

BAYOU



BIG HANDBOOK

Bayou Interpretative Guide

This B I G Handbook has been prepared as a public service by volunteers from the League of Women Voters of the Bay Area with the aid and advice of many experts. A copy was given to each person who attended the Bayou Interpretive Guide training program sponsored by the Clear Lake branch of the American Association of University Women. Any comments or corrections will be gratefully received.

Additional copies are available from the editor :

Marylou Morrow, EQ Chairman

League of Women Voters of the Bay Area
18227 Barbuda Lane
Houston, Texas 77058

Arrangements for guides to lead groups through the Armand Bayou area may be made by contacting one of the volunteers on the lists available in the Harris County and City of Pasadena Parks and Recreation Departments, and in the Pasadena, La Porte, or Freeman Public Libraries, or by contacting the :

Citizens' Environmental Coalition

1200 Bissonnet

Houston, Texas 77003 Phone 524-7451

INSTRUCTIONS FOR ARRANGING A GROUP TOUR OF THE ARMAND BAYOU AREA

1. Call Mr. Jim Harris, Director of the city of Pasadena Parks and Recreation Department, at 477-4424 or 4425, and make a reservation for the day and time you wish to lead a group through the area.
2. Pick up the key, making a one dollar deposit and filling out an application form, at the Parks and Recreation Department building at 3111 St. Augustine Street in Pasadena.
3. Return the key and redeem your deposit when you have completed the tour.

Please follow the procedure outlined above, for only by registering with the Pasadena Parks and Recreation Department will an accurate record of the groups touring the Armand Bayou area be kept -- and such a record serves to support the value of preserving the bayou in its undeveloped state.

Thank you

3
I meant to do my work today --
But a brown bird sang in the apple tree,
And a butterfly flitted across the field,
And all the leaves were calling me.

And the wind went sighing over the land
Tossing the grasses to and fro,
And a rainbow held out its shining hand --
So what could I do but laugh and go ?

Richard LeGallienne

Bees in the late summer sun
Drone their song
Of yellow moons
Trimming black velvet,
Droning, droning a sleepysong.

Carl Sandburg

"Who's that tickling my back ?" said the wall.
"Me," said a small
Caterpillar. "I'm learning
To crawl."

Ian Serraillier

GUIDELINES FOR A SUCCESSFUL TOUR

1. Be prepared with your trail guide information. Review your guidebook and keep adding new findings. Wear comfortable shoes, long trousers and dust on sulphur powder to keep off chiggers.
2. Give basic instructions before you start. i.e. You are a visitor in a busy community. Let's keep it like it is. If you find a turtle shell, a hollow log or an armadillo skull, squelch the desire to take it home. If you are curious about a tree or plant species, notice small details and make a sketch instead of removing a sample.
3. Let the bayou or forest have its turn to speak. Don't be a chatterbox. Let your group take time to listen and observe.
4. Relate the new information to what the group members already know. Be flexible. Each group is different in age, background and attitude. Foster a sense of surprise, discovery and curiosity.
5. Encourage tour members to stretch their minds and use their senses. Let them look for evidence of animal homes, of subsidence, of how this place looks in changing seasons, varied weather conditions and different times of day.
6. Keep learning. Texas Parks and Wildlife magazine, science and nature shelves of Freeman, Pasadena, La Porte libraries as well as the universities and junior colleges, Channel 8, the Houston Museum of Natural Science in Hermann Park and the Mc Ashan Botanical Arboretum in Memorial Park are all good sources.
7. Guiding in pairs is an effective technique used in schools as team teaching, in Scouts as co-leaders and in summer day camps. It gives two points of view and allows more flexibility in case of a nosebleed, bee sting or other surprises.
8. Remember section 6 and section 17 of the Antiquities Code of Texas states a penalty of \$50 to \$1000 and/or 30 days in jail for removing, altering, destroying or swiping artifacts and implements from Indian campgrounds or dwellings. There are several archeological sites on Armand Bayou land.
9. Let your group teach you. And let them know you want their ideas, facts and feelings.
10. Don't walk so fast that your visitors are looking down too much at their feet. As Clear Lake High student Mark Wood said "It's like concentrating on the bubblegum on the floor of the Louvre!" You miss the greatest treats.

NATURE TRAIL

This Armand Bayou guided nature trail is intended only as an initial guide for volunteer trail interpreters. It is difficult to pinpoint any one area or object as representing a particular concept or bit of knowledge. Many of the labeled stops could have been positioned at several other spots along the trail.

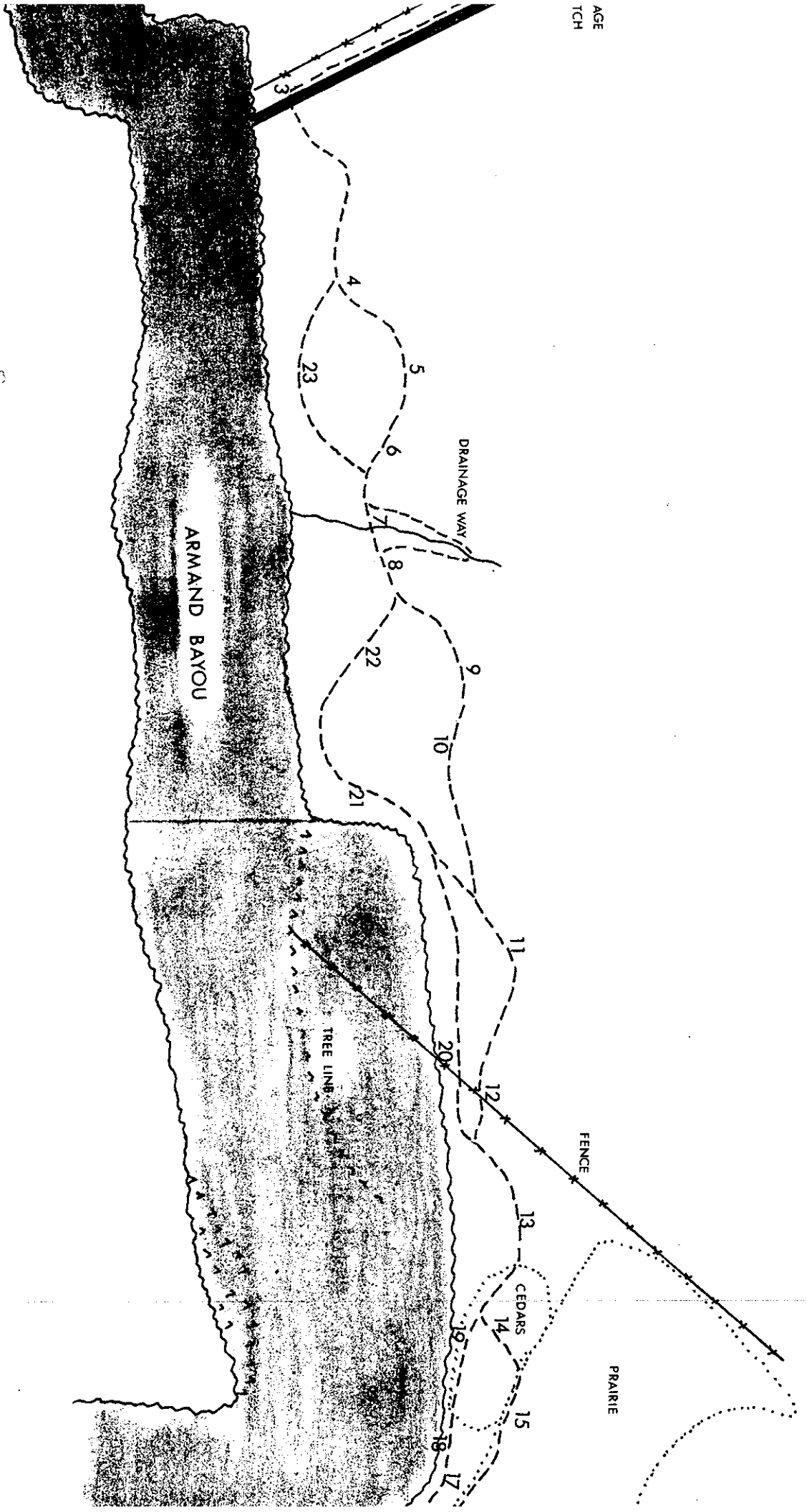
After you become familiar with the area, you may wish to change the order of stops where you feel the information given may be better exemplified or add stops of your own. There are many intersecting trails through this small section of Armand Bayou. Explore other trails for additional interest or variation. Several of the trails next to the bayou will only be accessible during low tide. Be flexible. The nature walk experience you furnish your group will be limited only by the bounds of your observation, imagination, and knowledge (as well as your group's).

Before the walk begins, encourage your group to take home "trophies" such as memories, photographs, poems, or sketches inspired by the area rather than physical objects or live specimens. Armand Bayou belongs to everyone and should be left as nearly natural and untouched as possible.

ARMAND BAYOU

Nature Trail

AGE
TCH



STOPS

1. Man Made Drainage Ditch

This ditch was constructed in recent years to deliver runoff water from higher grounds along Bay Area Boulevard to the bayou. With the present increase in land development, precipitation which would normally penetrate the ground runs off roofs, roads, and parking areas. Man has built many such ditches to drain land that can no longer absorb the heavy rainfalls.

2. Plant Succession

Vegetation was removed from the banks of this ditch during construction. Over time, small plants became established in the bare soil. Their roots form an interlocking net which holds the soil in place (notice erosion where plant cover is sparse). In time trees and shrubs move in from surrounding seed sources. The small pine trees across the ditch are an example of this. If the area were left undisturbed, hardwoods such as oak and hickory would move in and replace the pines. This process is known as plant succession.

3. Energy Dissipators

The concrete floor blocks which you will step on to cross the ditch are installed to slow the force of the water as it enters the bayou.

4. Open Area

The low density of tall trees in this area allows much light and moisture to reach the forest floor. Notice the heavy growth of low, diverse vegetation which thrives in the sunlight. Applying the concept of plant succession discussed previously, what would you expect to happen to this area?

As you enter the thicker forest, notice any differences in wind, temperature, and sounds.

5. Shaded Area

All plants and animals have adaptations to places where they live and to the things that live with or on them; they accommodate themselves to the environment.

The dense canopy formed by the trees overhead catches the sun before it penetrates well to the floor and the soil beneath is very moist. How has the vegetation here adapted itself to these conditions?

6. Roots

Roots you see crossing the trail have been exposed by trampling feet and water. Roots absorb water and minerals from the soil and anchor the tree in place. There is as much of the tree hidden below ground in the form of roots as there is above ground. The roots seem to know which direction to go to reach water and a

larger number of roots can often be found extended toward a stream. Where plenty of minerals and water can be found the roots will form a interlacing mass.

7. Natural Drainage-Way

This is one of the ditches nature has formed to deliver runoff water to an outlet. These small drainageways are interlaced all through the bayou. Without the formation of these ditches the flat lowlands of the bayou area would be entirely flooded in heavy rains.

The role of Armand Bayou Park as a natural stream and floodplain zone cannot be stressed enough. Preservation of the bayou in its natural state will prevent increased water runoff from encroaching suburban development, thus reducing the need for costly and unsightly channelization.

8. Indicator Plants

Lengthy and frequent flooding of this area has greatly reduced the amount and kinds of vegetation which will survive here. The presence of palmettos indicates that the area is often inundated (just as the presence of sagebrush would indicate semi-arid conditions). Plants whose very presence tell of a particular environmental condition are called indicator plants. Can you think of any other indicator plants?

9. Decomposition

Dead material littered along the forest floor is in the process of decomposition. Soil bacteria and soil fungi (mushrooms, etc.) break down the dead material returning the major portion to the air in gaseous form, and the remainder, now mostly humous, mingles with the soil and becomes re-used by other organisms.

Without such decay, dead matter would form heavy accumulations, minerals would remain tied up in organic debris, and soils would stagnate.

Notice the abundance of mushrooms and other fungi where the soil is moist and there is a presence of dead organic matter.

10. Pine Remnants

These pines are remnants in a typically mixed hardwood forest. Disturbance by man has probably resulted in these pine seedlings establishing themselves here. Given time, and no further disturbance, these pines would once again be replaced by hardwoods.

Pine needles are tight, cylindrical leaves bound in bunches or fascicles (in this case three to a fascicle). The pine leaves have a resistant covering and can live up to two years.

11. Plant Adaptations To Light

Observe how leaves are arranged on stems and twigs so they don't shade one another and in this way get the most possible energy from the sun. Leaf edges are often notched which allows light to reach the lower leaves, and in the same manner, stalks of lower leaves are longer than stalks of upper leaves

Vines have weak stems and so use other plants for support so that its leaves and flowers may catch the sunlight. Common vines in this area are greenbriar, Virginia creeper, grape, and supplejack.

12. Fence Line

This fence line was built by Jimmy Martyn who made his home along Armand Bayou in 1894.

13. Fallen Log

Watch this rotting wood for awhile and you should see several forms of insect life. This log serves as a home for insects which will help nature return the decaying wood to the soil.

Looking away from the bayou is a dead tree full of holes made by the pileated woodpecker. Dead trees serve an important role as homes and food for a large animal population.

14. Cedar Grove

Notice that these cedars are planted in several straight rows. Mr. Martyn planted many cedars on his land. Cedar logs were shipped in a family sloop down the bayou to a lumber mill in Galveston. He also planted pear trees, several of which are still standing alongside this grove of cedars.

15. This prairie was cleared as part of the Old Martyn Ranch. Shrubs and trees have yet to move into this clearing which provides shelter and food for many small forms of wildlife.

16. Fallen Cedar

This old cedar has been toppled by the combined action of wind and soil erosion. As the bayou stretches its sides with increased runoff and subsidence it washes soil from the banks. Loss of soil from the root area of trees decreases their support allowing a heavy wind to blow them over. Notice that the roots remaining in the soil are receiving enough water and minerals to keep a portion of the cedar alive.

17. Indian Shell Midden

Various indian tribes may have lived or wintered in the Clear Lake area for several thousand years. This shell midden locates one of their campsites on the eastern shore of Armand Bayou. The park area contains at least six relatively undisturbed indian occupation sites. Archaeologists plan to develop an exhibit here and thus it is most important to preserve the area as it is and not to destroy further any of the historical information available to us.

18. Exposed Roots

Root form is easily visible here where water has washed the soil away. Notice the size and growth form of these roots. What appears to be the fate of these trees and why?

19. Mulletts

The fish you see jumping in the bayou are mullets. Mulletts live in the salt water of the gulf and travel up into the bays to spawn in warm, fresh water. They are herbivores and so live only on vegetation. They travel in schools to find food. In deep water areas mullets may reach a length of two feet.

20. Subsidence

Subsidence of this area becomes very evident when you see how the land which this fence divided is now covered with water. It is estimated that elevations in this area have dropped as much as six feet. The major cause is believed to be the withdrawal of subsurface waters for industrial and domestic purposes and, locally, the withdrawal of petroleum and natural gas. Following this withdrawal the clay and sand subsurface layers compact resulting in a general lowering of the surface. Predictions are that even if the use of underground aquifers is stopped, settling will continue to an ultimate level six feet below the present elevations.

21. Animal Life

Armand Bayou Park serves as a home for many different forms of animal life which are representative of three major merging natural environments --- the southern mixed hardwood forest, the Gulfcoast tall grass prairie, and the coastal salt marshes. Known to occur in the area are 17 species of mammals, 338 species of birds, 34 species of reptiles and amphibians, and 56 species of fishes and invertebrates. It is expected that many more species will be found here as studies are continued.

Watch for animals or their signs such as homes, voices, droppings or tracks.

22. Moss, Lichen, and Fungi

"Spanish moss" is a misleading name for the plant hanging from the trees above because it is neither Spanish nor moss. Nor is it a parasite, as is commonly believed, but relies on the branches of trees for support.

Lichen, found growing on the surrounding tree trunks and fallen branches is a combination of algae and fungus. The algae produce food and the fungi provide protection. They are both so closely associated that botanists consider the lichen as a single species; neither the fungus or algae exists alone in nature.

Mushrooms and other fungus fruiting bodies contain no chlorophyll and so are not able to produce their own food. They come in many colors but have no sign of the living green of other plants. Some of them are parasites, as certain species of bracket fungi observable in the bayou which are deadly enemies of living trees. Most of the fungus species we see are saprophytes and live on dead vegetation.

The mushroom is a saprophyte. Notice the many kinds of mushrooms varying greatly in color, size, and form. Wherever they appear it means that sometime previous the mushroom spores have been planted

there. There they threw out threads which have penetrated the food substance and gained a successful growth, which finally resulted in sending up the fruiting bodies we call mushrooms.

23. Value of Armand Bayou

In a highly urbanized area like Houston, it is vital that such remaining natural systems continue to remain undeveloped to perform the free services that such areas render -- dust and noise reduction, temperature modification, storm water storage and absorption, assimilation and biodegradation of pollutants of air and water, and recycling of nutrients such as carbon, nitrogen, and sulfur.

There is also the great ecological value of the tidal habitat itself, not only in replenishing nutrients to the land by tidal overflow, but also providing either nursery grounds or feeding areas or both for countless birds, fishes, and other vertebrates, shellfishes, and innumerable micro-organisms, all of which depend on the bayou for food, shelter, and protection.



RACCOON

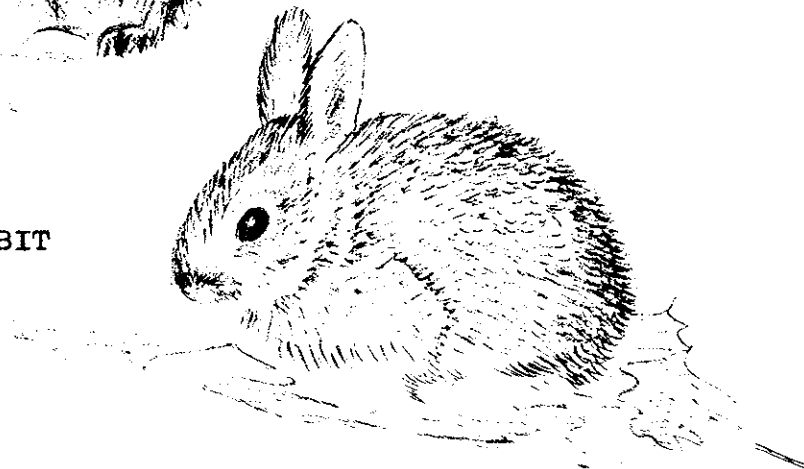


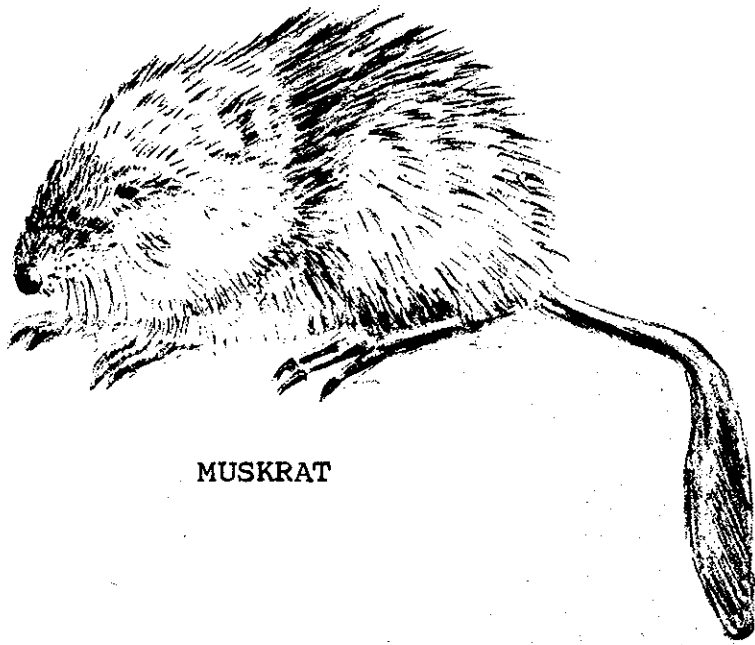
WHITE-TAILED DEER

BOBCAT

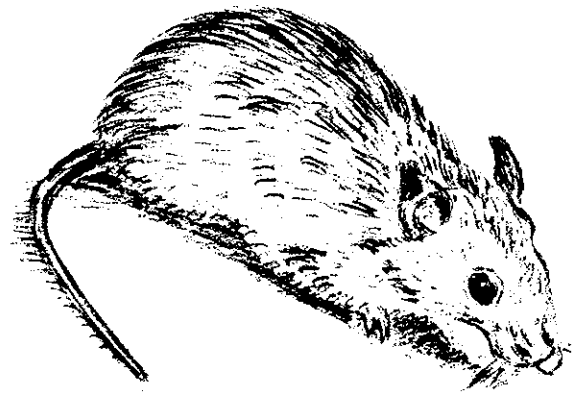


SWAMP RABBIT





MUSKRAT



WHITE-FOOTED MOUSE



SHORT-TAILED SHREW

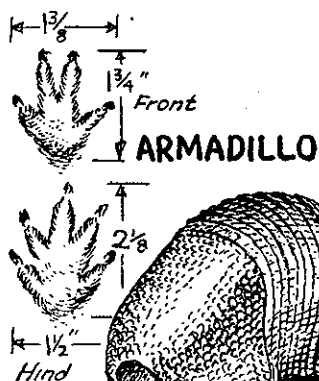
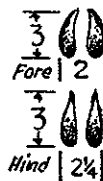
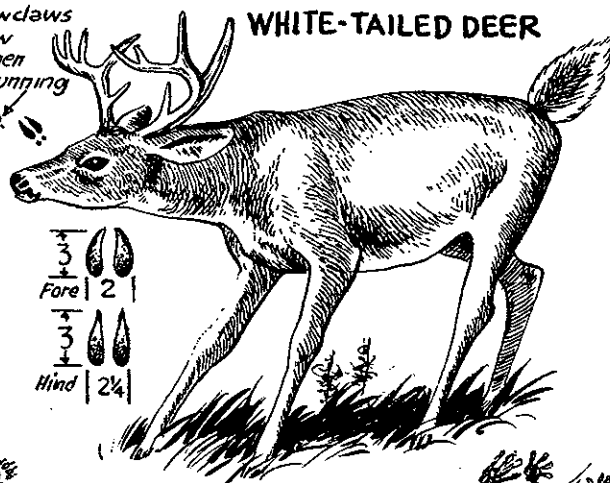
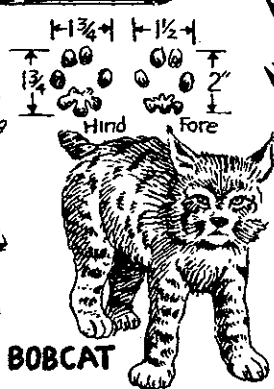
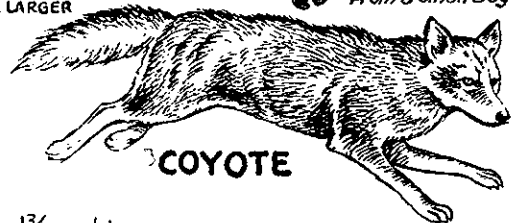


EASTERN GRAY SQUIRREL

Price

TEXAS TRACKS

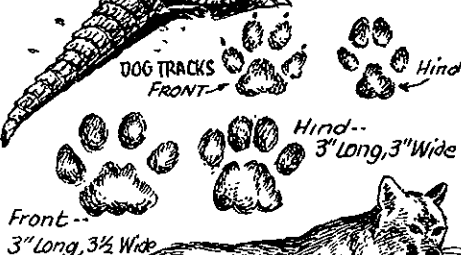
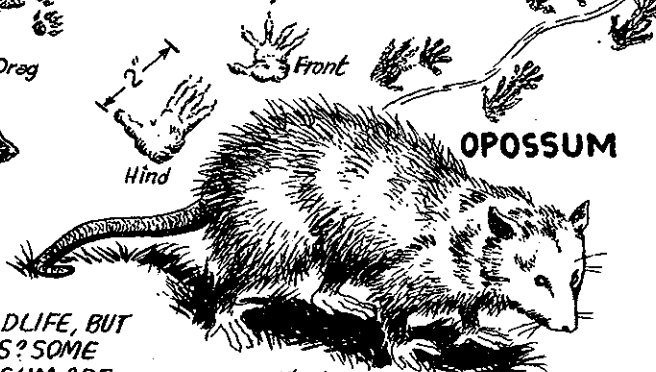
DO YOU KNOW THEM?



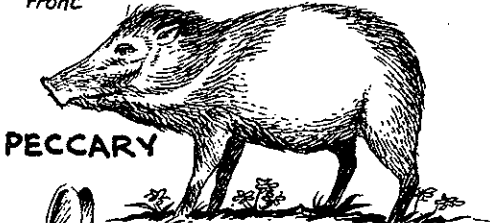
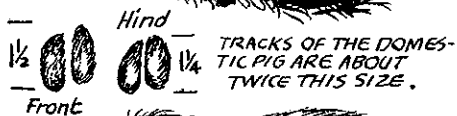
ARMADILLO



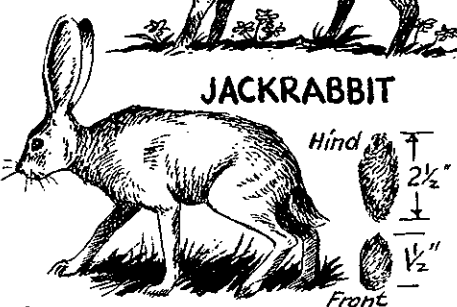
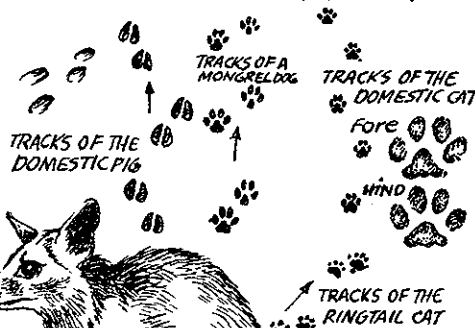
SKUNK



YOU MAY KNOW TEXAS WILDLIFE, BUT DO YOU KNOW THEIR TRACKS? SOME LIKE THE RABBIT AND POSSUM ARE EASILY RECOGNIZED. OTHERS SUCH AS THE COYOTE, DEER, PECCARY, AND BOBCAT MAY BE CONFUSED WITH THEIR DOMESTICATED COUSINS THE DOG, PIG, AND HOUSE CAT. TRACKS ARE EASILY FOLLOWED IN SNOW OR LOOSE SAND, BUT PRINTS MADE IN SOFT MUD ARE BEST FOR STUDY.



COTTONTAIL RABBIT
Hind 2" Fore 1"



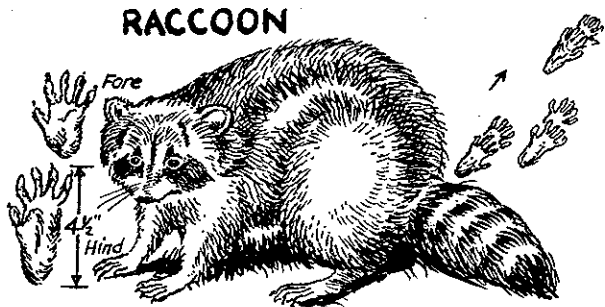
JACKRABBIT
Hind 2 1/2" Fore 1 1/2"



FOX SQUIRREL



RINGTAIL



RACCOON

THE

10

COMMANDMENTS OF SHOOTING SAFETY



1. Treat every gun with the respect due a loaded gun. This is the cardinal rule of gun safety.

2. Guns carried into camp or home must always be unloaded, taken down or have actions open; guns always should be encased until reaching the shooting area.

3. Always be sure that the barrel and action are clear of obstructions.

4. Always carry your gun so that you can control the direction of the muzzle, even if you stumble. Keep the safety on until you are ready to shoot.

5. Be sure of your target before you pull the trigger.

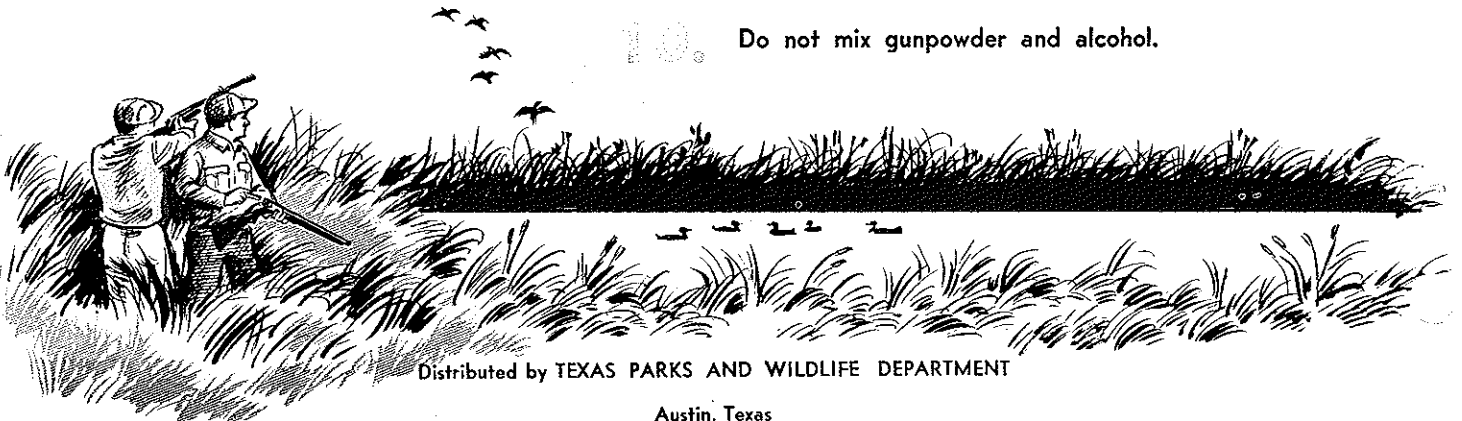
6. Never point a gun at anything you do not want to shoot.

7. Unattended guns should be unloaded; guns and ammunition should be stored safely beyond reach of children and careless adults.

8. Never climb a tree or a fence with a loaded gun.

9. Never shoot at a flat, hard surface or the surface of water.

10. Do not mix gunpowder and alcohol.



Distributed by TEXAS PARKS AND WILDLIFE DEPARTMENT

Austin, Texas

SOME HISTORICAL NOTES ON THE ARMAND BAYOU AREA

Archeological data indicate that the Clear Lake area had been occupied by various Indian tribes for several thousand years. According to the Texas State Historical Survey Committee, the proposed Armand Bayou park site contains a "minimum of six relatively undisturbed archeological sites." One of the most important, a shell midden, lies right on the east bank of the Bayou south of Bay Area Park. The available archeological information is not yet definitive, and new discoveries are being made all the time. Hence, the importance of preserving these sites.

In the 1870's about a dozen pioneer families settled on the east bank of Middle Bayou, north of the present Clear Lake Forest subdivision. This small settlement flourished for several decades. These early residents lived by hunting, fishing, and raising produce which they floated in barges down the bayou to market.

Jimmy Martyn lived near the banks of Middle Bayou from 1894 until his death at the age of 85 in 1964. The Martyn family raised cattle and produce, and cut cedar logs which were shipped in a family sloop down Middle Bayou to a lumber mill in Galveston. The Martyns' pear orchard, cedar plantation, hurricane house, barn, and cattle-loading chute can still be seen.

Jim West, another well-known resident of the area, owned at one time some 30,000 acres surrounding Middle and Horsepen Bayous. West raised cattle and maintained his ranch as a game preserve for deer, turkey, quail, peccary, and prairie chicken. In 1938 the Humble Oil and Refining Company (now Exxon U.S.A.) purchased the entire J. M. West ranch for its oil and gas resources. In 1962 Humble created a real estate subsidiary, the Friendswood Development Company, and placed under its control 15,000 acres for residential and commercial development, and 7,250 acres for industrial development--Bayport.

NASA's selection of 1698 acres of the former West ranch for the Manned Spacecraft Center in 1962 added impetus to development, and construction in Clear Lake City and Clear Lake Forest was started in the middle sixties. In 1967 Bay Area Boulevard was built, cutting the proposed park site in half. During this construction the Friendswood Development Company donated to Harris County 64 acres of land south and east of the bridge for Bay Area Park.

The movement to preserve Armand Bayou began in January 1970 after the tragic death of Armand Yramategui, the late curator of the Burke-Baker Planetarium and one of Texas' leading conservationists. Mr Yramategui considered Middle Bayou a priceless natural area, and it is especially fitting that it was renamed in his memory.

COMMENTS ON THE ECOLOGY OF THE ARMAND BAYOU AREA

Armand Bayou is ecologically unique, for along its banks merge three distinct habitats ; the southern mixed hardwood forest, the Gulf coast tall grass prairie, and the coastal salt marshes, thus forming a biological transition zone. This bayou is one of the last in the area with most of its watershed course virtually intact. The diverse habitats it provides foster a wide variety of flora and fauna, and make it possible to observe the intricate inter-relationships of various eco-systems. Its location on the Mississippi flyway is most important, for the woodlands, marshes, and prairies offer cover, food, and nesting places fast disappearing in other areas of this section of Texas.

Coastal Salt Marshes and Estuarine Areas

Armand Bayou is an estuary -- a tidal stretch of a coastal river where the fresh water and the salt water mingle -- extending approximately twelve miles from Clear Lake to its headwaters just north of Spencer Highway in Pasadena. Most of the bayou is an upper estuarine area with variable salinity and moderate tidal action. The bayou and its tributaries -- Horsepen Bayou from the west, and Willow Springs Bayou, Spring Gully, and Big Island Slough from the east -- drain 54 square miles of southeast Harris County.

Shallow marshes provide nutrients, spawning areas, and protection for many marine organisms, including the economically important blue crab, brown and white shrimp, menhaden, Atlantic croaker, sand and spotted trout, and red and black drum. Such salt grass marshes also provide important feeding and breeding areas for aquatic birds such as the great blue heron, green heron, Louisiana heron, and the black-crowned night heron. The mottled duck and the wood duck nest in marshy places and a variety of other ducks use them for feeding and refuge during the winter.

An estuarine tidal marsh is one of the world's most productive ecosystems, with a possible output of six times more protein than an Iowa cornfield. Armand Bayou is especially important to the Gulf coast shrimp industry, for about 98% of all Texas seafood landings are dependent on estuaries. If an estuary is properly protected, it will continually produce economic returns without any cost for maintenance -- it never runs out or down !

Coastal Prairies

The Gulf coast tall grass prairie is part of a series of coastal terraces that slope very gently toward the Gulf. Armand Bayou partially drains an ancient delta of the Brazos River. Tall grass coastal prairies were a part of the vegetative cover of this section of the state but today only remnants remain -- most commonly seen on railroad rights of way, roadsides, cemeteries that have been protected from grazing, or on land managed for hay meadows. On the ranchlands the natural climax grasses -- little bluestem, big bluestem, Indiangrass, eastern gamagrass, switchgrass, Virginia wildrye, and others -- have been so suppressed by heavy grazing that it is difficult to determine how much of them remain.

Restoration of the prairie is planned, and technical assistance has been offered by the U. S. Department of Agriculture Soil Conservation Service.

FLOODPLAIN FORESTS

Bayous cutting through a prairie along the upper Gulf Coast are frequently bordered by forests. Forests require considerable amounts of moisture and in prairie country will generally grow naturally only in a flood plain--i. e. land along a watercourse subject to periodic flooding.

Forests absorb rain water and release it slowly into the bayou and into the atmosphere through evaporation. Roots of trees and shrubs increase the porosity of the soil and allow water to penetrate into the ground.

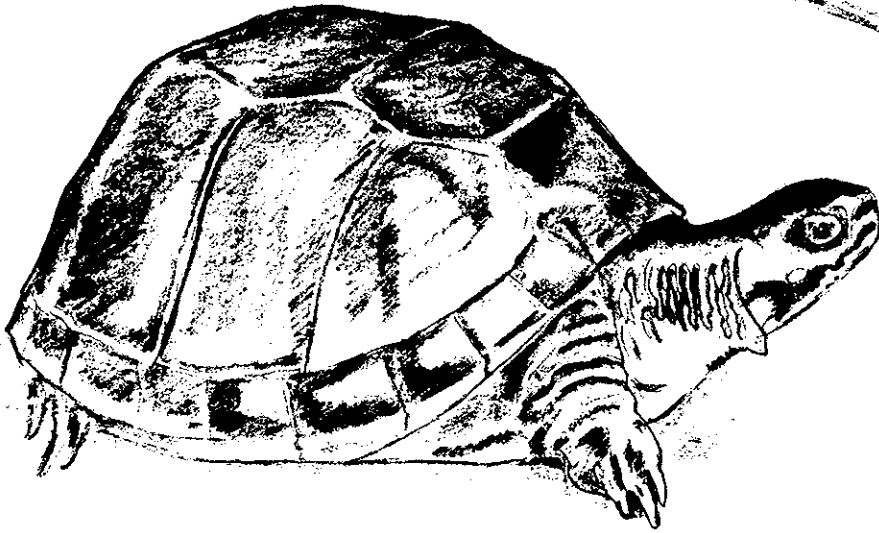
When forests are cleared--as has been the case along most bayous--the volume of rain water and the velocity of its flow into the bayou is greatly increased. Fertile top soil, no longer held in place by a network of roots, is washed away. A muddy stream and barren land results. Water which was once absorbed by vegetation now runs off rapidly carrying a load of silt. The danger of downstream flooding increases, and silt deposition in the lower bays and estuaries may destroy shrimp, oysters, and fish.

Forests are conservers of soil and water as well as providers of raw material. They can serve as barriers -- to hot polluted air, harsh sounds, and solar radiation -- at the same time as they restore the atmosphere with volumes of oxygenated air.

" The forest is a community, or a whole complex of interwoven communities, dynamic and ever changing, in which millions of living creatures struggle for water, sunlight, soil nourishment, and space in which to grow. Some grow because others die, decay, and decompose. The blight of one can be the blessing of another. Others benefit through cooperation or partnership, such as that between the fungus and algae in a lichen. . . . Insects and animals benefit plants by carrying pollen. Wherever insects are abundant, other insects come to eat them. An abundance of insects means an abundance of birds; the young of insect-eating bird species hatch at the very time when insects are nearing their maximum numbers for the year -- such is the marvelous mechanism of the biological clock. "

quoted from the National Park Guide

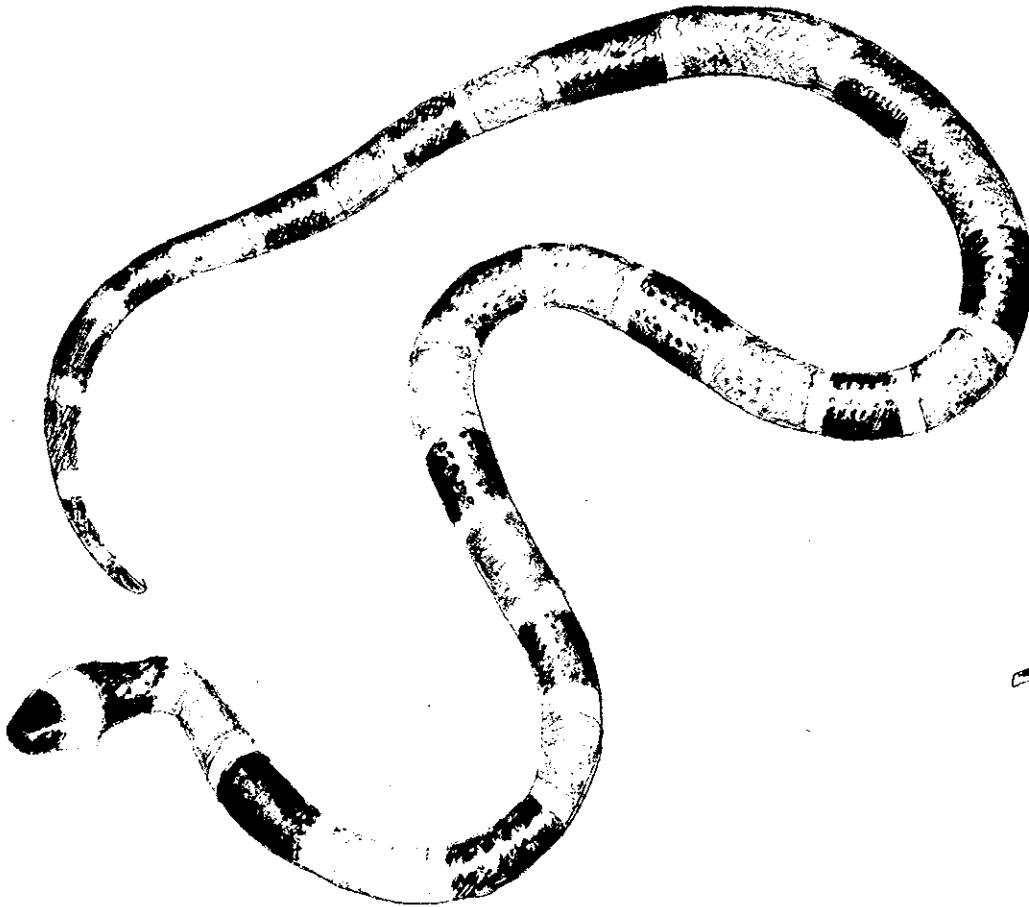
THREE-TOED BOX TURTLE



GREEN ANOLE
LIZARD



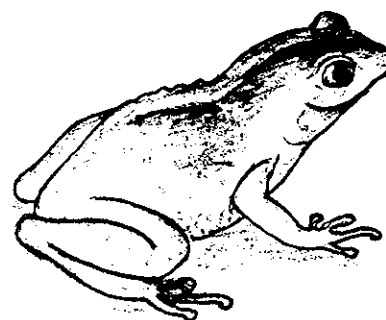
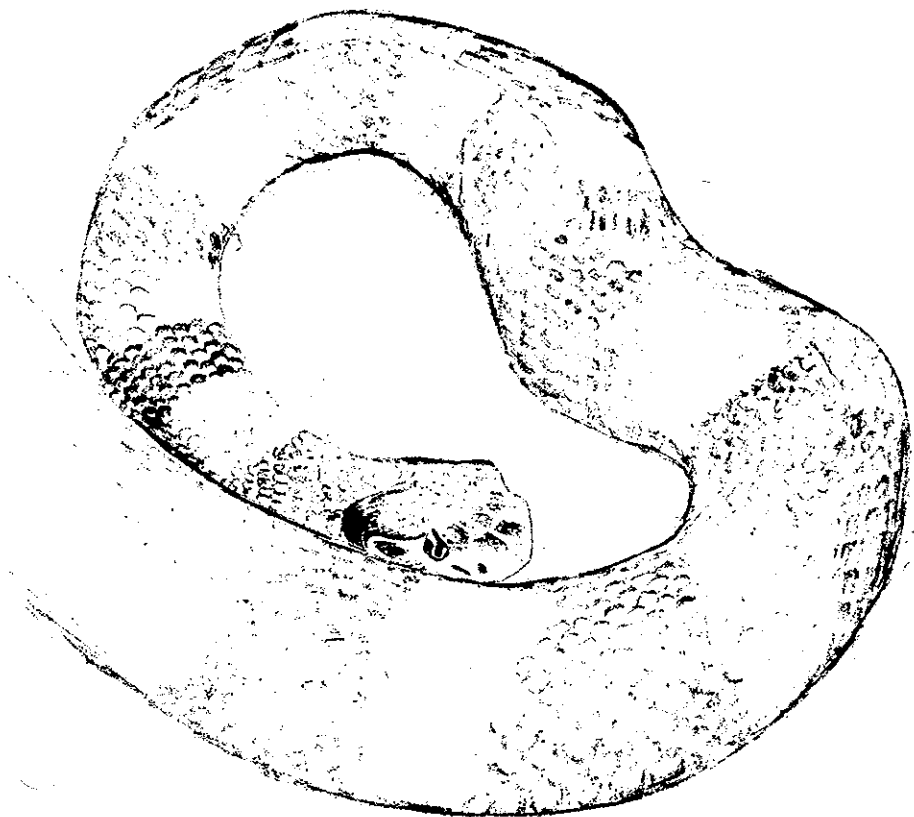
FIVE-LINED
SKINK



TEXAS CORAL SNAKE

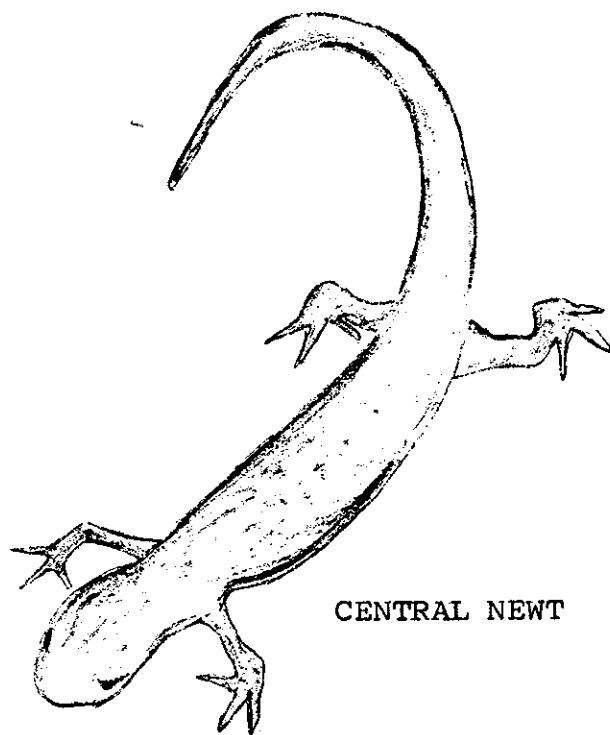
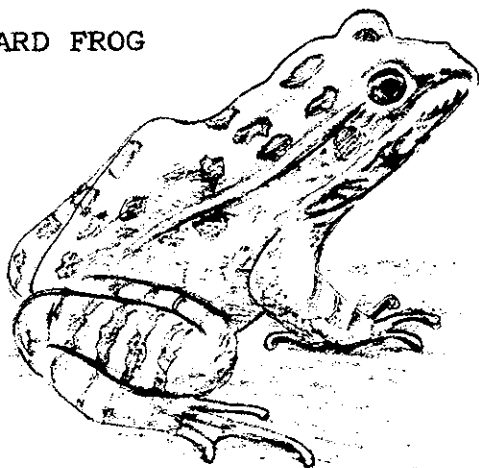
Price

SOUTHERN
COPPERHEAD



GREEN TREE FROG

LEOPARD FROG



CENTRAL NEWT

VEGETATION

Individual plants and animals do not exist in isolation--they are members of interdependent communities which support them and which they in turn help support. These biotic communities are not static but are forever changing. The changes may take place slowly, on a small scale, and may be almost imperceptible, or they may be quite noticeable. They may occur in response to changing climate or geological conditions, to catastrophic events such as fire, hurricane, disease, or to disturbance resulting from man's activities. A cleared forest, for instance, will gradually be revegetated by a succession of plant forms, beginning with grasses and herbs and ending with trees. The change in species is rapid at first and becomes slower with time. Eventually species change becomes very slow; this is known as the climax stage.

The land along the east side of Armand Bayou has been farmed. There are a number of openings in the forest in various stages of plant succession (regrowth). An open area is first invaded by sun-loving herbs--grasses, weeds, wild flowers; these are replaced by black berries, sea myrtle (eastern baccharis); then by southern red cedar, willow oak, loblolly pine, and persimmon. Gradually slow growing trees and other plants capable of growing in the dim light under the tree canopy will come in--the elms, ashes, hickories, and oaks, and a number of shrubs and vines--yau-pon holly, American beautyberry, trumpet creeper vine, Virginia creeper, greenbrier, mustang and muscadine grape vine, Alabama supplejack (rattan-vine), and Carolina jessamine. During the intermediate stages the brush species often become very dense. Gradually, as the canopy closes and there is less light, the understory vegetation will thin out.

The west side of the bayou has been disturbed much less. The trees are older and the forest is more mature. The same species of plants occur there as on the east side, but there are more oaks and fewer elms.

The presence of a variety of plant communities provides habitat for a variety of animal species. The woolly croton which tends to grow in disturbed areas, for instance, is an important dove food. Seeds of the sugar hackberry and American beautyberry provide food for many birds particularly in the early winter when food is becoming short.

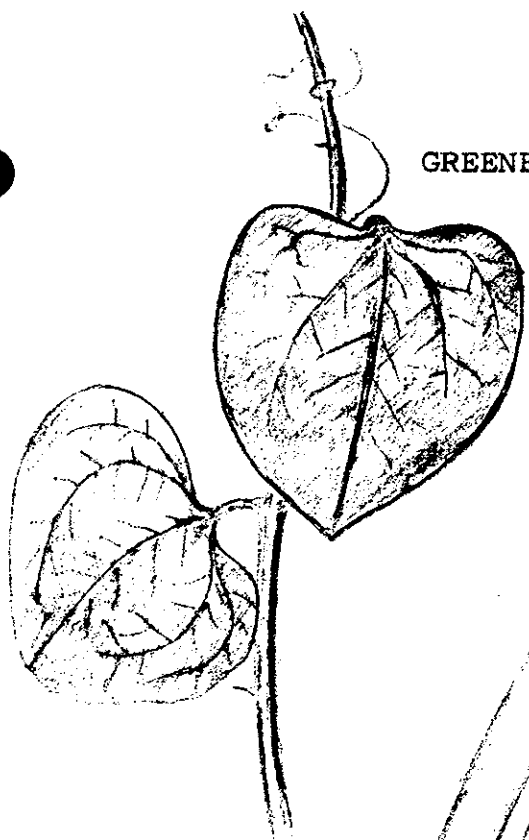
At Armand Bayou another type of plant succession is occurring. As the land subsides and water level rises, wetland plant species will gradually, and over a long period of time, replace upland species. This may involve replacement of forest by marsh vegetation.

There is a natural zonation of plants as one moves from the edge of the water to higher ground. Near the water's edge is a shrub zone dominated by sea myrtle which will grow in water up

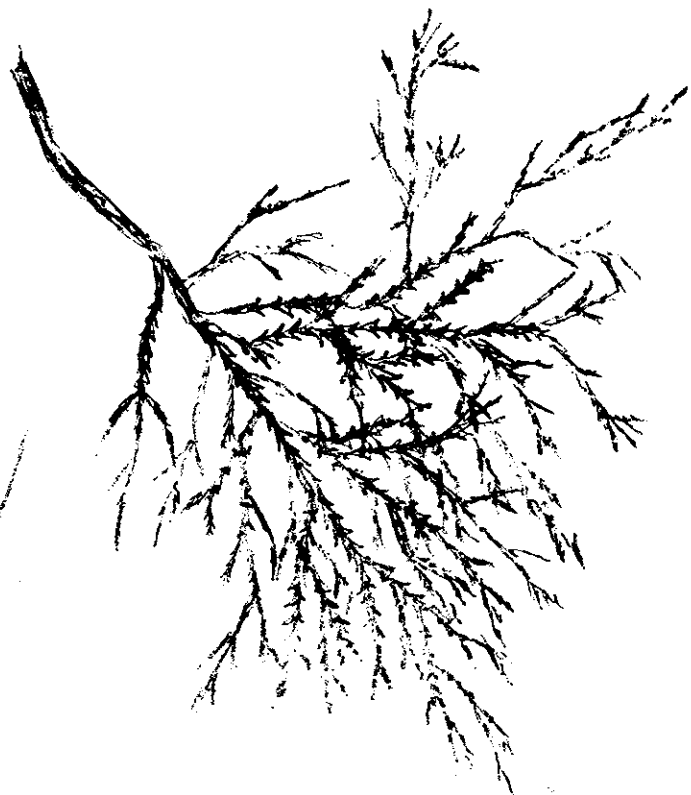
to about six inches deep. Adjacent to the water where flooding is frequent we find mostly cedar elm, winged elm, and a number of vines. These trees which grow in waterlogged areas where roots can not obtain enough oxygen are, in general, smaller and less vigorous than trees in better aerated soil. There are a number of dead trees near or in the water which have been drowned as a result of land subsidence. Many of these trees are draped with Spanish moss. Spanish moss gets its nutrients and moisture from the dust and the rain and grows along the edge of the bayou where it is exposed to the wind. Spanish moss is not a parasite and does not harm trees. Cypress trees and willows do not grow along the bayou because they can not tolerate the brackish estuarine water.

Among other less abundant species of trees are Carolina linden and Western soapberry. Moving to higher ground, one finds willow oaks, water oaks, elms, ash, the southern red oaks, sugarberry, hickories, and finally pine and post oak.

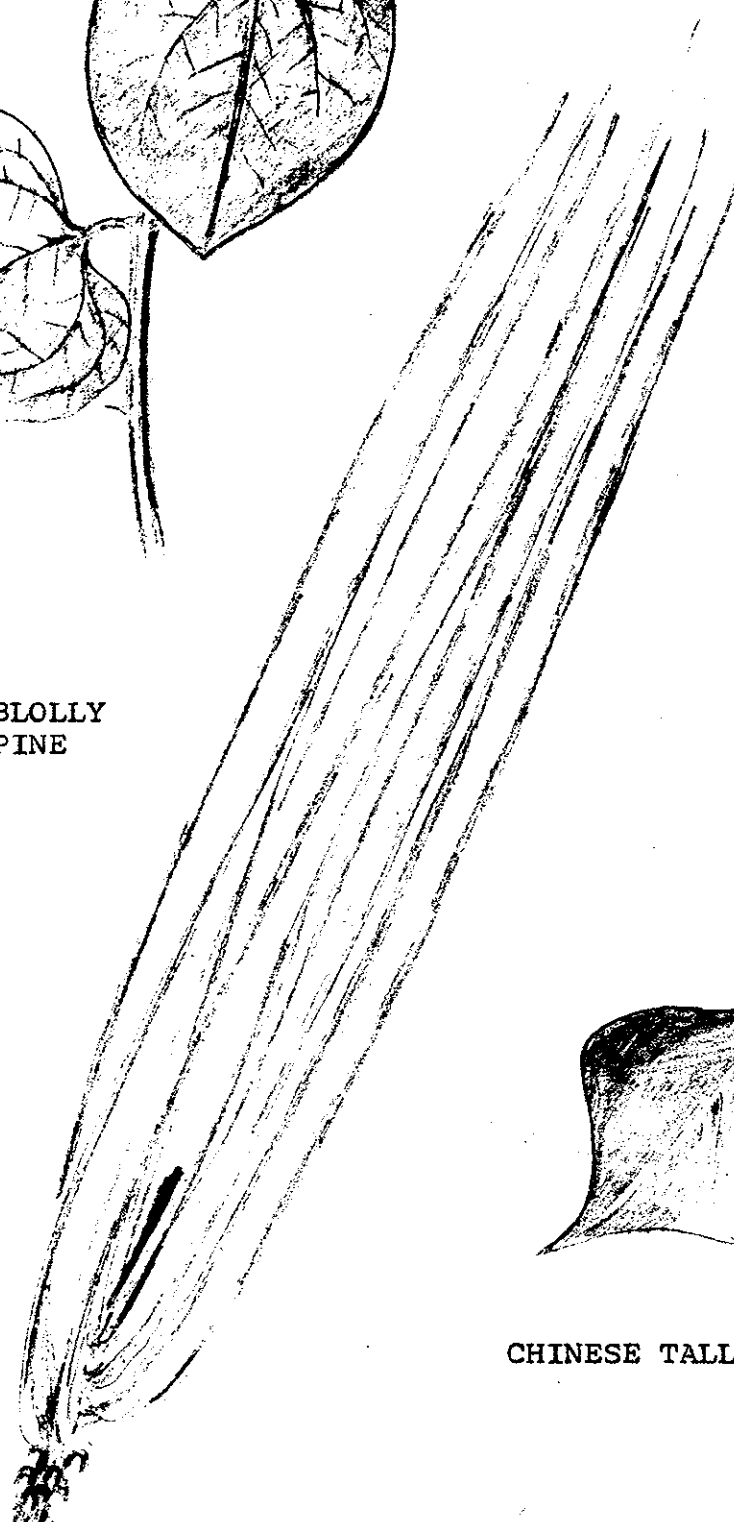
GREENBRIAR



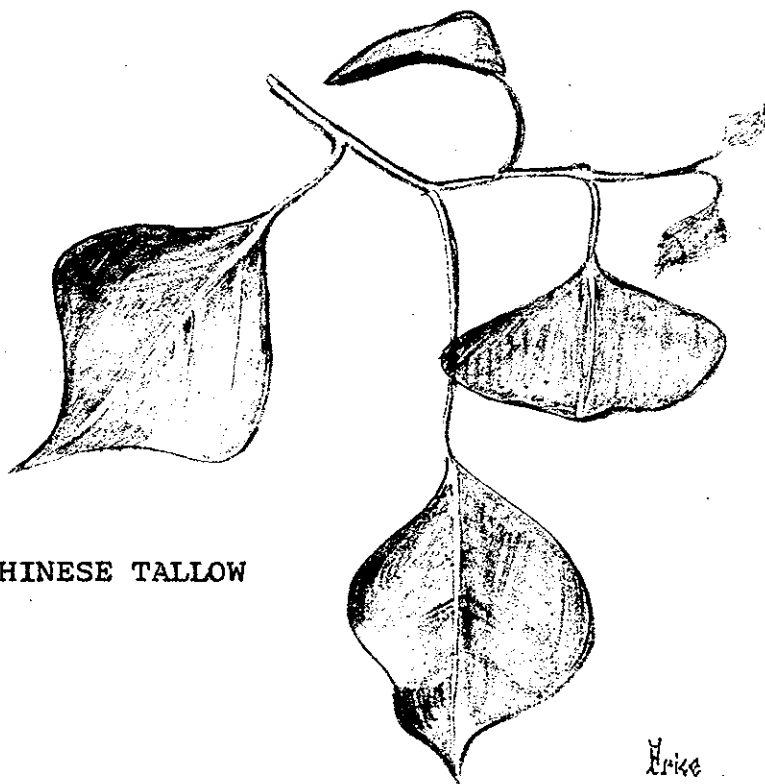
SEACOAST JUNIPER



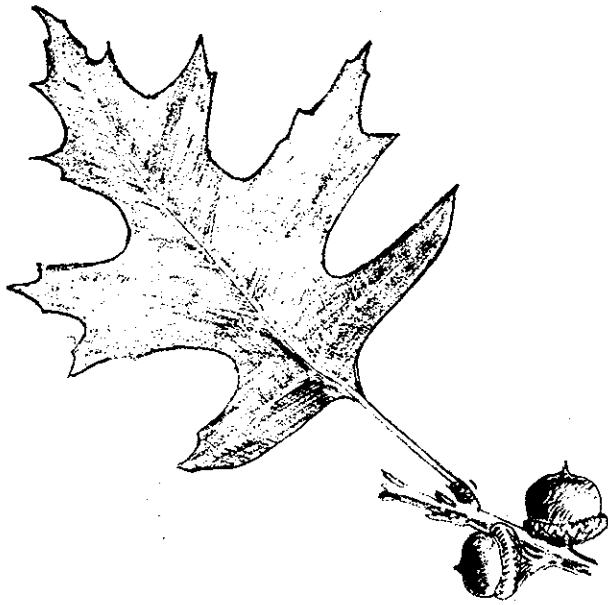
LOBLOLLY
PINE



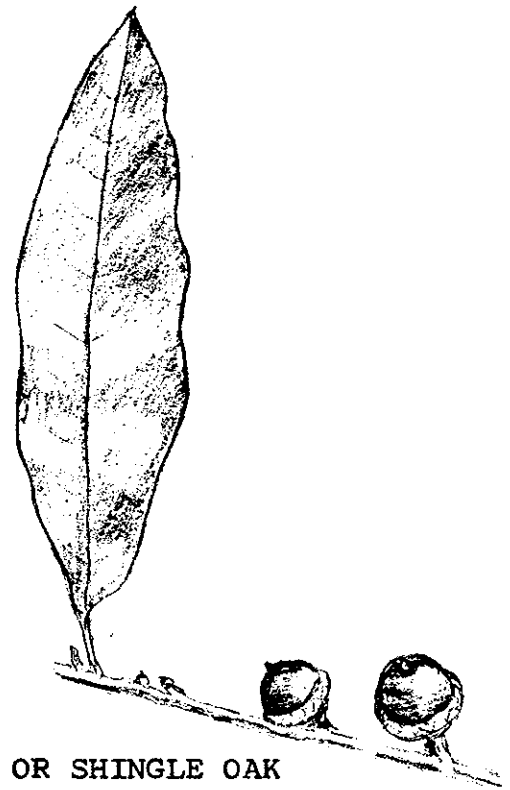
CHINESE TALLOW



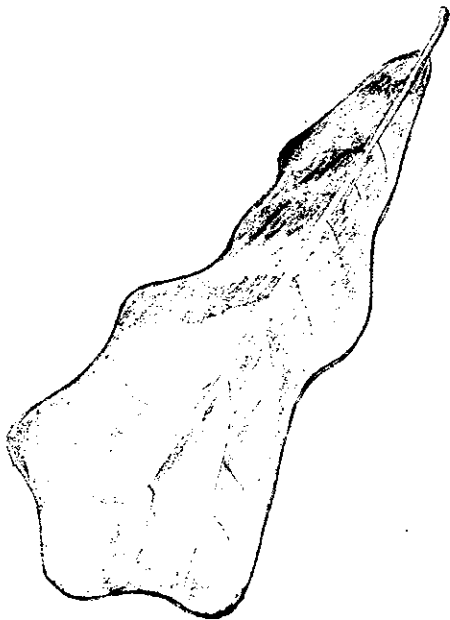
Price



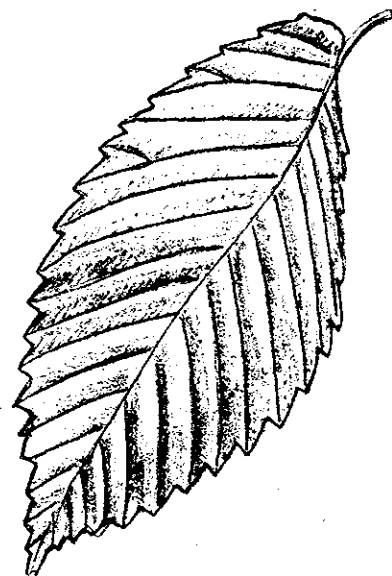
PIN OR WATER OAK



WILLOW OR SHINGLE OAK



BOTTOMLAND POST OAK



AMERICAN ELM

BIRDS SIGHTED IN ARMAND/HORSEPEN BAYOU AREA

Eared Grebe
Pied-billed Grebe
Double-crested Cormorant
Olivaceous Cormorant
Anhinga
Great Blue Heron
Green Heron
Little Blue Heron
Cattle Egret
Common Egret
Snowy Egret
Louisiana Heron
Black-crowned Night Heron
Yellow-crowned Night Heron
Least Bittern
American Bittern
Wood Stork
White-faced Ibis
White Ibis
Roseate Spoonbill
Canada Goose
White-fronted Goose
Snow Goose
Blue Goose
Mallard Duck
Mottled Duck
Gadwall
Pintail
Green-winged Teal
Blue-winged Teal
Cinnamon Teal
American Widgeon
Shoveler
Wood Duck
Ring-necked Duck
Lesser Scaup
Ruddy Duck
Turkey Vulture
Black Vulture
Cooper's Hawk
Red-tailed Hawk
Red-shouldered Hawk
Swainson's Hawk
Broad-winged Hawk
White-tailed Hawk
Marsh Hawk

Osprey
Sparrow Hawk
Bobwhite
King Rail
Virginia Rail
Common Gallinule
American Coot
Killdeer
American Woodcock
Common Snipe
Spotted Sandpiper
Solitary Sandpiper
Willet
Greater Yellowlegs
Lesser Yellowlegs
Least Sandpiper
Long-billed Dowitcher
Western Sandpiper
Black-necked Stilt
Herring Gull
Ring-billed Gull
Laughing Gull
Bonaparte's Gull
Forster's Tern
Common Tern
Royal Tern
Caspian Tern
Rock Dove
Mourning Dove
Yellow-billed Cuckoo
Black-billed Cuckoo
Barn Owl
Screech Owl
Barred Owl
Whip-Poor-Will
Common Nighthawk
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher
Yellow-shafted Flicker
Pileated Woodpecker
Red-bellied Woodpecker
Red-headed Woodpecker
Yellow-bellied Sapsucker
Hairy Woodpecker
Downy Woodpecker

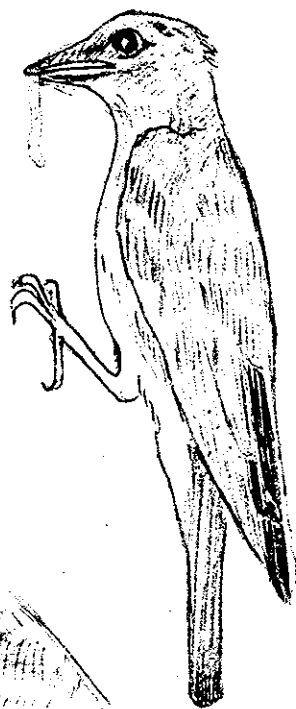
Eastern Kingbird.
Scissortail Flycatcher
Great-crested Flycatcher
Eastern Phoebe
Acadian Flycatcher
Least Flycatcher
Eastern Wood Pewee
Horned Lark
Tree Swallow
Bank Swallow
Rough-winged Swallow
Barn Swallow
Purple Martin
Blue Jay
Common Crow
Carolina Chickadee
Tufted Titmouse
Brown Creeper
House Wren
Winter Wren
Carolina Wren
Long-billed Marsh Wren
Short-billed Marsh Wren
Mockingbird
Catbird
Brown Thrasher
Robin
Wood Thrush
Swainson's Thrush
Veery
Eastern Bluebird
Blue-gray Gnatcatcher
Golden-crowned Kinglet
Ruby-crowned Kinglet
Water Pipit
Cedar Waxwing
Loggerhead Shrike
Starling
White-eyed Vireo
Yellow-throated Vireo
Red-eyed Vireo
Black and White Warbler
Worm-eating Warbler
Orange-crowned Warbler
Nashville Warbler

Parula Warbler
Yellow Warbler
Magnolia Warbler
Myrtle Warbler
Black-throated Green Warbler
Yellow-throated Warbler
Chestnut-sided Warbler
Ovenbird
Northern Waterthrush
Louisiana Waterthrush
Kentucky Warbler
Yellowthroat
Yellowbreasted Chat
Hooded Warbler
Canada Warbler
American Redstart
House Sparrow
Bobolink
Eastern Meadowlark
Redwinged Blackbird
Orchard Oriole
Baltimore Oriole
Rusty Blackbird
Boat-tailed Grackle
Common Grackle
Brown-headed Cowbird
Scarlet Tanager
Summer Tanager
Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Painted Bunting
Dickcissel
Purple Finch
American Goldfinch
Rufous-sided Towhee
Vesper Sparrow
Slate-colored Junco
White-crowned Sparrow
White-throated Sparrow
Fox Sparrow
Lincoln's Sparrow
Song Sparrow
Wild Turkey

SNOWY EGRET

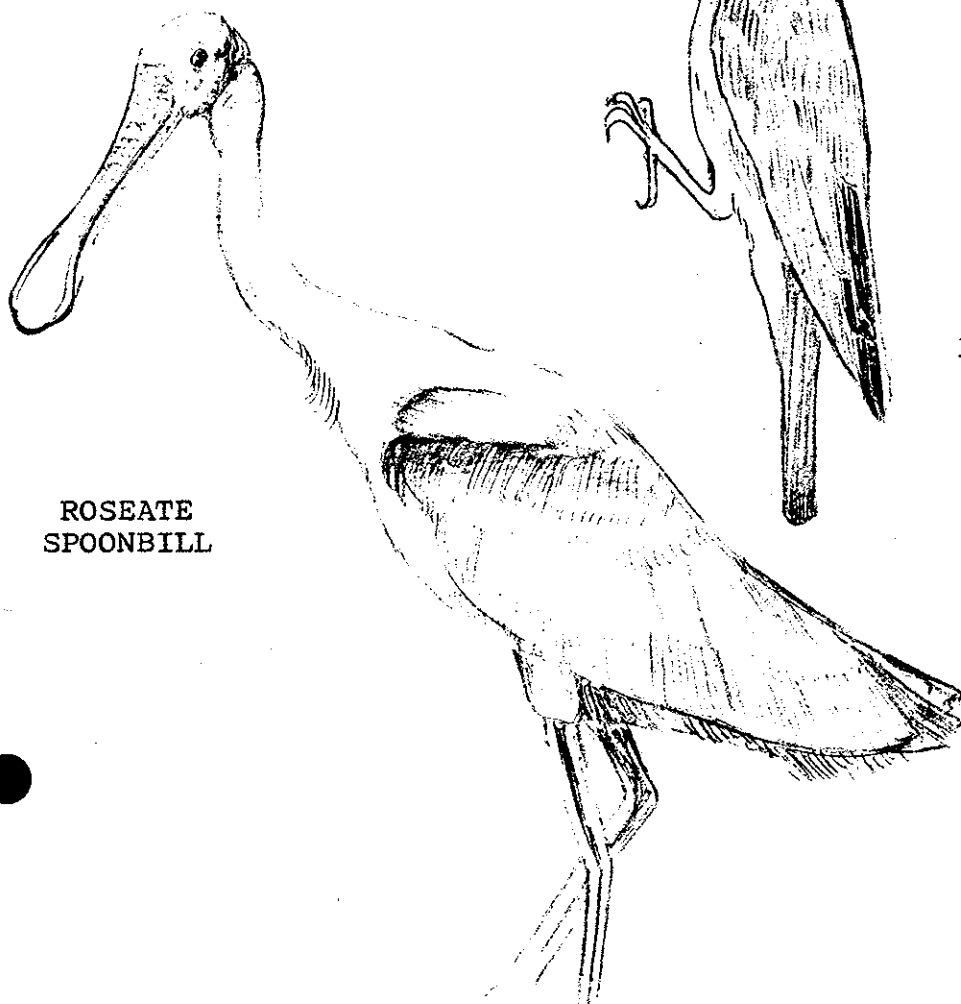


TURKEY
VULTURE

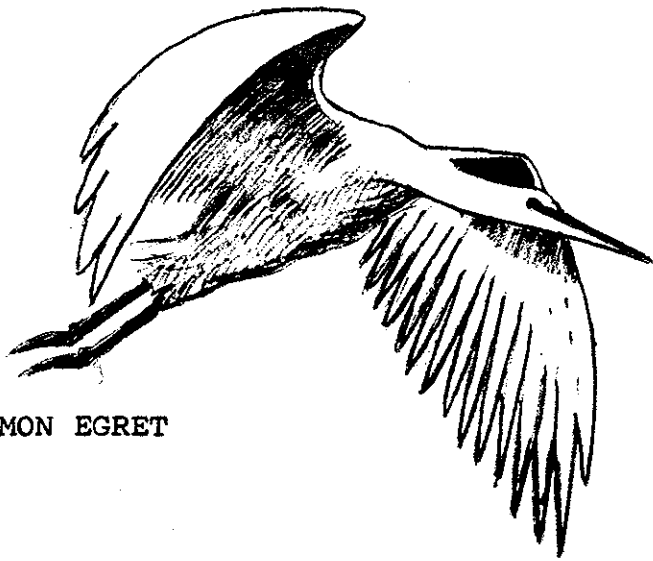


EASTERN BLUEBIRD

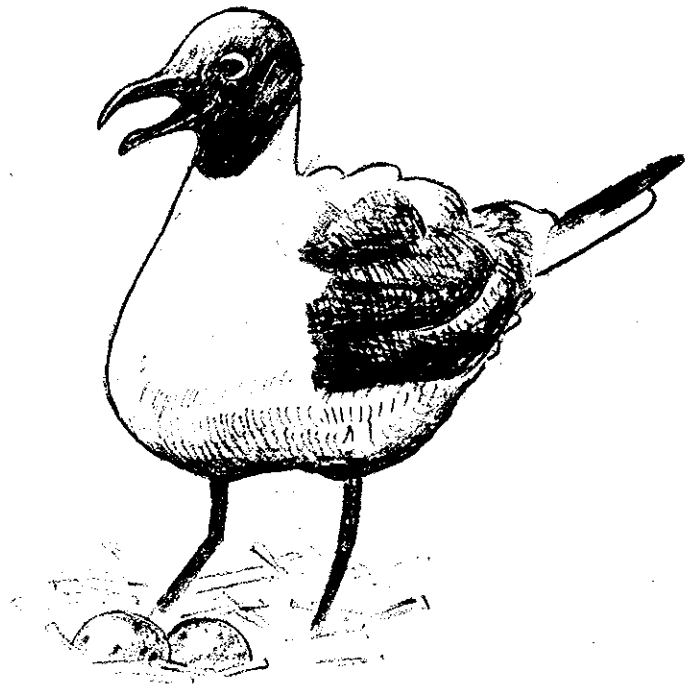
ROSEATE
SPOONBILL



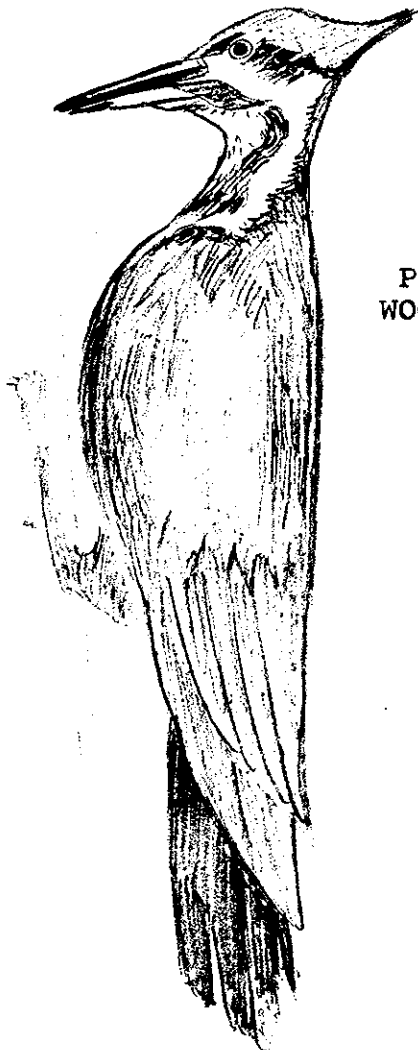
Price



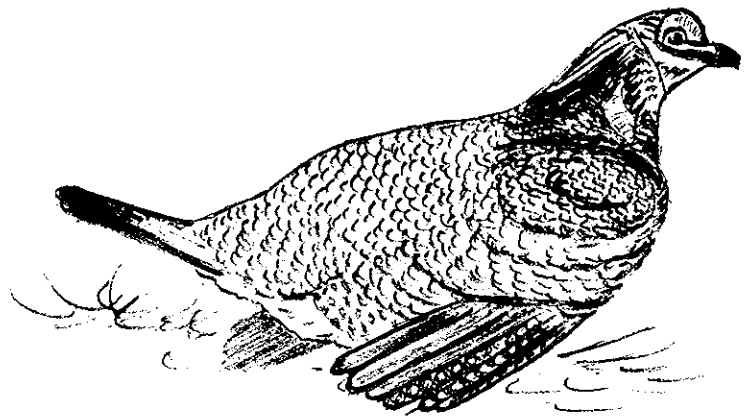
COMMON EGRET



LAUGHING GULL

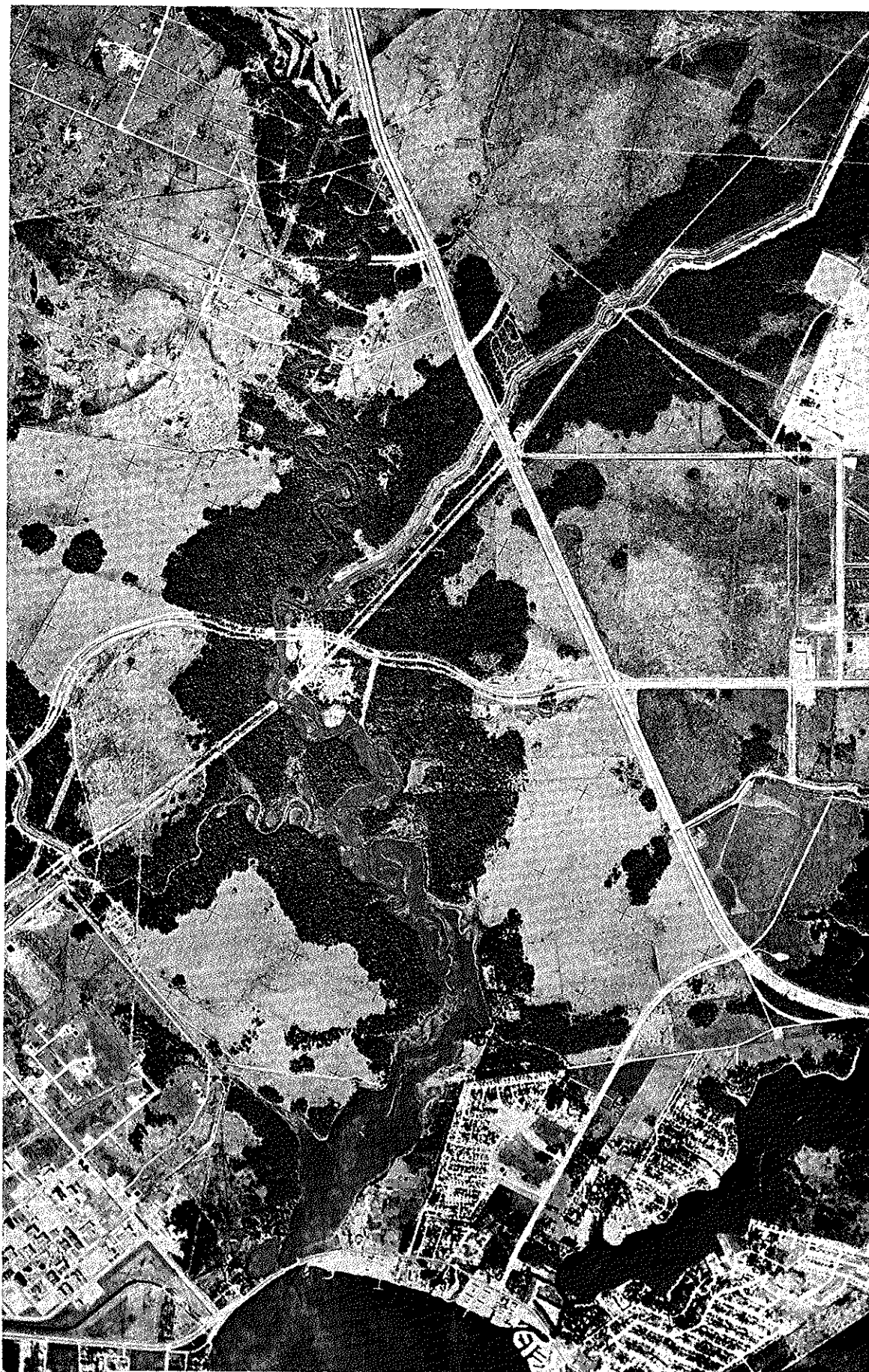


PILEATED
WOODPECKER



PRAIRIE CHICKEN

Price



11-3-1970

NASA photo

A NATURE CENTER FOR ARMAND BAYOU

The movement to preserve Armand Bayou and to create a 3000 acre park is gaining momentum. Harris County, with the help of a 50% matching grant from the U. S. Bureau of Outdoor Recreation, will soon be buying 404 acres along Armand Bayou and expects to buy 805 more acres with another BOR grant in 1975. This, added to the 955 acres already acquired by the City of Pasadena, will bring the total acreage to 2165. The University of Houston plans to create a 150 acre ecological preserve on adjoining land along Horsepen Bayou, a tributary of Armand Bayou. Thus, the land set aside for preservation will total 2315 acres. To insure the preservation of the bayou an additional 625 acres (north of Bay Area Boulevard) should be acquired.

A general plan for development of a nature interpretive center within the park is now being completed in consultation with the Nature Center Planning Division of the National Audubon Society, the Planning and Review Subcommittee of the Preservation of Armand Bayou Committee, the Houston Audubon Society, the Harris County Parks and Recreation Department, and the Planning and Parks Departments of the City of Pasadena.

Preservation of the wildness and unspoiled beauty of the area for the enjoyment and enlightenment of people is the chief aim of the plan. If it is implemented a proposed program directed by a professional teacher-naturalist staff will help visitors gain an understanding and appreciation of the intricate web of life upon which man depends for survival. It will help young children discover the mysteries and wonders of animal and plant life and will provide teenagers with opportunities for constructive and educational activities. The nature center will serve as a training ground for young scientists, it will permit adults to use its facilities for research and pursuit of hobbies, it will give families a place to walk--through the woods, across the prairie, along the bayou--for enjoyment and pleasant relaxation. The Nature Center will broaden and enrich the lives of the people of the Houston-Galveston area.

With this plan emphasis will be on providing an outdoor experience, and only those facilities will be developed that are needed to enable the general public and school groups to see and enjoy the area safely with minimum impact on the natural resources. These facilities will include an interpretive building with exhibits to help orient the visitor, elevated walkways over wetlands, a floating dock for the study of aquatic life, animal feeding and observation stations, permanent photographic stations, and outdoor displays.

A trail system through the various bayou habitats and scenic areas will be designed to blend elements of surprise, adventure, and discovery into a rewarding experience. A series of guide booklets, prepared for different age groups and different

seasons and focusing on different aspects of the bayou system, would be available at the start of each trail. A geology trail-guide would explain the composition of earth's surface, how its various features developed, and how they affect the soil and the plants of the area. A soil study guide would focus on the action of water as a soil builder and eroder, and on the relationship of vegetation to the type of soil. A plant succession guide would point out changes in vegetation that occur as a disturbed area gradually returns to its climax stage. An animal home and shelter guide would help the visitor understand how the habitat of the area is used by various animals by pointing out nests, burrows, dens in the ground or in hollow and decaying trees. A transition zone guide would show that areas where different plant communities (prairie, forest, marshland) blend are particularly rich in wildlife. An estuarine guide would point out the importance of vegetation along the bayou in providing nutrients for marine organisms. Such guide books would also be prepared for canoe trails. A special trail for the blind and handicapped will be developed.

Man's dependence on his environment, starting with the earliest inhabitants, will be shown in a historical setting. Archeological and historical features of the park will be developed and interpreted. Exhibits, both at an Indian occupation site near the bayou and in the interpretive building, will add to our understanding of the importance of the estuarine environment not only to the Indian but to modern man as well. The way of life of the early settlers will be recreated in a pioneer homestead and historical museum. At a native crafts center children will be able to observe and participate in household activities of the early settlers such as candle making, organic gardening, food preserving, soap making, wood and metal working, and making dyes from wild plants.

The nature center program will be coordinated with activities of various educational institutions and civic organizations. The center will offer guided nature walks for schools, youth groups, and civic groups. It will conduct workshops for teachers and youth leaders, engage in joint research projects with colleges and universities, plan work-learning projects in cooperation with youth organizations and much more.

Let your officials know how you feel about the proposed park and nature center . . .

Write: County Judge Bill Elliott
Family Law Center
1115 Congress
Houston, Texas 77002

. . . and your own commissioner at the same address

Commissioner Tom Bass

" Jamie Bray

" Bob Eckels

" E. A. Lyons

Also: James U. Cross
Executive Director
Texas Parks and Wildlife Department
John H. Reagan Building
Austin, Texas 78701

And the Texas Parks and Wildlife Commissioners:

Pearce Johnson, Chairman, Del Valle, Texas 78617
Harry Jersig, 315 Paseo Encinal, San Antonio, Texas
Jack R. Stone, Wells, Texas 75976
Max L. Thomas, 4618 Wataugan, Dallas, Texas 75209
Joe K. Fulton, 1905 Vicksburg, Lubbock, Texas 79407
Robert Burleson, First National Bank Bldg., Austin, 78701

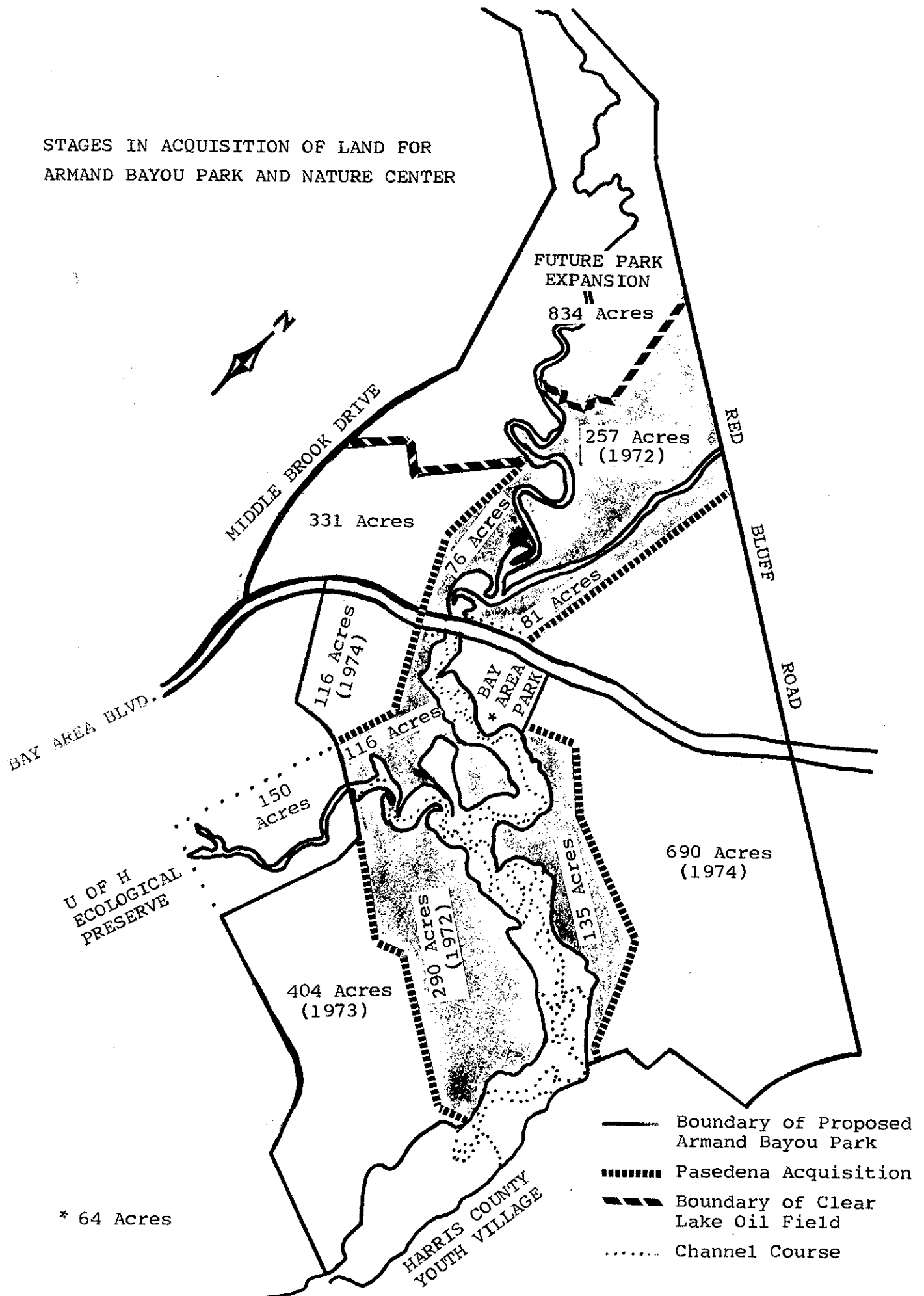
Contact your state legislators, encourage them to express their interest also to the TP&WD and to the Commissioners, and urge them to insure that adequate funds for the acquisition of the park on Armand Bayou are included in the 1974 budget and appropriation bill.

The PRESERVATION OF ARMAND BAYOU COMMITTEE has raised \$438,000 toward the purchase of parkland along Armand Bayou. It hopes to raise additional funds for the land still needed, as well as funds for development of facilities of the nature center and for its operation.

Contributions to the ARMAND BAYOU FUND are tax deductible.
P. O. Box 2000
Pasadena, Texas 77501

The Fund is administered by Armand Yramategui Memorial, Inc. a non-profit charitable corporation.

STAGES IN ACQUISITION OF LAND FOR ARMAND BAYOU PARK AND NATURE CENTER



SOME AIDS FOR WORKING WITH GROUPS

Do your own thing -- express your special interest or enchantment with the area to your group. And realize that the experience that your group has will not be like that of any other group -- but do make it a good experience ! Quote a poem you like . . . or talk about a picture you love . . . Tell a story about something you see . . . or point out a striking comparison. Give your special gift to the group you lead -- and most important of all, have fun !

Perhaps Walt Whitman was speaking to you as you remember your frustrations in understanding nature and your attempts to communicate your concepts, when he wrote :

The earth never tires;
The earth is rude, silent, incomprehensible at first --
Nature is rude and incomprehensible at first;

Be not discouraged -- keep on -- there are divine things,
well envelop'd;
I swear to you there are divine things, more beautiful than
words can tell.

The National Park Service approach to environmental education involves five avenues, called the strands, to help in seeing the total environmental picture.

S P I C E

Similarities and Varieties
cataloguing things by factors that can be observed

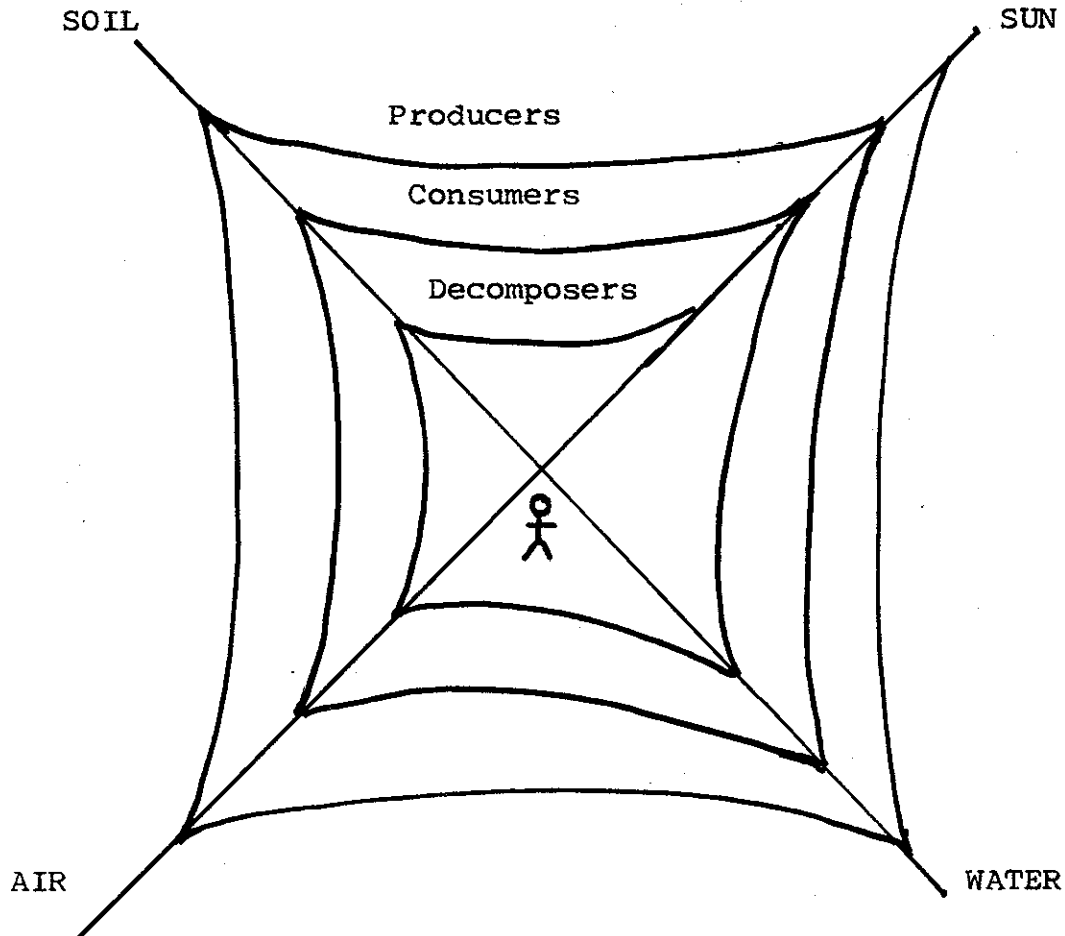
Patterns
organizing factors in such a way that they can be
easily recognized

Interaction and Interdependence
showing that nothing exists in isolation; everything is
constantly interacting with living and non-living things.

Continuity and Change
studying processes in living and non-living things that
are always changing

Evolution and Adaptation
looking at how things alter and develop over long periods
of time

THE WEB OF LIFE



The Web of Life is actually an ecosystem.

In an ecosystem the living and non-living elements interact using the energy of the sun and inorganic material to manufacture food -- then use the stored food and return it through the decomposers to simple inorganic substances.

Light, air, water, and soil are the elements of life . . .
Life is divided into producers, consumers, and decomposers . . .
Homes in a defined area form a community . . .
Inhabitants of these communities live together in competition,
cooperation, or neutrality . . .
MAN is the chief predator !

"When we try to pick out anything by itself, we find it
hitched to everything in the universe." John Muir

may my heart always be open to little
birds who are the secrets of living
whatever they sing is better than to know
and if men should not hear them men are old

Excerpt from MAY MY HEART ALWAYS BE OPEN TO LITTLE BY E. E. Cummings

The strands alone are not enough. You must relate to nature in a personal way, directly or indirectly, before you can communicate effectively with others.

To see a world in a grain of sand
And a heaven in a wild flower,
Hold Infinity in the palm of your hand
And Eternity in an hour.

William Blake

SOME TECHNIQUES FOR DEVELOPING SENSORY AWARENESS

SIGHT -- Try a bug's eye view of the world -- get down on your hands and knees -- grass blades are immense, trees are scarcely perceived.

When you walk past an interesting area, stop for a moment. . . Suppose that you have been blind and have just recovered your sight. . . Look again at your interesting area with increased awareness.

SOUND -- As you walk and see, take the time to be still and listen. What do you hear ? Happy sounds ? Busy sounds ? Lazy sounds ? Frightened sounds ? Pleasant sounds ?

SMELL -- Take time to smell too. What kinds of smells do you notice ? Nice ones ? Unpleasant ones ? Spicy or sweet ? Salty ? Marshy ? Can you tell where you are by what you can smell ?

TOUCH -- What can you feel ? The moist earth, the grainy sand, bark that is smooth and some that is very rough, leaves that are fuzzy and some that are smooth and very delicate, stones that are rounded and rocks that are jagged.

Remember the Don't touch 's -- poison ivy and poison sumac, any Indian artifacts, don't put a hand in a hole --

TASTE -- We do not use our sense of taste in this place, for we could not without destroying something, without depleting the area for the enjoyment of the next visitor.

When leading a group, you could supply a snack of things that might grow in the wild, and talk about them as you munch -- such as raisins, grapes, nuts, sunflower seeds, berries, and other fruit.

Remember to be flexible and adapt to your particular group. Age, cultural background, degree of sophistication, previous experience all influence an individual's attitude about the environment. Try not to get in a rut -- look for changes in the area every time you are there.

ENVIRONMENTAL AWARENESS ACTIVITIES

Nature's Kaleidoscope -- The leader selects an area with a variety of ground cover; then gives each person a handful of variously colored toothpicks and instructs them to scatter their own. Thirty seconds are allowed to pick them up again. The player with the most wins. Discuss protective coloration, bright plumage to attract (reproduction) or distract (danger).

Animal Locomotion -- Ask the group to move from their present location to another one nearby. In so doing each person must use the type of movement of some animal other than man. You, as the leader, must be the first one to take off -- hopping, crawling, slithering.

Trust Walk -- This activity blocks out one sense thereby stimulating the others. Let each person pick a partner. One is blindfolded and then led through an area where he must step over, under, through, and around obstacles. He is guided only by hand motions as he holds hands with his partner. The leader with his partner leads the way.

Creepy Crawler Race -- Ask each person to find a small crawling animal (beetle, caterpillar, worm, etc.) Draw a circle in the dirt and mark the center. Start the creepy crawlers at the center and see which reaches the edge of the circle first. Or you could time them with a stop watch.

Build a Bird's Nest -- Let each person try to build a bird's nest, finding his own materials and doing the construction himself.

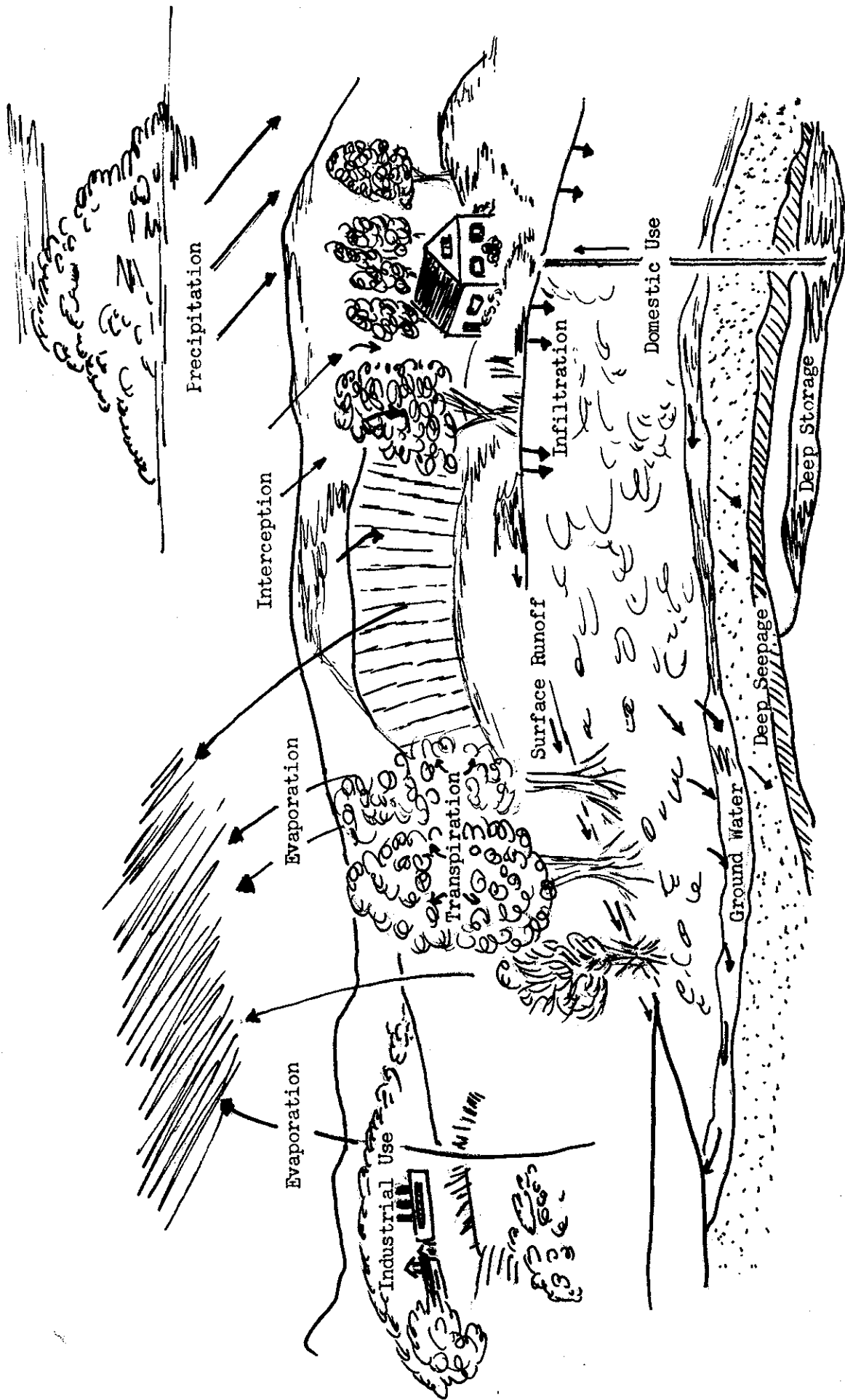
Area Census -- Divide into teams, each having one forester, one geologist, botanist, bird expert, entomologist, mammalogist, etc. Each team is given XX minutes in which to list everything found in their special area. . . or all teams could use the same area.

Roadside Cribbage -- Each player is given 10 pebbles, wood chips, blades of grass, or whatever, and a list of more than 10 items to be found on the hike. Whenever a listed item is seen, the player who first sees and calls out the name of the item can throw away one pebble. The one who first throws away his tenth pebble wins.

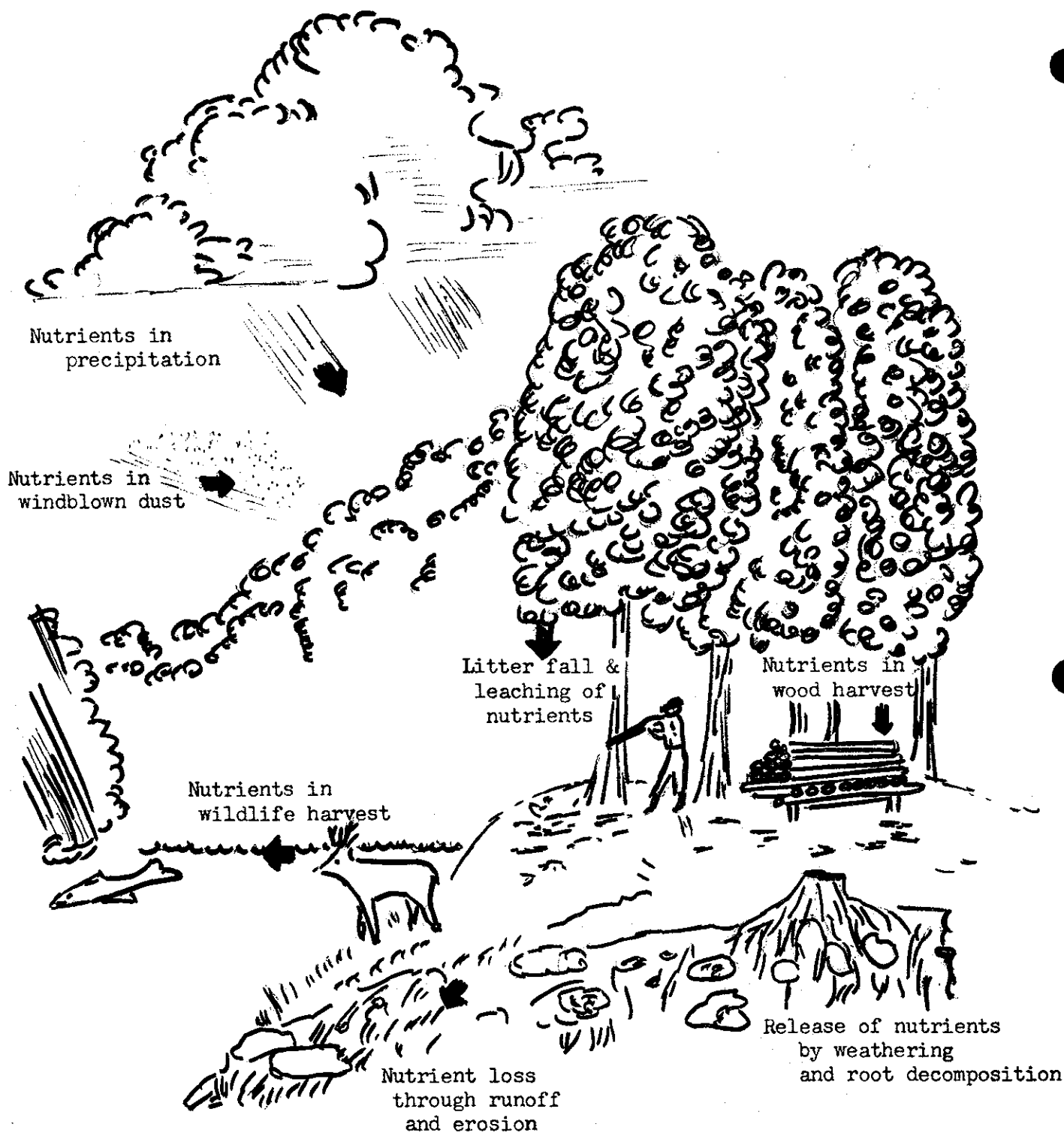
Balance of Nature -- Each player selects a plant or animal to become. At a given signal the struggle for existence begins. Anyone tagged by his particular "enemy", when away from his "safety", becomes that enemy (or is out of the game). Such as : skunk eats mice; mouse is safe in hollow tree, underground nest, abandoned bird's nest; skunk is caught by hunter; skunk is safe in hole in ground; mice eat corn; etc.

Feel It -- Have several different objects, each in a numbered paper bag. Let players (in turn) reach into the bag and feel the object for X seconds, then write object's name and bag number on a piece of paper. Player with most correctly identified objects wins.

Conservation Good Turn -- Take a few minutes to discuss what a 'good turn' would be. On a given signal the group is given X minutes to locate and list some needed good turns. A follow-up might be to complete one of the 'good turns' as a conservation project.



THE WATER CYCLE



THE NUTRIENT CYCLE

Some of the big and little things talked about at the first
BIG workshop:

You don't have to be an expert to be able to appreciate and enjoy the opportunity to be in a wild and undeveloped area or to lead a group to share your experience.

There is no waste in nature--everything is recycled.

A native plant community does not need to be fertilized, watered, or sprayed with pesticides.

Plant and animal communities have a few common (dominant) species and a large number of less common species. Changed conditions produced by changes in climate, fire, disease, hurricane, etc. might greatly reduce the dominant species, but some of the rare species, better adapted to the new conditions will be ready to take over. The diversity of species makes a community less susceptible to damage.

Since the year 1600 350 species of animals have become extinct, and 800 more are on the endangered list. A countless number of plants has become extinct or endangered.

Wild species of plants form an important genetic pool which can be of great economic importance. The native muscadine vine saved the French wine industry. When the French vines were threatened by blight they were grafted onto a blight resistant root stock of the muscadine vine imported from America. The trifoliate orange is the root stock of cultivated citrus fruit.

Estuaries are nursing grounds for 90% of commercial and sport ocean fish, shrimp, and crab. Estuaries and wetlands are among the world's most productive environments. Decaying organic matter washed into the bayou from the forest floor provides the nutrients which support the marine organisms. The number of fish in Galveston Bay is probably directly related to the amount of undeveloped land along the bayous.

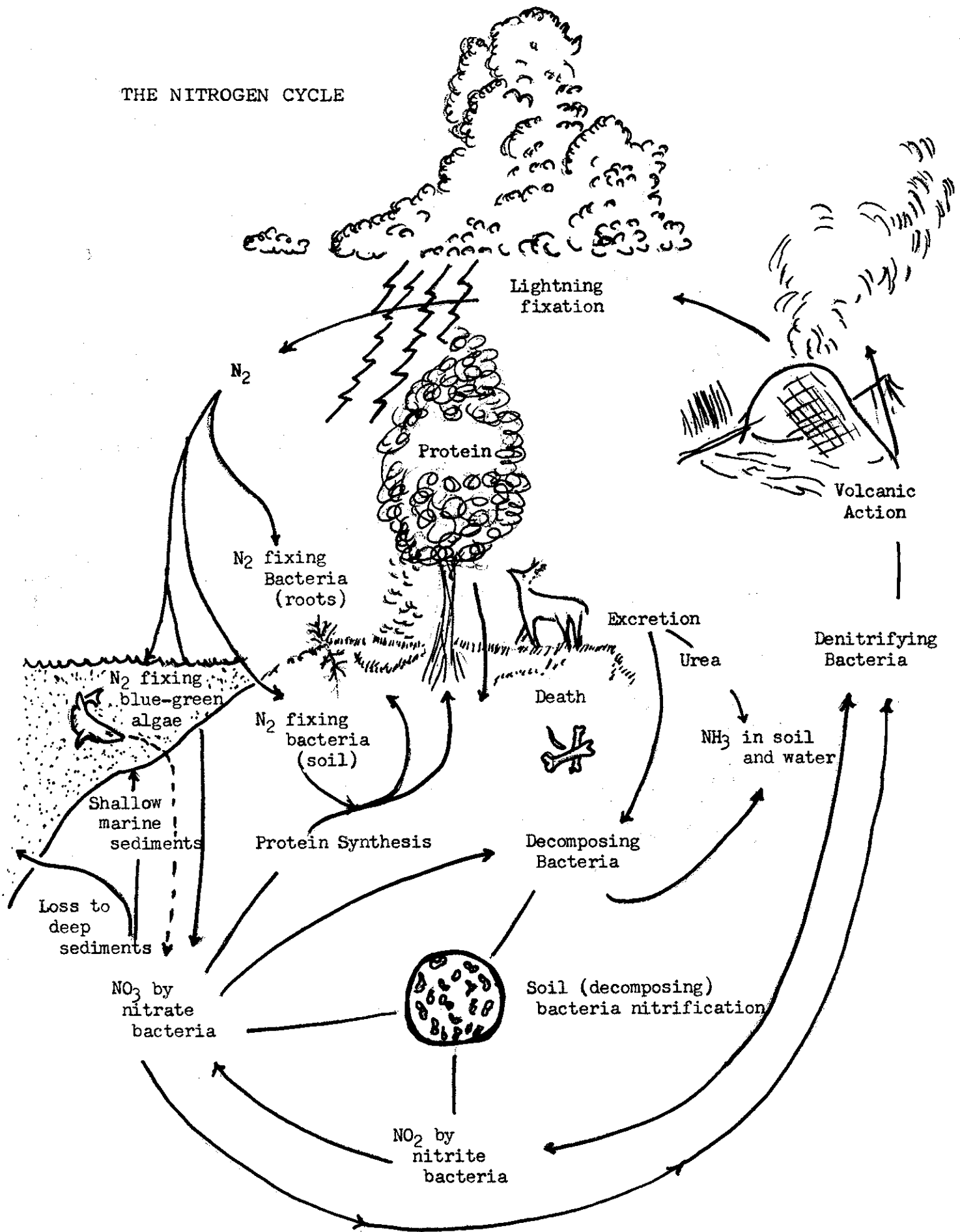
One third of all the wetlands in the United States has been lost. They have been drained, dredged, filled, or inundated.

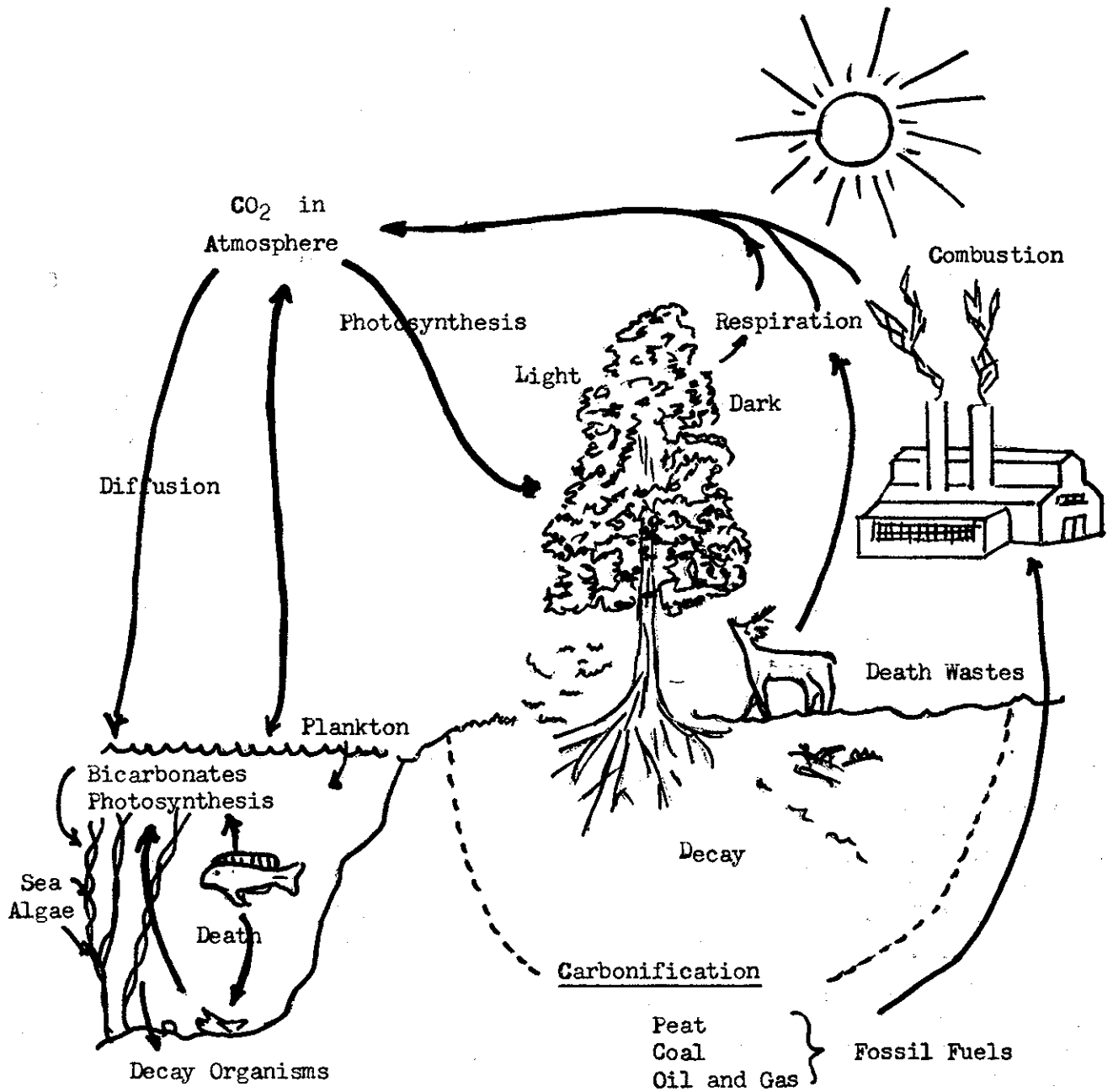
The yellow marble sized berries of Western soapberry tree form lather when mashed with water. Indians used them as laundry soap.

Holes in the ground and in dead trees are homes of many animals, skunk, opossum, raccoon, armadillo, rabbit, squirrel, rodents, snakes. They are not good places for childrens' hands.

Armand Bayou is a fragile environment and can be destroyed by collectors. Help us preserve it. Take home as souvenirs memories, pictures, photographs, not objects.

THE NITROGEN CYCLE





THE CARBON CYCLE

FREEMAN MEMORIAL LIBRARY
16335 DIANA
Houston, Texas 77058

EASY BOOKS: (pre-school--3rd grd.)

E525 Carrick, Carol
Swamp Spring

E595 Russell, Helen Ross
Small Worlds: A Field
Trip Guide.

E598.2 Gans, Roma
Bird talk

E598.2 Gans, Roma
Birds eat and eat
and eat.

E598.2 Gans, Roma
It's nesting time.

J574.5 Waters, John Frederick
Neighborhood Puddle.

J581 Farb, Peter
The Forest (Time-Life
series)

J591.9 Eckert, A. W.
Bayou Backwaters

J598 Wells, Robert
Bird Watching as a
Hobby

J599 Rue, Leonard Lee
World of the Racoon

JUVENILE BOOKS: (4th-6th grades)

REF Golden Book Encyclopedia
J574.03 of Natural Science

J574 Bendick, Jeanne
Living things.

J574 Jordan, E. L.
Hammond's Nature Atlas
of America.

J574 Nicholas, B. Melville
Round the Year.

J574 Pettit, Theodore
Guide to Nature Pro-
jects

J574 Pringle, Laurence P.
From Pond to Prairie

J574 Sherman, Charles L.
Nature's Wonders in
Full Color

PERIODICALS:

Natural History

National Geographic

PAPERBACKS FOR YOUR OWN LIBRARY

A Sand County Almanac, A. Leopold.
(Ballantine Books, Inc., N.Y. 1966.)

A Sense of Wonder, R. Carson.
(Harper & Row, N. Y., 1965.)

In Wildness is the Preservation of
the World, H. D. Thoreau. (Sierra
Club, N. Y., 1967.)

Design with Nature, Ian L. McHarg.
(Doubleday & Co., N. Y., 1971.)

PASADENA PUBLIC LIBRARY
1201 Minerva
Pasadena, Texas.

Y-574.6 Arue	Symbiosis	Y-591.08 Prin	Discovering Nature Indoors
Y-574.5 Bill	Understanding Ecology	Y-582 Rahn	Seeing What Plants Do
Y-574 Buck	In Yards and Gardens	Y-574.5 Reid	Nature's Network
Y-574.9 Disn	Worlds of Nature	Y-574.5 Ross	Who Lives in This Log
Y-574 Doan	A Book of Nature	Y-576 Schw	Life in a Drop of Water
Y-574.5 Head	High Meadow	Y-574.57 Shut	Natural Partner- ships
Y-574.52 Klei	A World of Differences	Y-574.929 Usin	The Life of Rivers And Streams
Y-631.58 Kohn	The Organic Living Book	PAPERBACKS	
Y-574.5 Lauw	Man's Impact on Nature	Y-PB Cars	Silent Spring
Y-581.5 McCo	The Life of the Forest	Y-PB Cars	The Edge of the Sea
Y-631.4 Matt	Soils	Y-PB Kirk	Wild Edible Plants of the Western United States
Y-635.965	Learning About Nature Through Indoor Gardening	Y-PB Mite	Egotactics
Y-574.192 Patt	The Chemistry of Life		
Y-574 Prin	Discovering the Outdoors		

PARTIAL BIBLIOGRAPHY
 ECOLOGY/NATURE STUDY
 LA PORTE LIBRARY #-526 SAN JACINTO

K-2

BAKER, Jeffrey J.W.	Patterns of Nature
BEHNKE, Frances L	What we find when we look under rocks
BRONSON, Wilfrid S	Turtles
BROUILLETTE, Jeanne S	Butterflies
CONKLIN, Gladys	When Insects are Babies
DEVAULT, M. Vere	Horned Lizards
GANS, Roma	It's Nesting Time
GATES, Richard	The true book of Conservation
RUSSELL, Helen Ross	Small Worlds, a field trip guide
RUSSELL, Helen Ross	Winter, a field trip guide
STEWART, Bertie Ann	Turtles

3-4

ADRIAN, Mary	Fiddler Crab adrift & ashore
ASIMOV, Isaac	ABC's of Ecology
BEVANS, Michael H	Sea Shells
GORVETT, Jean	Life in ponds
HOFMANN, Melita	A trip to the pond
HOGNER, Dorothy C	A book of snakes
McCLUNG, Robert M	Horseshoe Crab
MAY, Julian	Plankton
SCHLICHTING, Harold E	Pollution
SHEPHERD, Elizabeth	Tracks between the tides
SMITH, Frances C	Conservation
SORRELLS, Dorothy C	The little shell hunter
WATERS, John F	Neighborhood puddle

5 and up

ABBOTT, R Tucker	Sea shells of the world
ARNOV, Boris	Homes beneath the sea
BEHNKE, Frances L	The changing world of living things
BROWN, Vinson	How to make a home nature museum
BURGESS, Thornton W	The Burgess bird book for children
CAVANNA, Betty	The first book of sea shells
CLEMONS, Elizabeth	Shells are where you find them
CONKLIN, Gladys	The bug club book

PARTIAL BIBLIOGRAPHY
ECOLOGY/NATURE STUDY
LA PORTE LIBRARY--526 SAN JACINTO

5 and up

ECKERT, Allan W	The king snake
GEORGE, Jean C	Spring comes to the ocean
JOFFE, Joyce	Conservation
MORRIS, Percy A	Boy's book of frogs, toads, & salamanders
NESPOJOHN, Katherine V	Worms
PAYSAN, Klaus	Creatures of pond and pool
RHINE, Richard	Life in a bucket of soil
VILLIARD, Paul	Reptiles as pets
ZIM, Herbert S	Insects
ZIM, Herbert S	Seashores

HIGH SCHOOL/ADULT

ABBOTT, R Tucker	American seashells
ALEXANDER, Taylor R	Botany
ANDREWS, Jean	Sea shells of the Texas coast
CLANCY, Edward P	The tides
CRUICKSHANK, Helen G	A paradise of birds
HALSTEAD, Bruce W	Dangerous marine animals
HAUSMAN, Leon A	Seashore life
IVERSEN, E S	Farming the edge of the sea
MARZANI, Carl	The wounded earth
NIERING, William A	The life of the marsh
SELLE, Ralph A	El Jardin
SILVERBERG, Robert	The world within the tide pool

Available: The Peterson Field Guide Series complete
Including such titles as:
A Field Guide to the Birds of Texas
A Field Guide to Western Reptiles and Amphibians
A Field Guide to the Insects

A Guide to the Natural World Life Nature Library
Including such titles as:
The Sea
Ecology
The Insects

PERIODICALS

Field and Stream
National Geographic
Natural History

Science
Scientific American
Texas Parks and Wildlife
Magazine

BOOKS USED AND RECOMMENDED BY
NATURE CENTERS IN THE NEW YORK AREA

1. THE AUDUBON NATURE ENCYCLOPEDIA, Vol. 1 thru 12, by the Nat. Aud. Soc., Curtis Publishing Co, New York, 1971.
2. A JUNIOR NATURALIST'S WORKBOOK by John F. Gardner, The Interstate Printers and Publishers, Inc., Danville, Ill., 61832 (\$.60) - Conservation activities, projects and investigations
3. A LEADER GUIDE TO NATURE ORIENTED ACTIVITIES, Second Edition, Betty VanderSissen and Oswald H. Goering, Ames, Iowa (\$3.95)
4. LEARNING ABOUT NATURE THROUGH GAMES prepared for National Recreation and Park Association by Virginia W. Musselman, 1967, Stackpole Books, Cameron and Kelker Streets, Harrisburg, Pa., 17105
5. LEADER'S NATURE GUIDE by M. E. Gandette, Girl Scouts of the USA (\$.35)
6. TIPS AND TRICKS FOR OUTDOOR EDUCATION by Malcolm D. Swan, The Interstate Printers and Publishers, Inc., Danville, Ill., 61832, 1970 (\$3.95)
7. NATURE STUDY FOR CONSERVATION by John W. Brainerd, Macmillan, N. Y., 1971 (\$4.95)
8. FIELD STUDY MANUAL FOR OUTDOOR LEARNING by M. Milliken, A. F. Hauser, E. G. McDonald, Burgess Publishing Co., Minneapolis, Minn., 55415, 1971 (\$2.95)
9. TECHNIQUE FOR TEACHING CONSERVATION EDUCATION by Robert E. Brown and G. W. Mouser, Michigan State University, paperback, Burgess Publishing Co., 426 South 6th Street, Minneapolis, Minn., 55415
10. AUDUBON AIDS IN NATURAL SCIENCE, Nature Bulletins, study programs, Nature Charts, Flash Cards. Ask for the free catalogue. 950 Third Avenue, N.Y., N.Y., 10022
11. TEACHER'S HANDBOOK FOR STUDY OUTSIDE THE CLASSROOM, Shirley A. Brehm, Charles Merrill Publishing Co., Columbus, Ohio, (\$1.95)
12. NEW FIELDBOOK OF NATURE ACTIVITIES AND HOBBIES, William Hillcourt, G. P. Putnam's Sons, N.Y., N.Y. (\$5.95)
13. MASTER TREE FINDER, M. T. Watts, Nature Study Guild, Berkeley, Calif., (\$.75)
14. WINTER TREE FINDER, M. T. Watts and Tom Watts, Nature Study Guild, Berkeley, Calif., (\$1.00)

SOURCES AND REFERENCES

Armand Bayou Park and Nature Study Center--a Proposal

Armand Bayou: A Land Use Study-- Karen Cheely, Austin College
1-30-73.

National Park Guide--Pub. by Rand McNally, New York, N.Y. 1971.

LWV--Facts & Issues, Where Rivers Meet the Sea, Feb., 1970.

A Field Guide to the Mammals--W. H. Burt & R. P. Grossheider,
Houghton-Mifflin, Boston, 1964.

A Field Guild to the Birds of Texas--R. T. Peterson, Houghton-
Mifflin, Boston, 1963.

A Field Guide to Trees and Shrubs--Geo. A. Petrides, Houghton-
Mifflin, Boston, 1972.

Forest Trees of Texas--How to Know Them--Bulletin # 20 Texas
Forest Service, College
Station, Tx., April, 1963.

The Reptiles of North America--R. L. Ditmars, Doubleday, Garden
City, N. Y., 1936.

undeveloped land doesn't

just SIT there !

It perform\$ the\$e free \$ervice\$

1. oxygen production
2. pollution abatement
3. dilution of poisonous gasses
4. dust and noise reduction
5. temperature modification
6. storm water storage and absorption
7. nutrient storage
8. low energy carbon and nitrogen recycling
9. nurseries grounds for marine life
10. genetic pool of abundant life forms

The Odum formula for ecosystems evaluation estimates that:

Armand Bayou performs \$10,000 worth
of service per acre per year
for the surrounding communities.