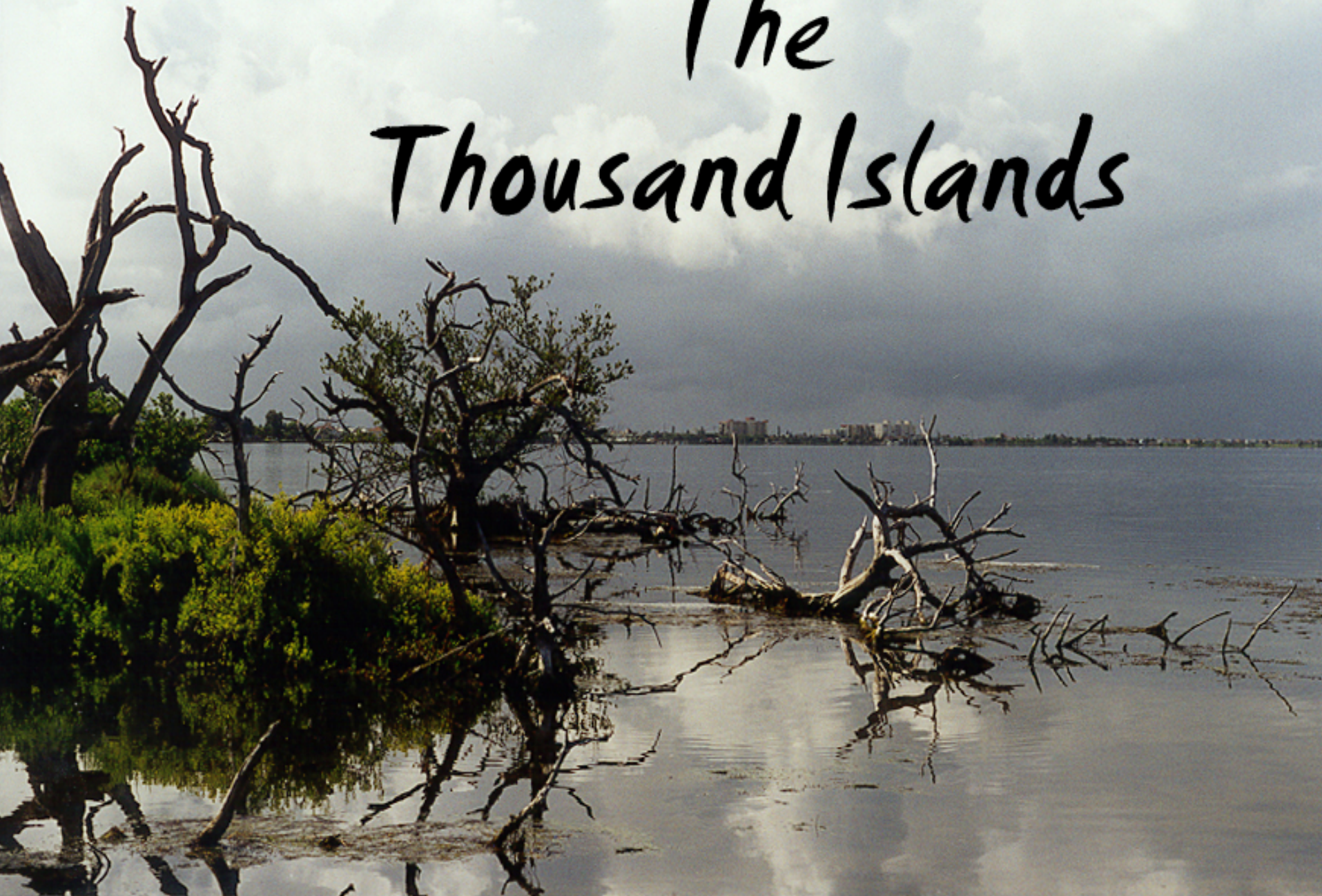


# The Thousand Islands





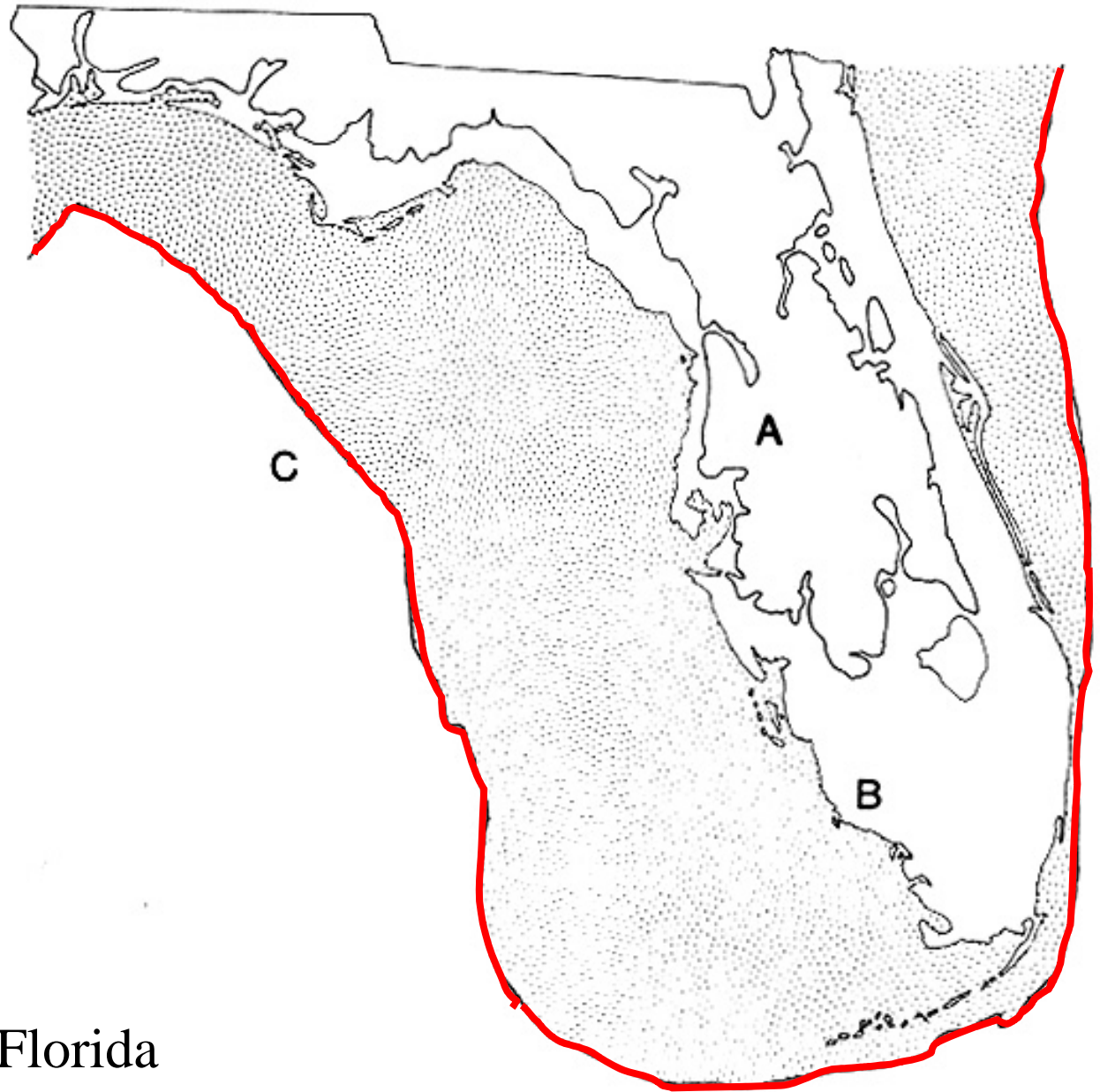


There are two main influences that shape the landscape in coastal Florida - the sea and man.

The sea has left its mark on the landscapes of Florida. The red arrows above point to shorelines, both old and new, that tell us the level of the sea has changed much through time. Sometimes the ocean was higher than it is now, and at other times it was lower.

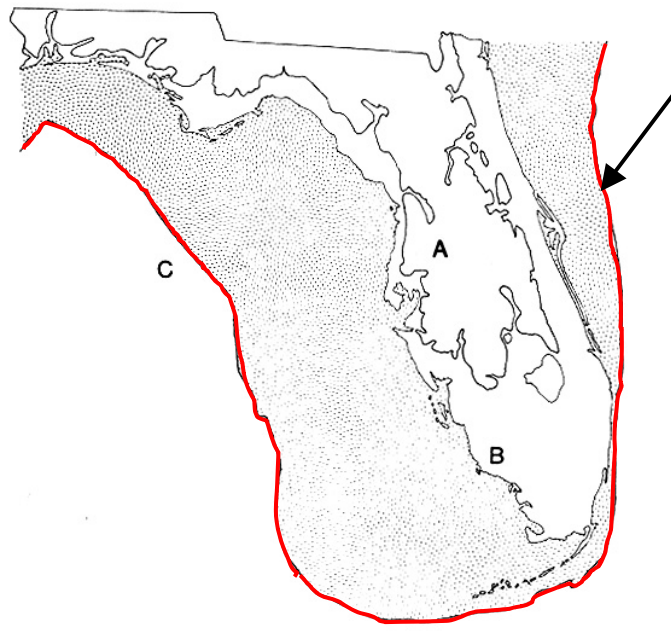
The picture of the surf was taken in Cocoa Beach during Hurricane Floyd.

Fig. 4.8. Three outlines of Florida during the Quaternary Era. *A.* Wicomico shoreline (probably early Pleistocene interglacial interval). *B.* Present coastline. *C.* Estimated Wisconsinan glacial shoreline (about 20,000 YBP). Outlines after Fernald, 1981.



From Ecosystems of Florida

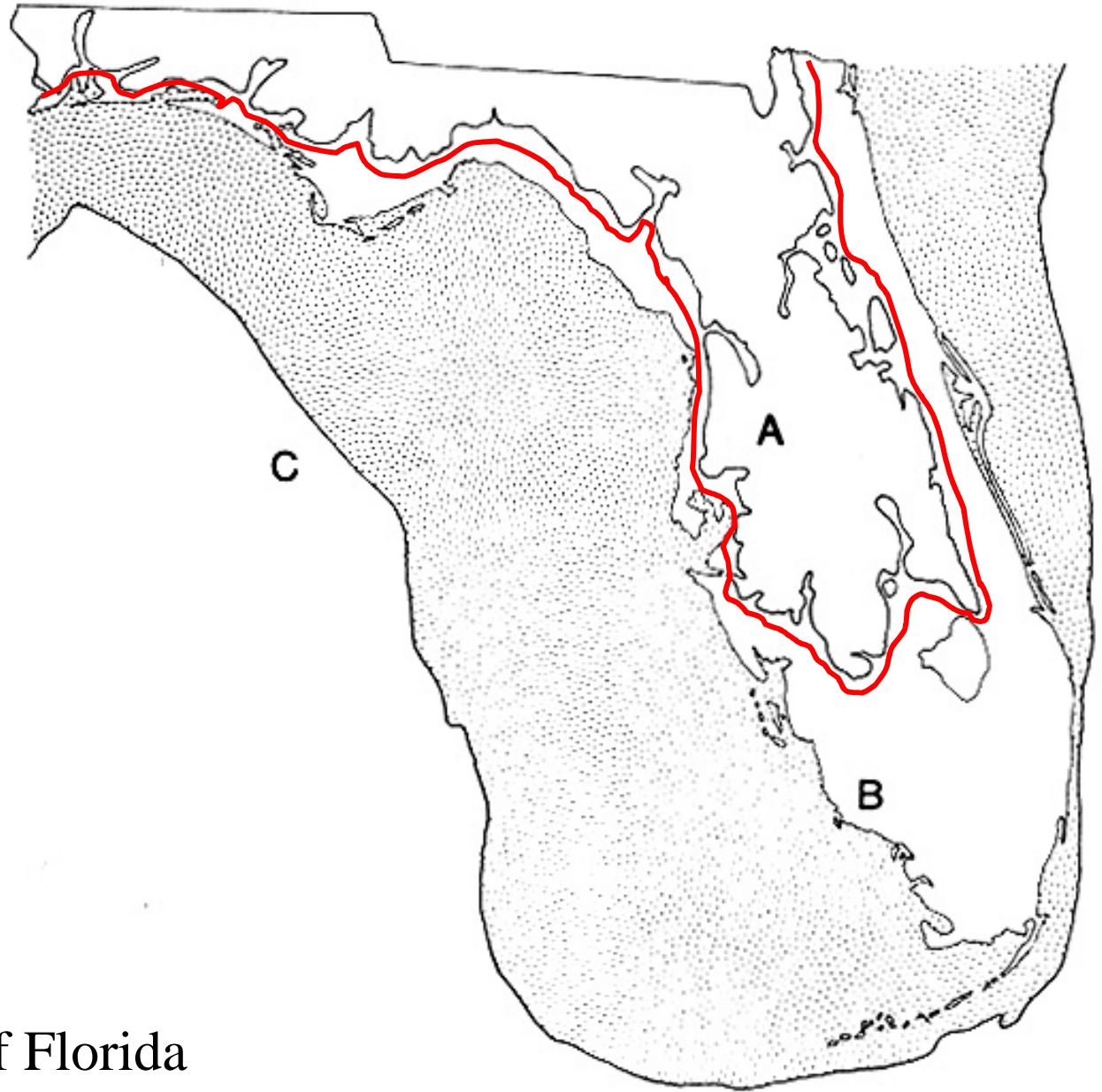
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Red line depicts the shoreline of Florida about 20,000 years ago.

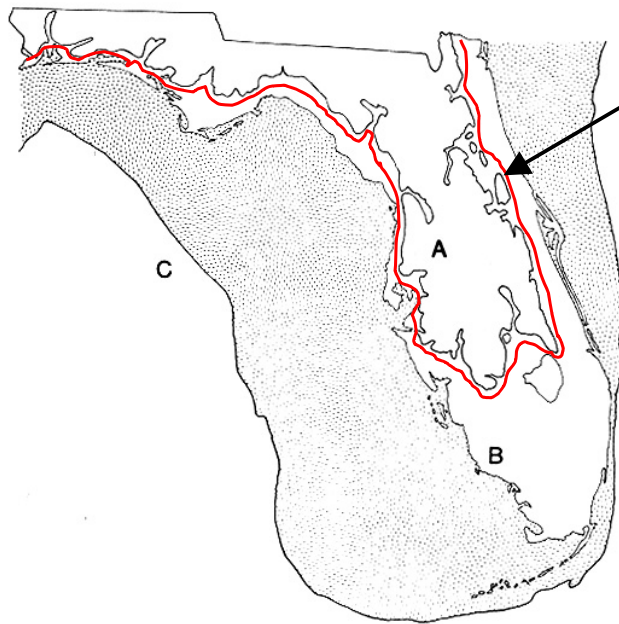
The changes in sea level are linked to increases and decreases in the size of glaciers. When global temperatures are cooler, glaciers expand taking water from the sea, and sea levels fall. During this time Florida was about twice its present size.

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Red outline depicts the shoreline of Florida 120,000 years ago when sea level was about 9 meters higher than it is now.

When temperatures warm, the glaciers melt and sea level rises. These cycles in temperature change have repeated themselves several times during the past 2 million years. This is a concern as earth's temperature rises due to global warming.

How high above sea level is your house?







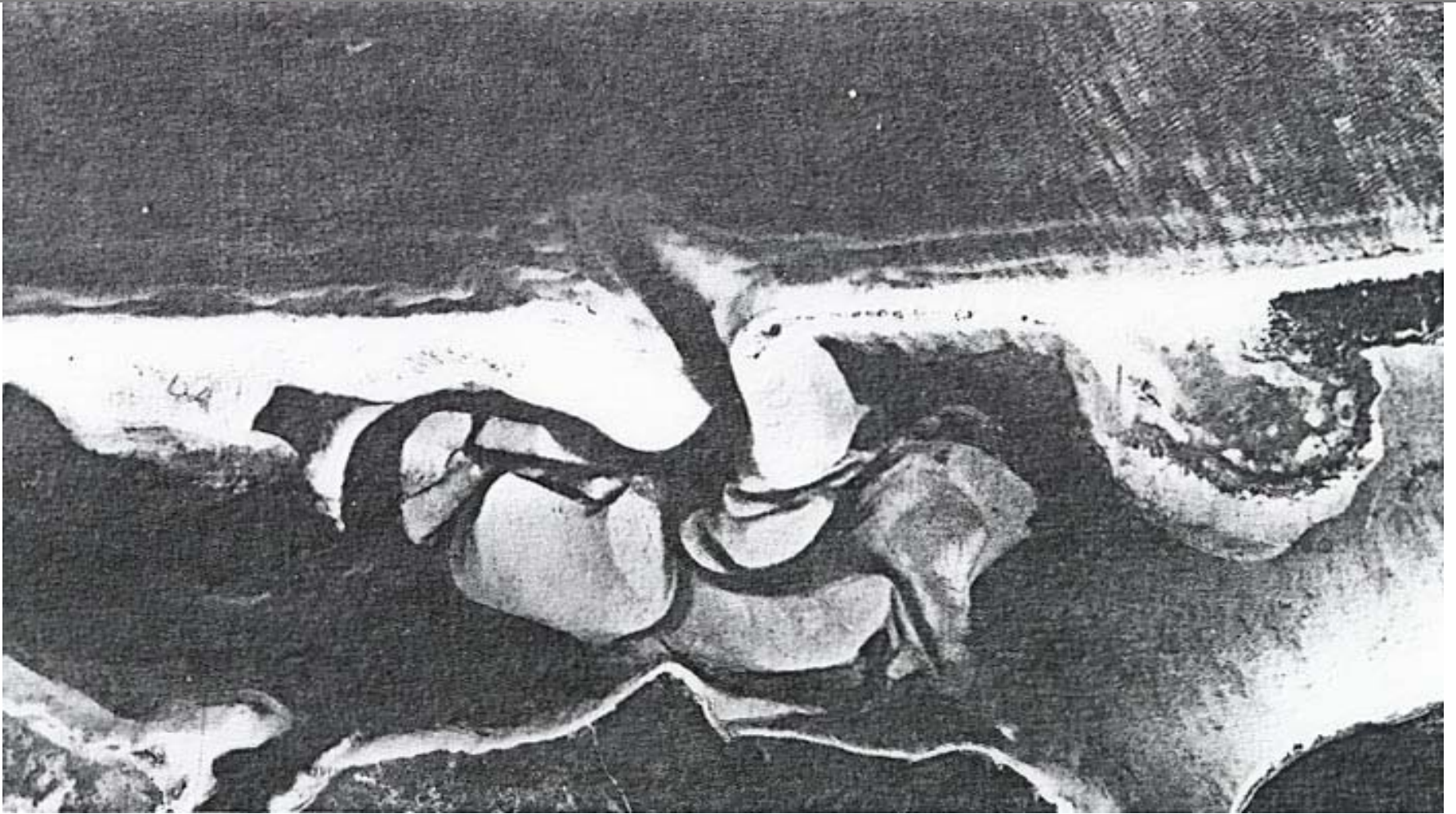
Three successive shore lines on the east side of the Lake Wales Ridge, just outside Lake Wales, Florida.

These old shorelines can still be seen in places. Here, on State Rd. 60 we see the stair-step pattern of three old shore lines that mark a fall in sea level that happened a very long time ago. These relict shorelines remind us that things were not always as they are now.

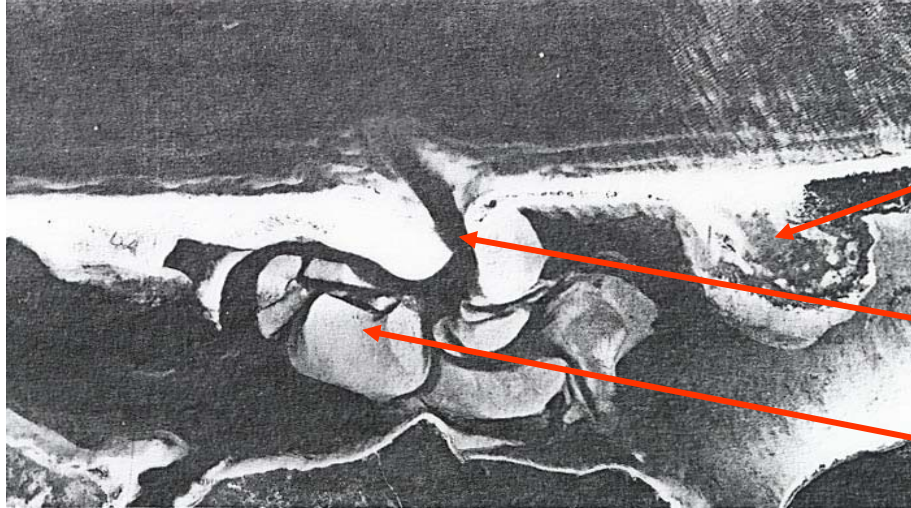




This picture was taken from the 215 foot level of launch pad 39B next to space shuttle Discovery. Here the landscape of Kennedy Space Center shows old shorelines very clearly as lines of trees along the old dunes. These old shore lines are probably only a few thousand years old.



From *Barrier Islands* S.P. Leatherman *Ed.*, page 73.



Overwash Fan

Inlet

Flood Tide Delta Shoals

From *Barrier Islands* S.P. Leatherman Ed., page 73.

We know that sea level is rising. When sea level rises, barrier islands migrate toward the mainland. This is why we have to re-nourish beaches to keep them where they are now.

Two ways that barrier islands move are by overwash - when storm waves wash over the dune and spread it out into the lagoon, and flood tide deltas when storm waves burst through the barrier island, making an inlet. The sand from the dunes is spread out like a river delta as shoals.



From *Barrier Islands* S.P. Leatherman *Ed.*, page 216



From *Barrier Islands* S.P. Leatherman *Ed.*, page 216

In this picture, the inlet (on the right) and shoals of a well-developed flood tide delta are very easy to see. This picture was taken when the inlet had just formed. The sand that had been part of the beach and dune has been re-deposited as shoals and appears white because no vegetation has had a chance to grow yet. Compare this aerial view with the next slide, an aerial view of Cocoa Beach from 1956.

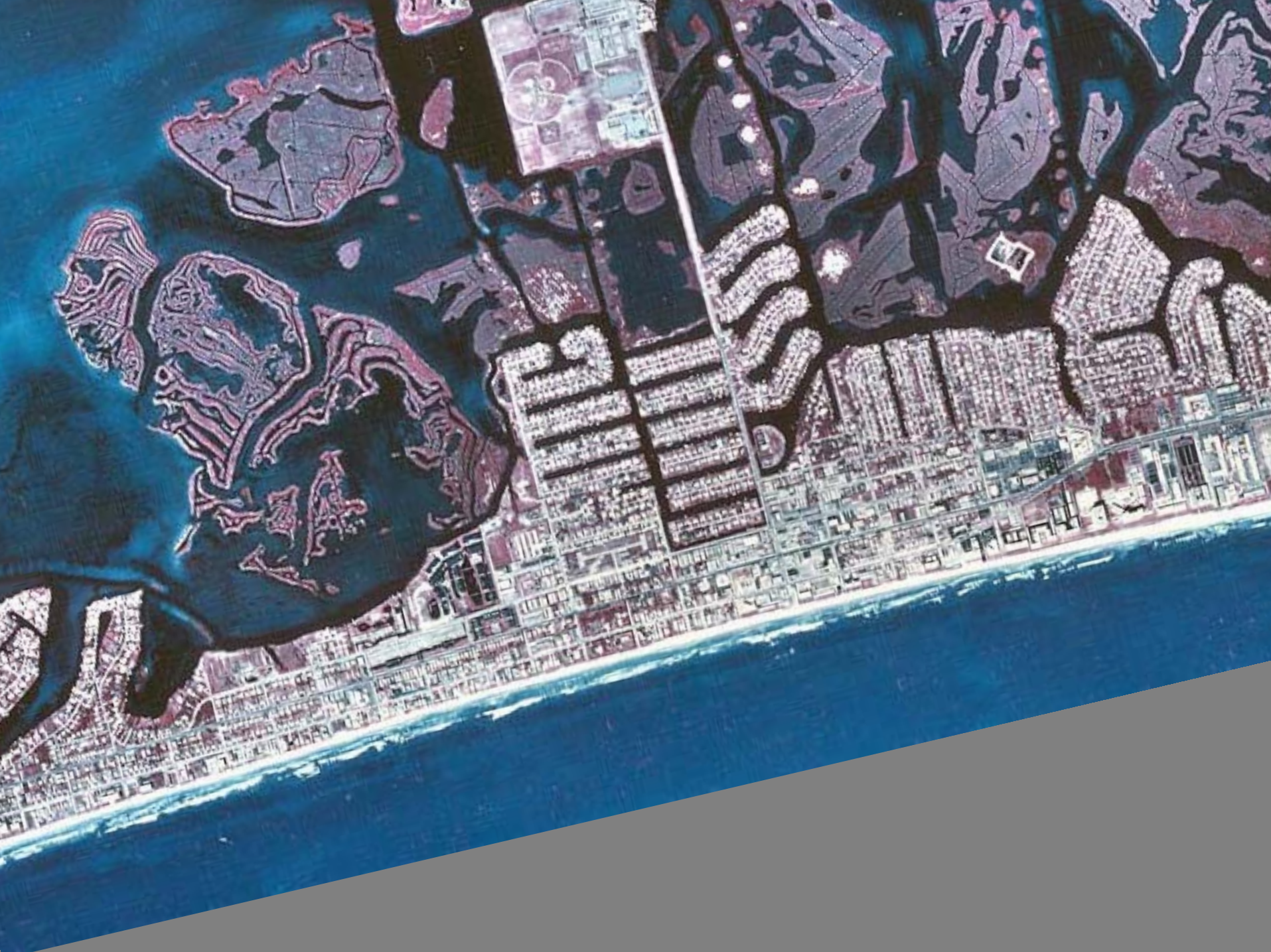


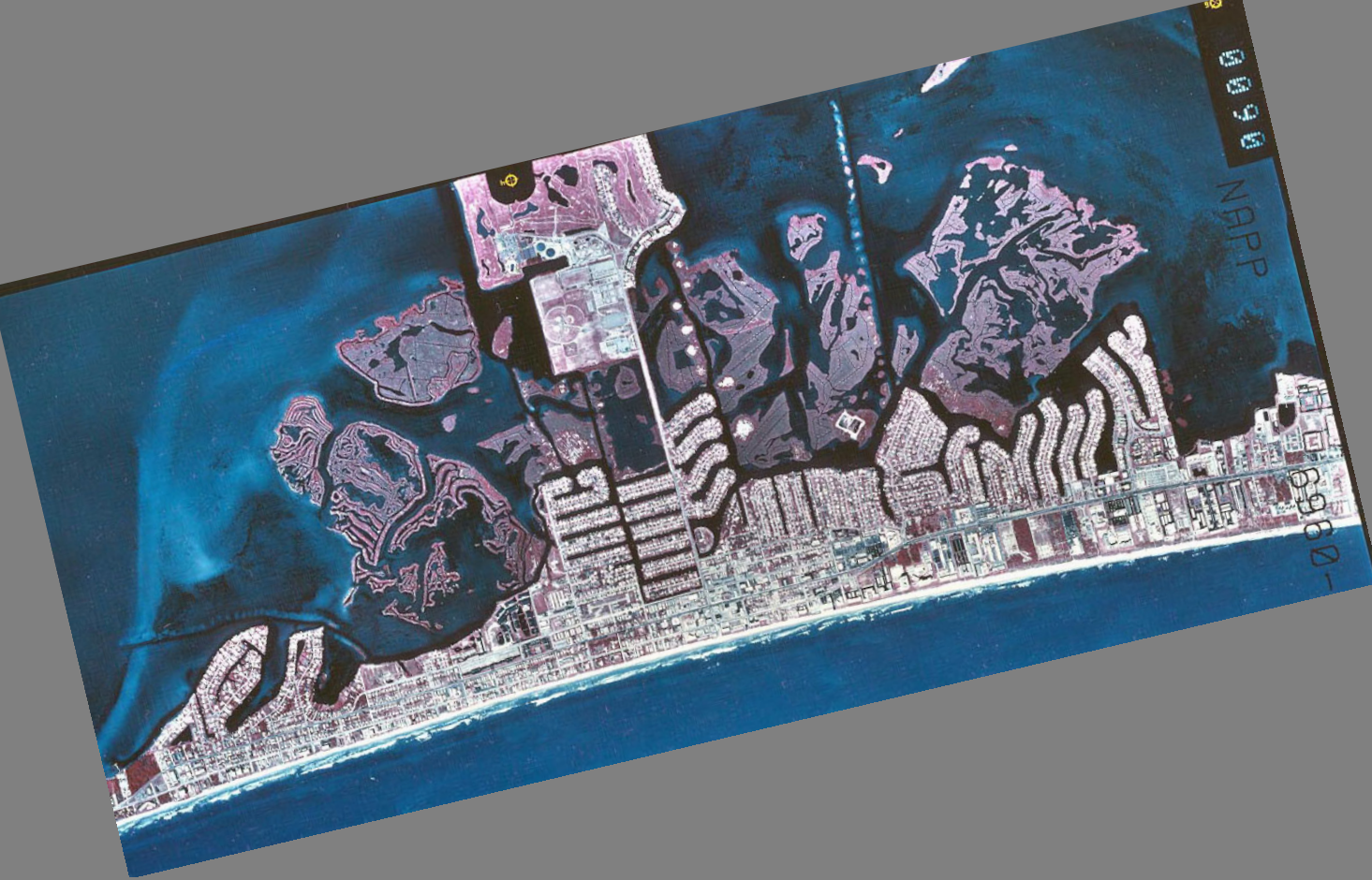
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The islands that you see in this aerial view began as sandy shoals just like the previous picture. Now, many centuries later, the inlet has been closed by sideways movement of sand along the beach called longshore drift, and the shoals have been populated by vegetation. If you've been to Sebastian Inlet you've seen the rock jetties on either side of the inlet. These jetties are there to stop longshore drift from closing the inlet.





This is how Cocoa Beach and the Thousand Islands look from the air now. Notice all the canals dredged through the islands.

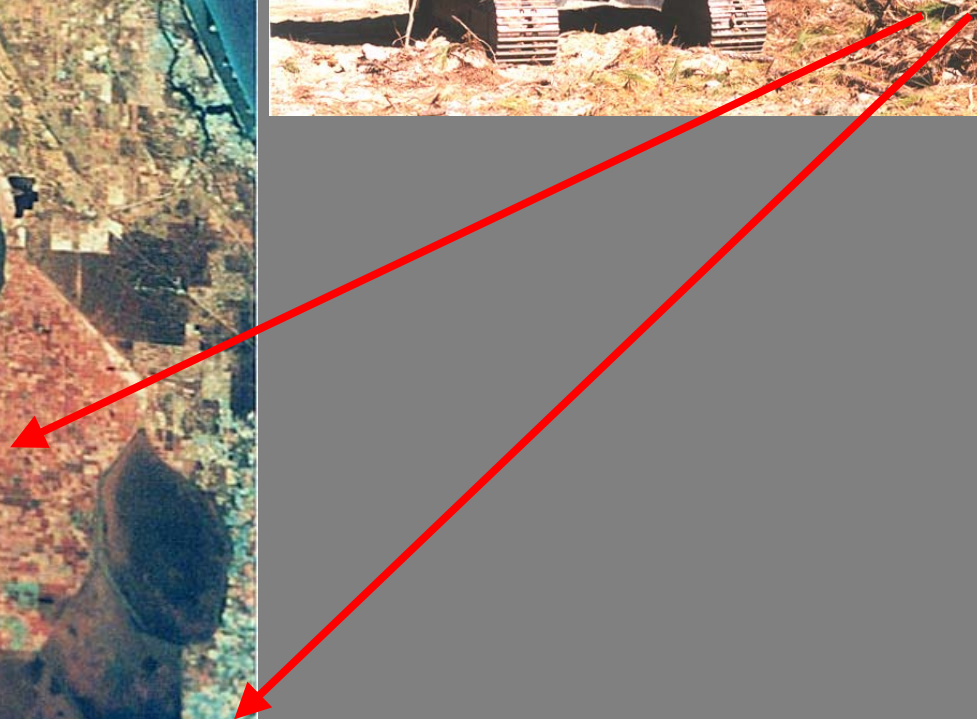




7/22/99

Columbia lifts off on STS 93

When the Space Program began NASA needed people to work on the race to the Moon. Brevard County was sparsely populated by people and infested with mosquitoes. Poisons alone were not effective in reducing mosquitoes. These insects evolved a resistance to DDT in as little as 4 years, so two men, Maurice Provost and Jack Salmela decided to use a method known as "Source Reduction" to help control mosquitoes.





Man's effect on the landscape of Florida can be seen from space. The upper arrow points to the vast sugar farms that threaten the health of Lake Okeechobee and the Everglades, and the lower arrow points to the urban landscape of the Miami area.

The image is in false infrared color which makes growing vegetation look red.







Dry pond, potential habitat for saltmarsh mosquitoes.

The saltmarsh mosquito has an effective defense against predators such as small fish that might want to eat its eggs or larvae. The female mosquito doesn't lay its eggs in standing water, preferring instead to find moist sand or mud. The eggs can last several months until rains flood the area. After hatching the larvae can mature before small fish have a chance to get to the flooded ponds to feed on them.

In Source Reduction the marshes are either kept flooded or dredged into dry land to reduce the amount of breeding that can take place there.





Mosquito ditches with mangroves  
along edges

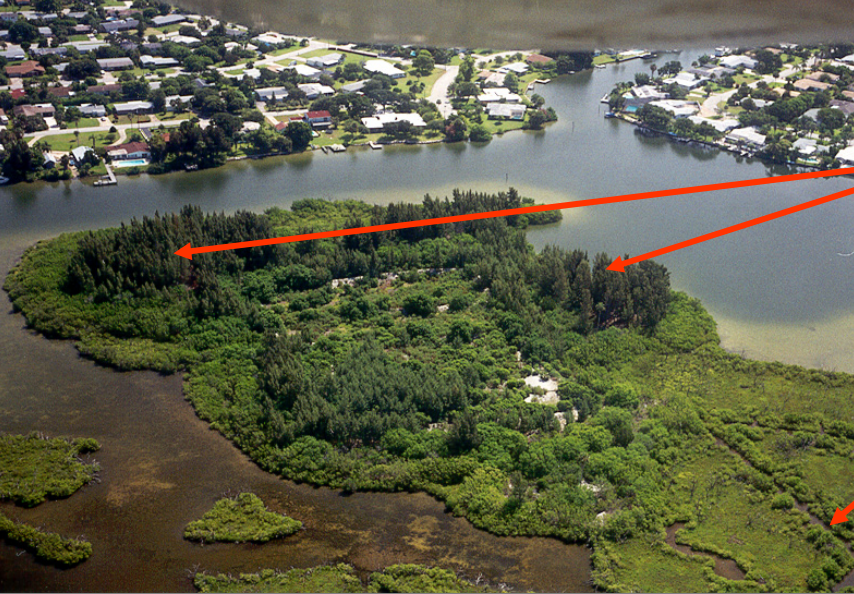
Beginning in the late 1950s, the first step was to cut small "mosquito ditches" through the marsh to allow small fish to find mosquito larvae and feed on them. This was not very effective. The only effect on plants was to allow mangroves to grow along the edges of the ditches.





In this more radical step the marsh is dredged into dikes, converting wetland to upland. The effect on the vegetation was dramatic. Marsh plants now only live along the edges of the dikes. Upland plants have invaded the dikes. Water quality in the "mosquito canals" has been degraded too. Very little seagrass grows in these canals.





Australian Pine

Mosquito Ditch

In this aerial of a dredged portion of the islands, the effects of the added soil are obvious. With the soil no longer moist or flooded, upland plants can invade. Many of these invaders are non-native (also called exotic). The most obvious are the tall Australian Pines. Notice how different the effect is between the dredged area and the mosquito ditches in the lower right corner.







One unplanned effect of dredging for mosquito control was a decrease in the number of Diamondback Terrapins. These animals require unaltered marsh to use for egg laying. Source reduction for mosquito control is also source reduction for this animal.





Australian pines crowd out native plants and provide little food for animals. This is a recurring problem with invasive non-natives: they out-compete natives for resources such as light or nutrients.





Band of small leaves.

Male flowers

Even though we call this tree "pine", the Australian Pine is not a pine. What looks like pine needles are really stems with small clusters of leaves that look like light colored bands in this picture. Up close you can see small leaves in an arrangement that looks like a crown.

True pine trees do not produce flowers; they have cones. The Australian Pine has true flowers. The female flowers look like small cones, and at the ends of the "needles" are clusters of male flowers.

So what's the problem with Australian Pines?





One of the ways that Australian Pine out-competes native plants is by controlling what can grow under them by creating a carpet of "needles" much the same way as a true pine tree would.

A seed falling on this "carpet" would not be able to germinate. In this way Australian Pines frequently come to completely dominate an area with no other plants living beneath them.







Bones and fur, what is this?





This is a *Great Horned Owl*, and the previous picture is an "owl pellet". Owls have weak digestive juices and no true stomach or crop. The opening into their intestines is small so they must spit up the bones and fur of their prey. This leaves behind the "owl pellet". This owl is known to have killed and eaten red-shouldered Hawks.

This brings up an interesting land management question - the non-native Australian Pines have allowed this Owl species to move into the Thousand Islands, an area it normally wouldn't inhabit. If the trees are removed in habitat restoration, the owls will have to move. What would you do?





One of the worst invasive non-native plants in Florida - Brazilian Pepper. This plant spreads when areas are disturbed such as when houses are built. It can crowd out native plants by poisoning the soil around itself with oils that come out of its roots. It is a close relative of Poison Ivey.





Spanish Bayonet, a pointed plant you'll see on the island.







This is Wisk Fern, a plant you'll see at the bases of palms. It is a "living fossil". Not true ferns. these small plants are very primitive, having no flowers, seeds, leaves or even roots! Only a handful of species are left of this group that once dominated the landscape some 300 million years ago.





Mangroves are tropical plants. In the Thousand Islands they are near the northern limit of their range and cold weather kills them.

Mangroves have several adaptations to help them deal with the environment they live in.

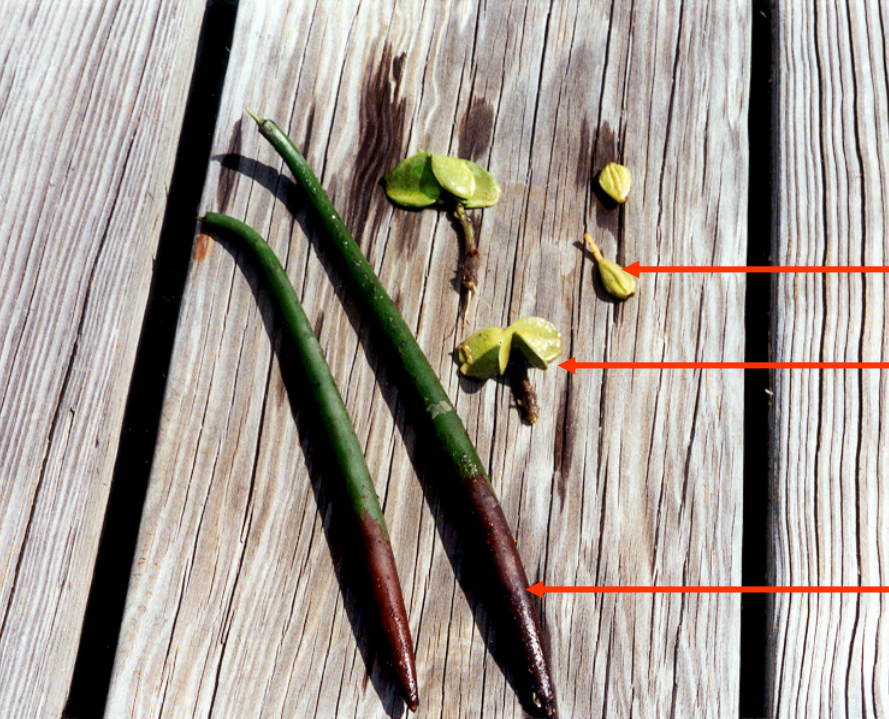




Saltmarsh Cordgrass

The Thousand Islands are the southern limit of the Saltmarsh Cordgrass, a plant dominating saltmarshes from Volusia County north.





White Mangrove

Black Mangrove

Red Mangrove

One mangrove adaptation is to not have seeds. These are Propagules - they are actually young plants. This adaptation gives the young trees an advantage in the water-logged soils of southern saltmarshes.







Aerial Roots

Another adaptation possessed by mangroves is a special kind of root to help the tree get its oxygen. These aerial roots are called Pneumatophores.

In some instances the White Mangrove can have these special roots, for example when they are growing in water. This White Mangrove has these roots.





These are the Pneumatophores of the Black Mangrove.





Aerial roots of the Red Mangrove

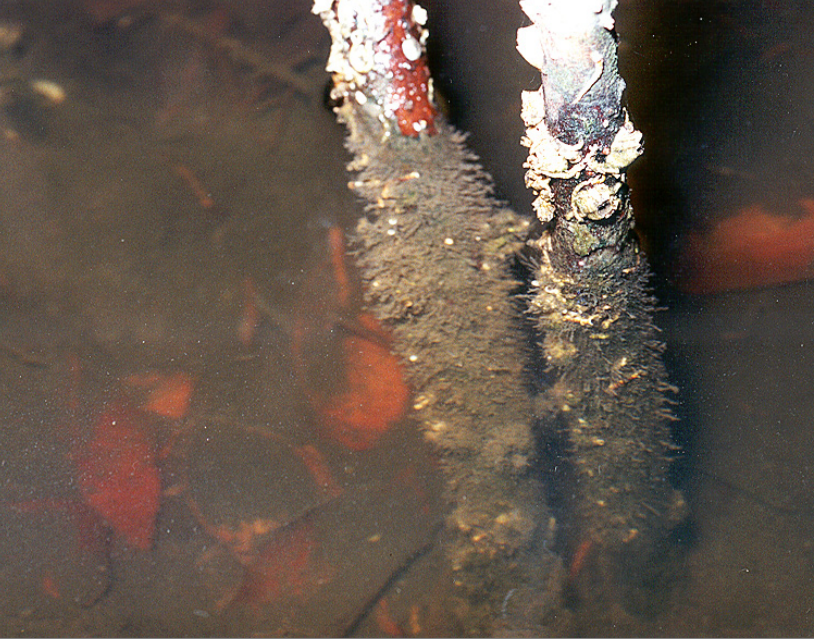




The detritus under a mangrove is an important source of energy in the Thousand Islands.







The aerial roots of mangroves act as habitat for various forms of life, plant and animal.





This plant is called Torchwood. It is a tropical plant more at home in the West Indies. These plants do not get much farther north than these in the Thousand Islands.





Another tropical plant near the northern limit of its range is this Jamaican Caper tree. Have you ever seen a flower like this before?





This tropical plant is called Snowberry. It gets its name from its snow-white berries.







Coral Bean, a semi-tropical plant.





White Ibis, also known as the "Hurricane Bird" and mascot of the Miami Hurricanes. The Ibis is supposed to be the last bird to leave before a hurricane comes. Is that smart?





Another White Ibis, this one is not old enough to have its white adult feathers.





Osprey

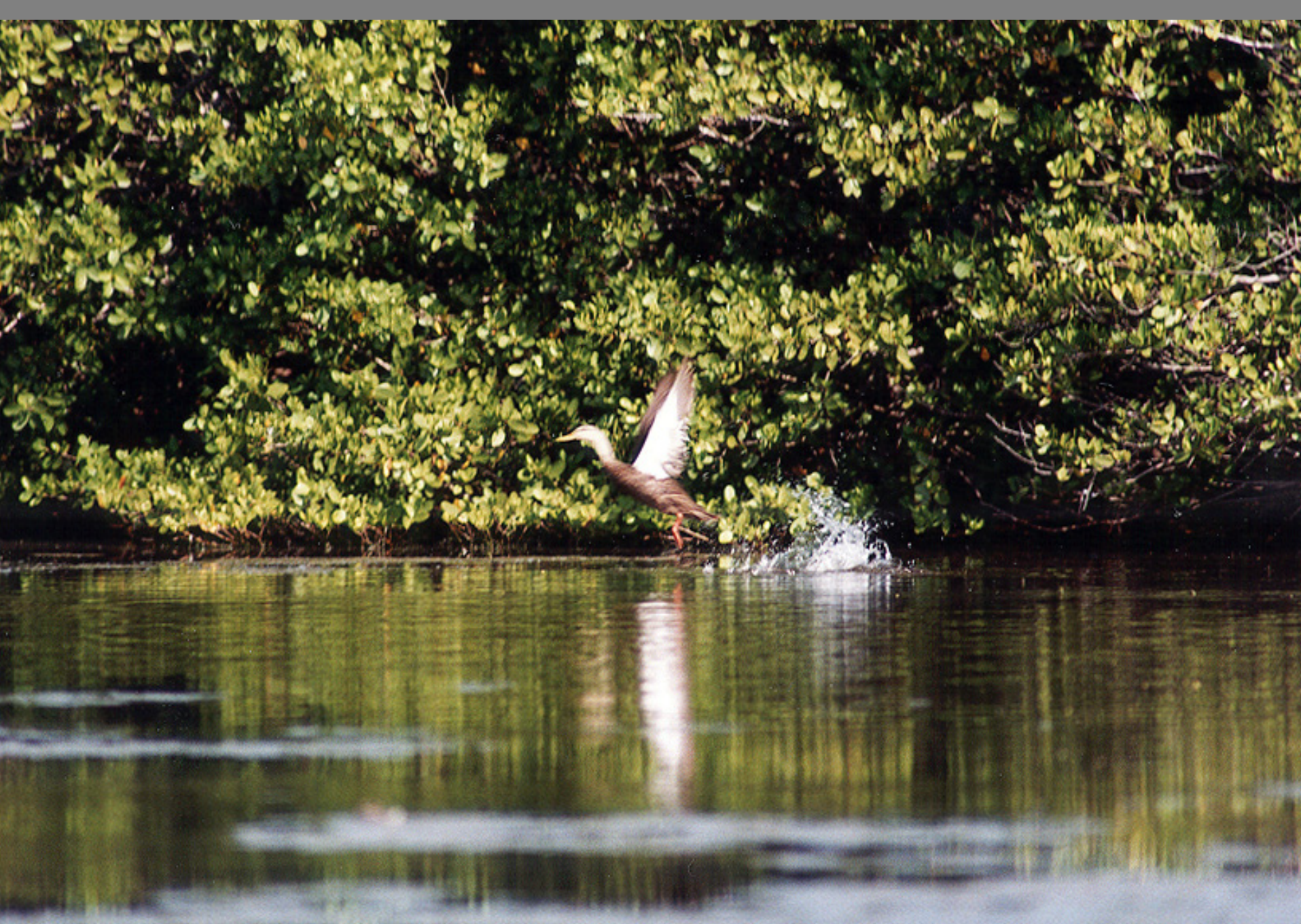
This picture was taken in late 1972. This was about the only Osprey seen in the Thousand Islands at that time. DDT nearly drove this species to extinction. The chemical interfered with the females' ability to secrete a shell around the embryo. The eggs broke when they sat on them.





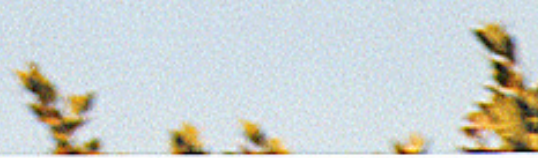


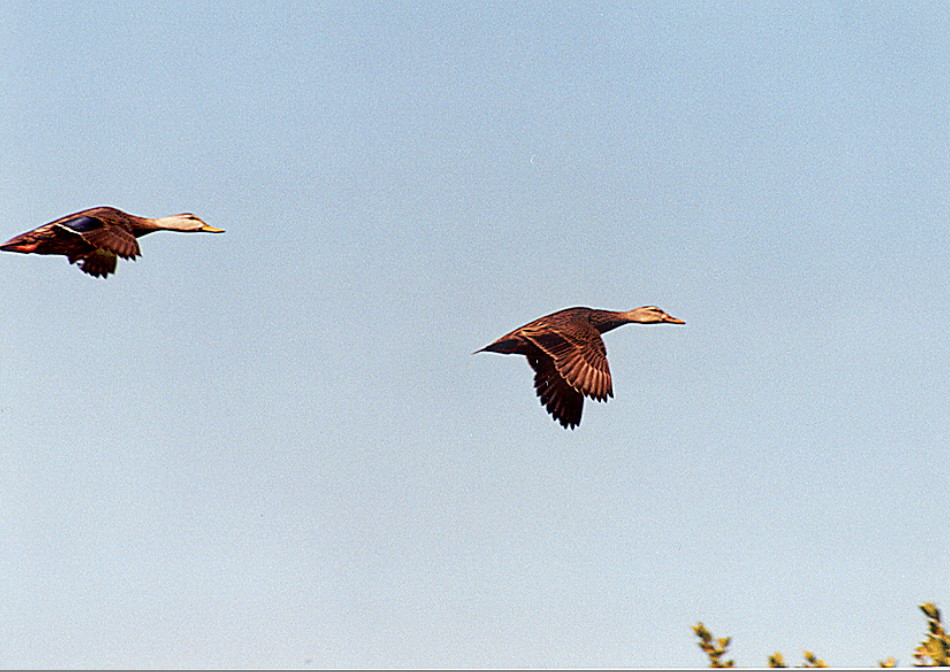
Since DDT has been banned Ospreys have come back strong and are now quite common. The fish it is holding is a jack.





This is Florida's native duck the Mottled Duck. It is in serious danger of extinction.





This is a duck that is a cross between the Mallard and the Mottled Duck - we call these Hybrids. People are releasing Mallards which then, not knowing to migrate, stay in Florida and breed with the Mottled Duck, polluting its genes.





Anhinga







White Pelican, a migratory bird.





Woodstork, an endangered species.





Grackle





Cormorant







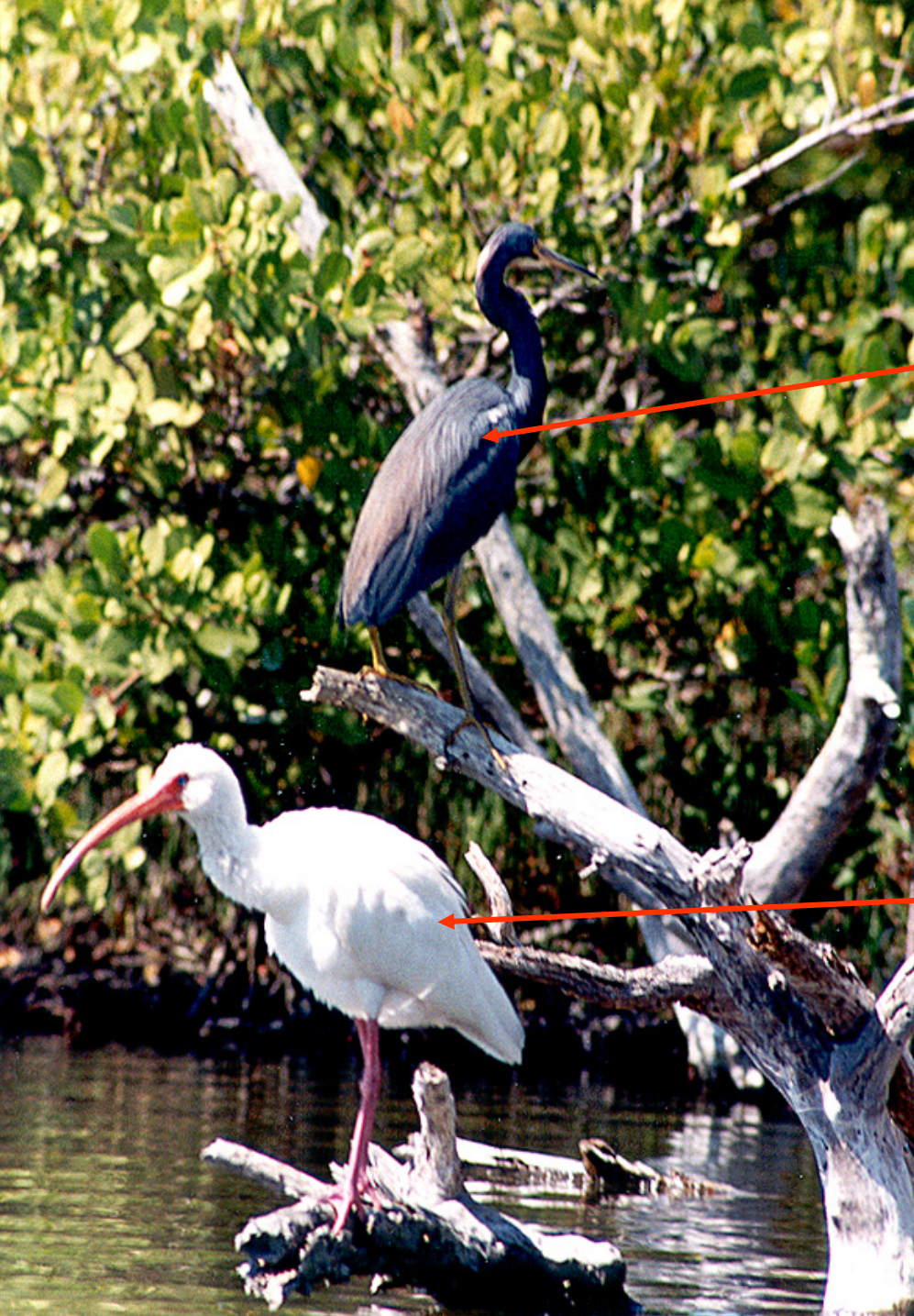
Cardinal





Great Blue Heron





Tri-colored Heron

White Ibis





Little Blue Heron







Another Woodstork





The Coot, another migratory bird.



**Kayaks and Compasses,  
An Extraordinary Fieldtrip into  
the Thousand Islands**

