

FLORIDA KEYS NATIONAL MARINE SANCTUARY
Water Quality Protection Program Steering Committee Meeting

March 9, 2023

DRAFT NOTES

Steering Committee Members Present

Wade Lehmann, United States Environmental Protection Agency (EPA), Region 4 (Chair)
Kim Shugar, Florida Department of Environmental Protection (DEP) (Co-Chair)
Karen Bohnsack, Florida Keys National Marine Sanctuary (FKNMS) (Designee)
Tom Matthews, Florida Fish and Wildlife Conservation Commission (Designee)
Shelly Krueger, Florida Sea Grant/IFAS Extension Monroe County
Barbara Powell, Florida Department of Economic Opportunity
Ted Yates, Village of Islamorada (Designee)
Sue Heim, Key Largo Wastewater Treatment District
Andrea Leal, Florida Keys Mosquito Control District
Chris Bergh, Florida Keys Program, The Nature Conservancy
Greg Boling, Florida Keys National Wildlife Refuges Complex (Designee)
Sandra Walters, Resource Environmental Solutions (RES)
Patience Cohn, Marine Industries Association of South Florida
Tylan Dean, National Park Service

Summary of Resolutions

- Motion 1 (passed): Wade Lehman made the motion to approve the agenda. Sandy Walters seconded the motion. The motion passed with no objections or changes.
- Motion 2 (passed): Sandy Walters made a motion to approve the August 11, 2022 meeting minutes. Patience Cohn seconded the motion. The motion passed with no objections.
- Motion 3 (passed): Sandy Walters made a motion to approve the Roadways and Water Quality Resolution as written, with the edits from the TAC incorporated. Further discussion about how to deliver the resolution will be continued at a later date. Patience Cohn seconded the motion. The motion passed with no objections.
- Motion 4 (passed): Shelly Krueger made a motion for the TAC to convene one or more workshops to a) review the main questions that need to be answered by the water quality monitoring program(s) within FKNMS and b) identify new technology that could be incorporated to help answer those questions. Sue Heim seconded the motion. The motion passed with no objections.
- Motion 5 (passed): Chris Bergh made a motion to approve the recommended priority topics for FY23 EPA funding, as edited. Karen Bohnsack seconded the motion. The motion passed with no objections.
- Motion 6 (passed): Kim Sugar made the motion to approve the creation of another seat on the WQPP Management Committee for Katie Bozza, DEP's Water Quality Coordinator. Karen Bohnsack seconded the motion. The motion passed with no objections.
- Motion 7 (passed): Kim Shugar made the motion to approve the addition of Mollie Sinnott, DEP Southeast Regional Coordinator, to the TAC. Barbara Powell seconded that motion. The motion passed with no objections.
- Motion 8 (passed): Wade Lehmann made the motion to reconvene the WQPP Steering Committee for a virtual meeting within the next six weeks to continue with the presentations that had to be deferred due to the water main break that shut off the Marathon water supply. This will be an information-sharing meeting as none of the presentations are anticipated to result in motions or voting actions. Chris Bergh seconded the motion. The motion passed with no objections.

I. Introduction and Opening Remarks

Wade Lehmann, Ocean and Estuarine Section Chief, EPA Region 4, called the meeting to order and welcomed everyone. Kim Shugar, Division of Ecosystem Assessment and Restoration (DEAR) Director, FDEP and Mr. Lehmann are the meeting co-chairs. Ms. Shugar briefly introduced herself; she recently returned to DEP last June, but has worked on south Florida water quality issues for her entire career.

Steering, management, and TAC committee members in attendance are introduced and/or recognized. Thanks to the City of Marathon and George Garrett for providing the meeting facility.

Mr. Lehmann gave the opening remarks on behalf of the EPA. On behalf of himself and the EPA Regional Administrator, Mr. Lehmann thanked everyone for their time, effort and focus on the WQPP. The program is really starting to take off again and there is a need for it. Yesterday a working meeting was held to outline some detail for the WQPP Report to Congress. We are aiming to get that completed by the end of this year. If someone reaches out to you about a topic, please be responsive so we can get this report done. The report is to help people understand what the WQPP has accomplished over the past decade while also helping us to secure funding. Supporting materials are online for your reference.

Ms. Shugar gave the opening remarks on behalf of FDEP, noting her appreciation for the WQPP members and stakeholders. A lot of time and effort has been put into water quality concerns in the area. I am looking forward to working with this group.

Mr. Lehmann reviewed housekeeping information, including the hybrid meeting format and instructions for attendee participation and public comment. The presentations and materials associated with the meeting will be available on the steering committee page on the Water Quality Protection Program website http://ocean.floridamarine.org/FKNMS_WQPP/.

Agenda and Minutes

Mr. Lehmann reviewed the agenda and minutes and requested edits or a vote to approve from the Steering Committee. Wade Lehmann made the motion to approve the agenda; Sandy Walters seconded. The agenda was approved with no changes and no objections. Sandy Walters made the motion to approve the minutes; Patience Cohn seconded. The minutes passed with no objections.

II. Monitoring Program Updates

Water Quality Monitoring Program

Dr. Henry Briceño, FIU, provided an update on the FKNMS Water Quality Monitoring Program. FKNMS was designated in 1990 by the Florida Keys National Marine Sanctuary and Protection Act. This also established the WQPP, which has been in place for 27 years. The purpose of the WQPP is to recommend priority compliance schedules and address point and non-point sources of pollution to restore and maintain the chemical, physical, and biological integrity of the sanctuary.

The water quality monitoring network was established in 1995 and designed to provide a synoptic view of water quality with a focus offshore. The original design was mainly analyzing nutrients and did not include monitoring very near shore in the halo zone. Monitoring began in 1989 before FKNMS was established. At its peak, 350 stations were monitored across South Florida, and ~70,000 samples were being processed and analyzed annually. Due to budget cuts, there are now 112 stations in FKNMS and only 3 stations in Florida Bay. Many stations were removed from Florida Bay and the nearshore areas of the Everglades; as more questions emerge about water quality, we have less information to answer these questions.

Water quality in FKNMS is dependent on a series of factors (some inside the keys, some outside, and some beyond our control). Water quality variability is affected by what's happening in the Keys, but also what's happening in the Mississippi Delta, South Atlantic, etc. It's all interconnected. The Gulf stream moves >100 times as much

water as all the rivers in the world combined (30 billion gallons/second). This forms a huge river within ocean. This connectivity is illustrated by the sargassum problems that have occurred in the Keys since 2011, which comes from northeast Brazil and is transported to Florida. Sargassum started to get bad in 2011, because oceanic circulation and atmospheric relationships began changing due to climate change. We currently have more sargassum in the Atlantic (in FL) due to what's going on in Brazil and the Amazon, from deforestation, fertilizers, etc. Sargassum feeds on all this, grows out of control, and then hits our shoreline. Sargassum affecting our canals and shoreline is due to processes that we cannot control/handle. Locally, drifters have been used to track general ocean circulation and have shown that we have seasonal variation in ocean currents. The overall picture is very complex and includes far field impacts from western Florida and the southwest Florida shelf, hurricane-generated impacts, runoff from Keys shoreline, and the Gulf stream. We don't have a good handle on how these currents all work and interrelate (some models were put together in the past but need reassessment).

Issues we cannot manage: Gulf and Florida current, hurricane-related effects (we can make our communities more resilient to hurricanes but can't control overall impacts).

Issues we can manage: what comes out of estuaries (Western Everglades, Florida Bay and Biscayne Bay) and terrestrial inputs from the Keys (stormwater, shallow injection wells, septic system leachate, etc.). Shallow injection wells in the Keys are a problem for local water quality; these wells cannot contain the effluent being pumped into them. It doesn't stay local, but rather flows out into the next canal or shoreline and gets into the ecosystem. Since 2017 most of FL Keys is connected to wastewater treatment plants, however, residue from septic tank still resides.

Nutrients dumped into septic tank system run through a drain field. The drain field is supposed to clean the water, but as it cleans, nutrient filled residue accumulates in the ground. When you stop using a septic tank, the residue remains in the ground and will leach out.

- Drain field geology: It's not very permeable, water moves slowly through it to clean. In the Florida Keys, however, the canals are close by, the drainage field is small, and the water makes it to canals fast (in a matter of hours). This allows little cleaning to occur before it gets to the canal. Over time residue will build up in canals, especially in deep canals. The waters down deep have very bad quality (no oxygen, no life, just aerobic life). Even after stopping the use of septic tanks, this area still exists and continues to leach out nutrients and chemicals into the canals.
- When doing restoration/remediation of a canal, we don't get an immediate change in nutrient content due to residue leaching. In canals, water quality deteriorates with depth; those with a depth greater than 6 ft are usually of poor quality. TN, TP and chlorophyll concentrations in canals are well above the nutrient criteria norm for FKNMS surface waters. Measures to remediate canals: backfilling is best; it's expensive, but this eliminates the deep water and gets to the root of the problem. Culverts are next best because it increases circulation, but will also dilute pollution. Air curtains are palliative. Overall, returning canals to their previous condition regarding nutrients is going to take a long time.

What changes have been seen during this 27-year monitoring study?

- Increased in phosphorus and chlorophyll concentrations within the system, mostly in areas close to the Keys land area (these are linked as phosphorus is food for algal blooms).
- Dissolved oxygen (DO) has been increasing through time in both surface and bottom water sanctuary-wide (which is good).
- Water clarity has declined in areas influenced by the Keys land area. This is measured as a decline in the attenuation coefficient K_d , which is a measurement of how much light can cross a water column. A higher K_d number means less light that's hitting the bottom (aka benthic communities).
- Phosphorus and nitrogen are increasing in halo zone (waters within 500 meters from shore).
 - There is a N and P gradient from the Keys to offshore; the closer to land the higher the N and P concentrations; it becomes less as it dissipates and moves out toward the coral reefs. This shows that the land is the source of nutrients.

Questions moving forward:

1. Are we sampling where we should be sampling? Are we sampling enough sites to accurately represent what we want to know about the system?
 - a. For original objective, yes. But now we need to reassess. There may be a need to add or eliminate some stations. More stations are needed in the halo zone as we don't know how the halo behaves. We have some information, but not enough.
2. Are we measuring and analyzing all the parameters we need to?
 - a. Currently covering all the traditional water quality parameters: nutrients, pH, DO, etc. However, there are chemicals that are now known to be problematic and should possibly be incorporated into the monitoring program. These include contaminants of emerging concern (CECs) microbial communities, etc.
3. Are we measuring at the frequency we should be measuring?
 - a. Definitely not! Only measuring quarterly. Many phenomena change at shorter frequencies than quarterly (e.g., daily, weekly, monthly). Only have an idea of seasonal variabilities based on quarterly sampling.
 - b. Use other systems or equipment to fill the gaps between sampling, to sample at a higher frequency, and/or sample during/after an event. For example, data flow is used by SFWMD in Florida Bay. This involves equipment attached to a boat, and it enables you run at 35 knots while measuring a set of variables. This cannot measure nutrients, but can measure other water properties (DO, pH, salinity). This could be an option for improving monitoring in the Halo zone and providing more information at a higher frequency and higher spatial density.
 - c. Other ideas incorporate drones where there are hot spots, have permanent buoyed stations that generate and transmit data every second, minute, or hour. This needs to be coordinated to relay information to WIN or another centralized system with the same QAQC and methodology.

Questions & Answers/Comments/Discussion:

- Chris Bergh: You really emphasize septic tanks and sargassum as the source of pollutants, but you didn't say anything about stormwater? How does stormwater factor in? And a question about the residual nutrients from septic tanks, do we know anything about how durable it is? How long does it last? Is there any bioremediation that might play a role in getting rid of it faster?
 - Stormwater is one of the things we can manage, and I believe it's currently one of the main sources of pollution to our waters around the Keys. Any urban development will have issues with this if the water is not cleaned before entering water bodies. Stormwater problems do not only come from bridges, but from every other roadway too. This needs to be the next focus.
 - The problem with the septic residue is not from the tank itself. EPA regulations state you have to clean that up and close it off as part of the septic tank closure. The problem is with what remains in the rocks themselves; we don't know what is in there. I can only hypothesize but it should be studied and analyzed. We need to see what is in those rocks, how leachable it is, and what comes out of it through tide changes, fresh vs. saltwater exposure, changes in seasons, etc. Collect a core of that area, bring it to the lab, expose it to different salinities, different pH, different chemical conditions and see what comes out of that core. Then we could extrapolate what's going on in the natural environment.
- Andrea Leal: Have you had an opportunity to do some daily measurements to see if that septic leaching really is in effect? Are there differences before and after rainfall? Or during tidal fluctuations?
 - No. But we have deployed some instruments to gather higher frequency measurements of different properties within canals to see variability. These allow you to set sampling time to whatever frequency you'd like; for example, every 5 min, 10 min, etc. We can see how DO changes. People mainly take measurements throughout the day when the oxygen levels are higher. If these measurements were taken at night, you might see it drop down low as only respiration is taking place. That frequency should be measured, that will give us an idea of the productivity of the water column.
 - The highest frequency at which we took samples was every week. In a few places we sampled every hour for two days (did that in Little Venice in 2002-2007 before and after the sewer connection).

- Tom Matthews: You mentioned that dissolved oxygen has a 24-hour cycle, the increasing long term DO trends you showed us earlier (referring to a graph presented), is that a daytime measurement? Or is that indicative of the 24-hour cycle?
 - Those measurements are taken during the daytime when we physically go out and sample. Several weeks of continuous measurements have been done in canals and we see that variability.
- Tom Matthews: I was just concerned that the trend showed DO was improving, but we know it's potentially linked to algae and not an actual net improvement.
 - The data is there but our conclusions are biased (not accurately reflecting the nights).
- Tom Matthews: The second trend I didn't fully understand was the long-term trend of light penetration at the reef is shown to be increasing. However, daily observations suggest that there's a lot more turbidity in the water and less light/relative visibility. Could you explain this?
 - When measuring turbidity, we have not seen an increase throughout time. There are cyclic changes, but on average those levels are about the same. Chlorophyll has increased, but we have found in the past is that there is not a direct connection between chlorophyll and turbidity. It has been reported many times that there isn't a direct relationship between the two. Graph shows we have less light getting to depths, something is dampening the light getting through. Maybe it's chlorophyll. Maybe it's something else. It seems to be based more on the relationship between chlorophyll and the light attenuation coefficient than with turbidity.
- Sue Heim: You've collected the data. What's the next step? What's the response? What's being done with the data? Where are we going with this and how are we justifying its value?
 - I think the data we generate during any research program is not just meant for scientific publications. People should know the meaning of that data. We are not very good at communicating with the general public and we should use the media to communicate with people; let them know what is going on, what the implications of what scientists find are. There are things that need to be changed and policies that need to be put in place in order to make use of this data that we've been collecting for 27 years. This data was paid for by the taxpayers and is available them. We have used these data in the past to make decisions and scientists use the data around the world.

Seagrass Monitoring Program

Dr. James Fourqurean, FIU, provided an update on the FKNMS Seagrass Monitoring Program. Referencing the previous presentation, Dr. Fourqurean noted that the decision to install a centralized sewer system in the Florida Keys was driven by the data collected by the Water Quality Protection Program. Major policies and projects have come from this long-term program. Pivoting to the seagrass monitoring program, he noted that people have limitations; they tend to work when the sun is up, can only sample sites a few days a year (due to funding/time restraints), etc. However, seagrass sits on the bottom sampling and integrating water quality 24/7, and thus shows the signals of water quality status. At least 40 papers have been published based on the data collected from this program, and it has changed how the world understands tropical seagrass systems.

FKNMS is less than 10% hard bottom/coral reef and less than 5% of that coral reef has live coral on it. But over 90% of the bottom has seagrass coverage. Seagrass is the primary living marine resource in FKNMS and is also in peril wherever people live (noticeable trend around the world). We've lost about 50% of the seagrasses since the early part of the 20th century on a worldwide basis due to water quality degradation. This made it an obvious resource to choose as a target for a WQPP monitoring program. We monitor the seagrasses, and the seagrasses monitor the water quality. Water quality is sampled at the same places where seagrasses and coral reefs are sampled, and the numbers match up with data from the water quality monitoring program. There are 40 seagrass monitoring sites throughout the sanctuary, 5 in Florida Bay and 23 in the Dry Tortugas. The same methods are used at each, and the dispersal of sites gives a larger view of what's going on with seagrass resources across this landscape.

What types of seagrass bottom are out there (analyzing 25 years' worth of data)?

- 7 kinds of bottom: 1. Dense turtle grass (*Thalassia testudinum*) meadows, 2. Moderately dense turtle grass with a lot of algae, 3. very sparse turtle grass, 4. very sparse turtle grass with a lot of algae, 5. Manatee

grass (*Syringodium filiforme*) meadow, 6. Shoal grass meadow (*Halodule wrightii*), and 7. places that seagrasses can't grow because there is not enough sediment.

- We can statistically state that these are the types of bottom coverage in FKNMS.

How stable are these bottom types across the sanctuary? Are they changing much?

- Looking at the relative abundance of the 48 most common taxa, we've observed that they don't change much, but in certain areas they do.
- Manatee grass meadows are the most stable. Manatee grass meadows in the lower Keys back country have been stable since 1995.
- The areas that transition between turtle grass dominant and macro algae dominant are the least stable communities (they transition back and forth).
- Some nearshore sites change species composition. Some offshore sites suddenly lose seagrass cover due to hurricane damage and do not recover for many years.

At the start, we were looking at regional patterns and water quality but realized we weren't spending enough time looking at where the changes were happening: within the first 500 meters from shore, the Halo-zone. Sites within the Halo zone were added in 2010 (currently have 12 years' worth of data). Halo zone sites show a change from turtle grass to shoal grass, a nutrient-loving grass. Additional research shows this change is driven by nutrient enrichment in the nearshore, specifically an increase in phosphorus availability. We are still seeing locally driven, phosphorus-generated changes in the nearshore benthic habitat.

Overall, the seagrass is "metastable" (stable provided it is subjected to no more than small disturbances), except close to shore where we're seeing changes driven by continued P pollution. That change between turtle grass and calcareous green algae is likely due to inter-annual nutrient availability and hurricanes. The impact of a hurricane can be very short or very long depending on how the hurricane damaged the bottom. After hurricane Georges, sites went from majority turtle grass dominated to something else. Some of those sites recovered, some of them they didn't. Wilma hit (basically the same areas) and knocked the seagrasses back again. There were several years of low turtle grass. Some places started recovering, then got knocked back again. We continue to see hurricane-driven changes at permanent sites, however this does not prove that hurricanes are causing loss of seagrass coverage across the entire FKNMS. Sites were set up only where there was seagrass. In this dynamic landscape, where seagrass is growing in some places after storms and disappearing in other places because of storms, we can only measure the disappearance within these permanent sites. It doesn't mean that we're having a cumulative impact due to hurricane driven loss of seagrass cover. To answer questions about overall loss, we'd need to do a remote sensing mapping of the benthic habitats in south Florida (hasn't been done since 1994).

Looking at pictures of sites before and after Hurricane Ian passed over the Dry Tortugas on 9/27/2022 with 120 mph sustained winds, we see there was almost a complete loss of seagrass meadows driven by the passing of that storm.

- Before = 45 ft deep healthy Tt meadow,
- After = Can see rhizomes that are normally buried about 6-7 inches under the soil. This is indicative of a huge erosion event. In other areas, sand ripples illustrate the current energy that was present even at 45' of depth.
- If the water quality is stable, it is believed that eventually, seagrass will grow back. Can have huge losses that last for decades following hurricanes.
- Projected increased hurricane intensity and frequency due to climate change are a cause for concern that the equilibrium distribution of seagrass is likely to change.

Seagrass samples can be linked to water quality based on measurements of how much nitrogen and phosphorus are in the tissue. These nutrients are long-term integrators of available nutrients. Measuring stable carbon isotopes is a way to measure how much light reaches the bottom, and measuring nitrogen isotopes relates to processes that put nitrogen into the water (usually a big sewage tracer signal). Looking at different zones in FKNMS (Florida

Bay, sluiceway, offshore, nearshore, etc.), through time we see variation in surface water TN and TP. N peaks are not at the same time as P peaks, they are offset.

In a publication from 2000, N:P ratios - how much nitrogen and phosphorus are found in seagrass tissue – were investigated across the upper keys part of the sanctuary. Inshore seagrass is more P limited (P driven changes). Reef adjacent seagrass is more N limited (N driven changes). What causes seagrass pollution and die off inshore might not cause pollution offshore (crossing gradients, act differently across system). For example, N pollution will not impact the benthic habitat at Little Venice (P-limited environment), but that same N when it reaches the reef (N-limited environment) will cause a pollution event that didn't appear close to shore.

There are times when P is high (N:P ratios are low in the water column) and time when N is high (N:P ratios are high in the water column). There are fluctuations in turtle grass density that follow those fluctuations in N:P ratios. Sites near the reef have more seagrass when more nitrogen is present (nitrogen limited environment). When there's more P relative to N in the water, then Florida Bay, a P-limited area, tends to have higher seagrass abundance. So those sites, even though they're always stable turtle grass meadows, have more turtle grass in rainy years. During times of low precipitation there is high phosphorus in the water column, and during times of high precipitation there is high nitrogen in the water column. Using general additive models, we see that in the long term interannual variability is being driven by south Florida precipitation. Little precipitation equals low amounts of seagrass in the offshore parts of the sanctuary. High precipitation equals more seagrass in the offshore parts of the sanctuary because the nutrient limitation is ameliorated.

Why is precipitation doing that? General circulation of energy in the atmosphere (the Atlantic Multi-decadal Oscillation) drives differences in rainfall, rainfall drives differences in runoff, runoff drives differences in regional nitrogen to phosphorus concentrations that then has an impact on what's going on in the sanctuary. Offshore, during rainy years, there's more seagrass. Inshore, like Florida Bay, the dryer years have more seagrass. This analysis is still in progress, so a full understanding of cause and effects is not worked out, but it seems if it rains more, across all southern United States, there's more nitrogen being delivered to coastal waters which is causing more seagrass. These data have not been looked at in coordination with the coral reef monitoring program (CREMP). Corals like nutrient-limited environment, so good seagrass years may be bad coral years. It is unknown how this will change in the future.

Questions & Answers/Comments/Discussion:

- Wade Lehmann: You mentioned both isotopes and total N:P ratios, does that affect epiphyte or surface growth? I noticed in the nearshore environments a lot of grasses are covered with epiphytes.
 - Seagrass people from around the world know that epiphyte and algae overgrowth is something that can lead to seagrass death. And we know that epiphytes growing on the plants affect carbon isotope ratios in many ways (for example they change the C diffusion gradients). In south Florida we tend to see a change from slow growing seagrasses to fast growing seagrasses because of the rate at which phosphorus is loaded into the system. So even in highly epiphytized areas in South Florida we have lower epiphyte concentrations in comparison to other areas (ex. Chesapeake Bay). Our geology and our relatively low population density in the Florida Keys contribute P that's driving that increase in phosphorus availability close to shore and is changing turtle grass to shoal grass. The next thing that happens, which can be seen very close to shore, is the loss of shoal grass.
- Wade Lehmann: Do you think atmospheric nitrogen is playing a role?
 - I have not done those budgets. My dissertation work was on Florida Bay, and we discovered that it's the most P limited environment on the face of the planet. Very little work was going into looking at nitrogen as a driver because it doesn't really matter how much nitrogen you put into the system. It wasn't until almost two decades after that that it became clear that the reef tract is nitrogen limited. So, nitrogen needs more examination. I don't know anybody that has looked at either dried or wet deposition of nitrogen as a driver.
- Chris Bergh: What are your thoughts about the legacy of nutrient pollution in the ground associated with historic septic tanks?

- I'm a little more pessimistic than Henry. Phosphorus and nitrogen are two very different elements. Nitrogen exists in multiple valence states and because of that, bacteria can use nitrogen in several ways (it is used to making proteins, use nitrate to burn sugars, use ammonia to fix CO₂ out of the atmosphere, etc.). So, what that means is that there's a natural loss term for nitrogen pollution. If you stop dumping nitrogen into an N-limited environment, it goes back to the atmosphere and is lost in the system.
- Our nearshore system here is phosphorus limited. P really only exists in one valence state. That means it can't receive and give up electrons, so it's relatively useless for supporting metabolic processes. So, there is no bacteria loss term from phosphorus. The only lost term from the phosphorus associated with living things, is the export of biomass out of the system (have to remove that organic stuff with phosphorus in it and get it out of the system).
- The other issue is that phosphorus sticks to carbonates and its mobility is limited by carbonates. So, we have not just the carbonated rock that slows down the movement of phosphorus, but we also have a system that generates carbonated particles in the water column because of photosynthesis. Mullet "whittings" are mostly generated by the direct deposition of calcium carbonate in the water column. So, these little limestone particles are made anywhere there's photosynthesis. That means all over the seagrasses and algae are tiny limestone particles that are phosphate sponges. So, the phosphate sticks to them and stays. So, the geology and the lack of a loss term to the atmosphere means nitrogen fertilization is temporary while phosphorus fertilization is relatively permanent and relatively long term.
- A series of experiments that started back in the 80s was done in Florida Bay, where birds were encouraged to sit on stakes and drop their feces into water over seagrass beds. This developed new techniques for seagrass restoration because bird feces act as a fertilizer for seagrass. A little bit of fertilizer when you're trying to get something restarted is a good thing. Too much fertilizer ends up killing the seagrass because it was over fertilized. Twenty-five years after this experiment, the area still had all the phosphorus that was dumped there 25 years earlier. And this area is in shallow water with good flow. We polluted our nearshore system with phosphorus. We must stop it then have patience. It's going to take a long time to remove that phosphorus from the biological activity that leads to a change in the benthic habitat.
- Tom Matthews: Are hurricanes flushing events? What about leachate from septic tanks?
 - Hurricanes move a lot of water so they are big flushing events. Florida Bay, however, is efficient at holding stuff. Irma basically drained all the water out of northeast Florida Bay, and when the water came back in, there was really no lasting differences in water quality.
 - Regarding septic tanks: Yes, as the storm approaches, water gets sucked out then is pushed back in as the storm hits, which will help flush a bit. The Gulf of Mexico has a higher sea level than the Florida current and that's what drives the Gulf Stream. What that means is that there's almost always a north to south groundwater flow under the Florida Keys that pushes the canal water and the ground water slowly back out. I think that day-to-day, long term net flow of water to the oceanside will do more to flush everything out over the long term than periodic hurricanes.
- Shelly Krueger: I think you were talking about mullet mud for a second when you were talking about the precipitant, and I don't know if everyone here knew what mullet mud was and what you were talking about.
 - Mullet mud is an event that geologists call whittings. You may notice them in Florida Bay; you might be cruising along in clear water, go over a bank, then suddenly the water is very turbid. That is called mullet mud. Sometimes this is caused by mullet stirring up the mud, however, that only accounts for a small fraction of whittings. A large fraction of these events are caused by the direct deposition of calcium carbonate. It creates high turbidity but it's reflective so doesn't have a huge impact on the amount of light reaching the bottom. So, it's bright down there but you still can't see anything (turbidity is not simply related to how much light reaches the bottom).
- Sue Heim: You made an important point about additional phosphorus inputs having to stop. What policy needs to change to make that stop?
 - Getting a centralized sewage collection was a great first step. Now we have to get the phosphorus that's in the central sewer out of circulation. We can't be putting it into emergency shallow wells.

The effluent needs to be gone – either out into the Gulf Stream or down in deep wells so that it’s deep enough in the aquifer that it won't bubble back up again and cause problems within 10 miles of shore.

BREAK

III. Florida Bay Status Update

This topic was deferred to a future meeting due to the water main break in the Keys requiring an early meeting adjournment. (See Addendum Notes from March 29, 2023 WQPP Information Sharing Meeting).

IV. Bonefish Pharmaceutical Contaminants Study

This topic was deferred to a future meeting due to the water main break in the Keys requiring an early meeting adjournment. (See Addendum Notes from March 29, 2023 WQPP Information Sharing Meeting).

V. Florida Keys Roadway Improvements and Coastal Resilience Efforts

This topic was deferred to a future meeting due to the water main break in the Keys requiring an early meeting adjournment.

VI. Technical Advisory Committee Report Out

Dr. Nick Parr, FDEP, and Sandy Walters, RES, provided a reminder on the background of the resolution discussed at the last meeting pertaining to roadways and water quality improvements, and reviewed the discussion and outcomes from the Technical Advisory Committee (TAC) meeting that was convened to provide input that resolution.

A resolution was proposed at the last Steering Committee meeting about the roadways and water quality improvement items. However, a vote was delayed on the resolution at that time due to a request for it to be reviewed by the TAC. The TAC was since convened, and they provided an edited version of the resolution that was sent to the Steering Committee for consideration during this meeting.

Sandy Walters provided a reminder that when it comes to stormwater management and treatment, particularly with roadway projects, there is a policy through the Federal Highway Administration that states stormwater treatment does not need to be provided if the road project is not going to change the footprint of that roadway. This has created a situation where agencies and local governments bend over backward to not change the roadway footprint because they can't get funding to add stormwater treatment. Our perspective on stormwater, as Henry mentioned earlier, is it's the next most substantial issue affecting water quality. A multi-million-dollar infrastructure bill was recently passed in Washington with a good deal of environmental focus. If there was ever the time to focus on roadway water quality improvements, it's now.

The updated language in the Roadways and Water Quality Resolution, as proposed by the TAC, is as follows:

“The Water Quality Protection Program (WQPP) Steering Committee for the Florida Keys National Marine Sanctuary urges the Florida Department of Transportation and the Federal Highway Administration to fund stormwater treatment for roadway improvement projects in the Florida Keys including those that do not increase impervious surface. A 1999 EPA report identified stormwater, particularly runoff from roadways, as the second leading contributor of nitrogen and phosphorous into the nearshore waters behind wastewater, which has since been a major focus of infrastructure improvements. Sanctuary water quality is a primary focus of federal and State management and protection in the Florida Keys, with stormwater treatment being identified as a top priority in 2020 by the WQPP Steering Committee. Therefore, treatment of roadway runoff must be a priority to reduce contaminant loading into the nearshore waters. This also addresses the Florida Keys Reasonable Assurance

Document to meet federal and State water quality standards and protect the world-class marine environment that the Florida economy depends upon.”

Questions & Answers/Comments/Discussion:

The following points were made during the discussion:

- Clarification was provided about the Florida Keys Reasonable Assurance Document. The purpose of this document was to identify a number of best management practices that would reasonably result in meeting water quality standards.
- Regarding next steps and the use of this resolution, it was noted that if the Steering Committee votes to approve it, it will become part of the meeting record. Beyond that, the Steering Committee can provide input on who would carry it forward and in what direction.
- Generally, the Committee supported ensuring the resolution doesn't just sit on a shelf.
- Discussion included how to get this resolution to FDOT. It was noted that the municipalities may be effective in delivering a message like this; those in the federal government are prohibited from such activities. Transmittal would have to be done by other members.
- If someone could be identified to sign a cover letter, a list of people to direct this resolution to could be developed. This would include the directors of the Federal Highway Administration and Florida Department of Transportation, and distributed more widely. There are a lot of professional civil engineers who work in this area who would agree with this concept, including local communities and the county here in the Keys. The issue is funding; if this document could open up funding, we could get a lot of support.

Motion (passed):

Sandy Walters made a motion to approve the Roadways and Water Quality Resolution as written, with the edits from the TAC incorporated. Further discussion about how to deliver the resolution will be continued at a later date. Patience Cohn seconded the motion. Co-Chair Lehmann called the question. The motion passed with no objections.

VII. Steering Committee Discussion: Next Steps for Initiating an FKNMS Water Quality Monitoring Program Evaluation

Shelly Krueger, Florida Sea Grant, led a discussion on potential strategies and next steps to initiate an evaluation of the FKNMS water quality monitoring programs. During the July 2021 Steering Committee meeting, Shelly made a motion for the Water Quality Protection Program Steering Committee to call on the TAC to review the current water quality monitoring program and provide recommendations back to the Steering Committee. During this discussion, the motion was amended to additionally task the Management Committee with developing a list of questions that would guide how the existing water quality monitoring programs are evaluated by the TAC. The Management Committee was also called upon to provide recommendations for avoiding conflict of interest in such an evaluation by the TAC. The Steering Committee requested an opportunity to review all management questions before they were presented to the TAC. Shelly summarized that the Management Committee needs to develop a list of management questions that need answering. From Henry's presentation earlier, the purpose of the water quality monitoring program is to recommend priority corrective actions. The list of questions and evaluation of the water quality monitoring program should consider the new technologies available (ex. satellites, datasondes).

Questions & Answers/Comments/Discussion:

- Karen Bohnsack provided further background information. Following the passage of that resolution in July 2021, a list of management questions and a draft framework for conducting an evaluation of the water quality monitoring program was presented to the Steering Committee in November 2021. As part of that discussion, it was noted that additional capacity and funding would be needed to complete this evaluation effort (ex. funding to get people to in-person meetings and having an outside facilitator to help make sure it was impartial). This was the most recent discussion on this topic. The draft framework is available on the WQPP website:

- https://ocean.floridamarine.org/fknms_wqpp/docs/wqpp/data/20211115/FL_Keys_WQMP_Evaluation_Framework_Guiding_Mgmt_Ques.pdf.
- Chris Bergh: My understanding is that beyond just FKNMS water quality monitoring, there's an ongoing discussion of how to integrate all water quality monitoring across the S. FL ecosystem and region. Wondering how those interact and if we should figure out how to ensure that the right kind of engagement is happening?
- Karen Bohnsack provided further context to Chris' question. Under the umbrella of the South Florida Ecosystem Restoration Task Force (SFERTF), which oversees Everglades restoration, the Working group and the Science Coordination Group (advisory bodies to the Task Force), have just put together a new Florida Coral Reef Coordination Team. They had their first meeting in January, and one of their first tasks is to create a collaborative framework for water quality monitoring across Florida's Coral Reef and feed that into Everglades Restoration efforts, with a goal of better incorporating coral reefs and other coastal marine resources into decision-making. The team has a goal to develop that framework this year, and hopefully have some recommendations by the fall. This is also being supported by a project DEP has funded to inventory and crosswalk a number of the water quality monitoring programs that exist along Florida's Coral Reef (within the scope of certain parameters, such as the duration of the monitoring program, parameters monitored, etc.). An effort by the WQPP should try to integrate into these larger processes.
- Chris Bergh emphasized the importance of staying up to speed on this process and making sure we're integrating into it. Regarding the discussion about needing funding and resources, was wondering if the people who have been running these programs for years have thoughts and/or ideas about the evolution of these programs. Could we get their input; perhaps have them come to the TAC and bounce ideas off of them?
- Wade Lehmann: Based on other groups I've worked with, I know that the state and EPA have been trying to identify water quality-related factors that could be the "biggest players" for causes of decline on reefs. There's a big literature search going on to put together criteria and standards for this. There are a lot of ongoing efforts we could tie into.
- Sue Heim: Do these efforts have a timeline? Is this mission-critical? When do we want to turn what we're discussing into action?
- Wade Lehmann expressed an opinion that this is not critical, but it is something that needs to be done. As one of the funding agencies, EPA contributes a lot of money (about \$1,000,000 per year) toward monitoring. For programmatic reasons, we want to make sure we're doing the right thing so that funding agencies support it. This could potentially be a topic we add to the list of priorities that are in our "request for proposals."
- Shelly Krueger suggested a motion to convene a series of TAC workshops to talk about Water Quality Monitoring and answer some of those questions already identified from the November 2021 meeting.

Discussion about the motion included the following points:

- Chris Bergh asked for clarification. For the TAC workshops, we noted the need for additional budget and staff time to do this. Is this request to convene the TAC intended to happen in advance of that, to help scope out a special study paragraph to go in the RFA which would subsequently lead to more support in terms of staff time, money, etc....?
- Shelly Krueger clarified that, yes, we should start with the TAC and have them take the lead on how to proceed. Some of these new technologies have a high initial cost but will save us in the long run. Also, we had talked about bringing in speakers, people who are experts in these areas, such as sales reps (ex. Xylem). They would come to us for free, their job is to sell this type of equipment. I don't know what products are out there or how much they cost but the TAC could be a starting place for thoughts on how to proceed. As Wade was saying, it is a significant amount of money every year and we have a lot of management questions that need answering that aren't being answered. We've been using the same technologies since 1995, a reevaluation should occur. Some Steering Committee members have also wanted to address sargassum events or large rain events, by having some insight into the newer technologies we might be able to look into these things too.

- Karen Bohnsack reminded the Committee that last year the WQPP put forward this topic, a Florida Keys water quality monitoring program evaluation, as a recommendation for the EPA funding opportunity, but it did not make it into the RFA. We've included it again this year as a recommended priority. The recommendation includes conducting an independent evaluation for long-term water quality monitoring programs within FKNMS. The objective of this effort is to assess the program's effectiveness in supporting evolving resource management priorities and to identify opportunities to improve data collection. This will lead to more informed management decision-making and consistency in water quality monitoring efforts across Florida's Coral Reef. A hybrid approach was suggested to convene the TAC to take a closer look at the questions that have already been drafted and drill down a little bit deeper to define our objectives and desired outcomes from pursuing this evaluation – in other words, to define “what do we want to get from this process?” Get some feedback from the TAC on that. The TAC could be a first opportunity to invite some of these speakers that can better inform those objectives and outcomes, and then we can bring something back to the Steering Committee. Hopefully then we can actually generate some interest and funding to do these things.
- Wade Lehmann clarified his intent when bringing up the discussion of the RFA and funding. The program evaluation is asking the question “are we monitoring the right things? Do we need to change what we are doing?” The RFA could be used as a vehicle to explore the technologies and/or monitoring to help inform that decision. As a committee, we are not going to write something up to necessarily submit. We could certainly come up with a line to potentially add to the RFA. Internally, we might have some funding to do such a program evaluation, but as Karen alluded, we need a focus and direction. We can, for the most part, do this internally, but with all that said, we need to engage the existing monitoring programs and make sure we are covering all our bases. Wade recommended we restate what we're trying to do: Use the TAC to learn more about what technology is out there and how it might apply. Additionally, we can have a TAC discussion surrounding the data we're generating, its usefulness, and whether we are missing anything.
- Chris Bergh referenced the 2007 Batelle report. This had a number of recommendations, but then we had no money to implement them. We need to do this, but keep it realistic.
- Following discussion, the motion was restated for a vote.

Motion (passed):

Shelly Krueger made a motion for the TAC to convene one or more workshops to a) review the main questions that need to be answered by the water quality monitoring program(s) within FKNMS and b) identify new technology that could be incorporated to help answer those questions. Sue Heim seconded the motion. Co-Chair Lehmann called the question. The motion passed with no objections.

BREAK

VIII. EPA South Florida Geographic Initiative Funding and Priority Topics

FY22 Projects

Steve Blackburn, EPA, updated the Steering Committee on the special study topics that received EPA South Florida Geographic Initiative funds in FY2022.

In FY 2022, 60 proposals were received that totaled \$30M in requested funds. With \$8M in available funds, 15 proposals were selected. These are funded at an average of \$530k per award. \$1.5M, plus ~\$1M for ongoing monitoring, went to projects in the Keys. Additional funds went to the Florida Reef Tract, Biscayne Bay, the Caloosahatchee, and Indian River Lagoon.

New Florida Keys special studies projects funded in FY22 were as follows:

- Tidal connection restoration in Curry Hammock State Park and the City of Marathon w/ FDEP
 - 3 yrs. of baseline monitoring including water quality and benthic habitat.
 - DEP is taking on engineering, design, and permit requirements for the installation of 2 culverts to reestablish tidal connections.

- Restored flow should improve water quality and benthic habitat, and reduce fish kills and erosion due to storm events.
- Florida Keys water quality and climate monitoring to inform lower Keys reef restoration w/ Mote Marine Lab
 - Part of the Mission: Iconic Reefs coral restoration effort.
 - 3 yrs. of monitoring to include water quality chemistry at six reef sites in the lower keys, going from west to east (a transect from land out to the reef).
 - Monitoring will be focused on storm events (complimentary to FIU's monitoring).
- Monitoring anthropogenic sources of pollution and contaminants of emerging concern w/ CFK
 - A continuation of work that was started in the Key West channel, this will establish a more thorough monitoring network around the City of Key West to investigate sources of water pollution.
 - This can integrate with Mote's monitoring project
 - Monitoring water quality in Key West Harbor and the shipping channel (Oxybenzone investigation, look at mooring field for ammonia nutrients, also going to look at water quality in area adjacent to Stock Island)
- Long-term trends in Florida Keys water quality and linkage to *Synechococcus* (cyanobacteria) and *Sargassum* blooms w/ USF
 - Will monitor and track water quality, including *Synechococcus* and *Sargassum* in the Florida Keys, including development of new multi-satellite water quality products with higher resolution.
 - Detect and analyze blooms from upstream discharges, identify and quantify *Sargassum*, identify "zones of influence" for land-based sources of nutrients, including *Sargassum* leachate, and statistically assess linkages between Florida Keys Water Quality and these exogenous blooms.

On-going projects are as follows:

- Canal 114 Plantation Key Gravity Flow Injection Well Pilot, Islamorada
- Florida Keys Seaweed Barrier Technology Project, Monroe County
- Impact of Wastewater Injection (shallow well) on FKNMS, Penn State
- Tracking shifts in bacterial community structure and function throughout the course of SCTLTD in Lower Keys and Dry Tortugas, Mote Marine Lab.
 - This project had to incorporate some adaptive management, SCTLTD numbers were low in the lower Keys and had to be shifted more toward the DRTO.
- Examination of the occurrence of pharmaceutical contaminants in bonefish in South Florida, FIU
 - Looking at pathways of exposure in the recreational fishery of bonefish
- Florida Keys Water Watch Sponge Restoration Aquaculture, UFL
- Disturbance response monitoring and surveillance of SCTLTD, FWC
- Restoring diversity to Iconic Reefs, NMSF
 - Conducting NCRMP surveys and working with dive operators to incorporate Blue Star initiatives and removal of marine debris.
- Observation, modeling of transport, and dispersion of water pollutants from South Florida watersheds and south of the Florida Keys, FAU

The EPA RFA is expected to provide \$8M in FY23. South Florida Congressional Language directed at least \$2M to monitor coral health; \$1M to enhance water quality and seagrass monitoring in the Caloosahatchee Estuary and Indian River Lagoon; \$1.15M to enhance water quality and seagrass monitoring in Florida Bay and Biscayne Bay; and \$1M for the expansion of the water quality and ecosystem health monitoring and prediction network using the vetted modern procedure.

FY23 Priority Topics for Consideration

Karen Bohnsack, FKNMS, reviewed the draft priority topics recommended by the Management Committee for FY2023 funding. As done the last three years, this list is for the Steering Committee's review and feedback. The first two represent new topics on this list compared to what was recommended in the past. The last four are similar

to what has been put forward in the past, but with updated language. These have been kept on the list either because there were no applicants in past years, or no projects were funded in the Keys on that topic. The draft priorities for FY23 were reviewed:

- Nutrient budget & Modeling – This is intended to improve understanding about the relative contribution of various sources of nutrients to our nearshore waters. The last time a modeling and nutrient budget was developed was before the installation of the central sewers. What is the current status now? How are we doing? What are the relative contributions from these various sources? This will give us more information for when we're making recommendations about corrective actions related to these sources.
- Coastal resiliency and stormwater mitigation - This project ties two important topics that the Steering Committee has discussed and elevated over the years: climate change resiliency and stormwater. We have a lot of focus and infrastructure funds coming this way and as we spend these billions of dollars upgrading our infrastructure to divert stormwater, let's make sure we're doing the best we can to protect the nearshore water quality associated with that runoff. Are there additional best management practices that we could put into place that would work in an area like the Keys? Is what we are currently doing protective? If it's not, can we do more?
- Canal water quality improvements - Continues to be a major focus of our county and municipal partners. This is a good source of funding to help with innovative technology for planning, designing, and monitoring.
- Water reuse – This was recommended last year, but did not generate any proposals. This ties to the recognition that even AWT is not sufficient to remove nutrients to a level protective enough for the marine environment in the Keys, nor does it address pharmaceuticals and contaminants of emergent concern.
- Nearshore water quality monitoring transects – This specifically came out of the presentation from Kathleen Sealey, who is the principal investigator on the project looking at the impact of canals on nearshore water quality. The presentation included a series of graphs that showed water masses coming from the land out into the ocean. Those curved lines showed “break points” or points where the nutrients were not significantly different between the nearshore waters and oceanic offshore waters. The “break point” that we currently use is 500 m, that's the definition of our halo zone. Her early modeling showed the “break point” happening much closer to shore: About 250m, in some cases closer, in others between 250 and 500. This 500 m threshold is used to determine if our nearshore waters are doing well; we should ensure we're measuring in the right place
- FL Keys WQ Monitoring Program Evaluation – As discussed previously, this is intended to seek additional support to do this adequately.

Questions & Answers/Comments/Discussion:

- Sandy Walters inquired where the list of FY22 funded projects can be located.
 - This is just a preview. Recipients have been informed but no money is out the door yet. Once that occurs a full list will be available.
- Regarding the (FY22) project to increase pollution monitoring around Key West, is the Stock Island portion targeting the landfill?
 - Yes, mainly looking at hydrogen sulfide.
- Wade Lehman noted that across other geographic programs, monitoring is coming off the list and is no longer a hot topic. We have requested and are fortunate to retain monitoring. It is important to emphasize the value of this effort, make sure we're monitoring the right thing, and maximize the impact from it. In the future this may disappear here as well. Approximately \$3M of this year's funding is from the infrastructure fund and we only have another four years of that money.
- Steve Blackburn added that we got a commitment of \$16M that is supposed to be focused on resiliency.
- Sandy Walters identified research on nature-based solution as a topic missing from this list; that is a large topic elsewhere in Florida.
 - Wade clarified this is a big part of the RFA, this just highlighted what is being funded in the Florida Keys. There are a number of nature-based solutions projects in Biscayne Bay, for example.
- Rhonda Haag confirmed these are federal funds and inquired if those come with a lot of new requirements.

- Wade Lehman confirmed that this is federal (infrastructure) money, but extra requirements are not passed on to grantees. As noted in the RFA, there are points assigned during reviews for environmental justice or climate resilience or green infrastructures. The more points a project gets, the more likely it is to get funded. Internally, there's a lot of reporting that goes on but most of that is done behind the scenes.
- Steve Blackburn added an example that 10 points are assigned to climate resiliency within a project. With about 60 projects it was competitive, and the average project that was funded had about 86 points. As much as possible they've tried to insulate grantees from the additional requirements.
- Sue Heim asked if the proposed list for FY23 is in order of importance.
 - No, the 6 topics included are not prioritized and ranked.
 - Sue noted that if they were to be ranked, water reuse should be moved to the top.
- Chris Bergh referenced the first topic included in the FY23 recommendation; can we define P and N more broadly? E.g., define those anthropogenic sources as not just coming from modern wastewater contributions, but also legacy wastewater. Also, can we expand #2 to include nature-based coastal defense projects?
 - Karen edited the wording included in the recommendation as requested.

Motion (passed):

Chris Bergh made a motion to approve the recommended priority topics for FY23 EPA funding, as edited. Karen Bohnsack seconded the motion. Co-Chair Lehmann called the question. The motion passed with no objections.

IX. City of Key West Water Quality Improvement Plan

Alison Higgins, City of Key West, provided an update on the City of Key West's water quality improvement planning efforts and priorities. In a 2021 survey, just under 4,000 residents of Key West identified the environment and water quality as one of their top six issues. Since then, the city has been considering what actions and/or activities they would be best suited to tackle. A core team was convened to provide guidance, and a variety of relevant strategies and plans were reviewed to identify where Key West could contribute. A number of WQPP strategies had already been completed to date, such as upgrades to central wastewater treatment, outfall closure, ordinance to prohibit dumping of fish scraps and yard waste into canals, etc.

The resulting draft Key West Water Quality Improvement Plan includes 11 topic areas with priorities within each:

1. Increase partnerships to address marine debris/derelict vessels.
 - a. Expand mooring field – 1. Stop anchors from dragging during storms and 2. Mandate that they use the pump outs that are provided (100 at Wisteria Island and 40 at Boca Chica)
 - b. Cross deputize city staff to report derelict vessels – currently only officers and code enforcement can officially report the vessels in order to have them removed.
 - c. Promote SEAFAN public reporting system.
 - d. Promote “Vessel Turn In” opportunities.
 - e. Partner workshop to find other synergies.
 - f. Monofilament and trap recycling.
 - g. Etc.
2. Ensure adequate staffing and support to effectively manage/advance the plan.
 - a. Additional staffing would help take care of Key West efforts which in turn help WQPP's overall efforts.
 - b. Participate in the WQPP and annual operations planning. We all have strict budgets, through working together we can accomplish more via shared resources.
 - c. Strengthen coordination with other local governments. There are a couple of policies in place across local governments; working together they could develop shared language to strengthen policies.
3. Data management
 - a. Upload all qualifying data from marinas and landfill to public database.

- b. Ensure new data can be utilized in public database.
4. Stormwater best management practices/technology.
 - a. Continue modernizing and elevating equipment and infrastructure. Key West is the most impervious city, but this is also the most underfunded program.
 - b. Update Stormwater Master Plan every 5 years. This is being updated now.
 - c. Putting together an adaptation plan which has a green infrastructure section.
 - d. Interested in looking at when we do road elevation work what can be done to better mitigate unintended consequences.
 - e. Explore Canal Keepers program.
 - f. Keep the public educated on what we are spending money on and why.
5. Evaluate the existing water quality improvement program – Evaluate data from around Key West and adapt the WQIP every 5 years; this would include looking at long-term baseline and discussing what needs to be done. This should include effective monitoring for corrective actions.
6. Incorporate contaminants of emerging concern into monitoring – Key West has a deep well injection but neighbors, Stock Island, do not, is that an issue?
7. Strengthen regulations to reduce marina and boater pollution – Requirement for every marina to be a Clean Marina by 2015 and every boatyard to be a Clean Boatyard by 2020. This did not happen. Key West has more than most areas but didn't have enough bandwidth from Key West code enforcement and other department to keep up with this. They believe they have adequate marine pump out services, but Key West ran into some of the same issues as county regarding regulations for fixed vs. mobile units. They are interested in working with the county on shared language that would work well throughout the entire Keys (county and local governments).
8. Advocate for upstream water quality improvements – not much that can be done but the city can write letters, as they have done it in the past.
9. Determine water quality risks and mitigation actions derived from climate change – one section of the adaptation plan is an environmental chapter looking at habitat changes and coastal erosion.
10. Participate in targeted shared educational campaign – put out one message a month we can share to educate the public (ex. radio ad).
11. Wastewater management best management practices/technology – doing the same thing as stormwater master plan but for wastewater. This should be evaluated every 5 years and efforts made to continue to modernize equipment and infrastructure. Very interested in water reuse.

The City of Key West's FY23 budget includes \$1.4M to develop an adaptation plan, \$100,000 for Mote to support coral restoration, and \$180,000 for CFK water quality monitoring.

The FY24 budget includes funds for a Ports Adaptation and Water Quality Coordinator and additional funds to support the CFK water quality monitoring partnership. Additional funds will support educational materials, monofilament receptacles, etc.

For more information, email: ahiggins@cityofkeywest-fl.gov

Questions & Answers/Comments/Discussion:

- Chris Bergh referenced the ongoing discussion surrounding large vessels and turbidity; this could be reflected in this plan as well. Also, along the south shore at Smathers Beach, there is often an accumulation of seaweed and debris. This is a problem area; the water quality degrades substantially as these things mix and begin to decompose.
- Wade noted that introducing a citizen monitoring network is cost effective and useful. By providing basic materials to support this, you can get a lot of data back. It's not always the best quality data, but it can be used to guide future work.

X. Biscayne Bay Commission Update

This topic was deferred to a future meeting due to the water main break in the Keys requiring an early meeting adjournment. (See Addendum Notes from March 29, 2023 WQPP Information Sharing Meeting).

XII. Public Comment

None provided.

XIII. Steering Committee Member Updates

None provided.

Meeting Wrap-Up and Adjourn

Kim Shugar discussed proposed updates to the membership of the WQPP Management Committee and Technical Advisory Committee (TAC).

Motion (passed):

Kim Sugar made the motion to approve the creation of another seat on the WQPP Management Committee for Katie Bozza, DEP's Water Quality Coordinator. Karen Bohnsack seconded the motion. The motion passed with no objections.

Motion (passed):

Kim Shugar made the motion to approve the addition of Mollie Sinnott, DEP Southeast Regional Administrator, to the TAC. Barbara Powell seconded that motion. The motion passed with no objections.

Wade Lehmann thanked everyone for participating in the meeting and reviewed accomplishments and the next steps. Due to water issues, the agenda had to be modified and the meeting adjourned early.

Motion (passed):

Wade Lehmann made the motion to reconvene the WQPP Steering Committee for a virtual meeting within the next six weeks to continue with the presentations that had to be deferred due to the water main break that shut off the Marathon water supply. This will be an information-sharing meeting as none of the presentations are anticipated to result in motions or voting actions. Chris Bergh seconded the motion. The motion passed with no objections.