Water Quality Protection Program Overview

- History
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- Significant Findings from Monitoring Programs
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- Discussion

Florida Keys National Marine Sanctuary and Protection Act of 1990, 1992

- Congress recognized the critical role of water quality in protecting the aquatic resources of the Sanctuary and directed the USEPA and the State of Florida (FDEP), in consultation with NOAA to develop a comprehensive Water Quality Protection Program (WQPP)

- The Water Quality Protection Program started in 1992 – The first WQPP for a national marine sanctuary

EPA United States Environmental Protection Agency

DEPARTMENT OF ENVIRONMENTAL PROTECTION FLORIDA

FLORIDA KEYS NATIONAL MARINE SANCTUARY

Stated Purpose of the Water Quality Protection Program

- **"Recommend corrective actions and compliance schedules to address point and nonpoint pollution to restore and maintain the chemical, physical and biological integrity of the Sanctuary, which includes:**

- **Restoration and maintenance of a balanced, indigenous population of corals, shellfish, fish and wildlife and recreational activities in and on the water"**

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

- NOAA – Conducts research, does enforcement, issues permits, establishes marine protected areas, installs mooring buoys and provides education

- EPA and State – Identifies of sources of pollution, recommends corrective actions, develop regulations (no discharge zones, water quality standards, wastewater requirements), establishes and implements a monitoring and research program, and documents water quality changes within Sanctuary

The FKNMS Sanctuary Act requires the WQPP to:

- **Reduce pollution from point and nonpoint source pollution**
- **Ensure Compliance with applicable federal and state laws**
- **Create a comprehensive monitoring program**
- **Adopt Water Quality Standards for the Sanctuary**
- **Provide a mechanism for state and local government consultation and public participation**

The WQPP Steering Committee est. in 1992

- The Act established the Steering Committee consisting EPA, FDEP, NOAA, NPS, F&W, COE, DCA, SFWMD, FKAA, three representatives from local government and three knowledgeable citizens.
- This 24 member group meets twice a year.
- The Steering Committee is responsible for setting guidance and policy for the development and implementation of the program.
- The Steering Committee is charged with <u>identifying funding for implementation of the program.</u>


US Army Corps of Engineers


WQPP Highlights

- Worked with state, county municipalities to address:
  - Wastewater – Monroe Wastewater Master Plan (2002), approximately 65% of the Keys are in compliance with AWT/BAT requirements. Working toward 100% compliance by December 31, 2015.
  - Stormwater – Implement Stormwater Master Plan 2001
  - Vessel Discharge
    - NDZ state waters (2002)
    - NDZ federal waters (2010)
    - mooring fields (Key West and Marathon)
  - Impaired residential canals (working with Monroe County to develop a canal master plan for the entire Florida Keys)
- EPA is working with the Florida Keys Aqueduct Authority to demonstrate advantages of centralized management of decentralized wastewater treatment systems in Lower Keys ($3.6M grant)

WQPP Highlights

- Funded water quality, seagrass, and coral monitoring programs for 17 years. ($19 million)
- Funded 30 Special Studies/Research projects to identify cause-effect relationships ($2.5 million)
- Completed the Little Venice Project – A study to detect changes in water quality in residential canals due to implementation of improved wastewater treatment. Study demonstrated improved dissolved oxygen, reduced bacteria numbers and recovery of seagrass beds.
- Most importantly, sustained collaboration among federal, state, county, municipalities, NGOs, and citizens for two decades

Findings from the monitoring and special studies program

- Overall water quality within the Sanctuary is good.
- However, data shows elevated nearshore nitrate levels that decrease with distance from land - suggests a land-based source of nitrogen pollution.
- Seagrass/benthic habitat monitoring has detected changes in seagrasses and macroalgae (seaweed) abundance between 1995 and 2011 consistent with increased nutrient availability, especially nearshore.
- Coral reef monitoring has documented and quantified the decline of stony coral cover and species diversity within the Sanctuary.
- Incidence of human viruses at the reef tract suggests that sewage contaminated groundwater may be making its way to the reef tract

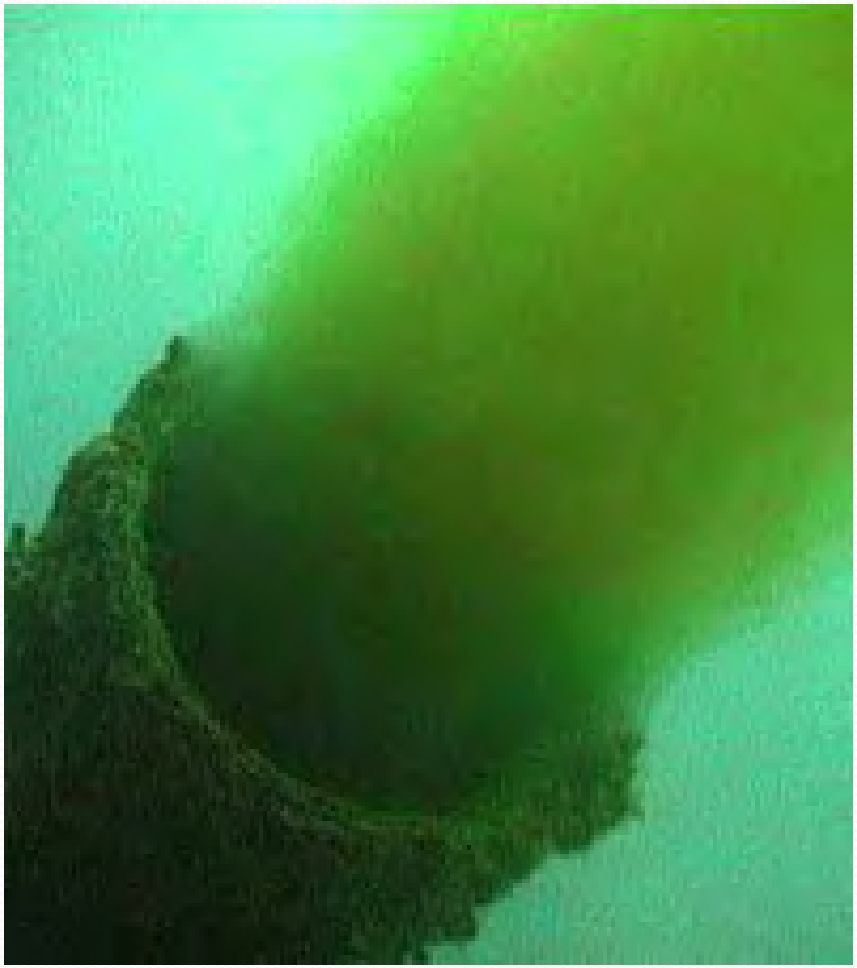
Oceanic Waters

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

Recommended standards are the ambient conditions

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

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



Importance of World Class Monitoring Programs (water quality, coral, & seagrass)

- **Baselines established - monitoring programs detect status and trends**
- **Correlative data for biological studies**
- **Document improvements in canals systems and nearshore waters**
- **Provides critical and crucial information for effective adaptive management**
- **Provide early warning system**
  - **South Florida Restoration (Everglades)**
  - **Algal blooms – SW Florida Shelf**
  - **Gulf Oil spills**
  - **nutrient transport from Mississippi River**
  - **Upwelling detection**

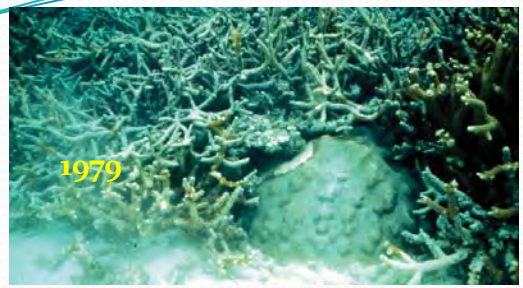
The WQPP has established its own water quality targets (chlorophyll, water clarity, nitrogen and phophorus)

EPA WQPP WQ Targets from 1995-2005 Baseline

Targets for reef sites include chlorophyll *a* less than or equal to 0.35 micro grams/l and vertical attenuation coefficient for downward irradiance (K_d, i.e., light attenuation) less than or equal to 0.20 per meter. Targets for all sites in FKNMS include dissolved inorganic nitrogen (DIN) less than or equal to 0.75 micromolar and total phosphorus (TP) less than or equal to 0.25 micromolar. Compliances were calculated as percent of those achieving targets divided by total number of samples. 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.

Table 1

EPA WQPP Water Quality Targets				
	Reef Stations		All Stations	
Year	CHLA ≤ 0.35 µg l^{-1}	K_d ≤ 0.20 m^{-1}	DIN ≤ 0.75 µM (0.010 ppm)	TP ≤ 0.25 µM (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	162 of 229 (70.7%)	150 of 207 (72.5%)	811 of 1,001 (81.0 %)	896 of 1,001 (89.5 %)



White pox disease

Bank reefs are in poor shape today

Poor recruitment

Few large predators, fish , turtles, manatees

Diseases and bleaching

Lack of grazers such as sea urchins, starfish, other important grazers

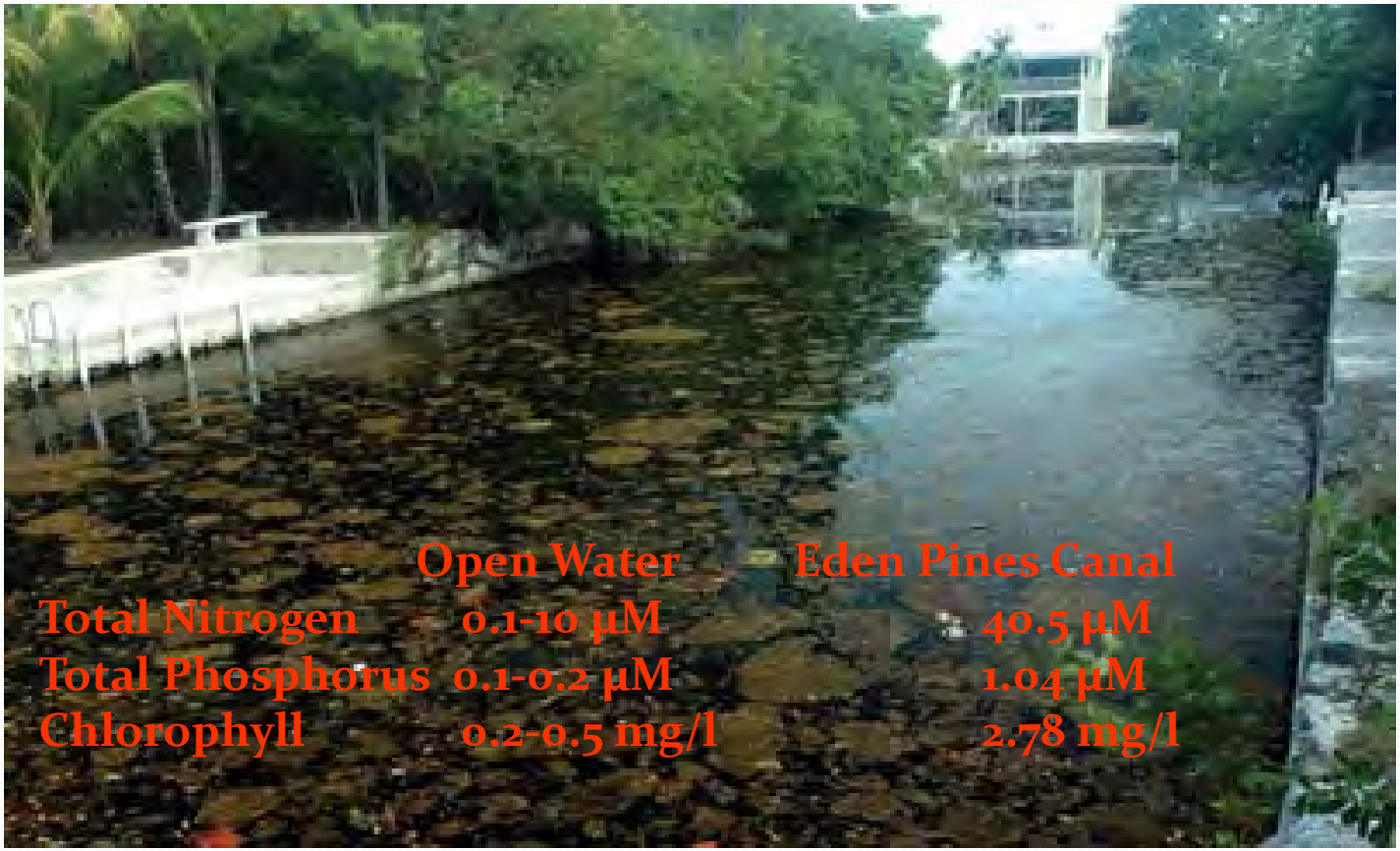
Climate change – ocean acidification

Florida Bay is an area of interest

Potential impact from Everglades restoration projects

Canals and marinas -high nutrients, low oxygen, higher bacterial numbers

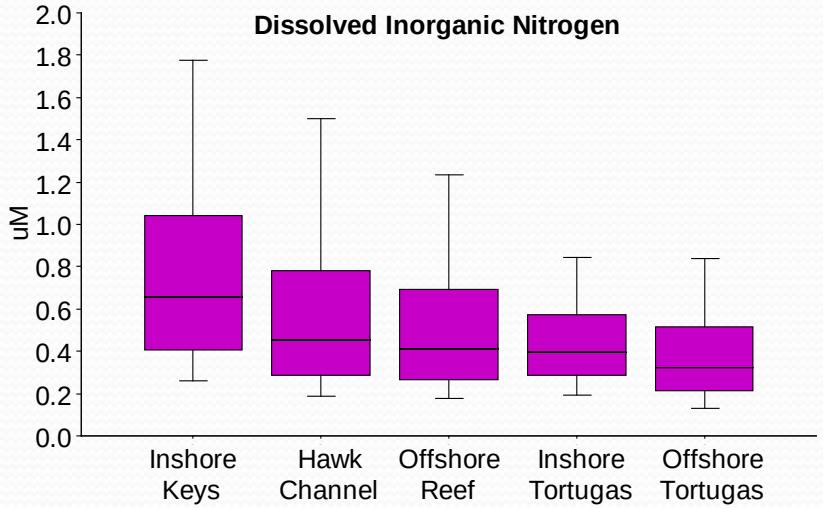
Source of pollution- inadequate treatment and disposal of wastewater and stormwater- led to State Law 99-395.



Canals can degrade receiving waters

- < 5 CFU 100 ml^{-1}
- > 5 CFU 100 ml^{-1}
- ≥ 10 CFU 100 ml^{-1}
- ≥ 20 CFU 100 ml^{-1}
- ≥ 50 CFU 100 ml^{-1}

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



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

Problems with canals

Poor flushing, dead end, lots of turns

Deep, stratified, no DO below a few feet

High bacteria and viruses

Fixes

Remove nutrient inputs- current wastewater improvements

Improvements- shallow canals, improve slope, weed wrack gates, aeration, remove culverts to improve flushing, remove material

WQPP Implementation Activities in the Action Plan

- W.3 Implement Monroe Continue Wastewater Plan
- W.5 Development of WQS and biocriteria
- W.11 Implement stricter stormwater permitting
- W.12 Implement stricter stormwater management
- W.14 Develop stormwater BMPs and outreach material
- W.10 Improve water quality in residential canals
- L.1 Ensure adequate marine pump-out facities
- L.6 Establish mobile pump-out services
- L.2 Develop marina siting plans
- L.3 Reduce marina pollution through infrastructure and education

* Water Quality Action Plan is part of the FKNMS Management Plan 2007

WQPP implementation activities continued

- W.19 Restoring freshwater flow to Florida Bay
- W.24 Research the effects of FL Bay on the Sanctuary
- W.18 Pesticide research on impacts of mosquito control
- W.17 Reduced aerial spraying within the Sanctuary
- W.21 Develop predictive aquatic resource predictive contribution models for nearshore/farfield sources
- W.22 Detect and identify wastewater/stormwater pollutant sources and ecological impacts
- W.23 Develop loading models and innovative monitoring tools (remote sensing)
- Other?

WQPP High Priorities

- Support Monroe Counties' effort to eliminate cesspools, traditional septic tanks, and non-compliant wastewater systems by Dec 2015.
- Completion of the Monroe County Canal Master plan and implementation of a demonstration canal restoration project.
- Implementation of the Monroe County Stormwater Plan. Key West has eliminated inflow and infiltration into their wastewater collection system and Marathon has successfully combined stormwater collection with wastewater treatment.
- Protect coral reefs from local stressors such as land-based pollution, physical damage from recreation and moorings and overfishing while recognizing the global threat from climate change.
- Continue long-term monitoring programs with increased emphasis on nearshore waters to document changes in water quality from wastewater and stormwater implementation.
- Working with State of Florida to develop nutrient numeric criteria

- Discussion
  - WQPP interaction with Sanctuary Advisory Council
  - WQPP participation with the FKNMS Marine Zoning and Regulatory Review process
  - Future Direction – Identification of areas that the Water Quality Protection Program should address