

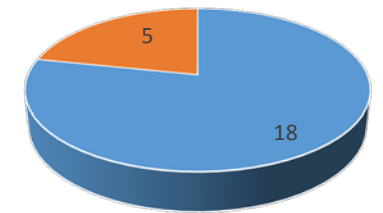
FKNMS WQPP Priority Activities Survey

- Purpose of Survey
 - Articulate priorities for the Steering Committee (requested at last meeting)
 - Reporting WQPP activities and priorities to resource agencies
 - Management plan development
 - Identification of funding opportunities
 - Funding prioritization for Special Grants/Monitoring Programs
 - Identification of TAC members
 - Development of future agendas
- 25 respondents: SC (12), Mngt (4), Researchers (4), Citizens (3)

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

- Highest priority, crucial to understanding WQ in Sanctuary
- Restore monitoring at DRTO's and SW shelf sites
- Identify additional funding to expand coverage
- Collect data relevant to Ocean Acidification impacts
- Increase sites within 500m halo zone
- Modify program to include more frequent monitoring to better understand influence of WQ on Keys ecosystems

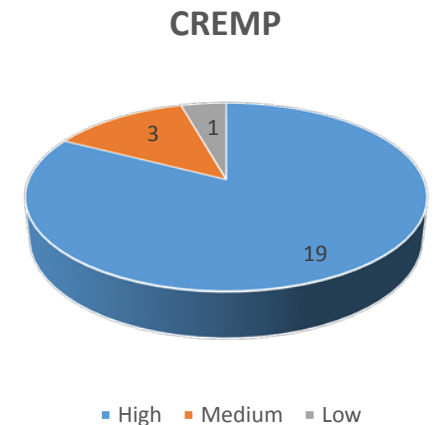
Water Quality Monitoring



■ High ■ Medium ■ Low

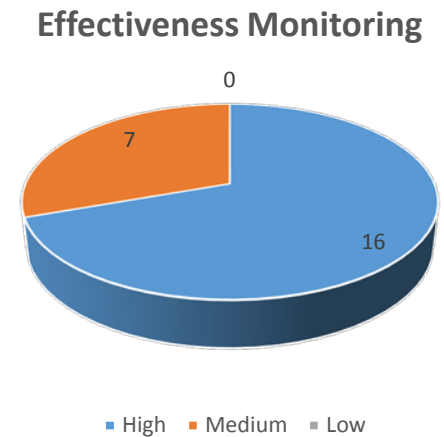
#2 - Coral Reef Evaluation and Monitoring Program (CREMP) – implantation of the long-term coral monitoring program

- since 1996 rendering important information on temporal changes in the Keys
- Coral workshop of all coral monitoring programs to obtain an integrated assessment of coral health
- Need long-term monitoring to document changes over time and avoid a shifting baseline for decision makers
- This type of monitoring important to track changes and assess effects of changing climatic conditions



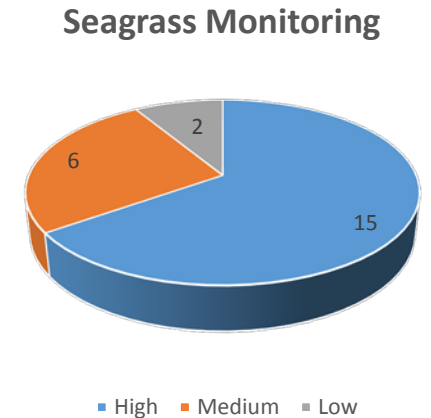
#3 - Implement monitoring programs to assess the effects of wastewater / stormwater infrastructure improvements, canal restoration, BMPs, etc.

- Critical to evaluate success of restoration projects for future funding
- Once we determined that the canal remediation techniques work, no need to continue
- Critical for determining success of stormwater/wastewater projects
- Can't this be part of the long-term WQ monitoring



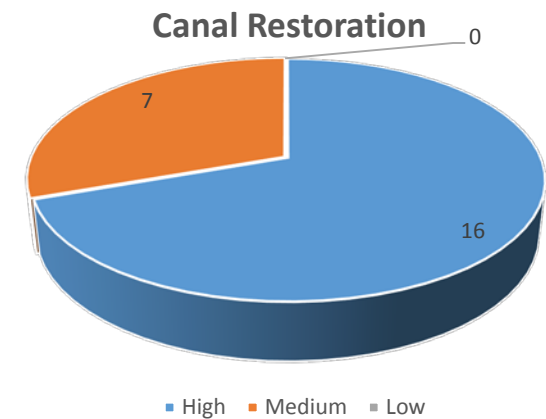
#4 - Seagrass/benthic habitat monitoring – implementation of long-term seagrass monitoring program

- Results of seagrass monitoring is used to understand food webs that support nurseries and feeding grounds
- Seagrass plants are indicators of nutrient enrichment and compliments WQ monitoring
- Objective analysis of monitoring frequency required for cost savings
- Most informative research because of information and analyses that can be gleaned from seagrass



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

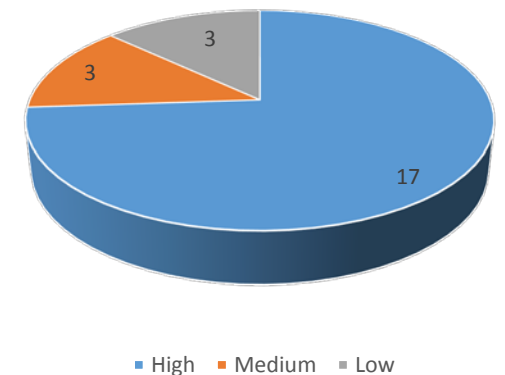
- Highest priority management activity
- Need to identify funding mechanism for implementation and maintenance
- Documented source of poor water quality and impacts nearshore water quality
- Canals are the heart of Keys inshore waters. As goes the canals, so goes the water based environment and economy of the Keys



#6 - Complete implementation of the Monroe County Wastewater Plan – W.3

- High priority goal, must continue to be actively involved with implementation of plan.
- 80 properties “cold spots” in the Keys that have made no progress towards compliance
- Done. WQPP should track and be supportive but we need to focus on gaps in WQ protection.
- Wastewater and stormwater (pulse of nutrients) entering waterways pose bigger threats to deteriorating WQ and marine life than canal water.

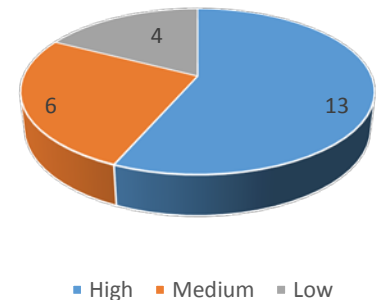
Monroe County Wastewater Plan



#7 - Ensure adequate marine pump-out facilities to eliminate discharge of waste from vessels into the Sanctuary – L.1

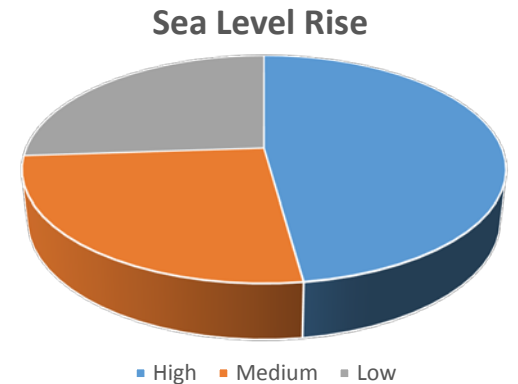
- More funding will reduce the opportunity for illegal discharges
- Needs assessment and steady source of funding, subsidy may be required
- If you own a boat, should be the true costs for these services
- Being done pretty well now by the County
- Enforcement

Marine Pump-out Facilities



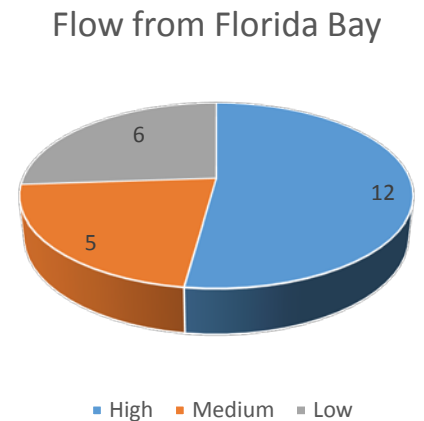
#8 - Identifying potential impacts of sea level rise on water quality and natural resources and developing plans and projects to reduce those impacts

- Being address by county and cities
- Pollutants (nutrients, bacteria) may be mobilized as frequency of abnormally high tides occur; recommend research (relate to earlier WQ comment)
- Research impacts of ocean acidification
- There's a lot of research occurring outside of the WQPP that is addressing this question



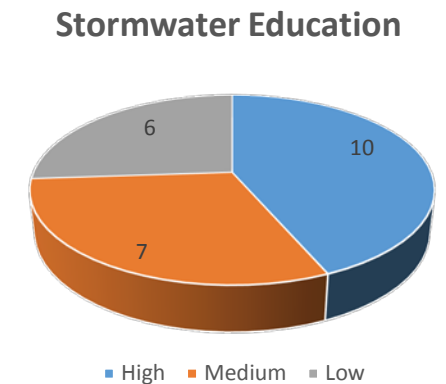
#9 - Restoring freshwater flow to Florida Bay from the Everglades – W.19

- Priority but for the WQPP, not much to do
- This research under the scope of other institutions
- Important question that CERP/CEPP are addressing
- Ongoing process should be tracked and monitored
- The SC could have a representative to influence work related to this priority



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

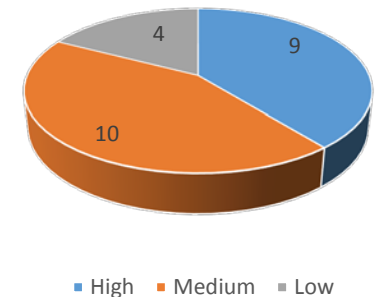
- Education very effective to address the issue at the source (people)
- Public education helps promote buy-in for helping to solve the problem
- Great benefit for little cost
- Regulations are more effective than voluntary controls
- Specific focus for outreach and education efforts
- People do not understand this, want lawns like up North



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

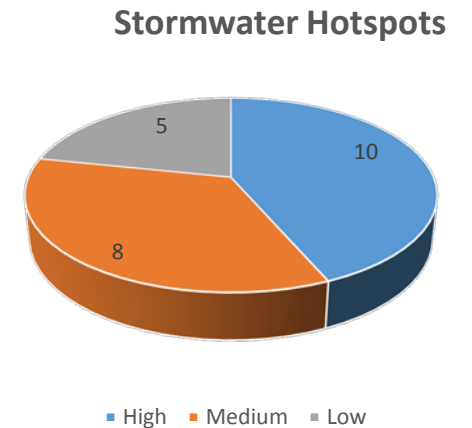
- Ordinances are needed to limit application
- Too much fertilizer getting into canal/nearshore waters
- Tallahassee prohibits municipalities from creating local ordinances
- Encourage use of slow releasing N and low P fertilizers
- Stronger ordinances control sources of stormwater contaminants a lot more efficiently and cheaper than technological fixes.
- How can the WQPP SC influence this?

Stormwater Ordinances



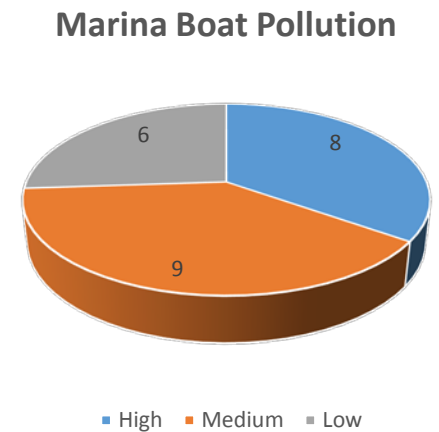
#12 - Reduce loadings of sediment, toxics, and nutrients to Sanctuary waters through engineering methods applied to stormwater hot spots – W.11

- Desirable goal that may be achieved through regulatory enforcement and public education
- The identification, quantification and delineation of stormwater hotspots is a necessary step for implementation of engineering solutions
- Have these hot spots been mapped and ranked, akin to what was done for canals. If not 1st priority.
- High priority but requires gradual implementation based on research and development of technology.



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

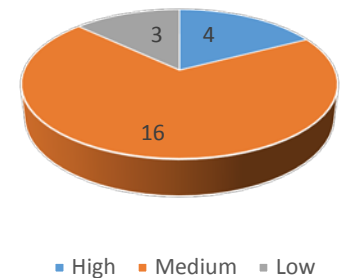
- This is a substantial issue that is very hard to enforce
- Not a lot of this happening/we don't have the leverage
- FWC and county need more resource for enforcement
- Marinas are sources of pollutants to coastal ecosystems
- Antifouling (copper and zinc) are commonly found at elevated concentrations in Biscayne Bay's marinas
- Enforcement and boater education important



#14 - Reduce marina pollution through appropriate infrastructure, education and enforcement programs- L.3

- Education and user-friendly facilities will greatly improve the situation
- Especially at fishing docks where infrastructure is limited and illegal discharges are most frequent
- FDEPs Clean Marina and Clean Boatyard programs are voluntary. KW is requiring all marinas to participate. Any action would be locally based and not part of WQPP
- FWC is responsible for enforcement
- I think FDEP is already doing a good job on this

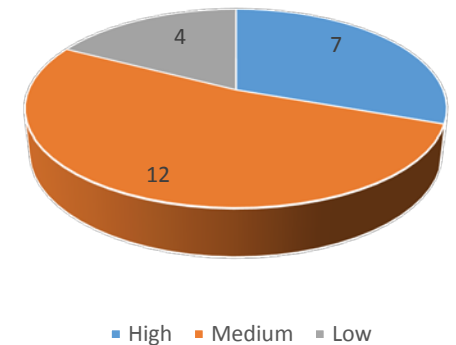
Reduce Marina Pollution



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

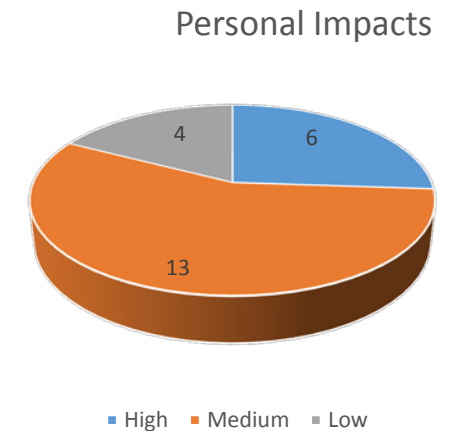
- What happens in Florida Bay effects Sanctuary
- Need WQ monitoring that links management of the Everglades and FL Bay to downstream impacts
- Others are working on this. We should keep tabs on this but not expend resources (time & funding)
- Knowing what is happening in FL Bay (seagrass die-offs, hypersalinity, HABs) is critical to Sanctuary mngt
- Blooms and seagrass die-off occurred in 2015, research to see if “bloomy” water flow to channels to ocean side of Keys

Impacts from Florida Bay



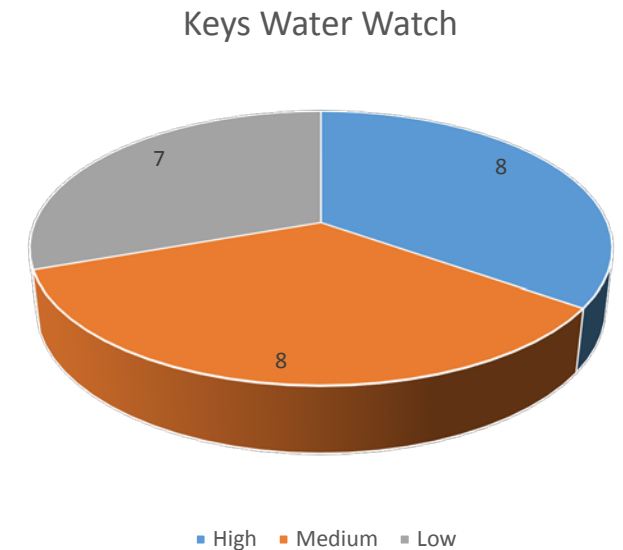
#16 - Research the impacts of personal/household use of pesticides and herbicides on Sanctuary resources by Florida Keys residents – W.18

- Best accomplished with public education and outreach programs
- The chemical are forms of “stealth pollution.” We know that they, and their derivatives, are often toxic to organisms at low levels. Should explore identifying, reducing or eliminating their use
- Research to provide science based data on risks for informed decisions
- Quantify input from upstream of Gulf



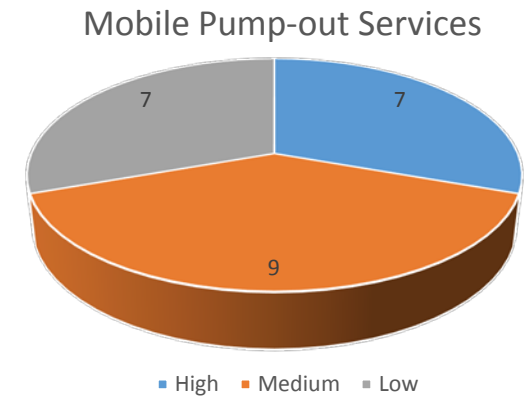
#17 - Support the Florida Keys Water Watch Citizen Monitoring Program

- Cost effective way for additional monitoring and citizen buy-in to protect our natural resources
- Include a school component to the program
- Active participation is best form of education
- Knowledgeable citizen scientist are effective in identifying changes in ecosystems that researches may miss
- Expand program to include public awareness - home use of fertilizers, marina/boat pump-out...



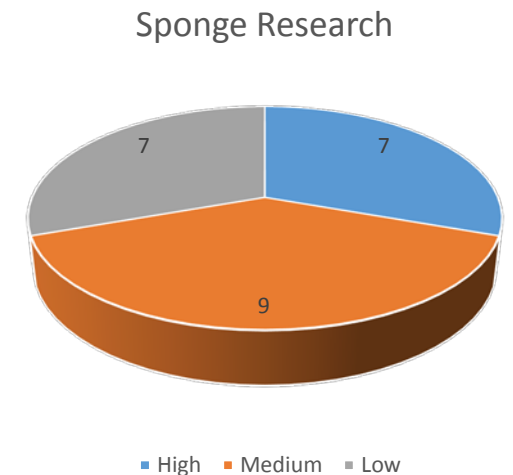
#18 - Increase the availability of mobile pump-out services - L.6

- Need a needs assessment and a steady source of funding
- Increasing mobile pump-outs may be helpful, but may not increase compliance from vessel owners
- I want an evaluation of how this infrastructure is payed for
- Being done pretty well now by the County



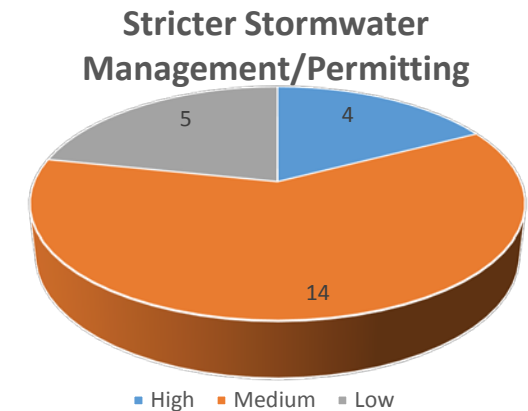
#19 - Evaluate the ecological importance of the hard bottom sponge communities on water quality and marine life in the Sanctuary

- Importance of sponge communities is well know, need to study mechanisms to re-populate
- This work is underway and continuation is important.
- Sponges are effective assimilating DOC for coral reef food webs and must be better understood
- Coral, urchins and sponges are three essential keystone species of the Keys ecosystem. All three can be augmented through successful breeding programs. Research must be encouraged and funded to provide best chance of ecosystem recovery.



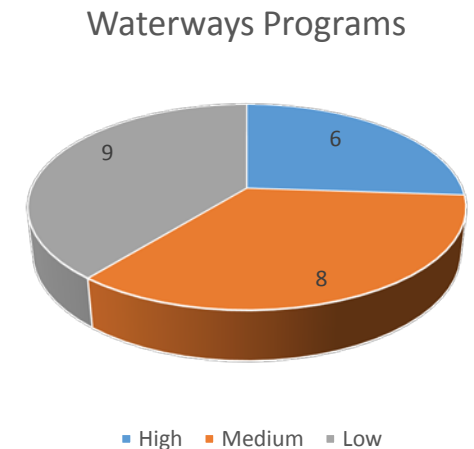
#20 - Implement stricter stormwater management / permitting – W.12

- Need to emphasize permitting and enforcement
- Not necessarily stricter, but more extensive coverage so that all stormwater inputs are managed
- Implementation of Stormwater Master Plan and enforcing current regulations are most important
- High priority base on development of technology
- I don't know how you can get much more stringent



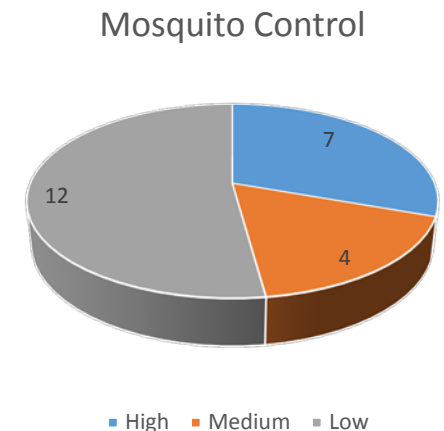
#21 - Continue to produce and promote Waterways Television programs

- Waterways should be produced for on-line/web outlets such as Youtube
- Focus on using up-to-date programs and reformat them in ways to widen their distribution
- Waterways is a great educational interface with residents and visitors. It should be promoted and continued.
- Great outreach opportunity
- Edit down to 2 – 5 minutes for social media



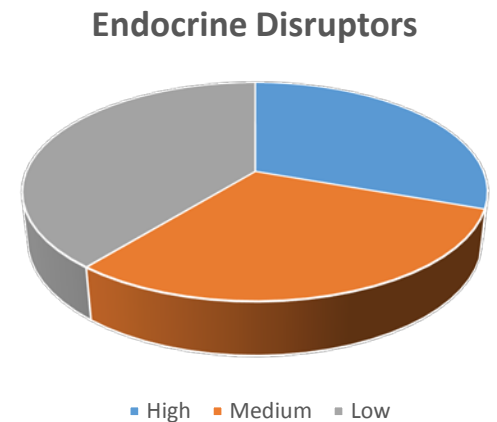
#22 - Research the impacts of mosquito control practices on non-target organisms within the Sanctuary and identify alternative means of mosquito control – W.18

- Studies on long-term impact of pesticides on Keys biota should be promoted
- Use results from on-going pesticide study to identify risk to non-targets and implement risk reduction
- Much work has been done. What has the research found? What needs to be done?
- Low priority but may change due to Denque/Zika
- Must constantly find ways to protect public health and reduce toxicity to non-target organisms



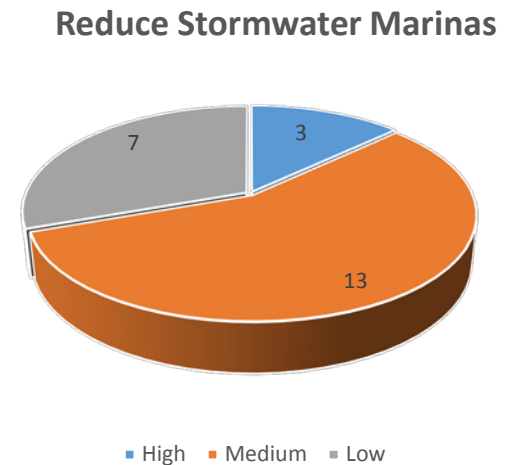
#23 - Understanding the threat of endocrine disruptors (pharmaceuticals, antibiotics, hormones, sunscreen) and developing plans/projects to reduce those threats – W.22

- More info. on sunscreen, pharmaceuticals, etc. would be helpful. The UM study at Looe Reef showed identified these chemicals at music fest
- I don't see any actionable conclusion that isn't apparent today. We postulate that these chemicals are bad and we do public service announcements, collection program to mitigate. What else can we do?
- Research is showing potential impacts to larval development of sea urchins, queen conch, etc., need more research.



#24 - Reduce stormwater pollution from marina/boat maintenance areas – L.3

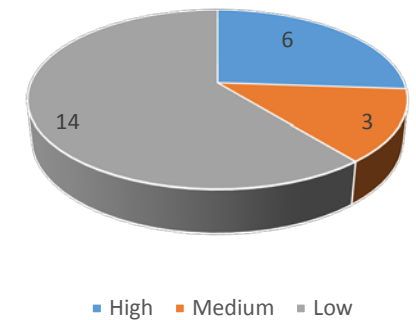
- Very necessary. Pollution hotspots are where industrial boat work, and boat maintenance occurs
- Boater education and outreach programs important
- FDEPs Clean Marina and Clean Boatyard programs are voluntary. KW is requiring all marinas to participate. Any action would be locally based and not part of WQPP



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

- Important to protect reef, bottom habitat, and enhance boats experience
- Will added mooring cause overcrowding at the reefs, or will they spread out the crowds?
- Anchor damage is a critical issue and moorings are the best method to avoid the problem
- Mooring field regulate live aboard residents. Live-aboards in the Keys should be limited to the number of facilities.
- A needs assessment would be needed before considering the addition of mooring fields in new areas

Additional Mooring Fields



Additional WQPP Priority Activity Recommendations

- Support derelict vessel, a source of pollution, removal program
- Support coastal mangrove assessments and research in the Keys. Mangroves act as a filter trap for nutrients entering waterways
- Assess impact of AWT effluent on Sanctuary. Scientifically examine the 1M GPD threshold for shallow vs. deep well injection. Revise, or not, regulations based on findings.
- Implement monthly water quality monitoring for N, P, Chl a and DO for shallow wells in the Keys. Require deep well if exceeds FDEP water quality criteria (TP=.0009mg/L, TN=.25 mg/L, Chl a = .3ug/L)
- Evaluate the impact of tourism on Keys reefs. Reefs are stressed due to millions of visitors annually. The carrying capacity for Keys reefs are unknown and no visitor limitations are in place.

Additional WQPP Priority Activity Recommendations (cont.)

- Enactment FKNMS visitor fee. Applies to all activities in which Sanctuary resources are utilized and impacted (e.g. fishing, diving, birding, etc.)
Collected by vendors who utilize Sanctuary resources
- Increased enforcement of FKNMS “no discharge zone”
- Study impact of OA on hard-shell marine invertebrates (larval stage) on coral reefs.
- Identify impacts from climate change: increased temperature and reduced pH (ocean acidification), and synergistic effects when combined with chemical stressors
- Similarly, implement seawater carbonate chemistry monitoring (pH/CO₂)
- Evaluate infrastructure to account for rising sea levels and climate change

Additional WQPP Priority Activity Recommendations (cont.)

- Review and assess FDEP's numeric nutrient criteria for Key's coastal waters adopted in Dec 2011. Are FDEP's regulatory standards being met? If not, is there a corrective action plan?
- Develop programs to promote and encourage wastewater reuse. Reclaimed water could be used in marinas, golf course, landscaping..
- Re-establish historic flows across U.S. 1 (mostly Marathon, Grassy and Fat Deer Keys), but to a limited extent elsewhere
- Create an association of Florida Keys Marine Labs and research institutions
- Initiate a grade school module of water quality for grades 4 - 5

South Florida Strategic Measures

ACS Code	Measure Text
SFL-SP45	Achieve 'no net loss' of stony coral cover (mean percent stony coral cover) in the Florida Keys National Marine Sanctuary (FKNMS) working with all stakeholders (federal, state, regional, tribal, and local).
SFL-SP46	Annually maintain the overall health and functionality of sea grass beds in the FKNMS as measured by the long-term sea grass monitoring project that addresses composition and abundance, productivity, and nutrient availability.
SFL-SP47a	At least seventy five percent of the monitored stations at the coral reef stations of the Florida Keys National Marine Sanctuary will maintain Chlorophyll a (CHLA) levels at less than or equal to 0.35 ug l-1 and light clarity (Kd)) levels at less than or equal to 0.20 m-1.
SFL-SP47b	At least seventy five percent of the monitored stations in the nearshore and coastal waters of the Florida Keys National Marine Sanctuary will maintain dissolved inorganic nitrogen (DIN) levels at less than or equal to 0.75 uM and total phosphorus (TP) levels at less than or equal to .25 uM .
SFL-1	Increase percentage of sewage treatment facilities and onsite sewage treatment and disposal systems receiving advanced wastewater treatment or best available technology as recorded by EDUs in Florida Keys two percent (1500 EDUs) annually.
SFL-2	The number of Everglades Stormwater Treatment Areas (STAs) with the annual total phosphorus (TP) outflow less than or the same as the five-year annual average TP outflow, working towards the long-term goal of meeting the 10 parts per billion annual geometric mean. (target 3 STAs)

EPA Performance Measure Commitments

Table 1: EPA WQPP WQ Targets derived from 1995-2005 Baseline

For reef stations, chlorophyll less than or equal to 0.35 micrograms liter⁻¹ (ug l⁻¹) and vertical attenuation coefficient for downward irradiance (K_d , i.e., light attenuation) less than or equal to 0.20 per meter; for all stations in the FKNMS, dissolved inorganic nitrogen less than or equal to 0.75 micromolar and total phosphorus less than or equal to 0.25 micromolar; water quality within these limits is considered essential to promote coral growth and overall health. The “number of samples” exceeding these targets is tracked and reported annually. Values in green are those years with % compliance greater than 1995-2005 baseline. Values in yellow are those years with % compliance less than 1995-2005 baseline.

EPA WQPP Water Quality Targets				
Year	REEF Stations		All Stations (excluding SHORE sites)	
	CHLA $\leq 0.35 \mu\text{g l}^{-1}$	$K_d \leq 0.20 \text{ m}^{-1}$	DIN $\leq 0.75 \mu\text{M}$	TP $\leq 0.25 \mu\text{M}$
			(0.010 ppm)	(0.0077 ppm)
1995-05	1778 of 2367 (75.1%)	1042 of 1597 (65.2%)	7826 of 10254 (76.3%)	7810 of 10267 (76.1%)
2006	196 of 225 (87.1%)	199 of 225 (88.4%)	432 of 990 (43.6%)	316 of 995 (31.8%)
2007	198 of 226 (87.6%)	202 of 222 (91.0%)	549 of 993 (55.3%)	635 of 972 (65.3%)
2008	177 of 228 (77.6%)	181 of 218 (83.0%)	836 of 1,000 (83.6%)	697 of 1,004 (69.4%)
2009	208 of 228 (91.2%)	189 of 219 (86.3%)	858 of 1,003 (85.5%)	869 of 1,004 (86.6%)
2010	170 of 227 (74.9%)	176 of 206 (85.4%)	843 of 1000 (84.3%)	738 of 1,003 (73.6%)
2011	146 of 215 (67.9%)	156 of 213 (73.2%)	813 of 1012 (80.3 %)	911 of 1013 (89.9 %)
2012	142 of 168 (84.5%)	135 of 168 (80.4%)	489 of 683 (71.6 %)	634 of 684 (92.7 %)
2013	148 of 172 (86.0%)	150 of 172 (87.2%)	496 of 688 (72.1 %)	603 of 688 (87.6 %)
2014	141 of 172 (82.0%)	133 of 172 (77.3%)	426 of 690 (61.7%)	540 of 690 (78.3%)
2015	122 of 172 (70.9%)	135 of 172 (78.5%)	487 of 688 (70.8%)	613 of 688 (89.1%)