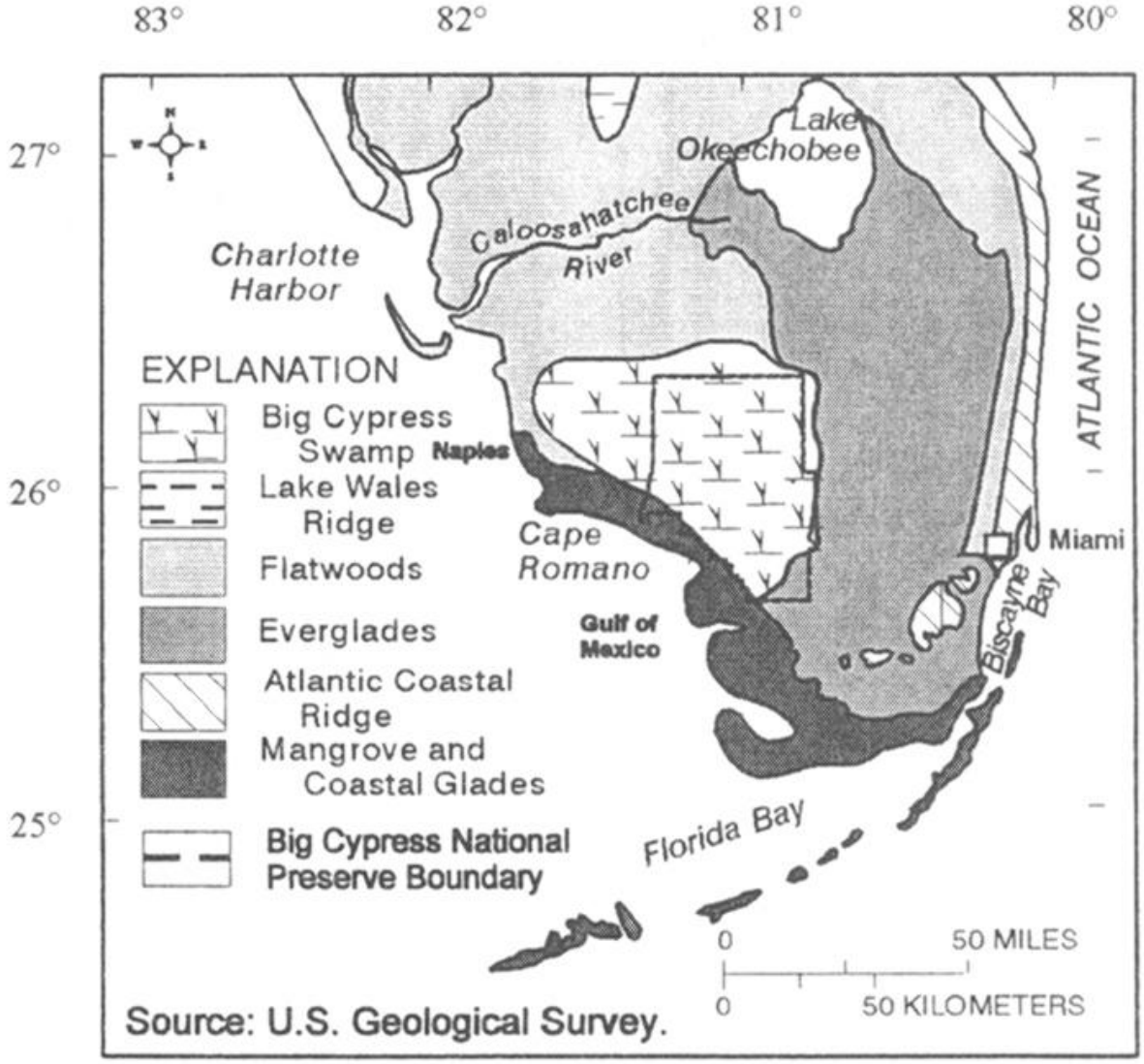


Figure 1. Location of Big Cypress Swamp and other physiographic regions of southern Florida.

The Florida Panther

Family Tree: The Florida panther is a subspecies of the cougar like you and your cousin are in the same family (subspecies) and you and your friend are humans (species). The cougar has many names in different regions such as puma, mountain lion, painter, catamount, cougar and panther.

Beauty Marks: The panther is a large cat with a tail almost two-thirds as long as its body. Males and females look alike except the males are larger. Their fur is medium tan and lighter tan on the chest and belly. The kittens have spots which fade by the time they are about six months old. These colors provide good camouflage for self-protection and hunting. Males weigh 100 to 150 pounds and are about 7 feet in length and females weigh 65 to 100 pounds and are about 6 feet in length. Many Florida panthers have a distinctive crook in the tail and a cowlick in the middle of the back.

All in the Family: Panthers are solitary animals except for brief mating times and except for the bond of the female for her kittens. Kittens may be born anytime in the year, but usually in late spring. Blind and helpless, they weigh less than one pound. A litter may have up to four kittens, but two is the average number that the female raises. For the first six weeks their primary diet is mother's milk, but at two months they begin to eat fresh meat brought to them by their mother. They remain with their mother for one to one and a half years while they learn to hunt and survive.

Danger! Pellagro! Once bountiful, the Florida panther is now the only cougar subspecies scientifically documented east of the Mississippi River. Prior to 1995 it was estimated that less than thirty panthers remained in Florida. Research efforts have helped to increase the population keeping the Florida panther from disappearing into the mists of time and gone forever.

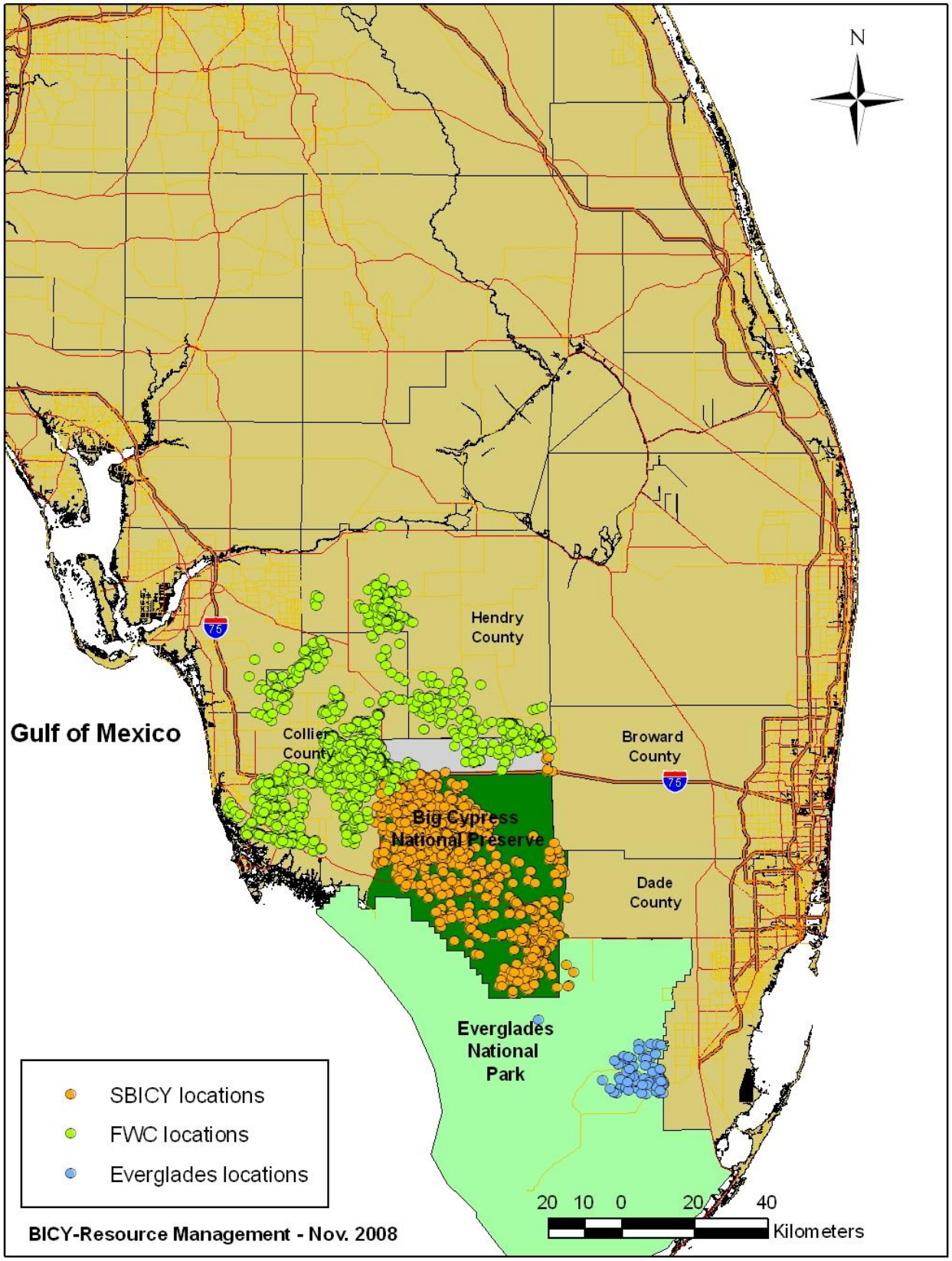


Figure 6. Geographical distribution of all Florida panther telemetry locations from July 2007-June 2008.

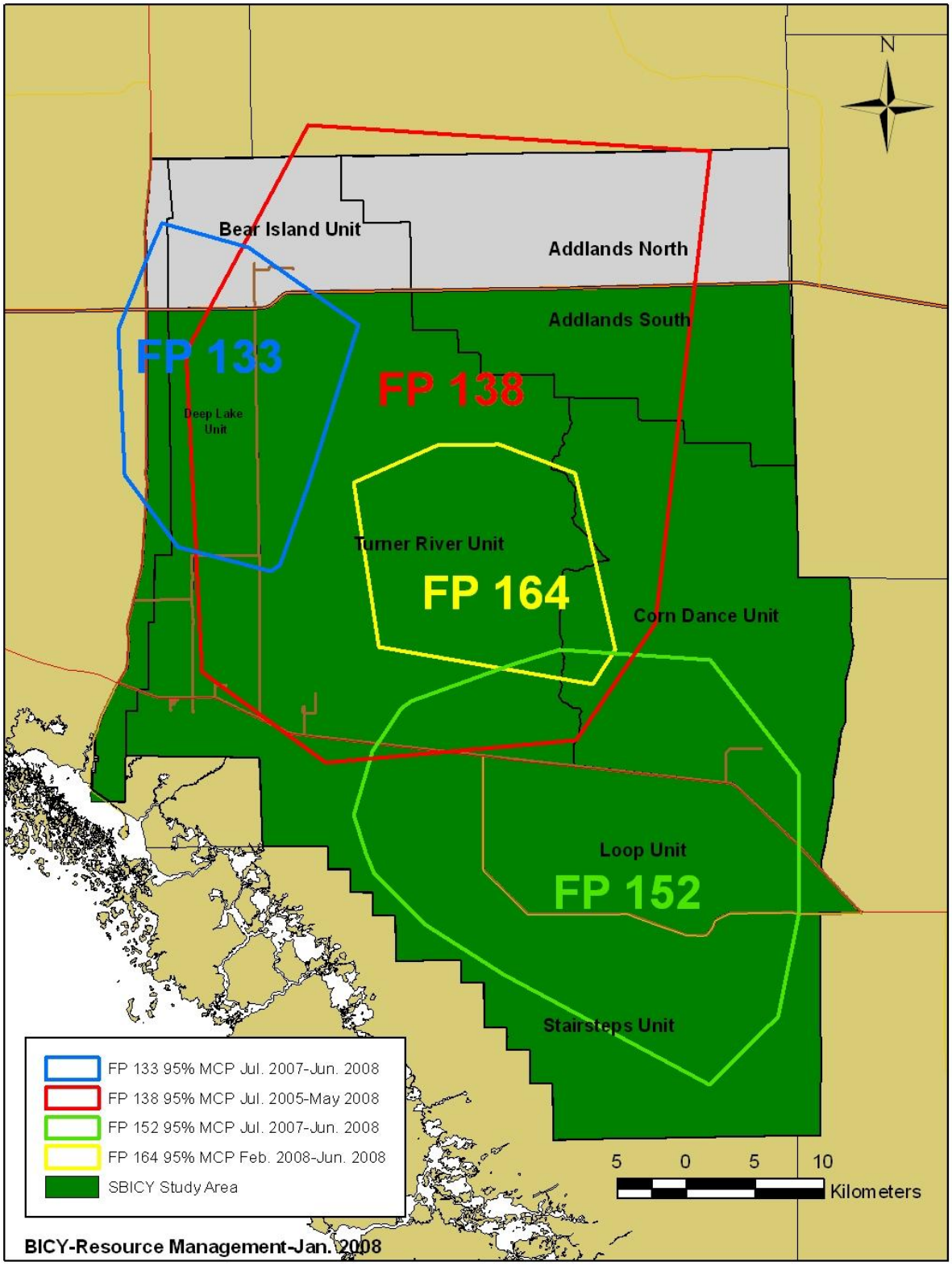


Figure 7. Home ranges of adult male Florida panthers monitored in SBICY from July 2007-June 2008.

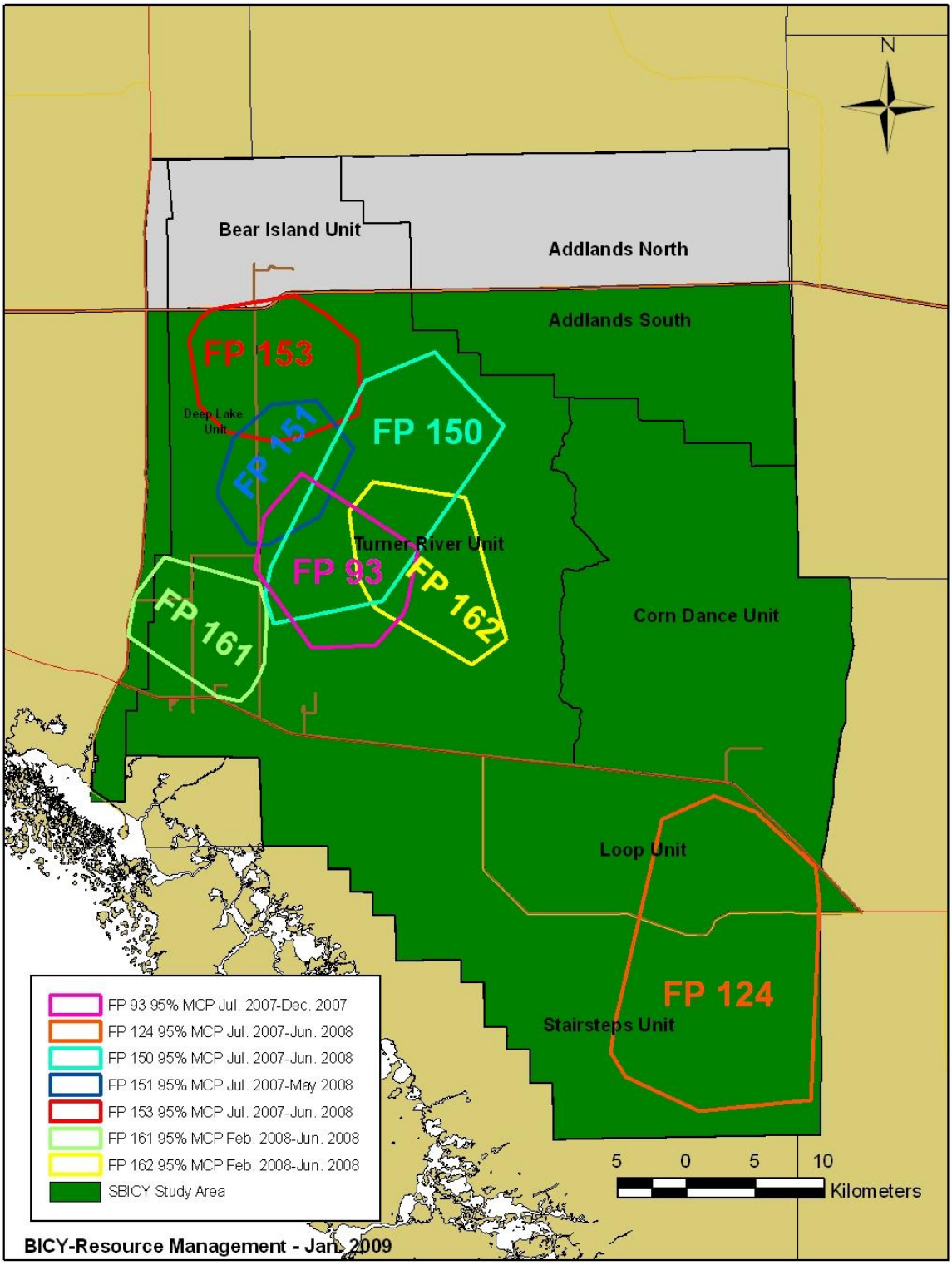


Figure 8. Home ranges of adult female Florida panthers monitored in SBICY from July 2007-June 2008.

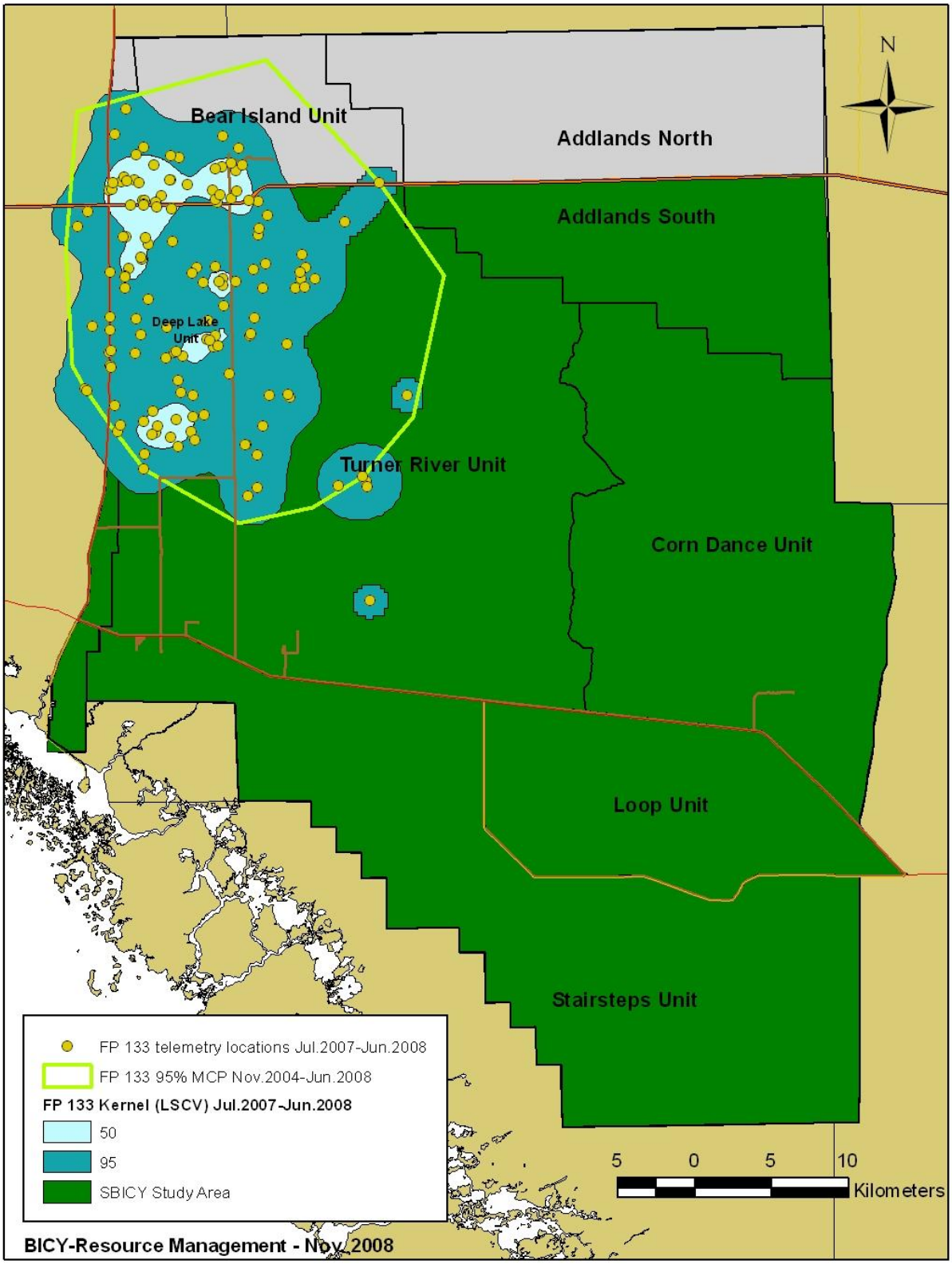


Figure 13. Home range of male Florida panther #133.

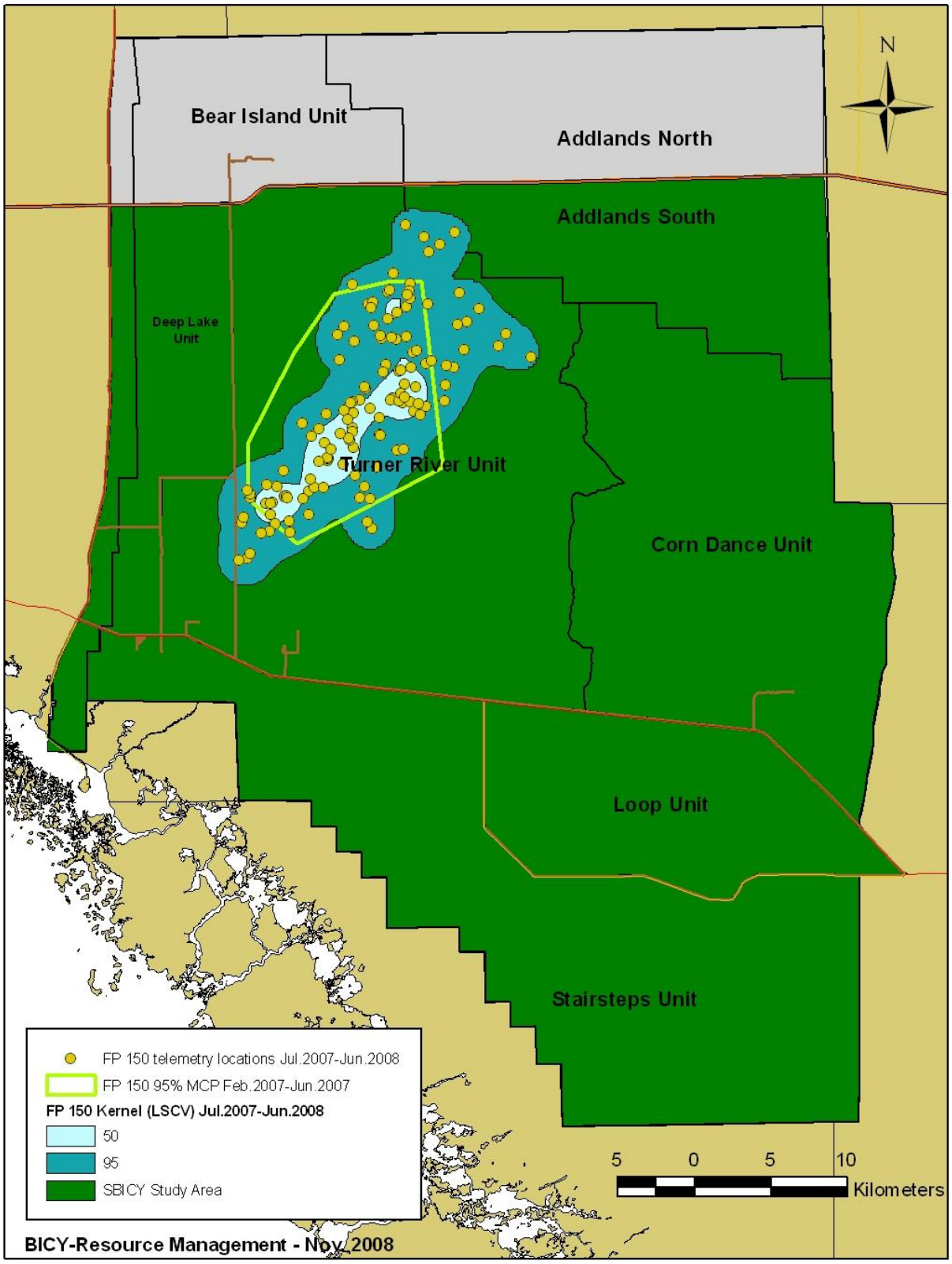


Figure 15. Home range of female Florida panther #150.

Panther Update

June 2009

Big Cat Field Stories

"Smoked Panthers": How Do They Weather a Fire?

On *April 21,* lighting struck from unsettled spring skies in the East Hinson Marsh area of Big Cypress National Preserve. This was the origin of "Deep Fire" which burned a total of over 30 thousand acres and was not designated controlled by The National Park Service until 9:00 p.m. on Monday, *May 11*. Areas of the Florida Panther National Wildlife Refuge burned as well when the fire jumped State Road 29 - roughly 1366 acres in all. The people of South Florida were forced to endure road closings and a smoke-filled atmosphere, but how did Florida panthers manage?

Panther biologists paid special attention to the animals whose home ranges overlapped with the fire perimeters (FP171, 119, 113, and 140). FP171, a Big Cypress cat, whose habitat was the most disrupted by Deep Fire, never left the area. He simply moved around in the burned and smoky vicinities of his territory finding pockets of unburned vegetation to rest in. The other collared panthers basically did the same thing – not fleeing the fires. Panther biologists will learn more specifics about FP171's behavior in this fire when it's time to retrieve his GPS collar.

FP 171's Unburned Island Refuge through a Smoky Haze during the *April 24* Telemetry Flight *Photo by Mark Lotz, FWC*

When asked about how Deep Fire affected these panthers, biologist Mark Lotz, gave this explanation, "Fire doesn't panic panthers. Panthers, and most other animals for that matter, actually fare pretty well. Most fires slowly creep along, burning ground cover, and flaring up when hitting a thick spot. Usually palmettos with cabbage palms and pines lead to the big flare ups if conditions are right. That type of vegetative layering provides a ladder for the fire to get up into the trees. So, in a large fire like Deep Fire, you'll get small creeping flames mixed in with large flare ups and spots where the fire didn't burn at all. That kind of mixed activity is what allows animals to escape the fire unharmed. Larger animals, like panthers, deer, and bears, fare better because they're able to move more quickly. Occasionally smaller animals do perish though. I've found armadillos and snakes after doing prescribed burns. I've seen rabbits and screech owls with singed fur and feathers. I'm sure smaller rodents are killed if they're not near a clearing and of course crawling invertebrates have little chance. The biggest potential problem though would be in the case of denning panthers. Depending on how quickly the fire was moving it is unlikely the mother would be able to save every kitten. Bear cubs have perished in this way. Fortunately this type of occurrence has never been documented with panthers.

FP171 Treed for Capture in March, Later to Hold His Ground While Deep Fire Raged *Photo by Ralph Arwood*

The South Florida environment is a fire-adapted community, meaning many plants and animals actually depend on fire to remain healthy. Down here, fire maintains and rejuvenates vegetative communities. Fire spurs new growth and when this happens it is very good for deer and, in turn, good for panthers. That's why the Refuge and other agencies conduct prescribed burns. Deep Fire was what I would call a "good burn": not too hot and not "complete" with very few trees killed and many unburned pockets or thicker areas to provide refuge, resting cover, and for denning. The area has already started to green up; some portions were greening as others still burned in fact. With the rains we've been getting, things should really be popping up now. Of course, deer like fresh grasses and where there are deer, there are often panthers." (Read another article about the fire by Tracy Weidert of FPNWR coming in the Friends Newsletter: http://www.floridapanther.org/newsletter.html.)

FP162: A More Cautious Mom the Second Time Around

By Deb Jansen, Wildlife Biologist, Big Cypress National Preserve

In February of 2008, well-trained cat hounds were intent on the trail of male FP138, whose collar was scheduled to be changed. Instead they treed his uncollared, three-year-old lady friend who became FP162. In spite of the possibility that the courtship was temporarily interrupted, FP162 did give birth to her first litter of kittens three months later (the average gestation period). FP162's choice of her first den site was not the best. It was a small hammock surrounded by open prairie. Most dens we find are located in dense saw palmetto, where dead and dry fronds crackle a warning to the female whenever something approaches. Upon entering this den to mark the kittens, we found only their remains, probably the handiwork of one of the two collared male panthers recently located in the area.

FP162 did get a second chance at motherhood. When we changed her collar on *February 11, 2009*, DVM Jenny Powers palpated a small head and estimated FP162 to be in her second trimester. As expected, she settled into a den site on *April 13*. We verified her location there for the next twelve days and were preparing to search for the kittens once FP162 left to hunt. Routine enough, so we thought.

But then FP162's behavior became erratic. On a few occasions, she would leave the den in late morning: somewhat unusual given the heat and less than ideal time to hunt deer. On one flight, Annette Johnson,

wildlife technician, saw collared male FP169 within a mile of the den and found FP162 one-half mile away. Then we found the den "beds" empty at the site. No kittens and no evidence of predation. We were now in fear of an outcome similar to that of her previous den.

FP162 relocated to a pine-palmetto-hardwood thicket over a mile away. There we saw vultures in the trees and on the ground during a brief check from the helicopter. She had lost the kittens, moved off, and had killed something to nourish herself after the two-week den attendance, we hypothesized. But she stayed in that location for six days and we knew that panthers don't feed on a kill that long in May's heat. So, with new hope that she had indeed moved her kittens, we found the den and discovered a squirmy, 4 ½ pound, 3 ½ -week-old female kitten (K280) on *May 7*!

K280's Got a Good Mom *by Ralph Arwood*

This is the first time we documented a female panther moving two-week-old kittens over a mile. She may have done this in response to the presence of the male panther, having learned from the fate of her first den.

Cameras left at the den after the female kitten was handled revealed that Mom came back at 12:38 in the morning, sniffed around for a few minutes, then picked up K280 and left. Although no other kitten appeared in the photos, it is possible that FP162 had moved more than one kitten over those few unsettling weeks. We hope to track behind her before the rains flood Big Cypress to see if more than one set of kitten steps are pressed in the mud.

FP162 Moving K280 to a Safer Location on ***May 8th*** *by Ralph Arwood*

May Mortalities: Two more panthers were documented killed on *May 14 and 25*. Both males, approximately two-years-old, died from vehicle collisions in Collier County. This brings the panther roadkill total to seven and all-total panther deaths to nine for 2009. In June of 2008, by comparison, ten total panther deaths were reported.

What Humans are Doing

On *May 12* volunteers at Audubon's Corkscrew Swamp Sanctuary witnessed and videoed a rare daylight sighting of a Florida panther as it took a morning stroll on the sanctuary boardwalk. Below are links to the associated video and articles.
http://www.nbc-2.com/articles/readarticle.asp?articleid=30038&z=3
http://www.naplesnews.com/news/2009/may/26/strolling-florida-panther-caught-video/

On *May 13*, Big Cypress National Preserve celebrated the country's fourth annual Endangered Species Day with the Naples Zoo. Big Cypress National Preserve representatives were on hand to help heighten awareness of our state animal, the endangered Florida panther along with other endangered and threatened species. The zoo generously offered free admittance to anyone who contributed to the South Florida National Parks Trust, which provides support to BCNP and three other national parks in South Florida.

The Florida Department of Transportation (FDOT) will be inviting the public to attend an information workshop in Everglades City in July about proposed wildlife crossings on U.S. 41 near Turner River Road in Collier County. These crossings are of vital importance in helping to reduce Florida panther road deaths. Watch for announcements and details in July's Panther Update.

What You Can Do This Month

SOUTH FLORIDA
NATIONAL PARKS TRUST

Find out how the South Florida National Parks Trust supports Big Cypress National Preserve with Panther research and other programs by visiting their website on: http://www.southfloridaparks.org/parks.html

Special Thanks To.....

Layne Hamilton, Florida Panther National Wildlife Refuge
Mark Lotz, Florida Fish & Wildlife Conservation Commission
Deborah Jansen and Ralph Arwood, Big Cypress National Preserve

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Alligators

The alligator has a split personality. It might be described as a lean mean eating machine. On the other hand, it is a powerful force in saving wetlands ecology.

A rough backed reptile with a broad, rounded snout and a toothy grin; the adult alligator usually ranges from eight to thirteen feet in length. The age can be determined by counting the growth rings in the leg bones or the *osteoderms*. Hey kids don't try this at home! The length of the alligator can be estimated by looking at the distance from the front edge of the eyes to the snout. If you estimate that distance is eight inches the alligator's length should be about eight feet. In captivity, an alligator may live up to fifty years, but in the wild thirty to thirty-five years is the approximate lifespan.

The head is flat and elongated and has enormous jaws with muscles powerful enough to crush the bones of large animals. It has eighty hollow pointed teeth which are replaced with new ones growing in. The alligator's eyes have enhanced night vision and a transparent membrane, which protects the eye, but allows clear underwater vision. Moveable flaps of skin protect the eardrums and special muscles close the nostrils when submerged. These *adaptations* make it an effective submarine.

Swimming silently and lunging powerfully to catch its prey, the alligator's diet has been said to consist of every living thing coming in range of its jaws that flies, walks or crawls that is small enough for them to kill. Baby alligators are born predators and eat insects, frogs, small fish, snails and small crustaceans. Adults are *opportunistic* and *cannibalistic*. They will eat many kinds of animals including fish, turtles, snakes, birds and even other alligators.

So why save the alligator? The wetlands are home to a complex society of plants and animals and have a role in the overall good of the planet that we are just beginning to study and appreciate.

The climate of the Florida wetlands is based on a wet summer and a dry winter. The characteristic home of the alligator is the "gator hole" which may be several yards across to the size of a small lake. Both males and females dig dens or holes by tearing the earth and roots loose with their mouths and legs, depositing that material on the banks. This keeps the ponds clear and builds banks that support vegetation. During the wet season these ponds connect with surrounding wetlands, but during the dry season much of the wetlands dry up, and the "gator holes" may be the last places deep enough to hold water. These form havens for aquatic animals as well as birds, plants, insects and others that depend on these as food.

Alligators also help to develop the geography. Alligator trails widen to form creeks, old abandoned nest mounds and banks form peat, which is resistant to fire and is a great place for plants, shrubs, and eventually trees. Islands of dry ground eventually build up.

May the Alligator Force be with us!

Global Positioning System (G.P.S.)

Global positioning system (G.P.S.) is a navigational tool (essentially a "high-tech compass") that uses satellites orbiting the Earth to:

- Determine the coordinates of your position on the ground
- Show your elevation, ground speed and compass heading
- Find the coordinates of a landmark
- Plot your route from one landmark to the next
- Estimate the distance from your current position to your destination
- Guide you in the right direction and keep you on course

G.P.S. is used by many different types of people, such as law enforcement officers, aircraft pilots, boat captains, firefighters, hunters and fisherman, campers, and hikers.

G.P.S. is even useful for swamp scientists like all of you. Scientists in the Big Cypress National Preserve use G.P.S. to:

- Plot the position of wildlife such as the endangered red-cockaded woodpecker and exotic, invasive vegetation like Melaleuca sp., Cassuarina sp. (Australian pine) and Brazilian pepper
- Track animals such as the endangered Florida panther and the white-tailed deer for conservation studies
- Plot trails created by off-road vehicles (O.R.V.s) and airboats to monitor the environmental impact caused by these vehicles
- Mark boundaries for prescribed vegetation burns
- Plot habitats such as sawgrass prairies, slash pine flatlands, hardwood hammocks, mangroves and cypress domes
- Mark the location of sampling sites for water quality testing so that the sites can easily be found

You will be using a G.P.S. unit during the field trip to find coordinates. These will be used in a mapping activity back in your classroom.

Radio Telemetry

The Wildlife Biologist in Big Cypress National Preserve uses *radio telemetry* to locate and study Florida panthers and other wildlife. These studies provide the biologist with valuable data used in the efforts to save this extremely endangered species.

First the panthers are captured and fitted with a radio collar that contains a transmitter. The transmitter sends out signals to a receiver much like radio frequencies are picked up by a radio in your home. The receiver gives off beeping sounds that help the biologist locate the transmitter on the panther again in the future. Tracking the panthers using this equipment provides important information about how far and how frequently a panther travels and where its home territory is. From this data the biologist can study what kind of food and cover is found in that area, potential threats that might be there and if it is a healthy habitat for the panther.

From the beeps or signals transmitted the biologist can also tell if a panther is staying in one spot for a long period of time. This could be a sign that there is a problem. The biologist will then go into the field and locate the panther to find out what the problem is. It may be that the panther is having kittens, is injured or maybe it has died. If there are new kittens a translocator chip is placed just under the surface of the skin so they can be identified when caught again as adults and fitted with their own radio collar. If the panther is sick or injured, a veterinarian may be able to administer treatment to make it healthy again. If a panther collar has given off the mortality signal and the panther is found dead, a *necropsy* is performed to discover what the cause of death was. This information may be used to save the lives of other panthers in that area.

During your field trip to the Preserve, you will be using a receiver and an antennae to locate a panther collar in three different habitats. Then we will gather data to determine if it is a suitable place for the Florida panther to live.

Animals

Shhh!!! Most animals in the swamp are *nocturnal* and you may only see signs that they were here, but you can still see many animals here during the day if you are quiet! Many animals are *diurnal* and might be busy hunting for *prey* or being hunted by a *predator* in the daytime. Some might even be watching you right now!

This ecosystem is teeming with wildlife. Thousands of animal species make Big Cypress their home including thirty-four animals listed as protected, rare, or *threatened* and *endangered* by the Federal or State governments.

Some animals are found only in specific habitats and others will occupy many different habitats. What makes them live where they do is the availability of food, water and shelter. So when scientists study what kind of food source is in an area, how much water is there and what could be used for cover by an animal they can decide what animals might live there and if that habitat is suitable and healthy. Take the alligator for instance. It must have plenty of fish and other small animals to eat, plenty of water year-round and lots of vegetation to provide cover for itself and its prey. An alligator hole would be a perfect habitat for it. The alligator hole contains water even during the driest part of the year when other more shallow areas dry down. At that time it is concentrated with fish and other animals that frequent the hole for water and food. There are plenty of types of aquatic vegetation there to provide cover such as the big, green leaves of the Alligator Flag.

There are many "signs" that tell scientists if there are particular types of animals found in an area. Tracks in the mud or loose dirt are one of the best signs. Scat (animal poop) is another. By looking at animal scat you can even find out what the animal has been eating. You may find feathers, fur or bones that are also signs of what type of animals live there and if they were the *predator* or the *prey*!

Human activities have had a great impact on the animals in Big Cypress. The consequences of some of these activities are easy to see like *Prescribed Fires*, O.R.V. trails, roads and exotic vegetation. Some you can't see right away, such as pollution, run off from agricultural areas, loss of habitat and diversion of water flow. All of these impacts must be studied to find out how they have good or bad effects on the animals and the environment and what should be done.

Vegetation

There are many different types of plants and trees or *vegetation* found in Big Cypress National Preserve. What types are found where is determined by their ability to tolerate many factors such as climate, nutrients, water and competition. Some types of vegetation are found only in specific habitats while others are found overlapping into a few habitats or in all of them.

The type of vegetation found in an area and the abundance of it is extremely important to many types of animals. This determines what kinds of animals and how many can live in a particular area. *Herbivores* and *omnivores* use vegetation for food. *Carnivores* are attracted to areas that have vegetation that is eaten by herbivores and omnivores. Vegetation also supplies a source of cover and protection for many species.

Some types of vegetation found in South Florida are called *Exotic Species* because they are not naturally found growing in this environment and in some cases are from another country altogether. Some of these are very invasive and can do much damage to habitats. Species like Melaleuca and Brazilian Pepper crowd out the native species of vegetation and grow so thick that wildlife can't even use the area. Some *aquatic* exotics growing in streams and ponds take up all the oxygen and prevent the movement of the water. The reason these plants seem to survive so well is that they have no natural predators here as they would where they have come from so they take over or invade the area!

Disturbances to the environment either natural or human caused may result in changes in the types of vegetation growing in certain areas. Fires, floods, hurricanes, development, overuse of trails and contaminates from agricultural lands are all things that can change the whole landscape. These areas can be monitored by scientists to find out what kinds of plants regrow or what new plants grow in their place. This could result in different types of wildlife living in the area.

Bald Cypress

A Gentle Giant

The bald cypress is a large cone-bearing tree with needle-like leaves that are flat, soft to the touch, and flexible. Unlike many trees, which would die if they were standing in water, the bald cypress thrives in water. The trunk appears smooth and gray and spreads widely at the bottom. Submerged roots spread around the tree and come up through the water in projections that look like someone's skinny knees. The wide base, roots and knees help the bald cypress survive periodic hurricane force winds, and the knees help provide oxygen to the roots.

This tree is called "bald" because it loses its leaves in the winter, which is very unusual. It is related to the dawn redwood in China, which also loses its leaves in winter, and to the giant redwood trees in California. Another of its cousins is the Montezuma bald cypress in Mexico, one of which has a circumference of 112 feet and is 141 feet tall. Dwarf cypress on the other hand, usually are less than 25 feet tall but may be hundreds of years old due to less favorable growing conditions. Both large and dwarf bald cypress can easily be seen in Big Cypress National Preserve.

One of the things making the bald cypress really special is that the heartwood is very resistant to rot. In fact, it is sometimes referred to as "wood eternal". This makes it great for building docks, warehouses, bridges and boats like mine sweepers. It is that quality that nearly destroyed the once abundant cypress in this area.

The trees here were heavily logged, and most of the trees you see now are second growth. Other enemies are the non-native plants that crowd them out, such as the Brazilian pepper, melaleuca, and Australian pine, and the changes man made to the watershed.

At this time Big Cypress National Preserve, along with others, is attempting to insure that the bald cypress survives in Southern Florida. Just by being aware of its plight, you too, may be able to help insure the survival of this gentle giant.

Water

Water is the most important environmental feature of Big Cypress National Preserve and because of that the Preserve was created.

There are many factors that determine what organisms live in and around the water. One of these factors is *water depth*. Many *aquatic species* of plants and animals depend on the depth of the water to survive. The water depth varies throughout the Preserve depending on the amount of rain that falls and the elevation of certain areas. This causes some areas to have longer or shorter *hydroperiods* and determines what plants and animals are able to survive there. The deepest water is found in the *Cypress Domes*. Even during the dry season the centers of the cypress domes stay wet and provide habitat for the alligators. This is why they are often called alligator holes. The *pinelands* are often the driest areas resulting in species of plants that require less water such as saw palmetto, sabal palms and pines.

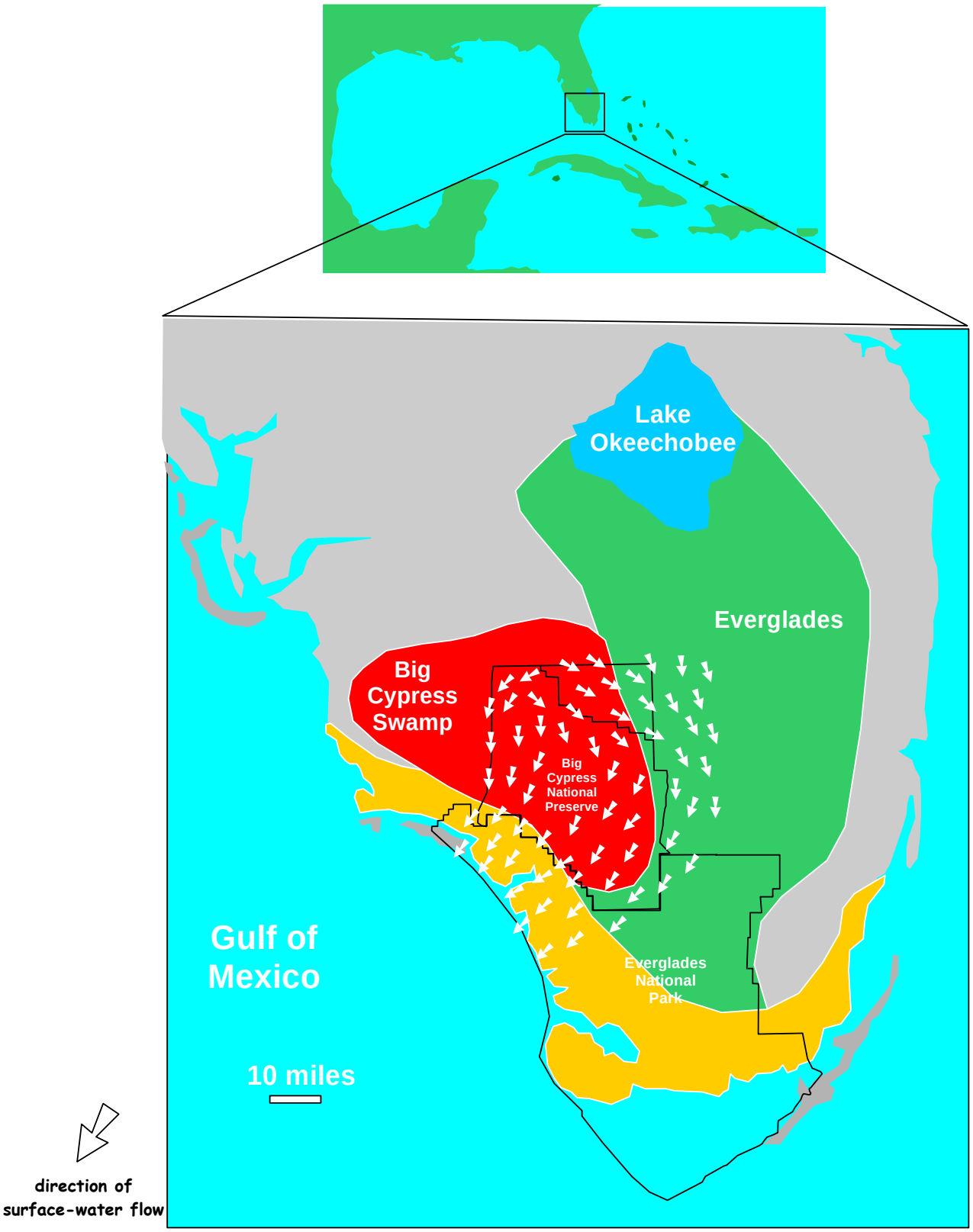
Another factor is *water temperature*. Water temperature is often affected by water depth and air temperature and can also determine the species found in various habitats.

Dissolved Oxygen is the oxygen within the water. This oxygen is essential to aquatic animals and some plant species. Aquatic animals respire or "breathe" oxygen from the water and most animals require a certain amount of oxygen to be in the water. Low levels of dissolved oxygen results in lower diversity of life. Some plant species use oxygen from the water instead of the air to carry out photosynthesis.

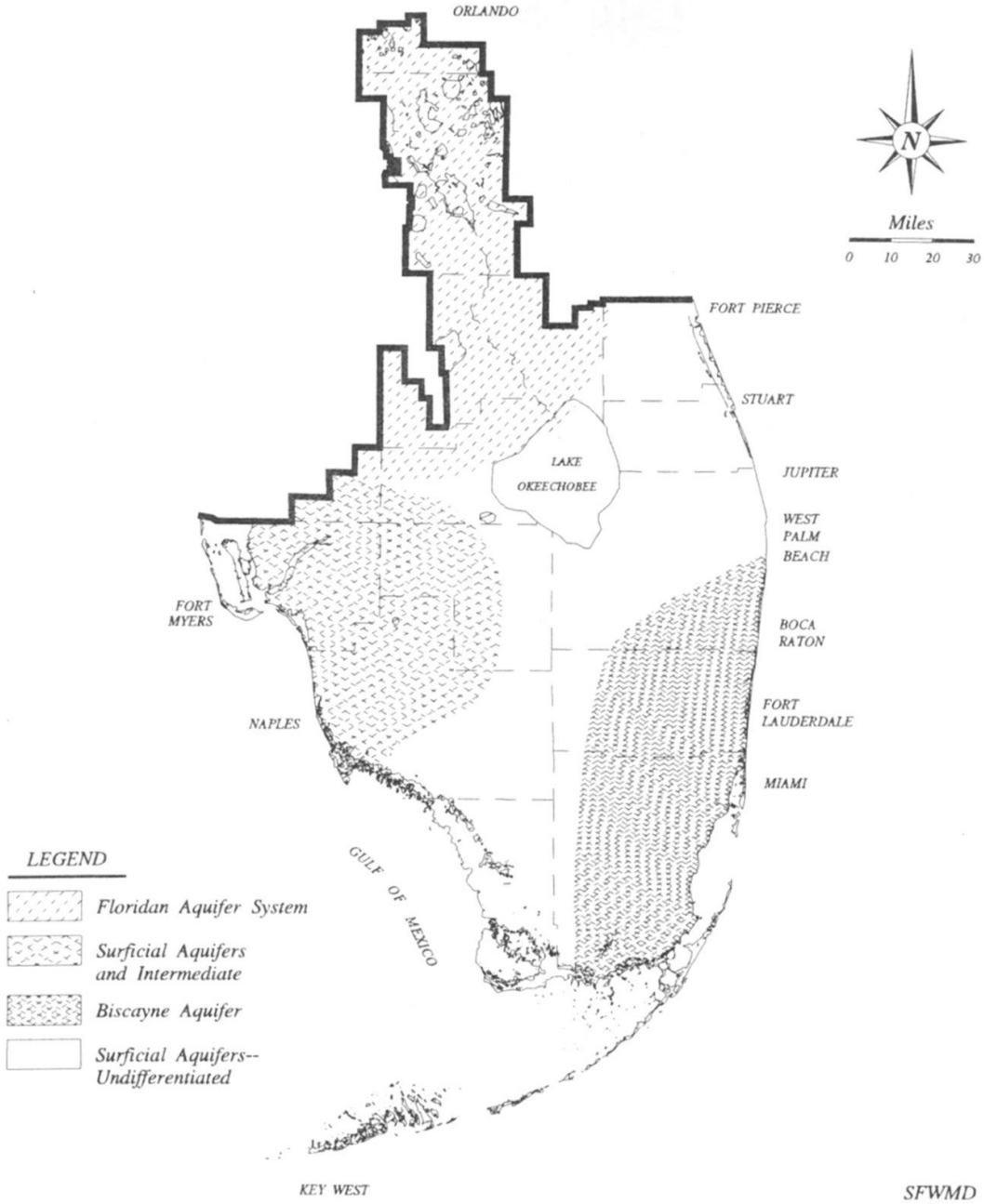
pH is a measure of the acidity or alkalinity in the water which also determines what lives there. It can be affected by chemical reactions in the water such as decaying organic matter and dissolving bedrock.

Water colors change throughout the habitats. Tannins from the pine needles and other vegetation turn the water brown like tea. Algae can cause it to turn green. Water color can also be affected by the amount of suspended sediments within the water, like pollen, which can appear yellow.

Big Cypress - Everglades Water Connection



Ground Water Supply



SFWMD
Planning Department
March 1994

Soil

Soils are some of our most important resources. Soils hold nutrients and water for plants and animals. Soils filter water as it flows through, cleansing it. Soils affect the chemistry of the water and the amount of water that returns to the atmosphere to form rain. The foods we eat and most of the materials we use for paper, buildings, and clothing are dependent on soils. Knowledge of soil is important in making decisions about where to build our houses, roads, and playgrounds.

Soil is formed from particles of rock that are broken into smaller pieces by physical, chemical and biological weathering processes mixed with dead plant and animal matter. The formation of soils is affected by climate, topography, living things, rock composition and time. Soil is made up of sand, silt, clay and organic material.

Soil moisture is a critical characteristic and dictates what types of plants will grow in an area and it determines if an area will flood or the water will run off. About one fourth of the volume of productive soil is water as either a vapor or a liquid.

Soil temperature influences all living organisms. The upper layers of soil insulate the deeper layers of soil and their inhabitants from temperature extremes.

Soil color is determined by the amount of organic matter present and on what minerals it contains, such as calcium carbonate that colors the soil white if the area is dry.

Texture is determined by the amount of clay, silt and sand in the soil. Sand is the largest particle, silt is next in size and clay is the smallest and defined as being smaller than 0.002 mm.

Gases may be trapped in *anaerobic* soils. Plants are broken down by little organisms powered by anaerobic respiration which gives off alcohol and methane gas. When you are walking through the swamp the methane gas is released and you can sometimes see the little bubbles of methane coming up to the surface, leaving a sheen on the water. The Methane gas smells a little like rotten eggs.
Sulfur also hangs around in soils that are wet most of the time and is sometimes present as a residual from oil and gas. It also has a very strong odor of rotten eggs.

The three main soil types in the Big Cypress are organic, marl, and sand.

Organic soils form when litter builds up. In dry areas the organic material is destroyed by fire, decay and oxidation. If water covers an area so that oxygen for decay is lacking, plant bits build up as *peat*. Peat development is dependent on water depth, pH, hydroperiod, vegetation type and topography.

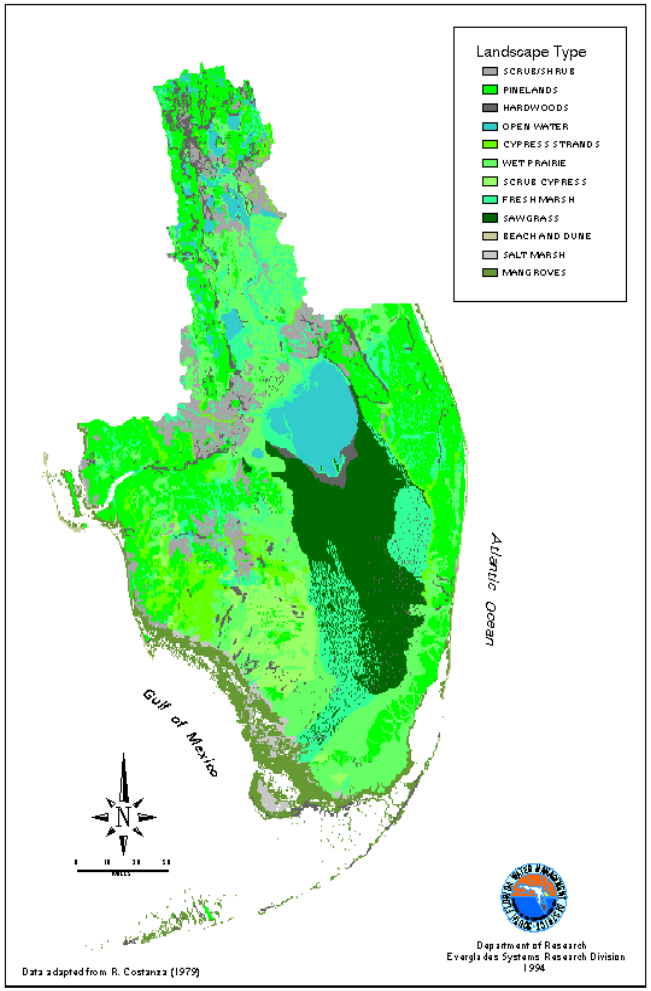
Peats and mucks, both having organic materials, have a greater ability to store water and serve as a reservoir for nutrients.

Carbonate marls are the most widespread loose soil type. These may occur as thin sheets over prairies, or more thickly in lakes and sloughs. Marl is a crumbly soil consisting mainly of clay, sand and calcium carbonate.

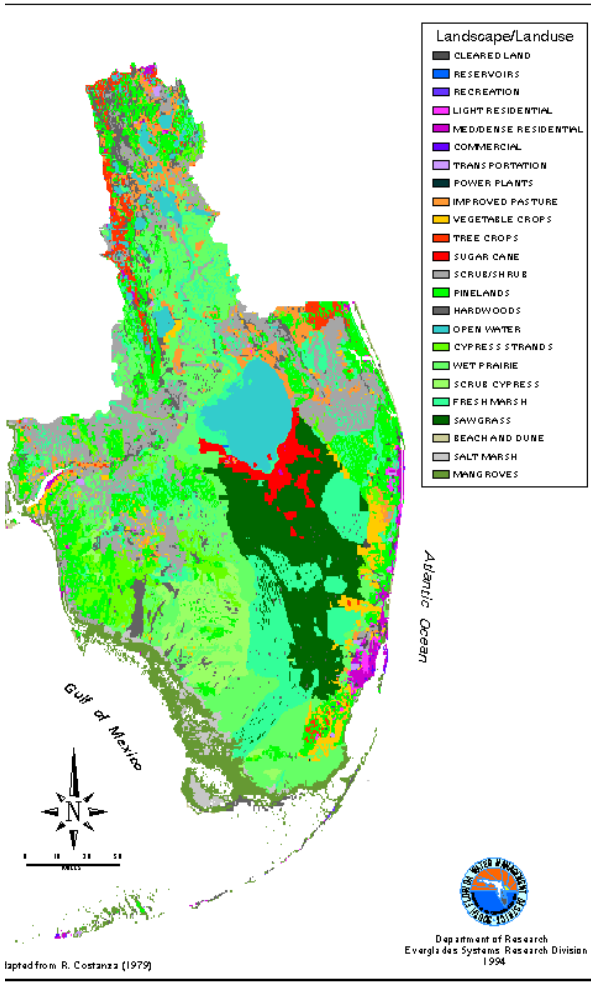
Sand is a loose granular material, made up primarily of quartz or calcium carbonate, that results from the disintegration of rocks. It contains particles that are smaller than gravel but coarser than silt.

South Florida Land Use, Over Time

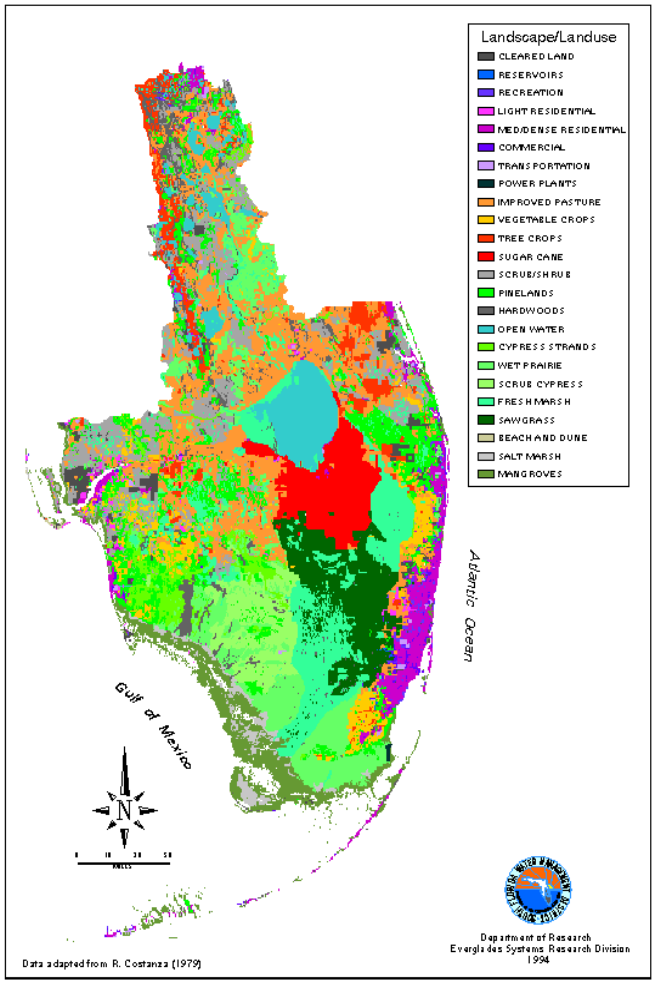
South Florida c.1900



South Florida 1953



South Florida 1973



Weather in the Swamp

Weather in the swamp is made up of five basic components: *wind speed, direction of wind, air temperature, relative humidity and dew point*. Weather is important to all of the Park Rangers, especially the firefighters. The weather components let the firefighters know when they can perform *prescribed fires*. It also lets them know when the wildfires have potential to become out of control with extreme fire behavior. Weather can be observed in prairies, cypress domes, and pinelands. The weather conditions can vary between the three habitats.

Prairies tend to be wide, open spaces. There is very little shade; therefore *air temperatures* tend to be higher. There are few obstacles to slow the *wind speed.* As a result, the *relative humidity* is often lower here. Weather in the prairie is important because the *wind speed* can push fires faster. The hotter *air temperatures* and drier air can help the fires burn faster too.

Cypress domes are made up of hundreds of cypress trees. There is very little space between the trees. All the obstacles slow the *wind speeds*. The trees provide shade that lowers *air temperatures*. The moisture held in cypress domes combined with lower *air temperatures*, cause the *relative humidity* to be higher. This information lets firefighters know that fires are a little easier to control in and around cypress domes.

Pinelands can contain a few trees or hundreds of trees. There are other plants found in pinelands such as saw palmetto, wax myrtle bushes, and cabbage palms. These obstacles slow the *wind speeds* like they do in cypress domes. Pine trees provide shade that can cause lower *air temperature.* Pinelands usually do not hold as much moisture as cypress domes, because the land is higher above sea level. *Relative humidity* in pinelands is usually lower than cypress domes because of less moisture and higher *air temperature. Relative humidity* in pinelands is usually higher than the prairies, because of lower *air temperature*. Weather information from pinelands lets firefighters know whether or not they will be able to control a fire burning in pinelands.

Dew Point is important because it lets us know at what *air temperature* we can expect dew to form on grasses, bushes and other things outdoors. Firefighters use this information to determine whether the dew will help them control a fire at night. A heavy layer of dew can help put a fire out over night. Campers, hikers and scientists can use this information to determine if their tents and gear will be soaked when left outside over night.

Fires

Fire is an important part of the South Florida Ecosystem

In South Florida wildfires can be caused by many things. Lightning and careless people are most common. Wildfires are usually watched and controlled carefully and put out in areas where it causes a threat to people and their property.

The firefighters at Big Cypress National Preserve actually start more fires than they put out. They start what we call *prescribed fires*. When old, dead brush, logs and grasses build up very thick it becomes fuel for a fire. If lightning were to cause a fire in an area that has this extra fuel it would cause the fire to be very hot and out of control and could even kill many of the native trees and plants. Prescribed fires eliminate extra fuel and lower the chances of a devastating fire occurring.

To plan for a prescribed fire, the firefighters study the fuel load in an area to see if the extra fuel needs to be burned off. They must study the weather to see when wind, humidity, and other conditions are just right in order to start a fire. It is very important that they work closely with Preserve scientists to find out information on water levels, soil types, and animal/vegetation species in the area. All of these factors are taken into consideration during the planning stages. After collecting all this data they write out their plan, or *prescription*, and begin burning. Firefighters are like doctors of the land; just like a doctor writes a prescription to make people healthy, fire prescription helps to make the environment healthy.

The fire burns old, dead growth eliminating the fuel while the ashes add nutrients to the soil. This allows new growth to have room to sprout, which supplies food and shelter for wildlife. Some plants and trees, like the slash pine, need heat from fires to grow and spread their seeds. The fires also keep other types of plants and trees from taking over certain habitats.

Big Cypress National Preserve has the largest prescribed fire program in the National Park System. Each year the firefighters set a goal of burning at least 70,000 acres in Big Cypress. That's about 10% of the entire Preserve!

Student Vocabulary

Abiotic - a non-living factor in the environment
Adaptation – the process of becoming better suited for survival in an environment
Aerobic – able to live only in the presence of air or free oxygen
Air temperature – the degree of the hotness or coldness of the air around us
Anaerobic – able to live and grow where there is no air or free oxygen
Anemometer – tool used to measure wind speed
Aquatic – growing, living in, or frequenting water
Aquifer - a water-bearing stratum of permeable rock, sand, or gravel
Biodiversity – the variety of life forms in a given area
Biome – all the living things within a region that make up a single ecosystem
Biotic – caused or produced by living beings
Bromeliads - any of a family (Bromeliaceae) of chiefly tropical American, usually epiphytic, herbaceous plants including the pineapple, Spanish moss, and various ornamentals
Camouflage – a way that animals blend into their surroundings for protection from their predators
Cannibalistic – The eating of the flesh of an animal by another animal of the same kind
Carnivore – a meat eater
Carrying capacity- ability of a given habitat to supply food, water, shelter and necessary space for wildlife
Climate - the weather conditions that are typical for a place or region
Colony – a group of people or animals living together in the same areas
Commensalism - a close association between two organisms in which one organism obtains some benefit (ex. food, shelter) from the other organism without causing harm or benefit; a type of symbiosis
Community – a system created by the interactions between organisms which inhabit a common environment and play specific roles (ecological niches)
Compass – tool used to find magnetic North and direction of travel in the woods
Competition – when two or more organisms have the potential for using the same resource
Conifer – a plant that bears its seeds in cones
Conductivity - the ability of water to transport an electrical charge
Conservation – the use of natural resources in a way that assures the continued availability to future generations; the wise or intelligent use and protection of natural resources
Consumer – organisms that use producers as their food supply because they can not make their own food
Consumptive Use – any use that involves an activity that results in the loss of wildlife or other natural resources
Cover – the vegetation, debris and irregularities of the land that provide shelter for wildlife to sleep, feed and breed
Culture – the way of life, customs, and traditions of a group of people
Cypress – a type of tree which grows in wet environments, such as the Big Cypress Swamp, and forms a habitat for organisms to exist
Cypress Dome – tall, dome-shaped tree islands of Bald Cypress trees occupying depressions in the limestone. These depressions contain water or have water running through them most of the year
Cypress Strand – an area of Cypress trees growing along a slough
Deciduous – referring to trees that annually shed their leaves

Decompose – to rot or decay
Detritus - loose material that results from disintegration – in organic matter it becomes the base of the food chain
Development – the spread of buildings, roads, railways, or other construction
Dew point - the temperature of the air at the point which the air is saturated one hundred percent with moisture
Direct Water Uses – apparent uses of water (ex. bathing, cooking, washing)
Dissolved oxygen – oxygen dissolved in water that is available for use by some aquatic organisms
Diurnal – active during the day; opposite of nocturnal
Diversity – a variety of different types and kinds
Ecology – study of the relationship between organisms and their environment
Epiphyte - a plant that grows on another plant and derives its water and nutrients from the surrounding environment
Ecosystem – communities of plants and animals interacting with each other and with the environment
Elevation - the height above a surface
Endangered species - a species of plant or animal whose numbers are so low it is in danger of extinction
Environment – the surroundings of a plant or animal including other plants and animals, weather and location
Everglades – the expanses of freshwater marsh originally extending from Lake Okeechobee to nearly the southern tip of the Florida mainland. The bulk of the Everglades ecosystem receives nutrients only from the atmosphere, primarily in the form of rainfall unlike other ecosystems which receive nutrients from associated rivers that overflow their banks. It is a "sheet flow" ecosystem independent of river or stream channels and is unique in the world.
Exotic species – a plant or animal that has been introduced into an area where it does not naturally occur
Extinction – the disappearance of a plant or animal species from our world
Food Chain – the relationship between predators and prey in an ecosystem
Food Web – the relationship between all of the food chains in an ecosystem
Freshwater- clean, unpolluted water containing no dissolved salt
Groundwater – water found in spaces between soil particles underground (in the saturation zone)
Habitat – food, water, shelter and space that compose an organism's environment
Habitat loss – the loss of a place where an organism lives (gets water, air, food and shelter)
Headwaters – the source of a stream
Herbivore – an animal that eats only plants and grasses
Hydrologic cycle – the never-ending circle of changes that water repeatedly undergoes as it moves from the oceans, rivers and lakes into the clouds and back into the surface waters (also called the water cycle)
Hydroperiod –the amount of time a wetland area is flooded with water
Indigenous – a naturally occurring species
Indirect water use – uses of water that are not immediately apparent
Introduced species – a plant or animal found in an environment where it does not naturally occur
Latitude – the horizontal location on a map North or South of the equator; measured in degrees or time
Longitude – the vertical location on a map East or West of the Prime Meridian; measured in degrees or time
Limited welfare factor – a factor in the environment (necessary for life) that will restrict the growth of a population when in short supply
Mammal – warm-blooded animal that has fur and young that feed on milk

Migrate – to relocate from one habitat to another in a regular cycle
Macro-invertebrates – invertebrates (animals without backbones) large enough to be observed without the aid of a microscope
Microorganism – an organism can be seen only through a microscope
Multiple Use Concept – principle by which habitat is managed to provide more than one benefit
Mutualism – a close association between two organisms in which both species derive some benefit; a type of symbiosis
Native species – an organism which occurs naturally in the environment
Natural resource – materials of nature, such as timber, water, and all species of wildlife
Necropsy – to perform an autopsy on
Nocturnal – active during the night; opposite of diurnal
Non-consumptive use – any use that does not directly harm wildlife (ex. bird watching, photography, hiking)
Non-point source pollution – pollution that comes from more than one place
Orchid – a large family of epiphytic or terrestrial plants that have three-petaled flowers with the middle petal enlarged into a lip and differing from the others in shape and color
Organic – coming from living things (ex. decomposed plant and animal material in the soil)
Omnivore – an animal that eats both plants and animals
Opportunistic – an animal that feeds on whatever food is available
Overstory - the layer of foliage in a forest canopy
Parasitism – a close association between two organisms in which one organism benefits from another organism at the cost of the parasitized individual; a type of symbiosis
Periphyton - organisms that live attached to underwater surfaces (ex. some algae)
Pesticide - a chemical used to kill bugs and other pests
pH – a measure that indicates the relative acidity or alkalinity of a liquid
Photosynthesis – a biochemical process found in green plants by which energy from the sun is used to turn water and carbon dioxide into food; oxygen and water are released as by-products
Plume – a cluster of large or showy feathers on a bird
Poacher – a person who takes fish or game illegally
Point source pollution – pollution caused by one direct source
Pollutant – waste or foreign material that contaminates soils, water or air
Predator – an animal that hunts other animals for food
Prescribed burn – a controlled fire that is deliberately set for management of the land and used to prevent wild fires
Preserve - an area restricted for the protection and preservation of natural resources (ex. animals or trees)
Preservation – saving natural resources for the future
Prevention – the act of prohibiting an activity
Prey – an animal that is hunted or caught by another animal for food
Private property – land owned by one person or a group of people that is not open for public use unless permitted
Producer – an organism that is able to make its own food and is eaten by other organisms (ex. green plants)
Public land – lands managed by the state and Federal government and usually open for everyone's use
Rare – referring to wildlife not presently in danger but of concern because of low numbers
Refuge – area used to protect wildlife

Relative humidity – the amount of moisture in the air
Resource – a portion of an environment upon which people have placed or assigned value for use
Restoration – the act of bringing something back to a previous condition
Runoff – water that drains or flows off the surface of the land
Salinity – the concentration of salt found in the water
Salt marsh – habitat that is saturated with salt water or flooded by the sea
Saltwater – water that contains a definite percentage of dissolved salt
Shrub land – an area covered by low-growing woody plants
Sling psychrometer – tool made with two thermometers used to calculate relative humidity
Slough –a depression in the limestone running through a swamp forming a long narrow creek
Solution – the mixture of a solute and a solvent (ex. Saltwater is a solution composed of salts (solute) and water (solvent))
Species – a group into which plants and animals are divided based on shared characteristics and the ability to reproduce their own kind
Stewardship – a practice which allows the responsible management of the environment for future generations
Succession – the orderly, gradual and continuous replacement of plant and animal species by other plant and animal species
Surface tension – attraction of water molecules at the surface of a liquid creating a skin-like barrier between air and underlying water molecules
Surface water – water above the surface of the land, including lakes, rivers, streams, ponds, floodwater, and runoff
Swamp – a wetland dominated by trees where the soil is saturated and often inundated with water
Symbiosis – a close living relationship between organisms
Thermometer – tool used to measure the temperature
Threatened species – a species that because of its low numbers is likely to become endangered.
Understory - an underlying layer of vegetation; specifically the vegetative layer and especially the trees and shrubs between the forest canopy and the ground cover
Vegetation – the plants that grow in a habitat
Venn diagram – a graph using circles to show relationships among sets of different things
Water – an odorless, tasteless, colorless liquid made up of a combination of hydrogen and oxygen. Water forms streams, lakes, and seas, and is a major constituent of all living things
Water cycle – see hydrologic cycle
Water table - top level to which ground water rises when underground
Water quality – the chemical, physical, and biological characteristics of water with respect to its suitability for a particular use
Watershed – land areas from which surface runoff drains into a stream channel, lake reservoir, or other body of water; also called a drainage basin
Wetlands – areas containing much soil moisture, such as marshes, bogs, swamps, rivers and lakes
Wildlife – non-domesticated animals, including mammals, birds, and fishes, which may be hunted as controlled by the law
Wildlife management – wise use and management of land and wildlife for the conservation purposes
Wildfire – fire that burns out of control
Wind direction – the direction from which the wind blows – example: a North wind blows from the North towards the South
Wind speed – how fast the air is moving

Swamp **W**ater **A**nd **M**e **P**rogram

Pre-Site Classroom Lessons and Labs Before Your Field Trip

SWAMP Backpack Orientation

Objectives

Students will be able to **(1)** identify and use the tools and instruments in the SWAMP backpack **(2)** feel comfortable with group work and the data recording process.

Overview

Students will rotate around to stations to become familiar with the different types of measurements and observations they will make during the field-trip.

Background Information

In order to be successful and make meaningful connections on the field trip, students must be familiar with the instruments, observations, and data recording protocols they will be exposed to during the trip. Each instrument or tool used on the trip is provided in the backpack you received from the Big Cypress National Preserve Educational Program. If no back backpack exists at your school, please contact the educational center. In the meantime, the procedure can still be carried out using replacement instruments that would most likely be stocked in a science classroom.

Materials

SWAMP backpack [includes the following: sling psychrometer, weather flag, anemometer, thermometer, various collection jars, pH strips, Dissolved Oxygen kit, compass, vegetation cards], also a yard stick or ruler for depth measurements. Optional: G.P.S., radio telemetry equipment, authentic depth stick.

Procedures

1) There will be four to five stations set up during this activity. Each station has a handout that can be printed and copied for use by the students at each station. The stations can be modified, combined, or removed as necessary.
2) Each student needs a data worksheet that can be copied double sided (see handouts).
3) Before the stations begin, explain and demonstrate the DO kit, and leave it on the water station table so that the students can observe and estimate the DO level of the water. If there is no G.P.S. unit available, explaining how G.P.S. works would also fit here.

Stations

Weather: sling psychrometer, flagging, and anemometer out. Can be outside or inside with a fan for wind. Student might need help with sling psychrometer if they have not used it before.

Water: Thermometer, a ruler or yardstick, pH strips, the DO kit, a container filled with pond/lake/stream water, sampling jar. Students go through steps to use each instrument, recording data. Make sure temperature is in Celsius. DO kit needs to be explained before stations.

Location: compass, G.P.S. (if available). Students use a compass to find direction from a landmark they choose to their current location.

Animal and Vegetation: This can be combined using an outdoor setting. Students will observe plants and animals in the area and fill out the table accordingly, answering the questions or recording data. If there is no outside setting, students can look out a window, watch a video, or look at pictures of a natural setting.

Evaluation

1) SWAMP field trip evaluation, Student records, teacher-generated multiple choice.

Student Data

Weather Station

Instrument or Test	**What does it measure?**	**My Data**
Sling Psychrometer		Dry Bulb = _____ Wet Bulb = _____ Depression: Dry – Wet = ____ - _____ = __ Relative Humidity % = _____ %
Weather Vane		Wind Direction = _____
Anemometer		Wind Speed = _____

Water Station

Instrument or Test	**What does it measure**?	**My Data**
Water Temperature		Temperature = _____
Water Depth		Depth = _____
Water Color		Color = _____
pH		pH = _____
Dissolved Oxygen (DO)		DO = _____

Location Station

Types of Habitats	Match the habitats to their correct pictures	
Landmarks	What landmarks do you see?	
Compass	Direction to your position from the landmark	
G.P.S.	Coordinates	

Animal Station

Animal Observation	What animals do you see?	
Signs of Animals	How do you know animals were there?	
Predators and prey	List some predators and some prey in the environment	

Vegetation Station

Plant Types	What types of plants do you see?	
Food Sources	What food is there for the animals?	
Cover	What places could animals hide in?	
Human Disturbances	How did humans impact the area?	
Natural Disturbances	How did nature impact the area?	

Weather Station

Directions: There are three instruments that measure different properties of the atmosphere that you will use during the SWAMP program. Read through each of the directions and work together to solve the problems.

1) **Sling Psychrometer**. This instrument measures the relative humidity of the air. That means it measures how much water is in the air compared to how much water the air can hold. On a humid day, when your skin feels muggy and wet, the relative humidity is high. On a dry day, the relative humidity is low.
    a. Dip the cotton ball in a small amount of water.
    b. Twirl the two thermometers in a circle above your head for 60 seconds, holding tightly and not letting the thermometers go for any reason.
    c. Record the temperature of both thermometers in your data table. The wet thermometer is the wet bulb; the dry thermometer is the dry bulb.
    d. Subtract the wet bulb from the dry bulb temperature to get the difference between the two temperatures. Then use the difference and the dry bulb temperature to look up relative humidity in the chart included at your station.

2) **Weather Vane (flag).** This flag allows you to determine wind direction. The direction that the flag is blowing is the direction the wind is blowing. Wind direction is written down as the direction the wind comes from. For example, if the wind is blowing from the North to the South, we say the wind is a North wind. Accurate wind direction can be measured using a flag and a compass.

3) **Anemometer**. This instrument measures wind speed. The anemometer you will use needs to be held vertically, with the opening facing the direction of the wind. The white ball will bounce. Take an average reading of the height of the ball.

Water Station

Directions: at the SWAMP you will be measuring water depth, temperature, pH, color, and dissolved oxygen levels. Read through the directions and work in your groups to solve the problems.

1) **Water Temperature**. Use the thermometer to record the temperature of the water. Do not touch the thermometer to any part of the container. Do not let it touch because you are measuring the temperature of the water, not the ground. Ask your teacher what decimal place to read the thermometer to.

2) **Water Depth**. Use the depth stick or a ruler to measure the depth of the water in centimeters. Make sure that the stick touches the bottom and the dept is read from the water line.

3) **Water Color**. In your group, record the color of the water. Some examples: light brown, colorless, or light green. Place a white sheet of paper behind the water container to make it easier to see.

4) **pH**. This is a measure of how acidic or basic the water is. Using the pH strips provided, dip one pH strip into the water and quickly remove it. Let the pH strip dry out on the table, and compare the color of the strip to the color on the pH strip container. Record the pH value in your table.

5) **Dissolved Oxygen**. Your teacher will have preformed this test for you. In the field, you will break the small glass ampoule into a water sample, which will suck up water and turn it a shade of blue. Compare the shade of blue in your teacher's ampoule with the standards sitting out. Record the dissolved oxygen value in your table.

Location Station

Directions: at the SWAMP you will be measuring water depth, temperature, pH, color, and dissolved oxygen levels. Read through the directions and work in your groups to solve the problems.

1) **Types of habitats**. Use the handout at the station to identify the three habitats you will be seeing at Big Cypress. Bonus points for identifying all of the different habitats!

2) **Landmarks**. How well can you describe your location? Could you describe it in enough detail to let someone else come find you? In your group, try to point out physical details and landmarks that could be used to mark your position.

3) **Compass**. Pick one landmark from your last activity. Move to that landmark. Once at the landmark, rotate your compass so that the red arrow is pointing to N or North. Now, record the direction on the compass that points toward your station. Also record how many steps to the station it would take to get there. (Example: twenty steps West of the station from the big tree.)

4) **G.P.S.**. You will not be using a G.P.S. in class unless your teacher has one. If your teacher does not have a G.P.S., he or she will supply the coordinates. If you do have a G.P.S. at the station, use the G.P.S. to record the latitude and longitude of your current location.

Animal / Vegetation Station

Directions: You will be looking for many different types of plants while on the SWAMP trip. Carefully follow directions and record data in your data table.

1) **Animal Observation**. In the three tables provided on your student sheet, list the types of animals you observe, the evidence that animals have been in the area, and the types of predators and prey you see evidence of or that you think live in the area.
2) **Plant observation (vegetation**). Next, observe the different types of plants in the area, and compare them with each group member's observations. Complete the table for the vegetation section, recording the types of plants, the cover for animals they provide, the types of food sources that plants in the area provide, and the human disturbances (for example: a human trail, garbage) as well as natural disturbances (wind, rain, storms) seen in the area.

Measuring Relative Humidity

Grade Level: 6
Florida Standards: SC.6.N.1.4; SC.6.E.7.3
Duration: 30-45 min. *(Alternate extensions for repetition and evaluation)*

Objectives

Students will be able to **(1)** define humidity in the context of different scenarios of water vapor saturation, **(2)** calculate the humidity of various scenarios given temperatures of a wet and dry bulb, **(3)** use a sling psychrometer to measure relative humidity of the outside environment, and **(4)** recognize that there is variance in the recording of experimental data due to researcher variation and due to the imprecision of instruments used.

Overview

Students learn about humidity and how it is calculated. Students then use a sling psychrometer to obtain humidity data for their own external environments.

Materials

Required: sling psychrometer(s) for each group, or two thermometers per group with a cotton pad covering one bulb, pencils. *Optional*: two different size sponges.

Background Information

Humidity is the amount of water vapor present in the air. **Relative humidity** is a percentage indicating how much water vapor is in the air compared to the maximum amount of water vapor the air can hold. When a mass of air is at its capacity of water vapor (100% relative humidity) it is **saturated**. Air doesn't always contain the same amount of water vapor. Molecules in air move faster when warm and cooler when cold; thus the colder a mass of air the less water it takes to reach saturation. The **dew point** is the temperature at which a given air mass with a specific amount of water vapor will become saturated (that is, if the temperature drops to that point). If the dew point is near the current temperature, then the air is close to saturated and it will feel very humid.

Relative humidity can be measured by using a **sling psychrometer**. The device is simply two thermometers – one with a wet cotton cloth around it – bound together and attached to a tether. When the cotton is wetted and the psychrometer is spun around, the water surrounding one thermometer evaporates and cools the bulb, creating a wet-bulb temperature reading from the wet thermometer and a dry-bulb temperature reading from the dry thermometer. The difference in these readings as well as a simple reference table can be used to measure relative humidity of an air mass.

Procedures

1) Introduce the concept of humidity by having students brainstorm times when they felt that the air was either very dry or very muggy or wet. In partners or groups, have the students illustrate or narrate this story. If pressed for time, call on 2-3 students to share.
2) Ask students where they think water is found in nature. Take any responses, looking to guide students towards the air as a place where water is found as water vapor. Inform them that when there is a lot of water vapor in the air, it feels muggy and sweat stays on your skin. When there is not a lot of water vapor in the air, it feels dry and your skin is ashy.
3) Demonstrate the concept of relative humidity by using two different size sponges. The sponge itself represents the air mass around them. The little sponge is a cold air mass. The big sponge is a warm air mass. Which one can hold more water? Which one will reach its maximum capacity of water first? Use the sponges to soak up various amounts of water and use this as a talking point for humidity and saturation. Dew point can be introduced to students at this point if time and motivation allows.
4) At this point tell students they will be measuring relative humidity today, and that the entire class will be performing an experiment together as research scientists. Have the students in pairs or larger groups depending on access to supplies.
5) Each group needs two thermometers, one with a cotton pad over the bulb, and a sling attached to both thermometers. These can be created in advance to save time. Demonstrate to the students how to use the sling psychrometer, making sure

to have them record all data as they take readings. If students do not know how to read a thermometer, a quick mini-lesson would be essential before proceeding. Make sure students read the thermometers in Celsius, as metric measurement is most pertinent to science.

6) Now, introduce today's experiment as a comparison of the humidity of the air inside and outside of the school building. Each group will be taking a reading of relative humidity inside and outside, and comparing the two values. Instruct each group to make a prediction (*template*: *"If relative humidity of both outside and inside environments at our middle school are measured using a sling psychrometer, then the outside humidity will be _____ than the inside humidity*").
7) Have student groups record relative humidity inside the building and then outside of the building. Management is easier if there is a reward for the most scholarly scientists that show careful and accurate recording of data without disturbing the environment.
8) Back in the classroom, have students write data on the board, and then calculate class averages for inside and outside. Instruct students to discuss the results with their partner and evaluate their hypothesis – can they accept their hypothesis or reject their hypothesis? Are the values too close to make a decision? What can we say about the difference of data in both conditions from each group? (mention researcher error, instrument error or lack of precision).
9) Have students record humidity over the next week, tracking changes in the external humidity using their sling psychrometers.

Evaluation

1) Have students keep a personal record of the external humidity using their sling psychrometer (or a group psychrometer) over an extended period of time.
2) Have one student measure and record relative humidity of the external environment each day for the remainder of the year or month, and explain to the class what that means compared to previous data.
3) Multiple choice or free-response questions for practice in class or for quizzes:

The air feels warm and muggy, and the sweat on your face and arms is trickling down – not evaporating off. Using the term relative humidity, explain why the air feels wet and muggy and the sweat is not evaporating off of your body.

There is 7g of water vapor in an air mass outside. The maximum water vapor the air mass can hold is 10g. What is the relative humidity of the air?

How would a scientist measure relative humidity of the air if they were interested in recoding relative humidity every day over a long period of time?

What instrument would most likely be used to measure the relative humidity of an air mass?

a. *Barometer*
b. *Sling psychrometer*
c. *One thermometer*
d. *Weather vane*

Relative Humidity (%)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
–20	100	28														
–18	100	40														
–16	100	48														
–14	100	55	11													
–12	100	61	23													
–10	100	66	33													
–8	100	71	41	13												
–6	100	73	48	20												
–4	100	77	54	32	11											
–2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	28	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	40	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16

Directions

The table above is a relative humidity reference table. First, measure wet-bulb and dry-bulb temperatures using a sling psychrometer after whirling it around your head for about one minute. Next, calculate the difference in the two temperatures (dry minus wet). Lastly, connect the corresponding difference column to the correct dry-bulb temperature row. Where they meet is a percentage – the relative humidity. *(Table from Flinn Scientific, flinnsci.com)*

Practice

1) Use the following sling psychrometer measurements to find relative humidity.
    a. A temperature difference of 3 degrees C at a temperature of 30 degrees C. _____
    b. A temperature difference of 5 degrees C at a temperature of 20 degrees C. _____
    c. A wet-bulb reading of 24 degrees C and a dry-bulb reading of 30 degrees C. _____
    d. A wet-bulb reading of 20 degrees C and a dry-bulb reading of 21 degrees C. _____

Experiment: Indoor vs. Outdoor Humidity

Name:
Date:

Problem: _____
_____
_____

Hypothesis: _____
_____
_____
_____

Data Collection

	Dry-bulb	**Wet-bulb**	**Difference**
Indoors			
Outdoors			

	Inside Relative Humidity (%)	**Outside Relative Humidity (%)**
My Data		
Class Average		

Conclusion: _____
_____
_____
_____
_____

Measuring Dissolved Oxygen

Grade Level: 6
Florida Standards: SC.6.N.1.5
Duration: 45 min.
(Alternate extensions for repetition and evaluation)

Objectives

Students will be able to **(1)** define dissolved oxygen and state the purpose of dissolved oxygen in an aquatic environment, **(2)** list the chemical and physical factors that affect dissolved oxygen concentrations, (**3)** measure dissolved oxygen in a sample of water by using a field dissolved oxygen kit, **(4)** evaluate the health of an aquatic ecosystem based on the results of a dissolved oxygen test, **(5)** recognize that science involves creativity, not just in designing experiments, but in creating explanations that fit evidence.

Overview

Students learn about dissolved oxygen and why it is an important indicator of a body of water's ability to support aquatic plant and animal life. Students will observe how gas enters water through the atmosphere by relating the affects of blowing into a solution of Bromothymol Blue and water. Students will also observe how plant respiration affects oxygen and carbon dioxide levels in water by relating it to submerging Elodea in Bromothymol Blue and water solution. (If time does not permit for both simulations, choose one). Students will then learn how to use a field dissolved oxygen kit to measure the amount of dissolved oxygen in a sample of water. Lastly, students will learn how to evaluate the ability of an aquatic ecosystem to support plant and animal species based on the amount of dissolved oxygen in the sample of water.

Background Information

Dissolved oxygen (DO) is the amount of oxygen dissolved in water. Oxygen enters the water either directly from the atmosphere or through plant respiration. The amount of DO in a sample of water is used to assess the ability of the aquatic ecosystem to support aerobic life.

Our air contains 21% oxygen. DO in water, however, only makes up a very small percentage of the water. Therefore, oxygen from the **atmosphere diffuses** (moves from an area of higher concentration to lower concentration) into the water. During **plant respiration**, plants take in carbon dioxide and let out oxygen as a byproduct. DO can range from 0-18 parts per million (ppm) -- parts of oxygen per million parts of water. Most healthy aquatic ecosystems need to maintain at least 5-6ppm. DO concentrations below 3ppm stress most warm water species of fish and insects. DO concentrations less than 2ppm have been known to cause mass fish kills or leave the fish more susceptible to disease.

There are many different chemical and physical factors that affect DO concentrations – temperature, time of day, weather, clarity of water, abundance of plants, current, and salinity.

Students will be working with Bromothymol Blue (BTB). BTB is an indicator. Indicators are substances that show the presence of certain chemicals by changing colors. BTB is an indicator used to show the presence of a weak acid. Carbon dioxide reacts with water, forming a weak acid, so BTB can indicate the presence of carbon dioxide in water. When the BTB is first put in water it is a blue-green color because the water has little acidity. Once students breath into the solution, it will turn to a yellow color, indicating that carbon dioxide has made the water more acidic.

In the field dissolved oxygen kit you received there are directions for how to successfully determine the amount of dissolved oxygen in a sample of water.

Procedures

1) Introduce the concept of dissolved oxygen by having the students take a slow deep breath in and then slowly breathe out. Ask – What gas did you breathe in? What gas did you breathe out? Explain that just like humans, there are fish and other aerobic forms of aquatic life that breathe in or use oxygen to survive.
2) State that the definition of dissolved oxygen is simply the amount of dissolved oxygen in a body of water. (Oxygen is considered dissolved

because it becomes surrounded by water molecules once it enters the water)

3) Explain that unlike the air we breathe, which contains 21% oxygen, water only contains a small percentage of oxygen that easily fluctuates with changing chemical and physical factors. Explain that there are two main ways that oxygen dissolves into water – through the atmosphere and through plant respiration. Explain to students that they will conduct two experiments to demonstrate how a gas can become dissolved in water. Tell students that they will do experiments with carbon dioxide, but that it is the same process as oxygen dissolving into water.
4) Divide students into group of 3-4 and distribute the materials to each group: goggles, three beakers for each group, graduated cylinder of water, droppers, Bromothymol Blue, plastic straws, Elodea plants, and two plastic test tubes with stoppers.
5) Students should fill one beaker with about 200ml of water using a graduated cylinder. Explain BTB as noted in the background and then direct students to combine drops of BTB solution into the water until it turns blue. Next, have students use a plastic straw to blow into the water. Ask students to record their observations and then facilitate a discussion on why the water changed color.
6) In a separate beaker, fill with 200ml of water and drop in BTB until the solution is blue. Have students now perform an exercise task for 1-3 minutes, such as jogging in place or jumping jacks. Now, have students blow into the BTB solution again and record their observations. Ask students why their solution did not turn as deep of color as last time? Explain that their "out of breath" feeling forced them to not be able to take in as much gas from the air and thus not be able to breathe out as much carbon dioxide into the BTB and water solution as they did before when they were rested.
7) Explain to students that just as they breathed carbon dioxide into the water, oxygen from the atmosphere goes into the water by the same process.
8) Introduce to students that they will be conducting another experiment to explore the affect that plant respiration has on concentrations of carbon dioxide and oxygen in water.
9) Direct students to fill the plastic test tubes with water and again add BTB until the water becomes blue. Have students again blow into each test tube until the solution turns yellow. In one test tube put in Elodea and place the stopper in the tube. In the other test tube, just place the stopper in the tube without putting in Elodea. Place both test tubes in sunlight. Explain to students that they will leave these two test tubes over night and record their findings the next day.
10) Once students have recorded their results the following day, ask students to explain what they observed. Guide students to the correct understanding that the Elodea plant takes in carbon dioxide and lets out oxygen during respiration. Therefore the beaker with the Elodea plant will contain less carbon dioxide and will thus be bluer than the beaker without the Elodea. The test tube without Elodea remained the same color since there was no plant to take in the carbon dioxide from the water. The presence of plants thus influences the amount of carbon dioxide in water – through plant respiration the plant takes in carbon dioxide and lets out oxygen, thus making the water less acidic from carbon dioxide and more oxygen rich. The less acidic and more oxygen rich an aquatic environment is, the better the water is able to support aquatic animal and place species.
11) Summarize with students how oxygen becomes dissolved in water – atmosphere and as a byproduct of plant respiration. Make sure to emphasize that this exploration of dissolved carbon dioxide in water is meant to simulate the same process by which oxygen becomes dissolved in water.
12) Explain that aquatic environments need a certain amount of dissolved oxygen in order to be able to support aquatic life. DO can range from 0-18 parts per million (ppm), which means - parts of oxygen per million parts of water. Most healthy

aquatic ecosystems need to maintain at least 5-6ppm. DO concentrations below 3ppm stress most warm water species of fish and insects. DO concentrations less than 2ppm have been known to cause mass fish kills or leave the fish more susceptible to disease.

13) Explain that there are many different factors that effect dissolved oxygen concentration in the body of water - temperature, time of day, weather, clarity of water, abundance of plants, current, and salinity.
14) Demonstrate how to determine the amount of dissolved oxygen using the field dissolved oxygen kit. For your water sample, use water taken from a body of water in your community or, if you performed the experiment with Elodea, you may sample the test tube with Elodea and compare it to the test tube without Elodea. (The directions are printed on the DO kit in your backpack – be very thorough as you are demonstrating how to do this. The students will perform the same test in the field on the day of the field trip.) Make sure the sample of water is tested immediately after taken from the larger body of water or after the caps are removed from the test tube.
15) Once the DO is tested, have students determine whether or not the water has enough DO in order to successfully support aquatic life. Have them list factors that may have influenced the amount of dissolved oxygen in the water sample based on their observations of where the sample was taken.

Evaluation

1) Have students predict whether the amount of dissolved oxygen in the waters of the cypress swamp will be sufficient to support a healthy aquatic ecosystem. Students must defend their predictions using the factors that affect dissolved oxygen content in water - temperature, time of day, weather, clarity of water, abundance of plants, current, and salinity.

2) Multiple choice or free-response questions for practice in class or for quizzes

Define dissolved oxygen and state why it is important to aquatic ecosystems.

The pond in your neighborhood is murky due to non-toxic waste that has been dumped into it from a nearby factory. Predict what the dissolved oxygen concentration will be and whether the aquatic ecosystem will continue to be healthy. Defend your prediction with your knowledge of factors that affect dissolved oxygen concentrations in water.

You test the lake near your house and determine that the amount of dissolved oxygen is 6ppm. What information can you gather from this test regarding the health of the aquatic ecosystem?

What is the predominant way that oxygen enters or diffuses into water?

a. Through fish breathing
b. Through the atmosphere
c. Through plant respiration
d. Both b and c

Experiment: Dissolved Carbon Dioxide in Water

Name:
Date:

Data Collection and Interpretation

Experiment One – Human Respiration			
		Color of Solution	**Indication**
1	**Before Breathing into Beaker**		What significance does the color of the solution have in terms of the amount of carbon dioxide in the water?
2	**After Breathing into Beaker**		Why did the color change? What does it mean in terms the amount of carbon dioxide in the water?
3	**After Blowing into Beaker Following Exercise**		Why did the color change? What does it mean in terms of the amount of carbon dioxide in the water?

Experiment Two – Plant Respiration			
	Initial Color of Solution	**Color of solution after 24 Hours**	**Indication** Did the solution change color? What does the color change or lack of color change mean?
Test Tube with Elodea			
Test Tube without Elodea			

Florida's Limestone – Tums for Our Water and Soil

Grade Level: 6
Florida Standards: SC.6.N.14; SC.6.E.6.1
Duration: 30- 40 min.

Objectives

Students will be able to **(1)** discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation, **(2)** understand the effect the limestone of Florida has on the pH level of water, **(3)** Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.

Overview

Students will conduct a controlled experiment to determine the effect Florida's limestone has on the pH levels of Florida's water and soil. Students will compare limestone's effect to that of other rocks and minerals found naturally in Florida. At the end of this investigation, students should be able to articulate the effect limestone has on the pH of water in Florida, the importance of this phenomenon, and a basic understanding of the process by which limestone effects pH levels in water.

Background Information

pH is one way that scientists can test the quality of water and soil. pH is measured on a scale of 0-14. If water has a pH level of less than 7 it is considered an acid, or acidic. Acidic substances are potentially harmful or deadly to land and aquatic wildlife and vegetation. If water has a pH level greater than 7, it is considered to be a base, or basic. Water that has a pH level greater than 7 is also not suitable to sustain plant or animal species. The ideal pH level for plant and animal species is approximately 7, which means that it is neutral, neither an acid nor a base. It is important to note that when assessing pH you are not just looking at definite numbers, but at ranges. For example, a stream is not only able to sustain plant and animal species at 7, it can actually successfully sustain plant and animal species in a pH range of 6-8.

Limestone is a sedimentary rock composed mostly of calcium carbonate. You may recognize that calcium carbonate is a substance used in making antacids you take for an upset stomach, such as Tums. Your stomach produces hydrochloric acid, which among other things, helps in the digestion of food by breaking it down. Sometimes your stomach may become too acidic and can make you ill. When this occurs you can take Tums, which is composed of the buffer calcium carbonate, and the acid in your stomach will become more neutral or closer to the appropriate level of acidity for your stomach as the calcium carbonate dissolves in your stomach. Calcium carbonate is considered a buffer, which means that when it comes into contact with a base or an acid, it reacts with it to make it more neutral. Limestone has a similar effect on the groundwater supply and soil of those regions in which it composes most of the bedrock, such as Florida.

Rainwater, which makes up a large volume of our groundwater supply and replenishes our streams, wetlands, lakes, and rivers, has the potential to be acidic, meaning that it has a pH less than 7.0. In fact, rain water in South Florida has an average pH level of 5. As acidic water comes into contact with the limestone that makes up the bedrock of Florida, which is considered a basic substance with a pH level greater than 7, the limestone dissolves into the water and neutralizes the acidity of the water. As the water attains a more neutral pH, it becomes more suitable for plant and animal species.

Groundwater also sinks through the holes in the limestone that have been dissolved away by acidic rain to create aquifers beneath the ground. **Aquifers** are an underground layer or water bearing permeable rock. It is from these aquifers in Florida in which we receive most of our drinking water. Limestone thus plays an important part in our daily life as it both helps to store water as an

aquifer and reduce its acidity as the calcium carbonate dissolved into it.

During your students' field work at Big Cypress, they will test the pH of the water. Your students will also observe the exposed limestone throughout the three habitats that they will visit. It is this limestone that helps to reduce the acidity of the water as it flows through each habitat.

Procedures

1) Introduce to students through discussion the aforementioned background of pH, limestone, aquifers, and their relationship to Florida and Big Cypress.
2) Divide students into lab groups. Distribute the materials to each group: limestone rocks, other rocks or minerals of a similar size, three clear plastic cups or beakers, pH paper or other pH testing device, water, large beaker or container for mixing, and vinegar.
3) Distribute the lab background sheet and allow for the lab groups to look over and discuss the information independently for approximately 6-8 minutes.
4) Explain to students that they will conduct their own investigation into the ability of limestone to alter the acidity of a substance. They will also test the ability of other rocks and minerals found naturally in Florida to alter the acidity of a substance.
5) Facilitate the procedure of the lab with the students in a step by step fashion and pause to elaborate upon the reasoning behind certain steps, which is outlined below:

    - Pour enough vinegar into a large cup or breaker so that you can test its pH. Test the pH of the vinegar. You will find that vinegar is a highly acidic substance. Note the pH level of vinegar.
    - Now, to the vinegar add water until the pH level of the mixture is between 3 - 5.
    - Fill the plastic cup or beaker half way to the top with limestone. Label this cup "Limestone".
    - Fill the second plastic cup or beaker with non-limestone rocks. Label this cup "non-limestone" or the name of the non-limestone rocks you choose to use.
    - Fill the third plastic cup half way with the water/vinegar mixture. Label this cup "Control". This third cup is termed control so that we can judge the effect of the limestone and non-limestone rocks as compared to the original substance.
    - Take the remainder of the water/vinegar mixture from step one and pour it over the limestone and non-limestone rocks of cups one and two.
    - Explain to students that they will let the three cups – limestone, non-limestone, and control – sit for 24 hours and take note of any changes the following day.
    - The following day test and record the pH of each cup, have the students individually answer the evaluative questions on the lab sheet, discuss their findings with their lab group, and then open up their findings to the class as you facilitate a class discussion and mark the class averages for data.

Evaluation

1) See Attached Document

Experiment – Measuring Limestone's Effect on pH

Name:
Date:

Question/Problem – What question or problem are you trying to answer?

Hypothesis – Do you think the pH will increase, decrease, or stay the same?

Control:

Non-Limestone:

Limestone:

Data Collection – Lab Group

	Initial pH	**Final pH** after 24 hours	**Difference** Final – Initial = Difference
Control water/vinegar solution			
Non-limestone non-limestone and water/vinegar solution			
Limestone limestone and water/vinegar solution			

Data Collection – Class Average

	Control Difference	**Non-Limestone Difference**	**Limestone Difference**
My Data			
Class Average			

Conclusion – What were the results of the experiment? Was your hypothesis correct? Why?

Evaluation

1) In what way does limestone affect the pH of water?

2) Why is limestone important to Big Cypress National Preserve and all of Florida?

3) Rainwater in South Florida typically has a pH of 5. How do you think a limestone rock would affect the pH of swamp water?

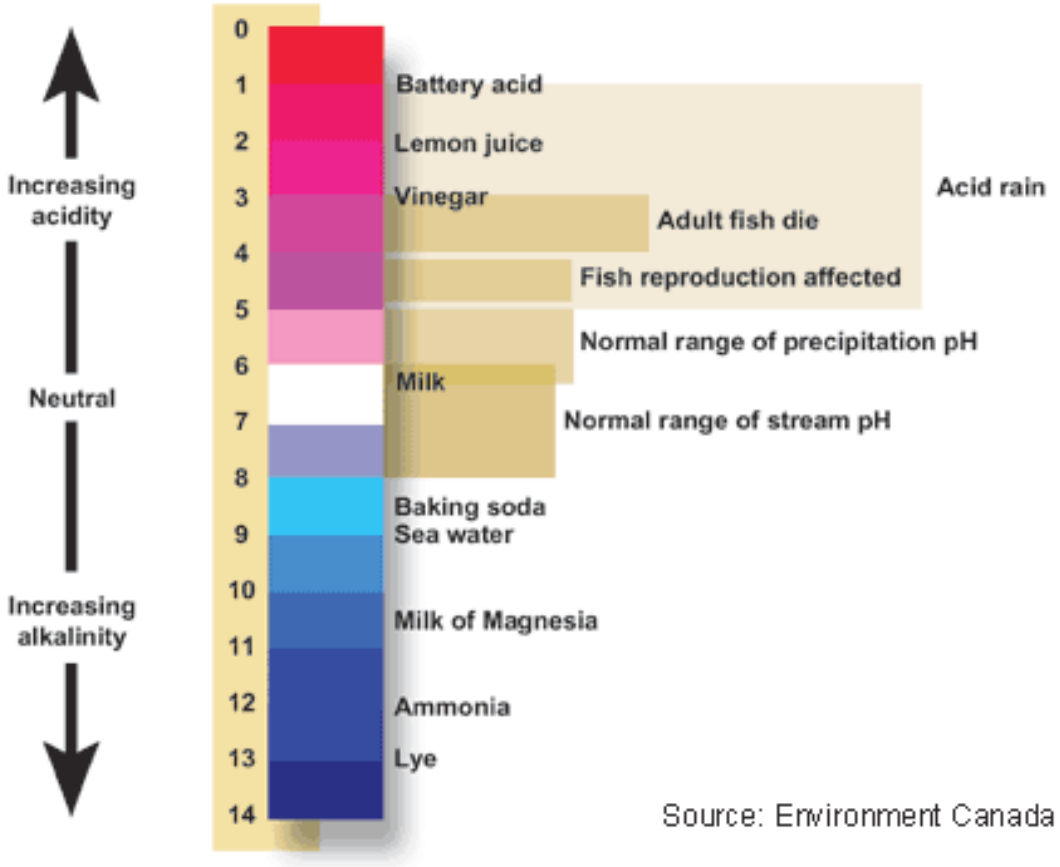
4) Look at the table below. Answer the following questions regarding appropriate ranges.

Normal range of stream pH: _____ - _____

Normal range of precipitation pH: _____ - _____

Range at which fish reproduction is affected: _____ - _____

Range at which Adult Fish Die: _____ - _____



Ecosystem Research: Getting to Know Your Field Site

Grade Level: 6
Florida Standards: SC.6.E.6.2; SS.6.G.1.1; SS.6.G.1.2.

Objectives

Students will be able to **(1)** use latitude and longitude coordinates to understand the relationship between people and places on the earth, **(2)** analyze the purposes of map projections and explain the application of various types of maps, **(3)** understand the location and habitats of their field site at Big Cypress National Preserve.

Overview

Students will use a map of their field site to determine the three habitats in which their field work will be done. Students will be divided into their field groups for the day of their field work at Big Cypress and will then gather information on the websites provided regarding the three habitats to begin building a background for their field work. It is important for students to understand that, as scientists, they must do background research of an area before they even go there in order to be prepared for what they'll encounter. This helps scientists to be more prepared and effective with their field work. There is much you can learn and understand about a certain place before you actually experience it. Going into a place with background knowledge helps you to better understand your work in that area and more effectively conduct your experiments.

Background Information

Your students will be scientists performing multiple experiments at their field site in Big Cypress National Preserve. All scientists, before they conduct field work, must become familiar with the ecosystem or variety of ecosystems in which they'll be working. This enables them to have a richer experience as they're able to be prepared to look out for things they would not know of otherwise during the day of their field work. More importantly, it helps them with their field work as they make connections to why their work is important and how their work may potentially supply information that will help them to positively affect an entire ecosystem. This lesson will provide a more general background into the area in which their field work will be done and it is meant to provide a base for the students to begin making connections between their work and the greater ecosystem.

Procedures

1) Distribute the Birdon Trail Field Site map to students (make sure to copy or print in color; or you may place a color copy on an over head). Explain to students that this is a map of their field site. During their field work they will be performing experiments in three of the five habitats of Big Cypress National Preserve – Freshwater Cypress Swamp, Pineland, and Freshwater Marl Prairie.
2) For your field work, your students will need to be divided into three groups. Now will be a great time to establish these three groups and have students work within their groups to begin establishing a team atmosphere for the day of their field work. Explain to students that scientists often work in teams to complete a scientific investigation. You may either choose groups for students or have students choose their groups, but make sure they are students who will be able to work well and professionally together.
3) Once students are divided into their three field site groups, assign each group one of the habitats from their field work. Explain that there are five habitats found in Big Cypress. The other two habitats – mangroves and hardwood hammocks – will not be explored at this time. Each habitat has different characteristics – different animals, vegetation, supply of water. Yet, the habitats are connected in many ways; the health of one is dependent on the health of the others that surround it. Tell students that they will be investigating the characteristics of their habitat

as well as the similarities between their habitat and others. Also, students will be investigating what determines why a certain ecosystem develops in a certain area (give students the hint to take note of elevation). Note that a habitat is also referred to as an ecosystem in which animals, vegetation, water, soil, and weather work together to create a unique environment.

4) Distribute ecosystem research paper to each student.
5) For the Freshwater Cypress Swamp, Freshwater Marl Prairie, and Pineland groups, direct students to www.nwf.org/everglades/tour.cfm. Tell students that the ecosystems on the page are ordered by elevation, with the first having the highest elevation above sea level and the last have the least elevation above sea level.

Evaluation

1) Students accurately complete the Big Cypress Research paper.
2) Students understand that what causes on e type of ecosystem to form in an area rather than another is due to elevation. Students can put all five ecosystems in order from highest elevation to lowest elevation. In addition, students understand that elevation influences water levels in each ecosystem.
3) Students can name all five ecosystems of Big Cypress and name one thing about each that makes them unique from and similar to the others.

Big Cypress Ecosystem Research

Name:
Date:

Name of ecosystem: _____

Three types of vegetation found in your ecosystem
(draw and label the one that is the most abundantly found in your ecosystem):
1) _____
2) _____
3) _____

Three types of animals (choose one to draw and label):
1) _____
2) _____
3) _____

Vegetation	Animal

What role that water plays in your ecosystem?
(how much water? where is it found in your ecosystem? is it there all year long?):
_____
_____
_____

What is one characteristic that is unique to your ecosystem?
_____
_____

What is one characteristic that is similar to the other two ecosystems?
1) Other Ecosystem: _____
Similarity: _____

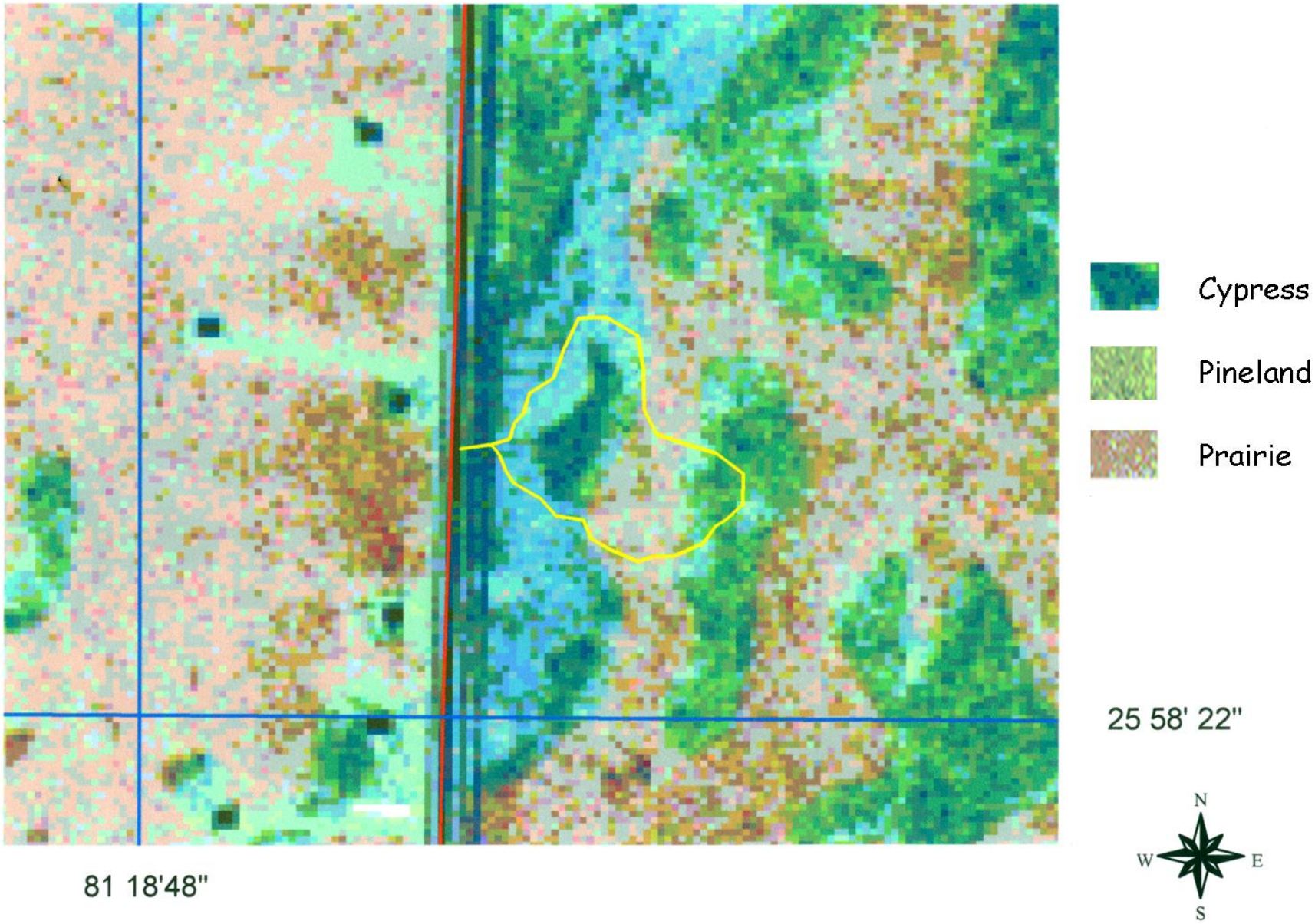
2) Other Ecosystem: _____
Similarity: _____

Put the ecosystems in order from highest elevation to lowest elevation:

_____ → _____ → _____ → _____ → _____

Draw your ecosystem:

S.W.A.M.P. Birdon Trail Field Site



Color key to ecosystems

- Cypress
- Pineland
- Freshwater Slough
- Mangrove
- Developed or disturbed land
- Hardwood Hammock
- Freshwater Marl Prairie
- Coastal Marsh
- Marine and Estuarine

Fire Ecology: Optimal Weather Conditions for a Prescribed Burn

Grade Level: 6
Florida Standards: SC.6.E.7.7; SC.6 N.2.3
Duration: 30-45 min

Objectives

Students will be able to **(1)** investigate how natural disasters have affected human life in Florida; **(2)** recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests and goals.

Overview

Students will learn that many of the ecosystems in South Florida are fire-dependent, which means that fire is a necessary component to ensure the ecosystem's ability to provide an environment suitable to support the plant and animal species that live there. Through this introduction, students will begin to understand fire as not just a randomly occurring disaster that must be extinguished immediately to ensure the safety of all involved, but as a potentially safe and prescribed endeavor by humans to ensure the continued health of an ecosystem. Once students begin to alter their perspective on fire, they will be introduced to the way in which information from hydrologists, botanists, wildlife biologists, pedologists (soil), and meteorologists is used to inform the work of a fire ecologist. At this point students may perform an investigation to understand the affect that relative humidity and other meteorological factors have on the decision to perform a prescribed burn. Students may also assume the role of a fire ecologist and perform a more comprehensive investigation to check the extended weather forecast online and chart which days have weather conditions suitable for a burn and which days do not. Once students have chosen the appropriate day or decide there are no appropriate days, they will write their own "prescription" for a prescribed burn.

Background Information

See Teacher Reference Sheet on Fire in the Teacher Reference Portion of this guide.

Procedures

1) Distribute the photos of the before, right after, one week after, one month after, and one year after a prescribed burn. Have students put these photos in order. Ask students what they notice about the sequence of the photos. Get a feel for how students feel about fire; guide students to the understanding that fire can actually have a positive effect on ecosystems. Ecosystems may even be dependent on fire to help them to continue to support the plant and animal species that live there.
2) Distribute the Teacher Reference Sheet for Fire to each student. Have students read this sheet independently and answer the short answer evaluation questions in preparation for discussion.
3) Highlight fire ecology as a field of science and that many other science fields contribute to the success of a fire ecologist's decision to perform a prescribed burn – hydrologists, botanists, wildlife biologists, pedologists, and meteorologists. Conditions with all the above factors must be perfectly suitable for a burn to be prescribed. Explain that you will mostly focus on the meteorological aspect of the fire ecology of a prescribed burn.
4) Review with students what they learned about relative humidity in the previous lesson. Explain to students that fire ecologists consider the relative humidity of the days before and the days of a prescribed burn. If the relative humidity is too high, there will be too much moisture in the air and in the plants for the plants to burn. If the relative humidity is too low, the plants will be very dry and thus will more readily catch fire, which may prevent the fire ecologists and fire-fighters from being able control a burn.

5) Demonstrate this concept with the follow activity:
    a. Take two small paper cups and pour a small amount of water into one cup, while leaving the other cup empty.
    b. Light a candle. Hold the empty paper cup over the flame. The cup should ignite relatively quickly. Immediately extinguish the flame.
    c. Next, take the cup with the small amount of water and hold it over the flame. The water inside the cup absorbs the heat from the flame, thus preventing the cup from being hot enough to burn. The heat being absorbed by the water causes it to evaporate. Once all the water in the cup has evaporated, the cup will become hot enough to burn.
6) Discuss with students that moisture content in plants and in air influences what days are chosen for a prescribed burn. Information on a day's relative humidity can be obtained on your local weather station or online. Fire ecologists are given very specific and detailed reports by local meteorologists to help them make a decision.
7) Inform students that they will now learn of the ideal weather conditions for a prescribed burn and play the role of a fire ecologist to decide which day is ideal for a prescribed burn. In addition, they will look at the ten-day weather forecast online to determine if any of the coming days would be suitable for a prescribed burn.

Evaluation

1) For what reasons are burns prescribed?
2) What other fields of science contribute to a fire ecologist's decision to perform a prescribed burn?
3) If relative humidity is high the days before and the day of the projected day for a prescribed burn, would conditions be considered ideal? Should the fire ecologists still perform the burn? Why or why not?

Optimal Weather Conditions For a Prescribed Burn

Name:
Date:

In the table below, you will find information regarding the ideal weather conditions for prescribed burns. Use the table to help you to answer the questions below.

	Ideal Conditions	**Reasons Why**
Wind Speed	1-5 miles per hour	Wind is an important factor in controlling fire. If the wind speed is too high, the fire poses a danger of spreading to places that were not intended to burn.
Relative Humidity	30-55%	Relative humidity is a measure of moisture content in the air. If the air contains too much moisture, the fire will not burn effectively. If the air contains too little moisture, the fire may ignite and spread too quickly and become unsafe.
Temperature	Fall and Winter: below 60°F Spring & Summer: 80°F – 90°F	Fire needs to reach a certain temperature in order to be become lethal to plants, - 147°F. If the goal of the fire is to clear underbrush, it is best to do it on a cool winter day so that it is easier to control and the heat from the fire does not damage the trees. If it is during the Spring and Summer growing season and you are targeting trees, it is best on a warm drier day so that the trees ignite more quickly and the fire is easier to control.
Rainfall/Soil Moisture	¼ to ½ inch of average rain	The preferred soil moisture is damp. Recent rainfall of ¼ to ½ inch followed by sunny skies, low winds, and low humidity is generally ideal.

1. Look at the local weather information below. Choose which day is most suitable for a prescribed burn.

	Monday 7/13/09	**Tuesday 7/14/09**	**Wednesday 7/15/09**	**Thursday 7/16/09**	**Friday 7/17/09**	**Saturday 7/18/09**	**Sunday 7/19/09**
Wind Speed	15 miles per hour	9 miles per hour	2 miles per hour	18 miles per hour	17 miles per hour	3 miles per hour	1 mile per hour
Relative Humidity	13%	18%	25%	33%	19%	45%	43%
Temperature	55°F	64°F	71%	77°F	64°F	83°F	81°F
Precipitation Chance	10%	13%	20%	40%	10%	10%	18%

On which day are weather conditions most suitable for a prescribed burn? _____

Why did you choose this day? _____

Fire ecologists of Big Cypress National Preserve are seeking to burn the part of the preserve found to the right. This is a 10,000 acre combination of prairie and pineland. In the data table below, you will record your research from online meteorological forecasts to determine if there is any day in the next ten days suitable for performing a prescribed burn. Once you have collected your meteorological data, you will then write your own prescription for a burn.

2. Go to www.weather.com. Search for the ten day forecast for Ochopee, Florida. Fill out the information below and assess whether or not any of the days will be suitable to perform a prescribed burn in the area. Record your weather data below.

Weather Data	**Next Ten Days**									
Wind Speed										
Relative Humidity										
Temperature										
Precipitation Chance										

3. Fire ecologists are like doctors of the land as they prescribe burns to enable ecosystems to be better equipped to support plant and animal species. From your meteorological research results above, write your prescription for the burn of the prairie and pineland area. Choose which day has the ideal weather conditions for a prescribed burn, and tell why. If there is not a day that has ideal conditions, write why no days are appropriate for a prescribed burn given then current weather conditions.

_____
_____
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Interactive S.W.A.M.P Journal

Grade Level: 6
Florida Standards: SC.6.N.1.2; SC.6.N.1.4; SC.6.N.2.1; SC.6.N.1.5
Duration: 20-30 min.
(Alternate extensions for

Objectives

Students will be able to **(1)** distinguish science from other activities of thought, **(2)** recognize that science involves not just designing experiments, but also creating explanations that fit evidence, (**3)** discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation, **4)**explain why scientific investigations should be replicable.

Overview

Students will first design a journal in which to record information and observations from their pre-site, field trip, and post-site work. This is an interactive journal, meaning that students will not only write and sketch in it, but will also paste or tape their pre-site, field trip, and post-site work in the journal as it is completed.

Following each in-class activity, students will record in detail or post their work for one or more of the following: their procedure, what results they gathered, what new information they learned from the results, what they think it means to Big Cypress National Preserve, how it may affect them, and what they plan to do with the new information. Their records should be detailed enough so that others can easily read, understand, and/or replicate what they have done.

Through the process of keeping this interactive journal, students will learn and practice how to keep detailed records of scientific inquiry as well as how to record their observations in a way that can be understood by the greater scientific community, which includes their peers as well as other scientists interested in the ecology of Big Cypress.

If time does not allow for this to be completed in class, students may complete their journal for homework on the days the activities are completed.

Background Information

It is important for students to understand that science is not just composed of facts about the world, but that science provides a way to think about the world. In science you do not just memorize information, but you process it and test it in order to find out how and why the world is the way it is. Science is not just information, but a process for gaining information. Students may one day be a part of discovering something about the world that no one else ever had. In addition, a scientist's work on how they see the world, what they've investigated, or what results they achieved must be specific, detailed, and organized so that their work is considered **replicable.** A scientist's work is considered replicable if another person can go through the same procedure and achieve the same results as the original scientist. If a scientist's work is not replicable, it has no importance in the field of science because there is no way to check whether or not the results are valid.

Procedures

1) Introduce to students that science is not just composed of facts about the world, but that science provides a way to think about the world.
2) Explain that in science, how you describe things, experiences, and phenomena must be very specific, detailed, and organized so that others may understand what you have done and/or use the same method to verify your results. The results of an experiment in science are not valid if they cannot be done again by a different person using the same procedure to achieve the same results.
3) To exemplify the importance of specificity, give students what will become the first working page of their journal. Tell students to draw a triangle and a square. Call a few students up to the board to share the shapes they drew. Next, write on the board the following directions - 1) Draw a triangle with three equal sides with one point of the triangle pointing to the top of the page, 2) Use the bottom part of the triangle as the top part of your square. 3) The square should have equal sides, 4) Draw the rest of your

square. Next, call a few students to the board to share their drawings

4) Debrief with students – Why was it important to be specific? Can anyone look at these directions and achieve the same results?
5) Explain that they will create a comprehensive journal in which they will record their investigations and observations from their pre-site, field trip, and post-site work.
6) Describe that following each in-class activity, students will record in detail or paste their work for one or more of the following: their procedure, what results they achieved, what new information they learned from the results, what they think it means to Big Cypress National Preserve, how it may affect them, and what they plan to do with the new information. Their records should be detailed enough so that others can read, understand, and/or replicate what they have done.
7) Explain to students that this is an interactive journal, meaning that students will not only write and sketch in it, but will also paste or tape their pre-site, field trip, and post-site work in the journal as it is completed.
8) Allow time for students to create their journal. Use a heavy material such as cardstock for the front and back covers. For the inside pages, use paper that is at least 8 ½ by 11 in size and use enough paper to cover the topics and worksheets you plan to use from this teacher guide also from your lessons. Also prepare for extra pages so that students may reflect, sketch, and paste pictures from their experience.
9) Make sure it is clear to students that this interactive journal will be assessed based on how well they communicated what they've done during their pre-site, field trip, and post-site observation. Emphasize that their work must be specific, detailed, and organized enough so that others may easily read, understand, and/or replicate what they have done.
10) Once the journal has been assembled and the meaning and process of the journal is made clear, students will complete their second entry:

Why is it said that science is not just composed of facts about the world, but is a way of thinking?

Evaluation

Multiple choice or free-response questions for practice in class or for quizzes

What is meant by a scientist's work being replicable?

Interactive S.W.A.M.P Journal: Introductory Entries

Name:
Date:

Follow teacher's directions to complete drawings for each box.

Why is it said that science is not just composed of facts about the world, but is a way of thinking?

Soil Moisture and Decomposition

Grade Level: 6
Florida Standards: SC.6.N.1.1; SC.7.N.1.2; SC.6.N.1.2; SC.7.N.1.4, SC.6.E.6.1, SC.6.E.7.4
Duration: 30 min. prep, a week or two after

Objectives

- Recognize how microorganisms interact with animals, plants, and humans in both harmful and helpful ways (decay, fermentation, disease.)
- Describe the physical and chemical characteristics of various soil types.
- Describe local/regional soil types and their formation (ridges, phosphatic limestone, Flatwoods soils, organic soils, etc.)
- Know the ways that plants and animals reconstitute the soil and alter the landscape.
- Distinguishes between biotic and abiotic factors in the environment.
- Uses appropriate experimental design, with consideration for rules, time and materials required when solving a problem.

Overview

Students investigate how water affects the rate of decomposition of organic matter in the soil.

Materials

Per group: Three 2-liter plastic bottles with the tops cut off. (Or use one container per group and set it up as a class experiment.)

Vegetable matter (grass or other plant clippings, veggie peelings, etc.), scissors for cutting vegetation if necessary, soil, rulers, spoons for mixing soil and plant matter, plastic wrap.

Procedure:

1. Add equal amounts of soil to each of the bottles- about 10 cm.
2. Add 3 cm of vegetable matter to each container of soil. Mix the soil and vegetable material together well. Be sure to use the same type of soil and vegetable matter in all the jars. Why is this important?
3. Label the jars as follows
    a. Dry
    b. Moist
    c. Wet
4. Water the containers marked “wet” with 500 ml (2 cups) of water - enough to saturate the soil so that there is a little standing water at the surface.
5. Water the containers marked “moist” with 250 ml of water (1 cup) - enough water to moisten the mixture with no standing water at the surface.
6. Do not put water in the “dry” containers.
7. Cover the jars with plastic wrap. Poke 15 pencil-lead sized holes in the tops so that air can circulate.
8. Every two days, saturate the soils marked “wet”. Moisten the jars marked “moist” at the same time. Record your observations. You may stir the soil to check on the state of the vegetable matter, but be sure to stir the soil in all three jars.

Evaluation:

1. Describe what happened to the plant material in the soil in each container.
2. What are the possible reasons for the changes in each container?
3. How might the effects of the water level impact plants and animals in the Big Cypress Preserve?
4. Choose another variable to test and write your question and hypothesis regarding this variable. Some other possibilities for experiments might include:
    a. Manipulating the hydro period
    b. Adding worms
    c. Manipulating the amount of light- put some in a shady spot and some in a sunny spot
    d. Manipulating temperature

Swamp **W**ater **A**nd **M**e **P**rogram

Post-Site Classroom Enrichment, Data Analysis, and Assessment

Communicating Your Results

Grade Level: 6
Florida Standards: SC.6.N.1.2; SC.6.N.1.4; SC.6.N.1.5; SC.7.L.17.1 SC.7.L.17.3
Duration: Two 30-45 min. Periods

Objectives

Students will be able to **(1)** recognize that science involves not just designing experiments, but also creating explanations that fit evidence,(**2)** discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation, (**3)** explain why scientific investigations should be replicable, **(4)** explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web, **(5)**Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

Overview

Students will work in their field groups to communicate their findings from their pre-site and field trip investigations to the class. This may take two class periods to complete – one to create the poster and presentation and another for each group to present it. Or you can have them complete the poster and presentation for homework and come prepare to present it to the class.

Background Information

As a scientist, it is important to not only perform investigations and collect data, but to analyze it and communicate it to others in a clear and meaningful way. In order to do this successfully, it is necessary to be specific, detailed, and organized in both the speech and content of your presentations. Often, scientists will create posters that offer a summative glance into the results and meaning of their work, which includes written descriptions, graphs, charts, pictures, and diagrams. The post is not meant to be an extensive look at their research, but is meant to offer a synopsis of the most significant data and what it means for the greater topic of investigation.

Procedures

1) Explain to students that they will complete a poster and presentation with their field group that communicates their conclusions from their pre-site investigations and field work at Big Cypress.
2) Distribute the requirements for their poster and presentation (you may add or take away criteria as necessary). Tell students that they will receive both a grade from the teacher as well as a grade from their peers.
3) As groups are working, circulate and ask guiding questions to those groups who may be struggling.
4) Once it is time for the groups to give their presentations, pass out a peer evaluation sheet to each student. When a group is giving their presentation, all other students will take notes and rate the group on the extent to which their work is scientifically sound. (See peer evaluation rubric for more details). In addition, explain to students that they will be given a quiz on the presentations of their peers and may use their notes from the presentations to complete the quiz.

Evaluation

1) See Rubric

2) Multiple choice or free-response questions for practice in class or for quizzes

What should be the characteristics of a presentation and poster created by a scientist?

Communicating Your Results: Poster and Presentation

Name:
Date:

- ✓ Create a title for your poster that sums up the big topic of your investigation
- ✓ Map of Birdon Trail Field Site
  - Label the three habitats
  - Write the coordinates for each habitat
- ✓ Make a Venn Diagram of the animals or tracks of animals (example: tracks, scat, fur, feathers, bones etc) you found in each habitat.
  - Of the animals you found, which are predators of the panther and alligator?
  - Of the animals you found, which are prey of the panther and alligator?
  - Where should panthers and alligators be placed on the food chain (near top or near bottom)? Why?
  - What are the threats to panthers and alligators?
- ✓ Make a Venn Diagram of the vegetation you found in each habitat.
  - Draw and label each type of vegetation that you found
  - Tell what kind of animal eats each type of vegetation or uses it for shelter
  - Describe the human causes and natural causes of disturbances you observed.
- ✓ Discuss the water quality of the Cypress Swamp.
  - Create a table for your data. Include: depth, temperature, dissolved oxygen, pH, and water color
  - Is the water quality indicative of a healthy ecosystem that supports a diversity of aquatic life? How do you know?
  - What cause pollution of water in the swamp and throughout South Florida?
- ✓ Draw and describe the type of soil from each habitat. What does the type of soil say about the habitat in which it was found?
- ✓ Create a table for the data you collected on weather at the Field Site at Big Cypress. Include: direction of wind, wind speed, relative humidity, air temperature, time of day.
  - What differences do you see in the weather of the habitats? What evidence can explain those differences?
  - What similarities do you see in the weather of the habitats? What evidence can explain those differences?
- ✓ Illustrate each habitat.
  - For each habitat, draw a diagram as accurately as possible that shows the animals, vegetation, water, soil, and weather
  - In the diagram, draw a food web that shows the interconnectivity amongst the animals and vegetation
- ✓ From your work in the classroom and in the field, why is it important to preserve Big Cypress?
  - What are ways that you can help to preserve the animals, vegetation, and water of Big Cypress? What will you do differently in your daily life?

Communicating Your Results: Peer Evaluation

Name:
Date:

Criteria	I	II	III	Score
Poster	The poster is sloppy and the topics are not organized.	The topics are clearly organized, but the work is sloppy.	The topics are organized well and the work is neatly done.	
Speech	The group did not speak loudly and clearly.	The group spoke loudly and clearly at some points, but not the whole time.	The group spoke both loudly and clearly the whole time.	
Content	Most content on the poster and in the presentation is not accurate.	Some content on the poster and in the presentation is not accurate.	All content on the poster and in the presentation is accurate.	
Understanding	It was clear that the group did not understand what they were talking about during the presentation.	The group spoke knowledgably about some topics, but not all topics.	The group spoke knowledgably about all topics.	
Participation	No group members actively participated during the presentation. Students shuffled around and hoped others would talk.	Some group members actively participated in the presentation, but not all.	All group members actively participated in the presentation.	
Scale: 14-15 A 12-13 B 11C 10D 0-10F			Grade	Total

Notes

Human Impact - Losing Habitat

Grade Level: 6
Florida Standards: SC.7.E.6.6; SC.6.N.2.3.
Duration: 30- 40 min.

Objectives

Students will be able to **(1)** identify the impact that humans have on the earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water, **(2)** Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.

Overview

Students will play the role of animals, vegetation, water, and human land developers in order to explore impacts, both negative and positive, of human development on the ecosystems within Big Cypress National Preserve.

Background Information

In order for human **development** (housing, grocery stores, shopping centers, farms) to be created, parts of ecosystems are paved over or cleared, and thus partially or completely destroyed. This kind of development has serious deleterious affects on the ecosystems of Florida, as well as all over the world. Each time humans develop a large or small part of land, local vegetation and small animals lose their homes and potentially disappear from the land altogether. As small animals disappear, so too do the larger animals that previously depended on the smaller animals in the food chain as a source of food. In addition, if humans are negligent with their waste during construction and daily life, the water and air can become polluted in their community and throughout the surrounding ecosystem, which has the potential to eliminate or harm many or all types of land and aquatic animals and vegetation as well as pose harm to the people who live there.

The affect of human development on an ecosystem can be studied in South Florida. In South Florida, there is much human development, yet there also exists Big Cypress National Preserve, Everglades National Park, Biscayne National Park, and other state and local parks. These parks and preserves exist in order to protect ecosystems of Florida. Despite what these parks and preserves are currently protecting, past land development and current misuse of developed land through pollution continues to affect the health and function of the many kinds of ecosystems in South Florida.

A large obstacle that development has posed to South Florida ecosystems relates to how water flows from the land to the sea. South Florida is what is known as a watershed, meaning that all the water within the ecosystem comes from rain. Due to the slight slope of Florida, that rain water flows through the land to the ocean. Development has interrupted the flow of water from Lake Okeechobee and Big Cypress to the ocean and so parts of Florida that once became saturated with water during certain parts of the year now remain dry and lifeless.

Scientists and engineers are working to correct this imbalance in the ecosystem through the creation and construction of canals that will direct water flow to the right parts of Florida. Yet, we're learning that once an ecosystem has been transformed by human development, it takes more work to fix it than it did to destroy it.

Procedures

1) Review with students the elements that are necessary for a habitat (food, water, shelter, and enough space for each particular kind of animal). Integrate their experience at Big Cypress into the discussion and ask what elements of a habitat they saw while in the field. Explain further that the habitats of Big Cypress that they experienced during the field work were only a very small percentage of all the land of Big Cypress. Explain that there are five main habitats in Big Cypress and they make up approximately 729,000 acres or 1125 square miles and they only experienced less than one acre of that land. Once the elements of a habitat are made clear and students understand the connection to Big Cypress, tell students that today they will explore the relationship between human development and the habitats of Big Cypress.

2) Divide students into five groups: herbivores, carnivores, vegetation, water, and people who will be land developers. If students are not familiar with the terms herbivore and carnivore, explain that herbivore is an animal that only eats plants and that carnivore is an animal that only eats other animals, and although it is not needed for this activity, explain that an omnivore is an animals that eats both plants and animals.
3) Give students art supplies in order to draw and label a sign that reveals what kind of herbivore, carnivore, or vegetation they are from Big Cypress (each member of the group must choose something different). At this time the water and human developers will also create signs for themselves.
4) Create a space large enough for all herbivores, carnivores, and vegetation to live comfortably in their habitat. This can be done with a large rope as the boundary either inside or outside of the classroom.
5) Give the herbivores, carnivores, and vegetation 3-6 minutes to set up in the habitat. Remind students that they must make sure they have enough space in their habitat while at the same time considering that they need to be near their food source as well as hidden from potential predators.
6) Once the herbivores, carnivores, and vegetation are finished setting up their habitat, tell those students who represent water to flow through the habitat. Remind them that they can easily flow near and around trees and wildlife.
7) Once the water has flowed through the habitat, tell the human land developers that they must create plans to develop this land. Give the group 6-7 minutes and a piece of paper to draw the current habitat as well as to make plans for how they will expand a nearby community whose population of people is growing to large for the amount of land they have.
8) Once the human land developers have finished their plans, give them 3-7 minutes to clear out and build what they need within the habitat. In order to clear out part of the habitat, tell students to gently remove the vegetation to outside of the parameters of the habitat. Tell the herbivores and carnivores that if their food source leaves, they must leave too. In order to designate what is being build, tell the human developers to take create signs. In addition , tell the human developers that each time they remove a part of the habitat and/or build upon, they have to state the reason why they choose to do it.
9) Once the expansion of the human community is complete, tell the water to flow through the habitat. Remind the students who are water that they cannot flow through or around buildings, but must stop if they reach one.
10) Have students stay where they are and guide them through a discussion about the activity. First, ask the herbivores, carnivores, and vegetation, and water how they felt before the development took place? After? Now ask the same questions to the land developers. What were the consequences of the developer's actions? Did any animals or vegetation die? What was the difference in water flow before and after development? How is that similar to what is happening in South Florida?
11) Were there any positive consequences to the development? What could the developers have done differently to change the consequences? Would it have been any different if the developers had used small scattered plots of land instead of developing the whole thing?
12) Ask students to summarize the possible effects that human development can have on wildlife. Are there places in your community where wildlife habitat has been lost due to human development? Are there places where wildlife habitat has benefited from human activity?
13) Compare with students a map of land development in Florida from 50 years ago to a map of land development in Florida today. What changes are there? What can you do to reduce the impact of human development on wildlife habitat?

Evaluation

1) In what ways can human development positively affect and negatively affect wildlife and ecosystems?
2) What negative consequences of human development and activity do you see in South Florida? What positive consequences do you see?
3) Is there anything you can do to make a positive difference in the quality of wildlife habitat in your community

Where's the Panther? Using G.P.S Coordinates to Determine Location

Grade Level: 6
Florida Standards: SS.6.G.1.1; SS.6.G.1.2.
Duration: 30-45 min

Objectives

Students will be able to **(1)** use latitude and longitude coordinates to understand the relationship between people and places on the earth, **(2)** analyze the purposes of map projections and explain the application of various types of maps.

Overview

Students will use a map of their field site to determine the position of the panther they tracked and located in each habitat using the G.P.S coordinates they reported during their field work. Students will mark on the map the location of the panther in each habitat.

Background Information

A Global Position System (G.P.S.) is a navigational tool used to determine your exact location on the earth through the use of latitude and longitude coordinates. Scientists have many uses for G.P.S.:

- Determine the coordinates of your position on the ground
- Show your elevation, ground speed and compass heading
- Find the coordinates of a landmark
- Plot your route from one landmark to the next
- Estimate the distance from your current position to your destination
- Guide you in the right direction and keep you on course
- Plot the position of wildlife such as the endangered red-cockaded woodpecker and exotic, invasive vegetation like Melaleuca sp., Cassuarina sp. (Australian pine) and Brazilian pepper
- Track animals such as the endangered Florida panther and the white-tailed deer for conservation studies
- Plot trails created by off-road vehicles (O.R.V.s) and airboats to monitor the environmental impact caused by these vehicles
- Mark boundaries for prescribed vegetation burns
- Plot habitats such as sawgrass prairies, slash pine flatlands, hardwood hammocks, mangroves and cypress domes
- Mark the location of sampling sites for water quality testing so that the sites can easily be found

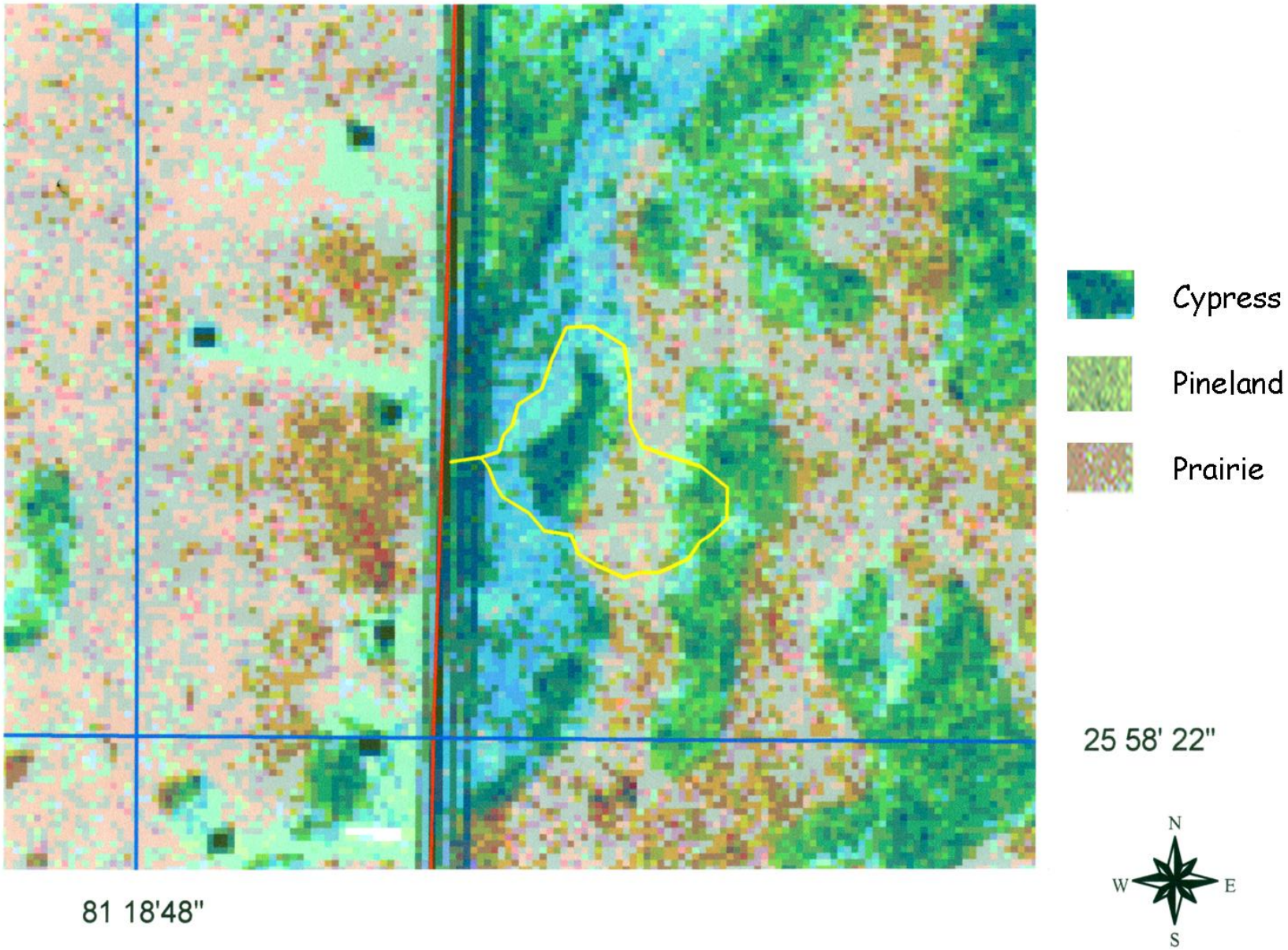
Procedures

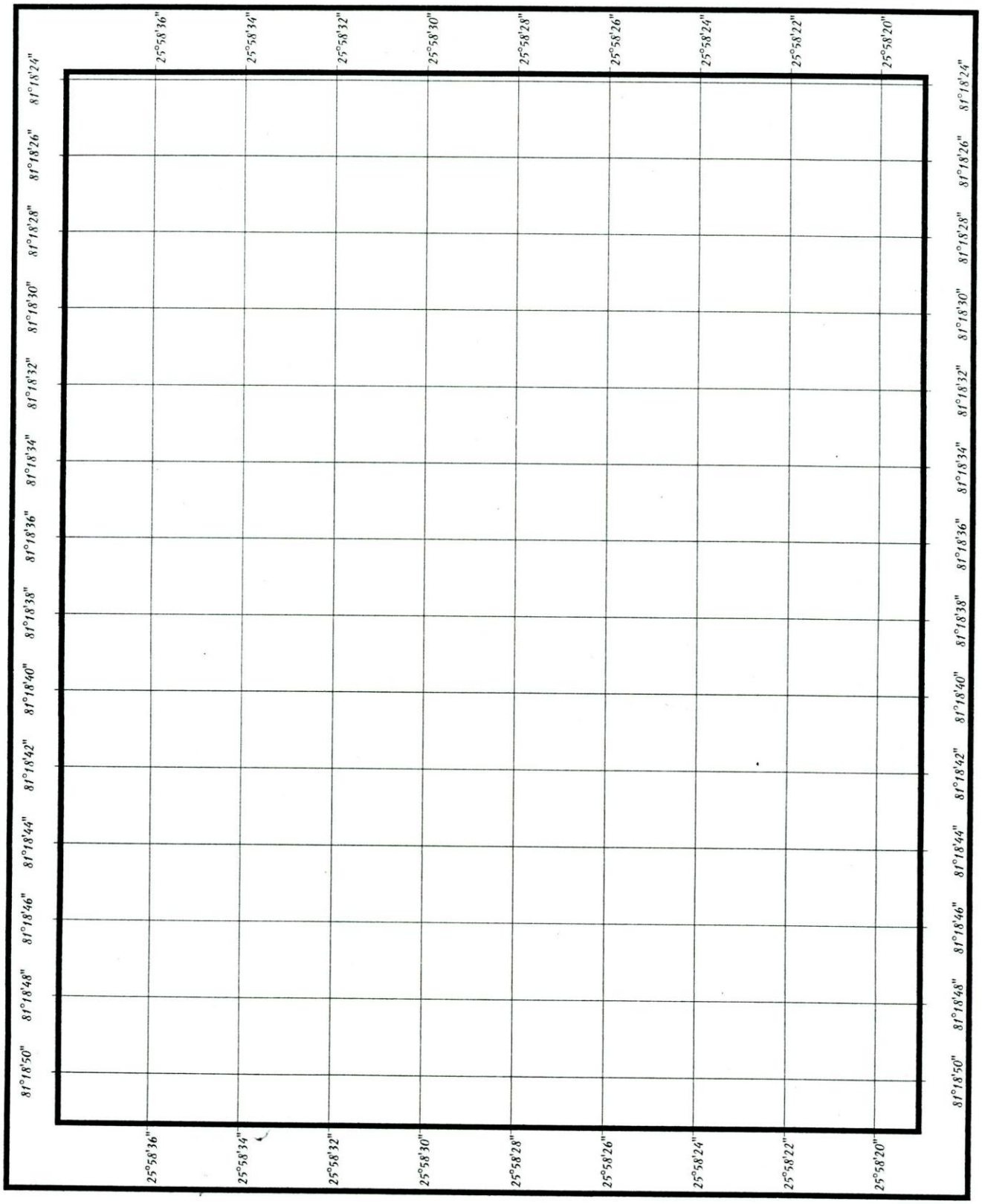
1) Review with students the way in which and for what reason they used G.P.S. on their field trip. Facilitate a discussion on the potential uses of G.P.S. in real world situations.
2) Explain to students that they will use the G.P.S. coordinates from the place in which they found the panther at their field site in order to determine its exact location on a map of their Birdon Trail Field Site.
3) Direct students to lay the transparency grid over the map, matching up the section lines.
4) Determine the position of the set of coordinates of the panther collars your groups found on the field trip.
5) Mark this spot with a grease pencil.
6) Mark all three sets of coordinates.
7) Determine which habitat the collars were found in by using the habitat key on the map. How does this compare with the information you recorded in your data workbook?

Evaluation

1) Points on the grid should match the coordinates for each collar. One collar was found in each habitat – prairie, pineland, cypress.
2) What does G.P.S. mean? For what reasons would someone use a G.P.S.?
3) How was the G.P.S. helpful to you during your field work

S.W.A.M.P. Birdon Trail Field Site





Print this page onto a transparency

Big Cypress Food Web

Grade Level: 6
Florida Standards: SC.7.L.17.1, SC.7.L.17.2, SC.7.L.17.3
Duration: 30- 40 min.

Objectives:

- Understands the complex nature of the interactions among organisms in an ecosystem. Students will chart how energy flows and matter is cycled throughout a system.
- Understands that food chains show specific trophic relationships, and food webs are used to illustrate interrelationships of trophic levels.
- Understands that humans are a part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in the ecosystem.

Overview:
Students complete the construction of a food web involving organisms living in the project area, and analyze some of the relationships and interactions within it.

Materials:
Pencils, copies of food web page

Procedure

1. Life is maintained by the recycling of the atoms that make up the molecules of living organisms. What provides the input of energy for this system?
2. Organisms that make their own food are called producers, or autotrophs. Which organisms on the diagram are producers? *(Bladderwort, cypress, lily, algae etc)*
3. Organisms that get their energy from other organisms are called consumers, or heterotrophs. Which organisms are consumers? *(Mosquito, grasshopper, rabbit, deer, dragonfly, crayfish, mosquito fish, frog, heron, fish, turtle, raccoon, alligator, panther, human.)*
4. Draw an arrow from each organism to an organism that might eat it. The arrow will show the direction of energy flow, and will point from the organism that is eaten <u>to</u> the organism that eats it.
5. Organisms that break down other organisms and return nutrients to the soil are called decomposers. What decomposers are shown in the diagram? *(Bacteria, fungi)* Because of space, we will not draw arrows to the decomposers. How many of the organisms on the diagram die and have their nutrients recycled? *(All of them.)*
6. Imagine that an organism in this food web were to disappear. How many other organisms would be affected *(remember that subsequent connections will also be affected.)*

Evaluation
Arrows should show the direction of energy flow. Any relationship that may be supported is acceptable. For example:
-Dragonfly larvae eat mosquito fish.
-Some humans eat frog legs, mushrooms, and crayfish etc.
-Bladderwort plants trap mosquito larvae.

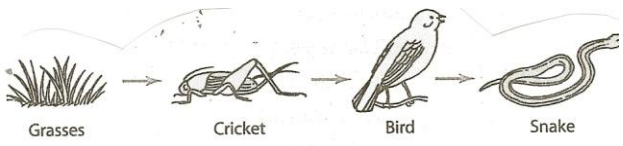
Big Cypress Food Web

Energy Transfer

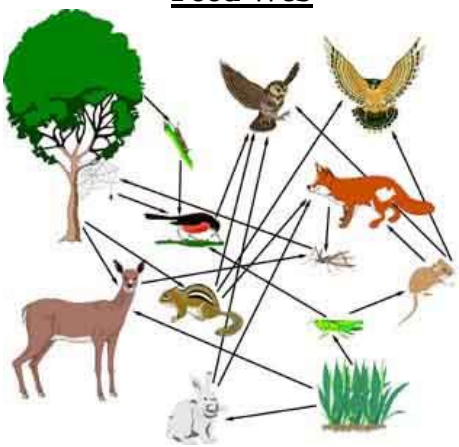
When one organism eats another organism, **energy** is **transferred** to the organisms that just ate, for example, if you just ate a delicious salad, the energy from the vegetables is transferred from the plant to your body.

A **food chain** shows the flow of energy from one organism to another. A **food web** is the connection of many food chains, showing the many paths that energy flows in an ecosystem. Food webs are a great way to ***visualize*** the energy flowing from the bottom level producers all the way up to top level consumers.

Food Chain



Food Web



Roles in a Food Web

Each organism in an ecosystem plays an important role in a food chain or web. The **producers** are the organisms that convert energy from sunlight into useable energy for the rest of the food web (like most plants or algae). The **consumers** are organisms that eat other organisms for energy. **Primary consumers** (e.g. rabbits, crickets) eat producers for energy – these are also called **herbivores** because they only eat plant vegetation. **Secondary consumers** (e.g. foxes) eat primary consumers. Lastly, **tertiary consumers** (e.g. hawks, owls) eat primary and secondary consumers. **Decomposers** are organisms that break down other dead organisms.

1) Take a look at the food web on the next page. Draw arrows from each organism to another organism in the direction of energy flow. One arrow is drawn for you.

2) Then put the organisms on the back in the category they belong:

Producers: _____

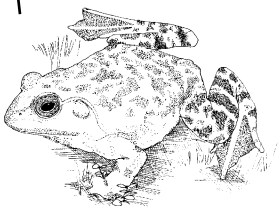
_____

Consumers: _____

_____

Decomposers: _____

_____



Swamp **W**ater **A**nd **M**e **P**rogram

Teaching Resources

Books for Teachers

Big Cypress and Everglades
Big Cypress Swamp & 10,000 Islands, by Jeff Ripple
Everglades Handbook, by T. Lodge
Land from the Sea – geologic story, by J.E. Hoffmeister
Discover a Watershed – The Everglades
The Everglades Handbook

Plants
Trees of Florida, by Nelson
Wildflowers and Roadside Plants, by Bell and Taylor

Wildlife
Alligator: Monarch of the Marsh, by Connie Toops
Audubon Field Guide to Florida
Birder's Guide to Florida, by B. Pranty
National Geographic Field Guide to Birds of North America
Florida's Birds, by Kale & Maehr
Florida's Fabulous Nature Series – Land Birds, Water Birds, Butterflies, Mammals, Reptiles/Amphibians
Manatees-Gentle Giants in Peril, by M. Unterbrink
Stokes Field Guide – Eastern Birds, by D. and L. Stokes

History
Florida Seminole Indians, by W.T. Neill
Forty Years in the Everglades, C.R. Stone
Gladesmen – Gator Hunters, Moonshiners and Skiffers, by G. Simmons and L. Ogen
Nine Florida Stories, by Marjory Stoneman Douglas
Man in the Everglades, by C.W. Tebeau
True Tales of the Everglades, by Stuart McIver
Voice of the River, by Marjory Stoneman Douglas

Books for Students

Alligators-A Success Story, by P. Lauber
Discovering Endangered Species
Leapfrogging through Wetlands
Everglades National Park Activity Book
Marjory Stoneman Douglas – Voice of the Everglades, by J. Bryant
One Small Square Swamp, by D. Silver
She's Wearing a Dead Bird on Her Head, by Cathryn Lasky
Sawgrass Poems, by Frank Asch
Missing Gator of Gumbo Limbo, by Jean Craighead George
The Talking Earth, by Jean Craighead George
Golden Guides

Web Sites

www.nps.gov/bicy/
www.owl-online.org/library/edu_anim/miss_o.htm
www.fws.gov/r9endsppkid
www.ed.gov/free/
www.fws.gov/educator
www.panther.state.fl.us
www.nea.org/helpfrom/wbworks4.html
www.eelink.net
www.greenmap.org
www.bio2.edu/education/student
www.restudy.com
www.wetlands.ca/
www.nifc.gov
www.panther.state.fl.us
www.fi.edu/tfi/units/life/
www.wwf.org/windows/ecoregions/index.html
www.arborday.net/kids
www.muohio.edu/dragonfly/
www.virtualbirder.com/vbirder/onLoc/
www.cr.nps.gov/ever/eco/wdstork.htm
www.cr.nps.gov/ever/eco/wading.htm
www.nwf.org/nwf/habitats/schoolyard
www.readnwritenaturally.org

Agencies That Supply Information

Big Cypress National Preserve
Everglades National Park
South Florida Water Management District - Big Cypress Basin
Florida Fish and Wildlife Conservation Commission
U.S. Fish and Wildlife Service

Swamp **W**ater **A**nd **M**e **P**rogram

Reproducible Masters

Chaperone Letter

Dear Chaperone,

Thank you for volunteering to assist with the S.W.A.M.P. field trip to Big Cypress National Preserve. An extra adult on the trip is always a big help to the rangers, teachers and especially the students. We think you will find it to be a rewarding learning experience while you have a fun day in the swamp with your child and his or her classmates.

There are some rules, however, even for the grown ups who attend. Full participation is expected by each chaperone. This means you go into the swamp with the students and assist them with all activities. You may be walking through ankle to knee deep water and mud depending on the water levels at the time of year you come. Check with your child or their teacher to see what the most recent conditions are. There is no facility for you to wait for the students to return from the swamp.

Included is a list of what you should wear and bring along on the trip. It is the same as the list for the students as the same safety concerns apply for both.

Comfortable clothing - suitable for the weather - that can get wet and muddy
Closed-toed shoes that lace on tight - old tennis shoes work best.
Socks
Long pants
Bring an extra long sleeve shirt in your pack - if necessary this can guard against the sun and insects.
White clothing will never be white again!

Sun protection
Hat, sunscreen, sunglasses.

Water
Plenty of it.

Bug repellant
This may not be necessary.
Please bring lotion instead of aerosol.

Lunch
Something that does not need to be kept cold between the time you leave your home and lunchtime.

What not to bring:
Cell phones - you will be busy helping the students who will be recording data from their activities for a grade. Cell phones have proven to be quite a distraction and can easily be dropped in the water. There are

many areas of the Preserve in which cell phones do not pick up signals. The rangers will have park radios and Nextel phones in case of an emergency.

Cameras can also be a big distraction and be easily dropped in the water. If you bring a camera please limit your pictures. Students may not bring cameras.

Money is not needed on the trip. We will be in the swamp. There are no gift shops, restaurants or snack machines.

Do not bring or wear valuables that could be damaged if gotten wet or lost.

Avoid bringing heavy backpacks full of stuff.
What your backpack *should* contain:
Water, lunch, sunscreen, bug repellant, long sleeve shirt, special medication if needed. Nothing else!
We will be walking a lot and there is no place dry to put your backpack if it gets too heavy.

We will be traveling on a dusty, sometimes rough gravel road for approximately 6 miles one way. Please keep this in mind if you decide to travel in your own car. Please do not leave valuables in your car. Make sure you have plenty of gas before leaving Naples.

Please remember this trip can be hot and strenuous. If you have any medical needs or physical limitations please inform the teacher.

Thanks again for volunteering. Parents like you help to make this program a success!
We look forward to seeing you on the field trip.

Sincerely,
The Environmental Education Staff

Date: _____

Dear Parent,

Your child came to Big Cypress National Preserve for the S.W.A.M.P. field trip along with the rest of the sixth grade science class last school year.

Occasionally photographs are taken of the students by park staff or local newspaper photographers during the experiments and activities of the trip. With your permission these photographs can be used in the production of educational materials such as exhibits, brochures, newspaper articles, our National Park Service web page or in annual reports. We may also use comments from the students about the program.

Would you please sign the following release so that this information can be used and send it back to school with your child. If you have any questions about the use of these materials please feel free to contact me at 239-695-1164.

Thank you for your cooperation.

Sincerely,

Lisa M. Andrews, Outreach/Education Specialist
Big Cypress National Preserve

Media Release Form

I, _____ attest that I am the parent/legal guardian of _____who is a minor child.

I give Big Cypress National Preserve permission to use photographs or comments of _____ in the production of educational materials such as exhibits, brochures, newspaper articles, our National Park Service web page or in annual reports for the Swamp Water And Me Program, S.W.A.M.P.

I understand fully that neither my child nor I will receive any form of compensation for the use of his or her photograph or comment.

_____
Signature

_____
Date

Teacher S.W.A.M.P Assessment Form

Please return this in the pre-stamped self addressed envelope within three weeks after your field trip. The information you supply us with will help to create better programs for the future.

Pre-Site Assessment		
Teacher:	Date of Pre-Site:	Pre-Site Ranger:
Did you receive enough materials and guidance in order to properly prepare your students for their field work at Big Cypress?		
Did you use the Pre-Site Study materials from the Teacher's Guide in order to inform your instruction? If so, which ones and in what way did you use it? If not, why?		
Do you have any suggestions for the improvement of the Pre-Site Study?		
Did you use the Pre-Site Lesson Plans in order to prepare your students for their field work at Big Cypress? If so, which ones? If not, why?		
Do you have any suggestions for the improvement of the Lesson Plans?		
Did you use any of the materials in the backpacks provided for you in order to prepare your students for their field work? If so, in what way? If not, why?		
Do you have any suggestions for how to improve the backpack provided for your classroom?		
During your Pre-Site Ranger visit, was the ranger knowledgeable and engaging? Did the ranger act in a way that was inappropriate or to deter from the success of your students?		

Field Trip Activities Assessment

One is the lowest; Five is the highest.

Teacher:						Rangers:
Activity	1	2	3	4	5	Why did you give this rating?
Radio Telemetry						
G.P.S.						
Animals						
Water						
Vegetation						
Soil						
Weather						
Extra activities						
Overall field trip						

Field Trip Experience Assessment

Did you receive enough information and instructions to be able to successfully conduct the field trip?	
Was the length of time of the field trip adequate?	
Was the Ranger knowledgeable and engaging? Did the ranger act in a way that was inappropriate or to deter from the success of your students?	
What did the students enjoy the most? Why?	
What did the students enjoy the least? Why?	

Post-Site Assessment	
Did you use any of the Post-Site Lesson plans? If so, which ones? If not, why?	
Did you give the Pre- and Post-Assessment to determine how much your students learned from this experience? If so, how did they do? If not, why?	
What new information did you learn about Big Cypress?	
What new information did you learn about ways that you can help protect the wildlife of Big Cypress?	
What would you like to see done differently with this program?	
Would you be willing to help in the development of new or improved materials and activities for this program? If yes, how can we contact you?	

Additional Comments: