

# CLIMATE CHANGE AND THE FLORIDA KEYS

By Hans Hoegh-Guldberg

**APPENDIX 1: KEY ISSUES FOR THE FLORIDA KEYS**

**APPENDIX 2: SCENARIO-PLANNING WORKSHOPS**

**JULY 21, 2010**

SOCIOECONOMIC RESEARCH AND MONITORING PROGRAM  
FLORIDA KEYS NATIONAL MARINE SANCTUARY (FKNMS)  
NATIONAL ATMOSPHERIC AND OCEANIC ADMINISTRATION (NOAA)



This study was funded by NOAA's Coral Reef Conservation Program

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# APPENDIX 1: KEY ISSUES FOR THE FLORIDA KEYS

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## HARD-TO-SHIFT FORCES

### 1 CLIMATE CHANGE

*All the workshops saw climate change as the underlying force. The various forces listed under climate change reinforce and interact with one another (such as warming and ocean acidification) but other external forces also show interdependence. For example, salt water intrusion is listed under sea-level rise as well as under water supply, reflecting the fact that the various effects of climate change exacerbate the impact of economic and demographic growth on the availability of water. Similarly, climate change and lack of pollution control are jointly responsible for coral health and loss of resilience.*

#### **Warming**

- Impact on coral health – bleaching (accompanied by a range of other marine diseases)
- Coral bleaching hit the Atlantic first (12 years before it hit the Great Barrier Reef).
- Loss of coral cover, especially shallow reefs
- Loss of endemic species of plants, wildlife and invertebrates
- Invasive species taking over ecological niches. Algal blooms.

#### **Sea-level**

- Rising much faster than projected; could flood most of the Keys
- Salt water into Biscayne aquifer
- Low-grade sewer systems – insufficient to deal with sea-level rise

- Need for better stormwater and wastewater treatment in Miami-Dade, Broward and Palm Beach
- Declining conditions for birds and fish at low tide

***Ocean acidification***

- Exacerbating the impact of warming along the Keys

***Hurricanes – more of them, or just more intense?***

***Other***

- Increased threat to fisheries
- Threat to real estate values
- Climate change deniers/skeptics still delaying action

**2 WATER SUPPLY**

***Biscayne Aquifer:***

- Florida Keys Aqueduct Authority managing the aquifer
- Intrusion of sea water, especially if sea-level rises
- Water becoming limiting factor for development
- Cumulative effect of drought in South Florida

***Alternative sources are expensive:***

- Treatment of wastewater in Miami-Dade County (mainly non-potable)
- Reverse osmosis technology may bring quality up to potable

***Local remedial action:***

- Rainwater cisterns coming back in; residents converting septic tanks to water storage systems
- Some homes provide all their own water needs
- Solar energy
- Other technologies if viable

**3 CARRYING CAPACITY**

- Carrying capacity study 2002: key document
- Based on endangered species model (hammocks connectivity, Big Pine endangered species)
- Rate of Growth Ordinance (ROGO): limited building permits, building heights
- County 2010 Comprehensive Plan: Tier system

### ***Population consequences:***

- Just too many people (locals and visitors) for too small an area
- Losing our workers, and volunteers
- Few young people return to work in the Keys
- Population projected to double in size in Florida by 2060
- Discriminating between types of residents and visitors to attract
- Litigation costs high if trying to prevent people from coming here
- Keys may become almost entirely populated by the wealthy
- Transient community – people living here part-time only

### ***Special issues in Key West:***

- Dilution of unique heritage through unbridled development
- Drastic community change could happen
- Newcomers' lack of understanding of heritage

## **4 EXTERNAL INFLUENCES**

- Offshore drilling threat from Cuba, especially to Tortugas
- Red tide from Mississippi, runoff; flooding Ohio and Mississippi Rivers; algal blooms in Gulf
- Pollution from Florida sugar cane industry expanded for biodiesel
- Stormwater from Everglades
- Pressures from densely populated Counties to the north
- South Miami/Dade development projects
- Cannot control ocean outfalls to the north (Keys deals with its own waste)
- Harder to organize hurricane evacuation if roads north can't handle capacity
- Opening up of Cuba: opportunity or threat to Keys tourism?
- Competing with Cuban dive spots
- Opportunity to cooperate on ferry and air transport
- Share destinations.

## **ISSUES THAT CAN BE MORE READILY INFLUENCED LOCALLY**

## **5 REEF HEALTH, SUSTAINABILITY AND FISHERIES**

### ***Main underlying issue: climate change***

- Major factor: warming



- Can act locally – main long-term factor environmental sustainability
- Work on coral resilience, sanctuary development
- Restoration of *Diadema* sea urchin as lost member of chain keeping ecosystem healthy
- Restoration of elkhorn and staghorn corals
- Reefs more vulnerable than GBR due to proximity to coast
- Reef health vital to reef use, including fisheries
- Great deterioration already observed since 1950s-1960s
- We all need to get on bandwagon to promote reef health, like GLEE and SFFFK

### ***Water quality***

- Keys acting as turbidity barrier
- Pollution from cruise ships
- Everglades restoration essential for fisheries and drinking water supply

### ***Fisheries***

- Division of fish stock between commercial and recreational fishers
- Access problems for commercial fishers due to rich recreational fishers
- Commercial fisheries strictly regulated. Recreational fishers are not
- Need to educate commercial fishers how to conduct good businesses
- Overfishing – declining fish size
- Long-term increase in fishing pressure even if current recession may provide respite
- Excessive technological use (GPS)
- Zoning and increased yield in unprotected areas
- Environmental damage from hurricanes – lines trapped around coral
- Prop-dredging, anchor damage – reef ‘death from a thousand cuts’
- Support fishing but limit damage to sensitive ecosystems and reefs
- Monroe County is a major commercial fisheries area

## **6 POLLUTION**

- Mandate to put in sewers
- Sewerage progress in Monroe County running behind mandate
- Monroe County stormwater control
- Coral bleaching, associated disease history, and land-based pollution and other influences
- How to maximize coral resilience

- Outfalls to the north mandated to shut down by 2025, but funding is a problem
- Pollution from external sources – major mainland rivers
- Turkey Point Nuclear Station expansion standards
- Water supply is again seen as the limiting factor for growth and development
- Composting toilets use no water and provide compost
- Use grey water for irrigation

***Government management issues***

- Is particular mandated government spending becoming irrelevant with climate change and sea-level rise?
- Allocation system for new residential developments determined by 24-hour hurricane evacuation time rather than environmental issues
- Inequities in application of stormwater runoff rules
- Lack of federal funding for authorized projects
- Support of sustainable building standards such as use of solar energy
- Lack of government incentives to use appropriate technologies
- Key dependence on wastewater treatment in Miami-Dade, and on own investment in Monroe County
- No growth in funding for Sanctuary budget

**7 ECONOMY, TOURISM, AND DIVERSIFICATION POTENTIAL**

***Economy***

- Affordability of living in Keys
- Lack of professional positions
- Boom and bust endemic
- Bussing people in for mundane positions
- Economy has gone ‘full-time’ last 25 years
- Big threat in polarized wealth distribution
- Carrying capacity – does sustainable growth equal redevelopment while protecting our natural areas and achieving efficiency of energy and water use?
- Role of ROGO and land use plan
- Role of military in economy
- Energy crisis and potential of alternative energy
- Importance of people living with alternative energy in No Name Key

### **Tourism**

- The economic engine – we are a tourist economy, first
- First-class restaurants scarce
- Hotels out-pricing tourist market
- Transition to upscale economy but lack of upscale services and facilities
- Getaway destination for millions from Miami
- Rising fuel prices will deter long-distance travel (both road and air)
- Lack of workforce to service tourist resort economy
- Cruiser destination, and implications
- Key West special – historic buildings and culture

### **Cultural change**

- Rising property values, locals able to sell at high prices (especially waterfront)
- People moving in buying to resell, or wealthy buying 3<sup>rd</sup> or 4<sup>th</sup> homes, including Europeans
- Loss of people who want to improve the community
- Lack of emotional investment
- Attract people who are concerned about Keys community and environment
- People who can live and work here full-time
- Preservation of lifestyle associated ultimately with reef

## **8 EDUCATION AND OUTREACH**

*Controllable by providing more/better education and outreach*

- Education – communication – enforcement
- Alleged lack of law enforcement
- Strengthen boat license conditions
- Encourage environmentally aware tourist attractions
- Education-based and ecotourism
- Ecotourism education center backed by educational institutions
- Programs like Green Lodging; involve guests as part of solution; good for business too
- Educate people on the success of things
- Educate locals in sustainable behavior in community's interest
- Educate local as well as visiting boaters on limiting reef damage
- Problems educating people from diverse cultures, especially older people

- Use children to reach the parents
- Involve people already here (dive industry, FKNMS) in educational effort
- People leading by example such as GLEE
- Promote recycling campaigns
- Promote alternative energy – local use; biodiesel for boats; solar panels; tie to global change
- More efficient promotion of no-take areas
- Anticipate impact of climate change (warming, sea level) to help build resilience
- Adopt a long-term planning view
- Learn from past mistakes

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## APPENDIX 2: SCENARIO-PLANNING WORKSHOPS

### INTRODUCTION

The five scenario planning workshops in the Florida Keys in June 2008 were recorded verbatim and proved a rich source. Participants were sent a preliminary list of main issues in October 2008, and again in June 2009. Further analysis shows that there are two types of issues though there are clear overlaps and connections between them:

1. **Primary issues (hard-to-shift forces):** climate change, water supply, carrying capacity, and external pollution and other influences from outside the Keys. The primary issues are described from the workshop proceedings in Sections 1 to 4 below.
2. **Issues under potential local control:** reef health, sustainability and fisheries; pollution control; the economy, including tourism and economic diversification; and education and outreach. See Sections 5 to 8.

The five workshop locations are listed from north to south (Key Largo to Key West).

### CLIMATE CHANGE

#### KEY LARGO

##### *Sea-level change and climate change*

- There is a projection that 80% of Monroe County will be under water by 2060. What would happen if such models prove increasingly accurate?
- And what happens when the threat of global warming becomes more apparent to people than it is now?
- Need to start planning for such eventualities just as hurricane planning is now practiced.
- Such a worst-case scenario would keep depressing real estate prices, which will make it more affordable in some ways, but it also makes long-term residents' houses harder to sell. In the short term, with a mortgage requirement to insure what the insurance company dictates to you how much compared to what you want to have is becoming a huge issue. Many are paying ten grand for all their insurances, but only \$1,300 in taxes.

#### ISLAMORADA

##### *Climate change is the fundamental issue*

- The Keys are so dependent on the environment, which is the reason people choose to live here and visit here.
- The climate also produces the natural resources needed for development, including fisheries; threatened under climate change.
- Further threats from ocean acidification to coral, calcareous algae etc.

- Many still think climate change is not real.
- We have to figure out ways in which we can either adapt to it or hopefully stimulate the prevention of climate change through our own efforts, but it's a worldwide problem.

## **MARATHON**

### ***Climate change and sea-level rise***

- Dramatic changes in coral cover and attractiveness of reefs over the past 40-50 years (two older members of the workshop)
- “Wild cards in the deck.” How much, how fast over how long a period? Maybe not a concern to us, but to future generations. “It would be devastating to the economy of coastal states, in particular the Florida Keys.” On our infrastructure even with small rises, sewage etc, and putting salt water intrusion into the Biscayne aquifer.
- “You know, it's not going to take much to start shrinking our little piece of paradise.”
- “From the standpoint of the impact on real estate values. I mean, as soon as it's predicted and predictable that it will happen, if in fact it does, I would think our real estate market in the Keys would just go into the toilet. No pun intended here.”

## **LOWER KEYS**

### ***Climate change***

- Seven or eight of the ten hottest years on record during the past decade. If that continues we are going to continue to see the impacts of those hot conditions on our coral reefs, on the other marine life, even on ourselves eventually.
- Thirty years' observations of the effect of climate change on our coral. Great Barrier Reef (with whom FKNMS cooperates) only saw first bleaching event in 1992. The Pacific in Australia has been running about 12 years behind what's happening in the Atlantic, and we're at greater risk here because of the small size of the wider Caribbean basin and the low diversity we have in corals.
- Prognosis: continued acceleration – coastal resources being affected in different ways by fish die-offs, harmful algae blooms, all triggered by high sea surface temperatures with a great deal of additional microbial activity as a result of this increased intensity. Corals will respond to this even in areas now considered resistant or resilient.
- New report by The Florida Coastal and Ocean Coalition looks at climate change around the State of Florida and the potential impacts. Not just climate warming two degrees since 1960 but sea-level change – things likely to change more radically than corals. But regarding corals, the report found that water quality is an exasperating parameter with climate change, and one recommendation is to improve both storm water and wastewater treatment as in Miami-Dade, Broward and Palm Beach County of removing in the next 14 years 600 million gallons of poorly treated sewage that goes out on those reefs every day.

- With climate change because of temperature changes and shifts, there's a shifting in species, non-native species moving in. Here in the Keys you probably could expect more tropical species coming in from the- Caribbean. Also introduced Australian trees which proved pests (*Casuarina*, *Melaleuca*) will move north.
- We can completely lose endemic species of plants, wildlife and invertebrates to climate change, either through direct or secondary impacts. And species like iguana [and lionfish?] taking over ecological niches.
- Jury not out on whether climate change will bring more or less hurricanes.
- Dry Tortugas has much more coral cover than the Keys reefs. There are four different reef types in the main Keys: The shallow group reefs, the deep reefs, the hard bottom habitats and the patch reefs. The shallow reefs, like the ones that we all go to, are the ones that are showing the greatest amount of decline. Prior to 1997-98 the coverage was about 20%. In 1997-98 we lost 30% of those shallow reefs. Now it's been stable since '98 with just a couple of drops in the hurricane years of '05, '04, '05.
- The patch reefs stayed stagnant and they've come up slightly in coverage, but in the Tortugas where we have the Tortugas Ecological Reserve, we have between 40 and 60 percent living coral on all of those reefs. And those are a fully protected area where activity is minimal to keep them in reserve, because that's upstream of the Keys and anything spawning there comes in this direction.
- Sea-level scenarios, (Harold Wanless, University of Miami). Alarming implications for the Keys.
- Sewer systems are engineered at a very low grade, and just a minimum amount of sea-level rise will start backing up sewers in major cities. We're talking about a decade or two – very short time frame (coastal North Carolina, Tampa, St. Petersburg used as examples).
- Decline of great white heron and its sensitivity to water levels at low tide. Also fish in the flats area such as bonefish.

## **KEY WEST**

### ***The environment is our livelihood***

- “Climate change and global warming. This is very serious, but yet we have responsible people today just pooh-poohing that idea.”
- Tide is changing quickly with documentation of what was projected to happen in 20 years now happening in two or three.

## **WATER SUPPLY**

### **MARATHON**

#### ***Water supply***

- Florida Keys Aqueduct Authority supplies all drinking water from a shallow aquifer called the Biscayne aquifer. Main concern: intrusion of sea water
- Threat from atmospheric conditions – drought
- Another threat to water is climate change and the potential for elevation increases in the sea, which would push salt water further in, which could contaminate the Biscayne aquifer
- Florida Regional Planning Council (Broward, Monroe and Miami-Dade County) now requires in all comp plan amendment proposals that you address water supply because it is becoming the limiting factor from the standpoint of development
- West Palm Beach, Broward and Miami-Dade are recognizing that they're will have to go to advanced wastewater treatment because they've been dumping throughout falls millions and millions of gallons of water every day
- Already recognized in the northern parts of Florida, southern parts of Georgia, lakes and rivers that used to exist are dry now. "Water is the new oil."
- Desalination plants in Key West and Marathon capacity to supply 1 million gallons a day in emergencies (at four times the cost of normal water) compared with total consumption of 17-20 million
- Reverse osmosis (RO) process getting cheaper. Freshwater lake at Ocean Reef Club (Key Largo) water golf course cheaper than available from Aqueduct Authority (but not potable)
- Treated wastewater mainly non-potable.
- Miami-Dade County only has 5-6% of treated wastewater. They dump most in the ocean. Will have to spend a lot of money on advanced wastewater treatment
- Key Largo was planning to improve RO technology to bring treated water up to potable
- Tampa has found that using RO has changed the chemistry of the Bay – more salinity affecting marine life
- Problem with RO: need for finer and finer screen and bigger pumps and lots of energy to push water through.
- Solar mentioned as possible energy source.
- Monroe County using not only Biscayne aquifer but also deeper Floridian aquifer with more salty water – using up 5% of total during busy season considered safe. Aqueduct Authority also building a low level reverse osmosis treatment plant on location at our well field, with which we will be tapping the Florida aquifer. But it's not as energy intensive as salt water. So we are looking for alternative sources. And the governing



board had to advance the capital spending on that by six or seven years from their original game plan because of the cumulative effect of drought that affects all the southern part of Florida. But the problem is wherever they stick the straw in the ground, they're drawing from the same common shared pool. So you can use reverse osmosis, but somebody's still going to pay for that.

## **LOWER KEYS**

### ***Water supply***

- Water quality and climate change, see above.
- Threatened by droughts affecting Lake Okeechobee and continued development in Miami-Dade and Broward Counties.
- Also threatened by new tower at Turkey Point nuclear station consuming water from Biscayne aquifer, within next 10 years.
- “In the early days the people in the Keys had cisterns in which they stored rainwater, and then when they built the pipeline to the mainland trying to get the water steady, then the cisterns were destroyed as part of the mosquito management thing, but now we're going back to cisterns.”
- “People are beginning to, of all things, change their septic tanks into water storage systems. And there are a few homes here in the Keys that actually provide all their own water, including their drinking water, and I think we're going to move toward that. Put that in your best case scenario.”

## **CARRYING CAPACITY**

### **KEY LARGO**

#### ***Population***

- The people we are losing in a declining population are the worker bees who worked in the community, also as volunteers
- According to two young women professionals in the group, few young people return to work in the Keys, especially graduates who are not paid what they can earn elsewhere (though graduates from Coral Shores High School seem to return in greater numbers).

#### ***Carrying capacity***

- Based on the built system and the natural system. How many more structures can we have within the Florida Keys and still maintain. We're in a state area of critical concern to maintain the connectivity of the hammocks, and the Big Pine area for the endangered species. It's all based on an endangered species model.
- We have limited rate of growth ordinance, limited amounts of building permits that we give because they saw that the Florida Keys was a sensitive habitat. We have limited

heights of our buildings so it doesn't become a mini Miami Beach, which could have happened if the Keys wouldn't have changed that back in 1985.

- Maybe what needs to be looked at is the transient community, how many people that will not live here. Maybe that should be capped, because there is no cap on that.
- The reason why they're talking about tying the carrying capacity to the number of structures; maybe only 30% of them are fully occupied at any one time, but the fact is those structures still exist, and if somebody came down and lived in those structures we would need this level of service on our highways, we would need this size power generating station, we would need this size pipeline.
- Only about 40% of the structures in Monroe County are homesteaded.

## **ISLAMORADA**

### ***Population – carrying capacity***

- Population increase and visitor numbers – too many people in too small a space. “The issue is the increase in population, is the number of people coming in, and right now we're kind of juggling it. You know, we're trying to prevent development of waterfront areas, we're trying to maintain working waterfront areas and usage, but eventually, whether we're looking at 20 or 50 years in the future, there's going to have to be some kind of restriction or some kind of control over population growth and development to be able to maintain the character of the Keys, assuming the Keys are still here.”
- Carrying capacity (locals plus tourists).
- “The issue that comes from there is both in Monroe County and here in the Village there are a certain number of permits that we give out for new houses. You can buy a house, tear it down and rebuild it, but to add a new dwelling unit, we have to account for that somewhere. Even to add nonresidential square footage, you've got to account for that somewhere. And there is a limit, and it's, I believe the Village has extended it to 2020.” But what happens after that date?
- The Keys may be entirely populated by the wealthy.

## **MARATHON**

### ***Population – carrying capacity***

- Carrying capacity study was to measure whether we are in a sustainable situation or not
- “In light of the reduced fish, loss of habitat, the pollution impacts from agricultural runoff, and a host of other things, ... I think that it's a good thing that we're slowing down and maybe it will bring us back into not a worst case scenario but a sustainable situation.”
- We couldn't afford the litigation to keep people from coming here based upon numbers and/or building their properties. State should (but isn't) use the economic downturn to buy land at the lower prices

- “One result of the carrying capacity study was a court order mandating a work plan and changing the County 2010 Comprehensive Plan in various ways. One of the big results was the tier system. And also setting aside that certain sized parcels are more sustainable in protecting the environment and therefore more valuable to the environment as a sustainable parcel of land. And then you got more negative environmental points about building on there and whether road counted as a break in the environment, etc. So there were specific results that changed the comp plan as a result of the carrying capacity study.”
- [Also see [http://www.monroecounty-fl.gov/pages/MonroeCoFL\\_HotTopics/tiermaps](http://www.monroecounty-fl.gov/pages/MonroeCoFL_HotTopics/tiermaps)]
- Loss of multi-generational handing over of businesses.

## **KEY WEST**

### ***Population growth***

- Keys is downstream from rest of Florida which is expected to double its population by 2060.

### ***Development***

- Disappearing waterfront.
- Unchecked development diluting unique cultural historical element in Key West.
- Up-scaling of the community may benefit individual businesses, but doubtful community benefits.
- Doubtful that long term will be sustainable in Key West, with drastic community changes.
- We may not like it, but change is probably unstoppable, natural progression, and ‘we haven’t become Miami’.
- Fifteen years ago we wanted better quality (richer) rather than more customers, now we complain it is killing the life blood of the Florida Keys.
- Development of upscale condominiums on waterfront. Senate study: short-term positive but long-term negative.
- “Because that's all that is, it's all just about greed and money, because they're not concerned about the impact on the environment and they're not concerned about changing the cultural aspect of wherever they build. There must be real big fast money on the front end.”

## EXTERNAL INFLUENCES

### KEY LARGO

#### *If Cuba opens, and oil drilling*

- Loss of ports that could handle Miami River little freighters and repairs. Loss of boating infrastructure. Loss of dockage in South Florida for boats 100+ feet long. Bought up by those buying \$4-5 million homes. Dockuminiums. Stock Island.
- Boot Key Harbor opportunity – safe dockage and facilities.
- Offshore drilling threat in Cuba – opposite Tortugas. Real threat.
- Drilling also huge threat in Alaska. And apparently permits exist in Everglades.
- Red tide from the Mississippi
- Penetrated from Louisiana, Texas, round the big bend to Tampa, eventually to Key West.
- Why and where did it come from?

### MARATHON

#### *Pollution from afar*

- Floods in the Ohio River, the Mississippi River. The Gulf Stream out there will turn to mud, and you'll be having to troll sometimes 50, 60 miles offshore to find any blue water. Will hit charter boats, burning more fuel, which means it becomes more expensive to go fishing.
- Oil drilling in Cuba
- China has already proposed to help develop offshore drilling, concentrating on the most promising areas, unfortunately on the northwest coast of Cuba. Explorative wells have been drilled. Gulf Stream ensures that oil spills would affect the Keys.
- However, the oil drilling industry has cleaned up its act. “The transportation part of it is where you usually have the problems, the Valdez and moving it through the tankers. But the actual drilling industry has become a very clean industry.”
- Uncertain what practices would be used to drill; a very expensive process to extract hydrocarbons from the floor of the ocean or the Gulf of Mexico.
- ANWR [Arctic National Wildlife Refuge] and other areas were disallowed and oil prices are soaring.
- The US economy has thrived on its low fuel prices. Now sales are down in the automotive industry (SUVs etc) and the marine industry is really hurting.

#### *Ethanol from sugar cane*

- Brazil became energy-independent 30 years ago

- “You've got up in the central part of Florida a sugar cane industry that would not exist if the price of sugar was not subsidized by this government. At some point somebody instead of wanting to drill in ANWR is going to say, well, shoot, what we ought to do is flood all that land and grow sugar cane and make bio-diesel out of it. That's what makes me nervous.”
- Sugar cane growing in the past 80 years has caused most of the pollution of the Everglades, which affects all the southern part of the peninsula.

## **LOWER KEYS**

### ***Pollution and other impacts from outside***

- We are dealing with our wastewater but cannot control the outfalls.
- Catching stormwater from the Everglades.
- Production of biofuels from increased sugar plantations. Increased nutrients being brought down through the Everglades into the Keys are fed by dangerous algae blooms harmful to the reef (see further under climate change).
- Development projects in South Miami/Dade. We share resources with those folks and there's more of them every day. So a combination of the sharing resources and folks vacationing on a weekend down here is going to put pressure on our infrastructure beyond dealing with residents and our regular hotel trade.
- The more people that are in South Dade and Broward counties the more traffic will be coming down here to support the tourist industry. A double-edged sword.
- Political threats or opportunities
- Threat or opportunity: Complete change of government and economic system in Cuba next 10-20 years. Cuba as a possible destination by ferry or air from Key West. Lots of dive destinations around Cuba. This can happen day after tomorrow. TDC has worked on Cuba opening up as a competitive destination. We can't compete with their beaches but maybe combine Cuba and Keys as destinations.
- Continued and expanded war in the Middle East.
- Biggest threat, however: linear thinking and people that are always going to continue to do things the way they've always done things. Not being educated out of that sort of thinking. Usually older people?

### ***Hurricane evacuation***

- The more South Florida fills up with people, the harder it is for the people in the Keys to evacuate in a hurricane. Maybe relatively easy to get out of the Keys (despite only one highway so you would have to leave early) but all roads would be clogged with people getting out of South Florida.

## **KEY WEST**

### ***Influences from outside***

- Even in Key West, you only live 175 miles away from 4 million people, and those people are going to continue to come down here on a regular basis, maybe not to the degree that they have in the past for whatever reasons
- “We can't control living downstream from the Gulf of Mexico, from the Tampa agricultural areas and the runoff and the algae blooms. I don't know how we deal with that other than the state making all these other areas terminate their outfalls and go to advanced wastewater treatment like the Keys are going to, but I just am very optimistic about what will happen in the future.”
- “The sea-level is coming up, temperature is going up, but all we can do is work to reduce our emissions which are the primary thing that's causing those things, and then work on removing some of those other cuts, destructive fishing gear, prop dredging, maybe sun screen on the reef.”

## **REEF HEALTH, SUSTAINABILITY AND FISHERIES**

### **KEY LARGO**

#### ***Reef health and fisheries***

- State of natural resources is the bottom line (reef health; no one would come if no fish).
- We can do things locally, especially on fishing, despite international nature of coral problem.
- Problem not just a result of climate change.
- While coral problem is global, we can act locally: identify areas of coral more resilient than other areas, less subject to bleaching.
- Can we connect some of these areas, through corridors, and allow them to recover?
- History of sanctuary development: initial resistance, then acceptance, and five years later special protected areas.
- Despite loss of some species, our reefs are amazing. Little coral cover but beautiful reef structures, lots of soft coral. So we have a beautiful system which needs protection.
- Is chumming for silvertail healthy for the reef and reef fishing generally?

#### ***Water quality***

- Tumors first in turtles, then lobsters, shrimp, fish, due to connectivity of systems .. water quality problems broader than they used to be. Theory expressed: outflow of organic matter (hormones, pharmaceuticals) from cruise ships and the coast through untreated sewage from septic tanks cause of the problem. Maybe cruise ships main problem because in greater concentration and on the water itself.

- Water quality issue huge: Everglades restoration essential not just for the Florida Bay fisheries but for our drinking water supply increasingly exposed to saltwater intrusion.
- Is the reason why we have so much coral that we do have in the Upper Keys versus Marathon because we don't have as many openings from the bay side to the ocean side? So the islands actually act as a turbidity barrier. It's going to be interesting to see what happens when they open up Jewfish Creek Bridge and take that stretch out, if that's going to affect some of our Key Largo reefs up with opening that up.
- If instead of paving US1 like we have now, it is put on piers like they do in Louisiana over the swamp, the water flow would go. The animals wouldn't be hurt.

### ***Environmental sustainability***

- The main long-term factor for the Keys.
- It all goes back to the environment, the reef. If we don't take care of the fisheries, the reef, the Everglades, then none of us are going to need to be here because there's not going to be anything going on.
- Three year study of reef resilience in Florida, looking at areas more resilient and resistant to different climate change scenarios, and able to recover from bleaching. People asked to vote on ten strategies for increasing resilience; stringent boater licensing came in as number three. Too easy to get one now, just answering a number of questions; no requirements to know about environmental matters. Any change being resisted by recreational boating industry.
- In 1983 we had our sea urchin die-off, and that was really the initial event that caused the beginning of the demise of what's gone on with the reefs now, and that was when the algae started building up and corals began to die, we saw more diseases.

### ***Commercial fishing***

- Fisheries management divide fish stocks between recreational and commercial fishers.
- Wealthy buyers preventing access for commercial fishermen.
- Now everyone uses GPS to go straight to the fish (man's got too smart for his own good). We are a lot more efficient when it comes to harvesting.
- Commercial fishing saved the Keys for a long time; recreational fishing grew from the mid-1970s changing the split of the assets.
- Commercial fishermen have to abide by strict regulations. Tourist rent boats and go fishing without knowing the fishing regulations and the laws, and they pull fish out of the water that should have never been iced and taken home. And they're blaming a lot of the fishing decline on the commercial fishermen.
- The mini-lobster season (two days end of July) is a nuisance. Lots of uncaring Miami people come, reefs get raped, the lobster fishers cheat, injuries happen, no one seems to be in favor.

- 90% of US spiny lobster tail production is in Monroe County, commercial fishing is a \$100 million industry but licensing becoming restricted to particular species: lobsters, stone crabs, yellowtails etc. Difficult to get a license without a record of catch or buying someone with a license out. Only a handful of good fishermen also know good business.

## **ISLAMORADA**

### ***Sustainability of the reef is vital***

- The reef is the focal attraction for tourists and for people living here.
- The coral reefs have an economic value to tourism between three to six billions of dollars dependent upon the base used. And the reefs are also the basis for the fisheries. While the whole ecosystem is under pressure, the coral reefs are central.
- Ocean acidification, sea-level rise, more intensive hurricanes destroying Keys infrastructure, small but finite risk of tsunamis which could hit the Keys despite protection by the Bahamas.
- “In a coral reef all throughout the Caribbean, the Bahamas, the Florida Keys, there's a balance between the growth of algae and the growth of coral, the balance that is controlled by herbivores.” Since the 1983 plague destroyed almost all the herbivorous sea urchins (*Diadema*), the coral reefs have declined precipitously (not the only reason for the decline in coral reefs, but a significant factor). Program at Mote Laboratories to restore reef resilience through reintroduction of *Diadema*. The current reef structure will allow coral to come back if herbivores are returned to eat the algae.
- Vulnerability of reefs due to proximity to Keys (much closer than the Great Barrier Reef to the Queensland coast).
- “The grouper is a long-live fish and the intensity of the fishery on it prevents them from really developing. So over-fishing is a very critical, and we're trying to control it through the Fishery Management Councils and through the Fish and Wildlife, the laws and regulations. And many times these are flouted, because people look at short-term commercial gain over long-term resource sustainability.”
- “This is where education comes in, and with recreational fishermen, too. Like even the lobster fisheries, the microcosm of what happens throughout the world here. You have people that do everything that they possibly can to flout the resource laws that are in place now. You know, they double-trip out and are harvesting lobsters out of season and short lobsters in tremendous numbers.”
- Cross purposes between diving/snorkeling and fishing – over-fishing; decreasing fish size.

## **MARATHON**

### ***The reef and water quality***

- Economy revolves around the reef and the water quality



- Perspective on reef deterioration since 1950s. Stoppage of water flow from the Everglades (C-111 Canal) – program undertaken to support growth of Miami and Palm Beach/part of Everglades restoration plan. Algal blooms in Florida Bay. Hyper-saline water in Bay aggravates coral bleaching etc.
- “In the early '60s, late '50s, I would dive off of Elliott Key and all the way down to Carysfort, and it was just covered with elkhorn and staghorn coral. It was really pristine. I can remember swimming in the salt water pool at Hall's camp and around the rocks there was hundreds of lobsters.”
- Diadema, critically linked to reef health because it forages on algae. Lost member of the chain that keeps things healthy
- Restoration of elkhorn and staghorn corals (Nedimyer)
- Elevation of water temperatures is the major factor causing reef deterioration worldwide, including the Keys
- Some promising signs of good coral cover: Duck Key, Hawk's Channel
- If we can get a status with the population and tourism where we were ten years ago, it could be little less impact on the reef.
- No human waste found on the reef [but University of Georgia research (James Porter) found massive death of elkhorn coral caused by enteric bacteria (*Serratia marcescens*) which live in humans and other animals, and can also survive as a free-living microbe in both water and soil). (<http://www.scienceblog.com/community/older/2002/B/20026007.html>)

### **Fishing**

- Amberjacks disappearing from shallow waters
- Fishing pressure dropping off due to fuel prices and the economy
- But compared with 1950s great increase in fishing pressure
- Fishing regulations, e.g. closures for snapper/grouper, use of circle hooks etc [on hooks, see <http://www.magazine.noaa.gov/stories/mag144.htm> - protection of sea turtles?]
- Number of people coming to the Keys with improved technology from the standpoint of fishing. GPSs that will put you on all of the lobster holes [Global Positioning System]
- No-take preservation areas have helped to increase fish stock in those areas. More should be added, and it is safe to assume that the Sanctuary is always looking for more areas. A lot of people on the Sanctuary Advisory Council feel like that we haven't shut down enough areas for protection areas.
- Has the reef rebounded due the closures in Tortugas where the largest no-take areas are? Tortugas reef in pretty good shape in comparison with other areas. Tortugas was specially protected because it still had a high number of species and the reef in good shape. And they went about it in a very diplomatic way in doing it. A lot of education, a lot of outreach to the general public, both recreational and commercial fishermen.
- Tortugas is a national park, not a sanctuary. The mandate there is to protect the species.

- If you can protect the brood stock, you have done something good to continue to fish those species sustainably.
- In the Great Barrier Reef, the yield in the unprotected zones went up significantly when the no-take area was increased from 6% to 30+%. (However, the GBR is huge and much further from the shore than in the Keys)
- Protection has helped increase fish sizes, e.g. goliath grouper, jewfish. Catch and release also helps to protect the fish
- Fish have learnt to stay in protected areas and not stray into the legal spear-fishing area adjacent to Pennekamp and Key Largo Marine Sanctuary. The fish have virtually disappeared in the spear-fishing areas
- Snapper numbers likely to increase due to circle hooks.
- We had two seasons in a row three years ago of very bad hurricane seasons and a lot of commercial fishermen's traps were washed into Hawk's Channel, trap lines got wrapped around coral. Commercial fishermen are worried that traps may be outlawed to protect the reef. SAC however is sensitive to prohibiting as also demonstrated about spongers on the flats ("they have as many rights as flats fishermen")
- Very grey areas. If lobster trap fishing is seen to negatively affect elkhorn and staghorn habitat, hard to know what would happen, because the Endangered Species Act has tremendous reaching ramifications.

## **LOWER KEYS**

### ***Change in fishing attitudes***

- Less "fill my freezer", much more catch and release.

### ***Prop-dredging and other damage***

- We keep killing the seagrass beds with ever larger propelled boats; the reefs too. A concern both from the sea-level rise standpoint and the standpoint of people abusing the environment, maybe not wanting to, but inadvertently doing it just because we pack too many people in areas that weren't designed for that many people to maintain the health of the ecosystem.
- "Part of the linear thinking that always drove me nuts was when we were deciding where to allow docks to be built, we knew about the phenomena of prop-dredging. So we said that docks had to be in locations that were at least four feet deep. So what we got was a bunch of boats that were four feet draft, that then proceeded to prop-dredge any place that was less than four feet. We probably should have said no docks allowed in any water deeper than three feet and then we would have gotten smaller boats and less prop dredge."
- "The mooring, absolutely, every time I go out there and throw an anchor over I'm tearing up the bottom. It doesn't make me feel good to do that, but I think it really needs to be looked at."

- Fixed gear fishermen leave debris and damage the reef and sensitive ecosystems. We want to support fishing in our community, but the type of fishing does significant damage.
- Mangroves full of neat little balls made of Styrofoam.
- The FKNMS maintains over 480 mooring buoys, most of them focused on coral reef areas, but some in seagrass areas, and over 500 marker buoys that mark the zones and the management areas, sanctuary areas and so on, and that marking costs nearly a half a million dollars a year to maintain.
- “We heard about prop-dredging and anchor damage and destructive fishing, the death by a thousand cuts on the other side, and it's really going to take a million different fixes to fix the thousand different cuts on the other side. We're all going to have to get on the bandwagon. We're on it already. Look at the success of GLEE, Green Living and Energy Education group here in the Keys. ... People are starting to become willing to make those changes and here we are picking up speed.”

### ***Sustainability***

- Keyswide Sustainability Project (under GLEE) specifically pulls together the major policy makers here in the Keys. All six local governments plus our three major utilities have been meeting together about quarterly. Almost all major fleets are in 20% biodiesel now, and that's mostly because people sat in the same room together. Helps tally all your emissions and places where you're wasting the most money or resources so they can step-wise work towards fixing it.

## **KEY WEST**

### ***Fishing generally***

- “If we took away the recreational activities, the commercial fishing, there really wouldn't be the community as we know it today.”

### ***Commercial fishing***

- Tourism is the juggernaut of the economy but commercial fishing is by no means dead.
- 800-900 permitted vessels with 2-3 crew each suggests that 5% of residents are directly involved in commercial fishing, bringing in \$100 million or more a year.
- To reduce human impact on the environment fewer people should be catching the same amount of fish making more money and being more upscale, professional fishermen.
- Without Monroe County, the South Atlantic Fishery Management Council would have very little to manage: County accounts for 40% of all federal snapper/grouper permits from Georgia to Key West, and catch 35% of all snapper/grouper. Similar with other species.

### ***The environment is our livelihood***

- Everything revolves around the environment.

- Sustaining the environment both globally and locally.
- How to adopt policies to establish preservation as a community.
- Lack of control by community, county, over State of Florida capacity to sustain itself.
- The key is sustainability: sustaining our everyday life and the environment.
- Sustainability depends on water and energy.

## **POLLUTION CONTROL**

### **KEY LARGO**

#### ***Pollution***

- We are not recycling any more: we throw it in the landfill
- Getting rid of the septic tanks should help us with the porous limestone
- We are mandated to put in sewers within a certain time
- Thirty years ago, the solution to pollution was dilution. Dump it in the ocean, as still happens off Miami, Fort Lauderdale and West Palm Beach, 300 million gallons a day. Draft legislation to terminate practice by 2025.

### **ISLAMORADA**

#### ***Pollution control***

- Sewage and other pollution. Outfalls mandated to shut off by 2019, but “no money so there are problems.”
- Pollution from external sources – major mainland rivers. Some of the greatest negative impacts that occur not only on our coral reefs, but also throughout the Gulf of Mexico and even the Atlantic coast is the discharges from our rivers, from the Mississippi, for example. The farmer in Indiana is contributing to our problems, but he doesn't realize that. So there has to be a way in which the entire ecosystem is addressed.

#### ***Government management issues***

- Misdirected government spending because of mandates, becoming irrelevant with climate change and sea-level rise.
- The allocation system for new residential developments is determined by 24-hour hurricane evacuation time – cap on total building permits – rather than by environmental issues.
- Apparently inequitable treatment by planners/regulators: mitigation for stormwater runoff to protect seagrass etc appears not to apply to everyone. “We try to mitigate for stormwater runoff. ‘Well, my neighbor doesn't have it.’ Well, maybe your neighbor did it without permits or maybe they ripped their grass out. I think it's a lot about education and making people aware that you moved down here for the character, you moved

down here for the reef, you moved down here for the fishing, but if you don't take a proactive step in addressing what you put out, whether it be the actual pollution or your footprint that you're leaving behind, you don't change that and think about the way that you're living your life, then it's not going to be here, period."

- State influence on local planning; push to have all local governments adopt water-planning and land-management standards by August 2008.
- Controlling development of waterfront areas.
- No grey water program.
- Sewer outfalls and unfunded mandates.
- Lack of federal funding and falling property taxes.
- Lack of public transport (but would the locals use it?).
- Public v private ownership - high government ownership of the Keys (95%?). [Carrying capacity study says 70% of the land area. HHG]
- Sustainable building standards (solar etc). "Solar is huge." "I think we'd be a great user of solar, not necessarily a manufacturer, but you need to use petroleum energy now to build the solar panels while we still have the oil so that eventually we can start using the solar."
- Lack of government incentives to use technologies. "The interesting question is not what technology can do, but whether we can make public policy environment let us make use of that technology. If you look at aviation, there's a lot of great technologies that could potentially solve problems, but unless we get to the point local governments and state governments will allow those things to happen, create great incentives to use those technologies, we're not going to get there."

## **MARATHON**

### ***Wastewater***

- Mandated by State of Florida to invest \$3 billion in infrastructure investment in Miami-Dade alone. That investment has to happen to preserve the environment in the Florida Keys and our economic base. And even here in the Keys we're putting in wastewater systems to the tune of 800 to 900-million dollars. Paramount that it happens.

### ***Pollution***

- Turkey Point nuclear station being expanded. Using bay water for cooling but where does it flow from the cooling canals: into the ponds "right here". [Where? "A separate supply of water that cools the turbine steam supply for reuse comes from a unique system of 36 interconnected canals. The canals act like a giant radiator to cool the water in a two-day, 168-mile journey before it is circulated back to the condenser for reuse." Wikipedia]
- We're mandated by the State of Florida to treat to the strictest standards at least for the moment for the State of Florida, to advance wastewater treatment levels which has to

do with the amount of nutrients within the wastewater. The two main concerns are phosphorus and nitrogen that need to be reduced to as low a level as possible because they may have a degrading effect to the near-shore water quality. And so we're mandated to do it at great expense; deadline 1 July 2010.

- Miami-Dade, Broward and Palm Beach have to end by 2025 for their ocean outfall. So they have between now and then create to replace the aquifer?
- Problems with canals and septic. Observations that fish disappear behind trailer parks with cesspits or septic tanks. Canals were dug too deep and have no tidal flow, causing eutrophication. With oxygen levels far too low, more population and more pollutants contribute to the lack of fish
- Sewerage progress: Key West is fully sewered (problem there is stormwater runoff), Key Colony sewered for 25 years, Layton just got them, North Key Largo is close, problem is unincorporated areas with 70% not done. Mandated to finish by 2010 – running behind.

### ***Stormwater***

- Monroe County is working on right now in conjunction with other agencies, specifically Department of Transportation, to control storm water, and any new development has to address storm water runoff. Many people believe that storm water is just as guilty of polluting and degrading our near shore waters as wastewater is. Will take long and cost hundreds of millions of dollars. With the new 18-mile stretch area with the new bridge up at North Key Largo, D.O.T. addressed a lot of the storm water runoff.
- When Henry Flagler built the corridor viaduct up there, he basically blocked the natural tidal flow that took place from the gulf side -- throughout the whole Keys.
- Examples of creating improved tidal flows through low-throughs and building of culverts: Key Colony Beach, Boot Key Harbor, private projects in Lower Keys.

### **LOWER KEYS**

#### ***Coral bleaching and disease history***

- First big signal in 1980 when we had a six-week period of slick calm weather patterns, we had a massive fish die-off from the reef. 1983: first Keys-wide coral bleaching event, 1987 a Caribbean-wide, and then in the West Pacific it bleached a little. 1990: massive bleaching event. It was the first year we lost a lot of corals, the first year it bleached inshore. In 1997 and 1998 we had back-to-back coral bleaching events here in the Florida Keys at a time the reefs were bleaching on the Great Barrier Reef and at the time there were harmful algae blooms in China, off the Northwest, off Seattle.
- That same year we were having fish diseases all around the wider Caribbean that were affecting reef fish like it did in 1980, and it was the year we had fisteria, an outbreak of a micro-organism as a result of land-based sources of pollution getting into the water, probably coupled with pig farming, essentially their waste got into the rivers, and that accelerated temperature caused this microbe to speed up and so the fisteria developed. It was no accident that all of that was happening around the globe at the same time.

- “We can put our finger on what the stresses are, local stresses I'm doing on my boat or I'm doing when I go around the back country. We need to keep a lid on those things to the extent that we can so if there's any hope at all for these systems to adapt and get tougher and get more able to deal with climate change, they'll have that chance.”

### ***Waste management***

- Is there some way to encourage waste management -- you have to actually pay more than your dump fee to have recycling happen on your property. This discourages recycling which needs to be supported by the county or state to cut down on landfill.

### ***Wastewater management***

- One thing that would really help for the Feds to finally stand up and contribute their part to the wastewater mandates that we have in the Florida Keys. However, while Congress may have \$100 million authorized, it is not appropriated. 20 percent of our nutrients are coming from wastewater, about 20 percent are coming from stormwater runoff. So these are things that we still have to deal with.
- Same thing, if you look at the South Florida Ecosystem Restoration, that's a \$12 billion project, yet the state has funded the majority of the progress that's been made on that to date and the Federal Government has not stepped up.
- The Florida Keys Sanctuary budget is operating on a 2001 level and has since 2001.

## **KEY WEST**

### ***Water***

- No regulation on the community who should know their capacity for water in a worst-case scenario. Where is the water coming from?
- Next limiting factor to growth and development in Florida, including Monroe County, is water (South Florida Regional Planning Council).
- Source of water for new hotel (say) – limited by amount of water that South Florida Water Management District determines.
- Advanced wastewater treatment needed in Miami-Dade by 2025; they will have to start processing sewer effluent to potable water, or at least water reuse levels to take the pressure off the Biscayne aquifer.
- We don't have water in the Keys, it's piped through the Biscayne aquifer. Water is a serious issue that will affect our economy and we must pay attention.
- Composting toilets – don't require water, provide compost. (GLEE).
- The Keys not as bad as some other places. In mainland Florida, potable water is used for irrigation for landscaping as well as agriculture.
- If you don't want a cistern, at least use the grey water for irrigation.

## **ECONOMY, TOURISM, AND DIVERSIFICATION POTENTIAL**

### **KEY LARGO**

#### ***Economy***

- Affordability of living in the Keys (with rising property prices etc)
- Currently people can't sell their properties .. opportunity for professionals move back into the community, to buy back into the area at more affordable prices.
- Taxation levels low in Florida compared to other states.
- Lack of professional positions for people. BPW active here because there are not that many jobs available for women in the community. "So they create their own jobs, they begin their own businesses, and they get active businesses going and successful businesses."
- There was huge turnover in the 1980s when large numbers of businesses regularly went broke. More stability in the nineties but now we are losing that stability again. Monroe County has always been boom and bust.
- Need to import people by bus from the mainland to do the sort of mundane jobs people down here aren't taking.
- Fuel and transportation costs. America has planned its whole society on cheap gas and commuting and in the Keys there is no public transport to speak of.

#### ***Tourism***

- Hotels out-pricing market for tourism.
- Shallow-water sports fishing (tarpon, bonefish) preceded diving.
- "We're so focused on tourism and getting people down here, but once those people are down here, they go and they dive and they don't necessarily take the necessary precautions"
- Bucket fishermen go out on boats or fish from bridges; may sell their catch unless caught.
- Charter boats may tell tourists that they are only entitled to a catch of 'x' – then they sell the surplus at back door of restaurants
- Tourists want first-class restaurants. Middle class disappearing from Keys – so we don't have the resources to supply these services.
- We need a monorail right down the Keys, elevated with lots of stops.

#### ***Cultural change***

- Rising property values causing many locals to sell out at high prices, especially for waterfront property.



- People moving in either buying for investment to resell, or very wealthy people buying third or fourth homes, and Europeans buying.
- Swelling out is affecting school and other infrastructure systems in the Keys.
- Loss of people who don't just work here but work in the community to improve the community.
- New people just don't care but just come when the weather is nicest. No connection, no emotional investment. "I'm not sure if the people who are coming down and buying these \$5 million homes on the water really give a rat's behind about the coral reef at all." No respect for the area.
- Respite now due to collapse of house prices (but this is causing other societal changes).
- Immigrant population and newcomers, even newcomers to Florida from the rest of the states don't take the time to learn the local rules or regulations and just come down and do their thing with total disregard for any kind of norm or manners or respect. The taking attitude.

***New business opportunities***

- Tourism is our one-legged stool
- Keys started with pineapple plantations, killed by Flagler who started importing from Cuba
- Medicine – University of Miami special cancer unit
- Marriage between marine environment and marine science programs
- We are a living laboratory for climate change.
- Boat building and school to teach boat building
- The arts and exploiting the Internet to develop new businesses (“doing playbooks for Broadway plays”)
- Artists’ market
- Using affordable housing and existing infrastructure to attract people coming here to study
- Hands-on learning for people who learned from books.
- Important to attract those who are concerned about our community and environment rather than Costa del Sol and the Azores.
- Need to do scenario planning in a structured environment: Where do we want our community to be? What do we want our economy to look like? Something that's stable year-round. We want people to be able to live and work here and prosper here 12 months.

### ***The Keys as leading indicator for the State of Florida***

- Affordable housing was first a problem in the Florida Keys and then moved up through Florida. Wind insurance was first a problem in the Florida Keys and then moved up the coast and then throughout Florida. Global warming is going to affect us and move right up the State of Florida. We're a very important benchmark to the whole state. It normally happens here before it happens to the state. There are likely to be other examples.

### **ISLAMORADA**

#### ***Threats to lifestyle***

- Compatibility of environmental change and need for economic diversification.
- Preservation of lifestyle associated ultimately with reef.

#### ***Scenic highway***

- Developing US 1 as a scenic highway.

#### ***Economic diversification***

- Diversification is not incompatible with addressing climate change. Primary concerns are economic diversity, infrastructure, and lifestyle (which is closely related to the reef). It is important that the character of the community is retained.
- Biodiesel from algae. "Of all the different terrestrial sources of good oil-producing plants that can produce oil for biodiesel, algae trumps them by a thousand percent."

### **MARATHON**

#### ***The economy***

- Tourism is the economic engine – without it, no economic base.
- Other attractions apart from the reef: great white heron refuge, Everglades, Key West (arts, Hemingway get-together).
- Keys are getaway for millions of people living nearby (Miami etc)
- Rising fuel prices is a long-term issue – likely to stay up (US economy has been conditioned to live off cheap fuel)
- Most impact on long-distance travelers, both by road and air
- As well as tourism, real estate is a huge element – State of Florida has lived off real estate transfers, but reduced over past 3-4 years having an impact
- Healthy robust economy statewide equates to a healthy robust economy in the Keys. Increasing number of storefronts closing

- 25 years ago we had a part-time economy (“from Labor Day until almost Christmas you could just about sleep on U.S. 1 without fear of getting run over”). We now have a full-time economy (geometric rise in bed taxes)

### ***Quality of life***

- One of the largest flyways for migratory birds stopping over – threatened by development. Huge role in the quality of life in the Keys.

## **LOWER KEYS**

### ***Florida Keys advantages and limitations***

- The real estate market is not forever dead, because we still have probably 50 years ahead of us as the only American dollar-spending English-speaking primarily tropical Caribbean island, and that will always be desirable to many people who don't feel comfortable investing in a vacation home elsewhere. As long as we are proactive in maintaining the qualities that make us unique, make our scale livable to give us access to the water, that will continue to make us attractive.
- We are a small market and there is a big world out there. We just have to be attractive to a tiny fraction of that market to generate phenomenal values. Several things are important to bring this along: “having a very secure place to live, secure from crime, particularly with elderly in second homes, secure medical and secure property values, and the property values, that comes with maintaining the unique growth control type place.” If we lose those three fundamentals, we would lose the transfer payments from the retirees in second homes.
- But we don't have affordability, cost of living, and another threat is growing economic disparity –big threat in polarized wealth distribution. And that's playing out locally. It's very difficult for local people to be able to afford to live in the Keys.
- Waterfront homes in the Keys remain relatively cheap.
- Growth control through the tier system.
- Talking about the economic benefits, retirees come down and work out of their homes, and this has always been an undervalued market. “I'm not trying to stop growth, but there has to be a new way of looking at it .. between the hurricanes, between the economic fallout, lower house prices, rising sea level.” Other people in business need to look for opportunities that still exist for them if they're willing to stick it out. They have to look more in the future and not a static, but we can't just keep going the way we're going now. We can't keep growing the economy with businesses and people.
- “The carrying capacity study determined the capacity for the marine and the land base of the Florida Keys to sustain further development, concluding that we had reached build-out in the Keys and that the marine module was difficult to assess because several of the studies actually showed that we had exceeded it, and we did have some decline on our reefs. So the question becomes: does the growth occur in a sustainable manner that focuses on redevelopment of what we have while protecting the natural areas and

improving our use of energy and conserving water and doing things smarter and better so that we can all maintain our quality of life. We need a political mind-set that everybody is part of this. It's doable within the reality of the technology that exists today. It's simply not politically achievable now because not enough people are willing to stand up and support it.”

- This will need leadership by key people in Monroe County and in the State of Florida, as well as bottom-up pressure.
- FIU study (2008) centered primarily around housing, but one of the things coming out of that is we have a very large piece of our economy that's strictly service sector to serve this tourism resort economy that really drives things here, in addition to the military. Over the last eight years there's been a steady decline, in particular the work force, that's been matched by a steady increase of second home market kind of filling in that space. So at what point do you lose the stability of supporting this tourism resort economy that's very high class when you don't have any workforce?
- The Florida Keys has a rate of growth ordinance and land use plan that is one of the most progressive in the country. And that's the reason why that the Keys have kept their character and their rural character.

#### ***Importance of military economy***

- Especially in the Lower Keys, the other linchpin apart from tourism is the military economy. “Something that would really rock the foundation of this community would be a pullout of the military. It would create opportunities. But it would be a significant challenge for this economy and for the culture of this place.”
- Military is big polluter (F-18). The navy, not the army!

#### ***Cruiser destinations***

- The Keys are a destination for cruisers. People actually live on their boats or in the wintertime come down from the north, through the intra-coastal waterways down and spend the winter down here in the Keys, but mostly they go through the Bahamas. So it's much more of a destination for cruisers and a lot of money goes that way, too. The Keys should look at making a cruiser destination here. It would bring a lot of money to the industry -- to the economy down here if it's done properly. With controlled pump-outs, but nobody listens.

#### ***Dredging to allow larger cruise ships***

- So as to go from 3,000 to 5,000 persons per ship.

#### ***Public transportation***

- Keys have very little compared with other major tourist destinations.

### ***Energy crisis and alternative energy***

- In the 1974 oil crisis, you could have taken a nap at noontime on U.S. 1. And could that again happen if gasoline prices keep going up? Could be a major hit for tourism, and also for the construction industry. And it's important to keep a construction industry going in the community, not least to cope with hurricane damage. There were big shortages of contractors after Hurricanes Wilma and George.
- “Unless we adopt a renewable energy policy the Keys' economic engine is going to drive to a screeching halt because we depend on drive-down traffic, cruise ships, resorts and vacations with people that have disposable income, and as the economy grinds slower and slower, we're already feeling the effects of that.”
- “This is the biggest dive destination in the world. We have the most charter boats, the largest commercial fishing industry, the leading tourism economy, and none of these things are possible when you have an energy crisis and when you have more and more devastating hurricanes and storms, which also have severe consequences on the coral reef as well, but I think the energy crisis is going to have a stronger impact on our economy than anything else at this point.”
- Solar energy has huge potential, and some people here are investing in a revolutionary approach to harness the power of the ocean. But we need a political mind-set and an agenda that is driven by looking at those alternatives as opposed to the current oil regime.
- The compressed air car (New Zealand, Spain, France).
- New Honda hydrogen car.
- California is more innovative in adopting alternative fuels than other states.
- The utility companies had a suggestion for No Name Key to sell their excess power to the utility companies. However, it appears to have been politically motivated. Meanwhile, the example of people choosing to live with renewable energy on No Name Key will be increasingly important.
- “Conflict of alliances or development of the no carbon dioxide emissions, so let's use that to have nuclear energy coming along. And that scares me tremendously. I can see this alliance of interests taking us to that solution.”
- Florida Power & Light is the largest producer of wind power and it's in Arizona. The Keys don't have the constant wind required.
- What we do have here is constant tides and waves, and that's what we're trying.
- “Nuclear energy has been brought up here. I just hope that that is not part of the future. It really, really scares me.”

### **KEY WEST**

#### ***The economy***

- Popular perception is that fishing, not tourism, is our economy.

- We are a tourism economy, everything else is somehow tied to that.
- Part of the problem is that we are a transient community. High turnover of inhabitants.
- Tourism is a big component of our overall economy, but real estate is the catalyst that makes it work.
- Real estate bubble has now burst, with a lot of people caught up.
- We have gone from a part-time to a full-time economy in 25 years, and now we are probably readjusting again.
- Real estate will always be expensive in the Keys. Always was.
- US economy has always been based on cheap fuel prices. Higher fuel prices inflationary because everything is tied to fuel.
- What drives conservation is the high cost of something. And the spillover effect is loss of revenues that circulate within the community.
- We conserve in the Keys because everything is so dear. We learned to live with smaller housing, etc.

#### ***Key West differences***

- Added attractions: historical buildings and culture
- Cruise ships: businesses downtown want them but is the short-term gain for those businesses worth the long-term effect on the environment?
- We're 120 miles long and we're made up with individual communities who don't think beyond the boundaries of their individual community. One thing everyone else out of Key West has in common is they tend to dislike Key West.
- More people come here once and then stay in the Upper Keys and come down and visit than the other way around. There are more divers that dive throughout the Keys and on their last day they'll come down here to play and party.

#### ***Tourism***

- Drives the economy.
- Tourism needs to be reduced to get higher scale people.
- Alternative of putting boat in water in Miami-Dade County taking an hour and a half, and driving to the Keys in three hours and have plenty of space.
- We need to protect all those things that produce money, and we need a better grade of tourist, but we also need all those folks in the middle.
- As we make the transition to this so-called upscale economy, we haven't upscaled our service and facilities.

#### ***Better energy use, alternative energy sources***

- Is clean coal among them (proposal to SAC for a clean coal burning furnace)?

- Need for big push to build cisterns for houses, and solar energy to run everything except the central AC. Would make us more stable from an energy standpoint.
- Peak oil – if here, prices will stay high and rise. Most dramatic short-term impact on Keys economy.
- Save fuel with more energy-efficient cars that can only do 80 miles an hour.
- Biodiesel from corn. Allegedly not a cause of increase in food prices, which are going up because of India and China. The new ethanol plants are more efficient.
- Windmills. North Dakota could generate enough electricity for the entire country. But there is the transit issue.
- Windmills not suitable for Keys.
- New solar technologies, plus longer-lived units being developed.
- Tidal power.
- Very little solar power installed in Keys: five houses tied to the grid, and some communities have no electricity except solar panel.

## **EDUCATION AND OUTREACH**

### **KEY LARGO**

#### ***Education, communication and enforcement***

- It comes down to these three things.
- Lack of law enforcement and education: Boats can be rented showing a credit card and driver's license. Some hoteliers try to educate people by suggesting alternatives and informing about the seagrass and the reef. Law enforcement allegedly in decline and people blatantly break laws, e.g. fishing in no-catch zones.

### **ISLAMORADA**

#### ***Central role of education***

- Central to everything
- Need to educate locals – especially those who have lived here a long time – on sustainable behavior, e.g., mitigation for stormwater runoff in the interest of community character.
- Need to educate visiting as well as local boaters to limit damage to reef.
- Encourage environmentally aware major tourist attractions (like Walt Disney World), and also chambers of commerce etc, to educate visitors. They can act as a stimulus for other proactive companies on both small and larger scale. “Not only is it the right thing to do, but it also makes business sense.”

- Using climate change will overwhelm people, be more subtle. For example, people may ask if operators are doing something in the Green Lodging Program (which makes each guest feel part of the solution). Basically, give people an idea of how they can help. Green Lodging Program
- Problems educating diverse ethnic populations with different cultures, especially older generations. Since some of them are poor, this represents an important part of their food sources. You can iron-fist it, or you can through education, which is going to be a long, tough, hard row to hoe. Often you're not going to be able to touch the parents and the grandparents, but you can break the chain through the children and the schools.
- “Kids have an actual physical relationship to a lot of these things, they've seen the manatees, hang out on coral reefs, I think it's easy for education here.” One response to this was: “I don't know. I have to teach them what happens when you flush a toilet when they came in and helped develop our web site. It's amazing when they understood what happens when you flush a toilet around here.”
- Overcoming individual rights v collective good
- Role of education in changing ingrained habits (such as littering)

## **MARATHON**

### ***Tourism and education***

- Key to future is switching gears to education-based tourism: ecotourism
- Having educational institutions invest in ecotourism education center; ecotourists would be much better stewards of the environment
- The opportunities in regards to bolstering our education, a college presence in the Keys and focusing on that and ecotourism could not completely replace recreational fishermen and recreational scuba diving, but it could be something that the community seriously needs to look at.
- People in the dive industry, in various NOAA facilities, a lot of people down here with Ph.D.s with time on their hands. If we create a community environment that welcomes that, we could change the dynamics of the community.
- Selling the idea of more no-take areas through education and outreach to the general public, both commercial and recreational fishermen. But difficult to understand why clear data showing over-fishing (especially targeting some specific fish) doesn't make people want to protect those resources as best they can.

## **LOWER KEYS**

### ***Education and outreach***

- Referring to the point about getting on the bandwagon (GLEE etc), it's education, it's outreach, it's keeping the course, working with people and getting them to understand. We got through getting them to understand about damaging coral when first they didn't



get it. Now we're doing that with seagrass and they're starting to get it with seagrass. It may take a while but we are getting there.

- Concentrating on the young while it is hard to change the attitudes of adults. Getting the students to teach their parents.
- “Our high school in Key West is very proactive in reference to looking for alternatives. They're light years ahead of us.”
- “We have so many in the Keys that's already leading by example, whether it's the homes out on No Name Key that, when GLEE does tours out there, people line up to see the fact that they don't live much differently than anybody else. That's what I love about it.”
- Spending a little bit more and then seeing real savings: “The ultimate grass roots level is that by upping their recycling from 6 percent to 7.6 percent the residents of Key West saved the city \$8,000 in three months.

### ***Sanctuary management***

- We are not managing the resources, we are managing people's activity and how they affect those resources. But GBRMPA [Australia] developed a reef managers' guide which is a response to coral bleaching. It points out that awareness and communication is the first step, and as a result we can now talk openly about “climate change” and “sequences”.
- The first thing to start getting people to recognize it is to know the reefs are going to change – we don't know how but we know they will. Sea levels will also change, but we don't know how much or how fast, but just knowing that we can start preparing ourselves economically and socially and environmentally for those changes as they take place and start thinking in terms of building resilient coastal communities, as well as having resilient marine and coastal resources.

## **KEY WEST**

### ***Education***

- Educate individual people on the environment.
- Green lodging: Everybody involved in the program is happy with the Keys because the educational thing is huge. And it puts a focus on the environment.
- “Most of us tend toward environmentalism, yet our economy is almost completely dependent on the excess or the extravagant use of energy to bring tourists to us. We don't want to stop the tourism, because that's the life blood of the economy, but if 3 to 4 million people come down here, that's a great opportunity to educate a large number of people that reduces our so-called footprint.”
- 20% biodiesel in boats, solar panels on your building, tie it in with the global change and the impact it could have on the reef.
- Hotels have an opportunity to educate lots of people, and not just green lodge.
- Two key issues: education and regulations.

- We need to educate people on the success of things.
- “Unless it moves up to Miami-Dade County or it moves to another state, we're still going to be impacted, and, how do we tie that political will in that needs to happen?” That’s why GLEE was started, which should become part of a larger organization.

***Past mistakes***

- Weren’t even monitoring carbon dioxide 50 years ago.
- Corps of Engineers wanting to reroute the Everglades.
- Insufficient zoning requirements.
- Some business decisions which became political decisions have problems now from the standpoint of the real estate market collapsing. But Keys will recover because we have only a limited amount of real estate.
- “We're going through a natural expansion/contraction of our economy. I think the unfortunate part is we've never learned past history lessons as to what's going on.”
- “We look at everything in the short-term year-to-year budget, administration to administration, without a long-term planning sequence that private enterprise can go into.”

***Marketing the change***

- Conservation and the green movement have gotten some traction over the last few years.
- Green lodging: If we can get half the people to support it, they find that actual savings are realized and conclude that it’s good for business.
- Teaching people to use energy sensibly, including transportation (limit car use to go shopping from frequent small to major planned trips).
- Billboards on the Keys: “You are now entering a national marine sanctuary, tread softly”, and “observe, preserve, conserve” which is the message we need to give out.
- “We need to take a portion of those funds that we collect to protect or control and put it into marketing. I know that sounds a little bit like Big Brother, but we have to say it and make it cool. And when you have people like Crist or Obama or Tiger Woods stand up and say, you know, "The coral reefs are the greatest things and we have to protect it," that's marketing. That's just getting that icon out there that's telling the message.”
- We have to take the scientific information (which can bore people) and put it into precise promotional concepts for people.
- “Shifting baselines: We all realize the changes, but everyday people come in and they go, "My God, it was so beautiful out there," and we're thinking you should have seen it years ago. In future, is it going to be more degraded? Are the people seeing it for the first time still going to be enthused about it? You know, it's a scary thought. We're never going to get our fisheries back to what they were in the past, but how do we make them sustainable and get that message out to the people?”

- “It's mandatory that we put some planning into sustaining what makes us us. You come down the Keys and you're driving and you hated Miami, then all of the sudden something happens, your whole feeling changes.”
- A strong majority of the people don't want to see a whole lot more development in the Keys. They want to protect the community character that they see here and they think it's the tipping point to where if some of the things that continue to go on, and the only thing that saved us to a great degree gives us another bite at the apple is the economy, because a lot of these projects would be going on still today if the housing market hadn't declined.