

**WQPP Activities – Unedited Comments**

**Complete implementation of the Monroe County Wastewater Plan – W.3**

- The Sanitary Wastewater Master Plan is an initial step towards reduction of nutrient loading levels in the marine ecosystem of the Florida Keys. As such, its implementation has been progressing since year 2000. Disposal of treated waters is by well-injection, but some wells are too shallow and injected waters would end affecting surface Sanctuary waters. Hence, analysis of current or new information is necessary to properly assess this issue.
- It is a very high priority goal. The Sanctuary must continue to provide input and be actively involved with the implementation of the County's Wastewater Plan.
- There are still about 80 properties in “Cold Spots” throughout the Florida Keys that have made no progress toward compliance with the onsite wastewater mandates.
- Without knowing the details of plans, it’s hard to comment but the priorities for WQPP activities should be in order 1) Wastewater 2) Storm Water 3) Canal Water. Wastewater and storm water entering the waterways are bigger threats to deteriorating WQ and marine life and enter into the system more regularly than canal water. While canal water is an eye sore for residents and visitors it does not pose the continual threat that is delivered from wastewater or the huge pulses of nutrients delivered via stormwater
- The City of Marathon is done with its wastewater improvements have connected 98% +/- of its residents and businesses. However, the remainder of the County must finish
- I’m assuming this is a done deal – i.e. – it will happen no matter what we vote because it is required by regs – therefore – I would not consider it a priority for the WQPP’s immediate areas of focus. If I’m wrong about this – then it would be High
- The WQPP should track this and continue to be very supportive but it has legs and we can focus on gaps in WQ protection rather than dwell on this.
- A huge project, but taken a step at a time, it can (must) be done.

## Priority Activities for the FKNMS Water Quality Protection Program 2016 - 2019

### **Implementation of the Monroe County Canal Management Plan, continue demonstration canal restoration projects – W.10**

- Efforts primarily directed to identifying a method to fund implementation and maintenance
- Waste water treatment and storm water management systems are intended to reduce nutrient loads to marine ecosystems via the canals, but it may not eliminate the impairment of water quality conditions, so remediation of canals has become a priority and Demonstration Canal Restoration projects should continue as designed. Final decision beyond this first demonstration phase is pending analysis and evaluation of monitoring activities.
- It is an important goal. However, we question the need for the Sanctuary to do it? Shouldn't the County be taking the lead on developing pilot projects?
- Canal restoration is critical to coastal water quality.
- Known source of poor water quality, and a strategy forward is well documented with the mapping/ranking that was done – so I consider this very high priority
- The canals are at the heart of the Keys inshore water. As go the canals, so goes the water based environment, and economy of the Keys.

### **Reduce loadings of sediment, toxics, and nutrients to Sanctuary waters through engineering methods applied to stormwater hot spots – W.11**

- The identification, delineation and quantification of stormwater water quality hotspots is a necessary step for the implementation of engineering solutions to eliminate sources of pollutants. Stormwaters are significant sources of nutrients, metals, herbicides, pesticides, hydrocarbons and bacteria.
- The existence of stormwater hotspots and their impacts would need to be assessed since some measures have been put in place since this plan was written.
- It is a desirable goal. It may be achieved by implementing/enforcing regulatory actions combined with public education through out-reach programs
- Important, but huge cost if in general there aren't any stormwater structures in unincorporated County and some of the Cities.
- Have these hot spots already been mapped and ranked, akin to what was done for canals? If not – I'd say first priority is to start with that step; if yes, medium priority to look into
- A high priority, but reality requires gradual implementation based on research and development of the technology that will be effective

## Priority Activities for the FKNMS Water Quality Protection Program 2016 - 2019

### **Implement stricter stormwater management / permitting – W.12**

- Need environmental data for science-based decisions
- Current management/permitting may be improved but enforcement of recommendations given by the Storm Water Management Master Plan(2001) and enforcing current regulations are perhaps more important. Ordinances without the necessary budget and personnel to enforce the regulations, render them useless.
- Both permitting and enforcement have to be emphasized.
- Not necessarily stricter permitting, but more extensive coverage so that all/most stormwater inputs are managed.
- The City of Marathon is done with its stormwater. However, the remainder of the County must finish
- WQPP Steering Committee needs direction in how as a SC we can influence this
- I would like to have an understanding of what this looks like before suggesting that WQPP jump in with both feet.
- Also a high priority but also based on development of the technology that will be effective. The management and permitting will be dependent on the needs of the technology.
- I don't know how you could get much more stringent

### **Develop stormwater ordinances to control fertilizer, herbicide, pesticide application on landscapes – W.14**

- Need environmental data for science-based decisions
- Requires Tallahassee action currently prohibited to municipalities
- Ordinance are needed to limit application/use of fertilizers, herbicides, pesticides, and insecticides. Additionally, usage of slow releasing nitrogen and low phosphorus fertilizers should be encouraged, if they are to be used at all.
- Outreach is needed to obtain compliance on any of these kinds of issues where people have to police themselves at their own residences. However, stricter rules or more education may be in order as home owners and yard maintenance workers routinely blow leaves into nearshore waters from land and fertilize too much or at the wrong time.
- Strong ordinances could help control the sources of stormwater contaminants – which is a lot more efficient than stormwater treatment, stormwater monitoring, engineering fixes for stormwater controls. The WQPP Steering Committee needs direction on how best to influence this as a steering committee body.

## Priority Activities for the FKNMS Water Quality Protection Program 2016 - 2019

- I like the specificity and action orientation of this activity. It links, perhaps, with interest in limiting endocrine disruptors entering the environment.
- This doesn't need to wait. It is an education problem as well as a runoff problem. Ordinances will need to be based on toxicity and there are many scientific papers and information now available that can serve as a foundation for the ordinances and a buffer against blowback by economic interests.
- This is very important for the credibility of the project to protect and improve the nearshore waters. Up to \$30K can be spent by a homeowner to comply with the onsite wastewater mandate. The result is the reduction of about 10 pounds of nitrogen per year per person. Compare that with a few bags of fertilizer and the need becomes apparent.
- the SW Florida Regional Planning Council has templates adopted by a number of counties and cities

### **Institute stormwater education programs to educate public regarding the use and disposal of fertilizers, herbicides, pesticides, hazardous chemicals – W.14**

- Public education helps promote buy-in for helping to solve the problem
- This is part of the canal homeowner education program in place and needs to continue while involving the greater community, too
- Need to include insecticides.
- Simple, not that costly for the benefit
- Education can be very effective to address the issue at the source (i.e. people).
- Regulations are more effective than asking for voluntary controls
- Very valuable and specific focus for outreach and education efforts.
- people do not understand this—still want to have lawns like up north

## Priority Activities for the FKNMS Water Quality Protection Program 2016 - 2019

### **Stronger enforcement of regulations to reduce marina and boat pollution within the Sanctuary – B.7**

- Marinas are important sources of pollutants to coastal ecosystems and the Sanctuary should advise Monroe Co. to closely control their functioning regarding pollution
- FWC and county would need the resources to improve enforcement.
- Contaminants from antifouling paint (copper and zinc) were commonly found at elevated concentrations in southern Biscayne Bay's marinas. Both enforcement and boaters education are important.
- This is a substantial issue that is very hard to enforce.
- Again – do we have any data on this issue – how big of a problem is this? If the data show that it remains a significant problem, I would rank this as High. If there are no data on this to know one way or the other – I would first recommend conducting an evaluation to get at this info.
- Sure, this is like apple pie, but I'm not convinced we have the leverage.
- Enforcement is essential but so is properly crafted regulations.
- as there is not a lot of this happening

### **Increase the availability of mobile pump-out services – L.6**

- More resources will reduce the opportunity for illegal discharges. Dependent on above – I would want an evaluation of how this infrastructure is paid for – seems to me that most boat owners are wealthy enough to own boats – so should pay the true costs for these services
- Again, funding.
- An increase in mobile pumpouts might be helpful, but it may not increase compliance on the part of vessel owners.
- A needs assessment and steady source of funding / subsidy may be required.
- being done pretty well now by the County

## Priority Activities for the FKNMS Water Quality Protection Program 2016 - 2019

### **Reduce marina pollution through appropriate infrastructure, education and enforcement programs – L.3**

- Education and user-friendly facilities will greatly improve the situation.
- Very important and high priority goal.
- Especially at fishing docks where infrastructure is limited and illegal discharges are most frequent.
- Dependent on above – I would want an evaluation of how this infrastructure is paid for – seems to me that most boat owners are wealthy enough to own boats – so should pay the true costs for these services
- More actionable than B.7.
- FDEP's Clean Marina and Clean Boatyard programs are voluntary. The City of Key West is requiring that marinas convert to being clean marinas; any action similar to this would be locally based (Monroe County) and not part of the WQPP activities. FWC is responsible for enforcement. Incentives that encourage participation in this program would be helpful.
- as I think DEP is already doing a good job of this

### **Establishment of additional mooring fields in the Sanctuary – L.1**

- Will added moorings cause overcrowding at the reefs, or will they spread out the crowds?
- Necessary to protect reef, bottom sediments, and enhance boaters experience
- Anchor damage is a critical issue and moorings are the best method to avoid the problem
- Important, but not necessarily WQPP's sweet spot.
- Mooring fields are essential to regulate live aboard numbers and activities of live aboard residents, however, the numbers of live aboards in the Keys should be regulated, and should be limited by the number of facilities.
- County is working on this as part of DEP program
- A needs assessment would be needed before it would be worthwhile considering more mooring fields, especially in new areas. Mooring fields are part of a pilot program under FWC and the results of this program can be used to better understand how moored vessels should best be managed.

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### **Reduce storm water pollution from marina/boat maintenance areas – L.3**

- boaters education and other out-reach programs are important.
- Very necessary. Pollution hotspots are areas where industrial boat work, and boat maintenance centers are located. Pollution hotspots must be inspected and regulated.
- FDEP's Clean Marina and Clean Boatyard programs are voluntary. The City of Key West is requiring that marinas convert to being clean marinas; any action similar to this would be locally based (Monroe County) and not part of the WQPP activities. FWC is responsible for enforcement.
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### **WQPP Monitoring Activities**

#### **Water quality monitoring –continue to conduct long-term water quality monitoring to provide broad-scale status and trends ecosystem information**

- Important to recognize long-term trends. Information is critical to assess success of existing and new water quality improvement action items.
- I believe this is the way we will be the only way to see the long term effects
- This monitoring program provides the most complete information on Water Quality for the Sanctuary. WQ data is being used by many institutions, corporations and individual for different purposes, from the purely scientific endeavor to economic evaluations. The program has suffered budget cuts -last in 2011- which resulted in discontinuation of data gathering from the Dry Tortugas National Park and the Gulf Shelf. We must remember that robust and reliable decision making is not possible without robust and reliable information. Hence, this activity should be continued and further expanded to include again the Dry Tortugas NP, collect data relevant to ocean acidification impacts. Finally, the number of stations within the 500 m halo around the Keys should be increased. This halo, where most human activity takes place in the Keys, is also the second most impacted in the Sanctuary. To make a long argument short, just remember that critical ecosystems in the Keys, where tourism and our economy pivots (mangrove forest, seagrass beds and coral reefs) are closely dependent on good water quality.
- Very important goal. Monitoring programs should be evaluated to assess its effectiveness. DRTO's sites need to be reestablished. Assistance from the park may help off-set sample collection costs. Park may be able to collect samples. Additional coordination is needed.
- Of the three monitoring programs WQ monitoring is the most in need of tweaking. While the broadscale quarterly sampling can and should continue to some extent to build upon existing dataset, episodic and daily, weekly, tidal measurements (with less parameters than the quarterly sampling) are needed to better understand the influences of water quality on Keys ecosystems. More frequent monitoring, with fewer parameters is needed at minimum 1 location in each

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region of the Keys and ideally 1 nearshore, 1 mid-channel, and 1 offshore location in each region. This has been advocated for years.

- Near shore water quality is the source of most coastal and offshore water quality issues
- I recommend a very careful analysis by leading and objective experts to determine if the monitoring programs could be revised to get more bang for the buck and/or to adjust for budget cuts if cuts come about. Example – a consideration of alternating years in which stations are monitored – so that every year some sub-set is monitored, but on an alternating pattern.
- We will not find what we don't look for. And we cannot plan for acceptable future water quality without historical and current data.
- as we can know results of efforts without monitoring
- This program shows long-term trends and geographic differences in water bodies in and around the FKNMS. This information has been invaluable in establishing a baseline that changes can be measured against. Monitoring of the SW Shelf is also important and used to be conducted by this program. (If another agency is not collecting wq from the shelf, it would be good to add those stations in this area upstream of FKNMS).

### **Coral Reef Evaluation and Monitoring Program (CREMP) – implantation of the long-term coral monitoring program**

- Important to recognize long-term trends, helps assess success of different coral restoration techniques.
- I believe this is the way we will be the only way to see the long term effects
- Coral reef and hardbottom habitats of the Keys have been monitored annually by the CREMP program since 1996, rendering important information on temporal changes that have occurred in the Keys.
- It is important that these monitoring programs continue to gather data for studying effects of global warming on coral reefs, nutrient cycling, etc.
- hold a workshop of all coral monitoring programs to get an integrated assessment of coral health.
- Expansion of looking into nutrient signatures in coral reef organisms (e.g. gorgonians would be important research that would help yield more information on water quality conditions on the reef)
- Long term monitoring is the only way document changes over time and avoid a shifting baseline for decision makers.
- Data are very helpful in tracking coral trends. This information (and more) is needed in the face of changing climatic conditions that affect coral health.



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- Consider conducting a very careful analysis by leading and objective experts to determine if the monitoring programs could be revised to get more bang for the buck and/or to adjust for budget cuts if cuts come about. Example – a consideration of alternating years in which stations are monitored – so that every year some sub-set is monitored, but on an alternating pattern.
- Also – if a major bleaching or weather event occurs, consider how to fund (e.g. some funds that can be moved quickly, but perhaps with reimbursable mechanism) a robust monitoring effort to capture a major event.
- We have a good history of coral reef monitoring and this should (must) be continued and improved.

### **Seagrass/benthic habitat monitoring – implementation of long-term seagrass monitoring program**

- I placed this lower because I think the above two are already tracking and if I had to make a choice I would do the above two.
- Seagrass monitoring has been performed in the Keys since 1995, and results of that effort has been used for understanding the structure and function of seagrass beds and the food webs that they support serving as nursery and feeding grounds for manatees, sea turtles, bottle-nose dolphins, snook, pink shrimp and a variety of reef fish and invertebrates.
- Investigate the accumulation of nutrients and their trends in concentration within seagrass rhizomes.
- Collect damaged grass beds, stop
- Probably the most informative research in relation to WQPP goals and objectives because of the isotope information and analyses that can be derived from seagrass.
- Long term monitoring is the only way document changes over time and avoid a shifting baseline for decision makers.
- I recommend a very careful analysis by leading and objective experts to determine if the monitoring programs could be revised to get more bang for the buck and/or to adjust for budget cuts if cuts come about. Example – a consideration of alternating years in which stations are monitored – so that every year some sub-set is monitored, but on an alternating pattern.
- This might be of a lower priority except for the problems historical and current in Florida Bay. When historical levels of freshwater flow from the Everglades is restored, then the monitoring priorities can be reassessed.
- as this is the only way to know the condition
- Seagrass plants are indicators of nutrient enrichment and monitoring their status tracks any changes and trends in water quality and in seagrass health.

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### **Implement monitoring programs to assess the effects of wastewater / stormwater infrastructure improvements, canal restoration, BMPs, etc.**

- I think water quality monitoring will provide the data and this is simply time series analysis of the above data
- Canal remediation is under way as a demonstration project and monitoring the changes driven by different remediation techniques is critical for decision making. From previous experiences in the Keys, remediated system take several years to return to healthy conditions for fauna and flora. This program represents a practical application of the experience gained by monitoring the waters of the Sanctuary
- This has been done to some extent and can continue to be done in 2 or 3 year intervals for benthic assessments. More frequently for WQ assessments.
- This is critical to determine the effectiveness of stormwater improvements.
- I recommend priority be given to additional canal restoration monitoring – because this initiative has a plan in place and implementation underway – therefore its effectiveness should be evaluated
- Generally we've listed this as Medium, as we need additional information about what would be monitored and what success criteria would be. We support monitoring the canal restoration, but once it's deemed successful do not see the need to continue spending funds for additional monitoring (e.g., long term monitoring of these sites is probably not necessary).
- This is critical at this time when we are embarking on major restoration projects. We absolutely need to know what the water quality conditions are before, during and into the future of these projects.
- this is the only way to know the effect of projects being implemented
- It may not be that worthwhile to monitor for improvements in stormwater and wastewater if the best technology and designs are being used. Much of the infrastructure is already in place. However, continuing to investigate canal restoration techniques is important at this stage.

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### WQPP Research Activities

#### Restoring freshwater flow to Florida Bay from the Everglades – W.19

- This research although important for the Sanctuary, is under the scope of other institutions and organizations (USACE, RECOVER)
- It is an important research question that CERP and CEPP are addressing. The Sanctuary should be involved in the discussions but not in developing research activities.
- This is an ongoing process that should be tracked and monitored because of the connection between FKNMS and the bay. This is a high priority action but for the WQPP, there may not be much to do.
- the Steering Committee could have a representative or more try to influence work related to this by working with Everglades restoration interagency groups.
- We support this effort, but as many others are working on this it shouldn't be a WQPP priority.
- This is critical to the health not only of the Everglades but also to Florida Bay, and in our own backyards, the canal systems of the Upper and Middle Keys and also to a somewhat lesser extent, the Lower Keys.
- not within our purview and the Legislature is addressing

#### Assess the negative impact(s) of Florida Bay on Sanctuary resources – W.24

- More than sporadic observations in Florida Bay a coherent water quality monitoring of Bay waters is of significant importance for the sanctuary to link management of the Everglades to downstream effects impacting the Keys
- Particularly relevant given reoccurrence of hypersalinity and seagrass die off in FL Bay in 2015.
- All of the research activities listed in this section are important for EPA as a whole, but the limited resources this program has should be focused on management action. Others are working on this research so we should keep tabs on updates, but not expend time and effort on this as a body (this comment applicable to research activities below)
- Florida Bay is a major part of the Sanctuary. What happens in Florida Bay affects the entire Sanctuary and knowing the current conditions and possible future negative effects of water from Florida Bay and all Sanctuary resources is a critical part of Sanctuary management.
- as new seagrass dieoff problems and discharge pumping happening
- If widespread cyanobacterial blooms reappear or intensify in the bay because of recent seagrass dieoff in the summer of 2015, it would be good to see the effects on FKNMS water quality (and corals?) when the bloomy water flows through the channels to the ocean side of the Keys.

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### **Research the impacts of current mosquito control practices on non-target organisms within the Sanctuary and identify alternative means of mosquito control – W.18**

- Use science-based results from on-going pesticide study to identify circumstances creating risk to non-targets and work with stakeholders to identify and implement risk reduction strategies.
- Studies on the long-term impacts of pesticides on Keys biota should be promoted
- As mentioned before, it is an important subject. An ecotoxicologic tests on butterflies to assess the impacts of insecticide use on low trophic level species is recommended.
- While this is important, I feel that a lot has been accomplished in this regard. Maybe there is more to be done but it would be worth briefing everyone on what has been accomplished and what has not been accomplished if this is to be a continued priority
- This could become important if zika and other viruses continue to spread because methods to control mosquitoes could change and intensify in order to fight threats to human health. It would be good to track pesticide impacts if practices change or if there are additional concerns.
- This is critical because many of the chemicals used by mosquito control are not to be used in environmentally sensitive areas (please see the MSDS Safety Sheets at <http://keysmosquito.org/labels/>).
- This priority may change due to the Dengue/Zika virus issues.
- My impression is that we have worked on this and have little to show for it.
- Mosquito control (especially with the new threat of the Zika virus) is of critical importance, not only for the health and comfort of residents and visitors, but this is something that can directly affect the overall health of specific areas of the Sanctuary, but also something over which we exercise complete control. Thus something that we need to constantly find ways to improve effectiveness and reduce toxicity to non-target organisms.
- Control of the mosquito population is extremely important to human public health. Particularly with Dengue and Zika virus circulating. Control must be sustainable and research is needed.
- as this appears to be pretty much addressed

### **Research the impacts of personal/household use of pesticides and herbicides on Sanctuary resources by Florida Keys residents – W.18**

- Determining combined effects of exposure to multiple chemical stressors provides critical information for determining risks to non-targeted organisms and will provide science-based data for informed decisions for risk reduction.
- It'd better to promote public education and out-reach programs.

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- Research is important to determine education and outreach strategies.
- These chemicals are a form of “stealth pollution”. We know that they, and often their derivatives, are toxic to many organisms at extremely low concentrations and all possibilities for reductions in their use should be identified and eliminated.
- as I am not aware of data on this issue
- These chemicals are coming from elsewhere too, upstream of the FKNMS. Riverine waters flowing into the gulf are likely bringing pollutants to the keys as well. Information on the concentrations of these chemicals in FKNMS waters and of their effects at different concentrations are needed, but not all work needs to be done in the FKNMS,

### **Better understanding the threat of endocrine disruptors (pharmaceuticals, antibiotics, hormones, sunscreen) and developing plans and projects to reduce those threats – W.22**

- Determine expected environmental concentrations and synergistic effects, as above. Cost effective to incorporate endocrine disruptors into above pesticide study.
- More information on sunscreen, pharmaceuticals, etc. would be helpful. The UM study at Looe Key reef before and after the underwater music fest did show that large groups of swimmers/divers are associated with such chemicals.
- I don't see any way this could lead to an actionable conclusion that isn't apparent today. We postulate that the presence of these materials is bad and we do what we can (public service announcements, collection programs) to avoid the impacts. What more would we do? I do not see us banning the materials so...
- Recent evidence about the potential impacts of endocrine disruptors on larval development of keystone coral reef species (e.g. sea urchins, queen conch, etc.) needs more investigation.
- Ranked as a high priority because of the known communication of shallow well injected waters with surface waters – posing a potential for these micro-pollutants to be entering the surface waters and impacting the aquatic resources of the Keys.
- Again, We cannot find what we don't look for. We know that endocrine disrupting chemicals are effective at very low concentrations, ppm, ppb, and even some at ppt (trillion), but we don't know what marine organisms may be affected. Thus the use of marine organisms in analysis of toxicity and implementation of relatively long term testing to determine if and severity of developmental problems to larval and juvenile life stages exists is critical to developing an understanding of what the threats from these chemicals may be to the marine life in our Sanctuary. The costs of an effective program to develop this information would be considerably high. I would not like to see the priority go from H to M, but the cost of the project may make this necessary

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### **Identifying potential impacts of sea level rise on water quality and natural resources and developing plans and projects to reduce those impacts**

- Higher sea levels occurring during abnormally high tides offer the opportunity of exploring future sea level conditions. Results from preliminary research on this topic we know that flooding waters receding back to the bays and coastal areas contain abnormally high concentrations of nutrients and bacteria, beyond the recommended or regulated levels. It is advisable to begin similar studies in the Florida Keys to design actions to prevent deterioration of Keys waters.
- Studies should include the effects of global warming.
- I interpreted this differently than issues related with sea level rise and how it affects human populations (see above section). Also, there is a lot of science going on outside of the WQPP that is addressing these questions
- This is a long term need with multiple agencies focused on the problem.
- This is a major game changer for the Keys. Terrestrial pollutants may become mobilized as the sea rises.
- It is critical to know what will happen to the Key in the event of significant sea level rise, and there are some indications that this may happen sooner than expected. But still it is considerably further in the future than many of the other threats and problems that we face and our resources may be better expended on more current threats, but with a sharp eye and concern for how to handle our response to sea level rise.
- being addressed by the County and cities
- This may be tied to stormwater impacts but probably low for the WQPP program.

### **Evaluate the ecological importance of the hard bottom sponge communities on water quality and marine life in the Sanctuary**

- The importance of sponges on water quality has been shown in previous studies and perhaps what is needed now is to study mechanisms to successfully re-populate hard bottom areas
- Recent evidence on the importance of sponges for the assimilation of dissolved organic matter for coral reef food webs must be better understood to ensure effective management strategies.
- Because work on this issue is underway, continuity of this work is likely important
- The health of our ecosystems depends on the existence and health of the keystone species that make up the basic ecology of the inshore and offshore ecosystems. Just as the *Diadema* sea urchins are essential to our coral reef environs, sponges are essential to both our Bay and offshore grass flats, sandy bottoms, and rubble zones. Corals, urchins, and sponges are benthic organisms that remain associated with specific areas. Only urchins are really capable of

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movement, but that is minimal. All three are essential keystone species and populations of all three can be augmented through population manipulation by breeding and restoration. These efforts are still in the early stages of research and these efforts hold great promise for ecosystem restoration. This research should (must) be encouraged and funded and evaluated to provide the best chances for significant improvement of our ecosystems despite the negative influences of a changing world.

- already addressed by Sanctuary study
- It is very good that such a project has been initiated in Florida Bay and the information gleaned from it and any restoration techniques can be applied to FKNMS if appropriate.

### Education/Outreach Programs

#### Continue to produce and promote Waterways Television programs

- These should be produced to be displayed in outlets as Youtube, instead of only a TV program
- Waterways programs should be produced for on-line distribution (web) rather than for TV.
- I recommend focusing efforts on using the existing programs that are still up to date and reformatting them in ways that widen their distribution and usefulness; this would be higher priority over generating newer shows, however – there may be some emerging issues that warrant new shows.
- Waterways is a great educational interface with residents and visitors. It makes a difference in how we understand and interact with our marine life and it should be promoted and continued.
- This can be a great outreach opportunity
- If money is available for media outreach in this way, it might be good to take the existing programs and edit them down to 2-5 minute pieces better suited for social media.

#### Support the Florida Keys Water Watch Citizen Monitoring Program

- Cost effective way to monitor and to get citizen buy-in to conservation programs.
- This or similar programs incorporating the community to perform WQ monitoring of their surrounding is an excellent step to foster understanding and gaining support to protect our natural resources
- This is another item where it would be beneficial to discuss the benefits and accomplishments of the program. Without knowing more it's hard to determine if it has priority.

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- Nothing works better for education than active participation and active participation strongly stimulates the growth of knowledge in the community. Also citizen scientists are extremely effective in monitoring the environment for negative, and positive, changes that the limits of science often miss.
- this can be a great outreach opportunity
- This is great outreach awareness tool and citizens can assist with monitoring the environment. This program also has a school component and that will add to long-term knowledge.
- It seems that this program could be expanded to include some the other above activities that need more public awareness/education (home use of fertilizers, marina/boat pump out, etc)

### Additional recommendations for inclusion

Additional Priority Item: Identify impacts from climate change: increased temperature and reduce pH (ocean acidification), and synergistic effects when combined with chemical stressors.

Comments: Proper evaluation of likely impacts of climate-caused changes in temp and OA should address synergistic effects with other stressors, such as pesticides and pharmaceuticals.

Additional Priority Item: HIGH PRIORITY – ASSESSING IMPACT OF DISCHARGE OF AWT ON SANCTUARY WATERS. Finishing the job of wastewater management should be a high priority. Although BAT treatment technologies have been put in place, there remains the job of documenting and understanding the impact of discharged AWT effluent on the waters of the Sanctuary.

Comments: The TAC should investigate the validity of DEP's assumption that there are geological confining layers throughout the Keys that prevent the rise of AWT effluent to surface waters from shallow wells, and therefore the AWT effluent has no adverse impact on sanctuary waters. Based on this assumption, DEP finds that, for all wastewater facilities treating less than 1 MGD, all AWT discharges from shallow wells in Keys will not cause or contribute to a violation of surface water quality standards. [NOTE: DEP's assumption at Cudjoe was refuted by the 2015 geotechnical testing that proved that confining layers did not exist. Hence a deep well at Cudjoe. See Water Sciences Aquifer Test Report for FKAA, and Briceno Dye Tracer Test Report for FKAA.] WATER QUALITY MONITORING: The WQPP/TAC should advocate/educate for monitoring of the impacts of AWT discharges in the Keys. DEP does not require groundwater monitoring of the underground injection of AWT effluent nor does it require surface water monitoring in the vicinity of the discharge of this effluent which contains pollutants. Moreover, even if DEP did require monitoring for nutrients or metals pursuant to its existing programs, it has no program in place to monitor for the release of pharmaceuticals and personal care products contained in wastewater after treatment (monitoring for sucrose is an inexpensive stand-in). [Please see "Pharmaceuticals are present in wastewater discharges" by Dr. Piero Gardinali, Tropical Connections pages 154 – 155.]

Additional Priority Item: Assess ecological risk from insecticide exposure to key/sensitive species.



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<p>Comments: Conduct toxicological tests on butterflies to evaluate ecological risks from exposure to commonly used insecticides</p>
<p>Additional Priority Item: Develop programs to promote and encourage wastewater reuse</p>
<p>Comment: Reclaimed wastewater could be a valuable source of freshwater. The Keys has a limited resource of freshwater and reclaimed water could be a source for specific and appropriate uses. Reclaimed water could be used in marinas, golf courses, parks, landscape irrigation water, boat and marine equipment cleaning/rinsing; street cleaning, etc.</p>
<p>Additional Priority Item: Review and assess FDEP's numeric nutrient regulatory program for the Key's coastal waters, which was adopted in Dec 2011.</p>
<p>Comments: Are FDEP's regulatory standards being met? And if they are not, is there a corrective action plan?</p>
<p>Additional Priority Item: Study ecological impacts of ocean acidification on hard-shell marine invertebrates (larval stage) on coral reef.</p>
<p>Comments: Increased ocean uptake of CO<sub>2</sub> is decreasing the oceans' pH level and is causing increase acidification. These changes need to be monitored.</p>
<p>Additional Priority Item: Increased enforcement of FKNMS "no discharge zone."</p>
<p>Additional Priority Item: Support the derelict vessel removal program and treat the derelict vessels as a source of pollution.</p>
<p>Additional Priority Item: initiate a grade school module of water quality, targeting grades 4-5</p>
<p>Additional Priority Item: Ocean acidification – implementation of seawater carbonate chemistry measurements (pH/CO<sub>2</sub> monitoring)</p>
<p>Additional Priority Item: Create an association of Florida Keys Marine Labs and research institutions</p>
<p>Comment: I'm unsure if WQPP \$ is still being directed to the SEFCRI/SE FL region. Given all the cuts to the WQPP should this \$ be redirected to the Keys for some of the priorities outlined in the survey. After all the WQPP was established in accordance with the FKNMS right? If there is to be an open discussion about priorities and funding among the steering committee a dialogue about \$ flowing away from the Keys and into SE FL should merit discussion.</p>
<p>Comment: One thing that would have been beneficial before this exercise is a synopsis of the accomplishments many of these activities have had and where they currently stand in terms of implementation or progress.</p>
<p>Additional Priority Item: Infrastructure development to account for rising sea levels and climate change.</p>
<p>Comments: Nuisance flooding is already a major problem in Key West and some other low lying areas in the Keys. Nuisance tides entrap trash, oil residues, pet wastes, etc., and deliver these products into the waterways. The threat from nuisance flooding and flooding in general will get worse with sea live rise. This should be an elevated priority for the Keys given its geography and susceptibility to sea level rise.</p>
<p>Additional Priority Item: Coastal Habitat Monitoring/Research of Mangroves</p>
<p>Comments: Mangroves act as a filter trapping many of the nutrients that could enter into the waterways. Nutrient analyses on mangroves prop roots or leaves can reveal loading into the system. In addition, mangroves are expected to increase in area with sea level rise. This could become a top priority for the EPA</p>

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<p>Comment: WQPP and would be a powerful potential contributor to evaluating whether WQ infrastructure enhancements are improving nearshore WQ conditions of the Keys. The mangrove system have been largely understudied in the Keys yet is an important contributor to maintaining good water quality.</p>
<p>Additional Priority Item: The impact of tourism on Keys reefs!</p> <p>Comments: Keys reefs are stressed in part due to millions of visitors annually. The carrying capacity of Keys reefs are unknown and currently there are no limitations in place for how many divers can access a reef in a day Potential outcomes of identifying carrying capacity could be a rotating mooring system so that some reefs do not endure fishing or diving activities year round or for more than 3 or 5 consecutive years</p>
<p>Additional Priority Item: Enactment FKNMS Visitor Fee. It needs to be done!</p> <p>Comments: Applies to all activities in which Sanctuary resources are utilized (e.g. fishing, diving, birding, etc.). Not collected at hotels but vendors who utilized Sanctuary resources. Money raised would go towards many of the above mention WQPP projects. I understand that this is not outreach specifically but it does serve as opportunity to educate people about the Sanctuary. A fee is used in many Caribbean nations, the Great Barrier Reef, etc and goes toward conservation of resources.</p>
<p>Additional Priority Item: Reestablish historic flows across U.S. 1 (mostly Marathon (Grassy &amp; Fat Deer Keys), but to a limited extent elsewhere as well. This strategy used to be a part of the MP</p>
<p>Additional Priority Item: Examine the 1 million GPD threshold for shallow vs. deep well injection based on latest information and experience. Alter regulations, or not, accordingly.</p>
<p>Comment: For the most part, I don't consider myself expert enough to be able to rank various initiatives because I do not know the relative effects of each problem on the overall ecology of the Keys. However, you will see below that I favor continued monitoring and research. You will also see that we at SSPOA have a particular concern in regard to canal restoration. We believe it is wrong to weigh unfavorably regarding the need for restoration of a canal the presence of mangroves in the canal, in a case where the mangroves are so thick that they are both choking off water flow and depleting oxygen. We have tried to raise this issue with the subcommittee, but (as yet) to no avail. We believe that FDEP-required mitigation should be waived when removal of mangroves would greatly improve water quality in a Poor quality canal. This would of course require a change in FDEP policy, but we believe that would be very helpful to our goal of cleaning up the Keys canals.</p>
<p>Additional Priority Item: Develop modern "social media" education/outreach efforts that take advantage of new technology. This can still be in the vein of "Waterways" but more bite sized and snappy.</p>
<p>Comment: The efforts of the Sanctuary E&amp;O staff should be strongly complemented on the tremendous job that they do to help residents and visitors understand not only the rules and regulations that in place to safeguard the natural resources of the Sanctuary, but also the safety and convenience of residents and visitors alike.</p> <p>Comments Provide the funding required for them to do the best job that they can.</p>
<p>Additional Priority Item: Implement monthly water sampling, testing and analysis of nitrogen, phosphorous, chlorophyll and dissolved oxygen whenever shallow wells are in use anywhere in the Keys for wastewater treatment. If water quality deteriorates per DEP standards for the Keys ((TP=.009 mg/l, TN=.25 mg/l and</p>

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chlorophyll=.3 ug/l), require the operators/owners of the wastewater treatment plant to immediately replace the shallow wells with deep wells.

Additional Priority Item: See below. This is not a priority item, but is an idea for E&O that may, or may not, be useful in making residents and visitors aware of the need for care and restoration of our environment.

Comment: There are two basic elements to public engagement with environmental issues. The first is the acquisition of knowledge, the what and why of environmental protection; and the second is not only how to implement this knowledge into personal behavior but also how to provide a stimulus to enhance the spread of this knowledge and behavior to others. As the Education and Outreach seat on the SAC, I look for ways that the SAC can aid the Sanctuary E&O staff in their mission to educate the public and stimulate not only acceptance and compliance with the rules and regulations that protect our environment but also to encourage the public to aid in developing the behaviors in others that would support environmental care and protection. To that end I wrote the following pledge that I thought might aid in this effort if promoted and distributed. I presented it to the SAC with the request that the SAC endorse the pledge. This stimulated much discussion and in the end the SAC determined; 1. that the pledge would be ineffective, and 2. that it was not appropriate for the SAC to endorse such a pledge.

The Sanctuary Friends Foundation of the Florida Keys did feel that the pledge was worthwhile and had it on their website for some time. I don't think that it is now on this website. Times change however, and at that time the use of such a vehicle to encourage compliance with environmental regulations may not have been useful. It may be different now. My feeling was, and is, that this, or something like this, if presented in the right way, in the right places, could be instrumental in raising awareness of, and stimulating compliance with, the basic elements of environmental care in use of our natural resources.

There may or may not be interest in using this or a similar document in one way or another to stimulate interest and care of our marine environments, but I think it is worth exploring. I claim no ownership or authorship in any use of the pledge as it is, or concern with any use or any changes that may be made. It is only an idea that may be useful.

### My Code of Ethics for visiting and living in the Florida Keys

I understand the fragile nature of the unique, beautiful, and rich marine environments that circle our Florida Keys, the only tropical islands of the continental United States. I know that if we do not treat our coral reefs, inshore waters, and natural resources with care, respect, restraint, conservation, and preservation they will not persist for our future and the future of our children.

Therefore I pledge:

That I understand that waste; nutrients, chemicals, plastics, and all other disposable matter does not just disappear into the water, it persists and is greatly detrimental to the animals and ecology of the Florida Keys. To the best of my ability, I will not add my waste to the water or the land and I will remove the waste of others as best I can.

That I understand that increasing populations and increasing usage of our waters and reefs degrades our natural resources. I will conserve our reefs, seagrass meadows, fish and lobsters by taking only what I need, and obeying the regulations that serve to preserve our natural resources. I will not wantonly destroy corals, fish, lobsters, or other organisms through ignorance or carelessness.

That I understand that our coral reefs and inshore waters have and are suffering greatly due to our exploitation and are in great need of care and restoration. I will support and aid the Florida Keys National Marine Sanctuary in their efforts to sustain and repair our unique marine ecosystems.

That I understand that respect for our natural world is the foundation of conservation and preservation of our natural resources. I will make this respect the foundation of my use and enjoyment of the great natural

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resources of our Florida Keys. That I understand that others will follow my example if I can communicate my knowledge and caring, and that I will take every opportunity to educate my fellow citizens on the fragile nature of our ecosystems and how to enjoy our resources with minimal environmental impact.

This is my personal commitment to the sustainable future of the ecosystems of my Florida Keys. My signature below seals this commitment to myself. I will keep this document where I will see it frequently and use it as a reminder of my obligation to the beautiful and fragile ecosystems that provide me with a unique and wonderful way of life.

An action item from the WQPP Steering Committee meeting held September 30, 2016, was for the group to identify a few priority issues for the WQPP program. To help narrow down the priorities, I've assembled a list of previous priority items from the WQPP Action Plan and included recommendation from the group. The list is not complete and I need your help to identify agency and local priorities for the WQPP to address.

1. First go through the list and rank each item as high (H = strong priority), medium (M = still need to follow), or low (L = no longer a priority for the group)
2. Second, these issue items are fairly broad. You are strongly encourage to add detailed comments to support your rating. All comments will be compiled for each item and shared with the group.
3. Last, identify missing priority items that you like submit for inclusion on the list. These will be compiled and submitted to the WQPP Steering Committee for consideration.

This information will be compiled and sorted to identify WQPP member's individual or agency priorities that will in turn be used for reporting, funding prioritization, identify TAC members and agenda development. Information from this survey will be presented at the March 2, 2016, Steering Committee. Please submit your feedback to me by Feb 10, 2016. You can complete the survey in the attachment or hit reply in the email and fill it in directly.