

FLORIDA KEYS NATIONAL MARINE SANCTUARY

WATER QUALITY PROTECTION PROGRAM

STEERING COMMITTEE MEETING

January 25, 2012

MARATHON GOVERNMENT CENTER,  
2798 Overseas Highway, Marathon, FL 33050

MINUTES

Members Present:

Tracy Ziegler, Everglades and Dry Tortugas National Parks  
Charles Brooks, Key Largo Wastewater Treatment District  
Armando Rilaboy, South Florida Water Management District  
Susan Hammaker, Key Largo Wastewater Treatment District, Sanctuary Advisory Council  
Ron Sutton, Key Colony Beach  
Pete Worthington, City of Marathon  
Charles Briggs, Department of Health, Bureau of Onsite Sewage Treatment Systems  
George Neugent, Monroe County Commissioner  
Charlie Causey Florida Keys Environmental Fund  
Sandy Walters, SWC, Inc., representing maritime interests of the Florida Keys  
Judy Cheon, Florida Keys Aqueduct Authority  
Gil McRae, Florida Fish and Wildlife Commission, Fish and Wildlife Research Institute  
Chris Bergh, The Nature Conservancy  
Bruce Popham, Sanctuary Advisory Council and a member of the business community  
Billy Causey, Southeast Region of National Marine Sanctuaries  
Anne Morkill, Fish and Wildlife Service, Florida Keys National Wildlife Refuges

**I. Call Meeting to Order  
Welcoming George Garrett**

George Garrett addressed the committee and welcomed everyone, including the EPA regional administrator region IV, Ms. Gwedolyn Keyes Fleming. She is always welcome to attend the meetings. Richard Harvey thanked George and introduced Ms. Gwen Keyes Fleming and the other guests, Mr. Jim Giattina, Water Protection Division Director, and Brandi Jenkins, Special Assistant to the regional administrator and Javoyne Hicks White, Chief of Staff for the regional administrator. He explained that the regional director will be making a few remarks. She has participated in a few meetings since she has been here. Jon Iglehart will make a statement on behalf of Secretary Vinyard, who could not be here today. Then, the agenda will be reviewed.

**Opening Remarks**

**Gwen Keyes Fleming, Regional Administrator, EPA Region 4**

Ms. Fleming thanked Richard Harvey, Bill Kruczynski and everyone else who put the field trip together. It was very informative and she learned a great deal from the quality of the projects. She apologized that her schedule has been such that she was not able to attend before now and hopes to make it an annual thing from here on out. She knows that the committee has been in good hands with Richard and she is asking him to still wear his co-chair hat. She is still getting caught up on everything that is being done in the region. The southeast region is fantastic and has incredible water resources: 2,000 miles of coastline, 5 million acres of lakes, and 460,000 miles of rivers. Everyone must continue to protect these valuable resources, but not just for environmental reasons, even though is where many people's hearts lie. These resources are important from an economic perspective. Water is the foundation and a strong part of the economy here in Florida and throughout the region. It is important to continue to protect water resources. Yesterday, she saw first-hand the passion and excitement around some of the things that have already been done to protect this great resource.

Over the last 16 years through the research and monitoring, everyone has developed a better understanding of the local, regional and global influences that affect the health in the Keys. She also learned about the world class monitoring going on with respect to water quality and the corals. Even though she did not snorkel, she did learn about the coral reefs through the Eco-Discovery Center. She also learned how seagrass can be negatively impacted by some of the booms in the economy and what can be done through partnerships to be able to protect the seagrass.

With all of the great work done, there is still opportunity for going forward. She was very interested in the canal issue and the successes around some of the canal improvements and some of the work that still needs to be done. She has never wanted to be isolated in Atlanta and this has helped put things in perspective. Florida has begun the process of looking at this new class 3 limited classification system and canals were one reason why they are doing so. She now knows what that will impact and it will help her going forward and continue to have success and improvement the lives of citizens on the ground and feed the economic base. She asks who will be involved in doing this work as the committee moves forward. She noted that both Bill Kruczynski and Richard Harvey have announced their intentions to retire. She asked everyone to give them a round of applause.

With the budget requirements, EPA will have to rethink how to use the resources and who should be involved. While EPA will not be immediately filling those two positions. Ms. Fleming noted that she now has the on the ground experience to help her make the decisions needed. She has created a "to-do" list for her team to explore when they return. But, regardless how everyone moves forward, this is a three-legged stool with the Southeast Florida Coral Reef Initiative, the Everglades and this program. As they move forward and determine the next steps, she will rely heavily on Jim Giattina's leadership. She will also rely on Bill Cox, who will be taking an increased roll as they determine who best to put on the ground here. Steve Blackburn is also another person who has spent time here. This is great opportunity and the key is how everything will fit together. She thanked everyone. She noted that thanks to Jim Giattina's advocacy and others, they didn't have to zero out some programs and were able to get a bump up from some of the money coming down. It is on headquarters radar screen how important these programs are.

She added that everyone should continue to look for support from EPA and she is glad again to have seen things first hand. She concluded by thanking everyone.

Richard explained that Jon Iglehart will read his statement from Secretary Vinyard and then everyone will introduce themselves.

### **Herschel Vinyard Jr., Secretary, FDEP**

Jon shared the remarks prepared by Secretary Vinyard. He welcomed and thanked everyone for coming. The secretary appreciates the work of the committee and demonstrating the achievements that can be made while working with federal partners and local and environmental communities. One of the top priorities of this agency is getting Florida's water right. The secretary and Governor Scott both realize that the future of the environment and economy depend upon health of water bodies. Getting the water right means improving the water quality and assuring that there is an adequate supply and balancing the needs so that Floridians can still live, work and play in Florida.

The work of this committee is playing a vital role in helping getting Florida's water right. As the state partner in this initiative, DEP is honored to here to help set the direction for the future. The purpose of the enabling legislation is quite clear—to identify water quality concerns in the Florida Keys and to implement actions to improve them. This committee has been directing actions to achieve these mandates for nearly two decades. The significant results of this work are three-fold. One, we have a community that now understands the symbiotic relationship between a healthy environment and a healthy economy. Two, we have a world-class environmental monitoring program. Three, we have implementation of central sewer programs throughout the Keys. Our communities have learned to embrace the Florida Keys National Marine Sanctuary. We recognize the sanctuary's important role in protecting this national treasure we know as the Florida Keys and the nationally known Keys way of life.

The monitoring program has been consistently funded and directed for more than fifteen years, creating a vast baseline of databases that will provide information and opportunities for generations to come and Florida has implemented a wastewater program, which has established timelines, funding mechanisms and rewards based within Florida law. Times are changing. We all know that at all levels, our resources are tighter and we owe it to the citizens we serve to make sure that we are responsible stewards of the taxpayer dollars. As members of the committee, it is our responsibility to make sure our resources are focused on achieving our mission—improving water quality. As we like to say at DEP, we want to make sure our environment is getting the most bang for the buck. We have been at a crossroads now for some time and we all recognize that we can no longer in good conscience sustain programs solely for the programs' sake. The lion's share of the budget has historically been and continues up until now to be directed toward the monitoring programs. The results of this significant and successful monitoring effort indicate the nearshore and offshore waters are essentially in compliance with all applicable water quality criteria and are stable. Seagrasses are in overall good shape and relatively stable. Our coral reefs are primarily impacted by outside forces. We have learned that the greatest water quality issues in the Keys come from the 110 plus miles of class 3 canals, both by what flows through them and by their very design. The monitoring work has provided us with

a very good understanding on how the water works in the Keys and as a result we have achieved a milestone of consensus on a reasonable assurance approach instead of TMDLs.

Now that we have sound science and a clear understanding of the source of water quality problems that can be readily improved, it is time for this committee to shift resources from the information gathering phase to the implementation phase. The department has pressed for several meetings to direct a portion of the funds to infrastructure projects that will have a direct benefit to water quality. Jon commented that he understands many people were able to see this yesterday on the field trip. We could and may continue to discuss the future direction for the next several meetings, but the DEP has determined that the need is now in terms of water quality, in terms of economic stimulation, jobs, and in terms of quality of life. Therefore, I have directed that this year that any accepted state funding for special projects be directed toward infrastructure projects that will have a direct improvement in canal water quality. I hope the committee will join us in this approach. Again, I congratulate the committee and its membership for the work that has been accomplished and implore you to use these accomplishments to set a course that includes funded projects that include tangible water quality, economic and quality of life benefits.

### **SC Member Introductions**

Richard Harvey thanked Jon for his comments. Participants introduced themselves.

Richard stated that there will be minor modifications to the agenda today because the regional administrator and staff have to leave about 11 am. Bill Kruczynski will start out with an overview of the program and an update on the book. Then, Charlie Causey will discuss project partnerships. Susie Thomas and Liz Wood will give updates on the wastewater projects. Margaret Blank, Key Largo, will also be giving an update.

## **II. Overview of Program, Bill Kruczynski Monitoring and Outreach endeavors, Book status**

Bill Kruczynski acknowledged EPA for giving him the time and support for this book, *Tropical Connections*. The book format and information level are designed to reach a general audience with what has been learned during the past 15 years related to marine ecology. It is also meant to help better inform people as to why sewer upgrades were needed and why they have to spend money making these improvements. As people learned about the book, its scope expanded to south Florida as well as the Keys. This is a joint EPA, Sea Grant project. Pamela Fletcher has been his partner and co-editor in this endeavor. There are 8 chapters with 163 authors and about 500 pages. Each chapter is accompanied by recommendations on management priorities, research gaps and monitoring needs in that topic area. Each chapter ends with annotated further reading for educators and students to learn more. The book has been peer reviewed by outside reviewers, WQSC Technical Advisory Committee and members, Florida Bay and Adjacent Marine Systems Program Management Committee, Florida Bay Oversight panel. He submitted the manuscript with the changes by September and was told it would be ready for this meeting. Unfortunately, publication was delayed, but it will be available soon.

The cost is very reasonable--\$30 for the book. It is available for purchase by chapter online ([ian.umces.edu/press](http://ian.umces.edu/press)) and thanks to Charlie Causey's organization; it will be available on a DVD. Bill Kruczynski thanked all of the agencies/organizations contributing to the book's publication and pointed out that their logos appear on the back cover. They are: Florida Sea Grant, NOAA, EPA, Sanctuary Friends Foundation, Friends and Volunteers of National Wildlife Refuges, National Wildlife Refuges, National Park Service, Department of Interior, Florida Fish and Wildlife Conservation Commission, Florida Department of Health, Florida Keys National Marine Sanctuary, Florida Keys Environmental Fund, FIU, Wildlife Foundation of Florida, University of Florida and Mote Marine Lab's Protect Our Reefs License plates. Production of Tropical Connections was paid for by EPA (\$100K) and the Protect Our Reefs (\$80K) grant. Reviews of the publication were paid for by Sanctuary Friends (\$3K) and National Park Service (\$5K). Printing costs came to about \$59.6, with contributions to reach that total from EPA (\$25K), FIU Foundation (\$5K), Sanctuary Friends (\$15,661), FAVOR (\$3K), Florida Department of Health (\$1K), Wildlife Foundation of Florida (\$5K) and Florida Keys Environmental Fund \$5K for the DVD. A round of applause was given to recognize the contributors.

Gil McRae recognized what a challenge it is to communicate scientific information and commended Bill Kruczynski for the fact that the document is so accessible to people and is a model for communicating science to general audiences. (see presentation in PDF format attached to notes).

### **Monitoring Program**

Bill Kruczynski provided an overview of the monitoring program using a handout (attached at end of notes). He will give a brief overview of what is known and has been learned through this program as well as explain what is not known and give some recommendations for the future. There are three reasons for giving this talk—to bring people up to date on what is known about the area, to give the mayors and other public officials some assurance that what has been done to upgrade sewage treatment was based on sound science and to give his vision for the future direction of the program. He began with a map of the Florida Keys showing that the Keys are a chain of islands sticking out in the middle of the ocean and are primarily subject to oceanic processes. Southwest Florida shelf waters travel to the Keys and are a source of pollution to the clear oceanic water. There are also some external sources through Everglades/Taylor Slough. Although this input is small, it may be increased when Everglades restoration is complete. For these reasons, the monitoring program should be designed to identify and tract far field sources of water (and the pollutants) entering the Sanctuary.

Remote sensing is not being used very much today, but this option should be considered because it gives the big picture. On occasion, when the Caloosahatchee or Peace Rivers release a slug of nutrients into the Gulf, the result is an algal bloom, some of which are toxic like Red Tide. Currents can carry the blooms down and around the Keys or through the Keys islands themselves where they can impact people and organisms. The monitoring program has to be in place to alert people about these events. The water coming out of Florida Bay is bad for coral reef growth (and has been for the last 6,000 years). In the Keys, oceanic waters, which are extremely low in nutrients and chlorophyll, extend to the shoreline except for "unusual" events. To say that the Keys waters meets all applicable water quality standards is a specious argument. These waters

from the deep blue sea have always met the standards and are as clean and free of nutrients as possible. This program can't take any credit for low nutrients; it was oceanic when the program started. On occasion, nutrients come from periodic upwelling and this has been happening for the last 125,000 years. Most nutrient-rich water originates where there are rivers along the coast and enters from the SW Florida Shelf and Florida Bay (areas with river inputs). He stressed that there is a research need to quantify mass-balance loading of nutrients from different sources.

The bank reefs are in poor shape today because there is poor recruitment and corals undergo boom and bust cycles. It is well known that the reefs are over fished. There are few large predators, turtles, manatees, seals (extinct). Corals are susceptible to the many diseases out there and it is important to know more about the causes, transmission, recovery, role of microbes. Microbes can provide some protection to corals and immunity to disease. There is a lack of sea urchins, crinoids, other important grazers. These are all topics that could be species studies. If biological integrity is taken as a metric of water quality, then offshore waters fail because of the condition of the reefs. The reef today is not the same reef as it was in the 1950s or 60s. Richard Harvey added that the factors that have affected reef decline were more global or regional in nature and did not originate on the Keys islands. Bill Kruczynski stated that we can't quite say that for certain and he will explain why at a later point in this talk.

One might ask the question, how can seagrass and coral reef communities flourish in nutrient poor waters like oceanic waters? The answer is that they out-compete everything else in nutrient poor waters, but once nutrients are available, other organisms out-compete the corals.

Jon Iglehart added that while reef systems in the Caribbean and other areas flourish in nutrient poor waters, they depend upon flowing waters to thrive and there are nutrients flowing across them in the great volumes of water that pass over them. Bill agreed that it is loading that is important and the loading of nutrient is low where reefs thrive. Nutrients are "limiting" in these waters and as soon as they enter the oceanic water, they are taken up and utilized. In Key West at the ocean outfall, the benthic community is at background levels within only a few hundred meters of end of pipe. Water quality should be monitored to: establish a baseline- detect change, determine correlative data for biological studies, document improvements in canals, and provide early warnings regarding south Florida restoration, algal blooms from the SW Florida Shelf, Gulf oil and Mississippi River inputs.

The world's corals and coral reef ecosystems are in crisis. In just a few decades, scientists warn, these "rainforests of the sea" and all their rich biodiversity could disappear completely. The following quote was shared, "While corals face numerous dangers, the overarching threats of climate change and ocean acidification are the greatest, and they're accelerating the decline of corals around the world. The year of 2009 marked the warmest ocean temperatures ever recorded, putting corals at risk and foreshadowing what we can expect as climate change continues. Urgent action is needed to save the world's coral reefs from extinction." (Center for Biological Diversity)

Climate change is a global problem that must be recognized and addressed by all levels of government. It is the elephant in the room. But, if other causes of decline are not addressed in addition to climate change, then not enough is being done. Actions must be taken locally to

relieve stresses to biological communities due to land-based sources of pollution, habitat loss, and over-fishing. Corals bleach with high temperatures and doldrum conditions and bleached corals may die and are more susceptible to disease. The Nature Conservancy is taking the lead in studying and identifying corals that are resistant to bleaching/disease and maybe resilient colonies should be grown and out-planted to help save the reef (another research topic).

The question about whether nutrients could kill reefs was posed and the answer is yes based on the Discovery Bay situation in Jamaica. Is nutrient pollution from Keys reaching offshore reefs? The answer was thought to be “yes” in 1990-1992, but now it is not so clear. More recent data on water quality do not definitively support this earlier claim (Swart, Evans, and Capo 2011). Yet we’ve all seen isolated patches of *Lynbia* and other noxious algae on reefs that thrive in high nutrients. Could there be a direct conduit from the Keys through the porous limerock to those locations? This is another important research topic.

A study showed that water injected in a 60 foot injection well can come back up and get into surface waters, but can it get out to the reef through this conduit? The answer seems to be yes and the rates of movement have been quantified in some areas of the Keys. There are cracks and crevasses in the limestone that sewage water can get into and be transported through.

Human intestinal viruses have been found in the mucus layers of corals. Reefs in the Upper Keys (including Key Largo with a population of approximately 26,000 people) and Lower Keys (including Key West with a population of approximately 39,000 people) had the highest percentage of reefs positive for human viruses, while the frequency of virus detection was considerably lower in the Middle Keys (with a human population of approximately 11,000). The rates of infection appear to be related to population levels. In the Upper Keys, 60% of corals were positive for human viruses and in the Lower Keys, the rate was 72.7%, but in the Middle Keys, the rate of presence was the lowest, 37.5%. It is not known whether the viruses are coming from boats or reaching the outer reefs from shore. In 60 foot wells off of Key Largo, the groundwater has intestinal viruses that can only get there from land based sources of fecal material. This work supports the conclusion that groundwater from the Keys that is contaminated by sewage can be transported to the reef through Key Largo limestone. More research is needed on this topic.

Canals and marina basins with confined water generally have high nutrients. A white paper released by this program in 1998 summarized that information. The source of this pollution was inadequate treatment and disposal of wastewater and storm water. Open water and canal waters are very different in terms of nitrogen, phosphorus and chlorophyll. A rain event can lead to an algal bloom in the canals. This situation led to State Law 99-395 (which called for county-wide upgrades). In the late 1990s- early 2000s, Key West had beach closings for health reasons, which drove away tourists and prompted the city to upgrade its sewage treatment.

Today, there are still problems with canals and it is recommended that people not have contact with canal water. In general, canals have poor flushing, dead end and lots of turns. They are deep, stratified, with no DO below a few feet and high bacteria and viruses. They may also have pharmaceuticals, which can act as endocrine disrupters and affect reproduction. A pilot project is needed to show how they can improve with by fixing the slope, making them more shallow,

adding flushing and controlling the weed wrack. How much do these canals degrade receiving waters? The answer is that there is a halo effect around the Keys from the nutrients. Bacteria can be viewed as tracers of nutrients emanating to receiving waters from canals. Nutrients are taken up quickly because they are limiting in oceanic water. Are nutrients from canals cause changes in biological communities of receiving waters? Yes, the Little Venice seagrass study shows that before remediation (going onto sewage treatment), there was low productivity, heavy epiphyte growth in the seagrass communities near the canal entrance. After remediation, the water was much clearer water and the productivity was higher. If the community changes from a seagrass dominated one to one dominated by algae, then that might affect the snapper and grouper populations since these fish as juveniles depend upon pinfish for food and pinfish thrive in seagrass beds.

Little Venice is a success story for canal water quality improvement. The nutrients were reduced and dissolved oxygen was improved. They now have fewer violations of the fecal coliform bacteria standard. Better sewage treatment removes more nutrients and deeper disposal reduces risks to nearshore waters.

Seagrasses are showing us the changes in water quality over time better than the water itself is. The most recent sampling showed that 19 of the 30 seagrass sites are showing some signs of increase in nutrient availability. Nutrient pollution leads to changes in the primary producers in a predictable way. Seagrasses are the sentinels and are tracking the nutrients every day.

EPA's role in the Florida Keys is different from the role it plays in other places. It is similar to an estuarine program and is not regulatory. Management of the Florida Keys National Marine Sanctuary is a partnership between NOAA, EPA, and FDEP as directed by Congress. NOAA does day to day administration, funds research, does enforcement, issues permits, establishes zones, installs mooring buoys, and conducts educational programs. The EPA and the State are responsible for establishing and implementing a monitoring and research program and looking for signals of change. His vision for the future is in the handout and can be discussed later when we talk more about the future.

Richard Harvey offered a few comments after Bill Kruczynski concluded his talk about the program results and visions for the future. Richard stated that when discussion water quality standards, it can be likened to a three legged stool with designated use, degradation component and water quality criteria needed to protect the designated uses. In the case of the Keys offshore waters, they are class 3 and must be capable of maintaining a healthy balanced population of fish and wildlife. In the case of the Reasonable Assurance Document (RAD), the EPA now has reasonable assurance once the wastewater and master plan are implemented, that standard will be reached. There may be outside forces like upwellings, global warming, etc. He doesn't feel that there is a need to go back and reexamine the RAD. Everything that can be controlled is being done. He does feel that they should determine once and for all through a study whether the bacteria showing up on the reef are coming from the land. He thinks that with upgraded treatment and disinfection, the bacteria will be removed. Deep-well injection will also help. He does have concerns about the shallower wells. Ms. Fleming thanked Bill Kruczynski again for everything he did for the trip yesterday and his presentation. In looking at Bill Kruczynski's visions for the future, she noticed pharmaceuticals were on the list and asked the committee if

they would consider joining her team in a regional effort have people dispose of their pharmaceuticals in a green manner. Her team has been working with groups like AARP, rotary clubs, etc. on proper disposal rather than have these medicines flushed down the system. The question came up about amnesty days in the Keys and whether or not there was a program. She is interested in learning more about any existing programs because that could be helpful to them.

Billy Causey noted that Bill Kruczynski talked about the interagency partnership and commented that he has never worked anywhere or seen the kind of close state, local and federal partnership that exists here in the Keys. EPA has been a leader on this water quality steering committee as has the sanctuary's advisory council. Bill's presentation clearly explained that we know more about these resources than anywhere else in world where there are coral reefs. That is possible because of the because of monitoring and commitment by EPA to help understand the system. However, it is also the most threatened coral reef environment in the world. It is the most heavily used reef in the world, too, and could be lost without proper attention. Right now, the reef "patient" is still in a declining state. It would be unheard of to disconnect the life support from a patient abruptly and look somewhere else in the body for problems. Billy Causey is very concerned about the fact that there is not enough identification of this place and its role as a national marine sanctuary. The sanctuary is a very special place. It is at the downstream receiving end of what is going to be happening in south Florida. The Army Corps will be stepping up its plans for more water flow through the Everglades system. If the patient is disconnected by taking away the monitoring, then they will be going back to the late 1980s and 90s, trying to guess what is causing the seagrass die-offs or other changes in the system. EPA has helped understand this system so much better and that has made a tremendous contribution to this resource, which is so economically important to this county, state and nation.

Richard Harvey commented that he doesn't think EPA is really talking about pulling the plug, but the south Florida office budget has to be considered. Any money decisions will not be up to Richard, but up to the folks in Atlanta. The question is whether or not to focus the limited resources on monitoring or focus on other areas. He feels that they do need to continue to do special studies in area of bacteria, pharmaceuticals. Jon Iglehart added that the system is a patient that doesn't have health insurance, so he feels that the infection needs to be cleared up at this time.

Chris Bergh called attention to the July meeting minutes in which the need for producing a report for Congress was mentioned and discussed. He feels that the program will have a better chance of getting funded if that report is written and given to Congress as is required. He stressed that Congress, the region, state, and everyone will become more aware through this report. (Possible ACTION ITEM: Congressional Report)

Richard Harvey introduced Charlie Causey who welcomed the regional administrator and her staff. Along with others, he had about an hour to talk with the regional administrator about an hour before the field trip started. He thinks she realized the passion and caring of the people who were there. After hearing Bill Kruczynski's presentation and serving on this committee for years, he appreciates what EPA has done and what other participants have been able to accomplish over time. At the same time, this community is in the later phases of the wastewater system. By the time it is in place, the citizens and business in this county will have spent \$600

million dollars and that is a lot for 75,000 citizens, who will have spent about 75% of the money themselves. In conjunction with that, the program has conducted monitoring successfully for 15-16 years. At the same time, trends that show the direction of things and what the wastewater systems are accomplishing. Obviously, there have been great results, especially in Key West.

Charlie Causey continued to explain that a citizen or even an outsider realizes that the Keys are about the water. He thinks that a study would show that at least 30-40% of economics is tied to waters, especially the nearshore waters. There is a need to keep waters fishable, swimmable, etc. He thinks it is important to do the things we can do to help improve water quality. So many influences are global. Coral reef decline is a global occurrence and it makes it difficult to do something local to improve that situation. We have the data, but do not have an infinite amount of money and it won't be there as things are tight. With a finite amount of money, where can those dollars best be used? He is not a scientist, but has a finance background. Where can the program get the biggest return for its money? One thing that can be done locally concerns the canals. The wastewater improvements will help, but not address the whole issue. He likes the reef, but what is the quality of the water inshore because that is tied directly to the economy (recreation) of the area and what will this water be like in 20 years is important to know. He noted that they have received a generous amount of money for monitoring. If we use \$1.2 million as the figure for the total budget, how much of this total is spent on monitoring alone? He looked through February minutes of last year and there was an extensive discussion on this topic. At that time, they decided to update the canal study done by Wendy Leonard. He has a proposal from AMAC, formerly MACTEC, with details of an update of the original canal study. This will let us get started on a canal project of some sort. He heard the regional administrator mention the words like opportunities and partnerships. These are the things that make sense to me. The best example he knows is what the foundation he works with has been able to accomplish in partnership with Everglades National Park. It requires flexibility, imagination, thinking out the box. This is a corporate kind of approach. The wastewater upgrades will improve canals, along with aerators, weed lines, etc. But, it makes sense to do more than just wastewater. He pointed to the February minutes again in which the idea of doing something other than monitoring was agreed on by the committee based on the discussion (and even before that time).

The first thing to consider when developing a project is finding a source of money. The partner agencies can provide some of that money. If he were doing this, he would ask EPA to carve out 500k from the \$1.2 million total. He would have State of Florida put up \$100k as they already are doing so. Secretary Vinyard would be supportive. He is not talking about studies, but bricks and mortar demonstration projects. He would hope that the county would put up \$100k, but he is not speaking for Commissioner Neugent. In this scenario, he would personally try to raise \$100k and guarantee \$50k. The community on which the canal is located would be \$100k, coming from the citizens on the canal. The residents end up putting up 10% of the total cost (\$100k for each of 10 canal projects) and that is an effective partnership. It won't cost the residents \$100k. If we implement something like this, maybe use a percentage of the total. He only used the numbers for illustrative purposes. He would love to have NOAA too. If get all the players at the table, hear all ideas, all have a financial stake. He would like to see this happen in some sort of a resolution this afternoon. It is really about economic opportunity, partnerships. The EPA will be leveraging state and local resources. If EPA did this, it would be a hero for the residents of this county.

Steve Blackburn informed everyone that EPA has a 319 program (part of the Clean Water Act) in Florida that has about 7 million in funds for addressing non point source, cesspit, etc. They have a 60:40 match and the 40 can be any kind. This program is meant to address things that have been discussed today. He added that you will need a lot of money to do the things you are describing and this could be a possibility for funds. (Possible Funding Source).

Commissioner Neugent commented that Monroe County is a designated an area of state concern. He wants to put as a subtext to what Charlie Causey has recommended. He completely agrees that it is time to go forward and the county as well as state and federal should take responsibility. But, this is an area of critical concern and a one penny sales tax would generate 30 million a year to help complete our wastewater storm water and then eventually canals. This would be paid by both residents and tourists.

### **III. Status of Implementation of Monroe County Wastewater Master Plan and Wastewater upgrades by Municipalities and Key Largo Wastewater Treatment District, Ms. Liz Wood, Monroe County, Representatives of Municipalities and Key Largo Wastewater Treatment District.**

Susie Thomas, City of Marathon, gave an update on the status of Marathon's wastewater and storm water treatment. She acknowledged the committee for the important work it has done over the years. This committee has made some really tough decisions and a lot of them have been implemented and we are seeing the results today. The City of Marathon will be complete with its storm, waste and reclaimed water projects by March 31st of this year. Over half of the people are connected already and reclaimed water at four of the five plants that is piped to users. The City supports the work being done with the WQPP and thanks DEP for its work on the RAD. This is an important document and is another result of this committee's hard work. She welcomed Ms. Fleming and her staff to the Keys and welcomed the opportunity to present the City's figures to her.

Margaret Blank, new general manager at Key Largo Wastewater Treatment District, addressed the committee. She provided a handout with a map of the service area and the progress that has been made to date. Key Largo is over 95% complete with construction. The table on the map gives some facts about the service area. They will be coming in at \$144 million, which is under the \$157 million initial cost estimate. To date, Key Largo has 66% of EDUs tied into the system and has built a full AWT plant with two deep injection wells. The plant has been operating the plant since November and it has been meeting the 5.5.3 reliably. It is a great plant and they are pleased with its performance. This represents a reduction in poor wastewater practices that had been going on in Key Largo. Ms. Blank explained that a study had linked a human intestinal bacterium to a disease in elkhorn coral. At the invitation of the district, scientists tested the influent into the plant and found that bacterium, but did not find it in the effluent. The treatment is definitely a success in this regard and with regards to nutrients as well. Key Largo also had a smaller AWT plant had also been operating since 2005. She presented an overview slide with a summary of how everything was paid for. Key Largo is borrowing and self financing \$89 million of the total with the rest coming from grants from Army Corps, DEP, Monroe County. The vast majority of loans are SRF at 2% plus one \$30 million bank loan for 4.5%. The laterals are not in

the numbers presented and it is about \$3,000 to 3,500 to be tied in the system. The south components of the island of Key Largo (E through K) have been moving forward. Construction has been pretty much completed. The population of Key Largo is 50,000 EDUs with about 30,000 people, depending upon the time of year.

Liz Wood, Monroe County, provided some additional background information. In 1992-93, people who lived here saw the decline in water quality and as a result we have the Florida wastewater law that applies to Monroe County. She then explained the current standards and the laws that govern them and the implementation in Monroe County. This is a mandatory connection and the county, municipalities and special districts, aqueduct are involved in implementing the statutes. She tracks the status of the projects and provides updates to this committee. Last July, the service available throughout the Key was 64%. Today, this is about 73%, showing that progress has been made since July. Ms. Wood reviewed a table (slide) with each of the service areas and the percentage connected at this time. The total for the county is 63%. She also reviewed the status of each service area (see slide presentation). She explained that the federal sources of funding were pure grants through Army Corps using ARRA money. EPA grants and FEMA unmet needs monies were also available. She really sees the need to quantify the amount of money it takes to treat nitrogen and somehow make the far-field sources that are responsible for part of the nitrogen issue pay for it, too. The Keys are treating pollution that doesn't always originate here and it is expensive for the residents. She reviewed a slide showing the total cost for the entire Keys is estimated to be \$714.8 million. Currently, the amount of projects funded and under construction is \$500 million Fourteen percent of that total comes from federal and state funds and 41% comes from local sources, which means that 20% of the projects received subsidy funding. This kind of continued contribution to the projects is what might be needed as a partnership to continue to move forward. She will post the presentation on the website and will take any updates and corrections.

Ms. Fleming thanked everyone again. She also wants to thank the city and county for undertaking this type of project. She knows it is not easy to ask people to pay for things in this climate. She applauds everyone. Others are not making the decision to be proactive and eventually it ends up costing them more through enforcement or because costs go up. She can't overstate how she wishes she could take this example on the road and they are revamping their website to show the good things being done for the environment and for their economic base of the community. She wants people to see what success looks like and hopes to see everyone again soon.

#### **IV. 15 MIN. BREAK**

#### **VI. Transitioning**

Richard Harvey made a few remarks after the break. EPA is in the process of closing the south Florida office. He explained that EPA will not be filling his or Bill Kruczynski's position when they retire (unless things change). He understands that Bill Cox who runs the wetlands program and Steve Blackburn, who works for him, will be working on this program. He also heard that Eric Hughes will be working on the program, too. Billy Causey mentioned that he has worked with Eric Hughes before and Eric is very familiar with south Florida issues. He attends the South

Florida Ecosystem Task Force meetings. If possible, Richard would like to give Bill Cox a tour of the area before he retires.

### **Recognition of service, Chair**

Jon Iglehart recognized Kent Edwards who is leaving the sanctuary. He has done a tremendous job here with many things, including putting the dive program together. Jon wished him well as everyone will miss him.

### **Funding issues, Chair**

In response to a question from Chris Bergh, Richard Harvey summarized the status of funding. Richard explained that EPA typically forward fund, he understands that \$1.6 million is available from fy2011 funds. He is not certain how that money will be allocated. This money goes for the whole south Florida geographic initiative. In the past, they have carved out a small portion of that money for the Southeast Florida Coral Reef Initiative, but they will not be doing that again this year. The whole everglades restoration issue is so contentious and has to do with federal judge rulings. To deal with this, they have had to hire consultants and spend money. EPA has probably spent about 5 to 7 million dollars on the Everglades (storm water treatment areas) over the past few years. He thinks the state has come back with a counter proposal in accordance with the judge's orders. If so, then EPA will have to evaluate that proposal. He doesn't know how much money will be spent on the coral reef initiative or on restoration issues, but what is left over will go to the Keys for monitoring, special studies, canal projects, etc. He will ask Steve Blackburn when he returns to break those figures down for the committee. ACTION ITEM: Richard/Steve

Charlie Causey wanted to explain that he feels it is time to do bricks and mortar work. There is already enough data on canals to know that a canal project can improve nearshore waters, although we don't know exactly how much. The citizens have already spent so much money that a couple million more will not be much to find out whether or not these things will be effective is not. He would propose a resolution that a subcommittee/entity be formed that is made up of EPA, state of Florida, Monroe County and a citizen designee for a specific canal that would help fund that canal restoration and the private sector designee as was mentioned this morning. FWC, NOAA or TNC could also participate. This would establish a list of partners that would meet and decide where the money is coming from and how much would be put up, etc. This group would provide direction and make decisions about money, etc. The resolution would be to form a group to decide which canal projects would be done and who would do it.

Richard Harvey added that it seems Charlie is asking for a priority list with canals that need restoration and then identify interested parties and the funding sources for that cleanup. Charlie wants to get the subcommittee together through a resolution. Richard added that maybe the steering committee could say that idea has merit and between now and the next steering committee meeting, this subcommittee could bring back recommendations as to the way the canal issues can be approached.

Gil McRae is certainly in favor of moving forward on canal projects. Canal projects are expensive and this would be more of a proof of concept project to show success with a relatively small amount of money. It is going to be important to identify a canal system that could benefit and be a proof of concept. Rather than prioritize based on need, prioritize based on the likelihood that the project will have and show impacts with the amount of money spent. He also wants to mention that the monitoring programs have experienced funding cuts and he doesn't know how much of those cuts are tied directly to using funds for SFCRI. If there is a decision not to use funds for SFCRI, he wants to know if funds will then be available for canal projects without impacting monitoring studies. Richard explained that it is all one pot of money and if funds are applied to the canal restoration proof of concept, less will be available for monitoring. Charlie added that hopefully Atlanta was impressed with what is being done here and perhaps, just perhaps there may be more money found for this. Richard stated that he had heard that even though they may not fund SFCRI, they will probably do another round of mapping in the Everglades and that usually costs 2 million (not all EPA money). He heard that they might receive an additional \$400k this year. He knows that Atlanta has already asked the folks in Athens to start getting ready to map. Up to about 1.6 million dollars total from the geographic initiative may become available.

Susan Hammaker followed up on Gil McRae's comments about monitoring. Monitoring will be needed for the kinds of projects that Charlie Causey is proposing. This element of pre and post sampling should not be left out of any canal projects.

Chris Bergh reminded everyone about the 319 funds allocated through the state (DEP). Richard thinks this is an excellent additional source of funding for canal restoration projects. Chris noted that Monroe County citizens have been putting a tremendous amount of money toward wastewater and why can't that be a match for 319. There is a lot of money being paid for by the citizens, not federal funds, and that money might be used to do the heavy lifting. And finally, he doesn't think any canal restoration should be done unless the citizens are willing to tax themselves or put up the lion's share of the money. They may need to put up more than 10%. Charlie agrees that the residents have to be able to put up 10%. Chris said maybe they should put up 90%. Charlie said that percentage won't work and is too high to get participation.

Sandra Walters explained that some people own their own canals. Some have proposed the idea of backfilling the canal using fill. Depending upon other factors, there may be partners along those lines. The biggest problems with trying to open canals, etc. are that if one or two people hold out, then it won't happen. If a special tax district could be created, then it might work if the majority of the people support it. Unfortunately we are still in an economic down turn and everyone is already paying for wastewater hookups. It might work if canal residents could be guaranteed improvements through some kind of partnership. This is particularly true if they have the opportunity to open the canal, which means overcoming the rules against dredging. The comprehensive plan forbids opening canals to get better flows. The reason residents back away from this kind thing is that they have to spend money up front and are not guaranteed that they can go forth with the project or that the project will produce expected results. Richard Harvey suggested that after lunch, people can come forward with a motion. Jon Iglehart suggested that a subcommittee be created to focus on this question and then report back in July. This motion can be addressed after lunch.

## **Reasonable Assurance Document, DEP (Scott McClellan)**

Scott McClellan explained that his company helped put the RAD (Reasonable Assurance Document) together. He is amazed how far they have come because today this document is the foundation of where we are going. He is pleased that everyone has worked together to get the document done. He explained that every five years DEP reviews the impaired bodies list of waters and the Florida Keys was examined in 2006. At that time, they began the RAD in hopes that the document would support the listing process for the Florida Keys. Due to time constraints and other things, they were not able to get the listing. However, 2011-12 is the second cycle and they are again trying to get the RAD accepted. He showed a diagram of the WBIDs (water body units) used in the modeling process. When Florida Keys were designated Outstanding Florida Waters in 1985, there was a baseline sampling done and that is used for comparison purposes. The goal is to improve it back to better than 1985. Modeling showed that if all the projects on the books were finished, the water quality would go back to 1985, although it would take some time. As reported in the RAD, modeling showed that if all activities were done, there would be a 63% reduction in nitrogen load and a 73% reduction of total phosphorus by 2020. The RAD includes all of the projects currently underway in the Keys and the current status of activities. All projects submitted letters about their projects as part of the RAD. Ultimately, the final document will list the WBIDs for nutrients as category 2 and for DO at 4e, which means mandatory activities are being done that should improve the quality of DO. It will be much better in the canals when all activities are done, but it will not be perfect at that time. The revised RAD will be submitted in the next few weeks. He believes it will be approved by DEP and then go on to EPA, where it will also be approved. This document will become the foundation of where we go in the future. He is very pleased and pointed out that things can happen when people do not give up. Scott offered to answer any questions.

After the presentation, Richard asked Scott McClellan if the “patient” was on life support. Scott answered by using the analogy of an antibiotic. The patient is at the stage of being on antibiotics and if the patient stops taking them, that could be a real problem. Richard’s point is that the factors that control water quality are not in what is done in the Keys. Most of what happens has a relatively small impact on offshore sanctuary waters and beyond control of what is done in this room. Scott wanted to clarify that the RAD’s focus is on the nearshore waters and less further away. What’s important is to take care of the backyard and if this was done, the nearshore effect would be minimized. Richard added that reducing nutrient loads in canals will make that situation better, if all the planned steps are taken. According to DEP, the water quality does not represent an imbalance.

Billy Causey said that Richard is not correct about this because the water used to be gin-clear every day at Looe Key and Key West and that is not true anymore. The net flow of water is from Florida Bay out. The nutrients are not killing the corals; it is the associated activities that are impacting corals. Nutrients are causing blooms that are harmful to corals and some nutrient water makes it to the reefs. Even the slightest elevation over oligotrophic conditions is a problem for corals. While there are other factors contributing to coral decline, land based sources of pollution is still one important factor. Corals exist in tropical low nutrient waters that are clear.

Keys waters are on the verge of that condition and that means it can't be said that everything is fixed.

Richard reiterated his point that the waters are in compliance that implies that can sustain a healthy balance of flora and fauna. If the standards are not protective enough, there is a process that can be undertaken to establish a tighter limit. Other than the fringe of the canals, the RAD shows that the actions taken will meet the Clean Water Act and EPA/DEP standards.

Gil McRae would like to emphasize that the RAD and water quality standards and the RAD is driven by dissolved oxygen criteria. Meeting the standard may imply that there will be a balanced population of marine life, but that is not necessarily true. It is known that the reefs are not healthy. He doesn't want to see the regulatory perspective drive the whole program. The intent of the program is not regulatory; the purpose is to maintain a balance indigenous population. Gil points out that it may not be one factor bringing things down. The point is that these reefs could be lost while meeting the water quality standards. The regulatory perspective doesn't give the whole perspective. The WQPP is not solely regulatory in nature even though EPA is a regulatory agency.

Bruce Popham stated that he was really taken aback by this because this issue is not just about regulatory issues. It is about doing everything possible to make things better and you can't convince him that polluted water is not making it to the reef. Richard says that we haven't identified what the real "smoking gun" is, but Bruce disagrees and it is likely a combination of things. He thinks that the role of the committee is to make sure that they control everything that can be controlled and disconnecting those pieces is not right in his opinion.

### **Major water quality issues, Sanctuary staff**

Billy Causey gave an update on water quality impacts to sanctuary waters. He noted that there are number of hotspots remaining and subdivisions that haven't been connected yet. There are still health issues associated with the canals. There will be benefits to making them safe to be in again. He is also concerned about the effects of mosquito spray. The county has a new director of the mosquito control department. This has been a topic in special studies in the past and needs to be addressed again to obtain more answers. He thinks that there is still more to be learned about the impacts of mosquito control. The mosquito people are tightening up their spray paths and doing other things to reduce their impacts. He would like to have the information that shows whether these measures work or not. Water quality is not just about organisms and chemicals, it is also about temperature. Every year there is concern and angst in the warmer months for the corals. Under higher temperatures metabolic processes speed up and if there are nutrients and microorganisms diseases, the result can be algal blooms. Disease incidence rises, too. It may be difficult to do something about water temperature, but if the nutrients and other aspects are taken care of, then the organisms have a better chance to survive. Water quality continues to be a top of list. He is very confident that this community is taking care of wastewater and is on top of storm water, too. He would like to see something done about the weed wrack need and the accumulation of seagrasses (dead) in the canals and how that has impacted water quality. These are things that can be addressed without a lot of money. (Sanctuary Recommendations)

Richard Harvey mentioned that over the years they have discussed how much EPA contributes to the monitoring program and from time to time, they have talked about NOAA. DEP has put money into the program. Billy Causey explained that he has addressed this question a number of times. NOAA contributes through different pots of money, through NOAA's Coral Reef Conservation Program. These are NOAA funds that come to this area and are used for coral monitoring, fish and lobster monitoring studies. The sanctuary uses these funds and its own funds to set up BleachWatch to work with volunteers and used it to start the MEERA (Marine Ecosystem Event Response and Assessment) program. We haven't contributed directly seagrass and coral monitoring since 2005. Richard stated that basically the money received from EPA is what is available to work with. Billy added that the sanctuary also funded SEAKEYS in years past, but not this year. EPA and DEP have been funding the monitoring that is authorized in the Florida Keys National Marine Sanctuary and Protection Act.

Susan Hammaker noted that the Keys have been very lucky in that they qualify for the \$29.6 million dollars of Army Corps money. In ten or fifteen days it will be decided how it is parceled out. The Congressional delegations of Ros-Lehtinen and Nelson did write letters for that money. Three years ago, the Army Corps asked for another proposal for another \$100 million dollar authorization and they put together something. Perhaps there are opportunities related to canals and water quality issues. She encourages that people to look at this because the first \$100 million is disappearing and the Keys do have an extremely good record. Marathon, Key Largo, Key West, Islamorada (to date has no plan) are authorized players. She has talked with some Monroe County and aqueduct people and there is a possibility of working with them. This may be something that is too soon for a resolution, although that could be a beginning point. Putting together a big proposal like this with ideas takes time and people. She urges some folks to think outside the box. They have been invited for three years to submit something and she has talked to people in the past. (Possible Funding Opportunity)

Richard Harvey mentioned that they are breaking for lunch now and then will hear from Charlie Causey after lunch and talk about special projects prioritization. He reviewed some of the special projects discussed during the morning: bacteria migration to reefs; pharmaceutical by products, mosquito spraying, 319 funds, etc. The meeting will reconvene at 1:30.

## **LUNCH BREAK**

Richard Harvey asked Scott McClellan to clarify some things about the RAD. Scott explained that the RAD originally was based on nutrient impairment of nearshore waters and didn't have anything to do with dissolved oxygen conditions. They looked at trying to come up with a nutrient target that was protective of biological resources and had a difficult time finding that end point (for nitrogen and phosphorus). They finally decided to use the pre-1985 condition as our target point. By completing the management activities that are planned, at some point in the future (say 2020), their modeling shows that the keys waters will achieve that pre-1985 condition. Richard wanted Scott to clarify the issue of nutrient vs. dissolved oxygen driven criteria. Scott explained that the original RAD came based upon a statement of nutrient impairment of nearshore waters of the Keys, which generally means there is an excess of nutrients that causes an imbalance in biological communities. In the update of the RAD, dissolved oxygen was added. The original nutrient criterion was a narrative, which stated that an

imbalance in flora and fauna could not be created by the activities. It is no longer a narrative for the Keys today. EPA and the Florida legislature still have to adopt the final criteria. The updated RAD defines the status of what is being done with the management activities and relates them to the nutrient impairment and then adds the dissolved oxygen criteria.

Richard stated that the implication is that the RAD concluded that once all of the wastewater and storm water master plans have been implemented the nutrient conditions in nearshore waters will support a healthy, well balanced population. Scott added that there will be ancillary improvements in canal water quality, maybe not at the end points of canals. Richard's earlier concerns with the RAD revolved around the fact that it might give a false impression about all water bodies. In the process for the RAD, DEP has still yet to make comments on and approve it before sending it to EPA for approval. Richard added that if the nutrient concentrations/endpoints are not adequate to protect the nearshore waters, there is a process that you can go through to petition DEP and if the state approves, then ask EPA for these criteria to be included. This can be done if the data exist to justify the suggested criteria.

### **VIII. Special Projects prioritization, Chair**

Richard Harvey initiated a discussion about special studies. It is a management/technical advisory committee process. If the steering committee decides that there are special studies that need to be conducted (pharmaceuticals, mosquito spraying, etc.), then the management committee can talk to the technical advisory committee and then come back to the steering committee for final approval. If approved, the technical advisory committee prepares a RFP and circulates the RFP and then reviews the proposals submitted. Bill Kruczynski has a list of potential projects. Bill found out at lunch time that the sheriff's department gets rid of drugs properly. Richard thinks that the regional administrator might like that if the committee conducted public outreach. Bill stated that it might work well if the committee sponsored an amnesty day when everyone can bring their old prescription medicines in for disposal. Gus Rios pointed out that the sheriff does have an established program for pharmaceutical disposal and he suggests working directly with them. Richard asked Gus to look into this matter and report back at the next meeting on the feasibility of having an amnesty day for medicines. Richard added that the committee could tell the regional administrator that they were immediately responsive to her request. Susan Hammaker volunteered to work on this with Gus. Richard confirmed that she wanted to work on this task and asked for any objections. There were none. Gus and Susan will take the lead and report back to the committee on this effort. ACTION ITEM: Gus/Susan H.

Richard Harvey pointed out that Bill Kruczynski has listed a number of items on his handouts that might be candidates for special studies. Richard would like to include studies on mosquito spraying and on documenting the effectiveness of the new treatment plans in removing bacteria that may be problematic to the reef. He would like to see documentation that the treatment practices take care of the bacteria so that if they reach the reef, they are not a problem. Richard asked Bill which studies he suggests considering. Bill pointed out that the suggested study areas are divided into the three main monitoring programs and perhaps everyone should take a look at them by category and the principal investigators can also weigh in on the discussion. Richard suggested that they take this list, along with a few other suggestions that have been made, and at the direction of the steering committee have the management committee review this list, discuss

it with the technical advisory committee and then come back before or at the next steering committee meeting with a recommendation on how to deal with these issues. The funding is a separate issue. Richard asked for objections and there were none. (ACTION ITEM: Management Committee/Technical Advisory Committee). Billy Causey added that will be great and add momentum to the process. Richard still thinks we need to communicate with the regional administrator. Jon Iglehart can let her know that we have heard her. Billy apologized because he had to excuse himself to attend another meeting in Texas.

Charlie Causey gave some more thought over lunch to the proposal discussed earlier. He believes that simplest way to approach is to form another committee to look at the funding possibilities and recommend something back to the committee at the next meeting. The motion in effect would read....This group hereby appoints so and so....to recommend alternative means of financing a canal restoration study funding procedure for consideration by the board/steering committee. He has his thoughts as to who should be appropriate. He thinks the following people should be on the committee: Jon Iglehart/Gus Rios, Steve Blackburn, George Garrett, George Neugent (has agreed) and himself. He also suggested having one or two scientists from the TAC who are local so that the meetings can take place in the Keys. First, the committee would try to get other sources of funding before turning toward this pot of money.

Billy Causey asked about the Army Corp's pot of money that was available to for restoration. It was explained to Billy that this money is very difficult to spend on water quality and has some very strict restrictions on how it must be spent. Billy knows that it has been used for causeways to open up circulation in the past. Another source of funding might be for mitigation of big projects with outside money. He has already had some inquiries as to what the funds could be used for. Richard asked if this was oil spill money. There was some Exxon Valdez money spent here a while ago; it was left over and not being used. Billy thinks that the committee needs to be ready for spending money in the event that opportunities come along. (Possible Funding Source).

Susan Hammaker stated in order to expedite the canal projects, you might think about picking a canal in the Little Venice area to capitalize on the fact that there has been so much research done on that canal system already.

Chris Bergh wanted some clarification. He sees the roll of the committee to identify potential funding sources. That is not a very ambitious goal and might be better done over the email. It might be better to identify potential project sites by looking the study and even starting to possible identify the sites that might be addressed in addition to funding sources. Charlie Causey agreed that his proposal should have gone beyond funding sources. He pointed to the Amec proposal and if there is time, he thinks it would be great to hear more about that from Wendy Leonard (Amec).

Jon Iglehart summarized the motion to create subcommittee to report to committee at large on prioritization of canal projects and potential funding sources for each. Charlie thinks that we might add a pilot project to that motion. Commissioner George Neugent formally moved to establish the committee that Mr. Causey mentioned and Mr. Iglehart articulated. The motion was seconded by Mayor Worthington. Richard called for discussion and there was none. He called

for a vote and all were in favor, with no one opposed. (MOTION PASSED/ACTION ITEM: Canal Subcommittee Members).

George Garrett addressed the committee. There is DEP money out there that has traditionally gone to Little Venice project, but it will not be this year. The City of Marathon has agreed to participate and they have considered several canals, one is near Little Venice. They are looking to have culverts installed in to this canal by the end of the summer. He looked at opportunities to improve canal flow and this was one of them. They have not worked out the monitoring at this point, but are moving forward with the engineering at a cost of about \$100K.

Gus Rios mentioned that during last steering committee meeting that there is money available for canal projects. Jon Iglehart sent out a survey to see how to prioritize the projects. They have \$100k available and are not going to an RFP at this point. If there is a project ready to proceed and a contract is in place, they may receive the money. In the long run, a comprehensive plan is needed, but this may be a start. The money has to be encumbered by June 3<sup>rd</sup>. (Possible Funding Opportunity)

## **IX. Monitoring updates**

### **A. Water Quality, Dr. Joe Boyer, Florida International University**

Dr. Boyer referred to the list of research suggestions for water quality presented earlier by Bill Kruczynski. The water quality monitoring program does provide baseline data and detect changes in baseline conditions, but it not set up to study harmful algal blooms. The program has identified sources of pollution to some extent in shore. In terms of assessing impacts of events, they are not always able to sample after a hurricane, for example, but do try to be responsive. Correlating water quality data with benthic data has been discussed, but the monetary resources haven't been there. They have been working hard on developing water quality standards for the past two years and he and Dr. Briceño have submitted documents to EPA and DEP on this topic. The program has undergone reduction in station number. Under the list of improvements provided by Dr. Kruczynski, they have done a lot of statistical analysis and undergone a reduction in station numbers. Last year, they reduced the number of stations by 40% (especially lost offshore stations west of the Marquesas) and added stations at canal mouths that are part of the seagrass sampling. They have a remote sensing project with NOAA to bring data into IOOS and couple them with remote sensing. So far, they have not added an episodic event sampling plan, microbiological sampling or quantification of pharmaceuticals and endocrine disruptors at selected stations. There was a question about how the reduction of stations was conducted. John Hunt clarified that there was a directive given to the management committee by the steering committee to contact monitoring teams and get their response on how a range of reductions would affect their programs and they responded to that request. Richard Harvey explained that the EPA budget was cut and that was the reason for the monitoring cuts.

Dr. Boyer began his formal slide presentation with the purpose of the program—to assess status and trends in water quality, integrate with other projects and evaluate the effects of external and internal influences. Originally, the program samples 155 fixed sites from upper Key Largo to the Dry Tortugas and performs a suite of analyses that provide a nutrient data, salinity, water temperature, etc. A portion of the coastal area is now being sampled by a contractor for

SFWMD and he has had a difficult time getting any data from those sites. As of 2011, they began to sample fewer sites (111 total). He showed the results for each year and how they related to the 2005 EPA strategic criteria for chlorophyll, dissolved inorganic nitrogen, light extinction and total phosphorus. The baseline was set using thousands of monitoring program data points and report to EPA. The program sampling regime also documents events. After the 2005 hurricanes, they detected water masses with high ammonia content. They also assessed long-term trends for a suite of parameters like dissolved oxygen. Maps showing the changes that have occurred during the past 15 years for each parameter were shown. There were increases in salinity in both bottom and surface waters. There have been declines in dissolved oxygen, especially where salinity has increased. Commissioner Neugent had a question about chemicals in the water that might be affecting people and marine life. Dr. Boyer responded stating that there have been some effects from the toxins in harmful algal blooms. This is especially true for cyanobacteria. The program does not quantify the cyanobacteria with this project, but he does have some data from a few sites and generally doesn't see the bacteria associated with impacts on brain activity.

Mayor Worthington explained about the algal bloom that has made the water cloudy in the Lower Matecumbe area. The bloom has been there for several years now. Dr. Boyer explained how salinity and temperature affect oxygen saturation in the water. High temperatures and high salinities have low oxygen saturation rates. He pushed for the water quality standards to include oxygen, but have it measured on as percent saturation. This information and these figures are in a report on their website. There have been increases in chlorophyll up on the shelf and bayside in the Matecumbe area, but not too much change is observed elsewhere.

There are very few changes that are seen on a large scale. One exception was nitrogen on the shelf nearshore. In terms of light extinction, it is greater near shore and has become better in other areas. There are widespread decreases in total organic carbon (TOC) that affect much of the area and have been observed back several years. This is taking place system-wide and the effects of this are unknown. In many areas, they are seeing an increase in carbon, not a decrease. This may be related to the Everglades or the Gulf because it is taking place in the Tortugas, too.

The ratio of one nutrient to another can help determine what is driving the system. Dissolved organic carbon is a big component used by microbes and is being produced by algae. TOC is almost a source tracking for terrestrial inputs. There is huge gradient of TOC coming out from the Everglades. In terms of explaining the causes of trends, most changes are due to variability in climatology and hydrological patterns/connectivity. Most large scale effects are "far field", meaning not related to land-based activities in the Keys and more work needs to be done with coupling monitoring with remote sensing technologies and coastal ocean observation systems.

They are using their data in a NOAA-IMPACT Project and attempting to couple with remote sensing. The program has also provided information for management, specifically regarding numerical nutrient criteria development, wastewater treatment effects, and canal remediation – Little Venice example.

A map showing how water parameters were different in different parts of the Keys and this information was used in developing criteria and in the RAD. Water quality in the FKNMS

responds to complex interactions of climate, marine currents, terrestrial runoff, and other anthropogenic activities. In summary, we need to use a nutrient budgeting approach and do better at interfacing with other regional research programs. When the upwelling water was analyzed, it showed that the nutrients coming from it onto the reef far outweighed what was coming from land. Water quality monitoring is not an esoteric pursuit but should be developed to become a more practical tool for answering management questions and developing new scientific hypotheses. Reports and data available at: [www.serc.fiu.edu/wqmnetwork/](http://www.serc.fiu.edu/wqmnetwork/).

Richard Harvey mentioned that EPA is sending out a new RFP for monitoring soon.

#### B. Data Management, Mr. Daniel Kiermaier, Fish & Wildlife Research Institute

Mr. Daniel Kiermaier manages the database for the water quality monitoring projects. They use STORET, the national database. To overcome license issues with Oracle, they created a virtual machine that allows continued use of the Oracle8i client, which is free to the public and operates in 32-bit environment only. Florida Wildlife Research Institute (FWRI) is creating a 'technical' User Manual to explain complexities regarding raw data received from field offices and the processes needed to prepare data for STORET input. This is intended to supplement the user manuals that accompany the FDEP STORET system. FWRI continues to upload monitoring programs' data to Florida DEP and STORET National Warehouse. FWRI works with Florida DEP as needed to edit/reformat WQPP data so they may be used to calculate Total Maximum Daily Loads (TMDLs). The 2008 Coral Reef Evaluation Monitoring Program (CREMP) data were entered into STORET and uploaded to the National STORET Database and Florida STORET last quarter. The 2009 and 2010 CREMP data are being processed now. With the funding cuts, they are no longer able to update the website, but a consolidation of raw CREMP data from the years 1996 through 2010 has been uploaded to the site as a public service. Some reports are not being put up there anymore, but raw data are there through 2010. For seagrass, data for 2010 was received from the field lab and was processed. For water quality data, surveys from 61 through 64 (October, 2010 through July, 2011) were received from the field lab and processed. Raw and synthesized data collected by the monitoring programs and special projects is backed up in three ways, including storing one copy in a waterproof fire safe at FWRI.

For a presentation, they usually create a CD rom with a copy of the website on it, including the data, reports, etc. They are not able to do that anymore at least for now. They also create Google earth files for the public for people who don't have ESRI and create shape files for ESRI users. A new version of the website is created each time it is updated. Site usage is dropping for the first time since inception. Since they post a date each time the site is updated, they are wondering whether this trend is a result of public impression "no new data". He showed an example of a web page and a diagram of the initial work flow and the current work flow. They make each set of data compatible with STORET and they validate the data. Due to funding cuts, they are no longer able to create ESRI shapefiles, google KMZ's, spreadsheet updates, special reports and perform web maintenance. The only thing they continue to do is update the archives. If they have the money, they would like to develop online GIS tools for viewing, querying, and analyzing monitoring project data.

During a quick break, the minutes were approved.

C. Coral Reef, Mr. Mike Callahan/Mr. Rob Ruzicka, Fish and Wildlife research Institute

Mr. Rob Ruzicka manages the Coral Reef Evaluation Monitoring Program (CREMP). He is going to touch on things that were said earlier today. Because of the funding reductions, they have just recently had to terminate subcontracts with the University of Florida and University of Georgia (Dr. Jim Porter's program). The link between human bacteria and coral disease was discussed earlier and was the subject of a special study that came out of CREMP work. Now we don't have the ability to fund a special study to supplement CREMP as in the past.

A brief discussion initiated by Richard Harvey took place about cuts to other monitoring programs. CREMP went from \$380k to \$250k, so it is a \$130k reduction. Richard noted that there may be some additional funds in Atlanta, but it is their decision as to how to use them. The seagrass program underwent a 38% reduction and the water quality program took significant cuts that translated into losing sites in the field. Together, all the programs lost about \$500k.

Rob Ruzicka explained that the University of Florida subcontract involved integrating water quality data with coral data, something that has been discussed and requested several times in the past both internally and because of external reviews.

Because they had to reduce their sampling effort, they lost one half-time CREMP/Fish & Wildlife Research Institute (FWRI) position. The Dry Tortugas sampling sites were lost and this is unfortunate because the Tortugas serves as a reference site for land-based sources of pollution. Unfortunately, it is not cost effective to get out there, but they are trying to work with the national park service to continue this work. The sampling effort put into image acquisition and analyses was reduced and this means that the changes that take place on a year to year basis will not be documented. They will not have the precision or effort that goes into detecting changes at that level.

He noted that all three of the monitoring programs are operating on a shoestring budget. The coral monitoring program is for the third largest contiguous reef tract in the world. The only comparable programs in scale and nature are in Australia and Hawaii and they probably have more resources available in comparison.

As a follow-up to his last presentation to the committee, he gave an update on the record breaking winter of 2010. Air temperatures tied a low record in Key West, but exceeded that earlier record in terms of duration. The coldest waters were seen inshore as compared with offshore. Temperatures at and below 16 degrees were in many cases lethal to corals. Many corals that had been around for 200 to 300 years perished in a matter of days. Two papers have been published about the cold impacts. The Nature Conservancy reported on a broad scale about the mortality associated with this event. They recently got another paper accepted that provides details about why some of these large corals died. These corals had been in good condition and had been monitored for 15 years or so. There have been other extreme cold weather events in Florida. While such cold snaps have been happening since the 1800s every so often, reef

building corals may have died because they were already so stressed from other impacts. The other possibility is that the duration of this cold weather was so long that it was unusual even for a cold snap. The colder bottom water from Florida Bay was found in some places and not in others, so that corals located near each other were subjected to different environmental conditions.

In a comparison of live coral cover between 2009 and 2010, a decline was seen in the patch reefs. This is different from the 1997-98 mass bleaching event when the patch reefs were mostly left alone. In the 2010 cold snap, there was a loss of spawning potential too because of the loss of large corals, especially *Montastrea annularis*. Macroalgae increases were noted between 2009 and 2010 in all habitats except back country patch reefs. In terms of long term trends of benthic organisms, he reported an increase in stony coral from 2008 to 2009 for the first time since the study began. It was unfortunate about the record breaking winter since they can't tell whether that was the beginning of true recovery or an anomaly in the data.

While the cause of decline may be related to global factors, it is critical to provide the best possible water quality to support the recovery of corals. Resilience has two parts to the concept—resistance to stressors and recovery after the stressor event. After the 2010 winter, we lost resistance to stressors on the large corals on patch reefs. The recovery has not been seen yet and water quality could play into recovery and this should be kept in mind as recovery may take a long time (compared to fish populations, for example.)

He showed a graph with the trends over time for the five main coral species. There is a huge sharp decline in *M. annularis* from 2009 to 2010 due to the cold event. This species was more affected by cold than it was in the 1997-98 bleaching event. There are some corals like *S. Siderastrea* that are doing okay. Usually after one of these major disturbances, macroalgae can move in and become the primary component in the system. For the most part, they haven't seen that happen in the Keys. Algae are usually controlled from the top down by grazing fish and from the bottom up by nutrient inputs. There are some increases noted in macroalgae at several sites throughout the Keys, but this trend seems to be more prevalent in the last five to six years, which may be a cause for concern. CREMP results suggest that there is a shift from stony corals to soft corals throughout the Keys on the shallow fore reefs primarily. He gave an example at Molasses reef where mass bleaching caused the loss of *Acropora palmate* and *Millepora complanata* and over time octocorals increased in that same site.

The following action item was discussed during the coral presentation and was formalized later in the meeting. During the coral reef presentation, Richard Harvey requested from each monitoring program a one page description of what has been cut from the program (money-wise) what specifically how the program has been affected, i.e. what is the significance of the cuts and what this loss means in terms of the loss of information. Richard will copy everyone, including the management committee and then make sure that Jim Giattini and Bill Cox receive it. (ACTION ITEM: Principal Investigators/data manager)

Bill Kruczynski noted that they have been making progress on the biennial report to Congress.

D. Seagrass, Dr. Jim Fourqurean, Florida International University

Dr. Fourqurean noted that the meeting was running behind schedule, so he will be giving a condensed presentation. The program was originally set up in 1995 to investigate broad scale patterns at the regional level. They were asked to assess trends of seagrass at the regional scale and cover temporal changes as well as spatial changes. They have a mapping survey that is repeated every 7 years to describe the status of the resource and provide the spatial component. The 30 permanent sites that are monitored four times a year provide the temporal component. This has given insights into how seagrasses respond to nutrients and how seagrasses respond seasonally during the year unrelated to nutrient availability, which is important to know. They are tracking nutrient content of seagrasses because it is related to nutrient availability. Seagrass plants are an early warning indicator of eutrophication. The program is collecting water quality data and measuring ratios of N to P in seagrass at the 30 permanent sites four times a year. From their data, they have developed detailed species distribution maps for the different seagrass species. Each species of seagrass and macroalgae responds somewhat differently to the different water quality conditions, including light and nutrient availability. Therefore, they have different distributions across the Keys. The study measures changes in abundance of primary producers at the different sites over time. A graph of species trends over time at one site in the Middle Keys shows a relative decline in *Thalassia* while other plants are staying the same or increasing. The portion of the biomass produced by slower growing species like *Thalassia* is decreasing and the portion due to faster growing species is increasing. They also have several sites like the one in Newfound Harbor that show increases in *Thalassia* and other plants as well. This kind of increase in density of *Thalassia* is the first thing that happens with an increase in nutrients. At their permanent monitoring sites, they are seeing long term changes in relative abundance of the different plants that are consistent with what is expected when nutrient availability is increasing. In the Upper and Lower Keys, there is a decreasing abundance of *Thalassia* over a 15 year period. In the Middle Keys, many sites are experiencing increases in *Thalassia*.

There is a spatial pattern in the relative availability of nitrogen and phosphorus in the system. Describing and mapping this pattern is one of the premiere achievements by the water quality monitoring program. The reef tract is nitrogen limited and the nearshore waters are phosphorus limited. Therefore, nitrogen injected into a well in the Keys could not have impacts close to shore, but could have impacts at a distance. This understanding is part of the knowledge base for resource managers now. The N:P ratio magic number is 25. At this ratio, seagrass is no longer limited by nutrients, but is limited by light. He showed an example of one site that has gone from a phosphorus limited system to a light limited system during the fifteen year sampling period. The study also measures and tracks changes in stable carbon isotope concentrations in plants. Last year, at 7 of the 30 sites, there were significant carbon isotope trends that are consistent with eutrophication. A summary table was presented showing the site specific indicators (N: P ratio, carbon isotope, etc.) for each region of the Keys. There are no places where change is not taking place and in many cases, the indicators are pointing to increased nutrient availability.

In 2005, the program developed two single number indicators to use when measuring whether the water quality protection program has met its goals. A graph was presented showing the trends for the Elemental Indicator (EI). A larger EI number indicates a more nutrient limited system. The plot of the EI from 2006 through 2010 shows a long term decreasing trend, suggesting that

the environment is becoming less nutrient limited on a sanctuary wide scale. Trends for the Species Composition Indicator (SCI) show that until 2010 there was a shift toward species that are more nutrient loving. In 2010, there is a slight rebound. In summary, on a large scale, there are changes in the seagrass beds that are consistent with eutrophication, but no widespread loss of seagrass has been noted at this time. He is reasonably hopeful that the wastewater infrastructure being developed will address a lot of these problems. There is a congruence of patterns among independent indicators, which increases confidence in the observation.

In terms of accomplishments, the project has defined the spatial and temporal pattern of seagrass community dynamics in the FKNMS. While there is a general downward trend, the signs of it don't show up in the nearshore communities, which is what would be expected if the nutrients were coming from land. They have not seen big declines near shore and smaller declines off shore, but may not be picking up on this because of the scale of their sampling regime. To tie impacts directly to a source like an outfall is not possible with this scale. We should probably be looking at the nearshore environment at a smaller scale to see the gradient of impacts from the shore outward and to document any improvements.

In response to a request to do more to address these small scale issues (with less), they have made adjustments in the sampling regime. They have added 10 sites in the nearshore environment—one off of Key Largo and one in Little Venice. They have modified their program to sample two times a year at the peaks and valleys and dropped out the synoptic sampling completely because with a 40% budget cut, they can no longer conduct that program. The close-to-shore sites have also been added to the water quality monitoring program. They expect to see more rapid changes at these nearshore sites in response to the abatement of nutrient loading. The indicators were metrics developed based on sampling four times a year and he will have to recalculate the EI and SCI indicators.

They have the N:P ratios and stable carbon isotopes and other indicators in Little Venice to show that seagrass responds rather rapidly to sewage abatement. The N:P ratios now depart from Redfield Ratios and are the only place in the system where the ratios are going away from Redfield. Stable carbon isotopes are getting heavier, which means more light is getting to the bottom. The money that DEP paid for the study at Little Venice was well worth it.

John Hunt addressed the committee. He hopes that some of what has been discussed today can be reported back. Everyone has heard data management and monitoring summaries today and the steering committee has heard management committee's response to your request for information. The management committee responded to the request from steering committee for information. These programs have been cutting back substantially while still attempting to keep some level of system-wide pulse measurement and while simultaneously trying to adjust their monitoring programs to be more responsive to management requests. This point seems to have been lost in the discussion. These programs have already become lean and mean and efficient. This is an important message and point that needs to be made and understood including by the steering committee. The message could also come from the steering committee itself. He noted that Charlie Causey's asked questions about changes that were occurring in the Florida Keys and received answers about these changes in the coral reefs, seagrass and water quality because there is an effective monitoring program in place. That could be part of the message as well and

recognized. Richard asked John to send a one page summary and it will be included. (ACTION ITEM: John Hunt)

Bill Kruczynski stated that it might be more effective if came as a resolution. It could be in motion form. Pete Worthington suggested putting what John said in a motion form. Susan Hammaker started to make a motion, but did not complete it. Richard said that hopefully Jon Iglehart will include a cover letter and sign on behalf of the committee when he sends up the package to the regional administrator. Richard stated that he presumes that the steering committee is all in favor of continuing a healthy, functional, viable monitoring program for the Keys and the committee wants to convey this message needs to the regional administrator. He doesn't think anyone disagrees with that. Someone needs to draft that message and have Jon Iglehart sign on behalf of the committee. John Hunt pointed out that a resolution makes sense in this situation. Commissioner Neugent stated that this committee, while supportive of monitoring, needs to go forward with bricks and mortar projects that address what has been learned from the monitoring program and the monitoring will continue to show us the effects of improvements (or not). He doesn't think that the resolution should just mention monitoring. Richard stated that he and Jon Iglehart are trying to strike that balance to which Commissioner Neugent refers. Richard said that no one has said to pull the plug on monitoring, but have to have a balance between what is monitored efficiently and what is being done on the ground to maximize the benefits to the resource. Commissioner Neugent stated that prioritization of projects that also utilize monitoring is important, too.

Chris Bergh asked Richard Harvey about summarizing how much money was lost in the recent cuts. Richard answered that it is about a half of million dollars total. He has received some information on the cuts and what that means, but each of the programs will be summarizing that info and providing it in a one page summary. He will make sure everyone gets a copy by letting Bill Kruczynski distribute them. He does think it is important to have a resolution from the steering committee and that it strike a balance between monitoring and on the ground projects.

Chris Bergh stated that one half million has been cut to the monitoring budget. That means about one million or \$900k is left for monitoring this year. Richard Harvey stated that they may get an additional \$400k next year, but he is not sure whether it will be a onetime occurrence. Next year, Everglades remapping will be taking place and he is not sure how much money will be needed for that project. Charlie Causey made the point that the percentage of the total budget spent on monitoring is still the same, about 90%. Jon Iglehart added that they saw this shortfall coming about three years ago and that's why they asked the management committee to reduce and thinks everyone is lucky to have had that advanced notice.

Sandy Walters pointed out that they are probably moving in the right direction. Earlier there was a resolution for subcommittee to look into how to move forward with canal improvements, which will give us information we need to make decisions. Until they receive more information on guidelines, sources of funding and prioritization, it will be difficult to make decisions. Sandy noted that her questions about research were answered in the presentations today by the principal investigators. She feels that the monitoring has been reduced as far as it can be while still having a program that will provide the information needed and focus that monitoring in the direction of making management decisions and evaluating the huge infrastructure investments that are

already being made. In terms of a resolution for the budget right now, she feels that they need to urge to stay where they are for another year to be able to evaluate alternative expenditures and not make any decisions until next year. If an additional \$400k becomes available, she would like to see it used for special studies that look at more systematically the effects on bacteria/microbe issue and how central wastewater is affecting bacteria. Other areas were also mentioned that cannot be done unless there are additional funds. These projects seem like a good use for possible one time funds.

Richard Harvey stated that he thinks the steering committee wants to formally convey a message to regional administrator regarding her visit to the Keys and he is trying to figure out what that message is. The first proposal was to focus on monitoring and then a balance approach was suggested to balance with some of this one the ground programs, which he personally liked. He asked about the sense of the steering committee and strongly suggested that someone draft something up, not today, and send it out. He strongly suggested that Jon Iglehart, to the extent that he can, sign it on behalf of the steering committee to be conveyed to the regional administrator. (ACTION ITEM: Jon Iglehart)

Carol Mitchell, Everglades National Park, introduced herself and explained that she was stepping in for Bob Johnson for a while. She noted that her understanding of the projects is at this time still at a rudimentary level. She wanted to say that she knows that monitoring funding is being cut across the board, but she also knows that anything in construction means huge amounts of dollars. So, if the committee is trying to achieve a balance between monitoring and constructions, she would personally say that since monitoring has already been cut, try to maintain what they have. And if the committee decides to go toward projects, then be careful in terms of what is framed because the actual implementation is probably way beyond what is available monetarily.

Richard Harvey added that if it is the sense of the steering committee, then this information could also be included in the resolution—that the monitoring program has already experienced a 40% cut and the committee doesn't want it to experience any additional cuts. The resolution could also say that the programs should be restored if that is what the committee wants to do. This could be included in the resolution while it was determined whether or not funds were available for canal restoration projects.

Jon Iglehart motions that the letters from the researchers be collated and sent to the regional administrator with a cover letter that expresses the steering committee's desire that the monitoring is extremely valuable and wish that funding continue in monitoring. The committee has also developed a subcommittee that will look at the development of shovel/bricks and mortar projects and will report back to the regional administrator next year with some recommendations on future funding. The resolution would be passed around by Nancy Diersing and then everyone could check and then he will sign the cover letter. If other committee members would prefer to sign it, that's fine.

Gil McRae asked if the point could be added that the monitoring program identify and prioritize projects. There is a connection between the information generated by monitoring and the identification of shovel ready projects. Jon Iglehart thinks they should be careful on how that

concept is stated because it might seem as if one stage (research) is complete and now it is time to move onto the second (implementation). It might be better to say that monitoring is essential to the identification of projects now and in the future.

Sandy Walters has reviewed the purpose of the steering committee, which states that “the committee will work together to ensure that the components (specifically--corrective actions, monitoring, research special studies, and public education/outreach) of the program are implemented and to seek adequate funding”. She thinks that we may want to quote this and address that the committee’s direction is to implement all components, not to swop out one for the other. The monitoring needs to continue but corrective actions are also needed and the monitoring is needed to provide feedback on the corrective actions. Everything relates.

Richard believes that everyone is pretty much on the same page and is assuming that if a vote were taken, then everyone would be in favor in a general sense. He added that now someone has to go out and draft it up and send it around for committee members to chew on and provide comments. Richard Harvey wants to know who can draft it up and it needs to be sent to Jon Iglehart. Richard can still send the one page summaries out, but thinks would be best to send them with a cover letter on behalf of the steering committee. It was suggested and decided that Jon will draft something, collate summaries and then send them out for comments and this was presented as a motion. Richard called for a vote and all were in favor. (MOTION PASSED/ACTION ITEM: Jon, principal investigators, everyone)

## **X. Public comment**

Wendy Leonard, Amec Engineering (formerly MACTEC), spoke during public comments. She is a senior hydro-geologist and she worked on the original canal assessment completed back in 2003. Today, she would like to describe a proposal for less than 10k to update existing GIS database with current GIS technology and add a key element, which is an evaluation of costs. She reviewed the proposal and provided copies to everyone and through Charlie Causey via email. The proposal will update the initial GIS inventory of all residential canals (conditions, GIS, physical parameters-flushing, depth). Parameters and these were correlated to existing water quality data. It also identified clean-up technologies. The GIS database could be a helpful tool, but it is out of date and old and needs to be updated to make it useful. This proposal goes beyond the first study in that it would develop technologies and cost estimates for pilot canals. It would also scale the cost based upon the canal. She wanted to give the committee a handle on what these changes are going to cost. They have an existing contract with Monroe County at this time. This is useful tool to give an idea of what can be done for different amounts of money.

Commissioner George Nugent sees this as a helpful tool in many areas, addressing shared information with certain municipalities. The suggestion he has at this point is for it to be presented to the county as an agenda item. (ACTION ITEM: George Neugent). It is a relatively insignificant amount of money and he doesn’t see why this shouldn’t be in the toolbox for use. Wendy added that when it is done, it would need a proper presentation so people can know that it is available. George Neugent added that he thinks there is more awareness about canals these days and he sees the value in this proposal. He thinks that the first step is for him to bring the proposal before the county commission and have a conversation with Mayor Worthington,

George Garrett, and his staff to get this moving forward. Chris Bergh agreed that this is not only a relatively small amount of money, but this update is an essential next step for the new subcommittee will need to make suggestions. He hopes that George has the full support of the entire committee for getting money for this proposal. George agrees that this is important and any help on educating his colleagues on the importance of this step will be appreciated.

Jon Iglehart made a motion that the steering committee support this project and any entity that helps fund it. Everyone was in favor of this motion and of seeing the proposal funded. (MOTION PASSED)

## **XI. Closing Remarks/Next meeting date, Steering Committee co-chairs and members**

George Neugent recognized Richard Harvey as an Honorary Conch and Citizen of the Florida Keys. He read the proclamation, which was issued by the Monroe County Commission. Commissioner Neugent thanked Richard for his hard work and time on the committee over the years. Mayor Worthington added his thanks. Richard thanked everyone and added that everyone should be extremely proud of what they have done.

Meeting **Adjourned.**

**ADDENDUM:** Handout from Bill K

### **Long-Term Status and Trends Monitoring and Special Studies in the FKNMS**

A Vision of the Future

Water Quality

Justification- pollution identification and public health

1. Provide baseline data and current conditions
2. Detect changes in baseline conditions
3. Identify sources of pollutants and reduces conjecture
4. Advance warning of harmful algal blooms and other stressors
5. Assess impacts of catastrophes
6. Provide correlative data for biological measurements
7. Development of water quality standards

Improvements

1. Perform statistical analysis to reduce station number, particularly offshore
2. Add stations at in and at mouths of selected canal developments
3. Investigate whether remote sensing can be incorporated in assessments
4. Add an episodic event sampling plan
5. Add microbiological sampling at selected stations
6. Add quantification of pharmaceuticals and endocrine disruptors at selected stations

Research/Projects

1. If all impacts of wastewater and stormwater were eliminated, water quality in most canals will remain degraded because of canal depth and geometry
2. Investigate the impacts of mosquito spraying on non-targeted organisms

#### Coral Reef and Hardbottom

Justification- the only barrier reef in the continental United States, a State and Nation treasure.

Economy of the Keys is based on a healthy coral reef system

1. Assess short and long-term changes in abundance and diversity of corals
2. Quantify coral disease abundance and patterns
3. Assess effects of marine protected areas (SPAs and Reserves) on recovery of coral populations
4. Provides data on causes of change and removes speculation
4. Assess effects of transplantation efforts

#### Improvements

1. Investigate whether station number can be reduced
2. Determine whether reduction in sampling frequency is justified and cost effective
3. Climate change and ocean acidification are major deterrents to coral growth and proliferation. Work at local, regional, and national scales to curb CO<sub>2</sub> emissions.

#### Research/Projects

1. Continue coral nursery/transplanting studies
2. Identify causes and methods of transmission of coral diseases
3. Identify the role of microorganism communities on coral health and resilience
4. Determine reasons for reduced coral recruitment
5. Determine role of genetics in coral resilience to disease and bleaching
6. Identify indicator species
7. Hardbottom community is a transition area between mangrove, seagrass and coral habitats and serves as a transition stage in the life history of many reef organisms. Yet not much is known about its structure and other functions, including energetics

#### Seagrasses

Justification- True integrators of nearshore environmental conditions; drives productivity of area; fisheries resources

1. Assess changes in abundance and species composition
2. Evaluate signals of eutrophication

#### Improvements

1. Evaluate new technologies, including remote sensing
2. Develop easy and cost-effective “indicators” of seagrass health

#### Research/Projects

1. Develop or refine models to predict changes in benthic habitats
2. Determine effects of multiple stressors on seagrass survival, species composition, and community structure.
3. Develop cost-effective seagrass restoration techniques

## Vision of the Future

Maintain long-term monitoring efforts

Streamline monitoring where possible

Add important missing elements (e.g., pharmaceuticals)

Special Studies are needed to better understand cause-effect relationships

Conduct canal demonstration project

Conduct pilot project on innovative ways of treating stormwater runoff from bridges, roads, and other surfaces

# Tropical Connections

*South Florida's marine environment*

William L. Kruczynski and Pamela J. Fletcher, Editors



- EPA – Florida Sea Grant project
- Fact page format for lay readers
- 163 authors; 500 pages
- 1. Geographic Setting/Impacts
- 2. Oceanographic Connectivity
- 3. Water Quality
- 4. Corals and Hardbottoms
- 5. Seagrass
- 6. Mangroves
- 7. Animal Diversity
- 8. Human Connections

•Management, Research,  
Monitoring Recommendations

•Annotated Further Reading

Peer review completed July 2011

Manuscript submitted Sept. 2011

Available Soon \$30 printed,  
pdf, dvd

•[ian.umces.edu/press](http://ian.umces.edu/press)

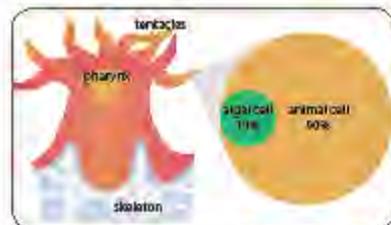


## Corals are amazing creatures

James W. Porter

### Are corals animal, vegetable, or mineral?

For all other creatures on the planet, the answer is one of these; but corals are animals that have characteristics of all three! Corals have been described as sea anemones that have a paperweight skeleton. Only 1% of the total weight of coral is living tissue and the remainder is the skeleton. The animal tissue cells contain symbiotic algae, called zooxanthellae. "Symbiosis" means unlike organisms living together. The symbiotic algae are single-celled plants that give corals their color.



Corals are made up of individual polyps. They differ from their closest relatives, sea anemones, in their ability to produce a calcium carbonate (limestone) skeleton. Algal cells live within the coral cells in a mutualistic symbiotic relationship, where both partners benefit.

### Did you know?

Corals were misclassified by the founder of modern taxonomy, Carl Linnaeus, who described them as Zoophyta (animal plants) in 1742. In fact, the species name of elkhorn coral, *Acropora palmata*, comes from the palm-like shape of its branches.

Corals are vegetarians by day (relying on food produced by the symbiotic algae), but are carnivores by night. They have tentacles with small harpoon-like barbs, called nematocysts, that can eject,

stab, and reel in unsuspecting prey that swim too close. Most Caribbean corals extend their tentacles only at night, but a few species, most notably pillar coral (*Dendrogya cylindrus*), leave them out all day.

No two coral specimens are exactly alike. The myriad of shapes, both between different species and between individuals of the same species, reflect subtle differences in light, shade, and water movement in their immediate surroundings. For example, boulder corals found in deeper water are flatter, which allows them to intercept more light coming down from the water surface.



Photomicrograph of coral tentacles showing stinging nematocyst cells that appear as small white spots. When triggered, the cells release a barbed harpoon that captures prey and is brought to the polyp's mouth.

Corals are among the most efficient organisms on earth

Like all plants, the symbiotic algae of corals are photosynthetic and use the energy of the sun to fix carbon dioxide from the water to produce sugars, starches, fats, and oils. The algae then "translocate" these foods directly to the animal cells. Almost nothing is lost in this transfer. Oxygen is a by-product of photosynthesis. Most other animals on Earth are only about 10% efficient in foodchain transfers. For example, when a cow eats grass, only 10% of the grass

contributes to the mass of the cow. Corals are 95% efficient in transforming plant material and energy from sunlight into living coral tissue. Whenever it is sunny, corals act as plants and produce more oxygen than they consume. Corals also use energy from the sun to convert dissolved calcium in seawater into a solid calcium carbonate (limestone) coral skeleton.

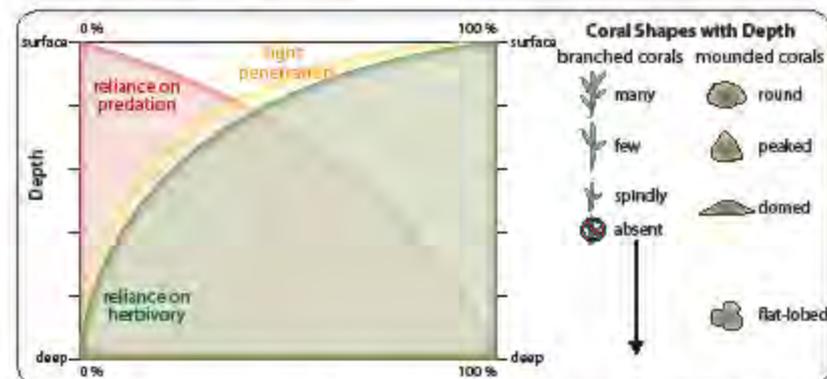
Corals are very efficient at recycling materials. During the day, as algae photosynthesize, they produce oxygen and the corals consume it. In turn, corals respire carbon dioxide that the algae need for photosynthesis. However, it does not end there; the corals then excrete nitrogen and phosphorus waste which fertilizes the plant cells.

Corals can reproduce sexually or asexually. Most release eggs and sperm into the water to produce swimming larvae called planulae. Planulae must find suitable substrate on which to settle and grow. Alternatively, corals can reproduce vegetatively when broken pieces reattach to the substrate. Vegetative reproduction is common following fragmentation of colonies

after hurricanes. Regrowth by asexual reproduction produces colonies that are genetically identical to the parent stock (clones). This genetic homogeneity may put vegetative propagules at risk during disease outbreaks because they lack the genetic diversity that may favor more disease-resistant individuals.

How can the most diverse and productive of all marine communities on Earth survive and flourish in the most nutrient-poor waters on Earth?

Tropical water over coral reefs is very clear because there is so little material in it (oligotrophic). Corals flourish under these conditions because of the perfection of the coral-algal symbiosis. Their reliance on solar power, energy efficiency, and material recycling has led to the long-term success and survival of coral reefs, one of the most diverse and productive environments on Earth. It is not a stretch of the imagination to suggest that corals provide a survival lesson for humankind; efficiency in the present may be a key to a sustainable future.



Light from the sun declines exponentially with depth on a coral reef (yellow line). As light declines with depth, reliance on photosynthesis as an energy source declines with it (green line). Corals make up for this energy loss by increasing the amount of food that they capture and eat with increasing depth (red line). As ambient light changes with depth, so do coral shapes. Branching corals are usually more dependent on high light intensity and disappear altogether with depth. Mounded (boulder) corals flatten with increasing depth to provide more surface area to intercept available light as the intensity of light decreases.

*"If you love south Florida's marine environment, then read Tropical Connections and share it. If you are not familiar with this ecosystem, then get acquainted through the copious illustrations, clear writing, and comprehensive summaries. The book does a fine job at distilling complex science for the non-specialist."*

**Dr. R. Eugene Turner**, Professor  
Louisiana State University

*"This work is very timely in that it addresses a unique environment of the United States that is under severe pressure because of activities related to human development. This book is effective in documenting the dramatic changes in south Florida over the last few decades in a format that is very attractive and easy to read."*

**Dr. Paul A. Montagna**, Professor  
Texas A&M University

*"This is a wonderfully accessible yet exhaustively researched book and I really like the quality and the abundance of the illustrations. To say it covers the key issues is a serious understatement. I think Tropical Connections will stand for quite a while as a milestone."*

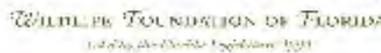
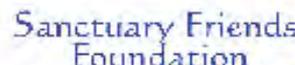
**Dr. John Ogden**, Former Director  
Florida Institute of Oceanography

*"Tropical Connections is a wonderful summary of the varied facets that influence south Florida's marine environment. The editors have brought together environmental experts from a variety of backgrounds to lend their talents to present a thorough understanding of the south Florida marine ecosystem."*

**Dr. Stephen A. Bortone**, Executive Director  
Gulf of Mexico Fishery Management Council

*"Tropical Connections is the culmination of an unprecedented effort to assemble a summary of the status and threats to south Florida habitats. My hope is that this book will serve as a call to action to residents, outdoor enthusiasts, environmentalists, educators, and policymakers alike to embrace a stewardship ethic that protects our natural heritage for present and future generations."*

**Anne Morkill**, Wildlife Refuge Manager  
U.S. Fish and Wildlife Service





## Production

EPA \$100K

Protect Our Reefs \$80K



## Review

Sanctuary Friends \$3K

National Park Service \$5K



## Printing (\$59.6)

EPA \$25K

FIU Foundation \$5K

Sanctuary Friends \$15,661

FAVOR \$3K

Florida Department of Health \$1K

Wildlife Foundation of Florida \$5K

Florida Keys Environmental Fund \$5K (DVD)

**\$247.6K**

# Overview of Program

What we know that we know

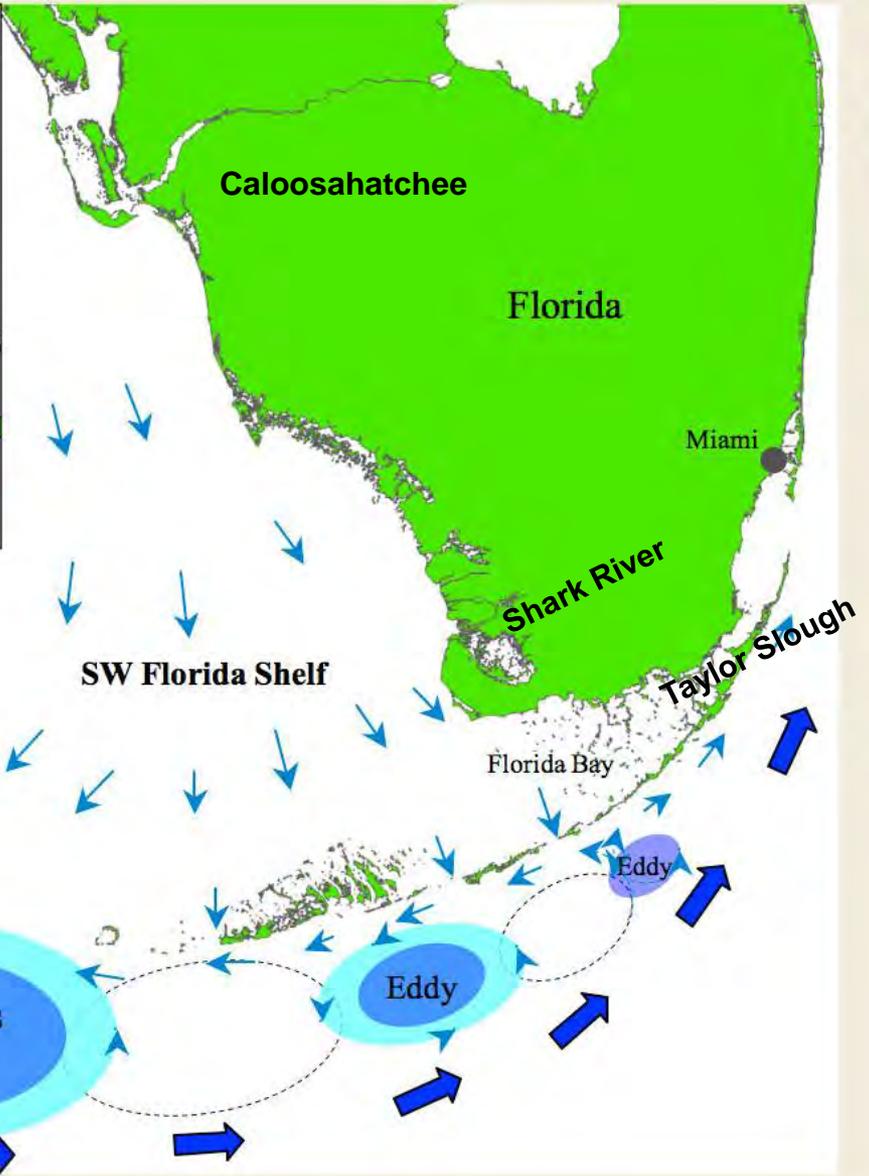
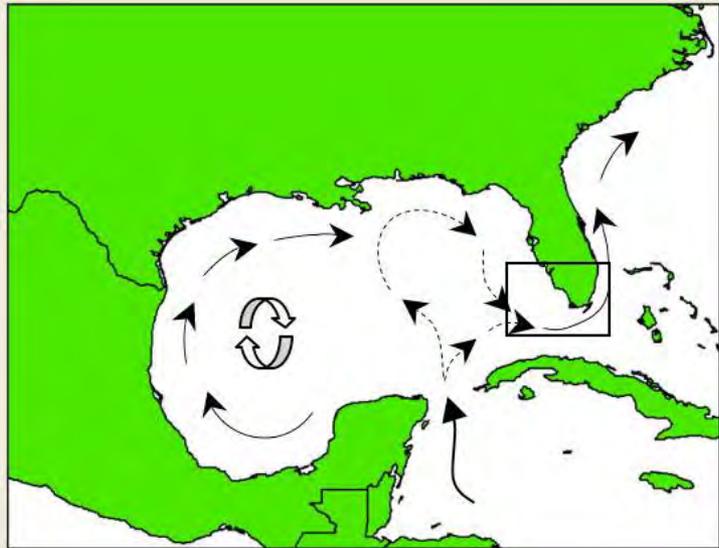
What we know that we don't know

Recommendations for the future





**The Florida Keys are a chain of islands sticking out in the middle of the ocean and are primarily subject to oceanic processes. No freshwater, no estuaries, no rivers.**



Loop Current

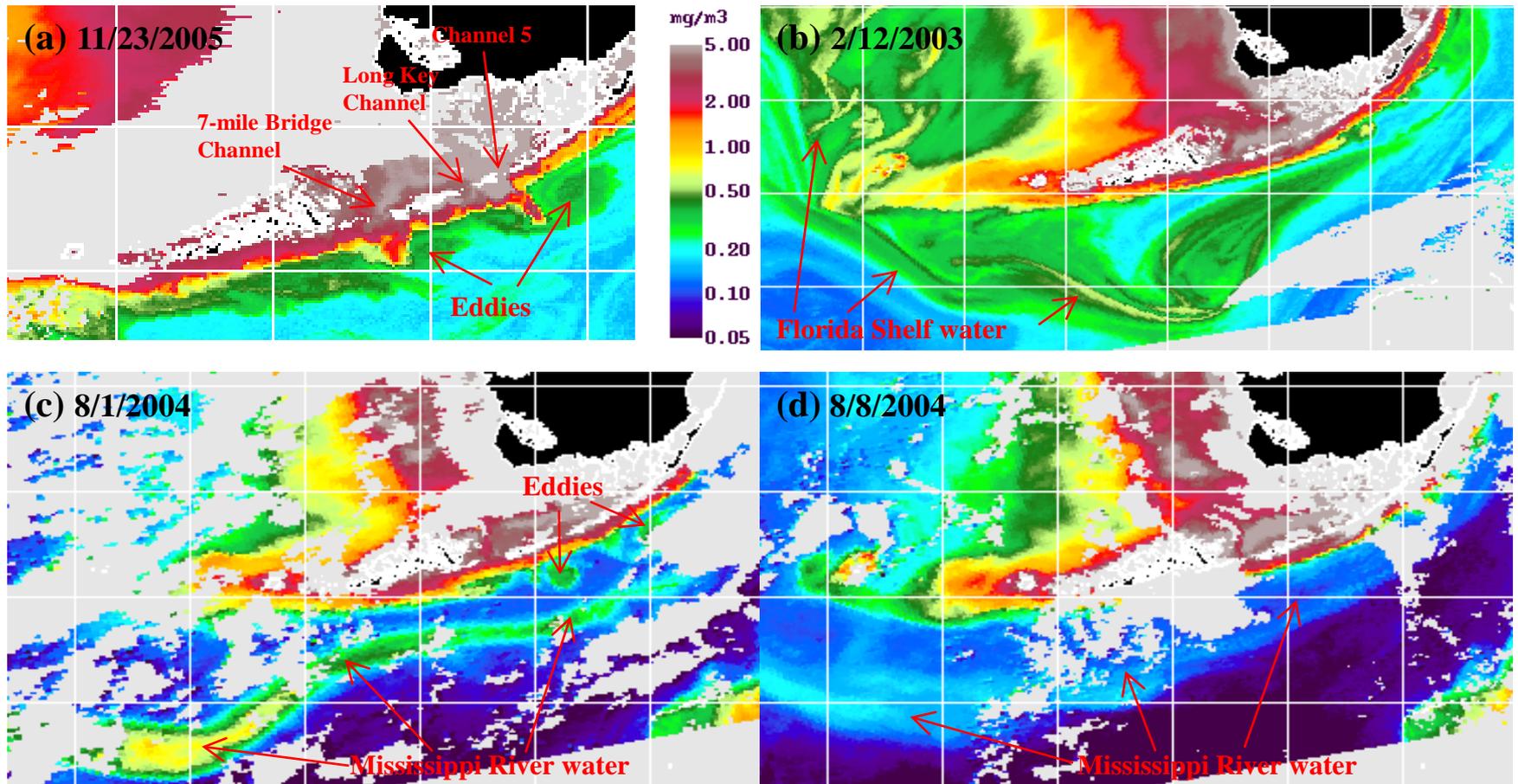
SW Florida Shelf

Florida Bay

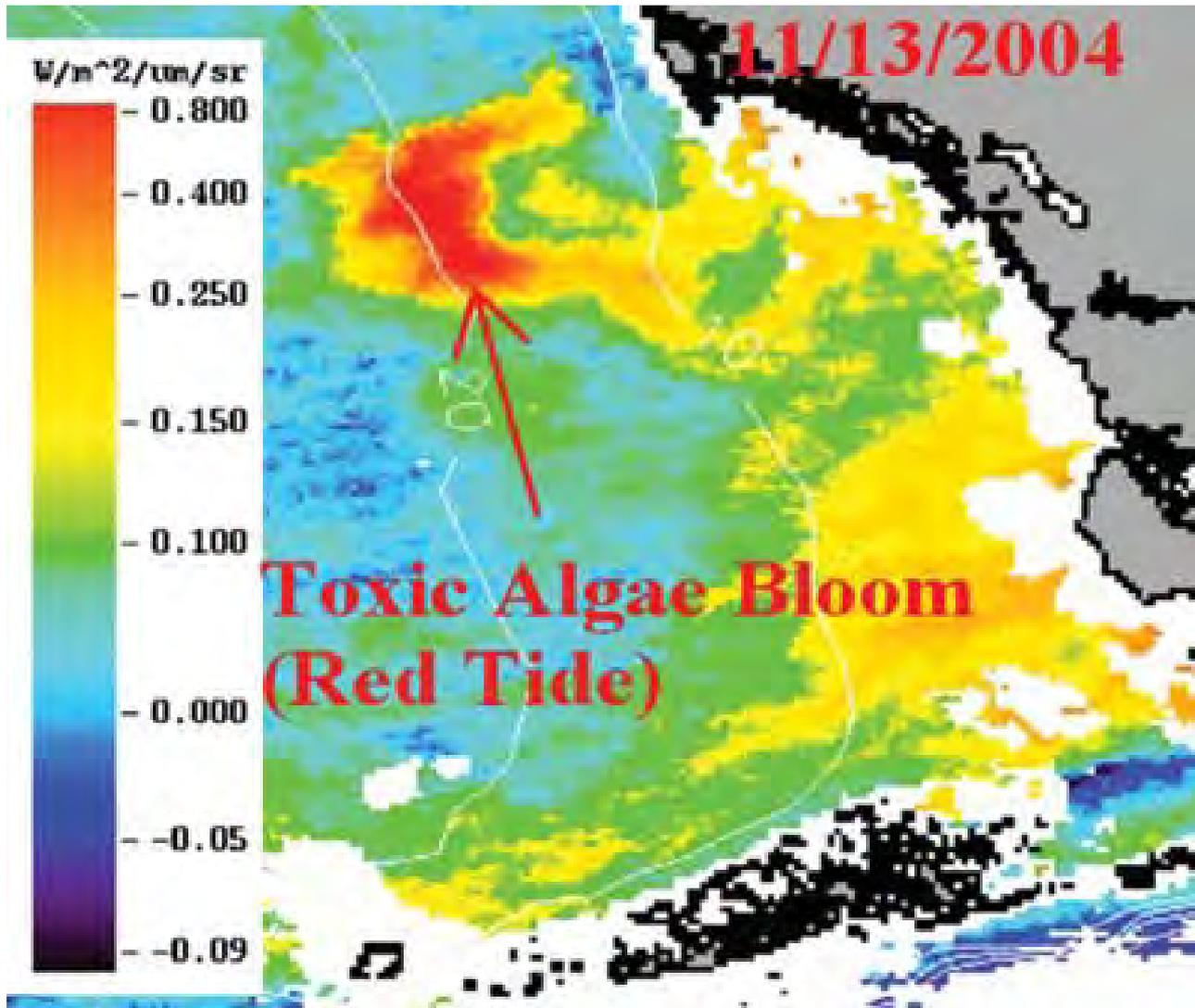
Tortugas Eddy

Eddy

Eddy



**Monitoring program should be designed to identify and tract far field sources of water entering the Sanctuary. Remote sensing gives big picture.**

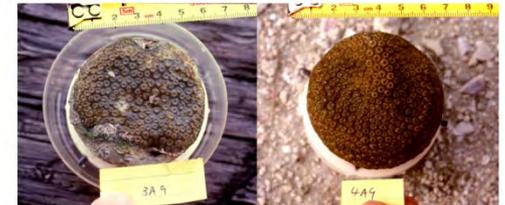


# Florida Bay water is inimical to reef development

Shallow water gets hot in summer, cold in winter

Reef development off passes restricted

Nothing new, last 6000 years



## Oceanic Waters

Oceanic water extremely low in nutrients and chlorophyll and in the Keys extends to the shoreline except for “unusual” events

To say it meets all applicable water quality standards is a specious argument. Standards are the ambient conditions

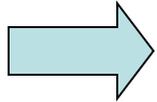
We can not take any credit for low nutrients, it was oceanic when we started the program

Periodic upwelling over last 125,000 years

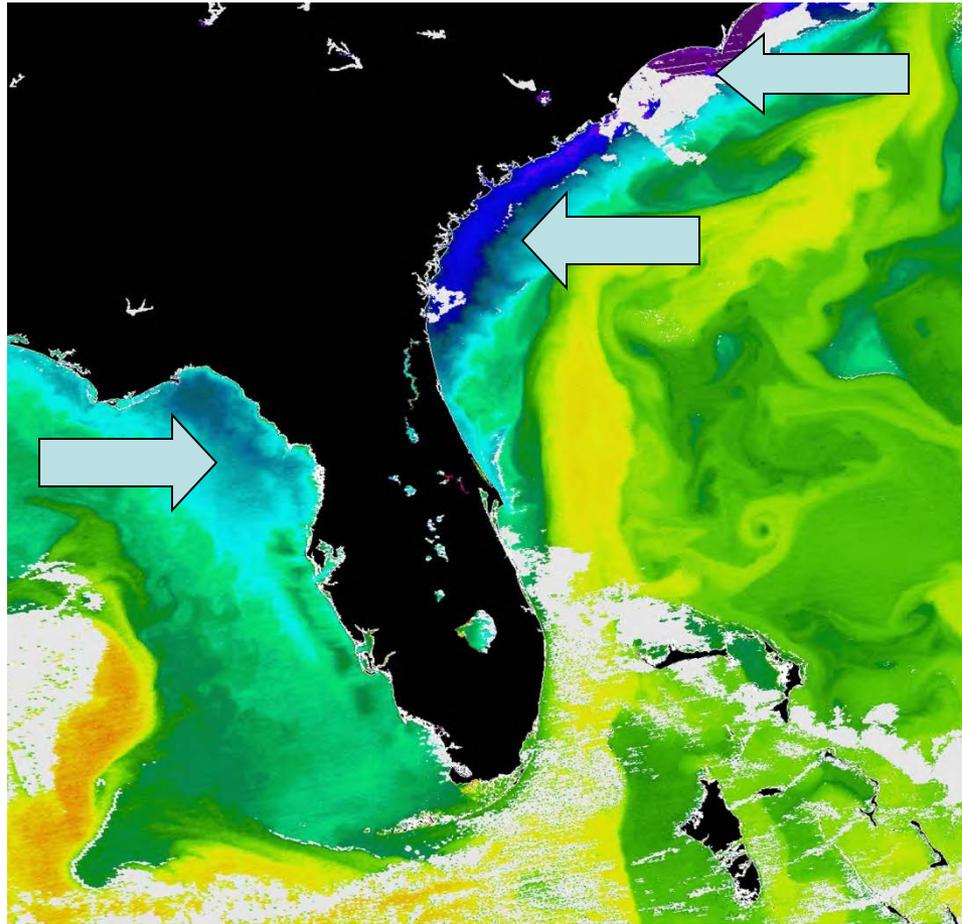
**“The ocean is a desert with its life underground**

**And the perfect disguise above...”**

**Dewey Bunnell and America**



**Nutrient-rich  
coastal  
waters where  
there are  
rivers**



**Most surface “far-field” sources of water to the Keys are “oceanic” Gulf Stream water, or upwelling of oceanic water**

**At times, nutrient-rich water enters from the SW Florida Shelf and Florida Bay (areas with river inputs)**

**Research topic: Need to quantify mass-balance loading from different sources**



**White pox disease**

**Bank reefs are in poor shape today**

**Poor recruitment**

**Boom and bust cycles**

**Over fished- few large predators, turtles, manatees, seals**

**Diseases- causes, transmission, recovery, role of microbes**

**Lack of sea urchins, crinoids, other important grazers**

**Topics for special studies**

**If Biological Integrity is a metric of water quality, offshore waters fail**



**Paradox:** How can the most diverse and productive of all of the marine communities on Earth, seagrasses and coral reefs, survive and flourish in the most nutrient-poor waters on earth?

Require clear water for photosynthesis- symbiotic algae

Very efficient internal nutrient cycling

Can out compete other organisms under “desert” conditions

**Nutrients are “limiting” in these waters and as soon as they enter the oceanic water, they are taken up and utilized.**

**Ocean outfall- benthic community is at background within a few hundred meters of end of pipe.**



**Water quality should be monitored to:**

- Establish a baseline- detect change
- Correlative data for biological studies
- Document improvements in canals
- Provide early warning
  - South Florida Restoration
  - Algal blooms – SW Florida Shelf
  - Gulf Oil
  - Mississippi River

# **Global Coral Reef Crisis**

**“The world’s corals and coral reef ecosystems are in crisis. In just a few decades, scientists warn, these “rainforests of the sea” and all their rich biodiversity could disappear completely. While corals face numerous dangers, the overarching threats of climate change and ocean acidification are the greatest, and they’re accelerating the decline of corals around the world. The year of 2009 marked the warmest ocean temperatures ever recorded, putting corals at risk and foreshadowing what we can expect as climate change continues. Urgent action is needed to save the world’s coral reefs from extinction.” (Center for Biological Diversity)**

**This is a global problem that must be recognized and addressed by all levels of government.**



**We must do what we can locally to relieve stresses to biological communities, due to:**

**Land-Based Sources of Pollution**

**Habitat Loss**

**Over Fishing**

**But can't continue to ignore the "elephant in the room."**

**Corals bleach with high temperatures and doldrum conditions.**

**Bleached corals may die and are more susceptible to disease.**

**“Local stressors reduce coral resiliency to bleaching.” (Carilli et al. 2009)**



**Coral Resiliency- The Nature Conservancy. Some corals are less susceptible to bleaching- genetics. (Grimsdich and Salm. 2006)**

**Research topic if we want to save our reefs.**

**Can nutrient pollution kill reefs? Most assuredly- Jamaica Discovery Bay- nutrients and overfishing.**

**Is Nutrient Pollution from Keys Reaching Offshore Reefs?**

**We thought that the answer was “yes” in 1990-1992**

**More recent data on water quality do not definitively support earlier claims (Swart, Evans, and Capo 2011)**

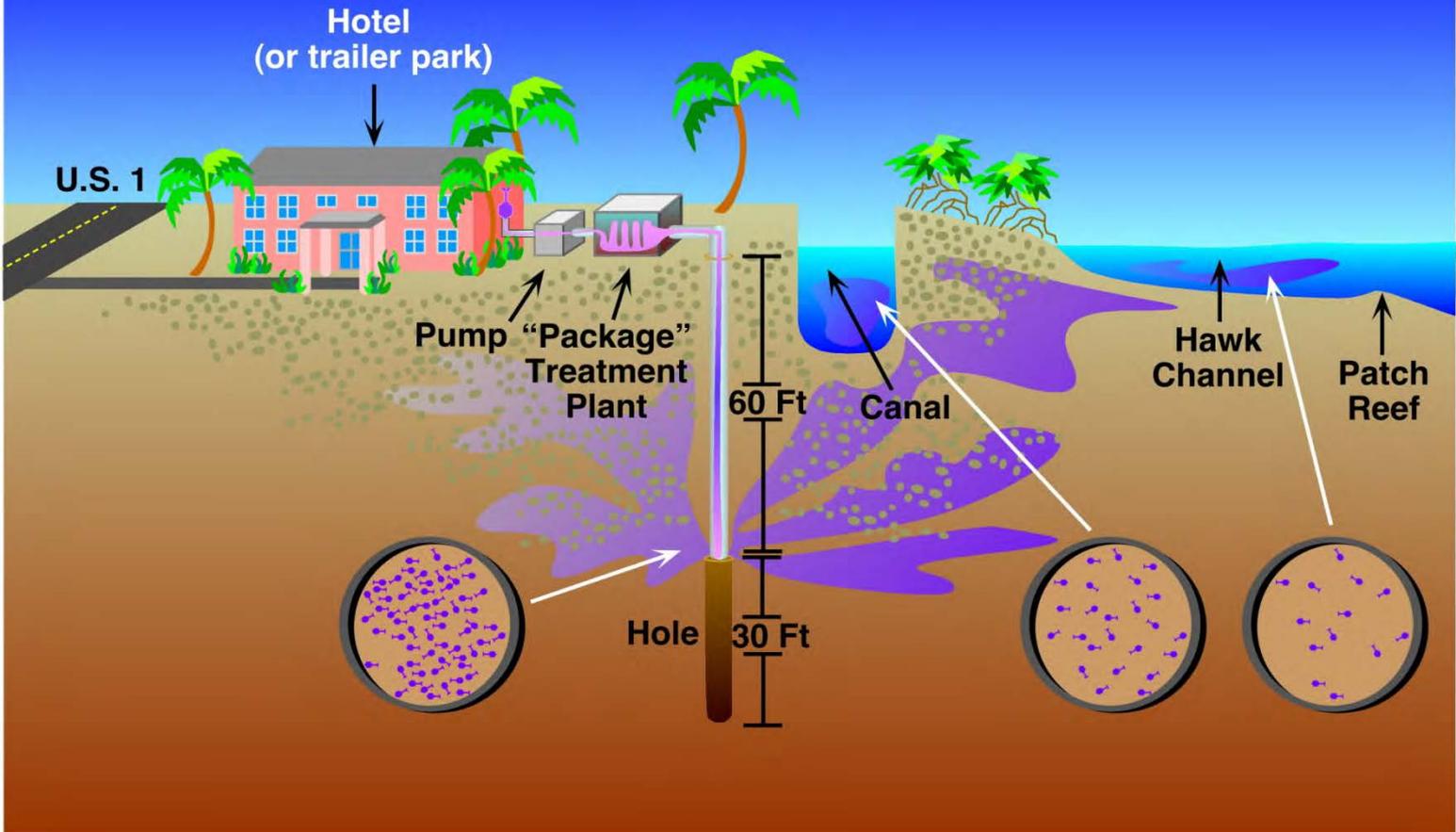


**Yet we’ve all seen isolated patches of *Lyngbya* and other noxious algae on reefs that thrive in high nutrients.**

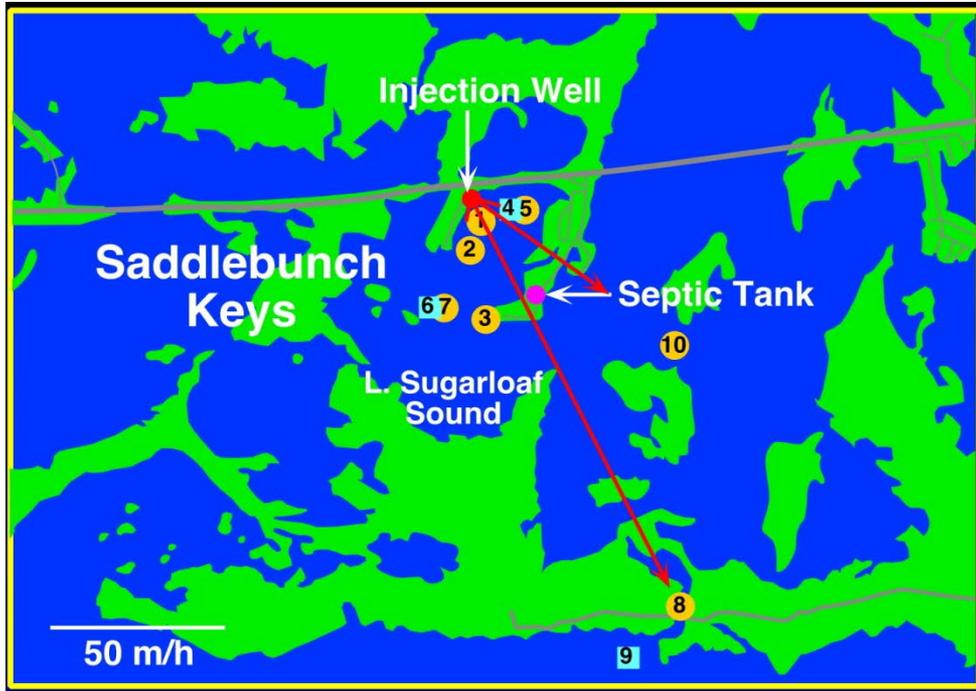
**Could there be a direct conduit from the Keys through the porous limerock to those locations?**

**Research topic**

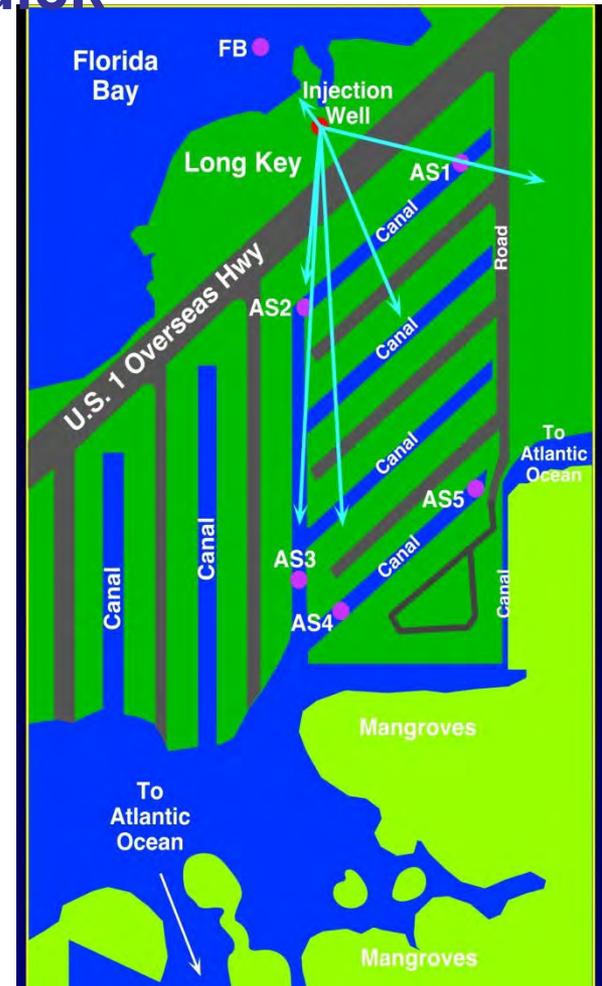
# Injection Well



# Measured rate of movement of injected wastewater through limerock is quick



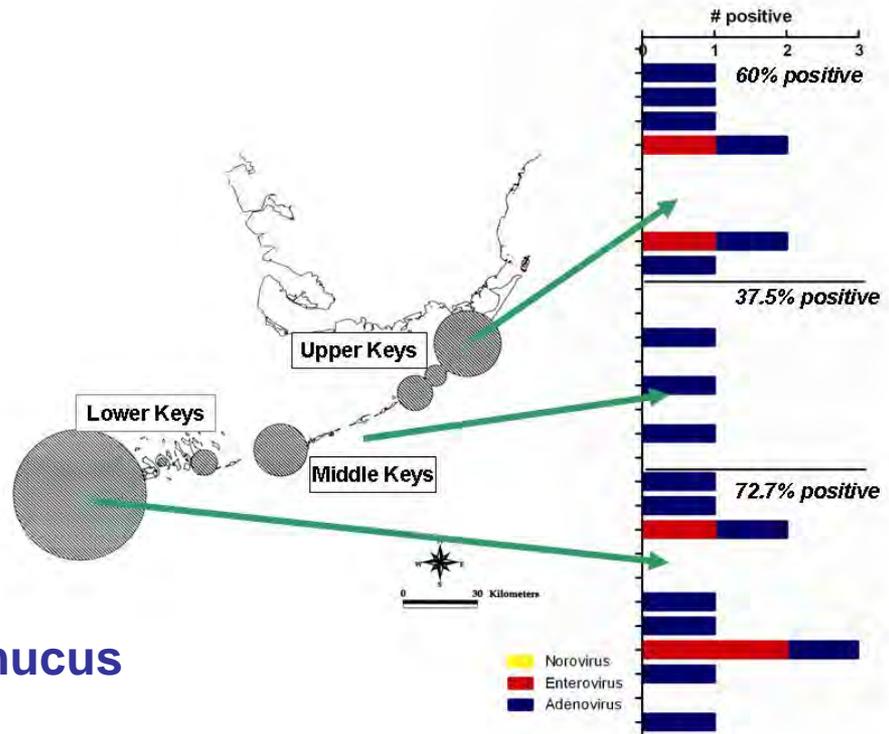
Rate of tracer ranged from 1.2 to 141 m/hr



Rate of tracer ranged from 0.35 to 22.5 m/sec



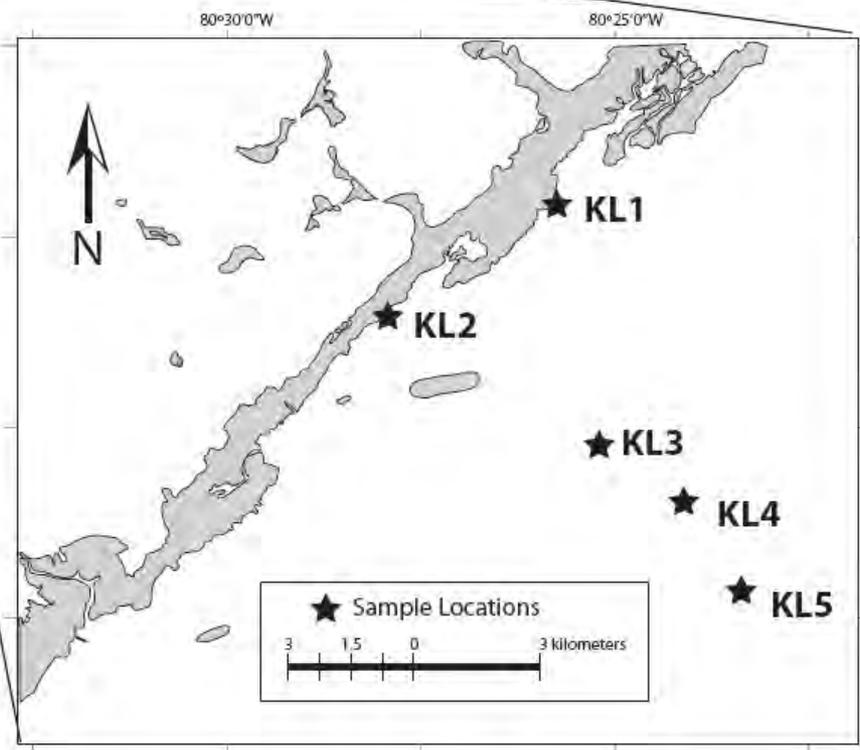
## Human intestinal viruses in mucus layer of corals



Reefs in the Upper Keys (including Key Largo with a population of approximately 26,000 people) and Lower Keys (including Key West with a population of approximately 39,000 people) had the highest percentage of reefs positive for human viruses, while the frequency of virus detection was considerably lower in the Middle Keys (with a human population of approximately 11,000).



88° 82° 80° 78°



80°30'0"W

80°25'0"W



25°5'0"N

25°0'0"N

★ Sample Locations

3 1.5 0 3 kilometers

★ KL1

★ KL2

★ KL3

★ KL4

★ KL5

## Enteric virus detection between sample types

Sample Type	Enterovirus detection frequency	Adenovirus detection frequency (b)
Coral SML(a)	16% (4/25)	72% (18/25)
Water Column	8% (2/25)	44% (11/25)
Ground Water	8% (2/25)	32% (8/25)

a Surface mucopolysaccharide layer

b Detection of adenovirus in SML was significantly greater than expected based on  $\chi^2$  analysis ( $p = 0.015$ )

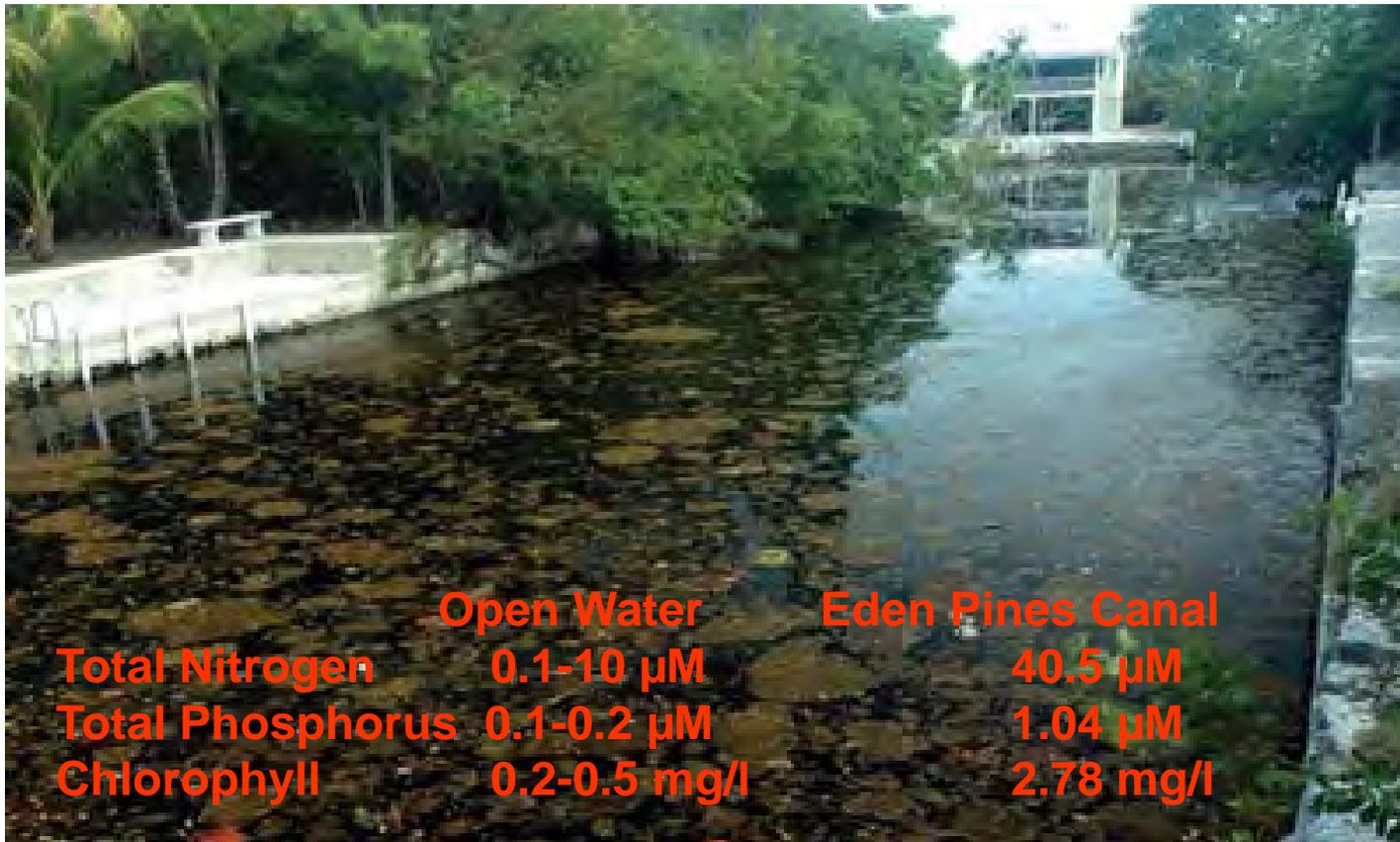
**This work supports the conclusion that groundwater from the Keys that is contaminated by sewage can be transported to the reef through Key Largo limestone.**

**More research is needed.**

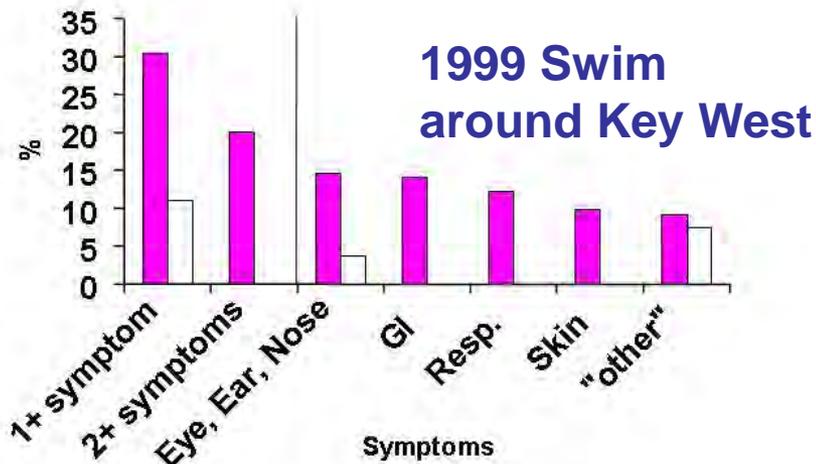
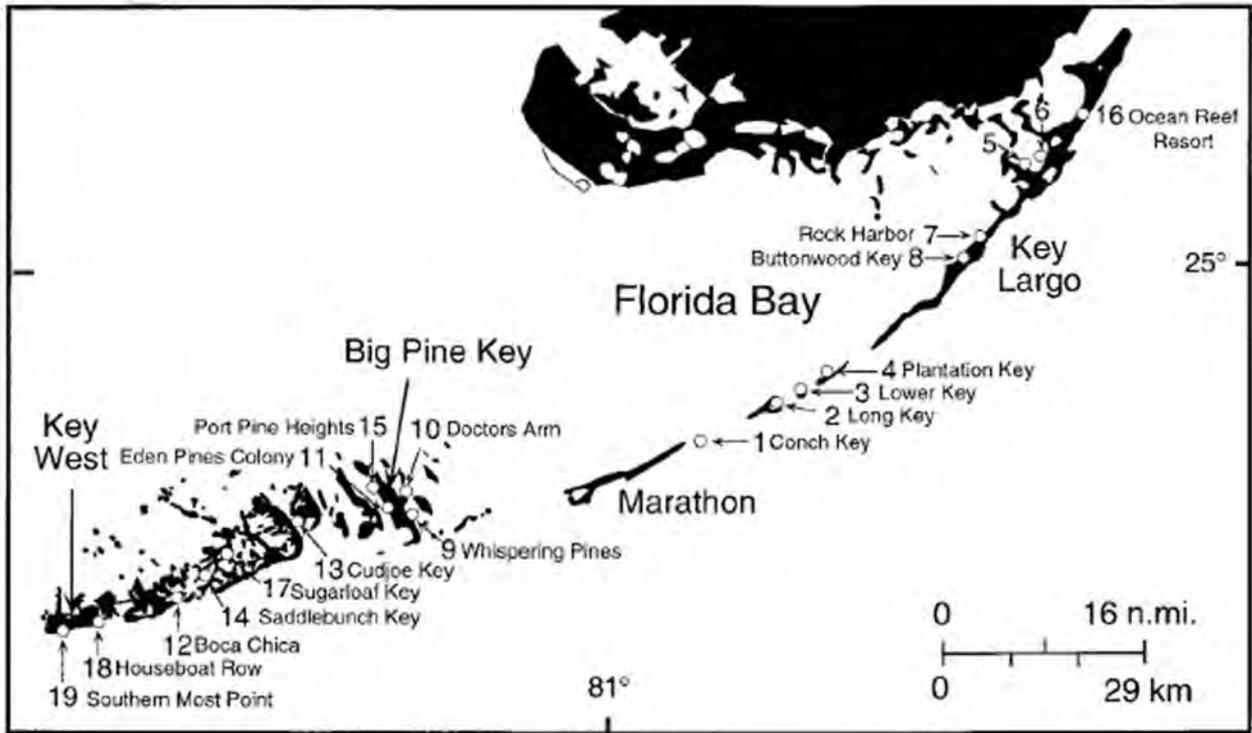
# Confined water (marina basins) and canals- high nutrients

Studies summarized in White Paper (1998)

Source of pollution- inadequate treatment and disposal of  
wastewater and stormwater- led to State Law 99-395.



	Open Water	Eden Pines Canal
Total Nitrogen	0.1-10 $\mu\text{M}$	40.5 $\mu\text{M}$
Total Phosphorus	0.1-0.2 $\mu\text{M}$	1.04 $\mu\text{M}$
Chlorophyll	0.2-0.5 mg/l	2.78 mg/l



## Water problems empty beaches

*Tourists cutting vacations short as bacteria spreads*

By MANDY BOLEN  
Cape Staff Writer

KEY WEST — Contaminated nearshore waters around Key West could have far-reaching effects on business and tourism.

Alarming bacteria levels off South Beach, Higgs Beach, Simonton Beach, Smathers Beach and the nearshore waters off North Roosevelt Boulevard from Kennedy Drive to Cow Key Bridge led to posted health advisories urging people to stay out of the contaminated waters. But the Agency's Authority is reassuring everyone that the tap water is safe. It stresses



problem. The major replacement project has uncovered leaks and crumbling sewer pipes that are allowing sewage access to the city's storm-water runoff that end up in the nearshore waters.

"Storm water from recent heavy rain carries fecal matter from yards and leaky sewer pipes," David Fernandez, the city's utilities director, said.

He reminded people that fecal matter is always at some level in their back yards and as long as fish and birds live in and near the water.

But the sewer replacement is a necessary evil, said David's Quintero of Best Relief.

"The sewer construction is not the cause because the new lines are part of the solution to the ongoing water pollution problem," she said. "This just reinforces the urgency of the problem to the public should we not act now."

Photo by MIKE HENTZ/The Citizen



**“The young, the old, and the immunocompromised should not have contact with residential canal waters.” (Joan Rose 2000)**

### **Problems with canals**

**Poor flushing, dead end, lots of turns**

**Deep, stratified, no DO below a few feet**

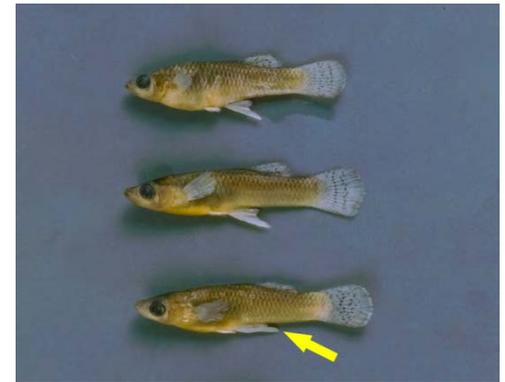
**High bacteria and viruses**

### **Fixes**

**Remove nutrient inputs- current wastewater improvements**

**Special Studies- Physical improvements- shallow, slope, add flushing- pilot project**

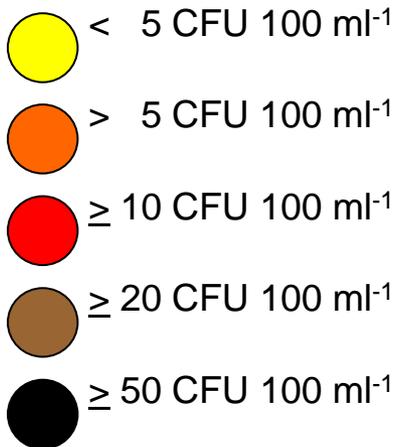
**Control weed wrack**



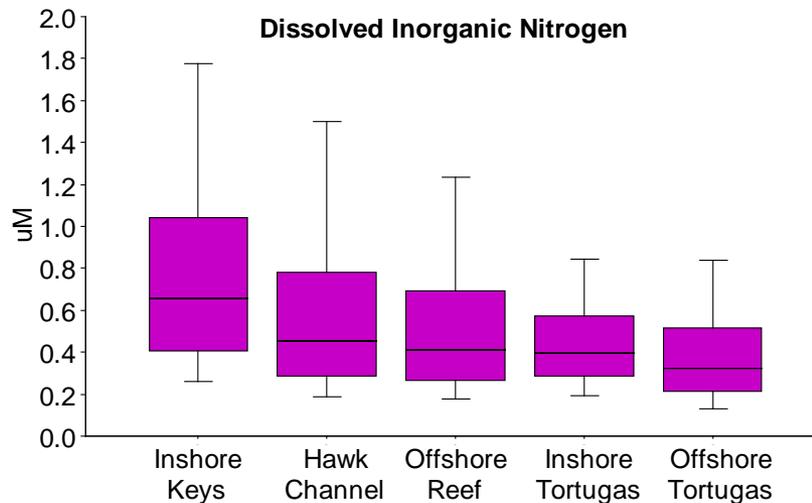
**Special Study- pharmaceuticals**

# Do canals degrade receiving waters?

## Contour plots showing the distribution of total coliform bacteria in Port Largo Canal during sampled tidal stages



**Bacteria can be viewed as tracers of nutrients emanating to receiving waters from canals. Nutrients are taken up quickly because they are limiting in oceanic water.**



## **Are nutrients from canals cause changes in biological communities of receiving waters?**

**Yes, Little Venice seagrass study**

**Before remediation- low productivity, heavy epiphyte growth**

**After remediation- clearer water, higher productivity**

**Avenue J canal- 4 acres of benthic algae in an area that should support seagrasses. Algae- poor habitat.**

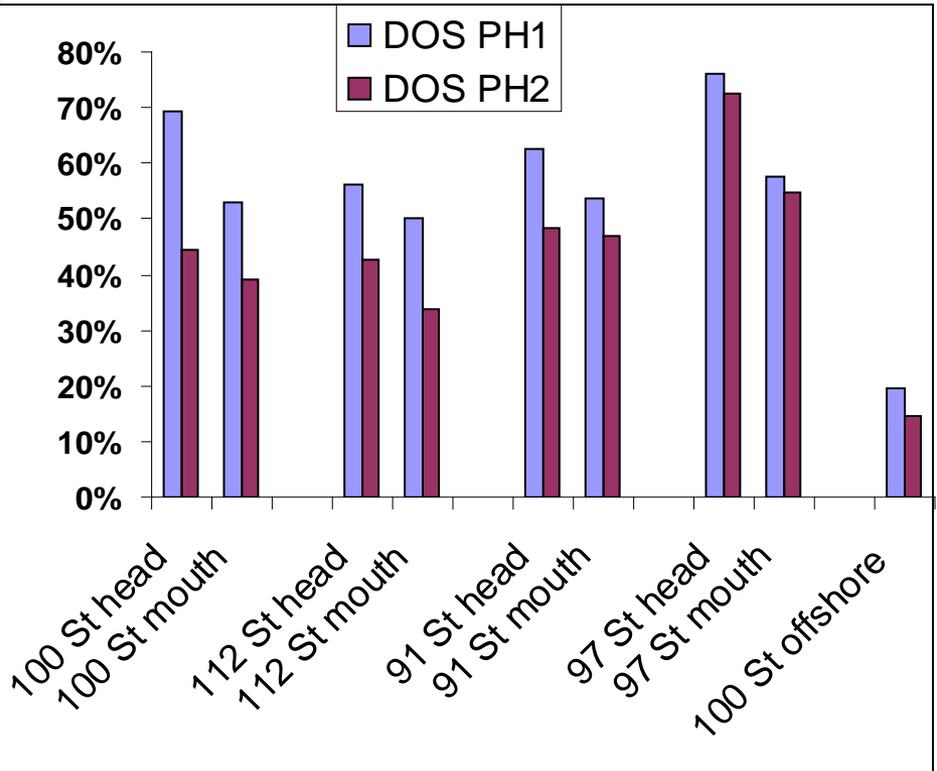
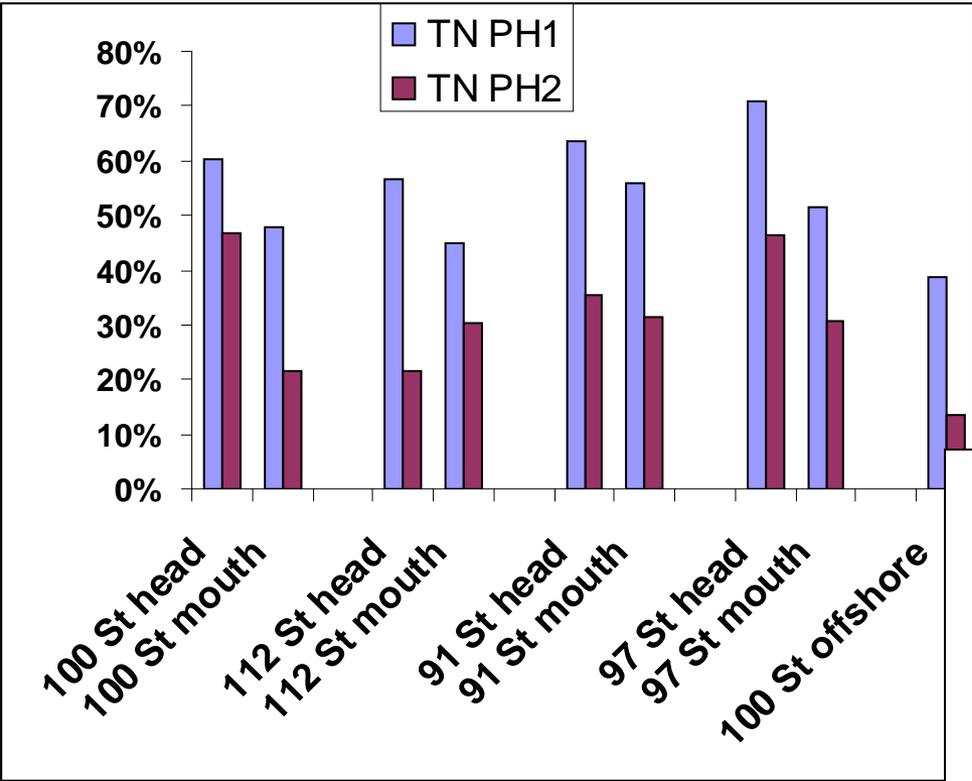
**Cascade effect through ecosystem-**

**Hypothetical:**

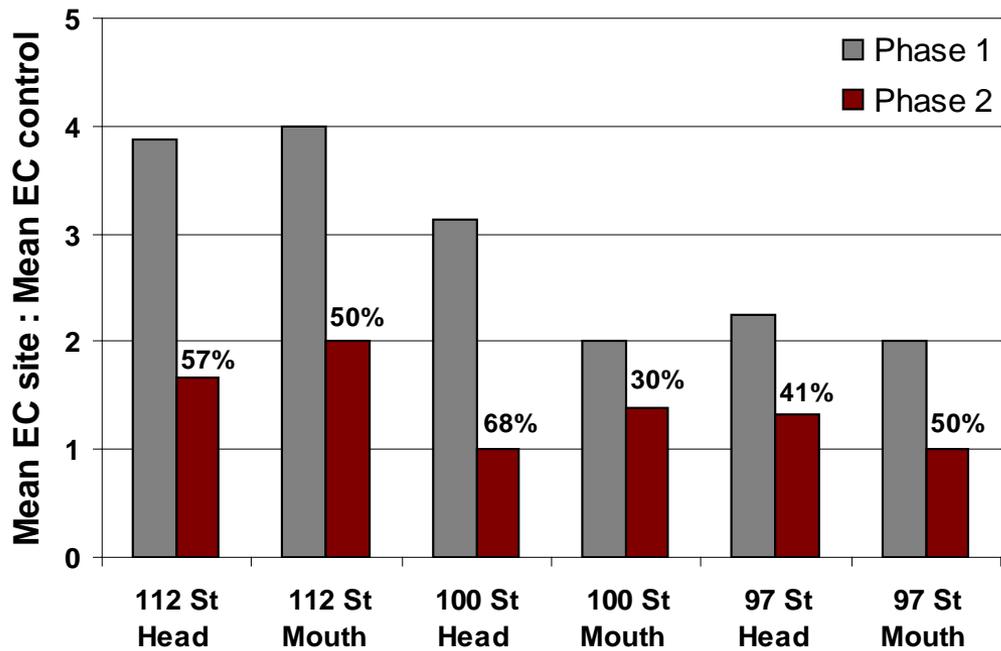
- snappers and groupers use seagrasses as nursery area**
- pinfish eat shrimp and amphipods associated with seagrass**
- juvenile snapper and grouper eat pinfish and shrimp**
- seagrass to algae = fewer adult snapper and grouper at reef**

**Needs more research**

# Little Venice- A Success Story



**State of Florida 62-302.530**  
**<4.0 mg/l DO**

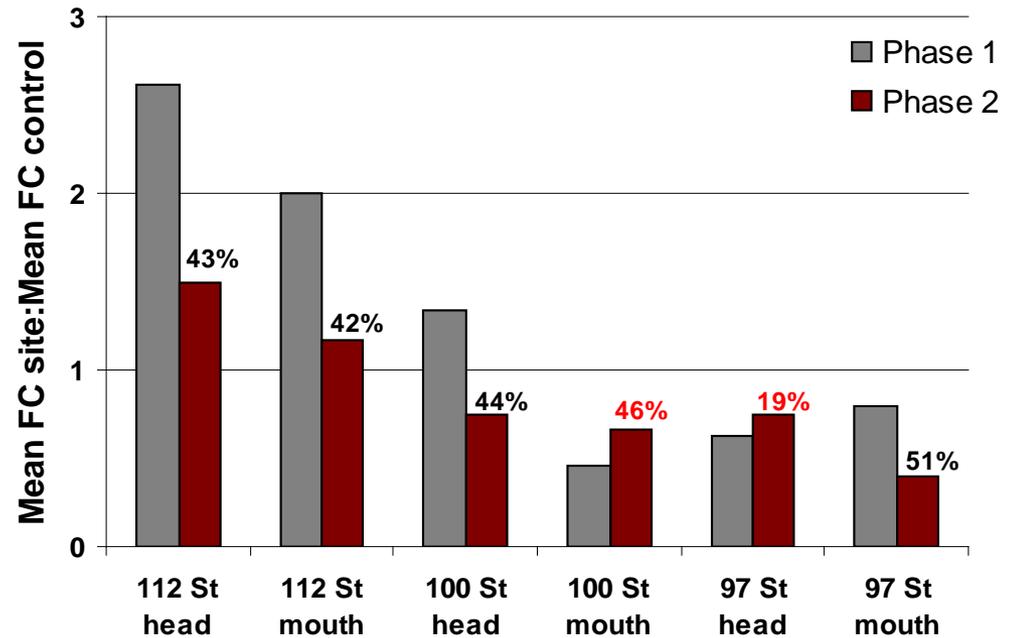


Ratio **Enterococci**

[EC] remedied : [EC] control

Ratio **Fecal Coliform**

[FC] remedied : [FC] control



Boyer and Briceno:

“Removing the sources of wastewater (septic tanks and cesspits) in Little Venice Area has led to water quality improvements by eliminating a substantial portion of bacteria and nutrient loading into the canals. Hence, similar remedial actions are recommended for other impacted areas in the Florida Keys.”

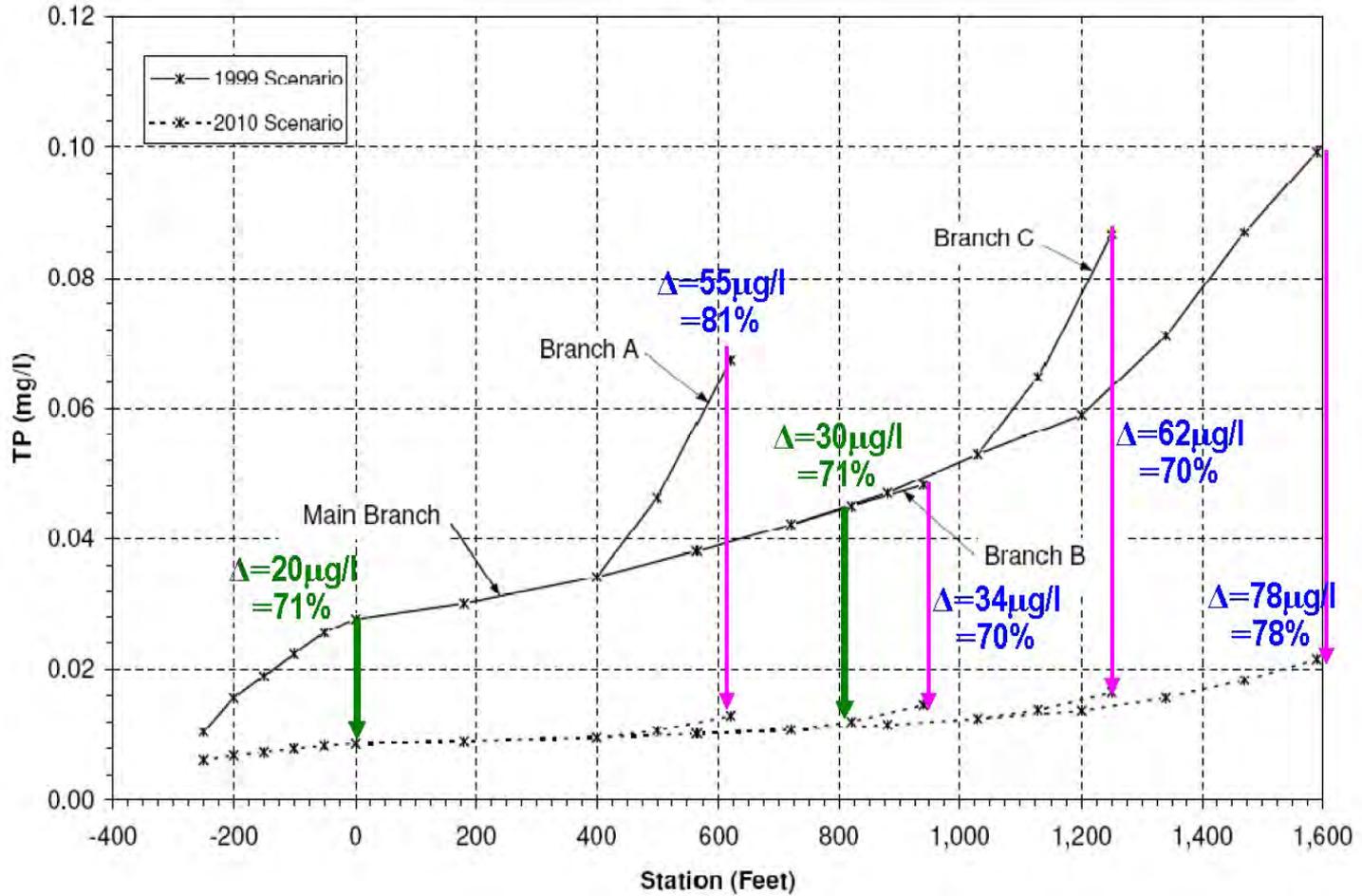
Lots of organic matter in bottom of canals- poor flushing

Influence of Florida Bay waters on occasion

Better treatment removes more nutrients

Deeper disposal reduces risk to surface waters

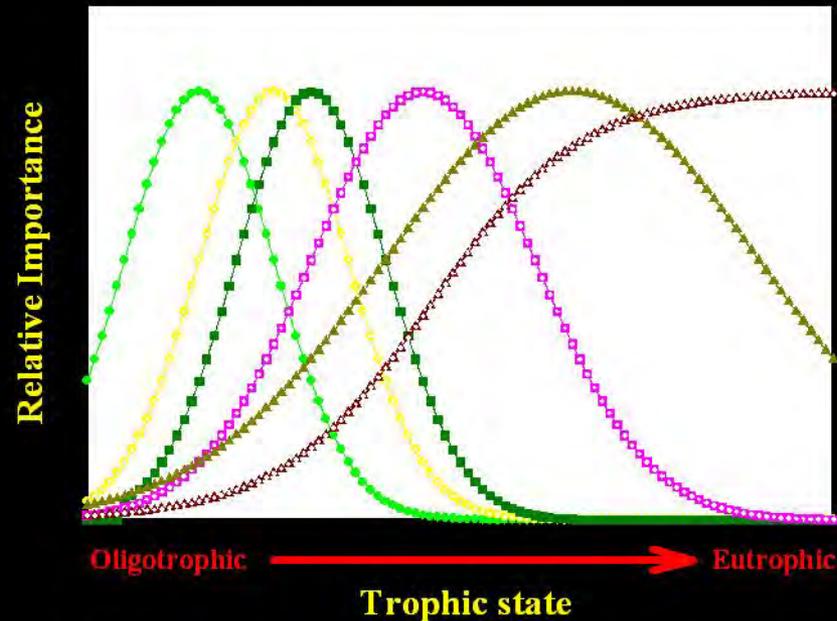
# TP Profile



What do you measure to assess eutrophication outside canals?

Seagrasses

## Eutrophication model



- *Thalassia testudinum*
- ◇— *Syringodinium filiforme*
- *Halodule wrightii*
- *Ruppia maritima*
- ▲— Macroalgae
- △— Microalgae

**Nutrient pollution will lead to changes in relative abundance of primary producers in a predictable way.**

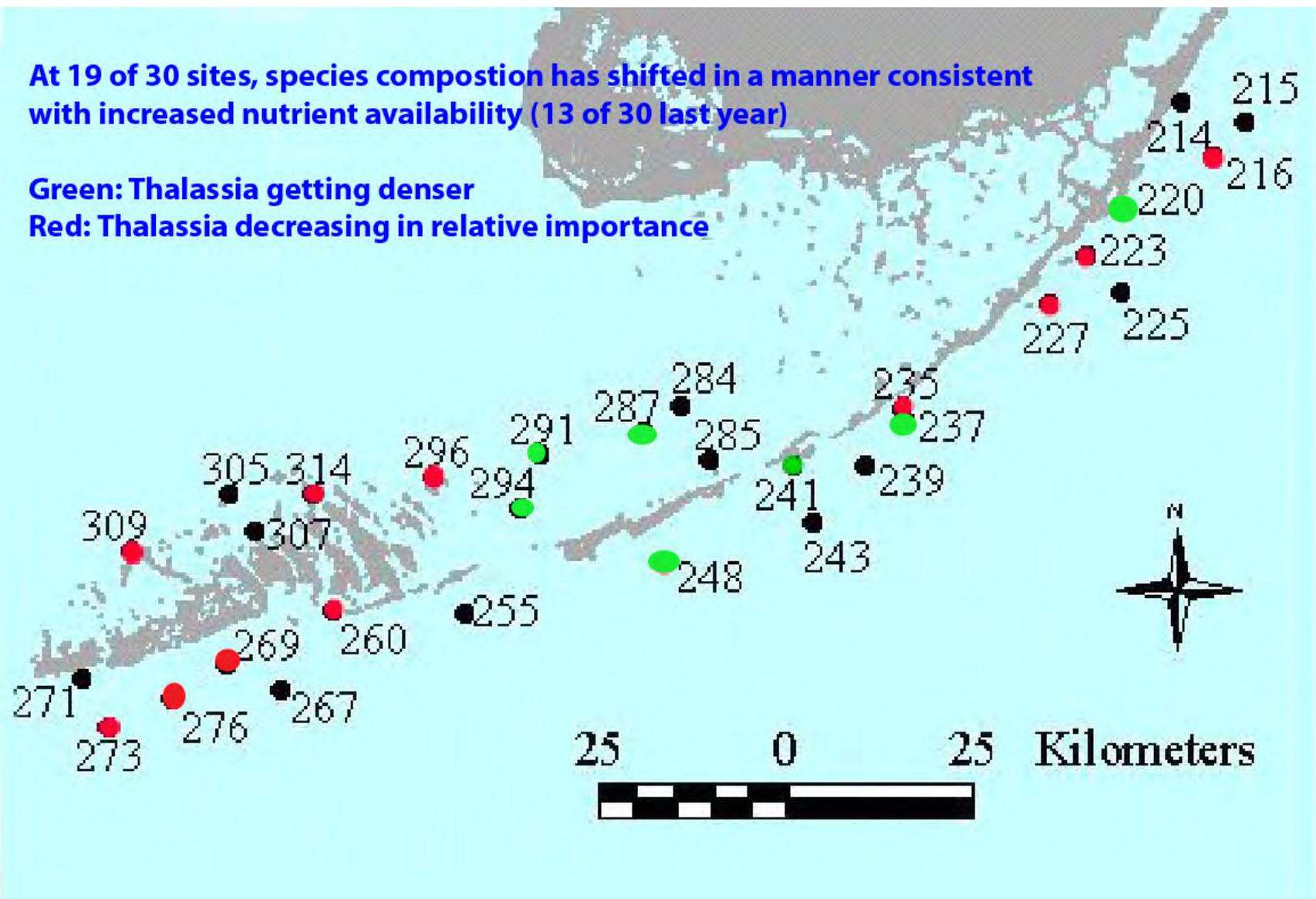
Avenue J canal mouth

Florida Bay during seagrass die-off-cyanobacteria blooms

At 19 of 30 sites, species composition has shifted in a manner consistent with increased nutrient availability (13 of 30 last year)

Green: *Thalassia* getting denser

Red: *Thalassia* decreasing in relative importance



# Indicators of Eutrophication in Seagrasses 1995-2009

Site	N:P	SCI	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$
214	Red	Green	Green	+
215	Green	Green	Green	+
216	Green	Green	Green	Green
220	Green	Yellow	-	+
223	Green	Red	Green	+
225	Green	Green	Green	Green
227	Red	Yellow	-	Green
235	Red	Red	-	Green
237	Green	Green	Green	Green
239	Red	Green	Green	Green
241	Red	Yellow	Green	Green
243	Red	Green	Red	Green
248	Red	Yellow	Green	+
255	Green	Green	Green	+
260	Green	Red	Green	Green

Site	N:P	SCI	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$
267	Red	Green	Green	Green
269	Red	Red	Green	+
271	Green	Green	Green	Green
273	Green	Red	Green	+
276	Green	Red	Green	Green
284	Green	Green	-	+
285	Green	Yellow	Green	+
287	Green	Yellow	-	Green
291	Green	Yellow	Green	Green
294	Green	Yellow	Green	+
296	Red	Red	Green	-
305	Green	Red	Green	Green
307	Red	Green	-	Green
309	Green	Red	Green	-
314	+	Red	Green	-

## **Public Law 101-60 Florida Keys National marine Sanctuary and Protection Act (November 16, 1990)**

**The U.S. Environmental Protection Agency and the State of Florida represented by the Florida Department of Environmental Protection shall develop and implement a Water Quality Protection Program for the Sanctuary.**

**The purpose of the Water Quality Protection Program is to recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of the Sanctuary. This includes restoration and maintenance of a balanced, indigenous population of corals, shellfish, fish and wildlife, and recreational activities in and on the water.**

**In addition to corrective actions, EPA and FDEP, in conjunction with NOAA shall develop a monitoring program and opportunities for public participation in all aspects of developing and implementing the program.**

# **Water Quality Protection Program**

- **Finalized 1996**
- **Included in Sanctuary's Final Management Plan- July 1997**
- **Consists of 90 Action Items**
- **Has four interrelated components**
  - **Corrective actions to reduce pollution**
  - **Monitoring to provide status and trends of biological resources and effectiveness of remedial actions to reduce pollution**
  - **Research/Special Studies to identify cause-effect relationships and monitoring tools**
  - **Public Education/Outreach- increase public awareness**

The role of EPA in this program is different than the daily activities of much of the agency



**C-111 Canal discharge into  
Manatee Bay**

### **A Simplification**

**Typically the Agency**

- **Identifies a source of pollution**
- **Stops the source**
- **Fines, legal action**
- **Restores the site**
- **Monitors**

**Other Large Ecosystem Programs- Chesapeake Bay, Great Lakes, Gulf of Mexico, etc.**

Management of the Florida Keys National Marine Sanctuary is a partnership between NOAA, EPA, and FDEP as directed by Congress

**NOAA- funds research, does enforcement, issues permits, establishes zones, installs mooring buoys, education**

**EPA and the State- establish and implement a monitoring and research program, look for signals of change**

**The Future of EPA's Role in the WQPP is in Your Hands**



**Vision of the Future**

# Status of Wastewater Implementation

January 25, 2012



Elizabeth Wood  
Monroe County, Sr. Administrator – Sewer Projects

# Compliance Mandate

- \* Chapter 99-395 was replaced by Chapter 2010-205 and amended Florida Statute 381.0065 (4) (l) and 403.086 (10) requiring the following by December 31, 2015:
  - \* Effluent from Wastewater Treatment facilities having design capacities greater than or equal to 100,000 gallons must not exceed the following concentrations:
    - \* 5 mg/l Biological Oxygen Demand,
    - \* 5 mg/l Suspended Solids,
    - \* 3 mg/l Total Nitrogen, and
    - \* 1 mg/l Total Phosphorus.
  
  - \* Effluent from Onsite Sewage Treatment and Disposal Systems (OSTDSs) with capacities less than 100,000 gallons must not exceed the following concentrations:
    - \* 10 mg/l Biological Oxygen Demand,
    - \* 10 mg/l Suspended Solids,
    - \* 10 mg/l Total Nitrogen, and
    - \* 1 mg/l Total Phosphorus.

# Compliance Mandate

- \* Chapter 2010-205 requires Monroe County, each municipality, and those special districts responsible for wastewater treatment to complete the projects detailed in the Wastewater Master Plan (2000).
- \* The adoption of mandatory connection ordinances by local governments provides legal requirement to connect.



# Implementation Status

\* July 2011

Service Available	Construction	Design
64%	15%	21%

\* January 2012

Service Available	Construction	Design
73%	6%	21%

# Connection Report

Service Area	EDUs	Connected	Percent Connected
Ocean Reef (NKLUC)	1,884	1,884	100%
Key Largo (KLWTD)	15,025	9,847	66%
Islamorada	8,468	907	11%
Layton (FKAA)	351	351	100%
Duck Key/Conch Key (FKAA)	1,454	1,051	72%
Key Colony Beach	1,502	1,502	100%
City of Marathon	8,665	3,503	40%
Cudjoe (FKAA)	8,600		
Big Coppitt (FKAA)	1,713	1,315	77%
Baypoint (FKAA)	437	420	96%
Stock Island (KWRU)	2,750	2,650	96%
Key West	24,075	24,075	100%
Total	74,924	47,505	63%

	Planning and Design
	Compliant
	Project Funded and under Construction

Note: KLWTD Planning and Design underway for Unique Properties

Source: NKLUC, Key Largo, FKAA, and Marathon Wastewater and Stormwater Projects at a Glance as of December 29, 2011

# Ocean Reef

## North Key Largo Utility Corporation

- \* Upgrade and expansion of 0.66 Million Gallons per Day Facility complete.
- \* All properties are connected.
- \* Upgrade and expansion project engineering and construction costs of approximately \$15 million paid entirely by users.

# Key Largo

## Key Largo Wastewater Treatment District

- \* Dedication of 1.96 Million Gallon per Day Regional Wastewater Treatment Facility held on 10-19-10.
- \* 30 day notices have been sent to all properties within the KLWTD service area (excludes unique properties).
- \* Of the 14,709 EDUs in Key Largo, 67% or 9,847 EDUs are connected.
- \* Over 50 FDEP permitted package plants have been abandoned.

# Key Largo

## Key Largo Wastewater Treatment District

- \* Construction Cost: \$138 million (does not include onsite plumbing or abandonment)
- \* Funding
  - Federal - \$21 million
  - State - \$10 million
  - Local grants (sales tax) - \$23 million
  - System development Fees - app. \$65 million
  - Gap – \$19 million
- \* Master Plan estimates an annual reduction of 70,000 lbs/Nitrogen per year and 16,282 lbs/Phosphorus per year.

# Florida Keys Aqueduct Authority

- \* The Florida Keys Aqueduct Authority (FKAA) is responsible for the construction, operation and maintenance of the Layton, Duck Key/Conch Key, Cudjoe, Baypoint, and Big Coppitt facilities.



# Big Coppitt

## Florida Keys Aqueduct Authority

- \* Dedication of the 322,000 gallon per day treatment facility held on July 14, 2009.
- \* FKAA has sent second reminder notices to unconnected properties.
- \* Construction Cost: \$36.5 million (does not include onsite plumbing or abandonment)
- \* Funding
  - State - \$11 million
  - Local grants (sales tax) - \$18 million
  - System development Fees - app. 7.5 million

# Duck Key

## Florida Keys Aqueduct Authority

- \* Upgrade to AWT standard complete.
- \* Collection system construction is underway.
- \* Construction Cost: \$18 million (does not include onsite plumbing or abandonment)
- \* Funding
  - Hawks Cay and Villages - \$2.5 million
  - Local grants (sales tax) - \$13.8 million
  - System development Fees - app. \$1.7 million

# Cudjoe Regional Florida Keys Aqueduct Authority

- \* Includes more densely populated areas of Big Pine Key through Lower Sugarloaf in centralized facility and less dense areas in decentralized system.
- \* Design of treatment plant and collection system for Cudjoe to Upper Sugarloaf complete.
- \* Construction estimated to cost \$150 million.
- \* Additional federal, state, or local subsidy necessary to deliver project with similar system development fees as other FKAA county projects.

# Keyswide Costs and Project Funding

Service Area	Cost	Federal / State			Local Sources		Complete ?
		%Federal & State	Federal	State	% Local Sources	Local (MSTU, SDF, sales taxes)	
Key West	\$ 66.0	3%	\$ -	\$ 2.0	97%	\$64.0	YES
Layton	\$ 5.2	80%	\$ 0.8	\$ 3.4	20%	\$1.1	YES
Baypoint	\$ 6.6	53%	\$ 3.0	\$ 0.5	47%	\$3.1	YES
Big Coppitt	\$ 36.5	30%	\$ -	\$ 11.1	70%	\$25.4	YES
Ocean Reef	\$ 32.5	3%	\$ -	\$ 1.0	97%	\$31.5	YES
Stock Island	\$ 4.0	0%	\$ -	\$ -	100%	\$4.0	YES
KLWTD	\$ 138.0	23%	\$ 22.2	\$ 9.9	76%	\$104.4	YES
City of Marathon	\$ 102.3	32%	\$ 19.8	\$ 12.2	68%	\$67.4	YES
Duck Key/Conch Key	\$ 19.6	8%	\$ 1.4	\$ 0.2	92%	\$18.0	YES
Islamorada	\$ 142.4	9%	\$ 2.7	\$ 10.3	19%	\$26.7	NO
Cudjoe	\$ 161.7	0%	\$ -	\$ -	34%	\$54.3	NO
<b>Total</b>	<b>\$ 714.8</b>	<b>14%</b>	<b>\$ 55.0</b>	<b>\$ 50.6</b>	<b>41%</b>	<b>\$399.8</b>	

**Notes:**

Cudjoe local source includes planned \$5,700 SDF assessment

Cudjoe does not reflect proposed Infrastructure sales tax extension

Marathon Project Costs source Wastewater & Stormwater Projects At a Glance As of December 29th, 2011

# Potential Subsidy

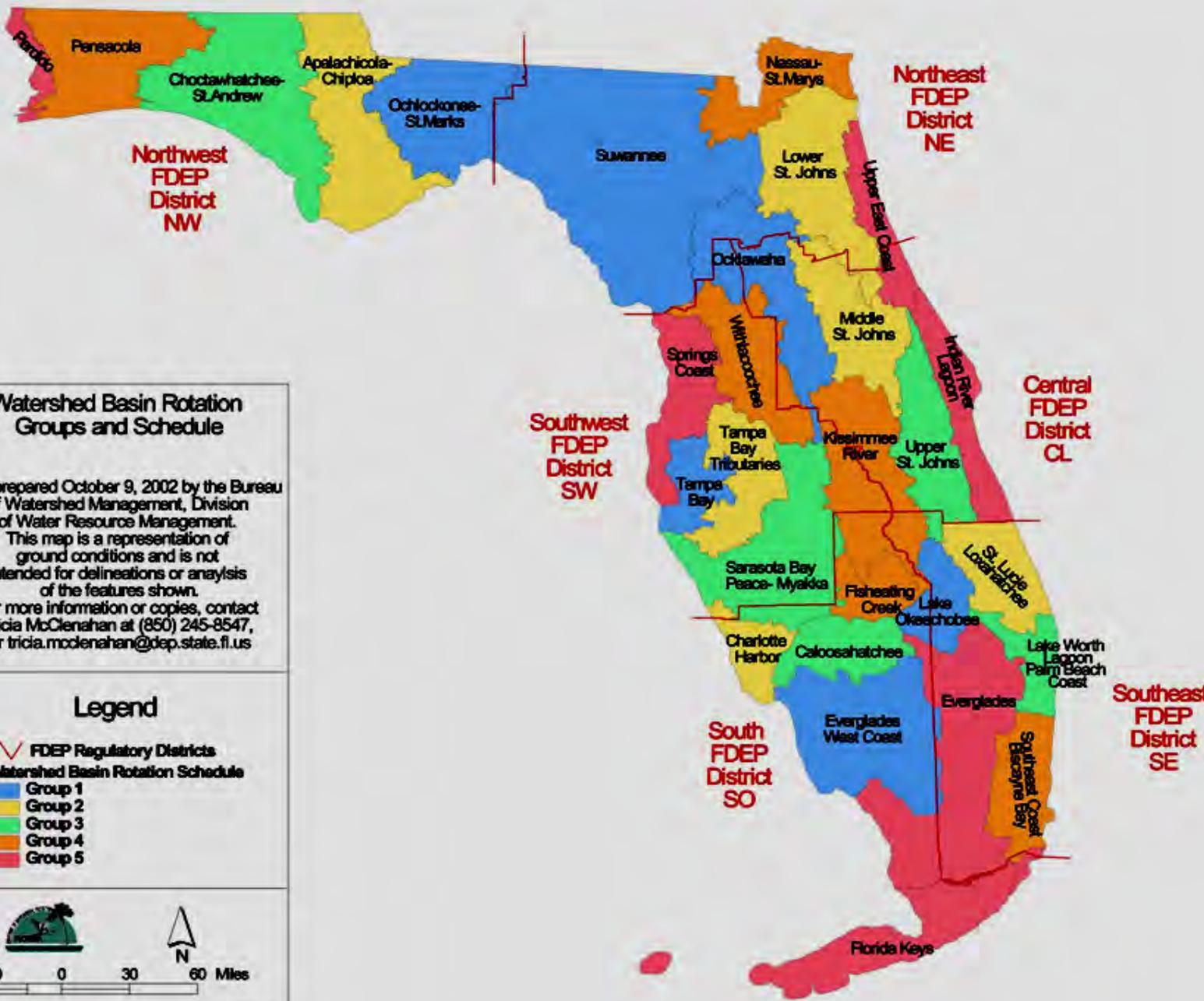
- \* Federal and State subsidy funding considered unlikely.
- \* Continued discussion about referendum to extend discretionary sales tax which sunsets in 2018.
- \* This approach splits the cost between visitors and residents.



*Florida Department of  
Environmental Protection*

*Status of Florida Keys  
Impaired Waters Listing &  
Reasonable Assurance*

January 25, 2012



### Watershed Basin Rotation Groups and Schedule

Map prepared October 9, 2002 by the Bureau of Watershed Management, Division of Water Resource Management. This map is a representation of ground conditions and is not intended for delineations or analysis of the features shown. For more information or copies, contact Tricia McClenahan at (850) 245-8547, or [tricia.mcclenahan@dep.state.fl.us](mailto:tricia.mcclenahan@dep.state.fl.us)

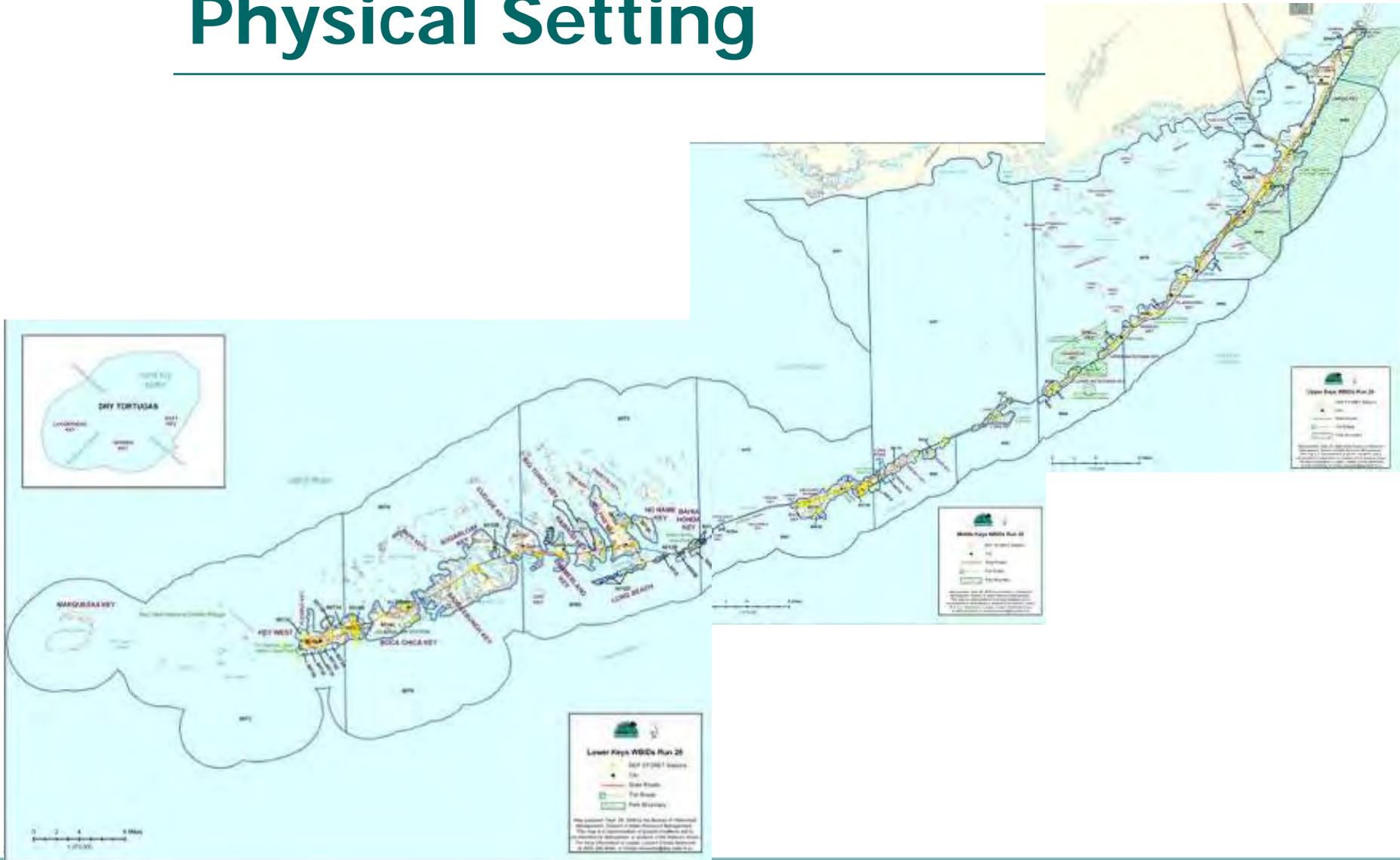
### Legend

-  FDEP Regulatory Districts
- Watershed Basin Rotation Schedule**
-  Group 1
-  Group 2
-  Group 3
-  Group 4
-  Group 5





# Physical Setting





# Setting of Nutrient Targets

- Average Nutrient Concentrations Better Than OFW Measured Concentrations

Summary of Average Nutrients					
Year	Total Nitrogen (ug/l)		Total Phosphorus (ug/l)		Note
	Bayside	Oceanside	Bayside	Oceanside	
1985	370	288	14	15	OFW Measured Data
1999	381	159	19	15	Baseline





# Model Results – Comparison to OFW

**Summary of Average Nutrients**

Year	Total Nitrogen (ug/l)		Total Phosphorus (ug/l)		Note
	Bayside	Oceanside	Bayside	Oceanside	
1985	370	288	14	15	OFW Measured Data
1999	381	159	19	15	Baseline
2020	346	126	9	6	With Mgmt Activities



## *Nutrient Load Reductions*

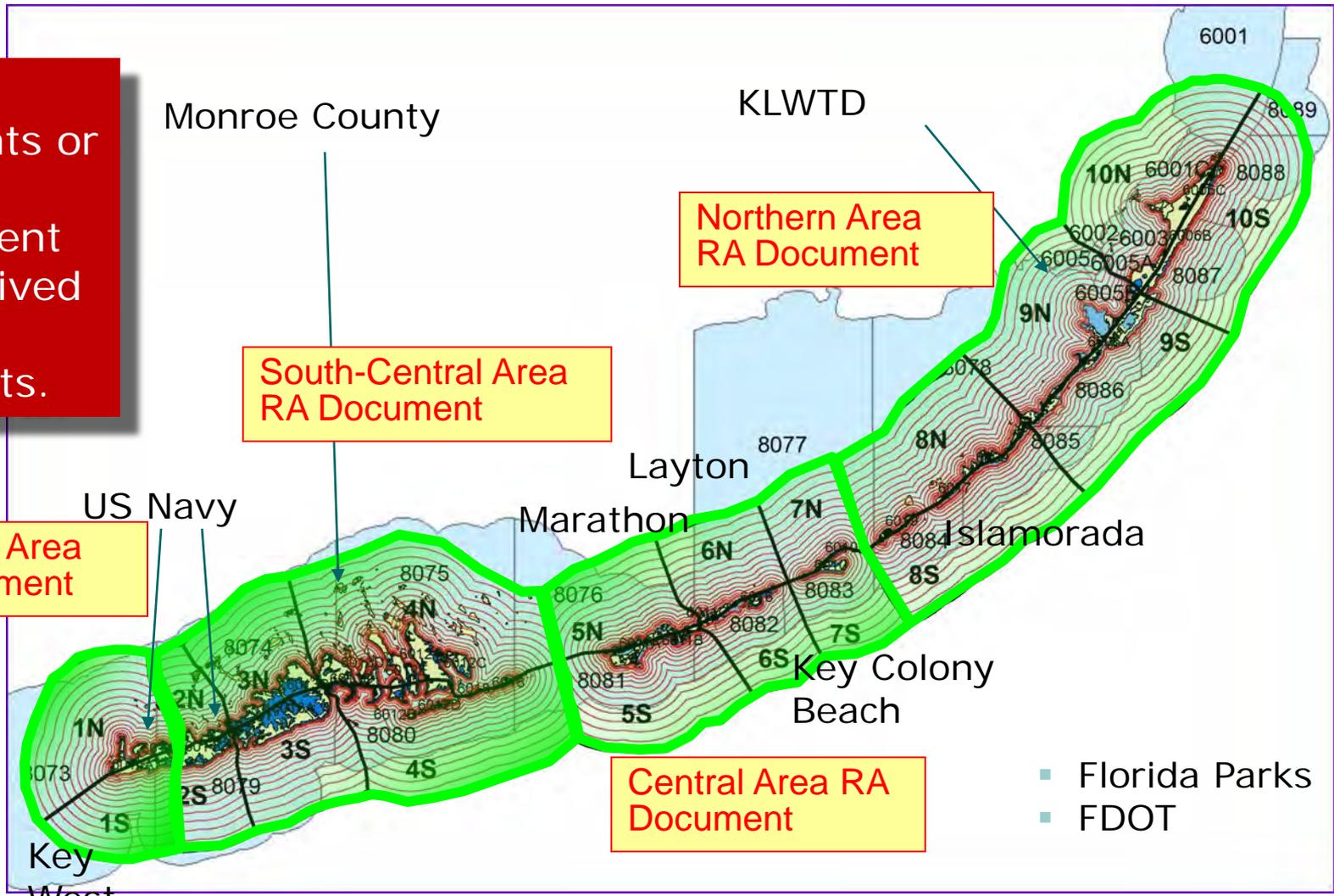
Loading	TN (lb/yr)	TP (lb/yr)
Baseline Loading (1999)	965,724	246,368
FKRAD Estimates after Mgmt Activites (2020)	360,939	67,840
% Reduction	63%	73%

- Original FKRAD – 81 Projects
- Updated FKRAD – 128 Projects
- Completed – 68 Projects





Signed Agreements or Letters of Commitment were received from all participants.





## Status of FKRAD Reports

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- The FKRAD Reports were delivered formally to FDEP on January 9, 2009.
- No listing action taken at the time.
- 2011/12 FKRAD Update
  - Added Status of Activities and DO Impairments
  - FDEP will list the Florida Keys WBIDs in Category 2 for nutrients
  - FDEP will list the Florida Keys WBIDs in Category 4e or Dissolved Oxygen - NEW





# Questions and Comments

Never Give up!

