2017 Greater Everglades Ecosystem Restoration Conference
April 17-21, 2017

THE GHOST TREE ISLANDS OF EVERGLADES WATER CONSERVATION AREA 2A: TRACING A HISTORY OF CHANGE

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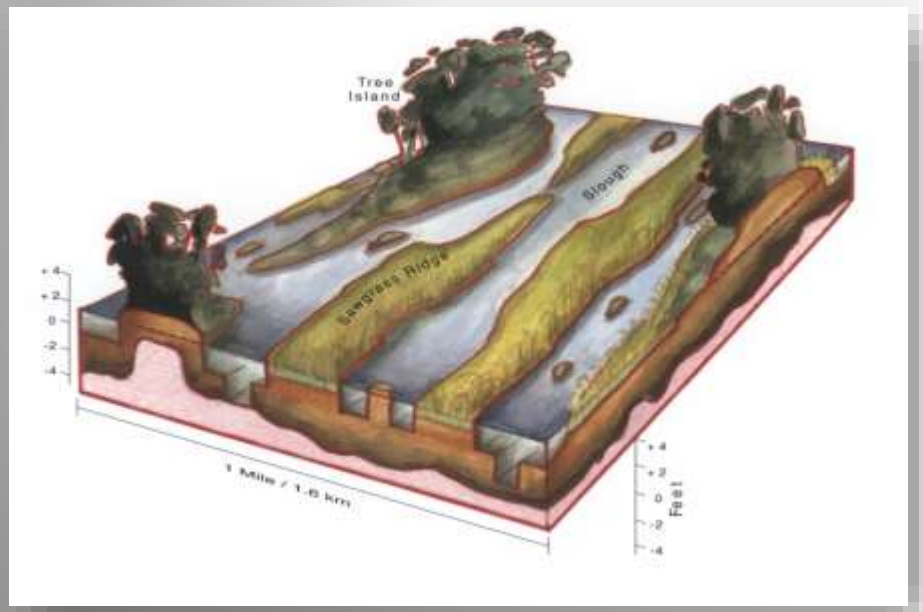
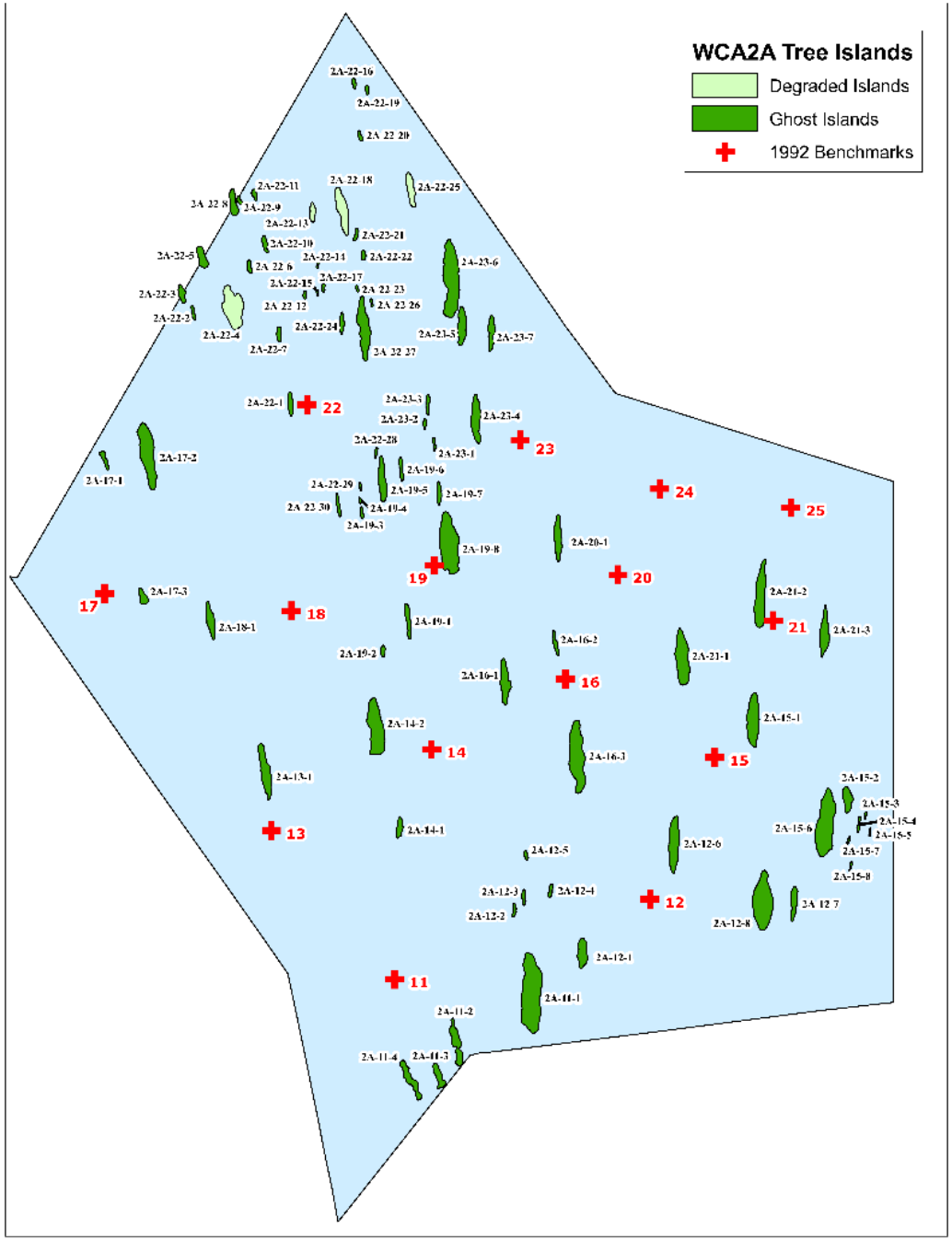
Everglades Landscapes

Landscape

- A mixture of custard apple swamp forest, sawgrass plains, ridge and slough, marl marshes

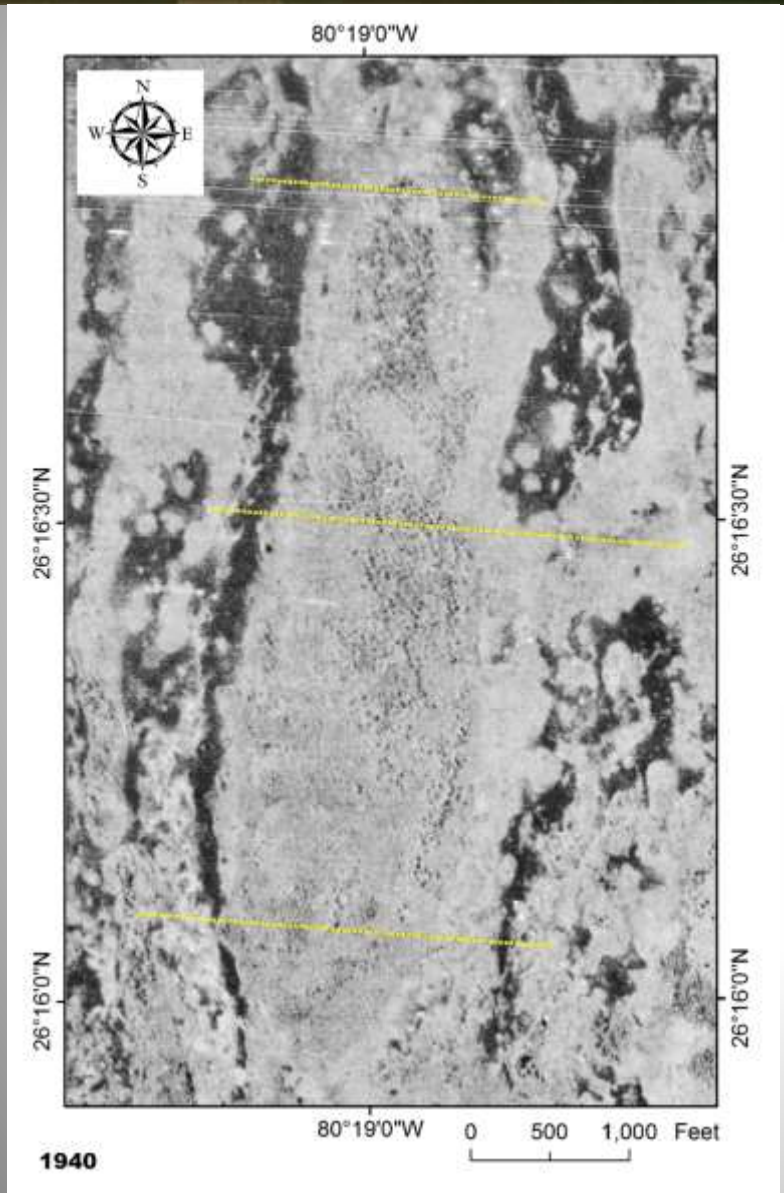


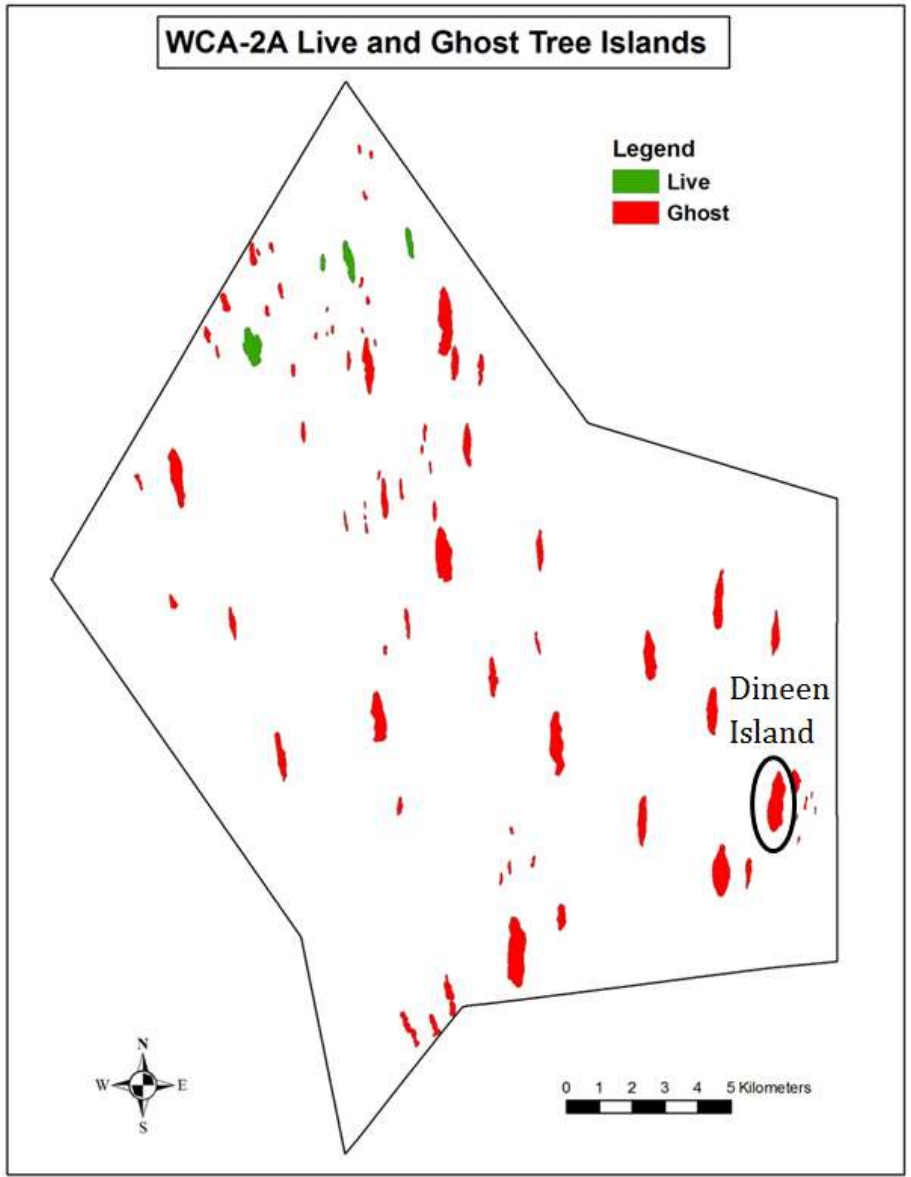
McVoy, Christopher W., Winifred Park Said, Jayantha Obeysekera, Joel A. VanArman and Thomas W. Dreschel. 2011. Landscapes and Hydrology of the Predrainage Everglades. University Press of Florida, Gainesville, FL. 342 pp. + 297 pp. on DVD.



Ghost Tree Islands: Everglades tree islands that have lost most of their woody vegetation

Dineen Island





Tree Island History

"A sediment core collected in the modern tail of one drowned tree island, Treece's Island *(central WCA-2A)*, illustrates some of the paleovegetational patterns. Pollen assemblages indicate that the island developed at least 1,900 years ago; from then until the 20th century, taxa characteristic of relatively dry tree-island heads dominated the assemblages. Increased abundance of waterlily pollen after 1960 reflects the development of sloughs in deeper water while the tree-island community declined."

Willard, D. A. 2004. Tree Islands of the Florida Everglades—Long-Term Stability and Response to Hydrologic Change. *U.S. Geological Survey Fact Sheet 2004-3095, Online Version 1.0*

Early 1900s

"One of the results of partial drainage is that along this same east border [of the Everglades] numerous low, timbered 'islands,' which were formerly quite wet, have now been changed to dry land. A considerable part of the foundation of these groves is peat and in dry times it is very liable to fire, and once begun it is well-nigh impossible to extinguish it. These groves, despoiled of their only defense against fire, are often wholly destroyed"

Simpson, C. T. 1920. In lower Florida wilds. G. P. Putnam's Sons, New York, pp. 126–127.

Dineen Report

In Depth REPORT

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT

VOL. 2, NUMBER 3 JULY-AUGUST, 1974

EXAMINATION OF WATER MANAGEMENT ALTERNATIVES IN CONSERVATION AREA 2A

by

J. Walter Dineen

Prologue

In May 1972, the District published an In Depth (Vol. 1, No. 5) titled "Life in the Tenacious Everglades" (Dineen, 1972). That report was a generalized version of Everglades ecology dealing with the present status and very recent history of the remaining freshwater Everglades. Some of that dissertation centered upon ecological changes which have been occurring for the past ten years in Conservation Area 2A (CA2A).

This publication is an attempt to explain these recent ecological changes and why they have occurred. It also will outline alternative water management practices available to alter CA2A to one or another form of Everglades-like area.

CONSERVATION AREA 2A WATER DRAWDOWN

Introduction

Everglades ecology is based on alternate periods of flooding and drying. The drying process in CA2A had been artificially removed by construction of L-35B (Figure 1) in 1962. This levee divided Conservation Area 2 into two pools, CA2A and CA2B. The CA2A portion retained more water than it had previously because L-35B reduced seepage. The CA2A pool was permanently flooded as a result of adherence to a Corps of Engineers regulation schedule predicated primarily on water supply and flood control considerations.

In 1973, a decision was made to drain CA2A in an attempt to reverse some of the ecological changes that had occurred. These changes had included:

(1) the loss of two species of wet prairie plants, beak-rush (Rhynchospora tracyi) and maidencane (Panicum hemitomon) which had been plentiful in the 1950's;
(2) the loss of trees and woody vegetation

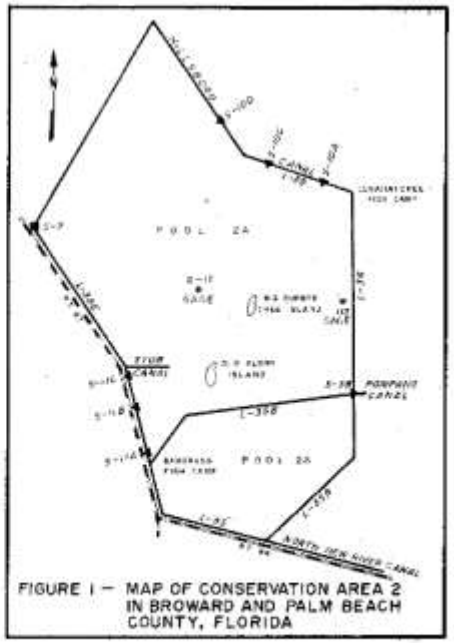
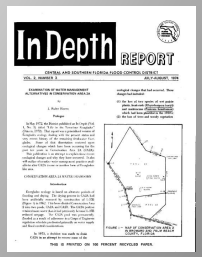


FIGURE 1 — MAP OF CONSERVATION AREA 2 IN BROWARD AND PALM BEACH COUNTY, FLORIDA

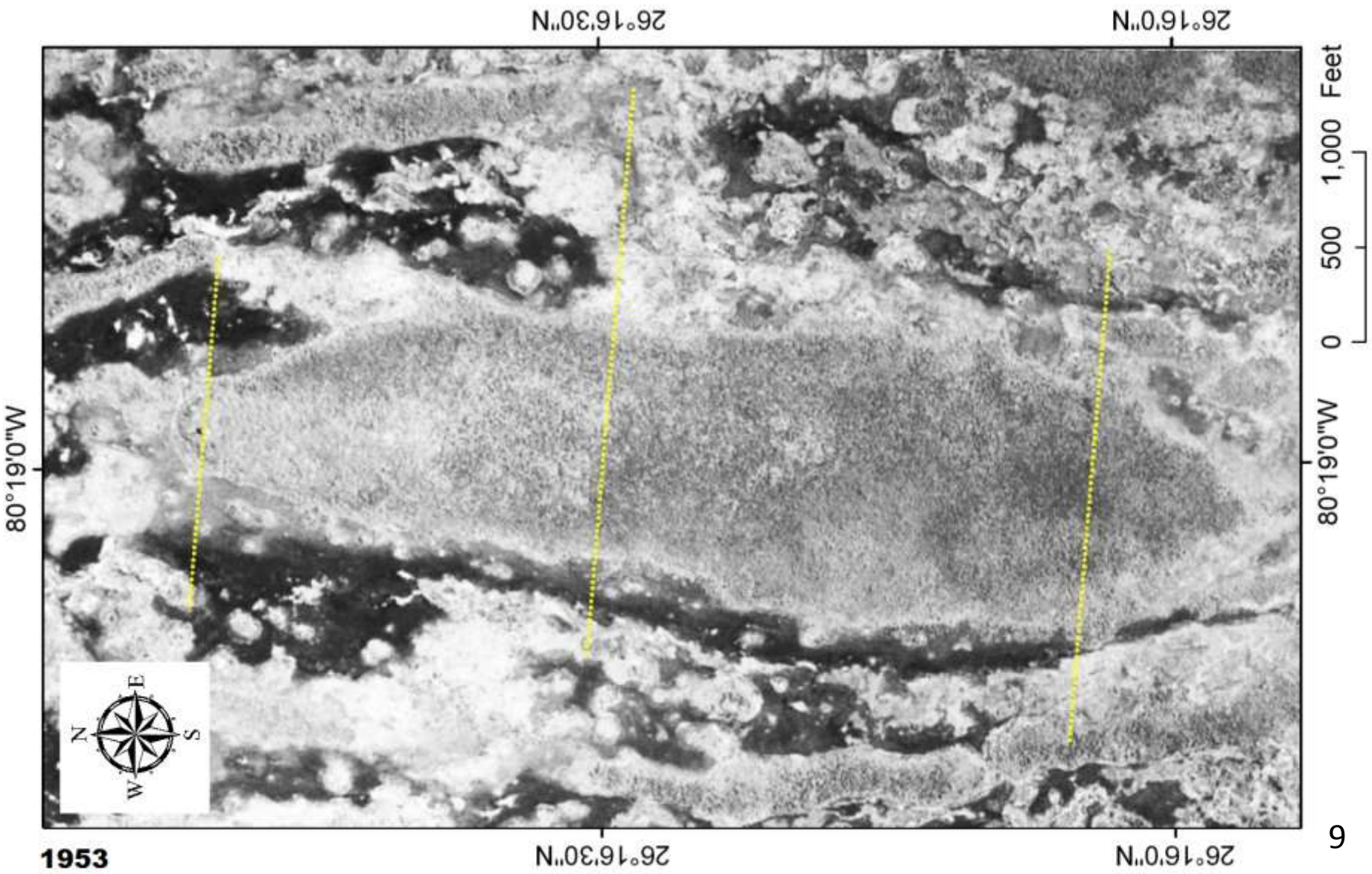
1953-1957

"The … earliest time span … (1953-1957) may well have been the formative years for many of the tree strands now gone from CA2A. Water conditions were very low, seldom covering the top of the tree islands, quite often falling below marsh ground level. The water regime of those years also promoted the growth of the wet prairie plants that have also disappeared from most of CA2A. In this particular set of years, some very serious fires occurred in CA2 due to low water conditions."

Dineen, J.W. (1974) Examination of Water Management Alternatives in Conservation Area 2A. In Depth Report, Vol. 2(3), Central & Southern Florida Flood Control District, West Palm Beach, FL, 11 pp.



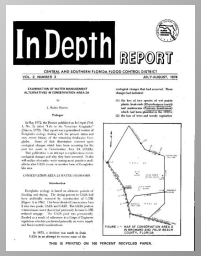
1953 Aerial Photo



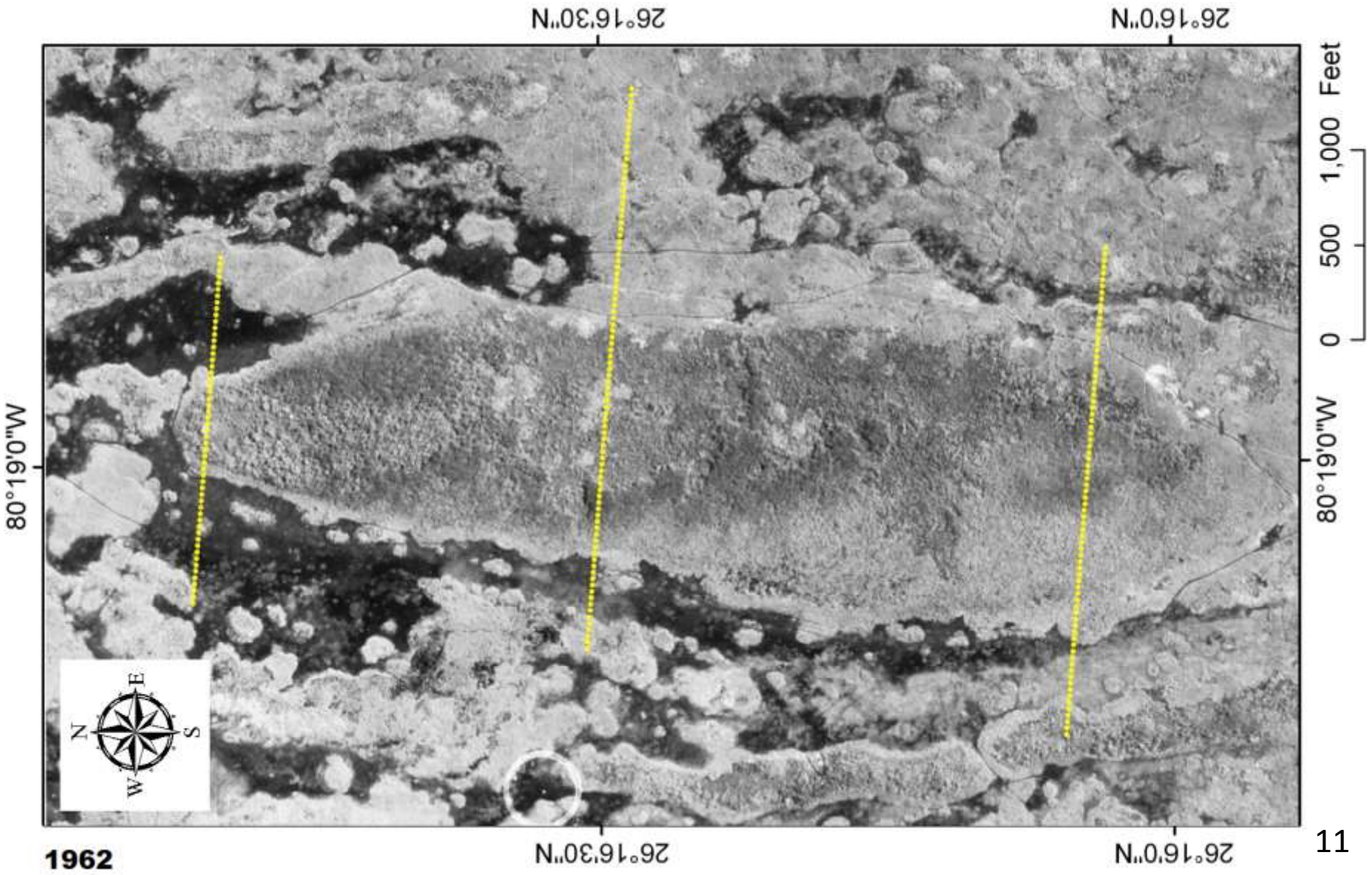
1958-1962

"The … five-year span (1958-1962) was one during which the trees were still in a healthy condition. The top of the island was never flooded in the 1958-1962 time-span during the months of March, April and May (Table 1), and only a very low percentage of the time in January, February, June, July and August."

"Completion of the L-35B in 1962 gave the capability to hold higher water stages for longer durations in the portion of the Everglades known as CA2A."

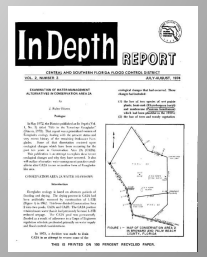


1962 Aerial Photo



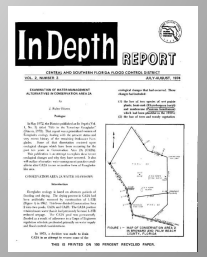
1963-1967

"The … period was selected for the years 1963-1967, the observed time span of the demise of the tree island. It was found that the top of the island (12.3 ft. msl) was flooded 100% of the time in all months except April, May and June, when the frequency of flooding during those three particular months in that five-year span was 91% in April, 58% in May, and 80% in June. This was a very wet tree island and obviously much too wet for willow (which died)."



Dineen Island

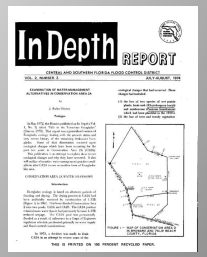
"The island is of extremely low relief, varying from elevation 11.0 ft. msl at the marsh edge to 12.3 ft. msl at the center line of the island. This is only 1.3 feet above the adjacent marsh (*slough*). In 1963, the island was clearly visible for miles as a long, green strand of live willows extending from north to south for about a mile. By 1965, it was difficult to locate the island on the horizon because most of the trees had died or were defoliated. By 1967, all sign of living trees were gone."



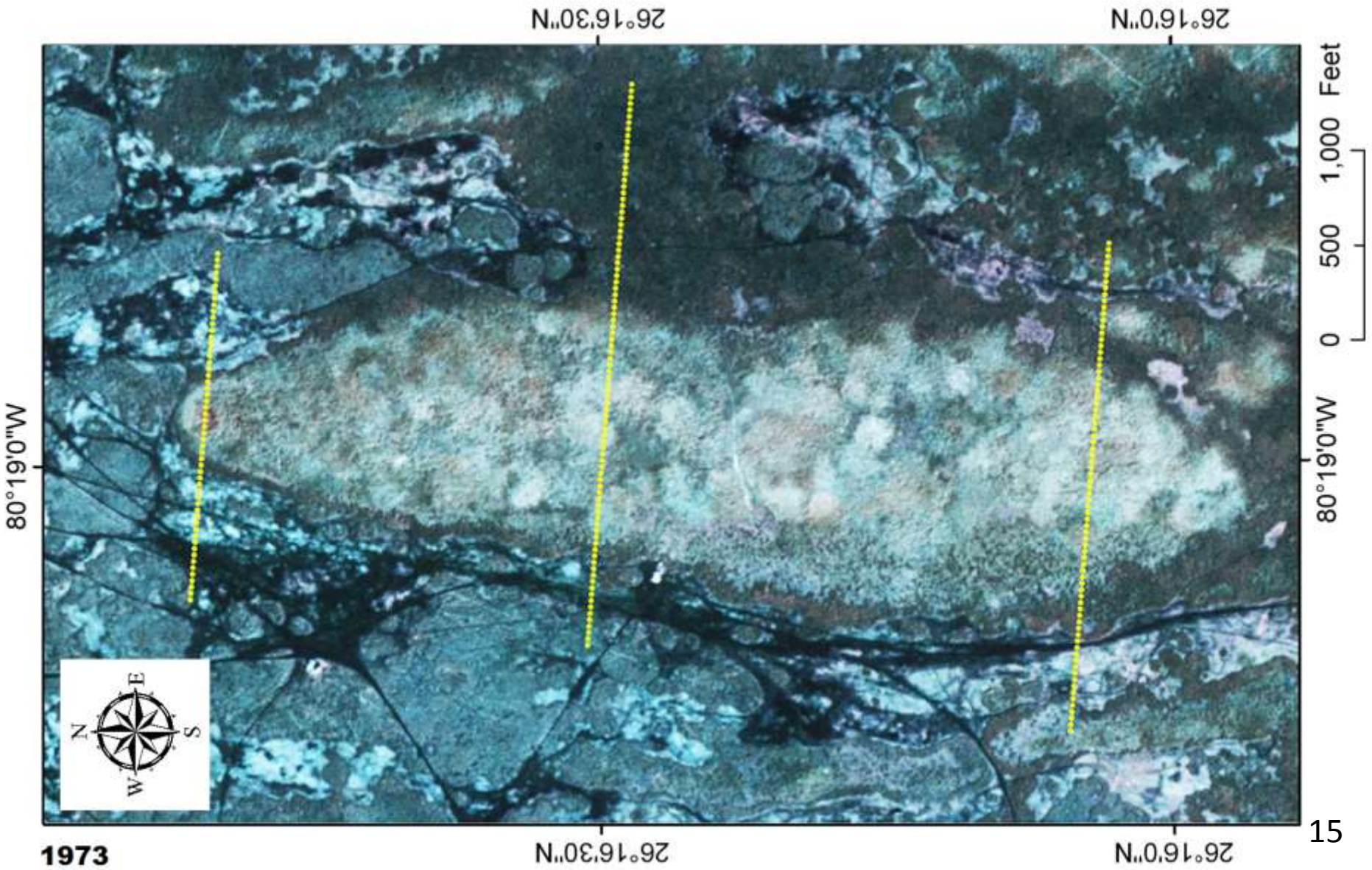
Peat Loss Evaluation

"During the spring of 1973, a topographic survey was conducted on a water damaged willow island on the east side of CA2A using dead tree stumps to delimit the island. This island was selected for three reasons:

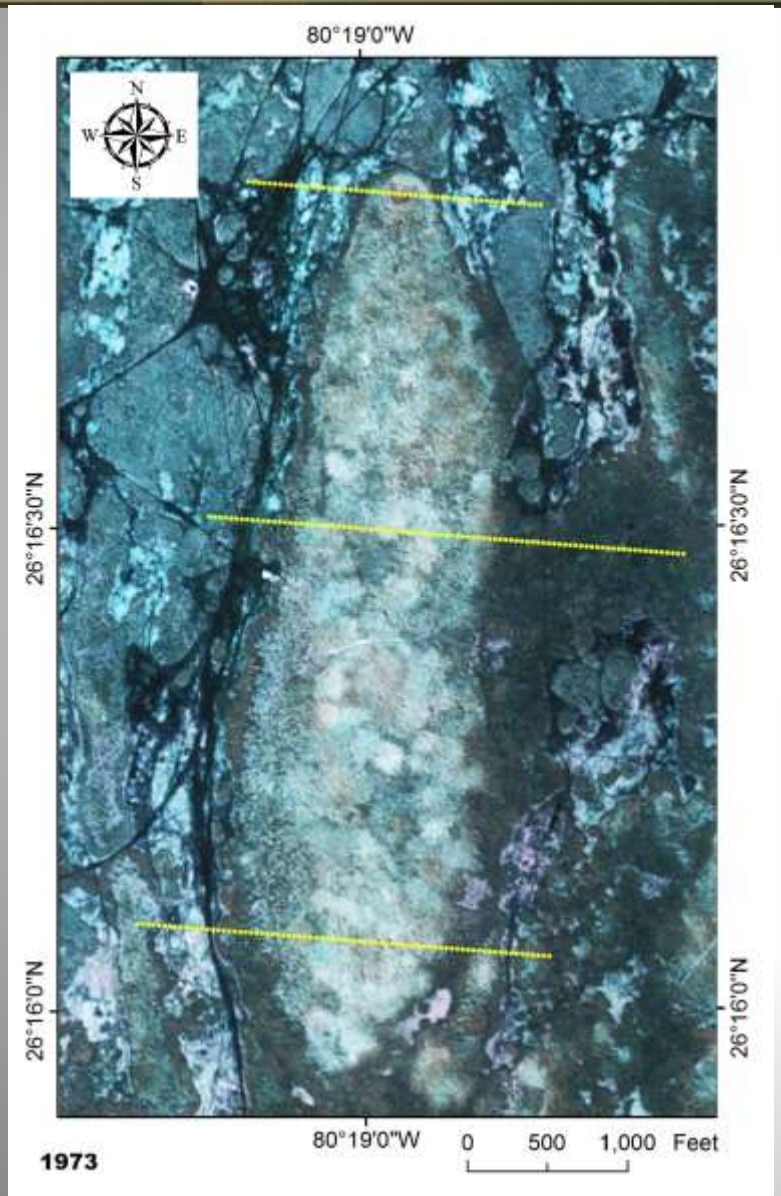
(1) It was considered to be typical of the type of island that was once so abundant in CA2A and is now almost totally gone.
(2) A history of field observations concerning that particular island for the years 1963 through the present time was available; and
(3)It had been a prime nesting location for Everglades kites in 1967 through 1969."

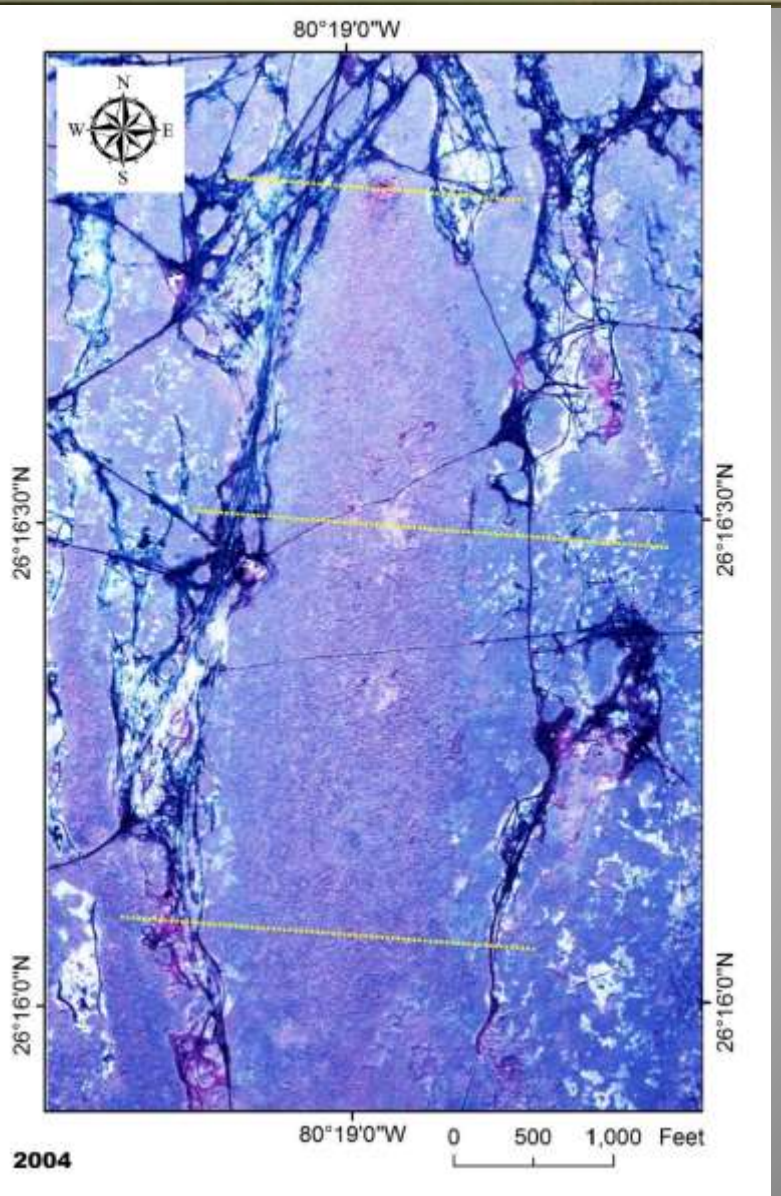


1973 Aerial Photo

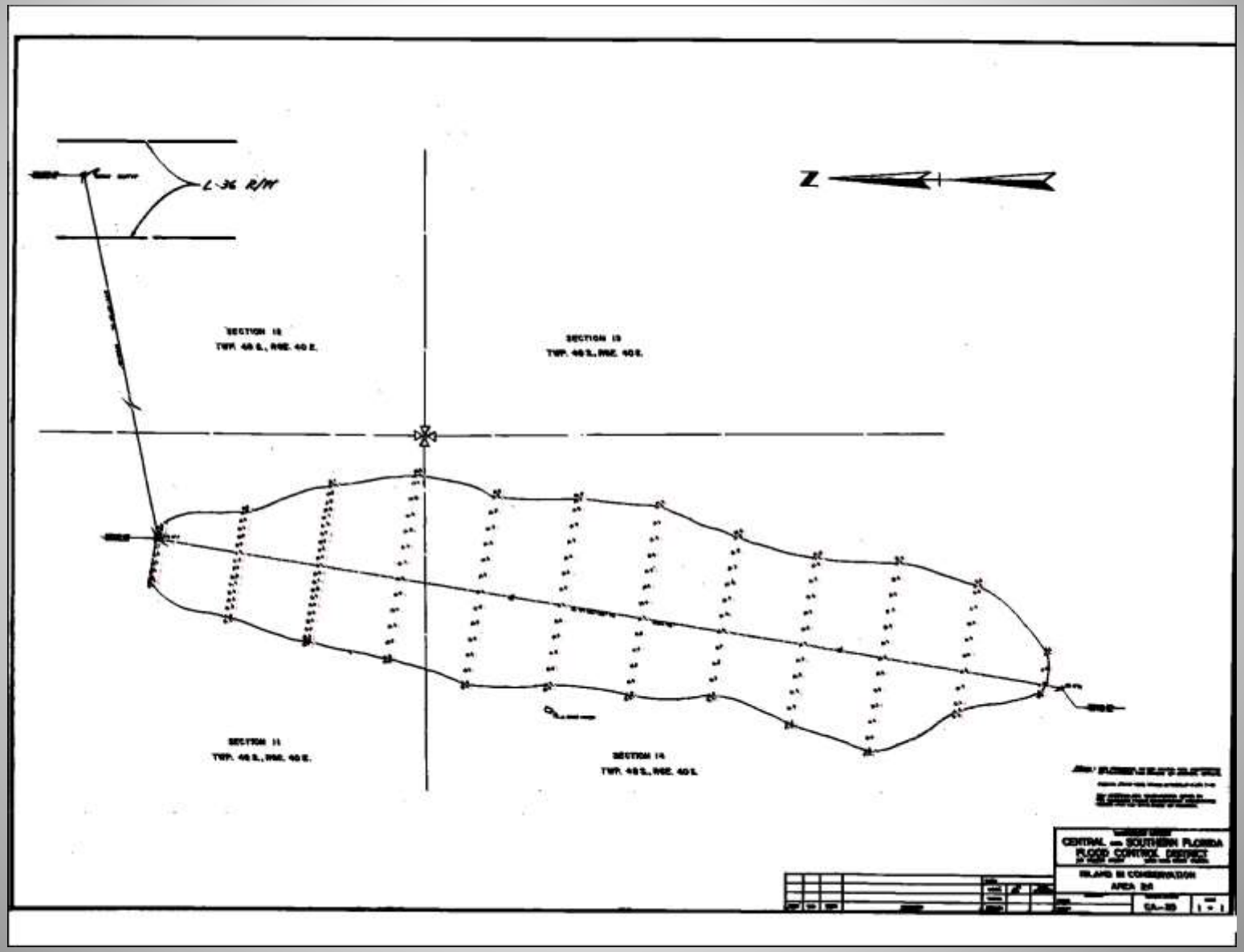


Evaluating Change: 1973 and 2004 Aerials

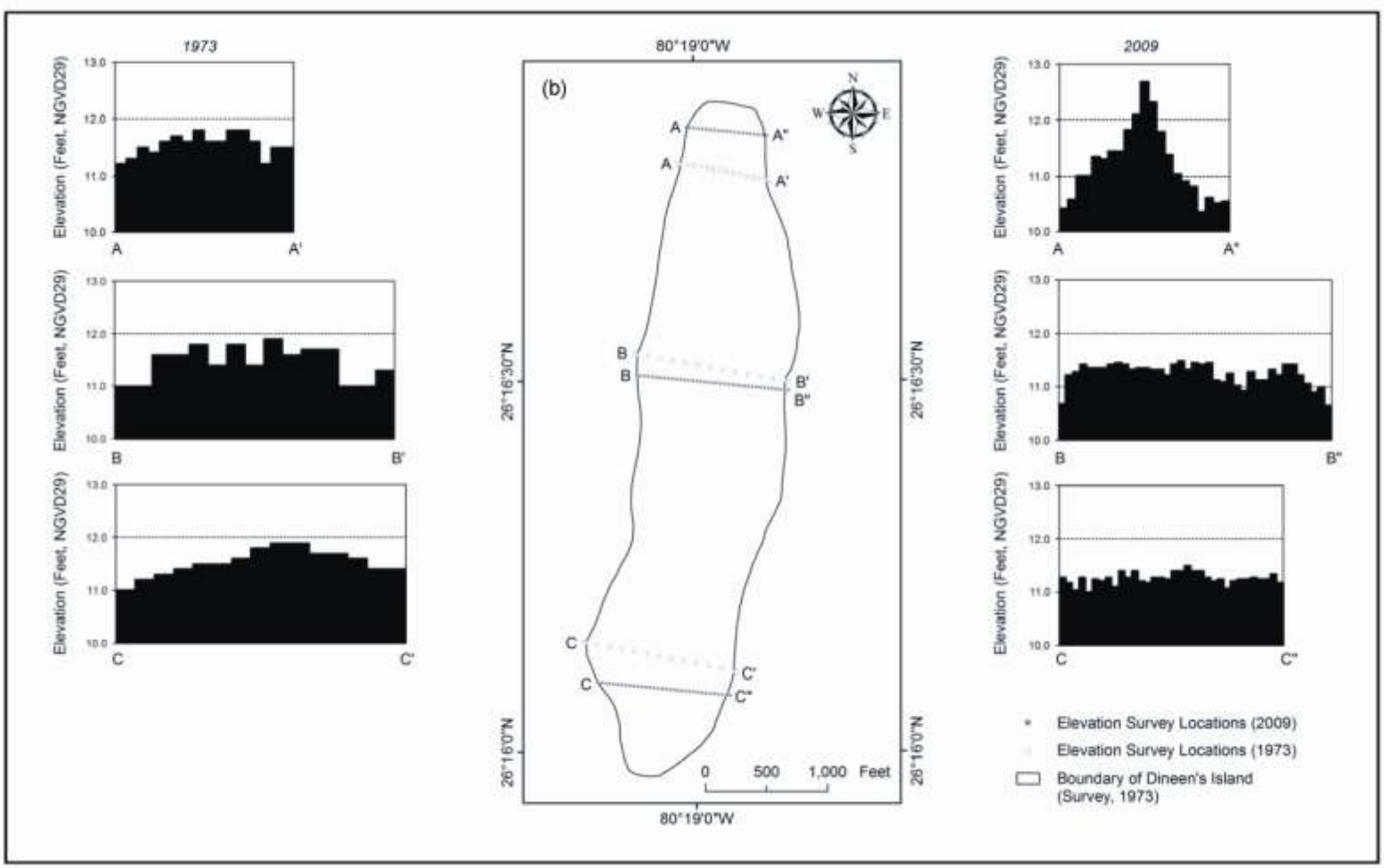




Dineen Island Survey, 1973

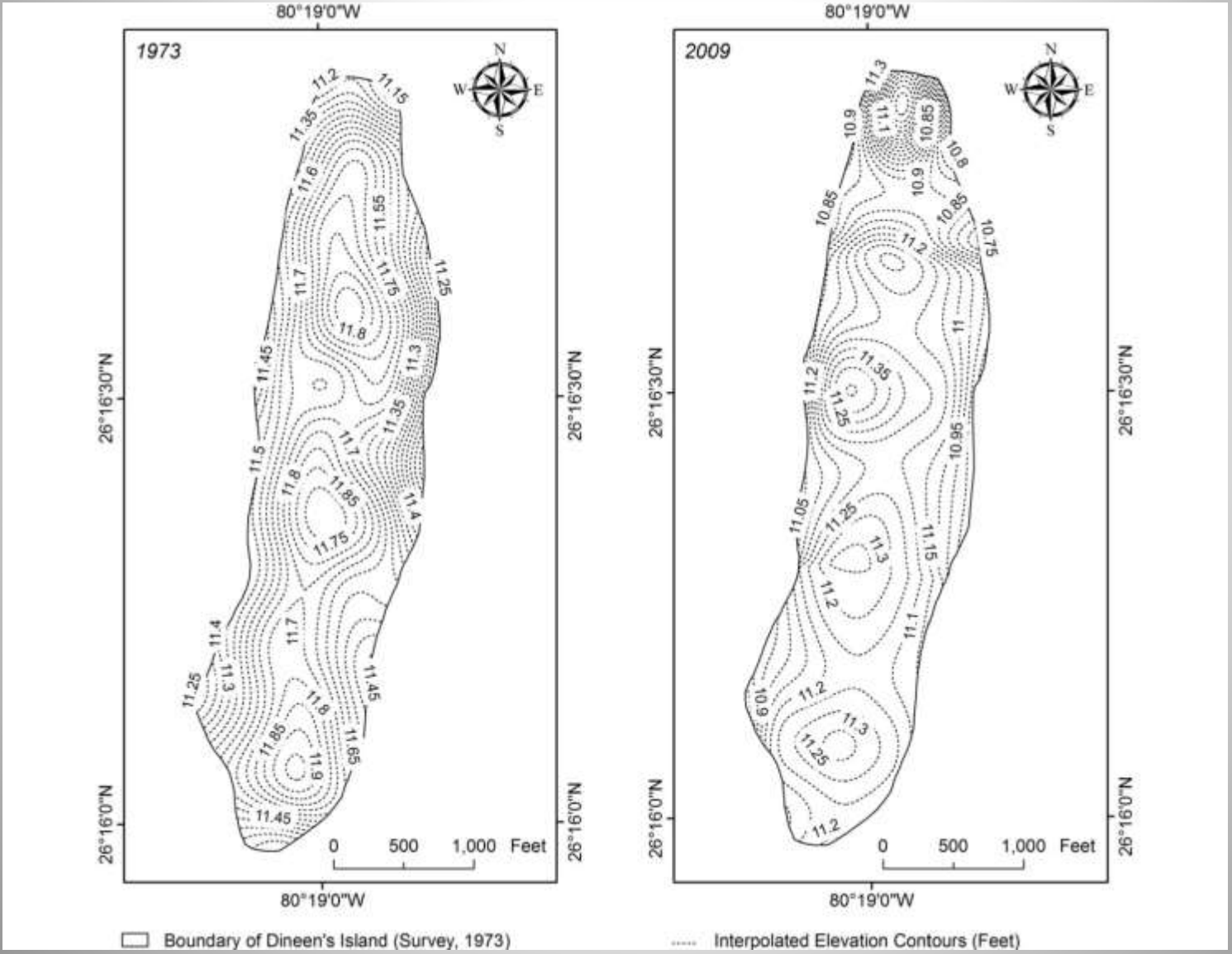


1973 and 2009 Surface Transects



(b) Comparison between historic and recent peat surface elevation along the survey transects in Dineen's Island.

Topographic Interpolations



Dineen Island Changes, 1973-2009

Lost from the island between 1973 and 2009:

- **8,000 metric tons of peat,**
- **3,600 metric tons of carbon,**
- **2 metric tons of total phosphorus**
- **230 metric tons of total nitrogen**

Aich, S., Ewe, S.M.L., Gu. B. and Dreschel, T.W. 2014. An evaluation of peat loss from an Everglades tree island, Florida, USA. *Mires and Peat* 14: Art. 2.

(http://www.mires-andpeat.net/pages/volumes/map14/map1402.php)

Dineen Island 2010

Restoration Approach

Restoration Concept: Create artificial "pop-up" floating islands that eventually establish on ghost tree islands.

Restoration Approach

Requirements:

- Must be deployable by airboat under “wet” conditions.
- Must provide height above current substrate.
- Using measurements from a ghost tree island (Dineen Island), we predict that from 1.5 to 3 feet (45-90 cm) of elevation are needed for trees to establish.
- Trees must be able to survive and become established through flood and drying cycles.
- Must be cost-effective (low cost) and simple.

A Natural Process

Peat pop-up or floating tree islands in WCA-1 were used as the model for the described technique.

Pilot Study at LILA

At planting

Harvest: 22 months later

Planting Studies at LILA

Current Study: Two bag orientations (controls), two fertilizer treatments, double planting and flotation (5 reps each), variable hydrology

At planting and two years later (Pond Apple)

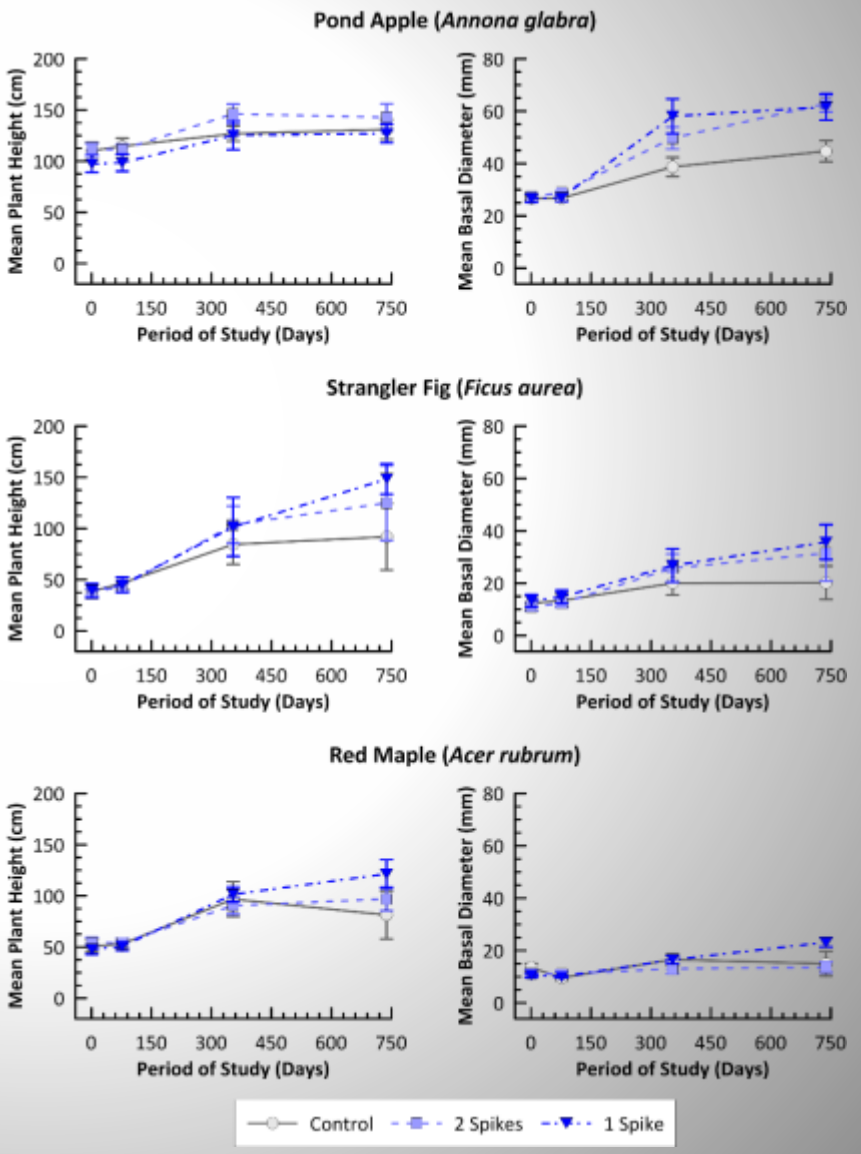
At planting and two years later (Strangler Fig)

With pot and bag removed (Pond Apple)

Restoration Approach

The study concluded that the best design criterial for a successful pop-up would be:

- To provide the greatest elevation increase,
- To provide a small increase in nutrients (one fertilizer spike),
- Plant only a single sapling per peat bag.



Ghost Tree Island Analysis Staff

The players in this story:

- **J. Walter Dineen and a surveyor with the Central and Southern Florida Flood Control District (initials B.R.)**
- **Sumanjit Aich; Ben Gu; Ken Rutchey; Eric Cline; Steven Hill (SFWMD)**
- **Sharon Ewe; Jennifer F. Vega; Kristin A. Vaughan; Russel Bahe; Colin Johnson; Robert Sekerka; Miriam Barranco (Ecology and Environment, Inc.); John K. Jones; Jamie Breig (Jones Airboat)**

Dreschel, Thomas, Eric A. Cline and Steven D. Hill. 2017. Everglades tree Island restoration: testing a simple tree planting technique patterned after a natural process. *Restoration Ecology*, in press.

Thank You

THE GHOST TREE ISLANDS OF EVERGLADES WATER CONSERVATION AREA 2A: TRACING A HISTORY OF CHANGE.

Thomas W. Dreschel, Section Leader
Everglades System Assessment
Applied Sciences Bureau

WCA-2A Ghost Tree Island History

- **"Pollen assemblages indicate that the island developed at least 1,900 years ago" (diverse tree taxa present in the early years; *Willard 2004*).**
- **"…formerly quite wet, have now been changed to dry land" (isolated from Lake Okeechobee, subject to fire, early 1900s; *Simpson 1920*)**
- **Loss of tree diversity during the early to mid 1900s from extreme drying and fire.**
- **"… (1953-1957) may well have been the formative years for many of the tree strands (moderate drying and the development of "willow islands"; *Dineen 1974*).**

WCA-2A Ghost Tree Island History

- **"…(1958-1962) … during which the trees were still in a healthy condition. Water conditions were very low… (still moderate drying and maintenance of the "willow islands"; *Dineen 1974*)**
- **"Completion of the L-35B in 1962 gave the capability to hold higher water stages for longer durations… (*Dineen 1974*)."**
- **"… 1963-1967, the observed time span of the demise of the tree island.(Flooding of the island caused the elimination of the willow; *Dineen 1974*)**
- **In 1963, the island was clearly visible for miles as a long, green strand of live willows extending from north to south for about a mile. By 1965, it was difficult to locate the island on the horizon because most of the trees had died or were defoliated. By 1967, all sign of living trees were gone."**