

BICY 654717

BIG CYPRESS WATERSHED

FLORIDA



T H E B I G C Y P R E S S W A T E R S H E D

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A Report
to
The Secretary of the Interior
April 19, 1971

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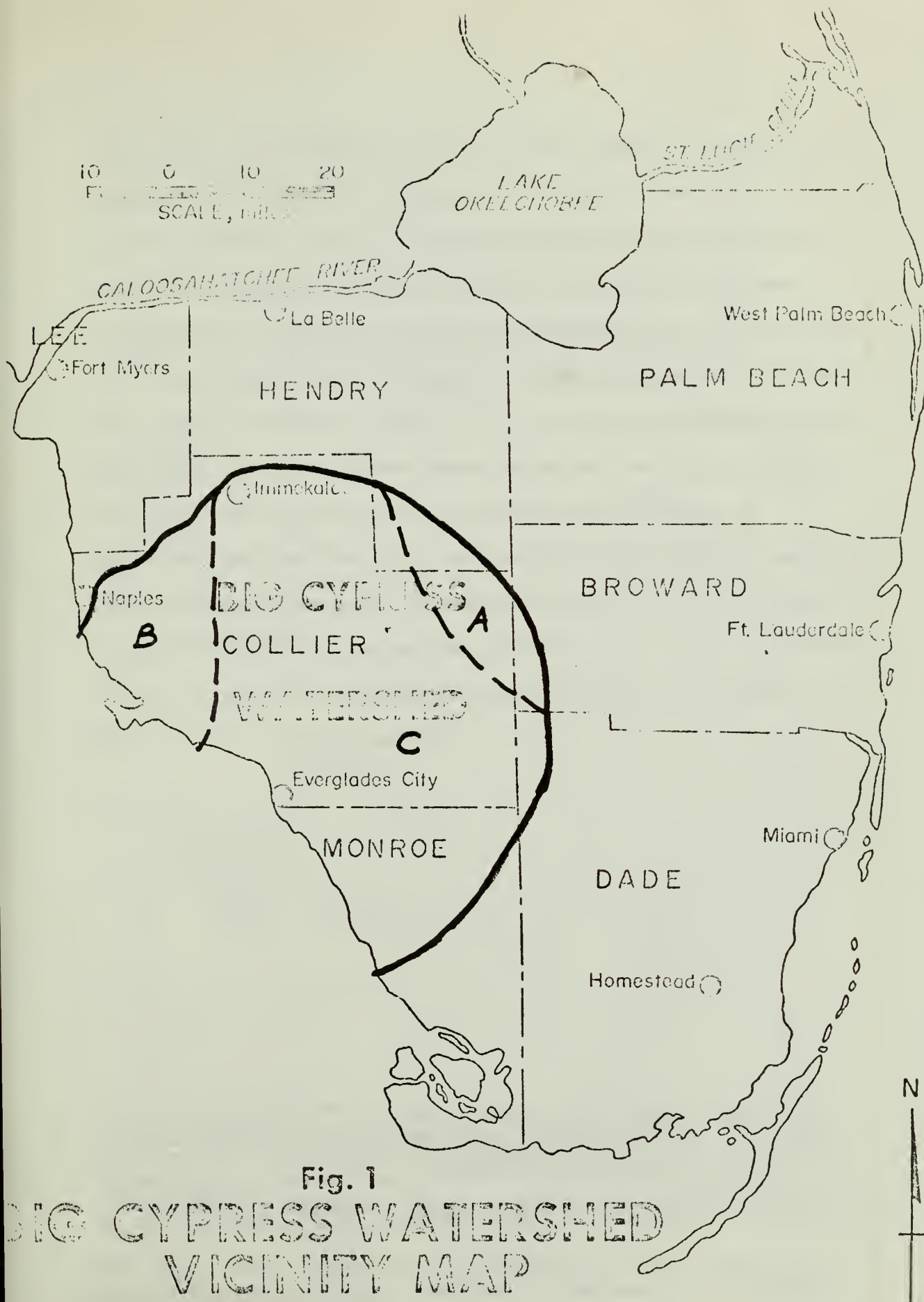
Values of the Big Cypress Watershed

Introduction

The fate of the broad, flat, very gently sloping watershed in southwest Florida, known as Big Cypress Watershed, hangs in precarious balance. In the extraordinary diversity and wealth of its natural resources, in the far-reaching effects of the uses to which it is put by man, and in its profound vulnerability to unwise uses, the Big Cypress has the potential for becoming the textbook or classic example of ecological ruin.

Inevitably, the destiny of the Big Cypress is intricately interwoven with that of an enormous and widespread array of living and inanimate things. Within its boundaries, its natural components can provide an unending procession of rewarding human experiences, and great scientific benefit. Because of its effects on volume, quality, and timing of water flow to much of Everglades National Park and environs, Big Cypress is the key to the survival of unique esthetic, cultural, and economic resources beyond its boundaries. As a natural "water conservation area," it recharges the aquifer from which burgeoning Gulf Coast communities draw much of their fresh water.

The Big Cypress is jeopardized by the pressure for progress based on sometimes well-intended, but too often ill-planned, exploitation. Unfortunately, the short-term gains of such exploitation are more easily recognized--and taken advantage of--than are the long term benefits of wisely planned use. (Fig. 2, p. 5)



This report, which draws on four excellent studies,¹ is prepared in response to a directive of November 19, 1969, by Secretary of the Interior Walter J. Hickel to several bureaus of the Department to undertake a study of alternative uses of Big Cypress Watershed (Appendix I). The need to protect Big Cypress was recognized in the Everglades Jetport Pact of January 16, 1970. By the terms of the Pact, the United States agreed to "* * * provide recommendations for land uses of the Big Cypress Swamp, which will be consistent with preserving and protecting the environment and ecosystems of Everglades National Park, the water supply of the affected communities and the marine resources of dependent estuaries." It is, then, a step in a process by which man may show himself, in at least one instance, capable of achieving an enduring harmony with the environment upon which he is so utterly dependent.

¹U.S. Geological Survey, Some Hydrologic and Biologic Aspects of the Big Cypress Swamp Drainage Area, Southern Florida, 1970; U.S. Department of the Interior, Environmental Impact of the Big Cypress Swamp Jetport (Leopold Report), 1969; Federal Water Quality Administration, A Synoptic Survey of Limnological Characteristics of the Big Cypress Swamp, Florida, 1970.

The fourth report, Everglades-Jetport Advisory Board, Alternative Uses of Big Cypress Swamp, 1970, was not published.

I have been thinking of you very much lately, and
wondering how you are getting on. I hope you
are well and happy. I have been very busy lately,
but I have managed to find some time to write to you.
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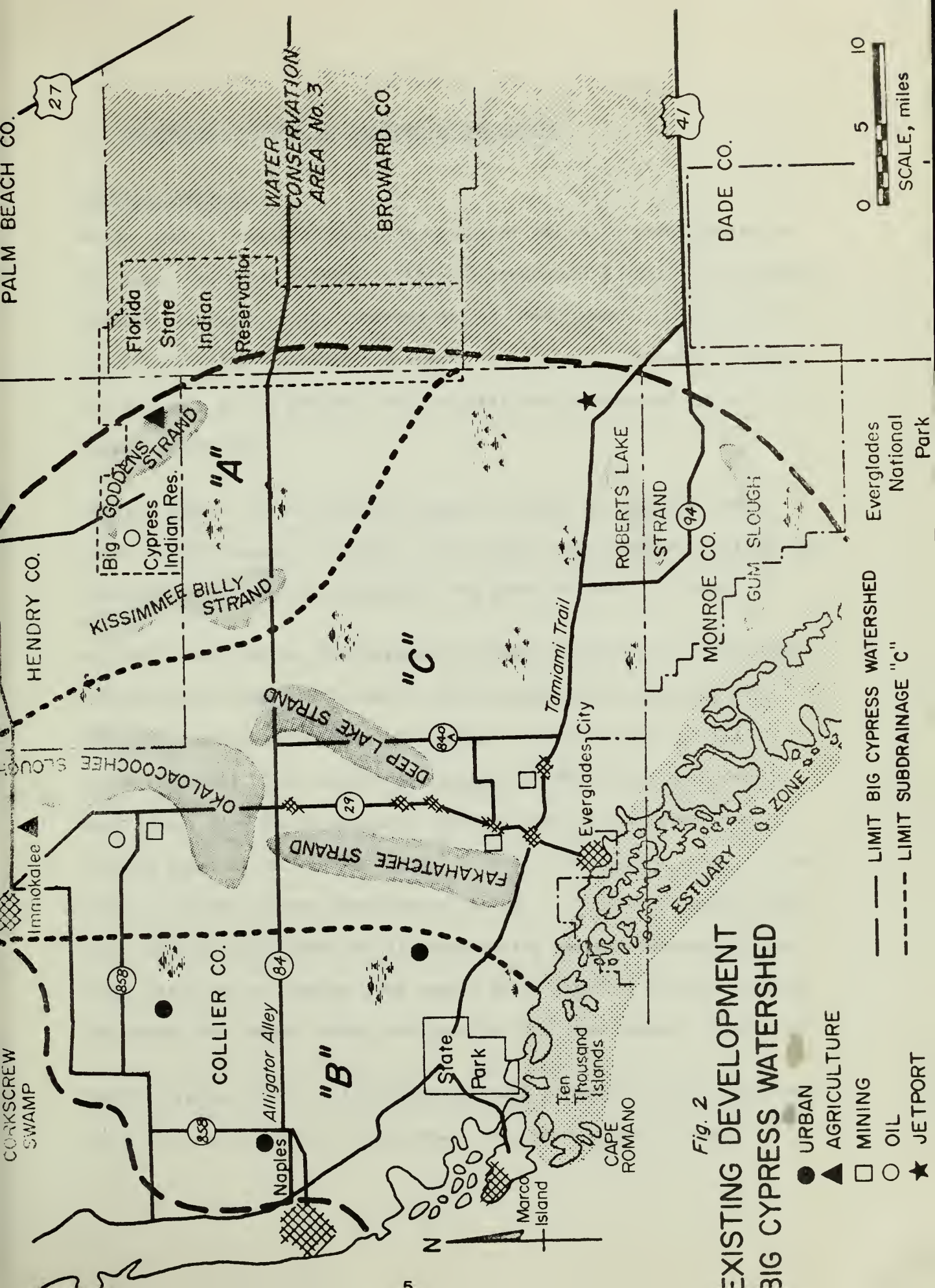


Fig. 2
EXISTING DEVELOPMENT
BIG CYPRESS WATERSHED



I. Attributes of the Big Cypress as an Entity

Natural Features

Aside from its manifold benefits as one of the vital underpinning of the ecosystem which provides critically important esthetic and economic benefits for much of the southern Florida Gulf Coast, Big Cypress is a highly significant resource in itself. The larger ecosystem of which it is a part is the Nation's only significant subtropical marsh community complex.

The Big Cypress is an intricate mosaic of marsh and lowland forest types--a wilderness of sloughs, tree islands (or hammocks), and bay and cypress heads. Cypress dominates, and gives the area its name.

A vital factor in the Big Cypress-Everglades ecosystem is the almost imperceptible slope of the land. This results in exceedingly slow drainage, which extends the "wet months" well beyond the period of actual rainfall. The unrelieved flatness of the area's topography makes sheet flow the predominant drainage rather than flow in well-defined channels or courses. Thus, a water level change of only a few inches oftentimes affects thousands of acres. In a year of normal rainfall, much of those areas still experiencing natural drainage stands under water for as long as four months after rainfall ceases. During the normal dry season, about one-tenth of the land remains inundated.

The Big Cypress rests on limestone and sand formations, which generally lie a few feet below the soil surface, but are exposed in some

locations. Most of its soils have a relatively low natural fertility and are basically composed of fine sand. Some marl is also present. Areas of dense rooted vegetation, found in low-lying areas, give rise to muck and peat deposits. The thickness of the peat deposits and extent of their coverage, differing underlying limestone formations, and a slightly higher elevation account for the basic geological differences between the Big Cypress and the Everglades. The latter has thicker, more extensive areas of muck and peat deposits overlying limestone.

Several major strands, characterized by extensive stands of cypress, exist in the watershed. Of these, the Fakahatchee is particularly significant. This strand is the major slough draining the southwestern Big Cypress. Its mixture of cypress and royal palm is a rarity in forest types, and is considered among the most unusual and beautiful in the world.

In 1948, a nationally prominent citizens' group identified the Fakahatchee Strand as being worthy of public protection. The area was studied by the National Park Service and found to be unique and of national significance as a natural resource. It is a Registered Natural Landmark, and is now being considered for acquisition as a State Park.

Nowhere outside the tropics are epiphytes, or "air-plants," which include orchids, some ferns, and bromeliads, found in such abundance

and variety as they are in Big Cypress. Seven species of orchids found nowhere else in the world grow in the Fakahatchee Strand, and because of depredation by orchid hunters can be classed as endangered flora.

Large portions of Big Cypress have so far experienced little man-made disturbance. The scars left by the early loggers have nearly healed. Nearly all the wildlife species native to semi-tropical Florida are contained within the watershed. Animal life is diverse and abundant. Large, showy, long-legged wading birds are a major natural attraction. Big Cypress provides important feeding, nesting and wintering areas, as well as a resting place for birds migrating to and from Central and South America.

Seventeen animal species found in the area have been designated as rare or endangered. Major concentrations of several of these species are highly dependent on the watershed for all or a portion of their life cycles. Included are the American alligator, Florida panther, Everglades mink, mangrove fox squirrel, wood stork, and roseate spoonbill.

Recreation

Extensive wilderness landscape, impressive natural vegetation and wildlife domain, and mild climate provide opportunities for recreation experiences of a kind almost impossible to find anywhere but in

Big Cypress. Big Cypress is accessible to high density urban areas, whose residents show increasing interest in the leisure activities afforded by its distinctive resources.

Visitors enjoy hunting, fishing, nature study, photography, camping, boating, picnicking, and the sense of wilderness. Although much of the watershed is remote, the more accessible areas offer some unusual experiences to the moderately adventurous, such as the opportunity to view extraordinary growths of epiphytic plants.

Water Conservation Area

The Big Cypress Watershed, in effect, is a natural water conservation area. As such, it could continue to insure an adequate water supply source for the coastal communities, the marine resources of the dependent estuaries, and Everglades National Park, and would, if properly coordinated, contribute significantly to a comprehensive water management program for all of south Florida. The watershed can fulfill the role of a water conservation area similar to those in the adjacent Central and Southern Florida Flood Control Project, without the construction of retention facilities, and its great recreational and scientific values could be realized fully, consonant with this usage.

There is a clear potential for a variety of other uses such as fish farming and cultivation of various aquatic and/or sub-tropical plants, without damage to the water conservation area.

Several other not-so-benign alternatives loom on the horizon.

Threats to the Watershed Environment

Residential

Residential growth is moving eastward from the Naples area and already is threatening Fakahatchee Strand. The proliferation of retirement communities in Florida is expected to accelerate, heightening the seriousness of this most significant threat. Residential development depends, for its success, on alteration of drainages, with concomitant increases in siltation, the degrading influence of pesticides, domestic, commercial and automobile wastes, and fertilizers.

Major residential development is incompatible with the preservation of the Big Cypress ecosystem, a major portion of Everglades National Park, the Ten Thousand Islands, and the marine resources of the related estuaries. In short, such development would work against its own environment and in detriment to environments that depend upon it.

Agricultural

While residential development spreads eastward from Naples, truck farmers and cattlemen are capitalizing on the agricultural potential of the northern portion of the watershed by extensive clearing and draining. These and other agricultural practices place considerable strains on the ecosystem. Increases in such activities would produce

substantial increases in siltation, water turbidity, fertilizers, and pesticides, and departures from the natural flow patterns will destroy the ecosystem as it now exists.

Commercial/Industrial

So far, little commercial or industrial development has occurred in the area other than the comparatively small mineral extraction industry and the single training strip at the Big Cypress Jetport. However, should residential or agricultural development be allowed to continue, wastes from commercial and industrial development could be expected to increase the burden on the ecosystem. One of the limiting factors to date has been the lack of an adequate supply of electric energy; but a major increase in power generation capacity would in all probability stimulate such growth. Florida Power and Light Company is currently constructing two major nuclear power complexes on the east coast to meet some of the power demands of south Florida.

In addition, the threat of pollution from oil drilling has arisen. Seismic testing has already begun and continued drilling will lay a grid of holes on the face of Big Cypress.

Recreational

The area has high value for recreation and preservation, but access is limited most of the year by the water cover, except for the swamp buggy. This cloddish high framed, large-wheeled, homegrown

product of the backyard garage, has a mobility that makes any area open to it. Unrestricted use of swamp buggies and other heavy vehicles has resulted in a chaotic criss-crossing of wheel ruts which have, in many places, altered flow patterns. Because altered flow has its response in altered ecologic patterns, the continuation of such unregulated vehicle use can cause severe damage. But, carefully located and designated routes for swamp buggy use can not only halt further destruction in the watershed, but can facilitate greater use and enjoyment of Big Cypress by more people.

II. Influence on Dependent Estuaries and Their Marine Resources

The limits of Big Cypress Watershed are difficult to define because the boundaries shift with changed water levels and flows even reverse in the northern portion; but one thing is known--without the seasonal fresh water runoff from Big Cypress Watershed, the mangrove-dominated estuarine zone along much of the Gulf Coast would, for all practical present economic and ecologic purposes, cease to exist.

Present Status of the Coastal-Mangrove Zone

The coastal zone within the influence of the Big Cypress Watershed contains about one-third of the total mangrove-estuarine complex of Everglades National Park. Levels of productivity and diversity of species as high as any to be found within the United States characterize the coastal zone. In addition to its very large bird populations, the area produces or maintains hundreds of species of aquatic organisms. The mangrove forest is considered among the finest in the world.

Nature of the Life Support Systems

Recent studies made in Everglades National Park have verified the high degree to which the richness of the estuarine system is dependent on red mangrove and on brackish water conditions.

One of these studies was "to estimate the annual production of dead plant material by the three main producers--red mangrove, sawgrass and blackrush; to investigate the mechanisms by which such material enters the food web and the rate at which this proceeds; to determine, as far as possible, fluctuations in the quantity, nature, and origin of the dead plant nutrient materials of the river; and, to ascertain the potential nutritive value of dead material if consumed at any specific stage of decomposition."

The importance of the mangroves became apparent when the study showed that although they occupied only about 65 percent of the studied area, they produced 85 percent of the dead plant material. About 5 percent of the annual leaf production by mangroves is consumed by grazing land animals. The rest eventually enters the aquatic system as debris and becomes an important energy source for the food chain. Debris of mangrove origin accounts for between 35 and 60 percent of the total suspended material each month.

Plant debris becomes relatively rich in protein as it degrades, probably due to buildup of microbial populations using the debris

as a nutrient source. This protein-building degradation process proceeds more rapidly in a brackish than in a fresh water or a terrestrial environment.

The mangroves as an energy source are important not only within the mangrove zone, but well into adjacent bays and coastal areas. The study showed that materials from these trees are transported principally in the period from November through February, when north-east winds blow coastal waters offshore, inducing drainage of fresh and brackish waters laden with detritus from the marshes. Thus, for four months, marine species which are unable to tolerate estuarine conditions feed on the nutrient largesse that flows out of the estuaries.

The mangrove estuary abounds in aquatic life. Toward the top of its incredibly rich food chains we find the more familiar species which attract 40,000 or more sport fishermen to the area every year and produce an average annual commercial catch in excess of one million pounds. Tarpon and snook are the game fish that serve as the chief draw for sport fishermen. Commercial fishermen harvest bluefish, channel bass, grouper, king mackerel, mullet, pompano, sea trout, Spanish mackerel, mangrove snapper, and stone crabs--which, with the exception of mullet and stone crabs, are also sought by sport fishermen. Some of these, although taken in the offshore waters, are dependent on food organisms produced within the coastal zone.

The mangrove-estuarine zone of the coast is vital to the continuing existence of the fisheries. It provides a protective harbor, especially for juvenile organisms, and rich sources of food that support the abundance and diversity of species present.

Many of the marine species occupy the protective brackish coastal zone as juveniles, and in later stages of maturity move seaward. Within the estuary, they derive protection from predators because of the lower salinities and the grasses and mangrove roots which afford abundant shelter.

Some fresh water species, such as the killifishes and mosquito-fishes, remain within the area throughout their lives. Some normally marine species do the same, among them many forage species and the popular spotted sea trout. The tarpon, snook, mullet, redfish and others are known to move freely to the open Gulf as they mature.

Dramatic evidence of the importance of the mangrove-estuarine zone can be found in the life cycle of the pink shrimp--mainstay of the commercial fisheries of the Sanibel and Tortugas grounds. (Fig. 3). The life pattern of the pink shrimp has been well researched. They spawn on the fishing grounds; their larvae migrate to the coastal estuarine waters, and in that food-rich, sheltering cradle, they develop through the post-juvenile stage, eventually migrating seaward to return to the fishing grounds to renew the cycle. There, they support the valuable commercial fisheries.

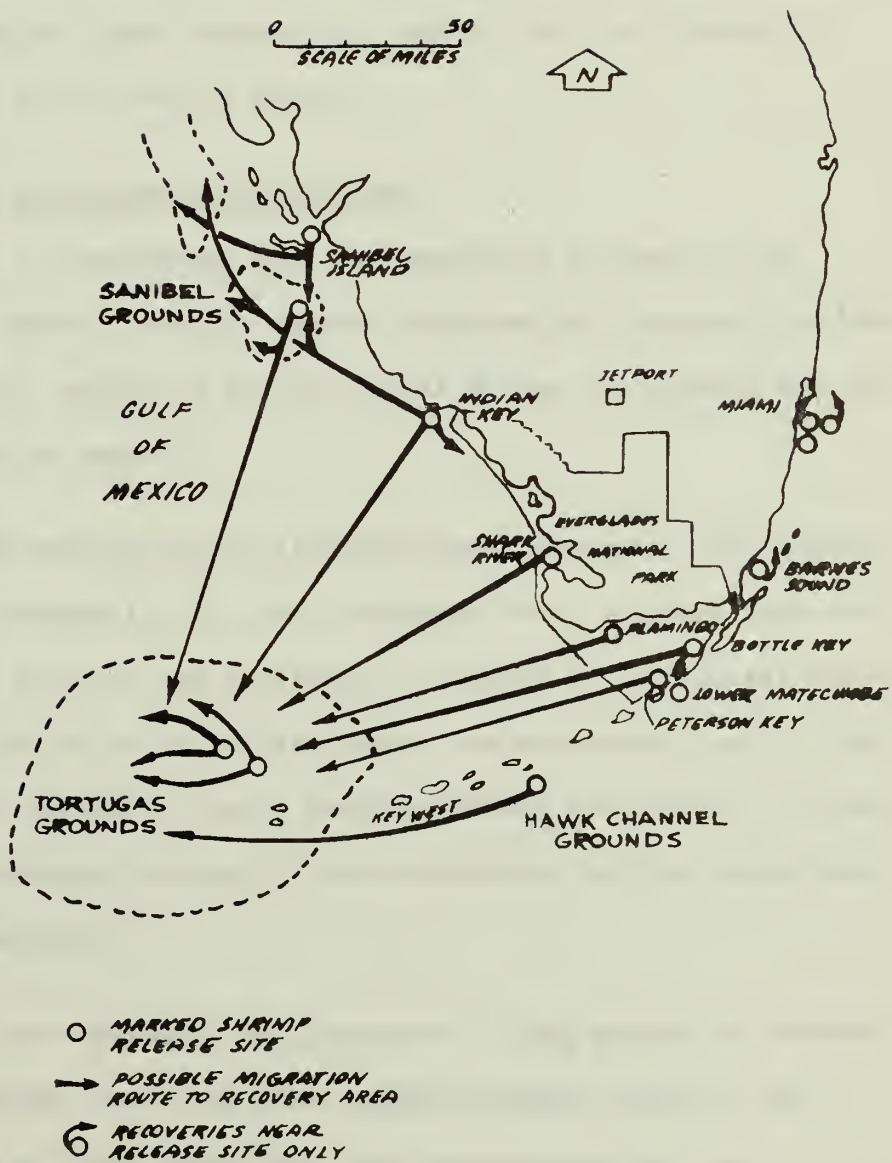


FIGURE 3 - RELEASE-RECOVERY SITES OF MARKED PINK SHRIMP IN THE WATERS OF SOUTH FLORIDA, 1958-63.

Disruption of south Florida's coastal estuarine areas by unwise development of Big Cypress would interrupt this life cycle, severely depleting the \$8 million Tortugas and Sanibel shrimp fisheries (1970 dockside value). Estuaries dependent upon the Big Cypress Watershed provide nursery grounds for a significant portion of these fisheries. This well documented life cycle demonstrates the direct ecological link between this coastal zone and thousands of square miles of the Gulf of Mexico.

Consequences of Systems Interruptions

Construction or development activity requiring drainage of any significant share of the Big Cypress Watershed will shorten the "wet months" period leading to fastern runoff during all seasons and thus lengthen the dry period.

The length of the wet period is particularly crucial. The extended wet period afforded by the slow, prolonged sheet drainage from the watershed is vital to the continuing integrity of the coastal zone ecosystem, just as it is to life within the watershed itself. Even if the annual volume of runoff passing through the coastal zone were to remain unchanged, changes in the seasonality of flow would have drastic consequences.

All coastal zone organisms are adapted to a long period of brackish water conditions, extending well beyond the rainy season. Any interruption of these conditions from construction or other

development activities would shorten the wet period which produces the brackish conditions, throwing it out of phase with the dependent spawning and nursery activities.

In addition, the rapid degradation of mangrove detritus, which occurs under brackish conditions, would be reduced, markedly disrupting the detrital food chain. The result would probably be a dramatic lowering of the high population levels and narrowing of the wide variety of aquatic species. Changes in turbidity, salinity, and temperatures parameters would compound the adverse effects.

Construction activities in Subarea C would increase silt and mud in the estuaries, adversely affecting benthic (ocean floor) forms, vital to the food chain, by covering them, cutting down on the penetration of needed light, and decreasing the amount of hard substrate to which the larvae of some species must be able to attach themselves.

Recent studies show a tendency toward a small increase in pesticides and nutrients in the water flowing into the park. Past experience elsewhere in the Everglades system has shown that such changes are affecting the species composition of the planktonic organisms. The water delivered through natural drainage tends to improve in quality through a process of self-purification as it flows slowly into the park. Water drained out of the watershed and delivered to the park by canal will not show the improved quality shown by water that drains naturally.

The effects of pesticide buildups, associated with residential and agricultural development, are many and profound. Because young organisms tend to be more sensitive to toxins than adults, the estuaries' nursery functions would be severely affected. One of the larger estuarine groups is the crustaceans, which is particularly intolerant of chlorinated hydrocarbons. Aldrin and endrin concentrations as low as 0.6 parts per billion will kill pink shrimp--the most important commercial crustacean in these waters.

Further drainage and development of Big Cypress would be almost certain to increase nutrients in the canals and estuaries, leading to changes in the species composition of the organisms in both the fresh water canals and the brackish estuaries. Speed-up of eutrophication--the death of waterways--also would result.

III. Importance of Big Cypress in Preserving Everglades National Park

The Everglades-Big Cypress "Web"

Everglades National Park, a 2,200-square mile sub-tropical wilderness at the southern tip of Florida, is utterly dependent upon a plentiful supply of high quality water flowing through the region in an over-land sheet pattern for up to 8 or 9 months of the year.

Water has been identified as "* * * the basis of being of the Everglades National Park * * *". A major portion of its water supply

comes from rainfall over the park itself. The remainder historically comes from the Lake Okeechobee drainage system and from Big Cypress Watershed, the latter accounting for about 56 percent of all outside water entering the park. Subareas A and C (Fig. 1, p. 3) are critical to the "* * * preservation intact of unique flora and fauna and the essential primitive natural conditions * * *" intended by Congress.

Because of the extremely slight elevation differences in the park's terrain, the effects of dessication and inundation resulting from seasonal changes in water levels are extraordinarily widespread. Only the alligator holes and ponds retain water throughout the natural annual cycle.

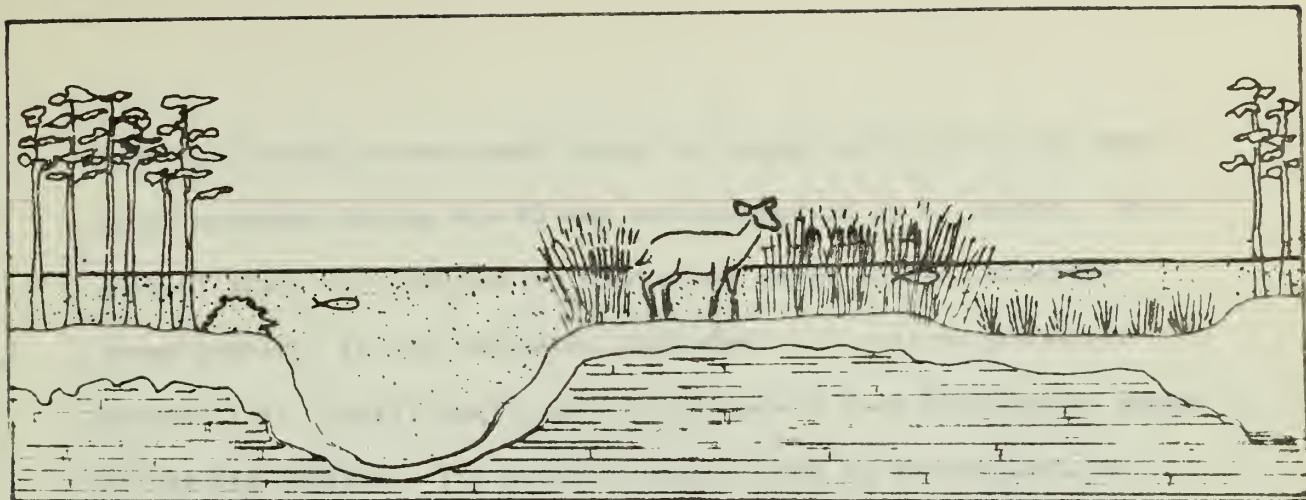
The summer wet period normally inundates extensive areas, allowing expansion of the aquatic populations--phytoplankton, crustaceans and fishes. Subsequently, water levels must sink to concentrate the summer production of food organisms sufficiently to supply the nourishment essential to larger fishes, amphibians, reptiles, mammals, and many species of birds.

This seasonal wet-dry cycle must coincide with the natural reproductive cycles of the many varieties of predatory animals that feed upon the small aquatic organisms supported by the water. If any of the links in this process are broken, the reproduction of the larger animals at the top of the food chains will fail. Either excessively high or low water can cause reproductive failure. So can too short a delivery period.

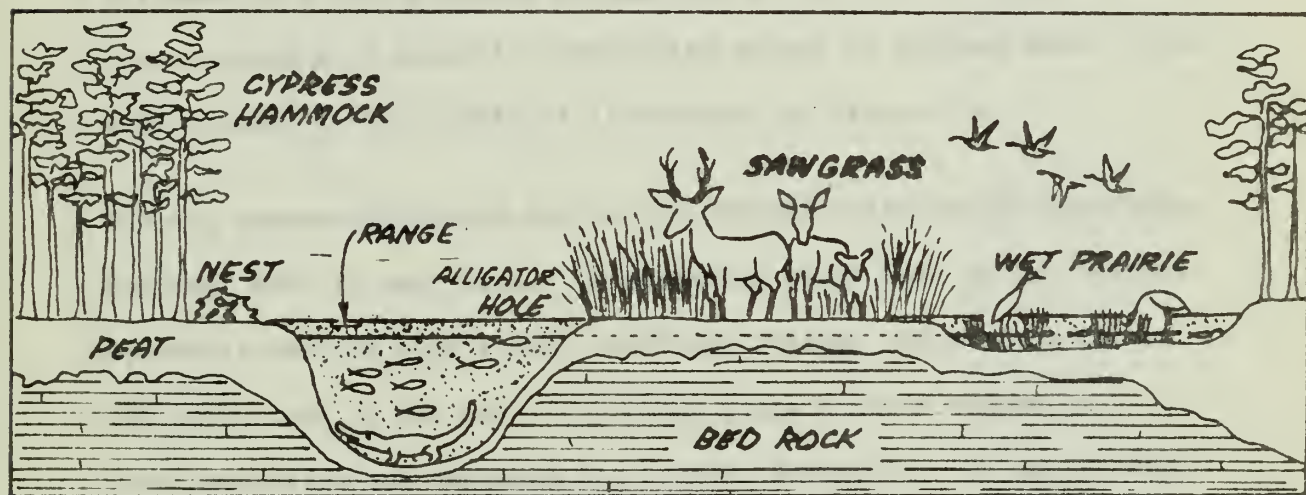
Figure 4 diagrams some effects of high, optimum, and low water levels. Ideal conditions are shown in the center diagram. Too low a water level dries out the peat deposits, some of which have taken thousands of years to accumulate, and makes them liable to destructive oxidation, and deeper burning by wildfire. Access becomes easy and poaching of alligators increases as the reptiles congregate about the remaining water. The area and volume of water becomes too low to sustain the population of small aquatic organisms that form the brood stock for the annual repopulation and their numbers decrease radically. Only the deeper depressions contain enough water to sustain fishes, alligators, and other species. Eventually, the oxygen content of the water in these holes may become so depleted by organic decomposition that fish kills result.

Excessively high water may also have adverse effects. Alligator nests, which never are placed very far above the water, may be flooded and the eggs prevented from hatching. Terrestrial animals such as deer and wild hogs are forced to compete for space and food in the few areas remaining above water.

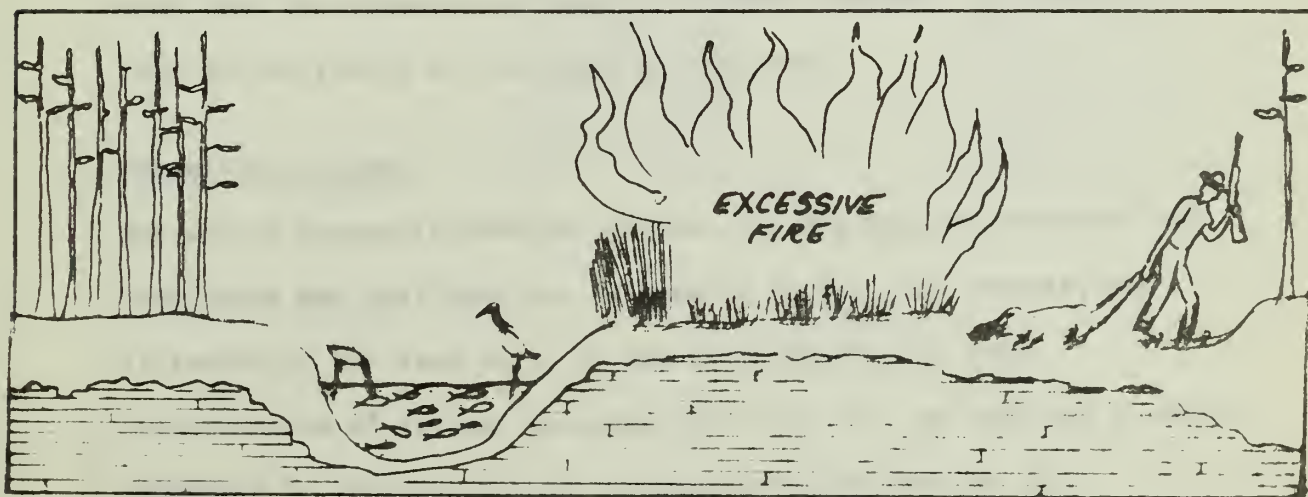
The most thorough case study of the relation between reproduction and the seasonal hydrologic cycle of the Everglades ecosystem is that of the wood stork. This bird feeds by groping, not by sight, and its feeding efficiency depends directly on the number of food items per unit of water volume. It requires large quantities of



FLOOD WATER LEVEL



OPTIMUM WATER LEVEL RANGE



DROUGHT WATER LEVEL

food when nesting--one study fixed the amount of food a young wood stork consumed during his 60-day nesting period at 65 pounds. In a 1960-61 study of 6,000 active wood stork nests in the Corkscrew Swamp Rookery, it was estimated that about 2.5 million pounds of aquatic life (mostly small fish) were removed from surrounding areas of the Big Cypress. The availability of food in such quantities requires a period of extensive flooding and high aquatic productivity, followed by a drying period during which the aquatic organisms are concentrated in a steadily diminishing volume of surface water. The significance of this cycle is illustrated by Figure 5 .

The Big Cypress Watershed serves the natural residents of Everglades National Park in many ways. Large wading birds such as the roseate spoonbill and the wood stork, important visitor attractions within the park, nest in the park, but their range extends beyond the park boundaries and includes Big Cypress Watershed. In non-nesting seasons large numbers of these birds take up residence in the trees that line the estuaries of the Big Cypress drainage, in search of food not available at that time in the park.

Threats to the Web

The web of interrelationships between the Big Cypress Watershed and Everglades National Park are vulnerable to the same threats, and in basically the same ways, as are those dealt with under "Consequences of Systems Interruptions" (P.17), in addition to those suggested by the description of water level effects (P.21).

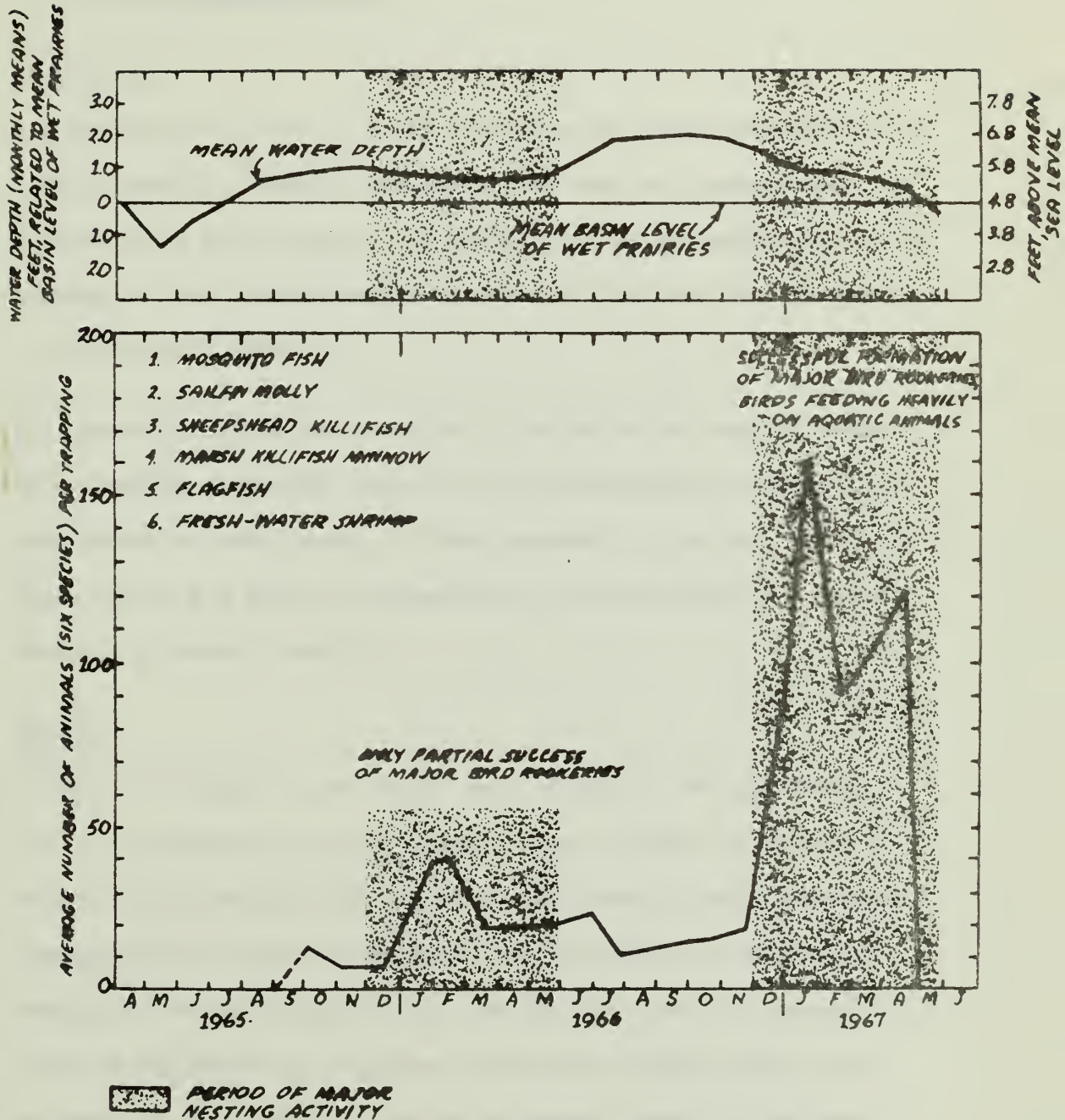


FIGURE 5 - COMPARISON OF SEASONAL VARIATIONS IN POPULATIONS OF AQUATIC ANIMALS AND WADING BIRDS WITH AN INDEX OF WATER DEPTHS IN UPPER SHARK RIVER SLOUGH

IV. The Big Cypress as a "Natural Water Conservation Area"

Serving Municipal Needs

Attributes

Big Cypress water will be a key factor in any future development of Collier County. Domestic and industrial uses will demand water in proportion to their growth. If residential developments were to be limited to those already underway, the population of the Naples area alone will double.

Big Cypress provides the water which recharges the shallow fresh water aquifer from which Naples and the surrounding developed area draws its water supply. Since rainfall is the only source of water in the Big Cypress drainage basin, the recharge is related directly to annual rainfall.

Threats

Already, the water in the canals east of Naples contains iron, lead, and aluminum at levels greater than are found in natural waters from undrained areas nearby. Given sufficiently increased concentrations, these contaminants can detrimentally affect the quality of the water supplies in the aquifer. Further contamination, by nutrients and organisms that affect public health, can be expected as a result of the use of septic tanks in the area, and in the event of further agricultural development in the Big

Cypress (Subarea C, Fig. 2 , p. 5). At the same time, irrigation needs will mount, putting additional demands on the waters of the Big Cypress.

Existing data on the subject do not rule out completely the possibility of a moderate amount of well-planned and tightly controlled future development; but it must be done within the limitations imposed by the water supply--which can best be provided by Big Cypress as a natural water conservation area.

The Report, "Environmental Problems in South Florida" (National Academy of Sciences/National Academy of Engineering, March 1970), states "It is clear that preservation of the Big Cypress Swamp as a natural water-conservation area would be most desirable relative to the Park, and, as indicated in the section on water management, probably most desirable to orderly development of the south Florida region as a whole."

V. Big Cypress, Integral to Indian Culture

The Big Cypress Watershed is an integral part of the Miccosukee and Seminole Indian cultures. All of Big Cypress Reservation (Federal) and portions of Florida State Indian Reservation lie within Subarea A (Fig. 2 , p. 5). Big Cypress Reservation is considered the Seminole Indians' home; Florida State Reservation was to be the home of the Miccosukee Tribe. In reality, about half

of the Miccosukee live among the Seminoles in Big Cypress Reservation, the remainder preferring to live in scattered settlements along the Tamiami Trail.

The National Park Service has provided the Miccosukee the use of a strip of land 500 feet wide (north-south) by five miles long (east-west) on the northern boundary of the park. This parkland is used only for housing and schools.

Miccosukee and Seminole tenure goes back more than a century and a half, to the period when they were driven, with other Creek tribes, from their traditional native lands in the Carolinas and Georgia.

The present ecosystem supports resources that constitute a major source of food and other materials on which the Indians depend. The ability to fish and hunt following traditional practices may be as important to the spiritual well-being of the Miccosukee and Seminole as it is to their physical nourishment.

Loss of fish and wildlife resources of the Big Cypress would spell yet another "ending" for a cultural group whose life style and habitat, ever since the advent of European man to this continent, have been a dismal procession of unhappy endings.

Careless development of the watershed would effect violent disruption of this distinctive and cherished life style.

Perhaps it is appropriate to note here that the Indian poling his dugout canoe through alligator-populated swamp, among cypress laden with Spanish moss, is the image of the Everglades carried by many a tourist. In truth, this represents a set of circumstances that exists only in portions of Big Cypress Watershed, and can continue to exist, even there, only if care and wisdom are exercised soon enough and in adequate measure.

VI. Summary

The Big Cypress Watershed can remain a viable resource complex from which its human residents and neighbors will gain enormous and lasting benefits; or it can be carelessly exploited for the immediate gain of a few--and an enduring disaster to many.

Maintained as a protected ecosystem, Big Cypress will provide major benefits which can be grouped in five broad categories:

1. As an entity in itself, considered apart from its surroundings, Big Cypress Watershed is a distinctive community of highly diverse flora and fauna, including a number of endangered species, serving as a habitat for the continuing evolution of plant and animal species whose potential in an evolving world is as yet unexplored, and furnishing opportunities for hunting, fishing, and the appreciative forms of recreation in a natural setting of a kind that is increasingly scarce and elusive.

2. As a source of fresh water and essential nutrient supply to the estuaries of Everglades National Park and the Ten Thousand Islands, Big Cypress Watershed is the key to survival of the far-reaching recreational and commercial fishing enterprises that depend upon those estuaries.

3. The entire food chain relationship that supports a major segment of Everglades National Park's plant and animal communities is dependent on maintenance of the continuing flow of Big Cypress water. The quality and quantity of the water, and the timing of its delivery into the park, must remain much the same as it is at present if the Everglades ecosystem and its wildlife are to survive.

4. The Big Cypress Watershed serves as a natural "water conservation area," recharging the aquifer from which rapidly growing neighboring communities will draw much of their fresh water. Deprived of such recharge, the aquifer would be vulnerable to damaging salt water intrusion.

5. The natural cycles of Big Cypress' water flow, and the life cycles of the living things dependent on that flow, are integral and vital parts of the lives of the Miccosukee and Seminole Indians residing on and near the watershed.

ALTERNATIVES OF ACTIONS

I. Fee Acquisition

This alternative provides for fee acquisition of those lands in sub-drainage C, lying, generally, between Conservation Area 3 on the east; Everglades National Park on the south; a line parallel to State Road 29 one mile east of the right-of-way thereof; and, on the north by the Hendry County line and a projection thereof to State Road 29 and shown more particularly on the accompanying map (Exhibit 1).

This portion of the sub-drainage contains approximately 547,040 acres, and has an estimated acquisition cost of \$155,607,000.

Discussion

The Geological Survey has determined that the Big Cypress Watershed can be subdivided into three sub-drainages. Only sub-drainages A and C (Figure 2) provide significant amounts of water to Everglades National Park.

Sub-drainage A drains to Conservation Area 3A by natural drainage and by canals of the Central and Southern Florida Flood Control District where this water comingles with other project water and via the Shark River Slough enters Everglades National Park. Acquisition of, or special control over, sub-drainage A is not felt to be necessary as there are at present no feasible means of diverting this water away from Conservation Area 3A. Although a potential exists for degradation of water quality, the slow flow through Conservation Area 3A provides for natural purification.

Sub-drainage C is the heart of the Big Cypress flow to the northwest portion of Everglades National Park. However, the sub-drainage within Hendry County and Collier County north of the western projection of the Hendry County line to State Road 29 is not proposed for fee acquisition because it is now undergoing drainage, oil field exploration and construction. Moreover, much of the higher lands are already in agricultural use principally as pasture lands. While a contribution to the flow is made from this excluded area, the changes which the area is undergoing make it desirable to detach that portion of the sub-drainage from the remaining portion of sub-drainage C proposed for fee acquisition. In the excluded sub-drainage reliance for achieving the objectives of this report would be placed on water quality standards.

The area beginning one mile east of State Route 29 and extending west to the western limit of sub-drainage C is also not proposed for fee acquisition in this alternative. A substantial part of this area will, in fact, be protected by the State in its acquisition of the Fakahatchee Strand. Only a part of this Strand supplies the park and its estuaries and that portion between the proposed State area and the western limit of sub-drainage C supplies no water to the park. State acquisition insures that a substantial part of the water supply for the future benefit of the west coast cities will be protected, as will be much of the Ten Thousand Islands in the coastal estuary.

The land between the State's acquisition in Fakahatchee Strand and the line one mile east of State Route 29, likewise, is not proposed for fee acquisition in this alternative because of the drainage works already constructed there and real estate sub-divisions already underway. In this area, it is proposed to rely on water quality standards and regulatory restrictions.

II. Control by State and County Authority

Alternative II proposes control by State and county authorities throughout the regulated use area of sub-drainage C as depicted on the map identified as Exhibit 2.

Discussion

Although an office of planning exists within the State government, its responsibilities, with regard to land use planning and zoning, are nominal, and are attended with sufficient doubts as to make it necessary for the State to pass legislation to give authority for land use planning, zoning, and enforcement.

Land use planning and zoning responsibilities are vested in the counties but their implementation has been ineffective in achieving the objectives of this report.

Significantly, local zoning is not static. Moreover, the objective of the local governments may change and become different from the Federal objectives. For example, local zoning bodies sometimes

exercise the zoning power in a way that will provide the highest taxable value on property, i.e., by rezoning from rural-residential to higher density residential or commercial development.

III. Joint Local-Federal Control

This alternative involves joint local-federal control through a combination of fee acquisition of Fakahatchee Strand and zoning throughout the regulated use area of sub-drainage C as depicted on the map identified as Exhibit 2.

Discussion

The State is now in the process of acquiring fee title to certain of the lands in sub-drainage C. For the remainder of the sub-drainage, the desired objectives would be achieved through zoning.

Two methods for achieving this purpose are discussed herein. Both methods involve local-federal zoning commissions.

(1) In order to achieve Federal participation in local zoning administration, partial surrender of the county's duties or authority in regard to zoning would be needed. Moreover, to achieve this end, some action of the State would likely be required.

Action by the legislature could authorize the Board of Commissioners of any county having lands within the sub-drainage to enter into an agreement with the Secretary to create an extraordinary zoning or rezoning commission for that area. The commission would include designees of the Secretary, as well as the local governments.

(2) Another possibility exists, namely, the creation by the State legislature of a District to be comprised of those private lands within sub-drainage C. Such an act could set limitations on uses and, again, provide for the establishment of an overseeing commission.

Effectiveness of these alternatives first turns on whether the State will permit the Federal Government to participate in the zoning process. Without State legislation authorizing the creation of a local-federal zoning commission, there could be no meaningful Federal participation.

If appropriate State legislation is enacted, however, certain controls could be assured. Total control by the Federal Government could not be assured because of the procedural and substantive constitutional limitations on the zoning powers of the states. These limitations would be binding on a local-federal zoning body because its authority to zone still is derived from the police power of the State. For example, zoning ordinances would have to be promulgated in accordance with State laws and could not, without constituting an unconstitutional taking of property, deprive a landowner of any reasonable use of his property.

Authorizing legislation for Federal participation would also be required under either of these methods.

IV. Trusteeship

This alternative proposes to establish a South Florida Environmental Trust to include the seven counties of south Florida as identified in Figure 1 of this report. The South Florida Environmental Trust will have a commission composed of members of the three levels of government. It would include a Federal member appointed by the Secretary of the Interior; a member appointed by the Governor; and a member appointed by the governing body of each of the seven counties.

Discussion

The Trust Commission will be responsible for the development of a comprehensive conservation plan that will preserve, develop and utilize the resources of the seven-county area of the Trust. The plan that will be developed shall be used to set policy on all matters regarding land use within the jurisdiction of the Trust. The land use plan should include, but not be limited to, land development, land acquisition, zoning, water flow, water quality, transportation matters and any other pertinent matters regarding the changing, modification or alteration of the land and water resources of this seven-county area of south Florida. This does not preclude private development compatible with the plan. This Trust concept, as proposed, would authorize the Commission to coordinate the activities of all levels of government and the private sector regarding acquisition,

development, and management of those specific areas within the Trust deemed significant for protecting and enhancing the south Florida environment.

V. Federal Control

This alternative involves a combination of fee acquisition and compensable land use restrictions through regulations.

(1) Establish the Tamiami Trail National Parkway between State Route 27 on the east and State Route 29 on the west.

Such a National Parkway could contribute significantly to the preservation of the quality of the environment in this corridor which is of prime importance in protecting the flow, as well as the quality of the water entering the park from the Big Cypress and the Everglades.

Moreover, to acquire as a part of such a Parkway the northernmost part of the Shark River Slough remaining outside of Everglades National Park, would assure the continuing integrity of this water flow into this vital drainage of the park.

The proposed Parkway would involve donation of the existing State right-of-way to the Federal Government and authorization to acquire additional right-of-way, the total not to exceed an average of 160 acres per mile. The proposed Parkway would also include acquisition by the Federal Government of (a) an area of approximately thirty-eight thousand acres (portion of Shark River Slough east of

Everglades National Park) adjoining the Tamiami Trail on the south and (b) the jetport site approximately twenty-five thousand acres to the north of the Tamiami Trail when the jetport is moved to a new site.

The 25,000 acre tract, representing the jetport, is to remain in public ownership under the Jetport Pact when this facility is moved to a new site.

It is estimated that acquisition costs (exclusive of the Jetport site) will be \$25,800,000.

Federal legislation authorizing the parkway would provide for protection of existing residential and commercial uses that conform to standards established by the Secretary. Moreover, it would permit owners of improved properties to reserve life or other lesser estates for a term of years, as is customary in Federal recreation area legislation. These factors will mitigate the estimated costs mentioned above.

(2) For the remainder of sub-drainage C lying between Conservation Area 3 on the east; the eastern boundary of the State acquisition zone of the Fakahatchee Strand on the west; Everglades National Park on the south; and the Hendry County line and a western projection thereof to State Road 29 on the north (see Exhibit 2 for particulars); private land uses would be restricted through the imposition of Compensable Federal Land Use Regulations. (Note: the portion of sub-drainage C in the Fakahatchee Strand and west thereof is proposed for protection through State action now underway.)

In application, the regulations would resemble more the acquisition of an interest or easement in the property rather than a mere regulation of uses characteristic of State and local zoning ordinances.

The proposal for Compensable Federal Land Use Regulations, moreover, meets the requirements of the Fifth Amendment of the Constitution by providing for the payment of just compensation where a taking (i.e., a reduction in value due to the restriction) is shown.

An important feature of the Compensable Federal Land Use Regulations is that such regulations are in no way intended to deprive an owner of an interest in property without just compensation. With this in mind, it is suggested that any underlying Federal legislation should create in the landowner a right of action against the United States, at any time within a prescribed period of time following promulgation of the regulations to demonstrate and recover any loss in value he can prove by virtue of the regulations.

In any case in which damage can be shown, the money judgment in favor of the landowner would operate to convey to the United States an interest in the property restricting its use in the manner described in the regulations at the time of issuance.

The issuance of such Federal land use regulations would contemplate the preparation of a land use plan for the entire area, encompassing both lands to be donated and purchased by the Federal Government and lands to remain in private ownership, subject to reasonable regulation.

Federal legislation is needed to authorize the Secretary to issue compensable Federal land use regulations.

It is estimated that compensation attributable to such regulations would not in any event exceed \$10,000,000.

VI. Extended Federal Control

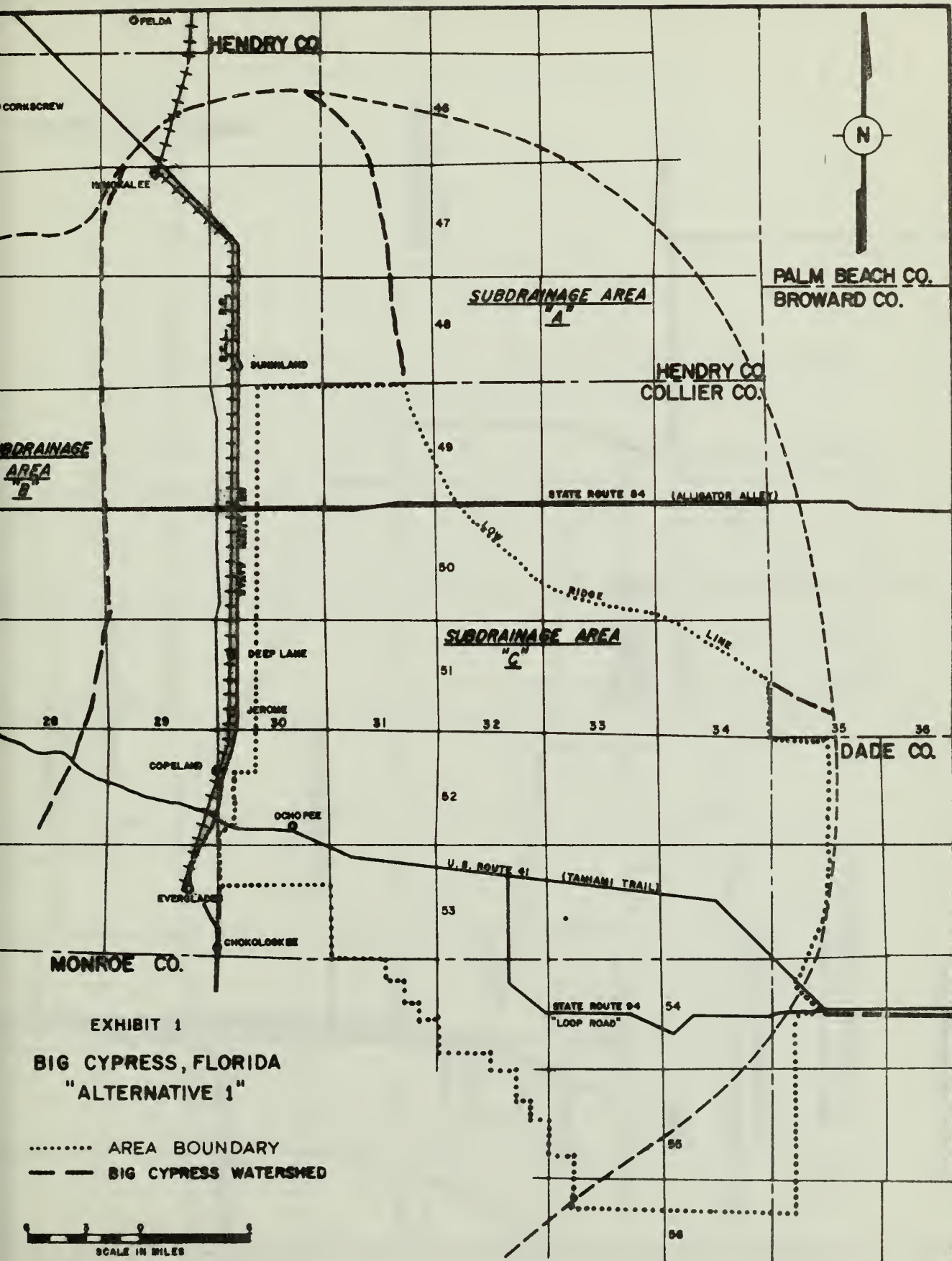
This alternative embraces Alternative V, EXCEPT that the Federal Government would acquire in fee simple all of the remaining lands bounded by the Tamiami Trail on the north; Everglades National Park on the east and south; and on the west, a line parallel to and one mile east of the east right-of-way line of State Road 29, IN LIEU OF imposing Compensable Federal Land Use Regulations on these lands.

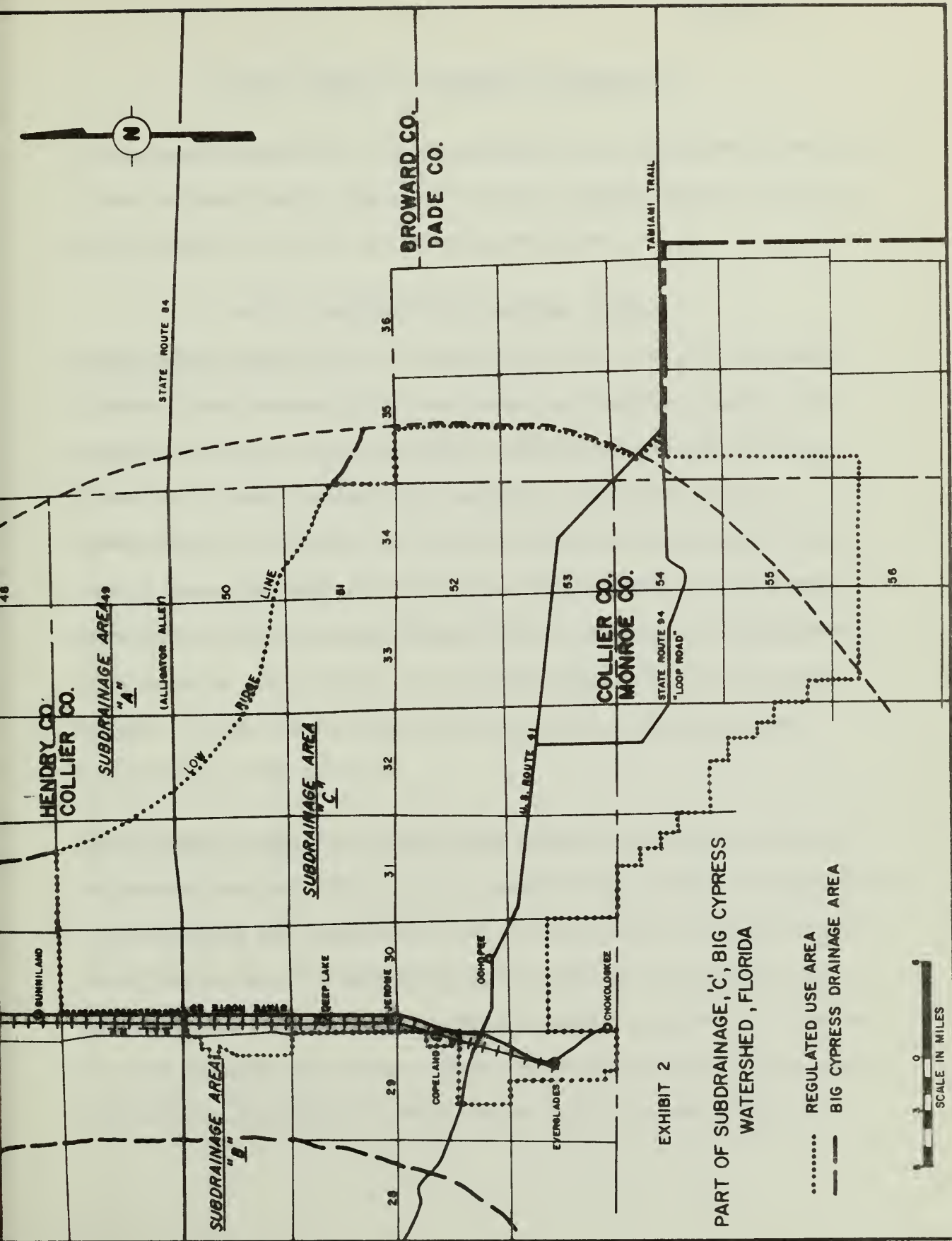
It is estimated that the cost of Alternative VI (exclusive of the jetport site) will be \$87,100,000, of which \$5,000,000 is attributable to Compensable Federal Land Use Regulations.

RECOMMENDATION

Alternative V is recommended as the best combination of State-Federal cooperation to achieve the mutual objectives of each in sub-drainage C of the Big Cypress Watershed.

Proposed actions to implement this recommendation is attached as Exhibit 3.





ACTIONS NEEDED TO IMPLEMENT ALTERNATIVE V

To implement Alternative V, as recommended by the Secretary's Everglades-Jetport Advisory Board, legislation by the Congress would be required, dealing with the subject matter mentioned below:

PART I--TAMIAMI TRAIL NATIONAL PARKWAY

Parkway Right-of-Way--The Secretary would be authorized to designate a right-of-way, generally following existing roadways, together with adjacent or related sites for public recreational use and for interpretation of scenic, scientific, cultural, or historic values, commencing in the vicinity of the intersection of the Tamiami Trail (United States Highway 41) with Florida State Highway 27 and running generally westerly along the Tamiami Trail a distance of approximately sixty miles to the vicinity of its intersection with Florida State Highway 29. The right-of-way would not exceed an average of one hundred sixty acres per mile.

Other Parkway Lands--The parkway would consist of the right-of-way so designated, together with an area of approximately thirty-eight thousand acres adjoining the Tamiami Trail on the south and an area of approximately twenty-five thousand acres to the north of the Tamiami Trail, the boundaries of which areas would be generally depicted on a map on file and available for public inspection in the offices of the National Park Service, Department of the Interior. The Secretary would be

permitted to make minor adjustments in the boundaries of the parkway by publication of a revised map or other boundary description in the "Federal Register," but the total area within the parkway would not exceed seventy-one thousand acres.

Land Acquisition--Within the boundaries of the parkway the Secretary would be authorized to acquire lands, waters, and interests therein by donation, purchase with donated or appropriated funds, transfer from any other Federal agency or exchange, except that property owned by the State of Florida or any political subdivision thereof could be acquired only by donation. Federal property within the boundaries of the parkway could, with the concurrence of the head of the agency having custody thereof, be transferred to the administrative jurisdiction of the Secretary for the purposes of the parkway, without a transfer of funds.

Use Standards to Limit Condemnation of Improved Property--The Secretary would be directed to refrain from exercising his authority to acquire improved property without the consent of the owner so long as the use of such property is consistent with the applicable standard set forth in regulations issued by the Secretary.

As soon as practicable after the effective date of the legislation, the Secretary would issue regulations specifying standards in accordance with which the use of improved property would cause the Secretary to

refrain from acquisition without the consent of the owner. Such standards would contribute to the effect of (1) prohibiting residential, commercial, and industrial use, other than a use permitted by the Secretary, of all improved property within the parkway; (2) promoting the continuation of existing uses which will not interfere with the preservation, development, administration, and public use of the parkway and its environs; and (3) prohibiting any use which will disrupt, alter, accelerate, or retard the flow of water from or in its normal channels or from or in its normal sheet-flow character or lower the quality of the same.

If at any time following the issuance of regulations specifying such standards, property is used in a manner inconsistent therewith, the Secretary would be authorized, at his discretion, to acquire such property without the consent of the owner.

Retained Use and Occupancy of Improved Property--Any owner of improved property which is acquired for the parkway would be permitted, as a condition of such acquisition, to retain for himself, his successors, or assigns, a right of use and occupancy of the property for a period of not to exceed twenty-five years, or, as the owner may elect, for a period ending at the death of the owner and the surviving spouse, if any. The Secretary would pay to the owner the value of the property as of the date of acquisition, less the value as of such date of the right retained by the owner. Such right of use and occupancy could be

exercised for any purpose consistent with applicable standards referred to above, and could be terminated by the Secretary, with payment for the value of the portion of the right remaining, if the property is used in a manner inconsistent with the applicable standard.

Definition of Improved Property--As used in the legislation, the term "improved property" would mean a building, construction of which was begun before April 1, 1971, together with so much of the land on which the building is situated, such land being in the same ownership as the building, as the Secretary designates to be reasonably necessary for the enjoyment of the building for the purpose of residential or commercial use in a manner consistent with the purposes of the parkway.

Establishment and Administration--When the Secretary determines that lands, waters, and interests therein sufficient to constitute an administrable unit for purposes of the parkway have been acquired, he would establish the parkway by publication of notice to that effect in the "Federal Register." Pending such establishment and thereafter the Secretary would develop, protect, and administer the property in accordance with the Act of August 25, 1916 (39 Stat. 535), as amended and supplemented (16 U.S.C. 1 et seq.), except that existing laws now available to the Secretary for the conservation and management of natural resources could be utilized to the extent appropriate.

Hunting, Fishing, and Trapping--The Secretary would be directed to permit hunting, fishing, and trapping on lands and waters under his jurisdiction within the parkway in accordance with applicable laws of the State of Florida and of the United States, except that he would be authorized to designate zones where and establish periods when no hunting, fishing, or trapping may be permitted for reasons of public safety, administration, fish or wildlife management, or public use and enjoyment. Except in emergencies, any regulations of the Secretary would be issued only after consultation with the appropriate State agency having jurisdiction over hunting, fishing, and trapping. Notwithstanding this provision, members of the Miccosukee Tribe of Indians of Florida would be permitted to continue their usual and customary use and occupancy of lands and waters within the parkway, including hunting, fishing, and trapping on a subsistence basis and traditional tribal ceremonies.

Indian Operation of Revenue-Producing Facilities--The Secretary would be authorized to enter into cooperative agreements with the recognized tribal governing body of the Miccosukee Tribe of Indians of Florida, for the construction and operation by the Tribe of revenue-producing facilities and services for visitors to the parkway. Such agreements could provide that all or an appropriate portion of the net receipts may be retained by the Tribe. Any facilities and services provided pursuant to any such agreement would be subject to such standards,

terms, and conditions as the Secretary may establish, and would be conducted only at locations designated by the Secretary. Before entering into any contract for visitor services or facilities for the parkway, the Secretary would be required to give the governing body of the Tribe ninety days in which to enter into a cooperative agreement for the provision of such visitor services or facilities.

Appropriation Authorization--The legislation should authorize to be appropriated such sums as may be necessary to carry out its provisions.

PART II--COMPENSABLE LAND USE RESTRICTIONS

New Construction Restrictions--Except as would be authorized by the Secretary pending the adoption of a master plan for authorized uses, the legislation would prohibit any person, persons, firm, partnership, or corporation to erect or construct on any premises within certain zones depicted on a map to be published in the "Federal Register," any works for drainage, dwellings, roads, airports, or other facilities which disrupt, alter, accelerate, or retard flow of water from or in its normal channels or from or in its normal sheetflow character or in any way act so as to increase or decrease the quantity or quality of the water from its normal time of flow, detention, or velocity; nor may the quality of same be lowered by less than the existing quality where such is known or below that of the State water quality standards for Class 1 in the absence of information on existing quality. The Secretary would be directed to prepare a master plan for

authorized uses within such zones, and, following public hearings, to adopt and issue such plan. In the interim, and prior to the issuance of an approved master plan, each and every activity to erect or construct such works on said premises would require the approval of the Secretary.

Alteration of Existing Facilities--Except as would be authorized by the Secretary pending the adoption of standards for permissible modifications and alterations, the legislation would also prohibit any person, persons, firm, partnership, or corporation to alter or modify on any premises within the zones depicted on the map, any works for drainage, dwellings, roads, airports, or other such facilities which will disrupt, alter, accelerate, or retard flow of water from or in its normal channels or from or in its normal sheetflow character or in any way act so as to increase or decrease the quantity or quality of the water from its normal time of flow, detention, or velocity; nor may the quality of same be lowered by such existing works to less than the existing quality where such is known or below that of the State water quality standards for Class 1 in the absence of information on existing quality. The Secretary would be directed to prepare standards for permissible modifications and alterations within one year following the effective date of the legislation, and following public hearings, to adopt and issue such standards not later than 18 months following such effective date. In the interim, and prior to the issuance of approved standards for permissible modifications and alterations, each and every

proposed alteration and modification would require the approval of the Secretary.

Prohibited Uses--The legislation would provide a basis to control and regulate the use of airboats, swamp buggies, wheeled terrestrial vehicles, and aircraft when the latter are on the ground, on any lands within the zones depicted on the map, except on existing roads, trails, or airstrips, or on such roads, trails, or airstrips which from time to time may be authorized for erection, construction, alteration, or modification by the Secretary.

Penalty for Violation--Legislation should also have to provide for some type of enforcement proceeding against landowners who fail to observe the land use restrictions. In addition to enforcement, the legislation would provide a basis for taking civil action to enjoin unauthorized uses within the designated zones.

Compensation--Any person, partnership, or corporation aggrieved by the imposition of the above restrictions could, within two years after the issuance of the master plan referred to above for new construction or the issuance of standards referred to above for alteration of existing facilities, seek redress by bringing an action in the Court of Claims of the United States, and any award of compensation made by such court in satisfaction of any such claim for redress would represent the acquisition of an interest in the land of the claimant by the United States to the full extent of the compensation granted.

Effective Date--This part would take effect and be in force from and after the first day the map referred to above is published in the "Federal Register."

