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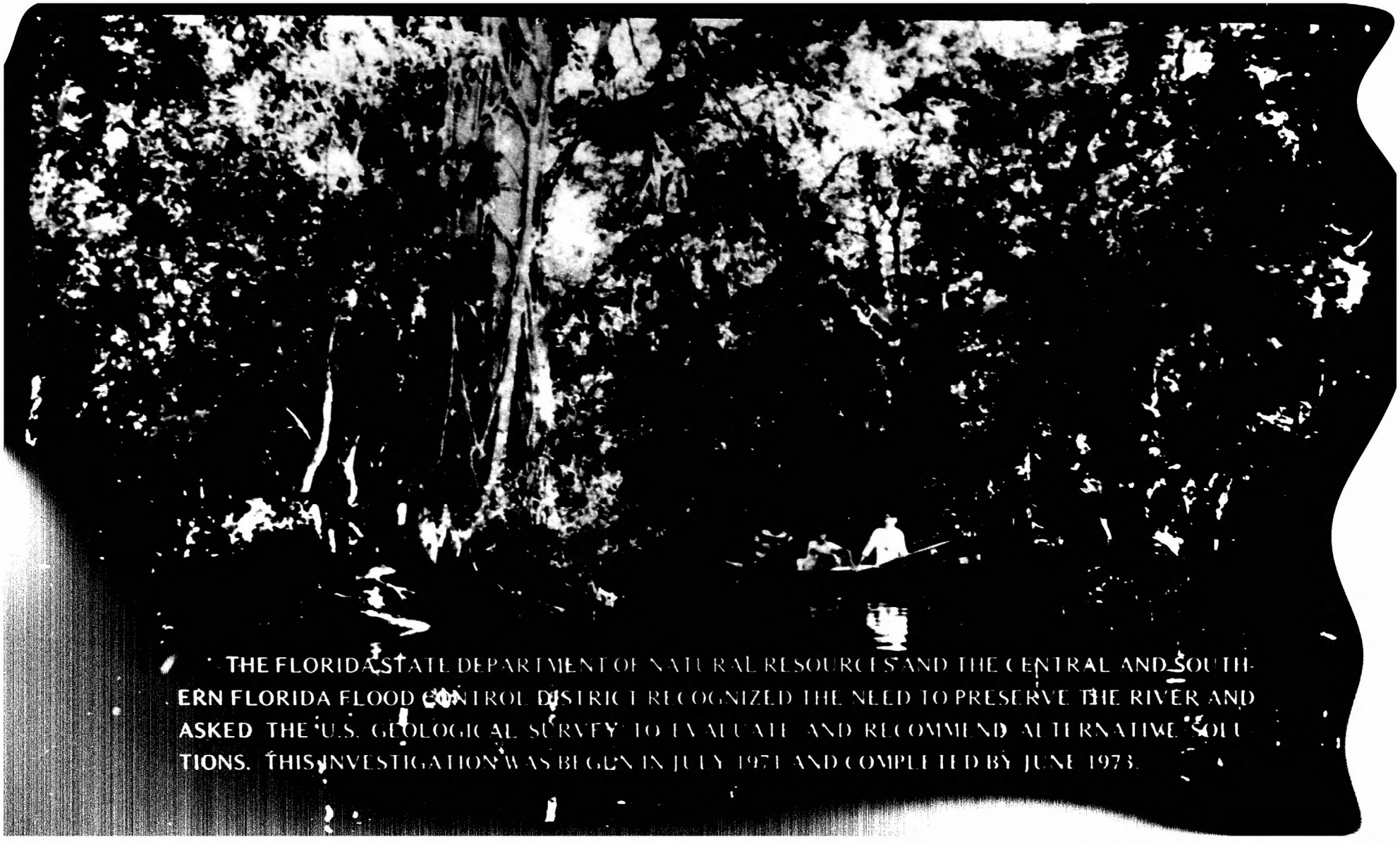
Prepared by
UNITED STATES GEOLOGICAL SURVEY

In cooperation with
FLORIDA DEPARTMENT OF
NATURAL RESOURCES
and
CENTRAL AND SOUTH FLORIDA
FLOOD CONTROL DISTRICT
1973

The Loxahatchee - A River In Distress Southeast Florida



THE FLORIDA STATE DEPARTMENT OF NATURAL RESOURCES AND THE CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT RECOGNIZED THE NEED TO PRESERVE THE RIVER AND ASKED THE U.S. GEOLOGICAL SURVEY TO EVALUATE AND RECOMMEND ALTERNATIVE SOLUTIONS. THIS INVESTIGATION WAS BEGUN IN JULY 1971 AND COMPLETED BY JUNE 1973.

Background and Problems

THE LOXAHATCHEE - A RIVER IN DISTRESS
SOUTHEAST FLORIDA

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Before the turn of the century, the northwest fork of the Loxahatchee River in southeast Florida sustained a flow of fresh water to the sea and its narrow flood plain was covered by a dense river-forest of sub-tropical trees and plants. Today, with land development, digging of canals, and water control practices salt water is encroaching upstream and has transformed the lower reach of this river into an arm of the sea. The upper reach too has

changed, having practically disappeared into a maze of canals and ditches and a quiltwork of farms and homes. Only the middle reach now remains virtually unchanged.

From the beginning of the middle reach at State Road 706 in Palm Beach County the Loxahatchee winds its way northeastward into Martin County then loops southeastward into Palm Beach County and flows to the sea; in this 25-mile stretch the gradient rarely exceeds 6 inches per mile. Except for the flood plain and a narrow belt of coastal sand dunes, the area surrounding the river is flat, and, on the average, is less than 18 feet above sea level. The flatlands adjacent to the river are covered with pine trees and palmettos except in the areas that have been cleared for agriculture and housing.

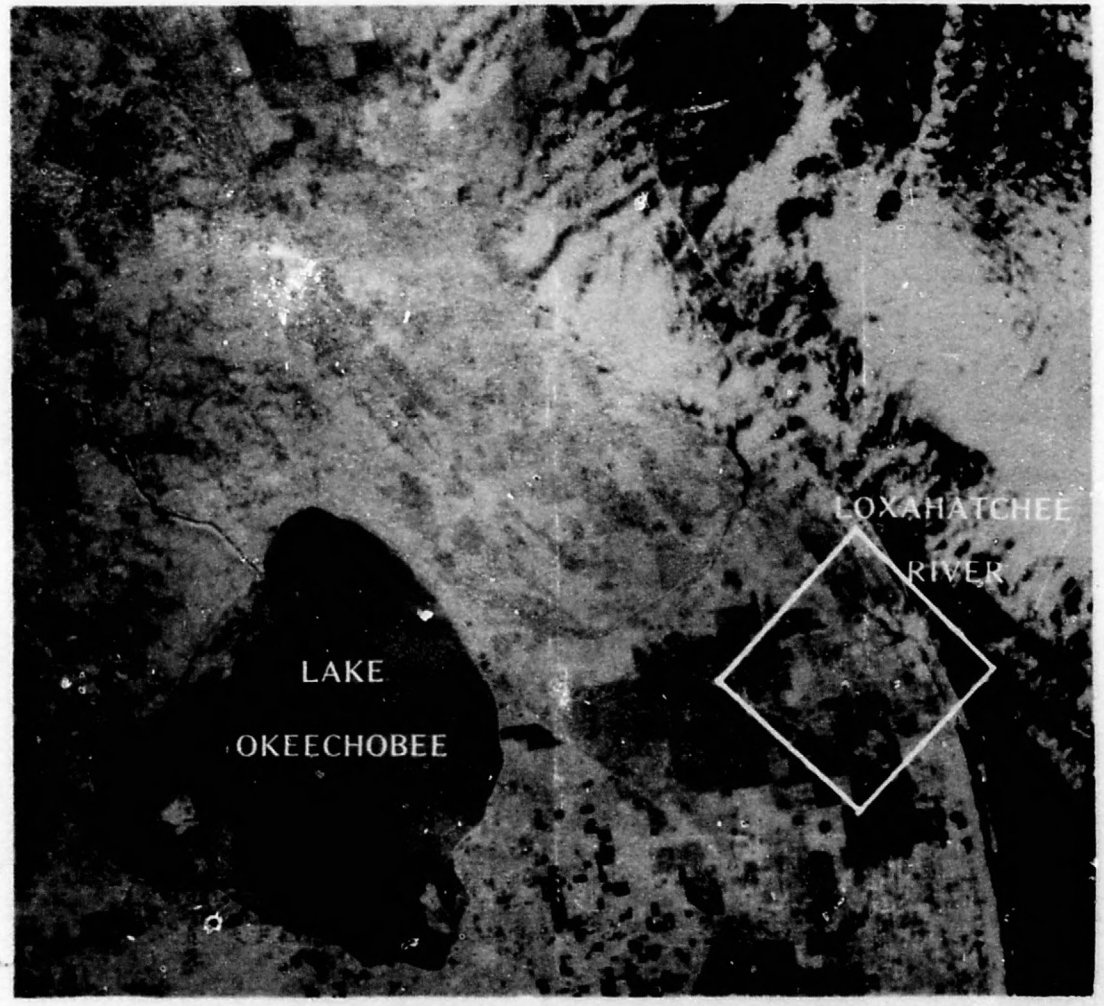
In the middle reach (between A and B on aerial photograph on right) the flood plain is about a quarter of a mile wide and continues to support a dense growth of fresh-water tropical trees and plants such as the bald cypress, pond apple, and air plants. In the lower reaches the flood plain widens to more than half a mile and is marked by communities of red and black mangrove which typify a brackish water environment. In many places dead cypress trees tower above the mangrove reflecting a former fresh-water habitat.

The middle reach of the Loxahatchee River is one of the few remaining natural river segments in south Florida. However, even this reach, is threatened with conversion to a brackish-water environment because diminishing fresh water flow is permitting salt water to move farther and farther upstream.

The question then is how much fresh-water flow from the interior must be maintained in the river to prevent tidewater from encroaching farther upstream. Data on stream salinity and rate of fresh water in the downstream, show that the river requires a continuous flow of 23,000 gallons per minute (50 cubic feet per second) at the beginning of its middle reach to retard further upstream movement of the sea. The 23,000 gallons per minute is valid only if ground water inflow along the middle reach does not fall below 1971-73 levels.

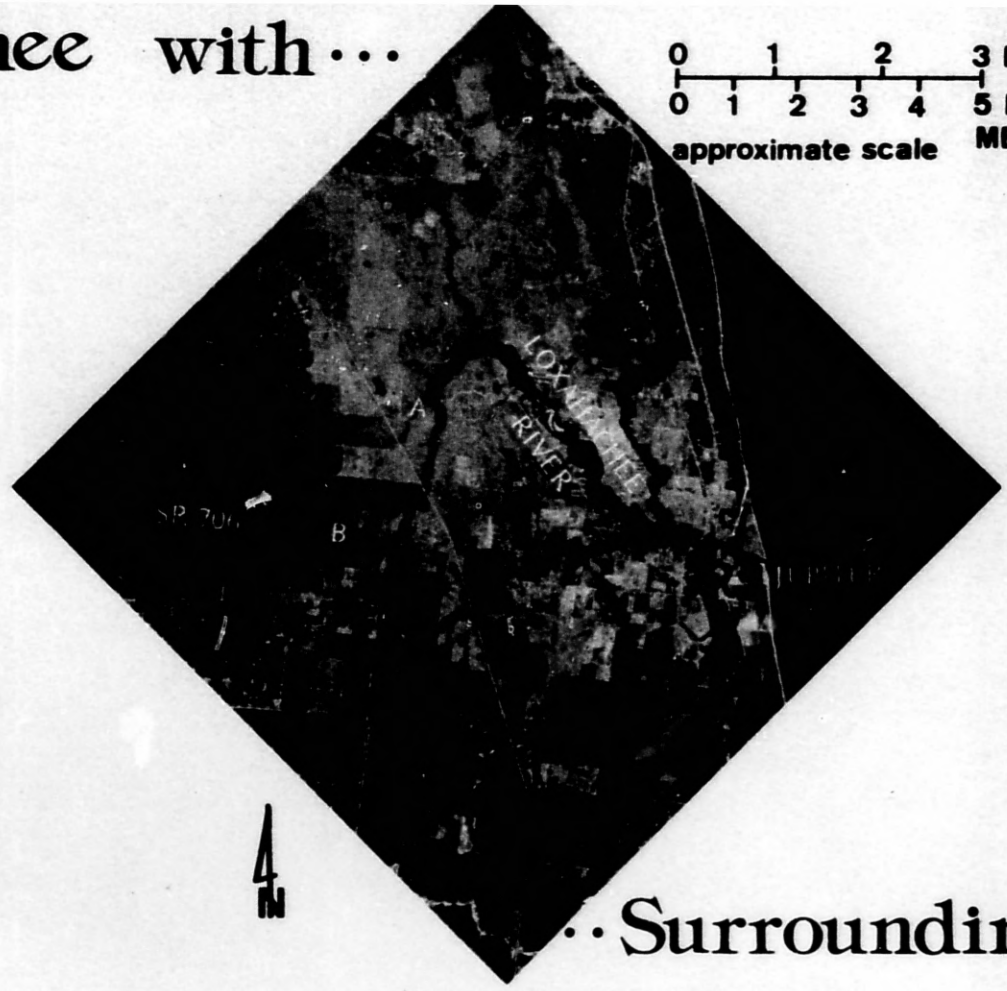
In addition to maintaining a minimum flow through the middle reach to control salinity, the flow should be low in pesticides, nutrients, or other toxic materials. Otherwise, because of the deleterious effects of these substances on plant life, much of the benefit of salinity control will be nullified.

Image Location



The Loxahatchee River and surrounding area are shown in a detailed, high altitude photograph taken on November 16, 1972. Spotted darker area immediately west of river is larger natural terrain; light gray indicates natural vegetation and intervening black areas are lakes and swamps, checkerboard patterns of grays and whites indicate agricultural and urbanized areas.

The Loxahatchee with···

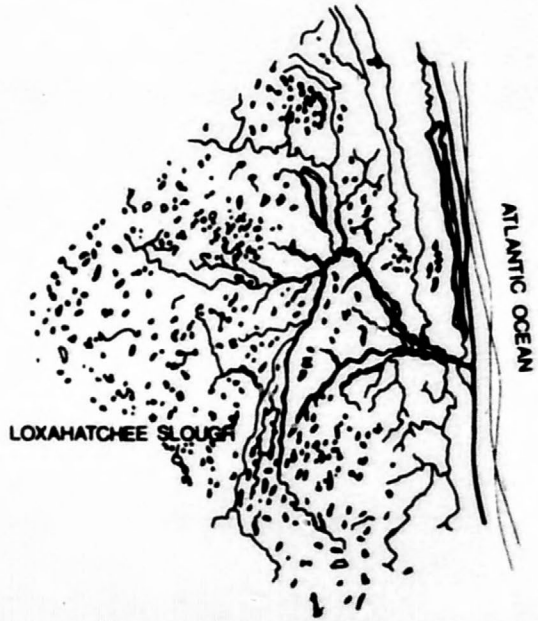


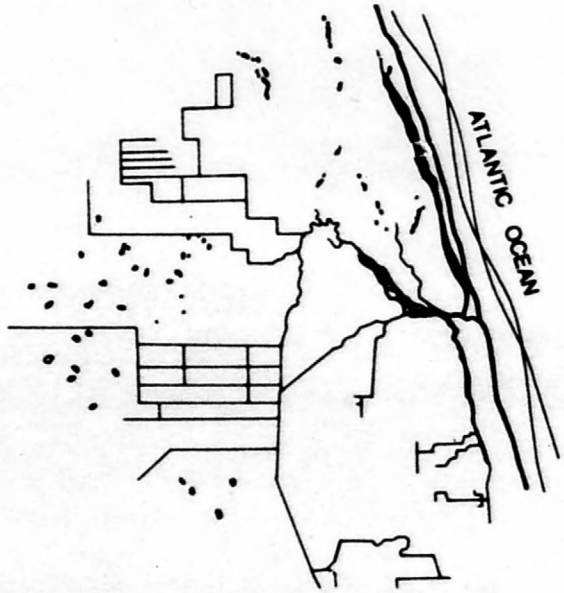
This is a black and white reproduction of an infrared color aerial photograph of the Loxahatchee River and its surroundings from an altitude of 60,000 feet. The river between A and B is the unaltered fresh water reach. Downstream from A, the river is estuarine and supports plant communities that tolerate salty water. The upper reach, south of B is dissected by canals and ditches.

··Surroundings

Drainage Patterns

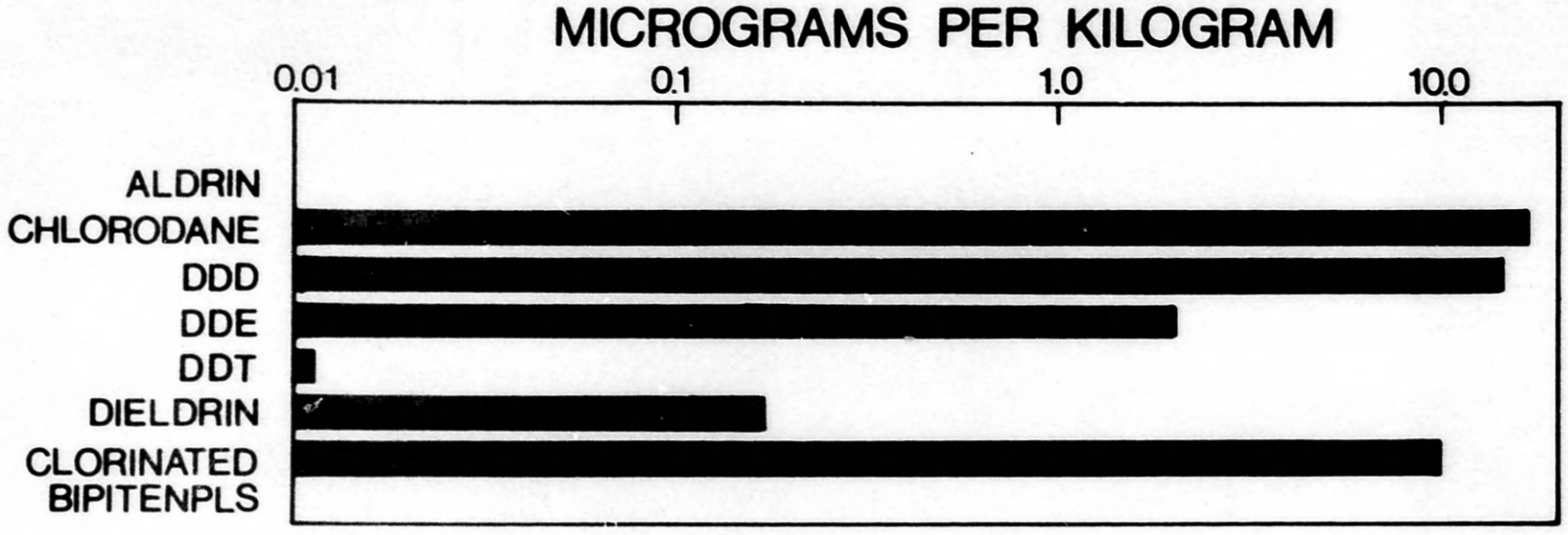
The map below shows about what the natural drainage pattern looked like years ago. In its natural condition, the Loxahatchee River arose in the Loxahatchee Slough near West Palm Beach. The physiography then was characterized by swampy flatlands with small lakes and streams that maintained sufficient flow into the Loxahatchee to prevent the upstream movement of salt water. The drainage was reconstructed by using photographic interpretative techniques.



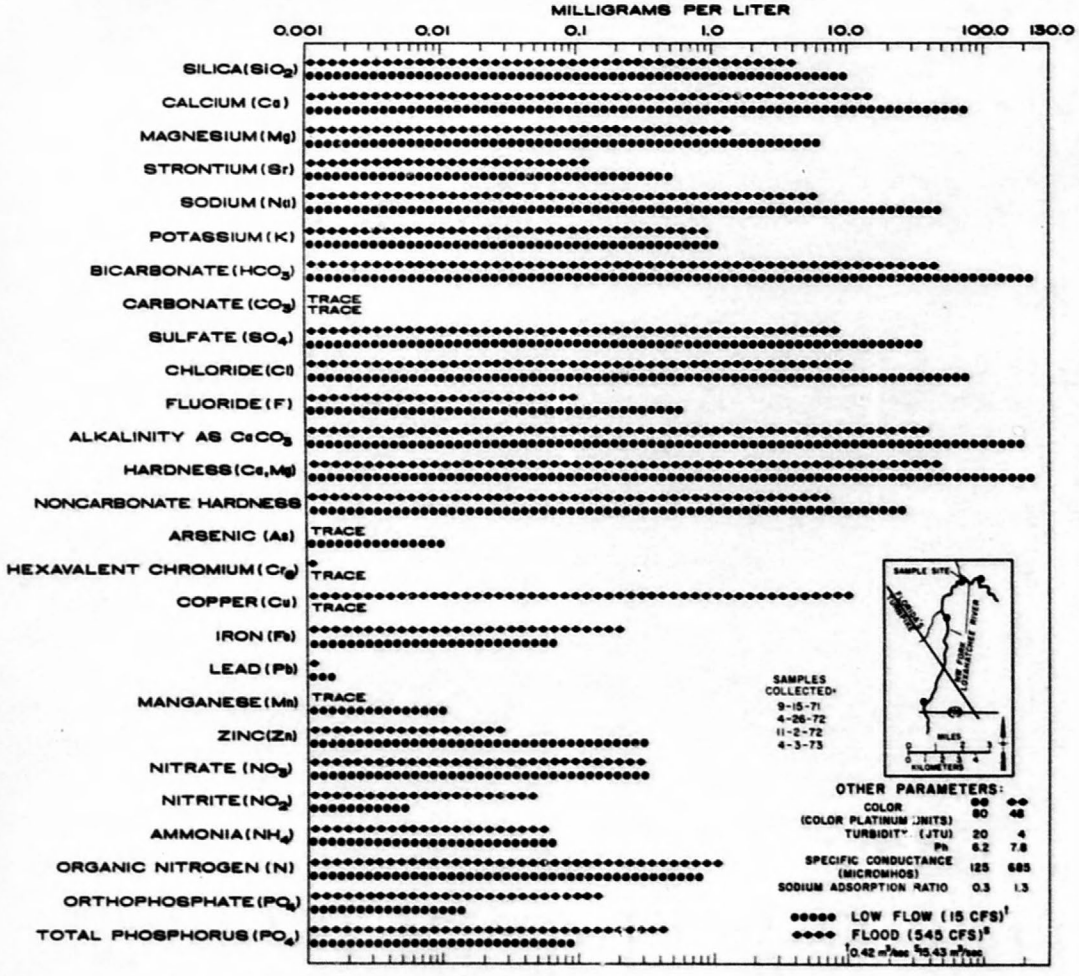


Today (1975), canals (shown by straight line patterns) have almost completely replaced the natural drainage causing the water table to drop as much as 10 feet. A combination of a higher water table that maintained sufficient base flows and oyster and sand bars at the mouth of the river once kept salt water out of the river during dry seasons.

Pesticides Accumulating in Sediments



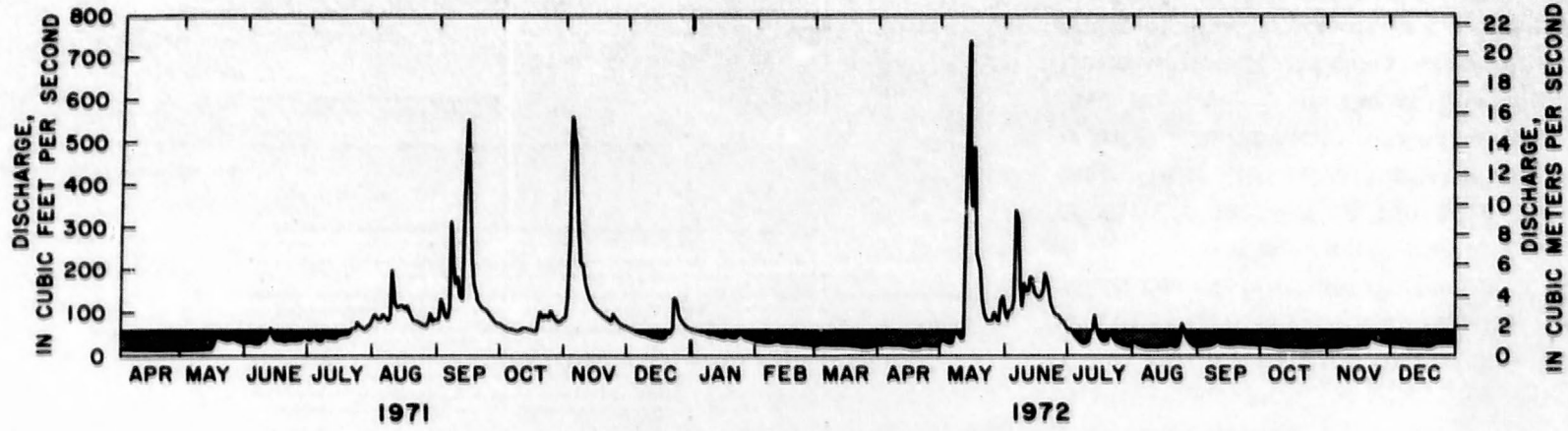
Graph above shows a significant amount of pesticide in bottom sediments of middle reach of river. Sediments are easily obtained with a dredge. In contrast the river water contained nowhere near as much because pesticides either move downstream or settle and accumulate in the bottom sediments.



Mineral Content Level Higher in Dry Season

Water quality of the Loxahatchee River changes from dry to wet seasons. The mineral content of the river water is higher in the dry season when the flow is lower than in the wet season when flow is high. In the dry season most of the flow is from ground water that has discharged into the river from the shallow aquifer. Construction of additional canals or deepening of existing canals in the basin will tend to lower the water table, and further decrease the flow of the river during dry periods. Before the land and aquifer were partly drained, low flows were sufficient to prevent serious encroachment of salt water into the lower reach that is now brackish.

Natural River Environments ...
Need Minimum Flow



The river needs a minimum flow of 23,000 gpm (gallons per minute) to preserve the remaining natural environment of its middle reach. This means that when the actual flow, shown in the above hydrograph is less than 23,000 gpm, it will have to be augmented by the amount shown (stippled pattern). For example, in April and May 1971 the flow averaged about 6,000 gpm. During that time approximately 17,000 gpm would have been needed to maintain the minimum required flow. The minimum required flow was determined by relating the streamflow recorded at the gaging station at SR 706 to the position of the salt-water wedge during that time.

Outlook for the Future ····

A sufficient flow of fresh water of good quality plus regulation of further land use changes in drainage in adjacent areas are methods that may be considered in order to preserve the remaining natural environment of the middle reach of the Loxahatchee River. The additional flow which is especially needed during the critical dry seasons could be provided by diverting water from inland canals and water storage areas. If the water is not available then a salinity barrier, dam or lock constructed downstream would block upstream movement of the salt-water tides and retard the losses of fresh water from the basin.

Acknowledgements

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This public document was promulgated at this issue's cost of $352.65, or $.587 per copy for 600 copies to provide basic information in various fields of science and technology as related to water management, and to assist the general public to gain background knowledge in matters affecting our environment.