SARASOTA COUNTY WATER ATLAS
ORAL HISTORY PROJECT
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Dr. Ernest Estevez received his Ph.D. from the University of South Florida and is currently the Director of the Center for Coastal Ecology at Mote Marine Laboratory, which he joined in 1979. Dr. Estevez has conducted ecological studies in three dozen Florida rivers and bays, and has worked for decades to link science and estuarine resource management programs throughout the state. A past president of the Florida Academy of Sciences and the Myakka Conservancy, with whom he received a Governor's Council for Sustainable Florida Award, Dr. Estevez is also the recipient of a Distinguished Alumni Award from the University of South Florida, and the Eugenie Clark Scientific Explorers Award.

Interview with: **Dr. Ernest Estevez**
Date, Time of Interview: **October 20, 2009, 7 p.m.**
Location: **Estevez Residence**
Interviewer: **Justin Quinn**
Subject of Interview: **Sarasota Bay Estuary Program**
Transcriber: **Ross Rieland**

JUSTIN QUINN: I thought we'd just start with an outline of how you came to Sarasota and to Mote, in general.

ERNEST ESTEVEZ: Okay. I was born in Tampa, and grew up in West Tampa. It was a custom of my family to come to Anna Maria Island for two weeks every summer. And we did that until I was ten, and then my parents bought an old house in Anna Maria with the expectation that they would fix it up and retire in it. This made it possible for us to spend much longer summers in Anna Maria and also all of the holidays and every other chance we could. So, all my free-time really was associated with , uh, Anna Maria Island, Tampa Bay, Egmont Key, the Gulf of Mexico, and waters south, and the friends I made were people who liked to fish, basically. Back in Tampa, we lived sort of halfway between the Hillsborough River and that part of Tampa Bay by the airport...

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: ...near the Courtney Campbell Causeway.

JUSTIN QUINN: Yep.

ERNEST ESTEVEZ: And so by the time I was twelve or thirteen, I was spending a lot of time exploring the Hillsborough River, and also spending time out on the Causeway, because on a

short—just on an afternoon trip—we would drive out to the Causeway and fish or crab, just hang out. So my sense of geography was influenced by my father, who was an engineer for the city of Tampa, so I knew where the Hillsborough River was and I knew where it started and knew where it ended, and I could name all the bridges across the river, and I knew where the Courtney Campbell Causeway went, and when the Skyway—the original Sunshine Skyway—bridge was built, I knew we would go, we would take that. And then in Anna Maria, geography was easy because there was no one there and you could stand in the middle of the island and see the Bay in one direction and the Gulf in the other because it wasn't all built up, it was a lot of vacant land. So that's what I did until I started college, and financially, the plan was that I could go to college, but I needed to pull something out of my hat, so I had applied for the Naval ROTC program in 1968, and I was interviewed and I took the battery of exams, and I was accepted and went to the Jacksonville and I took my physicals. I applied to the University of Washington and I was accepted. I wanted to go to the University of Washington because they had a fisheries program and I was interested in the marine sciences...

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: ...and they accepted me and I was all set, and in the Summer of 1968, the Students for a Democratic Society...

JUSTIN QUINN: Oh boy!

ERNEST ESTEVEZ: ...drove up and burned down the ROTC building at the University of Washington.

JUSTIN QUINN: Wow.

ERNEST ESTEVEZ: Which is actually astonishingly chronicled—ah, my wife has cleaned up—a couple of months ago. Doonesbury actually referred to it in one of the strips, and we cut it out and we had it around here. So the Navy told me "We have no housing for you and you could go to another school," and I didn't want to, so they said "Well, go to any school, and just start taking basic courses, and we'll pick you up a year later." Um, well, I went to the University of Southern Florida [sic] on a student loan, and after a year there, um, my consciousness was raised, and this was 1968, which was a very bad time in terms of Vietnam...

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: ...and I realized I... I didn't want to go to Vietnam and I didn't want to go in the military, so they let me off with no prejudice, and I stayed at USF. Still poor, so I joined the cooperative education program which was where you work a term and you study a term, and I was assigned to the Game & Fish Commission in Georgia, in Brunswick, Georgia, which was the marine fisheries station. So for the total of a year, I commuted between Brunswick and Tampa, and that really ignited my interest in science. I was kind of lackluster, really, but once I had practical reasons for wanting to learn, I started pegging out my classes and finished very strong, and I was offered a scholarship to stay for a master's degree. I started the master's degree, and after a year, the university approved a straight-through Ph.D. program, because up to that point you had to have a master's before you got into the doctoral program, and I was the guinea pig; I was the first student to go straight through for a Ph.D.

JUSTIN QUINN: Very cool.

ERNEST ESTEVEZ: And I worked on a problem in Cockroach Bay, which is a mangrove swamp between Bradenton and Tampa, on the... near Ruskin.

JUSTIN QUINN: Okay.

ERNEST ESTEVEZ: While I was finishing my Ph.D., I was contacted by John Morrill at New College, and he was trying to find someone to run an environmental studies program, because the previous faculty that had been there had left and made a lot of enemies—I don't know what happened—and John was holding the program together for the sake of the students that were in tracks and trying to graduate. So I came down and saw the campus and we talked, and he knew that I had been an environmental activist at USF, but I was trying to become more of a scientist...

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: ...because I thought that would be more influential than being an activist. And it seemed like a good fit so I came to New College in '78. I was there until the middle of '79 and that's when I went to Mote, so I've been at Mote thirty years.

JUSTIN QUINN: Very cool. So you've been at Mote for a while, wow.

ERNEST ESTEVEZ: Yeah, that's why I'm the old guy you're interviewing for an oral history.

JUSTIN QUINN: Hehehe, very cool. I remember seeing, uh, I was going around the Mote website, and around that time that you joined the Mote there was a program conducted in conjunction with Sarasota High School? It had a big boat...

ERNEST ESTEVEZ: Sarasota High School built a pontoon boat as a class project...

JUSTIN QUINN: Yeah.

ERNEST ESTEVEZ: ...and it was called the *Bay Explorer*, or something, and the teacher at the time, whose name I've forgotten, took students out on routine sampling trips. And we helped—"Mike" was his first name—in different ways, with used equipment, or referenced specimens in the light boat—we never had much of a formal association beyond that.

JUSTIN QUINN: That might be something interesting to look into for the future—just as an aside.

ERNEST ESTEVEZ: Well, what he was doing would actually become widespread and important. He was basically using volunteers to monitor Sarasota Bay, and now, in many estuaries around the nation, volunteer programs are highly structured activities that involve salaried staff who are the trainers and who provide volunteers with supplies, who provide the quality assurance, who collect the data and then later assemble it and interpret it, and EPA has, for certain categories of measurements, accepted volunteer information, and it fills in a lot of gaps that are otherwise very difficult, very expensive to do. So he—Mike Stewart—was doing that in the late seventies. And I think he was probably the only one doing that from the Tampa

Bay area, south. And nobody really lived north of Tampa Bay on the West Coast of Florida, because it was, well, it was the Seventies.

JUSTIN QUINN: Yeah...

ERNEST ESTEVEZ: Now, there would be an important program that sprung up in Crystal River that was student-based with their own boats, and Cockroach Bay would become a field station at Hillsborough Community College, and they had boats, and we would take the students out for routine sampling, and the college kept those data too.

JUSTIN QUINN: Yeah, I think that's really interesting. I went out on a scalloping trip with the county, and I found out that a lot of their help comes from volunteers in terms of, like, monitoring how many scallop skeletons attached to imitation sea grass bags that they had out there.

ERNEST ESTEVEZ: Yeah, volunteers are part and parcel now of environmental programs, and in terms of data collection. The value of volunteers is that it puts them in contact with the environment, whether it's Myakka River State Park, or Sarasota Bay, or the Rocky Mountains, you know. You... Without that contact and the experience of bad weather and the experience of night and the experience of failed projects, those kind of experiences really connect people to the resource. So, what you're really doing is building a constituency, this ambiguous constituency out there in the community that suddenly speaks up when something arises, you know, that they're not organized as such, they didn't form for that purpose, but they say "Well, you know I've put in four-hundred hours...

JUSTIN QUINN: Stakeholder.

ERNEST ESTEVEZ: ...you know, doing this stuff, and I know why this is important." So contact is probably the most important aspect of volunteerism.

JUSTIN QUINN: So has that, I mean, I guess Sarasota High isn't doing something like that at the moment, but... has there been, in your experience, more volunteerism across the board in estuarine management?

ERNEST ESTEVEZ: I think Sarasota High School may still be doing it.

JUSTIN QUINN: Really?

ERNEST ESTEVEZ: I think they built a second vessel. Until a few years ago, they were. And I know the American Littoral Society, which is a conservation association, was using the boat for their activities including tours and oyster experiments and the like. *The Carefree Learner* was the name of the first Sarasota High School boat.

JUSTIN QUINN: I briefly looked over the report they produced. I thought that it was pretty interesting stuff.

ERNEST ESTEVEZ: Yeah.

JUSTIN QUINN: Now, you guys used to be located out on Siesta Key, didn't you?

ERNEST ESTEVEZ: Yes. The Lab was established in 1955 down in Placida, which is the last little town you drive through before you go out to Gasparilla Island and Boca Grande...

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: ...and in the mid-Sixties it moved to the south end of Siesta Key, and after a year or two it was named the Mote Marine Laboratory—before that it was called the Cape Haze Marine Laboratory. Erosion was claiming a lot of the Laboratory's property in the mid-Seventies. Midnight Pass was closing, and when an inlet closes it behaves like the the tip of a whip, it starts meandering back and forth across the coast, and so it swept to the south onto the north end of Casey Key and then it swept to the north. It was undermining houses on the south end of Siesta Key and the people who were in the Lab at the time realized that they were, um, in a very unstable situation, and actually, Mr. Mote put work in place to relocate the Laboratory back to Placida. Now the staff and our families who were in Sarasota didn't really like the idea, but the City of Sarasota learned about the potential move, stepped in, and offered the site at City Island, and the Arvida Corporation stepped in and offered a little sliver of land that made for a more whole—a compact and complete—piece of property. So, the building that was designed for Placida was built on City Island, and it was first occupied in 1978. I was at New College when the Lab opened.

JUSTIN QUINN: Very cool.

ERNEST ESTEVEZ: Yeah.

JUSTIN QUINN: So off the top of your head, can you think of any important estuary or other water issue management issues that Mote has been involved in for Sarasota, of the area?

ERNEST ESTEVEZ: A lot of 'em. I can't get the dates right, but we would come to do all of the studies of Sarasota Bay and the Myakka River and the Manatee River for the state of Florida and EPA [Environmental Protection Agency] in relation to the discharges of effluent from wastewater treatment plants. At the time there was a federal program that focused on the impacts of sewage treatment. There was another federal program that focused on the influence of stormwater, and it came after the sewage treatment plant program. But the basic question was how much waste can a water body assimilate, and at the time, the Myakka River, Sarasota Bay, the Manatee River were data-starved areas. They really hadn't been studied in any fashion that would make it possible to calculate how much waste the waterway could assimilate. So, I led sampling programs over a couple years in the Myakka and Manatee Rivers and in Sarasota Bay to collect the data that would allow us to calculate the assimilative capacity of the water bodies. In the Manatee River, the two point sources of concern were the city of Bradenton's sewage treatment plant, which was fairly old and not very effective, and the other source was the Tropicana orange juice factory which, uh, was established in Bradenton and, just, was a big success and grew rapidly, but the state of the art at the time was to take their pulp waste and to discharge it into the Manatee River.

JUSTIN QUINN: Hm.

ERNEST ESTEVEZ: That organic matter has a huge oxygen demand, like sewage does. Sarasota had a fairly updated but by no means modern sewage treatment plant that put its effluent into Whitaker Bayou.

JUSTIN QUINN: Yeah.

ERNEST ESTEVEZ: And... there was a proposal which would later actually occur to spray effluent on ranch lands east of Sarasota at the top of a creek that flowed into the large lake in Myakka River State Park.

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: So we had to study that lake, Sarasota Bay, and the Manatee River, and that involved installing a number of tide gauges so that we could get at the physics of the Bay. Sampling on a routine basis for water quality, especially nutrients. Special studies, such as twenty-four or thirty-six hours of continuous measurements from boats and bridges and trucks all over the place so that there's a high density of simultaneous information, and some cool stuff like studying the movement of water in the Bay, we either used dyes or drogues which are just objects that float or sink in the water so that you can observe their movement over many tidal cycles to see how water moves.

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: So we would put, for example, a number of these drogues in the Whitaker Bayou on an outgoing tide, and then follow them for forty-eight hours—this was before GPS.

JUSTIN QUINN: Heh-heh, boy.

ERNEST ESTEVEZ: There was the precursor of using latitude and longitude electronically, a system called LORAN, and all around the nation were radio towers that emitted signals and the LORAN instrument described the interference pattern of the radio signals and told you where you were, but it told you in LORAN units not in latitude and longitude and there was no simple conversion, in fact there was no automatic conversion because the interference patterns changed all over the nation and over the ocean. But we thought it was pretty modern and sophisticated so that's how we did it, and we had little lights on the drogues so that we could follow them at night, and we'd be out there, three o'clock in the morning watching these little lights drifting around the Bay. Many other site studies—we'd spend three or four days in boats on the lake in Myakka River State Park, and in order to measure oxygen every fifteen minutes for two days or three days in order to get an idea of the oxygen cycles of the lake, the respiration of the lake basically. And that was interesting because in the middle of the night you'd take a light and shine it out across the lake and you'd see hundreds of red eyes just as far as you can see out there in the lake [laughs]. So that... that effort lasted, I don't know, maybe two or three years, we would go on to do that in the Hillsborough River in Tampa and in Clearwater Harbor and also the waters off of Pinellas County because more than once, there have been proposals to take waste water, whether it was industrial or municipal, and pump it offshore as a disposal method.

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: That's actually done, um, in Broward County and a few other southeast counties, creating tremendous algae blooms and smothering of coral reefs and so forth. But they're only a half a mile to a mile away from the Gulf Stream, the dilution factor is enormous—it's very deep too. And all that stuff goes up the coast somewhere. The West Coast is extremely shallow—you can go fifty miles offshore and be in sixty feet of water. There was always resistance to the idea of using an offshore disposal because once you get the pipe out there all you need are bigger pumps and you can just keep pumping more and more stuff out there, and it got very close in the '80s to actually happening off Pinellas County. That county had a very independent streak, they were sort of like the Texas of Florida.

JUSTIN QUINN: Heh-heh.

ERNEST ESTEVEZ: They were pushing hard for a pipe to go out in the Gulf of Mexico, and the Lab agreed to do the science. It wasn't our role to make the decision, the regulatory agencies would use the data and make a decision and they decided there's no way that we would put a pipe out there. But it was like the studies we had done in rivers and bays but it was out in the Gulf of Mexico quite a distance, so that other work that was done at the Lab related to water quality—many other projects. Sarasota Bay joined the National Estuary Program, and that sewer plant for the City of Sarasota was the reason. EPA found the City of Sarasota in violation of the Clean Water Act for putting its effluent in Whitaker Bayou, and fined the city, or—or intended to fine the city, I think, 80,000 dollars, and also compel them to clean up their act. Well, the city had a lobbyist and an attorney in Washington, D.C., who was really very clever, and he said, "Look, instead of fining the city $80,000, how about the city uses the $80,000 and Sarasota Bay joins the National Estuary Program?"—because he knew that would open the Sarasota area to the infusion of a lot of federal money under the Clean Water Act for national estuary programs. And the Department of Justice said, "Well, that's up to EPA, you know, they're the ones who admit estuaries, and you're going to have to apply and go through the route." And so I was recruited to write the State of Florida's nomination of Sarasota Bay to EPA for designating Sarasota Bay to the estuary program. Which I did—it involved working closely with people in the EPA, but I had studied the other estuaries in the nation that were in the program, and they were all severely polluted, and I thought, well, Sarasota Bay, you know, is a tiny little bay, there's really not that much distinctive about it. Compared to Tampa Bay, or... the Indian River Lagoon, it didn't have the most number of species of any estuary in the nation. Tampa Bay is Florida's largest estuary, it was a big port, it was important economically. And so I pitched Sarasota Bay as an example of an estuary, an American estuary that was affected more by overuse than by industrial pollution or municipal pollution or ports, or power plants, or big—commercial fishing, or things like that. So I cast it more as an urbanizing estuary that had lots of conflicting soft uses, and it was different for that reason and so it should be part of the NEP [National Estuary Program]. And EPA said, "Okay," because they made a deal with [the Department of] Justice, I think, and so we joined the estuary program, and I wrote all of the first-year documents to get that program going, and one of the things that was clear was that we didn't have the information we needed about where the grass beds were in Sarasota Bay or where the oyster beds were in Sarasota Bay or how many mangroves there were, or in... and, what have we lost over the years and what was the circulation, because the estuary program I defined as extending from the north tip of Anna Maria out into—no, was that right? Or maybe I'd chosen the bridge from Bradenton Beach to Cortez. I think that was the north end, and I chose Venice as the south end...

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: I didn't want to go past Venice because the geography changes and we're...

JUSTIN QUINN: We're like in Lemon Bay, the natural...

ERNEST ESTEVEZ: We're, yeah, we... we... we get into other counties, and so that opened the scope but EPA said, "Well, that's well and good, you know, that can be the estuary program, but there are three things we want you to look at in particular." And the first was Whitaker Bayou, which was the original issue, the other was sewage that was escaping from Manatee County's treatment plant into Sarasota Bay near Tidy Island, and the third was Midnight Pass, which had—I think—had already closed and was politically a real hot issue. So up here in Manatee County, Bradenton had its own little central sewage treatment plant. It had a collection system, a treatment system, and it put its waste in the river. Manatee County decided it was going to go and centralize—and provide central sewers as the county grew. So it was doing that, and it built a packet... it built a big treatment plant that would be at the extreme west-end of State Road 70, the road you crossed coming in here, and close to the north end of Sarasota Bay—in other words just a little east of Cortez. They had large ponds down near the Bay's shoreline, and these ponds were poorly maintained and the levees would breach and the pumps would stop and the gates would break and there was leakage of waters that were in the process of being cleaned up by the plant in the Sarasota Bay and that stimulated the most astonishing algae blooms you've ever seen. You've seen sea lettuce—uh, the broad, green, pale-green algae—that's sea lettuce, that's *Ulva*, and I remember wading in *Ulva* that was waist-deep along that shoreline because the *Ulva* snaps nutrients up—I mean they just love nutrients—and so it's an indicator of eutrophication. When you get these massive blooms of different species of opportunistic algae you know you're dealing with a nutrient pollution problem. Did you hear Rex Jenson's talk at the climate meeting? At...

JUSTIN QUINN: Umm...

ERNEST ESTEVEZ: That might have been the day after my talk. He's shorter, a Manatee... Lakewood Ranch guy.

JUSTIN QUINN: No, I missed his. He had... I heard him talking to the audience a little bit but I didn't have a chance to hear him speak.

ERNEST ESTEVEZ: Well, as soon as the videos are available, you might want to hear his history of sewage treatment in Manatee and Sarasota counties and how they differed. While the City of Sarasota had a treatment plant that was growing as the city grew—Sarasota County had this peculiar view that if they didn't provide services the county would not grow—they wanted the county to be small, and not, you know, flourish or, not, not grow as large as Tampa and St. Petersburg, because both Manatee County and Sarasota County have always looked north, and they didn't want to be like Tampa which they considered dirty and polluted—and it was—and they didn't want to be like St. Petersburg which was 95% built-out and, you know, just wall-to-wall people. So the county—Sarasota County—said, "We're not going to build sewage treatment plants. If a developer wants to build a development, he can use septic tanks or he can build his

own little package plant." That was a big mistake and now the county is undoing that damage. They're replacing septic tanks along Phillippi Creek, they're taking over sewage treatment plants that were built by developers and upgrading them and connecting them into the master system. But it made for a real checkerboard of badly-treated sewage over that area.

JUSTIN QUINN: That's happening to my house. Actually, next couple months I'm waiting for them to come in, the house I'm renting...

ERNEST ESTEVEZ: Is it near Phillippi Creek?

JUSTIN QUINN: Not too far, yeah, it's over by Webber and Bahia Vista and Beneva.

ERNEST ESTEVEZ: Got it, yeah. So the estuary program collected a lot of data, and Mote, in the initial phases, we did all the science, except for the engineering. The NEP, we arranged for the University of Florida to conduct studies of the circulation of the Bay in order to produce a computer model that simulates circulation in the Bay so that we can see how the water moves throughout the system. Mote doesn't have that expertise. But it was very informative—we learned that a lot of Sarasota Bay is whistle clean, there are hot spots, oils and greases and hydrocarbons are very abundant in areas where the marinas are, the sediments are contaminated. Whitaker Bayou and a fan-shaped area of Sarasota Bay extending out from Whitaker Bayou had tracers of sewage in the sediments, so we knew what the footprint of Whitaker Bayou's effect was on the Bayway. Hudson Bayou had very high pollution by lead...

JUSTIN QUINN: Hmm...

ERNEST ESTEVEZ: ...and oysters in Whitaker Bayou. When we did this work, the lead concentrations in oysters in Hudson Bayou were higher than anywhere reported anywhere else in the United States, so it's like, "Yeah! We're number one!" [laughing] We spent a lot of time down there on Midnight Pass because that was part of the deal, but it was important that we not focus on those three areas at the exclusion of other areas, so I developed a system of segmenting the Bay so that as money was spent we always made a point of collecting information from every segment of the Bay, and then because there were three areas of interest to EPA we'd add extra work to those three areas, but we weren't doing it with big empty vacant areas of data around the rest of the Bay. So the Lab's been involved in studies of many kinds in the Sarasota Bay area ranging from studies of manatees and dolphins to sharks and fishes, invertebrates of one kind or another, water quality, pollution of different kinds, red tide, [phone ringing] the contribution of rainfall and of dust to the nutrient budget of the Bay—sorry, heh, telemarketer. And if you're interested in some of that I can tell you about it, but in general, the Lab doesn't monitor for the sake of monitoring, that's really government's function.

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: We help set up monitoring programs, we will study something over a long period of time in order to learn about it in terms of basic research. Like the dolphin research program in Sarasota Bay is run by Randy Wells who was a native of Sarasota, and I think he started studying dolphins when he was a kid, and it's the longest running study, population study of any species of marine mammal in the world...

JUSTIN QUINN: Wow.

ERNEST ESTEVEZ: ...and, um, you know, they can recognize every animal in the Bay, and they know who that animal's parents and grandparents were, and they know where the teenage boys hang out on a Saturday night [laughing], they know who begat whom, and who the orphans are, and it's just an astonishing study. And they have gone—whenever new tools become available they use them—so they've studied the body burdens of different kinds of contaminants in dolphins. Dolphins are top predators, apex predators, and contaminants that bio-accumulate in the food web end up in dolphins, sharks, and so forth, so they're good sentinel animals in that respect. But, I have to contradict myself about not—we don't monitor for monitoring's sake. For some time now, we have been monitoring the waters of Sarasota County for Sarasota County...

JUSTIN QUINN: Yep.

ERNEST ESTEVEZ: ...because there was a time when the county had its own staff and was doing monitoring but the administration or the board at the time decided they didn't want to be in that business, and they had consultants doing the work. The State, I think, or the feds were not happy with it, and so we began doing the work and have ever since. And we consider it part of our service to the community to conduct these studies, but it turns out to be a great, um, reciprocal benefit because it provides us with long-term water quality data that make the study of fishes better, or improves the study of dolphins, or of scallops, or sea grasses and so forth.

JUSTIN QUINN: So I've read a little bit, and some background research I was doing, that there had been, I guess you could say crashes in the amount of sea life in the, well, larger sea life in Sarasota Bay that have since bounced back; is that just random nonsense I picked up on the Internet or is there any truth to that?

ERNEST ESTEVEZ: I think it's pretty commonplace anywhere on the coast of the United States that you hear old-timers say that things aren't as good as they used to be, and I have the same opinion, although I think I have a better understanding of what was really going on. In the 1950s and the 1960s Tampa Bay was fairly polluted by nutrients, but they were diluted as they came closer to the Gulf of Mexico, so the nutrients stimulated phytoplankton growth, the phytoplankton were fed on by copepods and other small crustaceans, which are fed on by the larvae and juveniles of fishes which grow up to be spot and mackerel and snook and redfish, and wahoo and sharks and so forth. So, at the seaward edge of Tampa Bay, it was incredibly productive. I'm not going to replay my recollections of that, but there were huge schools of bait, there were giant schools of mullet, really large flocks of birds—seabirds and shorebirds and the like—and there were very few people. So my experience fishing as a teenager was I caught more fish than a person really should be entitled to catch. We used to have contests when the mackerel were in to see who could catch the most mackerel, and the only rule was you couldn't start counting until you had a hundred [laughing]. And I think we know this is the case—in fact the study in Sarasota Bay was the source of this information. It works out that about ninety percent of the fish are caught by about ten percent of the anglers. That leaves ten percent of the fish to be caught by ninety percent of the anglers, and the difference is skill and experience, you know, and so as the population grows, that ninety percent of the anglers is getting bigger and bigger and more people are complaining about not catching fish, and we're at the point now in several estuaries where recreational fishing pressure is holding down fish stocks, but the State and the

marine fishery councils and the feds are constantly trying to manage the pressure, to keep the fish stocks at healthy levels. There was a perception among recreational fisherman that there was a big crash attributable to commercial net-fishermen. That led to a constitutional amendment banning most types of commercial net-fishing. And the commercial fishermen felt that basically unregulated recreational fisherman or pollution or other things were causing the problem, but what it really was was the failure of state government to manage the resource. If they had managed the resource properly, there would still be commercial fishing and recreational fishing. But it became a political issue and the commercial fishing was banned, and I think that subtracts from the diversity of Florida's maritime economy, and has other—had other social consequences—but the day may come when commercial fishing returns to Florida under the new and more modern forms of fisheries management that are unfolding around the United States and in other parts of the world. What precipitated it was really the oriental demand for mullet roe, and fisherman were out catching mullet—all the mullet they could—but when you put gill nets out and catch trout and snook and redfish and lots of other fishes, you know...

JUSTIN QUINN: Do they do anything with that or does it just become by-catch?

ERNEST ESTEVEZ: No the, um, the good fin-fish, the table fish, went to market, but a lot of the mullet was either sold as crab bait or sold for to grind up as fish meal or fish oils or just discarded because the roe was much more valuable than the fish, um, and so it was an opportunistic growth in net-fishing that led to the demise of that kind of commercial fishing. And shrimp trawling, in some ways. But the coast is enormously productive, and if we just give it a chance and we manage ourselves properly, you know, the productivity can be much higher than it is right now. The other crash that people talk about are red tides, and everybody judges an event based on their experience, and the fact is that most people in Florida came here from somewhere else and they haven't been here that long, and even the ones that have been here a long time aren't necessarily out on the water fishing all the time, and even the ones that go fishing all the time aren't that good at it, and the boaters tend to go out on fair weather days, and when they get tired they go home, and you get different results when you go out even if the weather's bad, or you go out at night, and you're using many different kinds of gear to catch fish of different sizes and different behaviors and different habitats—which the State does—and there's still a lot of fish in Florida. When they all die in a red tide, it's perceived as a great catastrophe and it's disgusting, and everything else is killed. If they're not killed by the toxin they're killed by the oxygen being stripped from the water by the decay of so much life...

JUSTIN QUINN: Mm-hmm.

ERNEST ESTEVEZ: ...and it can catalyze itself. You get into a positive feedback—or maybe a negative feedback loop, I guess a negative feedback loop where it gets worse and worse and worse—and it seems like everything has been killed. And that's not entirely true because the most mobile of fishes flee the area, but it can clean a bay right out. As it happens, the recovery begins almost immediately, once the stress ends. The invertebrates, shrimp and crabs and clams and so forth, having short lifespans and high reproductive output, flourish for a year or two because there's no predators. And if you study the real details of the invertebrate community, within three years, assuming there's no subsequent red tide, within three years you cannot tell the difference in the bottom-dwelling invertebrate communities after a red tide from those that existed just before the red tide. Fishes—it depends on where you are in Sarasota Bay—it looks

like three years is a pretty reasonable period of time for the recovery of all the different kinds of fish—the species—and at least one- or two-year classes of fishes—there aren't the really big ones yet because it takes them longer to reach that size—but in terms of the capacity to ramp up to where they were, they're only a few years away in the case of most species. Fishes that are on reefs offshore in deeper water, it's a slightly different story because those are habitat islands separated by large distances of water and just bare-bottom, and the recruitment and the colonization of those is different than it is in an estuary.

JUSTIN QUINN: Mm-hmm. Probably more like... physical... like land islands are.

ERNEST ESTEVEZ: Exactly. In fact, the theory of island bio-geography that was worked out to explain how many species and how many individuals there are on land islands actually also works underwater. Very powerful theory.

JUSTIN QUINN: I'm trying to think of some other issues that would be worth talking about; now obviously with the symposium recently, there's a lot of concerns on how Sarasota is changing in the future, which isn't really something that I'm speaking to with this project, but maybe you might have something to say about related issues in Sarasota's past and how change has been managed in terms of water usage, in terms of your relationship as you previously mentioned with county government, like federal agencies.

ERNEST ESTEVEZ: I don't know, there's an interesting historical difference in where water comes from. In Manatee County there was a dam built on this river, the Braden River, in 1939, and that was the City of Bradenton's water supply. In the 1950s, Manatee County built a dam on the Manatee River, um, several miles upstream to create Lake Manatee which is a reservoir. That's Manatee County's water supply. Sarasota relied on wellfields, and they had a desalinization plant near Van Wezel. They take in Bay water and they desalinize it.

JUSTIN QUINN: Hmph, I didn't know that.

ERNEST ESTEVEZ: Mm-hmm. You know where Centennial Park is, the boat ramp?

JUSTIN QUINN: Yeah, I was just down there... really recently.

ERNEST ESTEVEZ: Okay. When you're down at the Bay, and you look across the boat basin, there's this peculiar-looking dock that sticks out with a building on the end of it...

JUSTIN QUINN: Yeah, I saw that.

ERNEST ESTEVEZ: That's the intake for the City of Sarasota's water, which they desalinize.

JUSTIN QUINN: What do they do with that?

ERNEST ESTEVEZ: Well they take the salt out, and they used to put the salt in Hog Creek—you know where Hog Creek is?

JUSTIN QUINN: No.

ERNEST ESTEVEZ: You do, you just don't recognize the name.

JUSTIN QUINN: Oh, okay.

ERNEST ESTEVEZ: You know where the Publix is on [US Highway] 41 that looks out over Centennial Park?

JUSTIN QUINN: Yeah.

ERNEST ESTEVEZ: Just, almost immediately north of that, there's a park-like setting with a pond on the east side of 41, and it goes under 41 and falls a short distance to the Bay, and the city puts the brine—it mixes it with some fresh water and puts the brine in Hog Creek and comes out there—Venice does the same thing, they take water—sea water—and they desalinate it, and their brine goes into the Intracoastal Waterway near the old train station in Venice, and Sarasota County had a wellfield at the end of Fruitville Road called the Verna wellfield, and it's still there. But the more modern approach is to not build a dam in a river, so that in Charlotte County the General Development Corporation—the company that created North Port and Port Charlotte—put a pipe that pulls the water from the river, and then they treat that water, and that's how their water supply is produced. It has since been publicly acquired and is now the Peace River Manasota Basin Board, and that's their water supply. And all of these different water supplies are networking, and they're linking up to create a network of diverse sources which makes it more stable to perturbation. Now it's still an issue when there's a regional drought, because then *all* the water supplies are affected, no matter—except then, even the well water can be affected. And sea level, or sea level rise, is going to play out in different ways where these water supplies are concerned. The City of Bradenton's reservoir is held behind a wall that's only, effectively, two or three feet higher than high tides. So there's freshwater on one side and then the tide's going up and down on the downstream side. And when there's a big storm, when there's a lot of freshwater coming down the river and the storm is coming in off the Gulf, and saltwater is going upriver, that dam is completely underwater. When my daughter was twelve, I put her in a boat and we motored right over the top of that dam, and there wasn't even a dimple on the surface of that water, you know, when we went over the dam—it was totally covered. Now, the freshwater flow protected the reservoir, but the original dam was leaking and saltwater was getting into the reservoir, so they had to upgrade the dam and put a rubber gasket on it to keep the saltwater from getting in, and they're going to have to raise that dam as the sea level rises. The Peace River supply is interesting because it's a pipe that takes water out of the river—it's in a place in the river that's still tidal in the sense that water goes up and down on a tidal basis. It's freshwater most of the time, but during the dry season of a drought—dry year, there will be salt—there *is* salt—at the intake, and it can handle low, real low, levels of salt in the treatment process, but as sea level rises, one possibility is that salt will penetrate farther up the river and that could have an effect on the reliability of that source, but there are too many variables to project that right now.

JUSTIN QUINN: I can't think of much else to cover; can you think of anything else that might be worth adding?

ERNEST ESTEVEZ: I think it's worth noting that citizen groups, environmental activists have played a critical role in the paths that local governments have taken, and I don't think some of

the good conditions we have right now would be here at this time... They might have come along anyway, but they were certainly initiated or accelerated by the pressure from environmental groups and individuals who really committed themselves to the cause. They often suffered tremendously from city councils or county commissions that were belligerent or cruel. But that was part of the metamorphosis of Florida and Florida communities. The environmentalists predated the contemporary environmental movement that started with the passage of the National Environmental Policy Act, or the first Earth Day, for example. At some point somebody needs to gather all those names and stories up, just to honor those people—the thing about Florida is that Florida rarely looks back, you know, we don't look back to see which commissioner screwed things up fifty years ago, but we don't look back to see who did really positive things, either; we're always thinking about the future. But yeah, a lot of people went to the... In Sarasota there was a group called Save Our Bay that was formed, largely to prevent Arvida from pumping up more of the Bay to make residential islands. Bird Key was pumped up from the bottom of the Bay, and that upset a lot of Sarasotans, and then there was a proposal to pump up another mangrove island between Bird Key and Lido Key, and that's what galvanized that group. They were following a model set by a group in Tampa Bay who as early as 1967 or 1968 were organizing and objecting to the widespread destruction of mangroves for residential development and other projects. And, a husband-and-wife team here in Manatee County formed a group called Manasota 88, and I think they did that in 1978, but it could be 1968 now that I think about it. Thinking that about twenty years from now, you know, if we—if we don't act for the next twenty years, it'll be too late. And they were very good at what they did: they organized, they were relentless in their prosecution and persecution of elected officials; they had a huge membership, and they were litigious. They're both gone now, but the organization continues.

JUSTIN QUINN: So... I guess you could say that maybe some of the characteristics about this area that have made it a unique watershed have actually come from civic engagement?

ERNEST ESTEVEZ: Absolutely, absolutely. They, uh, citizen groups were on the forefront of opposing phosphate mining in the watershed, opposing proposals for the port in Manatee County and then the expansion of the port, um, promoting advanced wastewater treatment—sewage plants that do really good jobs at cleaning water up. The reason we have the ability to take effluent from a treatment plant and spray it on golf courses and neighborhoods is because the treatment level is ramped up to such a high degree that it's safe to do that. You couldn't take the older plants' [laughs]—well, you could have, but you would've been disgusted by the results if you're taking the effluent from an old sewage treatment plant and just spread it out there. Environmental groups were opposed to the disposal of sludge; it used to be that when a sewage treatment plant needed to be rehabilitated, they'd drain it down, and dig out deposited organic matter that accumulated at the bottom of ponds or at the bottoms of tanks and then take it out into the countryside somewhere and dump it on the ground. That's now highly regulated by the State of Florida and, interestingly, any property where that's been done has to have a note put on its deed forever informing subsequent owners that that land had been used in that way. It's one of the few cases where the transaction of exchanging property carries with it legally-required language about the quality of the land, uh... And, off the top of my head I can't remember other examples, but there were many, many, many examples of citizen campaigns. And they often lost—I mean, they didn't win everything, you know, but it gets back to that idea of a constituency and people speaking up for a resource and applying pressure, you know, in a political sense. Yeah, I think that's extremely important.

JUSTIN QUINN: Probably about the only other thing I can think of that we haven't touched on at all, something that was at the conference the day that I was there that you might be able to speak to a little bit, and that's things like hurricanes, large storms, the flooding that comes with those things and how those relate to the way the watershed has changed.

ERNEST ESTEVEZ: One of the signature beliefs about this area is that it is somehow protected or immune from hurricanes.

JUSTIN QUINN: There was one in 1948 that was pretty strong, wasn't there?

ERNEST ESTEVEZ: Yeah, but who remembers that? And, it's one of what I call the Florida myths. Another example is no matter who you talk to or where they live in Florida, if they live on a lake or a river or a pond or even a stormwater drain that was dug out of the ground by a developer, they'll tell you that it's spring fed; it's just legion, I mean it's everywhere, no matter where in Florida you go, people will tell you, "Oh yeah, well you know that body of water is spring-fed," and it's not. We know where the springs are in Florida, but people just really hold onto that idea. And in this area people hold onto the idea that there's something about the curvature of the state or the climate or the Coriolis effect or the alignment of the stars that makes us immune from being hit by hurricanes. Now, no reasonable person and certainly the people in government who are responsible for public safety and welfare think that. I mean, they plan very seriously for bad storms. And the storms have shaped the coast, and they've shaped our history, they've created inlets. New Pass, for example—that was created in a storm. Midnight Pass has occupied several locations that were either closed or opened by storms. And storms, I think, are just part of the ecological and evolutionary context of this place. There's a theory in biology that ecosystems that are perturbed a great deal are usually set back by them—by that. Ecosystems that don't experience any perturbations—and there really aren't any, but theoretically—aren't as productive as those that are perturbed from time to time. The process of setting the system back puts things into the exponential phase for recovery for a while, and then things level off. So, there's this intermediate level of perturbation that is understood to play a role in maintaining the productivity of an ecosystem. So out of curiosity I sat down and I made a list of what the perturbations were that affect this area, and I listed hurricanes and red tides, floods and droughts, and freezes, because until the mid '80s we would have killing freezes every so often. There'd be a harsh winter where you get three or four nights of really cold weather and it'd kill all the mangroves and kill fish in the rivers and stuff like that, and maybe there's another one I can't remember. So then I just dug up records on all these things, and I started marking the year in which they occurred, and when I was done what I found out was over a hundred-year period, it's rare to have a year when not one of those perturbations occurs.

JUSTIN QUINN: Hm.

ERNEST ESTEVEZ: It only occurred, in the hundred years I looked at, I don't know, twelve times or something. I could look it up, but that's about the right order. The longest period of consecutive years without one of those things happening was only four years. So, this region gets hammered by landscape regional-scale perturbations that differ in their nature—a freeze has a different effect than a red tide, and a red tide is different from a hurricane, and so forth—but it's being assaulted and recovering from these intermediate-level disturbances with sufficient frequency that it may explain the high productivity of our coast. The wrong image would be that

our coastal waters are some gossamer-fine spider web of delicate relationships that can be thrown askew by poking it. You know, it's not like that at all. I mean, uh, the natural restorative capacity is high in a system that doesn't have a chronic problem, and an example of a chronic problem would be a contaminant that gets into a system and doesn't get out and just keeps recycling and killing everything it touches.

JUSTIN QUINN: Would the lead be an example of that?

ERNEST ESTEVEZ: Actually the lead in Hudson Bayou is burying itself—the specific gravity of lead is much higher than the specific gravity of sand—and so the lead is literally sinking down into the bottom, and is covered now by... The highest levels are ten to twelve feet underground...

JUSTIN QUINN: Wow.

ERNEST ESTEVEZ: ...so it's taking itself out of the system. But PCBs get into a system—like the Hudson River, you know—I mean, those PCBs just keep cycling through the system over and over and over. Radionuclides, you get certain kinds of radionuclides that stay in the system basically forever. So not counting those kinds of persistent, chronic and extreme perturbations, the system—ecosystems, coastal ecosystems—are resilient and they'll restore themselves. Well, what we have to do is figure out how nature works, and let the forces of nature do the work. We spend a tremendous amount of economic and social capital trying to engineer the environment, and we're doing that because we don't really know how nature works and if we understood it, we'd let nature do the work, you know, and use that expenditure for more important social needs. To me, it's not a good thing that we're having to raise scallops or oysters or fish or endangered species to restore the system, because that's effort we could be spending on other needs. If we really understood how the environment—the ecosystems, those things are a part of—work, then we could get behind that process and speed it up, and wish it luck, you know, and let it solve the problem on its own.

JUSTIN QUINN: I think that's probably as good a place as any to end it. Do you have anything else...?

ERNEST ESTEVEZ: Yeah, good. Nah, I'm tired.

JUSTIN QUINN: Yeah, me too.