Coral Reef Conservation Fund 2013 - Submit Final Programatic Report (New Metrics)
Grantee Organization: Napili Bay and Beach Foundation, Inc.
Project Title: Storm Runoff Remediation in Napili Bay (HI) - II

Project Period	8/01/2013 - 8/30/2015
Project Location Description (from Proposal)	Napili Kahawai carries storm runoff down Napili 4-5 watershed onto the beach & bay at Napili, Maui. Napili is on northwest coast of Maui, HI.
Project Summary (from Proposal)	Finalize streambed remediation to complete planned flora restoration, and expand Napili Bay health monitoring efforts to include assessment of nutrient pollutants in runoff.
Summary of Accomplishments	Napili Bay and Beach Foundation hired a contractor to successfully clean out and replant the ephemeral streambed we have named Napili Kahawai (Napili stream). This was done in accordance with the plans from the consulting firm Sustainable Resources Group International, Inc. (srgii), to mitigate further erosion damage causing deposition of sediment into Napili Bay. Water quality monitoring and visual observations have demonstrated no sedimented runoff events from this watershed since this project was completed in Spring, 2014. An expanded water quality monitoring program that conforms to data needed by Hawaii Department of Health, Clean Water Board was initiated in Summer, 2015. Data from these initial samplings can be found attached to this final report. The Napili Bay and Beach Foundation Board of Directors plans to fund (private sources) and continue this periodic monitoring, and will use the results to guide future projects for mitigation of nutrient runoff sources. The stretch goal of conducting an educational workshop for Resort Staff members at Napili, Maui was accomplished in May, 2015; photos and data can be found later in this final report. In sum, all of the goals put forward in the original proposal were accomplished, on time and within budget.
Lessons Learned	Funding to do the initial cleanup and planting of our ephemeral streambed/banks was part of the original grant request, but no funding for the ongoing maintenance of these plantings was included. With two very heavy rainy seasons, the grasses and weeds have been vigorous...funds should have been budgeted to cover this part of the follow-up. The local contractor has conducted several volunteer workdays, but Napili Bay and Beach Foundation has procured non-Federal funds for ongoing maintenance, to ensure the plants get well established. The early marine biology monitoring involved high school student volunteers. The marine biology quality coordinator has learned that, though this is a great learning experience for the kids, expert help from adults (Fish Identification Network) is necessary to get information that is reliable for database entry. Our water quality monitoring efforts have benefitted greatly from having a dedicated local resident who takes samples of Napili Bay and neighboring bays, particularly after storm events.

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Activities and Outcomes

Funding Strategy	**Capacity, Outreach, Incentives**
Activity / Outcome	Coral - Outreach/ Education/ Technical Assistance - # people reached
Required	Recommended
Description	Enter the number of people reached by outreach, training, or technical assistance activities

# people reached - Current	140.00
# people reached - Grant Completion	140.00

Notes

Total = 140: 20 people have done streambed maintenance work since Q4, 2014; 45 people have done marine biology events ...which includes 26 students, 15 adult experts, 4 high school science teachers; 13 have been involved in Water Quality education and sampling events; 19 people attended the Staff training workshop - 14 staff executives and 5 interested neighbors; 15 County Planners (Maui and all other islands) participated in the site visit, workshop in September 2014; site visit and planning meetings with 2 DLNR staff; 26 participants in community educational meetings hosted by Napili Bay and Beach Foundation.

In addition: we have reached unknown number of Maui residents through occasional newspaper articles and Kahekili birthday bash presentation, and have 495 'likes' on our Facebook page.

Funding Strategy	**Habitat Management**
Activity / Outcome	Coral - improved management practices - Acres under improved management
Required	Recommended
Description	Enter the number of acres under improved management

Acres under improved management - Current	1.20
Acres under improved management - Grant Completion	1.20

Notes

Acreage shown is estimate of coral coverage in Napili Bay (2008 AECOS study). It was estimated
that our bay , which is approximately 23 surface area acres, has 5% coral coverage => ~1.2 acres of
coral reef under improved management.
8.20.15 - We have ongoing marine biology monitoring and water quality monitoring programs underway.
This is the extent of our coral 'improved management' program; there is no program to actively 'grow the reef', or similar. Our marine biology coordinator has noted coral 'keiki' (babies) during this calendar year, which we take as encouraging news.

Funding Strategy	**Habitat Restoration**
Activity / Outcome	Coral - Riparian restoration - Miles restored
Required	Recommended
Description	Enter the number of miles restored

Miles restored - Current	0.08
Miles restored - Grant Completion	0.08

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Notes	This estimate refers to the ~ 410 linear ft. of streambed tagged/planned for flora remediation +> ~0.8 miles. 8.20.15 - The work has all been completed, per plans. We are now in the 'plant maintenance' and weed control mode for the area, but there have been no erosion breakthroughs, even during the very rainy Spring.

Funding Strategy	**Habitat Restoration**
Activity / Outcome	Coral - Erosion control - Lbs sediment avoided (indirectly through capacity, outreach or incentives)
Required	Recommended
Description	Enter the amount of sediment prevented from entering system

Lbs sediment avoided - Current	1.00
Lbs sediment avoided - Grant Completion	1.00

Notes	Not sure how to estimate this as we have no baseline data to document how many lbs of sediment have washed into the bay after heavy storms over past 20 years or so. We know that the stream bank on the north side of the stream has eroded significantly, endangering a building close to the edge. We also know that erosion has resulted in significant portion of the south bank being washed away on the vacant lot property there. 8.20.15 - As noted in the previous section, there has been no further stream bank erosion since completion of the stream bed cleanup and re-planting. Our Water Quality data following storm events have been excellent, especially when compared to the neighboring Fleming Beach (see interim report and our data attached here). Thus, we know these steps have stopped erosion and runoff into the bay after heavy rains, so we believe we have met this goal.

Funding Strategy	**Planning, Research, Monitoring**
Activity / Outcome	Coral - Management or Governance Planning - # plan activities implemented
Required	Recommended
Description	Enter the number of management plan activities being implemented

# plan activities implemented - Current	4.00
# plan activities implemented - Grant Completion	4.00

Notes	By end of this grant, the streambed remediation plan will be fully implemented, as will marine biology monitoring, turbidity /visual assessment monitoring, and nutrient pollutant monitoring activities. These latter 3 activities will have occurred twice yearly over the course of 2013 -2015. 8.20.15 update: the streambed flora restoration has been completed - only ongoing activity is weed and plant management. Marine biology monitoring and visual assessment monitoring have occurred twice yearly since Q2, 2013. The nutrient pollutant monitoring program has only been implemented this Summer , but is much more comprehensive in scope than was originally planned. Further, it has become the leading edge of a program 'blessed by' HIDOH Clean Water

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Branch. Thus, more intensive sampling (6 samples in June, 12 samples in July, and 9 more to August 20th) has been instituted in order to develop solid baseline information for future periodic monitoring. We intend to continue the periodic monitoring and develop action plans for remedying parameters that remain inconsistent with clean coastal water standards.

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Show Map Below

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The following pages contain the uploaded documents, in the order shown below, as provided by the grantee:

Upload Type	File Name	Uploaded By	Uploaded Date
Final Report Narrative - Marine	Final Report Narrative-Grant #38245v.11.18.15.doc	Lindquist, Pat	11/24/2015
Photos - Jpeg	Photo 8.0 G0191302Blenny2 copy.JPG	Lindquist, Pat	09/10/2015
Photos - Jpeg	Ph 9.0 No erosion on streambank 11.15.JPG	Lindquist, Pat	11/20/2015
Photos - Jpeg	Ph 10.0 Napili Bay clear after heavy rain, storm runoff from desilting basin into stream.jpeg	Lindquist, Pat	11/20/2015
Photos - Jpeg	Photo 1.0 The Napili Kahawai jungle before copy.jpg	Lindquist, Pat	09/10/2015
Photos - Jpeg	Photo 2.0 View from south bank BEFORE 3.14 copy.JPG	Lindquist, Pat	09/10/2015
Photos - Jpeg	Photo 3.0 South streaembank Jan. 2015 copy.JPG	Lindquist, Pat	09/10/2015
Photos - Jpeg	Photo 4.0 Napili Kahawai south bank 8.15 copy.jpg	Lindquist, Pat	09/10/2015
Photos - Jpeg	Photo 6.0 Quick-Storm-Brown-Water-041-140 copy.jpg	Lindquist, Pat	09/10/2015
Other Documents	P.D. 3. Staff Training Workshops 2015flyer.pdf	Lindquist, Pat	09/10/2015
Other Documents	P.D. 4 Napili_species_list_gold_copy copy.xlsx	Lindquist, Pat	09/10/2015
Other Documents	P.D. 5 Email summary of Planners Conference 9.10.14.docx	Lindquist, Pat	09/10/2015
Other Documents	Photo 5.0 Jan 3, 2015 DT Fleming Beach .pdf	Lindquist, Pat	09/10/2015
Other Documents	P.D.2 StaffTraining Workshop 5.6.15. rfs.ppt	Lindquist, Pat	10/28/2015
Other Documents	P.D.1 Nutrient Sampling and Analysis in Napili Bay copy.docx	Lindquist, Pat	11/20/2015

The following uploads do not have the same headers and footers as the previous sections of this document in order to preserve the integrity of the actual files uploaded.

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Final Programmatic Report Narrative

Instructions: Save this document on your computer and complete the narrative in the format provided. The final narrative should not exceed ten (10) pages; do not delete the text provided below. Once complete, upload this document into the online final programmatic report task as instructed. **Please note** that this narrative will be made available on NFWF's Grants Library and therefore should provide brief context for the need of your project and should not contain unexplained terms or acronyms.

1. Summary of Accomplishments

In four to five sentences, provide a brief summary of the project's key accomplishments and outcomes that were observed or measured. This can be duplicative to the summary provided in the reporting 'field' or you can provide more detail here.

The grant proposal included three long term conservation outcomes:
a) Further reduction of sediment laden runoff into Napili Bay by stabilizing the badly eroded streambed, 'Napili Kahawai'
b) Protecting and encouraging viability of coral reef benthic habitat at Napili Bay
c) Educating community members as to best management practices regarding the streambed and the benthic habitat

a) The first outcome was achieved by cleaning out debris, by removing all invasive woody plants that have caused streambank/streambed erosion, and replanting these areas with native plants suitable for erosion control of streambank. Ongoing plant maintenance and weeding activities are being funded by Napili Bay and Beach Foundation with non-Federal money.

a & b) The restored streambanks are no longer eroding, based on visual evidence at the site (i.e. no erosion gullies), no storm runoff breakthrough events during the past two years, and very favorable sediment/turbidity data after multiple strong rainstorms , compared to measurements in nearby bay (DT Fleming beach/bay) after the same storms. A recap of the data gathered on January 3, 2015, following the heavy storm of January 2nd, and presented in the Interim Report submitted 2.1.15 is as follows: DT Fleming had measured levels of 53 – 138 turbidity units (NTUs), while Napili had 2 turbidity units (NTUs). These comparative water quality data, and several other sets obtained after heavy rains, demonstrate that erosion has now been controlled at this site.

c) Through a training workshop for Napili resort staff members and posts on Napili Bay and Beach Foundation's Facebook page, the community has been educated regarding the relationship of damage to the streambed and resulting damage to the reef.

2. Project Activities & Outcomes

Activities

- Describe the primary activities conducted during this grant and explain any discrepancies between the activities conducted from those that were proposed.

  a) We proposed to obtain necessary State and County permits, permissions from local landowners, and contract removal of all woody invasive, non-native plants from 410 linear feet of the ephemeral streambed we have called "Napili Kahawai" (Napili S**tream, in Hawaiian). We proposed to either trim the very large Albizia trees (major cause of bank loading and erosion on southern streambank), or, if we could raise an extra $9,000.00 of community funds, we would have the trees removed. The latter action was deemed a better outcome by our contractor and by Sustainable Resources Group International, Inc. (srgii) , our consultants on the restoration plan for this stream bed.**

  We <u>accomplished</u> all of these actions, including raising the extra funds from the neighboring property owners and having **the Albizia trees removed.**

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A reviewer of our initial proposal (July, 2013) suggested we install erosion pins as a way to measure further erosion or lack thereof. We did reach out to Tova Callender as an informational resource for this activity. Tova indicated that R2R would be working with USGS and UH to get some of these sorts of sites set up during Fall, 2013. Our project implementation timeline did not synch up with theirs, and we did not implement this activity. Tova has just advised that Ridge2Reef has now installed two such 'pin arrays' on West Maui watershed lands. They are measuring the erosion rates at those sites, as baseline information, i.e. before restoration efforts. What we know at Napili Kahawai, is that portions of the southern streambank were washed away due to storm runoff, prior to our project. What we know now is that this same streambank has not shown any signs of erosion. After a very significant October 17, 2015 rainfall event that caused our desilting basin (Napili 4-5) to runoff through the outlet valve (first such runoff since the valve was installed in late 2011) and overflow into the streambed/streambank area we restored, no storm runoff reached the bay. I have attached additional photos to corroborate these statements. (Ph 9.0, 10.0)

b) We proposed to expand the scope of our Water Quality (WQ) monitoring program so that levels of common nutrient runoff pollutants (ammonium**, total phosphorus, nitrates/nitrites) for which Hawaii's Department of Health Clean Water Board (HIDOH CWB) has listed Napili as 'out of compliance' with Clean Open Coastal Water standards could be assessed.**

This activity did not proceed as we had envisioned (twice yearly monitoring through Q3, 2015). It has, however, developed into a more robust program as a local group (Maui Nui Marine Resource **Council) has worked with HIDOH CWB to develop s**tandardized protocols, Quality C**ontrols, and prepare volunteer training protocols. This will enable regular water quality (WQ) monitoring of these and other nutrient pollutants at more frequent intervals and at more sites, particularly in West Maui waters. By end of our grant cycle (August 20, 2015), thirty** samples had **been taken from 3 different locations in the bay, to help us establish baseline levels of nutrients which can cause damage to our coral reef habitat.** Data from this work can be found in the Project Document Section of this report, "P.D. 1 Nutrient Sampling and Analysis in Napili Bay" and provide us with a good baseline against which we can measure progress toward clean 'Open Coastal Water' standards set by HIDOH and EPA. In this report, the Open Coastal Water standards that Napili Bay should achieve are shown by the yellow baselines on the Geometric Mean tables. What you can see is that we have more work to do for several of these parameters. Details regarding sampling and assay techniques and results can be seen in the WQ Report, P.D. 1.

I am pleased to report that the equipment we purchased for turbidity, salinity, and pH testing is being used at twelve other monitoring sites on the West Coast of Maui. Dana Reed, our Water Quality project leader, is now the Chair of Maui Nui Clean Water Committee, and has also reported that our funding of the nutrient monitoring has provided a great beta test case upon which other such monitoring of Maui coastal waters will be built.

c) Our third goal was to educate community members as to best management practices regarding the streambed and our benthic habitat at Napili Bay. We proposed to achieve this through **training workshops, or** by **pro**viding **scholarships to workshops being offered by West Maui Watershed Ridge2Reef program.**

We presented a training workshop on May 6, 2015, attended by 14 staff members from Napili bay resorts, one BOD member from neighboring bay (**Ka**hana) and 4 other Napili **stakeholders. The curriculum was prepared and presented by myself, Tova Callender and Liz Foote. A flyer with purposes and outline of the workshop** and a **copy of the Powerpoint presentation I made can be found in the Project Documents**
(P.D. 2, 3) **section of this report.**

This workshop was well received by participants and has led to participants' offers of help for maintaining the streambed plantings and for monitoring WQ and marine biology in Napili Bay.

Our Facebook page has also become an effective educational tool (see further details in **Dissemination** section, below).

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Outcomes

- Describe progress towards achieving the project outcomes as proposed. and briefly explain any discrepancies between your results compared to what was anticipated.

As indicated above, our streambed cleanout/restoration of flora project was completed successfully and, to this date (18 **months after completion),** there have been no sedimented breakthrough runoff events into the bay, **even following** some very heavy s**torms.** We consider this a complete and successful achievement of our first proposed outcome.

Our water quality monitoring program achieved the goals of determining effectiveness of remediation to the streambed/streambanks as a means of mitigating sedimented runoff into the bay, onto the reef. Although several student training days were held, the best data were generated by a local adult who took the first training course we offered and then took the initiative to gather samples / assay them for turbidity. She was able to monitor after particularly **heavy ra**infall events that **would have sent** muddy runoff into the bay, in former years (we have photos back to 1993). **Thus, our initial plan of training local high school students and doing the water quality monitoring twice yearly has been discontinued in favor of a more effective methodology which is more spontaneous, but 'owned by' a local WQ** leader (Dana Reed) **who receives a stipend provided by Napili Bay and Beach Foundation.** What you can see in the data from Summer 2015 sampling, is that the south end of Napili Bay continues to have the highest levels of turbidity, without any storm runoff occurring. In the WQ Report (P.D.1) , our local WQ and Marine Biology coordinator makes these summary comments:

" It is clear from the second set of plots that Napili Bay exceeds the state water quality standards for every parameter except for total phosphorous. The water quality on the south side of the bay is generally not as good as on the north side of the bay. Fish and algae surveys done by snorkeling the bay confirm the poor turbidity readings on the south side of the day. It is generally very difficult to see marine life on the south side of the bay due to poor visibility. The north side is generally much clearer and speculation is that the circulation is better on the north side of the bay. Additionally, an ephemeral stream occasionally enters the bay on the south side and historically has brought a great deal of sediment into the bay on the south side. In 2011, NBBF repaired a defective outlet valve on the sedimentation basin above the stream and the bay, which has significantly improved conditions on the south side."

We also outlined and had initiated discussions with a WQ expert here in Maui, to expand the monitoring to include nutrient pollutants. That effort was overtaken by a larger effort on Maui to develop a more cohesive and comprehensive WQ monitoring program, described in the previous section, (b). We are very pleased with the results of this 'different approach', and are supporting **our WQ coordinator's efforts in this regard.** We anticipate that the broader program will involve local volunteers as the program grows. **Our expectation is to continue to support this activity** through our privately raised funds, which the Board of Directors has approved spending for these ongoing efforts. No defined time limit has been set, but the BOD agrees the program is very important.

At this point in time, the initial data are being used to make decisions regarding plan details of monitoring program as well as possible sources of water pollution we can target for upcoming projects. The new data suggest we target potential nutrient and sediment sources at the south end of Napili Bay.

In response to the reviewer question regarding details of this larger WQ effort on Maui, our coordinator says:

"Recognition of the importance of water quality to reef health has been growing in the community of Maui. The state department of health clean water branch (HIDOH-CWB) is responsible for water quality monitoring in Hawaii. However, budgetary declines leave the HIDOH-CWB with insufficient

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resources to adequately monitor water quality in many areas. The island of Maui has one HIDOH-CWB field technician that monitors water quality for the entire island. As a result, many areas are monitored only once or twice a year at best. A community water quality monitoring program is being developed (Hui O Ka Wai Ola) to work with the DOH in the collection and testing of water in the coastal areas around Maui. A Quality Assurance Project Plan (QAPP) has been written and submitted to the DOH to make certain quality assured data is collected. This document will cover several community groups who are interested in collecting water quality data in Maui that can be used by governmental agencies and researchers. The partners in this organization include West Maui Ridge to Reef Initiative, The Nature Conservancy, Maui Nui Marine Resource Council, Hawaiian Islands Humpback Whale National Marine Sanctuary, and University of Hawaii (Maui College and Water Resources Research Center). Funding for this project will come from multiple sources, but the program direction will all be done under the partnered organization, Hui O Ka Wai Ola.

- Provide any further information (such as unexpected outcomes) important for understanding project activities and outcome results.

The Water Quality results, in terms of turbidity/sedimentation after heavy storms has been dramatic enough to be able to say, WE HAVE IMPROVED THIS PARAMETER OF BAY HEALTH. However, HIDOH did not do WQ sampling at Napili bay for their 2014 report on impaired waters, so that part of the goal as stated in our original proposal, was not achieved. Further, as can be seen in P.D. 1, we now can see how Napili Bay waters compare to DOH open coastal water standards, and have data from three sampling points. Historically, DOH samples have only been taken in the south end of the bay.

We are not, at this time, able to make any scientific conclusions about improvements to the benthic habitat. We've seen positive signs (fish species not seen in Napili for a number of years; diversity in species, as observed by Fish Identification Network (FIN) volunteers, and fish keikis (babies). However, the time it takes and the amount of data needed to draw substantiated conclusions about changes to the health of Napili Bay's benthic habitat have not been achieved – really cannot be achieved in the less than two year period of this grant cycle. The data collected have been entered into REEF.org database, and our coordinator has also kept detailed records in an EXCEL spreadsheet, comparing current findings with those made in 2008 (AECOS). This spreadsheet can be seen in the Project Documents (P.D. 4) section of this report, and includes the monitoring information on fish, algae, coral and other invertebrates. This has been carefully done and documented to monitor our benthic habitat. No estimates of percent coral cover were done as part of this work, however our marine biology monitor notes no significant increases or decreases in the coverage since her monitoring surveys began in 2013. Thus the estimate she would make of average percent coral coverage is 5%, as was observed by AECOS in 2008.

3. Lessons Learned

Describe the key lessons learned from this project, such as the least and most effective conservation practices or notable aspects of the project's methods, monitoring, or results. How could other conservation organizations adapt similar strategies to build upon some of these key lessons about what worked best and what did not?

Things we did WELL, which had a positive effect on outcomes:

- We had an expert consultant carefully outline what needed to be done to remediate the badly eroded streambed/streambanks
- We had local experts do training of marine biology and water quality monitoring techniques
- We got VERY LUCKY to engage community members with a real love of the environment to head up the streambed restoration and our Water Quality and Marine Biology monitoring programs. The stipends we provide do not cover the amount of time and effort they put forth on behalf of our goal to protect and improve Napili Bay health, but hopefully they do demonstrate that we greatly value their contributions.

Things we did, which ultimately worked, but took much more time/effort than anticipated:

- Getting State Right of Entry permits. This required many meetings/conversations and pressure from other

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government agencies to finally get through the steps needed. Old baggage regarding who was responsible for which actions, infringements in the distant past threatened to 'hammer' the whole process. Our advice would be to keep your message / goals clearly out there, keep getting it out in front of the 'gate keeper', and don't be afraid to ask for support from other government officials who can see the merit of what you are trying to achieve. Secondly, be sure you plan enough lead time into the project so that the actual work can be achieved …even with a long permitting time.

Things we wouldn't recommend to others, or repeat ourselves:

- Not plan for how plantings will be maintained over time – weeding doesn't appeal to many folks, and baby plants need lots of weeding and watering before they get established.

- Count on high school students to generate reliable data on marine life of various kinds. We learned that our efforts with them were GREAT in terms of raising their awareness/teaching them about marine life, but the data generated was not really reliable info for monitoring relative abundance of fish/other species, as a measure of reef health. For reliable data, our coordinator has involved Fish Identification Network adults, expert volunteers.

  Here are the details behind this statement provided by our marine biology coordinator, in response to reviewer's query:

  "We reached out to a local private school for student participation in fish, algae, and invertebrate monitoring. The principal suggested we work with the marine science and environmental science classes in the high school section. During the two year period where monitoring was performed with student participation, we worked with three different teachers. The students were juniors or seniors in high school and we worked with the entire class each semester as opposed to one or two students. We spent three to five days in the classroom working with the students on species identification, survey techniques, and the importance of recording data only when a species has been positively identified. We provided electronic handouts to the students on all the species of interest for them to study before taking them out on a field trip to do the surveys. Each time we took students out, we re-evaluated how well the students had done. We did a student survey once per semester, and we occasionally had overlap from one semester to the next where some of the same students were involved, but often we had different students each semester to work with. The students got participation credit in their classes for the work they did, but did not get any extra credit. Each semester we worked with around 10 students. The data that the students collected was recorded each semester and evaluated for accuracy and completeness. Each semester the data got more accurate because we asked for a smaller number of species and increasingly emphasized the importance of recording data only when a positive identification was possible. However, the data was never accurate enough to use in the final assessment.

  We learned a lot of lessons in the two years we had student participation:

  1. Even though the students were enrolled in the marine or environmental science classes, they may not be comfortable in the water and many of them had never snorkeled before. We never required anyone to go in the water, but often we had students in the water with flotation devices that were struggling to swim in the ocean, and experienced considerable difficulty using a mask and snorkel.
  2. After the first semester, we dropped invertebrate identification from student participation and focused on algae and fish identification only. We did the algae identification out of the water by having the biology monitoring lead bring algae samples in sea water back to the classroom where the students could work with references and microscopes.
  3. The first semester we provided students with approximately 75 species of fish to learn and identify. This was way beyond their capability for the short amount of time we worked with the students. We subsequently dropped the number of fish species to 25 of the most common species. This helped, but identifying fish species under the water is much more difficult than identifying them from a nice close up photograph from a fish species reference. A very small number of students were successful with most of the 25 species, about half could successfully identify 10 species, and some struggled to identify even one or two species.
  4. Taking the students on a field trip to the beach required advance preparation in obtaining a van,

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getting the students released from other classes they would miss due to the field trip, and getting equipment and materials set up. Based on this, we were pretty much locked into the scheduled day even if the conditions in the ocean were not very good. The last semester we took students out, the visibility was fairly poor and the surf was high. We were constrained to a small area for safety and there few identifications made.

The students generally really enjoyed the lessons and field trips. However, based on the lessons learned, I (as marine biology coordinator) would recommend that student participation be limited to no more than 2 or 3 students in a semester and have the selection of those students be based on expressed interest, and good water skills (swimming and snorkeling). Often, students are looking for senior projects and they can get credit for doing work with a community group or scientist. I am currently working with one student who had participated in the last biology class survey, on her senior project and am finding that much more satisfactory both for the student and myself. This also allows any data collection to be done outside of the regular school hours when careful consideration can be given to weather and water conditions. Most of the senior projects require some minimum number of hours which means the student can devote much more time to studying species before going in the water. It would also allow the student multiple outings in the water to collect data where they can refine their skills. Identifying marine species is a difficult task even when conditions are good and requires much practice to obtain the necessary accuracy for good data acquisition."

4. Dissemination

Briefly identify any dissemination of project results and/or lessons learned to external audiences, such as the public or other conservation organizations. Specifically outline any management uptake and/or actions resulting from the project and describe the direct impacts of any capacity building activities.

The most effective information about our project/project results has been disseminated through our Facebook page. In the past few months, thanks to the networking help provided by Liz Foote and Tova Callender, our Facebook following has really grown – from about 70 people to >500. We have told the dramatic story of clear water after a heavy Winter Storm, and compared it to the same day/event and samples taken just to the north of Napili at Honokahua Bay (also known as DT Fleming beach, below the Ritz Carlton Hotel). We have shown some of the photos of coral and reef fish, we have advertised workdays on the streambed and why working there is helpful to health of the reef in the bay. It's been a most powerful tool during 2015, especially.

During the Kahekili Birthday Bash event in August, 2014, we also prepared a flip book with the story of our projects at Napili Bay. A copy of that book was uploaded into NFWF EZ grants in an interim report July 17, 2014.

We have built our capacity to fund actions (e.g. monitoring, maintenance of new plantings, educational workshops) through participation in an annual Charity Walk sponsored by Maui's resort and hotel industry. This has been key to our ongoing financial viability.

In September, 2014, we were invited to present the case study of Napili Bay and Beach Foundation's successful projects (Napili 4-5 desilting basin and Napili Kahawai remediation) to a group of County Planners from across the State of Hawaii. This entailed a site visit, an oral presentation and informational handouts for all participants. The overall theme of this meeting was coastal zone management, with good and bad examples. The summary I prepared from the meeting was distributed to Napili community and others, and can be found in Project Documents (P.D. 5) of this report. A copy of my handout for that meeting was submitted to NFWF in September , 2014; it is available again, on request.

We continue to have strong support from Maui County (Planning and Dept. of Public Works), from UH SeaGrant program (Tara Miller Owens), from State legislator Roz Baker, from West Maui Watershed Ridge2 Reef (Tova Callender and Liz Foote, in particular), and have built support from the General Managers at all the resorts on Napili Bay.

What's Next for Napili Bay and Beach Foundation?

As you are aware, the US Coral Reef Task Force designated West Maui Watersheds as a priority partnership in the Pacific in 2011, beginning with Wahikuli and Honokōwai, and now including **Kahana**, Honokahua and Honolua, from the summit of Pu'u Kukui to the outer reef. In April 2015, West Maui was designated as a

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Resilient Land and Waters Initiative site by the Department of the Interior, the Environmental Protection Agency and the National Oceanic and Atmospheric Administration. The Watershed Management Plan for Wahikuli and Honokōwai is now in the implementation phase. Planning for **Kahana**, Honokahua and Honolua Watersheds is underway and will be completed by early 2016. **As Napili is located in the Kahana** watershed region, we contributed input to the overview based on our own experiences. We have now turned our attention to the overall plan to identify the hot spots where we need to focus our next efforts, and, in combination with our new water quality data showing most impaired water quality at the south end of the bay, we have selected a spot where resort parking lots and a beach road with dirt shoulders both contribute to runoff at an unfiltered drain. Funding is currently being sought for this next effort.#

5. Project Documents

Include in your final programmatic report, via the Uploads section of this task, the following:

- 2-10 representative photos from the project. Photos need to have a minimum resolution of 300 dpi. For each uploaded photo, provide a photo credit and brief description below;
- Photo 1.0 The streambed BEFORE the cleanup began (same day as project start)
- Photo 2.0 Another view of the streambed BEFORE the cleanup…taken from road, showing south bank
- Photo 3.0 View of southbank as of January, 2015
- Photo 4.0 Streambed photo taken August, 2015
- Photo 5.0 Heavily silted runoff into Honokahua Bay, January 3, 2015
- Photo 6.0 Napili bay near mouth of Napili Kahawai stream, January 3, 2015
- Photo 7.0 Forcepsfish flaring … August 2014; a fish we haven't seen much at Napili
- Photo 8.0 Healthy coral and a blennie from Marine Biology monitoring December, 2014
- Photo 9.0 Restored streambank, November 2015: no erosion
- Photo 10.0 Photo from south end of Napili Bay October 17, 2015 – clear, even when desilting basin overflow valve was running for first time since new outlet valve installed (late 2011).
-
- Report publications, Power Point (or other) presentations, GIS data, brochures, videos, outreach tools, press releases, media coverage;
- P.D. 1 Nutrient Sampling and Analysis in Napili Bay
- P.D. 2 NBBF Overview – Workshop 5.6.15
- P.D. 3 Staff Training Workshop flyer
- P.D. 4 Napili Species list gold copy
- P.D. 5 Email summary of Planners Conference 9.10.14
- Any project deliverables per the terms of your grant agreement.

POSTING OF FINAL REPORT: *This report and attached project documents may be shared by the Foundation and any Funding Source for the Project via their respective websites. In the event that the Recipient intends to claim that its final report or project documents contains material that does not have to be posted on such websites because it is protected from disclosure by statutory or regulatory provisions, the Recipient shall clearly mark all such potentially protected materials as "PROTECTED" and provide an explanation and complete citation to the statutory or regulatory source for such protection.*

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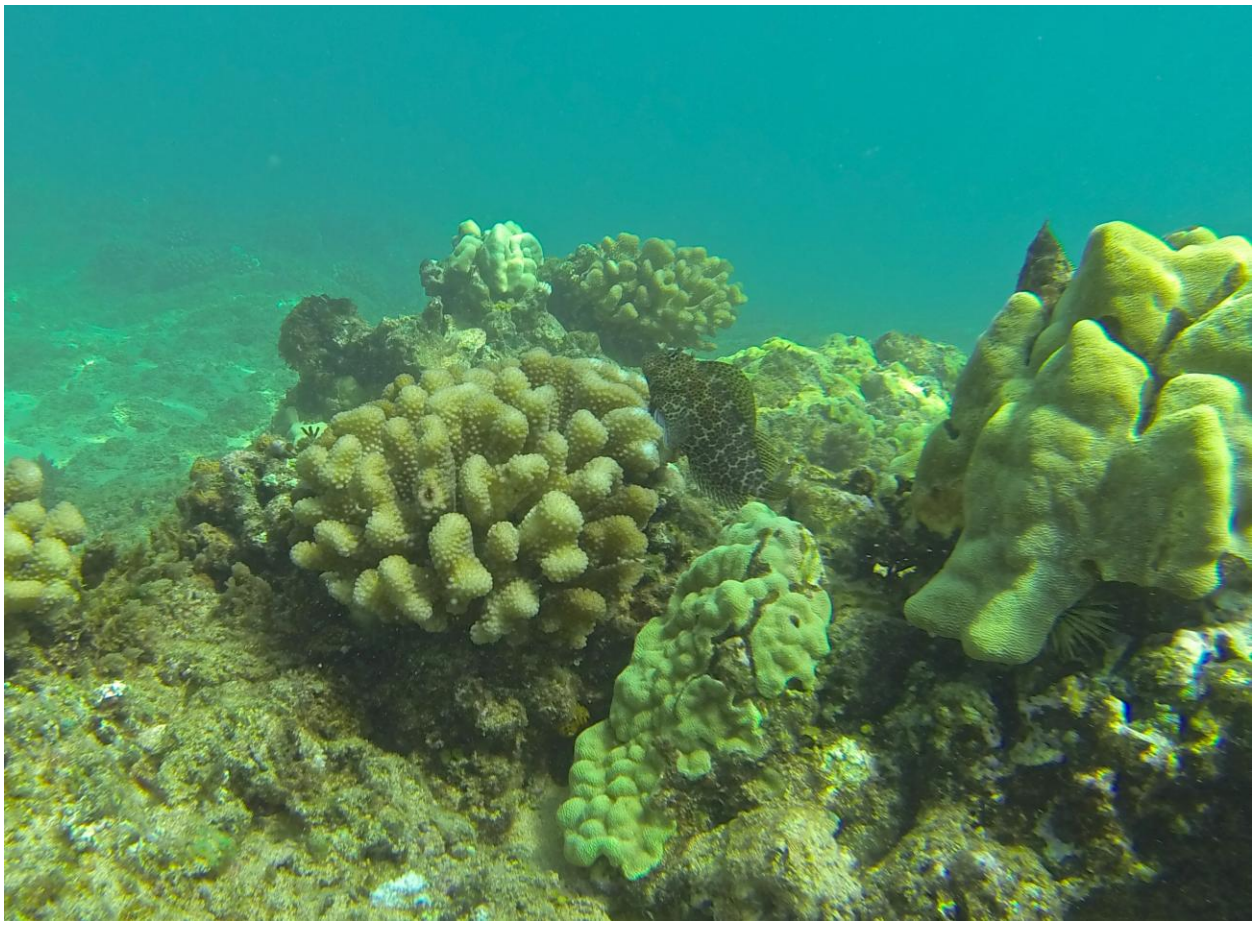

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NAPILI

Bay and Beach Foundation

Staff Training Workshops 2015: for Napili Resort Maintenance, Groundskeeping, and Housekeeping Supervisors
May 6th, 2015, Pili Room, Napili Kai Resort

Purposes:

I. Share Napili Bay and Beach Foundation vision, work accomplished to date, plans for next few years
with folks who can make a difference at our resorts.

2. Gain 'buy-in' on the goals of NBBF for the beach and bay.

3. Share current Best Management Practices for Grounds, Maintenance, Housekeeping 'usual' activities/responsibilities.

4. Create a plan of action for 2015: more steps to a healthier bay & beach at Napili.

Workshop Outline:

Introductions and E Komo Mai (coffee and breakfast rolls) (9:00 am)

I. **WHAT** is being done/will be done by NBBF (9:20 to 9:45 am)
- **Overview Powerpoint of actions taken by NBBF since 2011 (Pat Lindquist)**
- What we've done in Napili to improve our watershed to protect reef health
- Questions? Comments?

II. **WHY?** (9:50 to 10:15 am)
- **General Overview: watershed impacts on Coral Reef (Tova Callender)**
- Big picture overview of WHY : Info on the R2R programs underway/planned
- Questions? Comments?

III. **How you can help**: (10:15 – 10:40 am)
- Best 'ocean friendly'products/practices for everyday uses **(Liz Foote)**
- Questions? Comments?

IV. **WRAP UP and Next Steps** (10:45 – 11:00 am)

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Abundance Legend

R – Rare – only one or two individuals observed.
U – Uncommon – several to a dozen individuals observed.
O – Occasional – seen irregularly in small numbers
C – Common -observed everywhere, although generally not in large numbers.
A – Abundant – observed in large numbers and widely distributed.

S - single individual observed
F - 2 to 10 individuals observed
M - 11 to 100 individuals observed
A - over 100 individuals observed

				AECOS	Reef Novice (2)	Reef Novice (16) Expert (2)	
Genus species	**Common Name**	**Hawaiian Name**	**Status**	**Abundance 2008**	**Abundance Spring 2013**	**Abundance October 2013**	**Abundance April/May 2014**
Albula sp.	bonefish	*o'io*	Ind	U			
Echidna nebulosa	snowflake moray	*puhi kāpā*	Ind	R		S/R	
Gymnothorax flavimarginatus	yellow margin moray	*puhi paka*	Ind	R		S/R	
Gymnothorax meleagris	whitemouth moray	*puhi 'oni'o*	Ind	R		F/U	
Gymnothorax undulatus	undulated moray	*puhi lau milo*	Ind	R			
Herklotsichthys quadrimaculatus	goldspot sardine		Ind	R			
Encrasicholina purpurea	Hawaiian anchovy	*nehu*	End	C			
Saurida gracilis	slender lizardfish	*ulae*	Ind	R			
Synodus ulae	Hawaiian lizardfish	*ulae*	Ind	R			
Synodus binotatus	twospot lizardfish	*ulae*	Ind			F/U	
Synodus dermatogenys	clearfin lizardfish	*ulae*	Ind			S/R	
Platybelone argalus	keeltail needlefish	*aha*	Ind	R	F/U	M/C	M/C
Aulostomus chinensis	trumpetfish	*nunu*	Ind	R	F/U	F/U	F/U
Fistularia commersonii	cornetfish	*nunu peke*	Ind	R	S/R	F/U	F/U
Scorpaenodes sp.	unidentified scorpionfish			R			
Sebastapistes coniorta	speckled scorpionfish		Ind	R			F/U
Kuhlia xenura	Hawaiian flagtail	*aholehole*	End	U		M/C	M/C
Cirrhitops fasciatus	redbarred hawkfish	*piliko'a*	Ind	R		F/U	F/U
Cirrhitops pinnulatus	stocky hawkfish	*po'opa'a*	Ind	U		S/R	
Paracirrhites arcatus	arc-eye hawkfish	*piliko'a*	Ind	C		F/O	F/O
Paracirrhites forsteri	blackside hawkfish	*hilu piliko'a*	Ind	C		F/U	S/R
Apogon maculiferus	spotted cardinalfish	*'upapalu*	End	R			
Pristiapogon kallopterus	iridescent cardinalfish	*upāpalu*	Ind				F/U
Caranx melampygus	bluefin trevally	*'omilu*	Ind	R	F/U	M/O	M/O
Decapterus macarellus	mackerel scad	*'opelu*	Ind	U			M/O
Scombroides lysan	leatherback	*lai*	Ind	R	S/R	S/R	S/R
Mulloidichthys flavolineatus	yellow stripe goatfish	*weke a*	Ind	R	M/C	M/C	M/C
Mulloidichthys vanicolensis	yellowfin goatfish	*weke 'ula*	Ind	A	M/C	A	M/C
Parupeneus bifasciatus	double bar goatfish	*munu*	Ind	C	S/R	F/O	F/U
Parupeneus cyclostomus	blue goatfish	*moano 'ukali ulua*	Ind			F/U	F/U
Parupeneus multifasciatus	many bar goatfish	*moana*	Ind	C	F/U	M/C	M/O
Parupeneus pleurostigma	sidespot goatfish	*moana*	Ind	C		F/U	F/U
Parupeneus porphyreus	white saddle goatfish	*kumu*	Ind	U	F/U	F/U	R
Chaetodon auriga	threadfin butterflyfish	*kikakapu*	Ind	O	F/O	F/U	F/U
Chaetodon fremblii	bluestripe butterflyfish	*kikakapu*	End			S/R	S/R
Chaetodon lineolatus	lined butterflyfish	*kikakapu*	Ind	U			
Chaetodon lunula	raccoon butterflyfish	*kikakapu*	Ind	C	S/R	F/U	F/U
Chaetodon lunulatus	oval butterflyfish	*kapuhili*	Ind			F/U	
Chaetodon miliaris	milletseed butterflyfish	*lau wiliwili*	End	U		F/U	F/U
Chaetodon multicinctus	multiband butterflyfish	*kikakapu*	End	O		F/U	F/U
Chaetodon ornatissimus	ornate butterflyfish	*kikakapu*	Ind			F/U	F/U
Chaetodon quadrimaculatus	fourspot butterflyfish	*lau hau*	Ind	R	F/O	F/U	F/U
Chaetodon trifascialis	chevron butterflyfish		Ind	R			
Chaetodon unimaculatus	teardrop butterflyfish	*lauhau*	Ind			F/U	
Forcipiger flavissimus	forcepsfish	*lauwiliwili nukunuku 'oi 'oi*	Ind			S/R	S/R
Abudefduf abdominalis	Hawaiian sergeant	*mamo*	End	C	M/C	M/C	M/C
Abudefduf sordidus	blackspot sergeant	*kūpīpī*	Ind	C	F/U	F/U	M/C
Abudefduf vaigiensis	Indo-Pacific sergeant	*mamo*	Ind			F/O	M/C
Chromis ovalis	oval chromis		End	A			
Chromis vanderbilti	blackfin chromis		Ind	C		M/C	M/C
Dascyllus albisella	Hawaiian damselfish		End	U	F/U	M/C	M/C
Plectroglyphidodon imparipennis	bright eye damselfish		Ind	U		F/U	F/U
Plectroglyphidodon johnstonianus	blue-eye damselfish		Ind			F/U	F/U
Plectroglyphidodon sindonis	rock damselfish		Ind	U			
Stegastes marginatus	Hawaiian gregory		Ind	O	S/R	M/C	M/C
Anampses chrysocephalus	psychedelic wrasse		End	R		S/R	
Anampses cuvier	pearl wrasse	*'opelu*	End	R	F/U	M/O	M/O
Bodianus bilunulatus, albotaeniatus	Hawaiian hogfish	*'a'awa*	End	R		S/R	S/R
Chelio inermis	cigar wrasse	*kupoupou*	End	R		F/U	F/U
Coris gaimard	yellow tail coris	*hinālea 'akilolo*	Ind	O	S/R	F/U	F/U
Coris venusta	elegant coris	*hilu*	End			F/U	F/U
Gomphosus varius	bird wrasse	*hīnālea 'akilolo 'i'iwi*	Ind		F/U	F/O	F/U
Halichoeres ornatissimum	ornate wrasse	*'ohua*	Ind	C		S/R	F/U
Labroides phthirophagus	Hawaiian cleaner wrasse		End	U		F/U	F/U
Macropharyngodon geoffroy	shortnose wrasse		End			F/U	F/U
Novaculichthys taeniorus	rockmover wrasse		Ind	R		S/R	S/R
Stethojulis baleata	belted wrasse	*'omaka*	End	C	M/C	M/C	F/O
Thalassoma duperrey	saddle wrasse	*hinalea lauwili*	End	A	M/C	M/C	M/C
Thalassoma trilobatum	Christmas wrasse	*'awela*	Ind	O	S/R	F/O	F/U
Thalassoma purpureum	Surge wrasse	*hou*	Ind		S/R	S/R	S/R
Iniistius umbrilatus	blackside razorfish	*laenihi*	End	U		S/R	
Calatomus carolinus	stareye parrotfish	*ponohunuhu*	Ind	U	F/U	F/O	M/C
Chlorurus spilurus	bullethead parrotfish	*uhu*	Ind			F/U	S/R
Scarus psittacus	palenose parrotfish	*uhu*	Ind	C	M/C	M/O	M/C
Scarus rubroviolaceus	redlip parrotfish	*uhu pālukaluka*	Ind			F/U	F/U
Cirripectes obscurus	gargantuan blenny		Ind	R			
Cirripectes vanderbilti	scarface blenny		Ind	R		F/U	F/U
Exallias brevis	shortbodied blenny	*pāo'o kauila*	Ind		S/R	F/U	
Gnatholepis anjerensis	eyebar goby		Ind	R			
Hazeus nephodes	cloudy goby		Ind	U			
Zanclus cornutus	Moorish idol	*kihikihi*	Ind	R	F/U	M/O	F/U
Acanthurus blochii	ringtail surgeonfish	*pualu*	Ind			F/U	F/U
Acanthurus dussumieri	eyestripe surgeonfish	*palani*	Ind	U		F/U	F/U
Acanthurus leucopareius	whitebar surgeonfish	*māikoiko*	Ind	R	S/R	F/U	F/U
Acanthurus nigricans	goldrim tang		Ind			S/R	S/R
Acanthurus nigrofuscus	brown surgeonfish		Ind	R	M/C	A	A
Acanthurus olivaceus	orangeband surgeonfish	*na'ena'e*	Ind	O		F/O	F/O
Acanthurus triostegus hawiiensis	convict surgeonfish	*manini*	End	C	M/C	M/C	M/C
Ctenochaetus strigosus	goldring surgeonfish	*kole*	End			F/U	F/U
Naso brevirostris	paletail unicornfish	*kala lōlō*	Ind			F/O	M/C
Naso lituratus	orange spine unicornfish	*umaumalei*	Ind	U	F/U	M/C	M/C
Naso unicornis	bluespine unicornfish	*kala*	Ind	A	M/C	M/C	A
Zebrasoma flavescens	yellow tang	*lau'ipala*	Ind	R		F/U	F/U
Zebrasoma veliferum	sailfin tang		Ind			F/U	
Bothus mancus	flowery flounder	*paki'i*	Ind			S/R	
Bothus pantherinus	panther flounder	*paki'i*	Ind	R		S/R	
Melichthys niger	black durgon		Ind	R		F/U	F/U
Melichthys vidua	pink-tail durgon		Ind			F/U	F/U
Rhinocanthus aculeatus	lagoon triggerfish	*humuhumu nukunuku apua'i*	Ind	O		F/U	S/R
Rhinocanthus rectangulus	reef triggerfish	*humuhumu nukunuku apua'i*	Ind	C	M/C	M/C	M/C
Sufflamen bursa	lei triggerfish	*humuhumu lei*	Ind		S/R	S/R	F/U
Sufflamen fraenatus	bridled triggerfish	*humuhumu mimi*	Ind	O	S/R	F/U	F/U
Cantherines dumerilii	barred filefish	*'oili*	Ind	R		F/U	F/U
Cantherines sandwichiensis	squaretail filefish	*'oili lepa*	Ind	R		F/U	F/U
Ostracion meleagris	spotted boxfish	*moa*	Ind	O	F/O	M/O	M/O
Arothron hispidus	stripe belly puffer	*o'opu hue*	Ind	R		R	
Canthigaster amboiensis	Ambon toby		Ind	R	S/R	F/U	F/U
Canthigaster jactator	white spotted toby		End	R	F/U	M/O	F/O
Diodon hystrix	porcupine fish		Ind	R		S/R	S/R
				83	39	91	

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Genus species	**Common Name**	**Hawaiian Name**	**Status**	AECOS **Abundance 2008**	**Abundance Spring 2013**	**Abundance Fall 2013**	**Abundance Spring 2014**
Symploca hydnoides			Ind	R			
Cyanophyta unspecified					A		A
Ahnfeltiopsis sp pg 92		*limu ʻakiʻaki*	Ind	U			
Acanthophora spicifera pg 138			Invasive			U	U
Akalaphycus setchelliae pg 58			Ind	U			
Asparagopsis taxiformis		*limu kohu*	Ind	C	C	C	C
Coelothrix irregularis			Ind	C			
Dichotomaria marginata			Ind			O	
Galaxaura rugosa			Ind	U			
Halymenia sp		*limu lepe o Hina*	End	R			R
Haliptilon subulatum			Ind	O			
Hydrolithon gardineri			Ind	O			
Hydrolithon onkodes			Ind	O			
Hydrolithon reinboldii			Ind	O			
Hypnea musciformis			Invasive				C (tide pool)
Jania pumila			Ind	U			
Liagora sp.			Ind	C			C
Peysonellia rubra			Ind	R			
Pneophyllum conicum			Ind	C			
Pterocladiella capillacea			Ind	C			C
Pterocladiella caerulescens			Ind	C			
Cladophora sp.			Ind	U			
Chaetomorpha antennina			Ind				O
Codium sp.		*limu ʻaʻalaʻula*	Ind	R			
Dictyosphaeria sp.	bubble algae		Ind	U			
Halimeda discoidea			Ind	C	C	C	A
Halimeda kanaloana			End	C		C	C
Neomeris sp.			Ind	R			
Ulva fasciata		*limu pālahalaha*	Ind	A	C	C	C
Colpomenia sinuosa			Ind	R			R
Dictyopteris australis		*limu lipoa*	Ind	C			
Dictyota friablis			Ind	U			
Dictyota sandvicensis			Ind	C			
Padina sp.				C			
Ralfsia expansa			Ind	R			
Sargassum echinocarpum		*limu kala*	Ind	A	C		C
Turbinaria ornata			Ind	O	O	O	A

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A – Abundant – observed in large numbers and widely distributed.									
Name									
				AECOS					
Genus species	**Common Name**	**Hawaiian Name**	**Status**	**Abundance 2008**	**April 2013**	**October 2013**	**April 2014**		
Clathria sp.	vermillion clathria		Ind	R				sponge image	
Pennaria disticha	Christmas tree hydroid		Ind	R				hydroid image	
Palythoa caesia	blue-gray zooanthid/rubber coral		Ind	R				zooanthid image	
Pocillopora damicornis	lace coral		Ind	O				lace coral image	
Pocillopora meandrina	cauliflower coral		Ind	C	C	C	C	cauliflower image	
Montipora capitata	rice coral		Ind	C		O	O	rice coral image	
Montipora flabellata	blue rice coral		End	C		O	O	blue rice image	
Montipora patula	sandpaper rice coral		End	C			O	spreading coral image	
Porites brighami	Brigham's coral		End	R				Brigham coral	
Porites compressa	finger coral	*pohaku puna*	End	R		R	U	finger coral image	
Porites lobata	lobe coral	*pohaku puna*	Ind	C	C	C	C	lobe coral image	
Porites lutea	mound coral		Ind	R			R (right side)		
Pavona duerdeni	porkchop coral		Ind	R				pork chop image	
Pavona varians	corrugated coral		Ind	R			R	corrugated coral image	
Leptastrea bewickensis	Bewick coral		Ind	R				bewick coral image	
Spirobranchus giganteus	Christmas tree worm	*kio*	Ind	U			U		
Loimia medusa medusa	spaghetti worm	*kauna'oa*	Ind	R		R	R		
Cellana exarta	black-foot opihi	*'opihi makaaiauli*	Ind	R					
Cellana talcosa	giant opihi	*'opihi ko'ele*	End	R					
Siphonaria normalis	false opihi	*'opihi 'awa*	Ind	U					
Nerite picea	nerite		Ind	R					
Littoraria pintado	dotted periwinkle		Ind	R					
Serpulorbis variabilis	variable worm snail	*kauna'oa*	End	R					
Hipponix australis	conical hoof shell		Ind	R					
Cypraea caputserpentis	snakehead cowry	*leho' kupa*	Ind	R					
Cypraea helvola	honey cowry	*leho' opule*	Ind	R					
Cypraea maculifera	reticulated cowry	*leho' kolea*	Ind	R					
Cymatium nicobaricum	Nicobar triton		Ind	R					
Morula granulata	granular drupe	*maka awa*	Ind	U					
Morula uva	grape drupe		Ind	R					
Conus ebraeus	Hebrew cone		Ind	O					
Conus imperialis	imperial cone		Ind	U					
Conus lividus	spiteful cone		Ind	O					
Conus sp.	unid. cone		Ind	U					
Arca ventricosa	ventricose ark shell	*'olepe papaua*	Ind	R					
Pinctada margaritifera	black-lipped pearl oyster	*pa*	Ind	U					
Isognomon californicum	black purse shells	*nahawele, papaua*	End	C	C		C		
Octopus cyanea	day octopus	*he'e mauli*	Ind	R					
Stenopus hispidus	banded coral shrimp		Ind	R					
Corallianassa borradailei	Borradaile's shrimp		Ind	R					
	unidentified hermit crab		Ind	R					
Calappa hepatica	common box crab		Ind	U					
	unidentified swimming crab		Ind	U					
Pilodius areolatus R Ind	areolated xanthid crab		Ind	R					
Graspus tenuicrustatus	thin shelled rock crab	*'a'ama*	Ind	O					
Percnon planissimum	flat rock crab	*papa*	Ind	R					
Hapalocarcinus marsupialis	coral guard crab		Ind	R					
Pseudocryptochirus kahe	Kahe Point crab		Ind	R					
Linckia guildingi	green linckia		Ind	R					
Ophiocoma erinaceus	spiny brittle star		Ind	C					
Ophiocoma pica	pied brittle star		Ind	C					
Echinothrix calamaris	banded urchin	*wana*	Ind	U		R	C		
Echinothrix diadema	blue-black urchin	*wana*	Ind				O		
Echinometra mathaei	rock boring urchin	*'ina kea*	Ind	A		A	A		
Echinometra oblonga	rock boring urchin	*'ina*	Ind	A		C	C		
Heterocentrotus mammilatus	red pencil urchin	*ha'uke'uke 'ula'ula*	Ind	C		C	C		
Pseudoboletia indiana	pebble collector urchin	*'hāwa'e po'o hina*	Ind	R					
Tripneustes gratilla	collector urchin	*'hāwa'e maoli*	Ind	A		A	A		
Actinopyga mauritiana	speckled sea cucumber	*loli*	Ind	R		R	R		

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CORALS	LOC	NUM	**GREEN ALGAE**	LOC	NUM	
rubber coral			*Ulva fasciata*			
lace coral			*Cladophora sp.*			
cauliflower coral			*Codium sp.*			
rice coral			*Halimeda discoidea*			
blue rice coral			*Halimeda kanaloana*			
sandpaper rice coral			*Dictyosphaeria sp.*			
finger coral			*Neomeris sp.*			
lobe coral						
WORMS						
Christmas tree worm			**BROWN ALGAE**			
spaghetti worm			*Dictyota sp.*			
			Padina sp.			
			Sargassum aquifolium			
			Sargassum sp.			
MOLLUSKS			*Turbinaria ornata*			
Cone shells			*Colpomenia sinuosa*			
Octopus						
			RED ALGAE			
ARTHROPODS			*Liagora sp.*			
Hermit crabs			*Asparagopsis taxiformis*			
			Hypnia musciformis			
			Acanthophora spicifera			
ECHINODERMS						
Crown-of-thorns						
Linkia sea stars						
Light rock boring urchin						
Black rock boring urchin			**CYANOBACTERIA**			
Spiny sea urchin						
Slate pencil urchin						
Collector urchin						
Speckled sea cucumber			R - rare (1 or 2)			
Black sea cucumber			U - uncommon (3 - 10)			
			C - common (10 - 100)			
			A - abundant (>100)			.

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Date	Specific location	Depth	Sample Time	Turbidity (NTU)	Salinity (ppt)	pH
8/24/2013	North side	Shore - 1 ft	13:20	< 0.5	N/A	
2/8/2014	Center bay	Shore - 1 ft	15:36	1.18	N/A	
4/29/2014	South side	Shore - 1 ft	9:45	1.43	32	
5/5/2014	South side	Shore - 1 ft	11:25	0.79	32	
5/5/2014	North side	Shore - 1 ft	11:30	1.31	32	
5/10/2014	South side	Shore - 1 ft	11:05	1.12	31	
5/10/2014	North side	Shore - 1 ft	11:10	0.89	32	
8/30/2014	North side beyond outlet	Shore - 1 ft	11:39	1.14	38	8.1
8/30/2014	North side beyond outlet	Offshore - 1 ft	11:40	1.29	37	8.1
8/30/2014	North side beyond outlet	Offshore - 8 ft	11:42	0.94	38	8.1
8/30/2014	North side Napili Kai	Shore - 1 ft	11:44	2.37	35	8.1
8/30/2014	North side Napili Kai	Offshore - 1 ft	11:46	1.09	36	8.1
8/30/2014	North side Napili Kai	Offshore - 8 ft	11:48	1.17	36	8.1
8/30/2014	Center bay	Shore - 1 ft	11:50	2.44	35	8.0
8/30/2014	Center bay	Offshore - 1 ft	11:52	1.18	37	8.1
8/30/2014	Center bay	Offshore - 8 ft	11:53	0.75	36	8.0
8/30/2014	South side, north of outlet	Shore - 1 ft	11:54	1.77	35	8.0
8/30/2014	South side, north of outlet	Offshore - 1 ft	11:56	1.13	35	8.1
8/30/2014	South side, north of outlet	Offshore - 8 ft	12:00	1.09	36	8.1
8/30/2014	South side, south of outlet	Shore - 1 ft	12:12	1.47	35	7.8
8/30/2014	South side, south of outlet	Offshore - 1 ft	12:14	1.12	36	8.0
9/13/2014						

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Aloha all:

On September 10, 2014, I had the opportunity to participate in a County Planning Office workshop with participants from all Hawaii. This was a 'mobile' workshop which highlighted a number of West Maui coastline properties…with success stories and 'next to disaster' stories.

I want to share with you some of what I learned and encourage you to go on your own 'field trips' to see what is WORKING AND MAKING A POSITIVE DIFFERENCE in health of beaches/bays, as well as WHAT IS NOT WORKING, not helping to preserve our West Maui coastlines.

Feel free to forward this to your AO Boards or others you think would benefit from the information…I know you all have many West Maui connections.

Our first stop was **Hololani**…just north of the **Royal Kahana**. This resort has two 8 story buildings ocean front, with a swimming pool makai, and underground parking lot. The photo from their website (attach. 1), shows the beach looking nice and wide, but each year in the Winter swells, the beach erodes. There is danger at times of highest wave action of compromising the building integrity. The resort has used sandbags to shore up the beach…and is now applying for a permit to do a full rock revetment /plastic backstop type seawall. The Royal Kahana is waiting outcome of Hololani's permit and wishes to do the same thing to protect its ocean front high rise structures. That will result in a fair stretch of Kahana's shoreline being "walled"…which will encourage further loss of sandy beach up and down coastline.

While seawalls have been used in the past on Maui to respond to shoreline erosion, the use of armoring today is highly discouraged due to the likelihood for negative impacts, and just north of Hololani is **Pohailani**, and **Kahana Reef Assoc**. which have had a seawall in place for some years. The seawall interrupts the process of long shore sand transport which happens seasonally with north or south wave swell actions. What you can see, if you go on a 'field trip' is that there is no sandy beach in front of the seawall. The seawall basically bounces waves off, scouring the sand in front of it and that results in NO SANDY BEACH over time (see attachment #2; Reuters).

The **good news side of the workshop** showed the very beneficial effects on the beach in front of **Kahana Villages** (north of Pohailani), based on actions they took working with Tara Miller Owens (coastal geologist) and Maui Planning department:

1. They removed the sandbags..putting that sand (~ 125 cu. yds.; originally from the beach) back on the beach.

2. They removed naupaka which becomes like a seawall when its irrigated in landscaping.

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3. They planted a sand dune region with pohuehue  and akiaki grass  , which 'grow the beach' by helping to retain incoming sand.

As it turns out, the vast majority of sand in Hawaii was laid down 500 - 1,000 years ago…so our Parrot Fish are not creating new beaches for us. Our sand lost to deep ocean is never recovered.

4. They put a marker in the ground to show the edge of their lawn and then the top of the high tide line - 10 ft. away. WHEN you go today, you can see that their beach has 'grown' so that the high tide line (on Sept. 10th) was about 10 ft. further seaward. (See attach. 3).

5. They created defined beach entry points to keep the dune plantings from being trampled.

6. The "dunes" are only 1 ft. high…no impairment of views.

What you can see in the background of attachment 3 photo…is that the hardscaped coastlines just south of Kahana Villages have NO BEACHES.

What we learned from Kahana Villages Groundskeeper was that, as a local kid, when the area was a fishing village…the kids would ride horses all the way down this coastline to Ka'anapali, on the beach…which no longer exists over much of the stretch.

What we also learned from him is that AO Boards were nervous about taking this approach to protecting their beachfront property, but that they are now THRILLED with the outcome!! A nice beach means more happy tourist guests!!

IF you'd like to see these areas for yourselves (attach. 4), go to the south end of Kahana Villages and there is a public beach access marked which will take you to the south end of their beach. I RECOMMEND IT!!

The last stop on the workshop was our Napili 4-5 desilting basin and Napili Kahawai streambed remediation project….which they were very happy to hear about. Obviously the things we've done to help protect our beach and bay from storm runoff damage are seen as very positive steps.

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IF you are interested in more information about protecting your beachfront property in a way that promotes a healthy beach…you should contact Tara Miller Owens , copied above. She will also point you to the Maui County Planning folks who created a special type of 'dune management zone permit' , which allows the AO of the coastal property to do certain things without new permits…over a 5 year period.

Aloha nui loa,
Pat

Pat B. Lindquist

President, Napili Bay & Beach Foundation, Inc.
PO Box 10823
Lahaina, HI 96761
http://www.napilibayfoundation.org

Mobile: 650-303-3150

P Please consider the environment before printing this e-mail.

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Nutrient Sampling and Analysis in Napili Bay

WQ parameters:

- Turbidity
- Salinity
- pH
- Total Phosphorus (P)
- Total Nitrogen (N)
- Nitrate Nitrite Nitrogen ($NO_3^- + NO_2^-$)
- Ammonium (NH_4^+)
- Phosphate (PO_{43}^-)
- Silicate (H_4SiO_4)

Sampling methods:

- Three locations at Napili Bay were sampled each week for a 10 week period. One location was at the north end of the bay near Napili Kai in front of the shower. A second location was in the center of the bay in front of the steps coming down from Hale Napili. The third location is at the south end of the bay on the south side of the ephemeral stream that enters the bay (in front of Napili Surf). See the map in figure 1.
- During each collection period, two separate samples were taken at each sampling site. The first sample was collected in a 125 mL clear plastic bottle which was rinsed three times in the sampling location and then the sample itself was taken with the bottle facing into the surf during an incoming pulse about 6 inches below the surface. This sample was then immediately put on ice and was used to measure turbidity, salinity, and pH.
- The second sample was taken using a sterile 60 mL BD syringe with no rinsing of the syringe. The syringe was placed under the water facing into the surf in about 6 inches of water (sampler was knee/thigh deep in the water) and 60+ mL of water was drawn into the syringe. Once out of the water, a disposable syringe filter (PALL acrodisc 25 mm syringe filter with 0.2 um GHP membrane) was attached to the luer end of the syringe. Approximately 5 mL of water was pushed through the filter before the filter was placed over the mouth of a 125 mL acid washed bottle and the remainder of the sample was passed through the filter into the acid washed bottle. The bottle was then capped tightly and placed on ice. The acid washed bottle was kept closed until the filtering began and was not rinsed prior to filtering the water sample into the bottle.
- All samples were transported on ice to my house where the nutrient samples were immediately stored in my freezer for preservation. These samples were accumulated in the freezer for 2 weeks (encompassing 3 sampling periods) and then shipped with blue ice in a Styrofoam pack to the SOEST lab on Oahu for testing. The samples were shipped FedEx priority overnight and generally arrived at the lab within 24 to 30 hours after being packed for

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shipping. The SOEST lab tested all of the samples within the 28 day maximum holding period.

- The samples gathered for basic water quality parameters were then tested for turbidity, salinity, and pH. These samples were not held after collection and analysis.

Figure 1 Sample sites

Analysis Methods:

Turbidity:

- Turbidity was tested using the Hach 2100Q turbidity meter. The meter was calibrated with Stablcal formazin primary standards in July 2015. The same standards were used to calibrate Gelex secondary standards which are used prior to every analysis session to verify the validity of the calibration of the meter.
- Prior to testing, the distilled water stored in the sample cell was tested for turbidity to verify the sample cell was clean. Once all samples were tested, the sample cell was rinsed many times with tap water and then distilled water to ensure no sediment remained in the sample cell. The sample cell was then oiled with silicon oil according to manufacturer s instructions and stored with distilled water.

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- Samples were gently agitated to re-suspend any fine sediment that had settled during transport before testing. The sample cell was then rinsed 3 times with the sample before filling for the turbidity measurement. The turbidity meter is set to read a signal average over approximately 10 seconds of time. This mode allows any sand in the sample to settle before reading. The meter beeps when the averaging period is complete and the turbidity reading is recorded on the data sheet.

pH:

- pH was measured with a portable pHTestr 10 handheld pH meter. The pH meter was calibrated prior to each sampling session with buffer solutions of pH7 and pH10 which bracket the expected pH of the samples. The calibration was performed according to manufacturer s instructions.
- Samples were tested by inserting the pH meter into the sample bottle and waiting for a period of 2 minutes to ensure the meter had stabilized before recording the reading on the data sheet.

Salinity:

- Salinity was measured with a portable ATC refractometer. The refractometer was calibrated with 35 ppt salinity calibration solution prior to sample analysis.
- After pH testing, a plastic pipette was used to pull water from each water sample. The pipette was rinsed with the sample water 3 times before drawing the final water into the pipette. Four drops of the sample were placed on the prism of the refractometer and a reading was taken. The reading is then recorded on the data sheet. Measurements are provided in units of parts per thousand (ppt).
- After each sample, the prism was gently rinsed with distilled water a patted dry with a Kimwipe.

Data Storage and Analysis

Data is stored in an MS Excel spreadsheet. The data is stored in units used by the Hawaii Department of Health, Clean Water Branch. The basic water quality measurements (turbidity, salinity, and pH) were measured in the standard units used by DOH-CWB. The organic and inorganic nutrient parameters were provided by the SOEST lab in micro-moles per liter. This data was subsequently converted into milligrams per liter to enable comparison to the DOH-CWB measurements and the Hawaii state water quality standards. The conversions are straight forward for Phosphorous and Nitrogen where the conversion factor is just based on the molecular weight of the elements. The conversion factor for the compounds is based on just the element of interest. In the case of Phosphate, for example, the conversion factor is based just on the molecular weight of phosphorous since that is the element of interest in this compound. In the nitrate plus nitrate parameter, the conversion factor is just based on the molecular weight of nitrogen. The same conversion strategy is then used for Silicates and ammonium. Table 1 contains the conversion factors used for each of the nutrient parameters provided by the SOEST lab.

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Parameter	Molecular Weight (gm/mol)	Conversion Factor (mg/micromol)
Phosphorous (P)	30.9738	0.030973761
Nitrogen (N)	14.0067	0.0140067
Phosphate (PO_{43})	94.9714	0.030973761
Silicate (H_4SiO_4)	96.1149	0.0280855
Nitrate + Nitrite ($NO_3 + NO_2$)	108.009	0.0140067
Ammonium (NH_4)	18.0385	0.0140067

Table 1 Conversion Factors

Data analysis has been limited at this point to just four of the parameters provided by the SOEST lab, because these four parameters are the only parameters called out in the state water quality standards: Total Nitrogen (TN), Total Phosphorous (TP), Nitrate+Nitrite Nitrogen (NNN), and Ammonium (NH_4). Additionally, data was collected on turbidity by both the DOH and during the NBBF nutrient analysis surveys. Turbidity is also part of the state water quality standards.

The DOH collects samples on the south side of Napili Bay in approximately the same place that data was collected during the NBBF survey. Therefore, expectations would be that data collected at the south location of the bay should most closely compare to the DOH data. The current comparison between DOH data and the NBBF data compares only data collected by DOH in 2015. DOH has collected 9 samples over the course of 8 months in Napili Bay. All of the data in the NBBF survey was collected over a 10 week period, primarily in July and August of 2015. Therefore, some differences in the measurements could be expected due to the difference in sampling periods.

Data is presented in two different ways. The first set of plots shows all points plotted against the collection dates and colored by the sample site location or DOH. The second set of charts presents the geometric mean of all data points plotted by location (and DOH) and compared to the state water quality standards. Both the dry and wet criteria standards are plotted on the charts (dry is designated by the yellow line and wet is designated by the red line). The state DOH uses the dry criteria standard for Napili bay.

It is clear from the second set of plots that Napili Bay exceeds the state water quality standards for every parameter except for total phosphorous. The water quality on the south side of the bay is generally not as good as on the north side of the bay. Fish and algae surveys done by snorkeling the bay confirm the poor turbidity readings on the south side of the day. It is generally very difficult to see marine life on the south side of the bay due to poor visibility. The north side is generally much clearer and speculation is that the circulation is better on the north side of the bay. Additionally, an ephemeral stream occasionally enters the bay on the south side and historically has brought a great deal of sediment into the bay on the south side. In 2011, NBBF repaired a defective outlet valve on the sedimentation basin between the stream and the bay which has significantly improved conditions on the south side.

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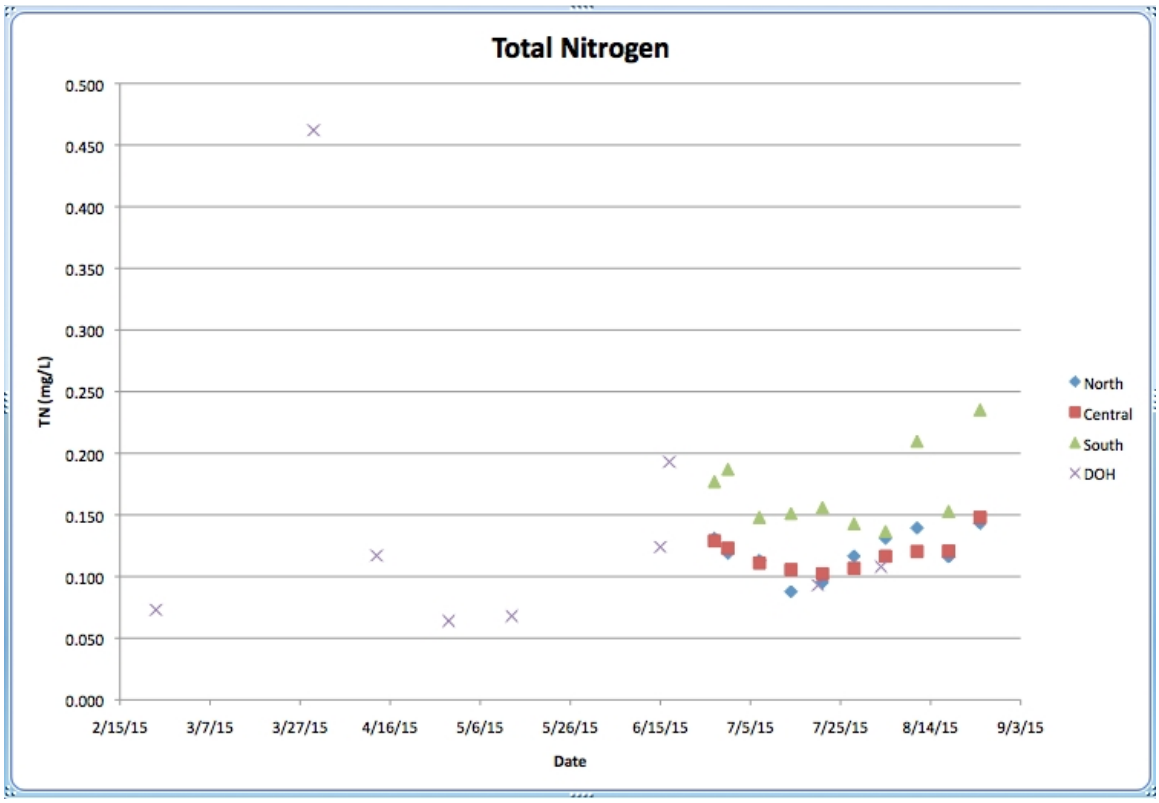

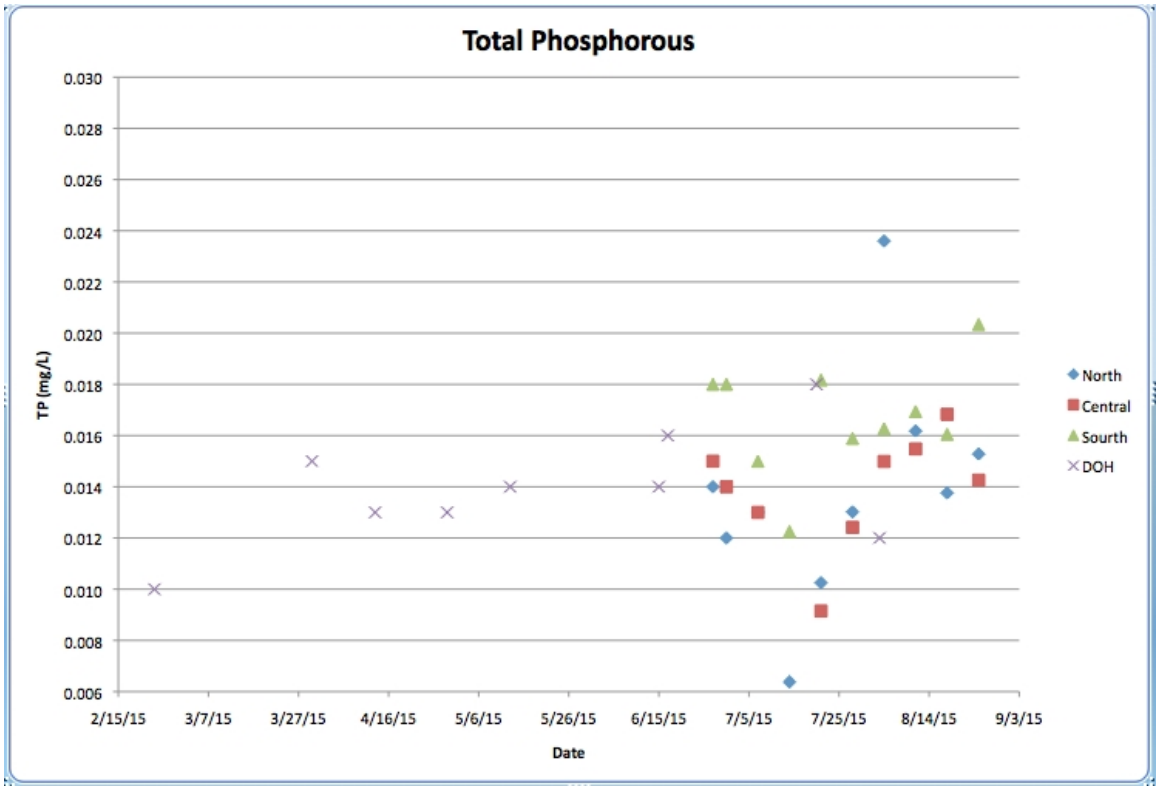

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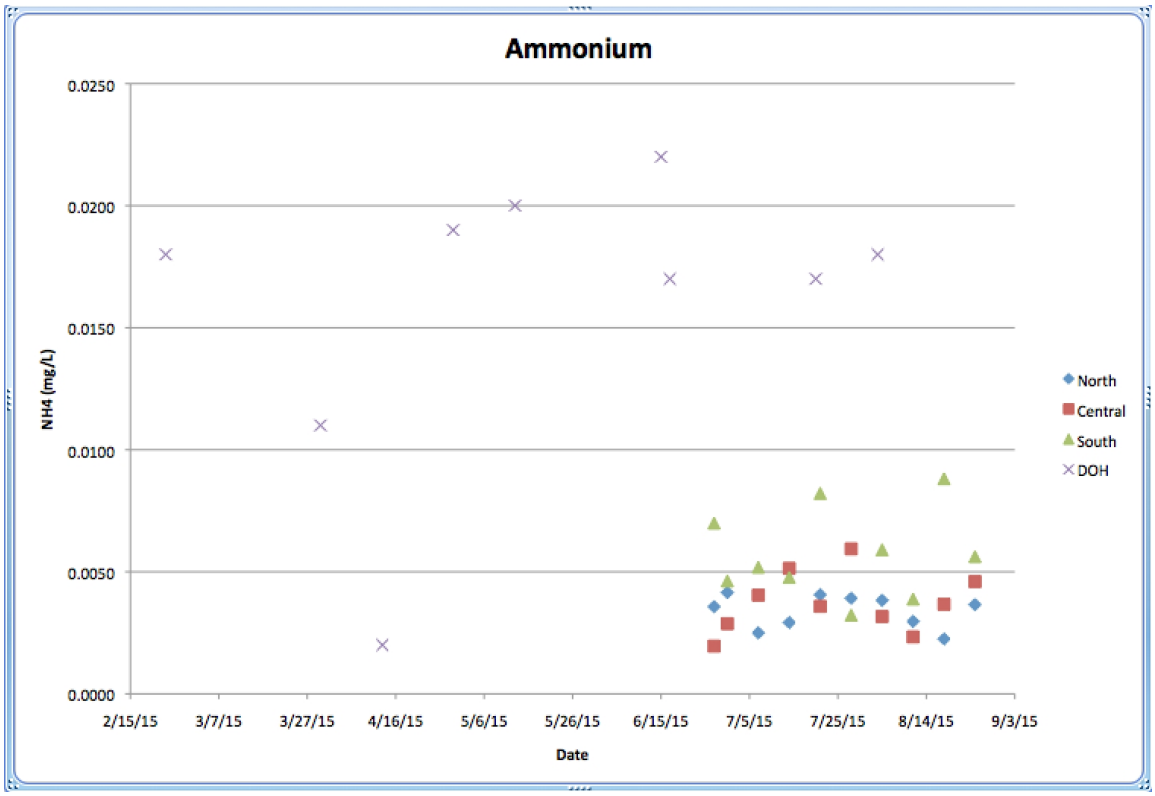

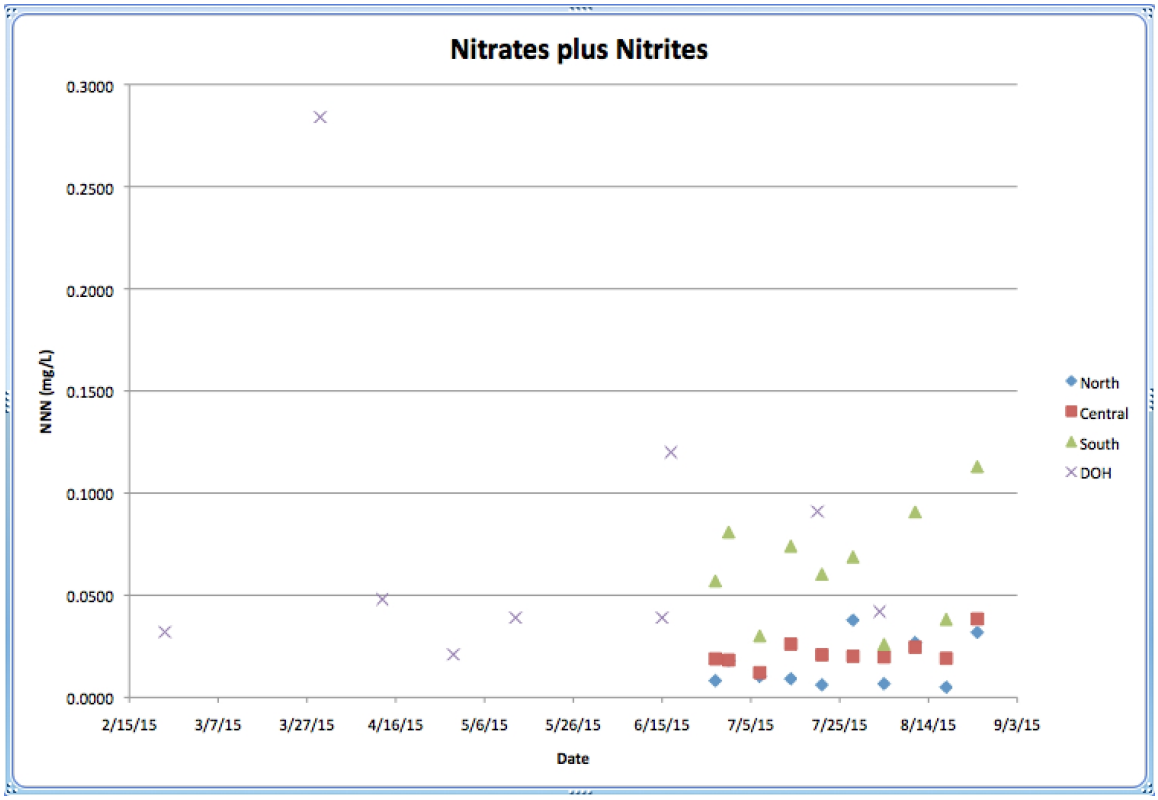

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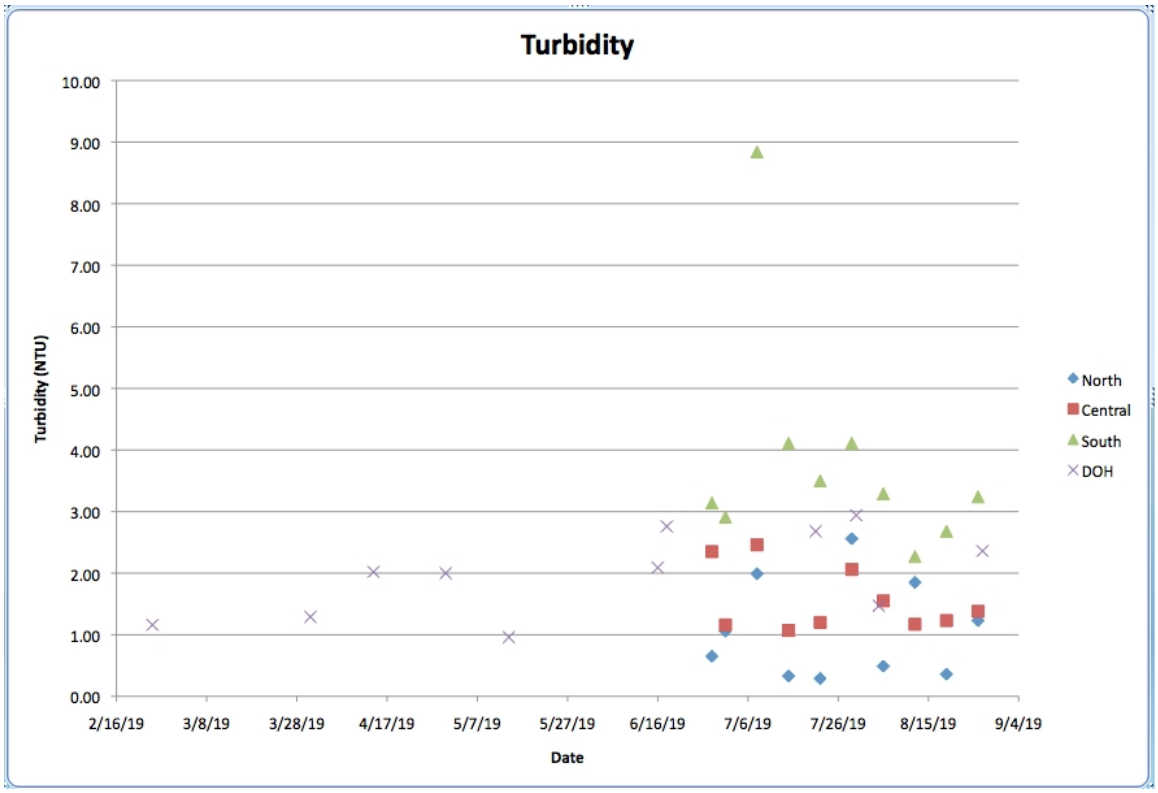

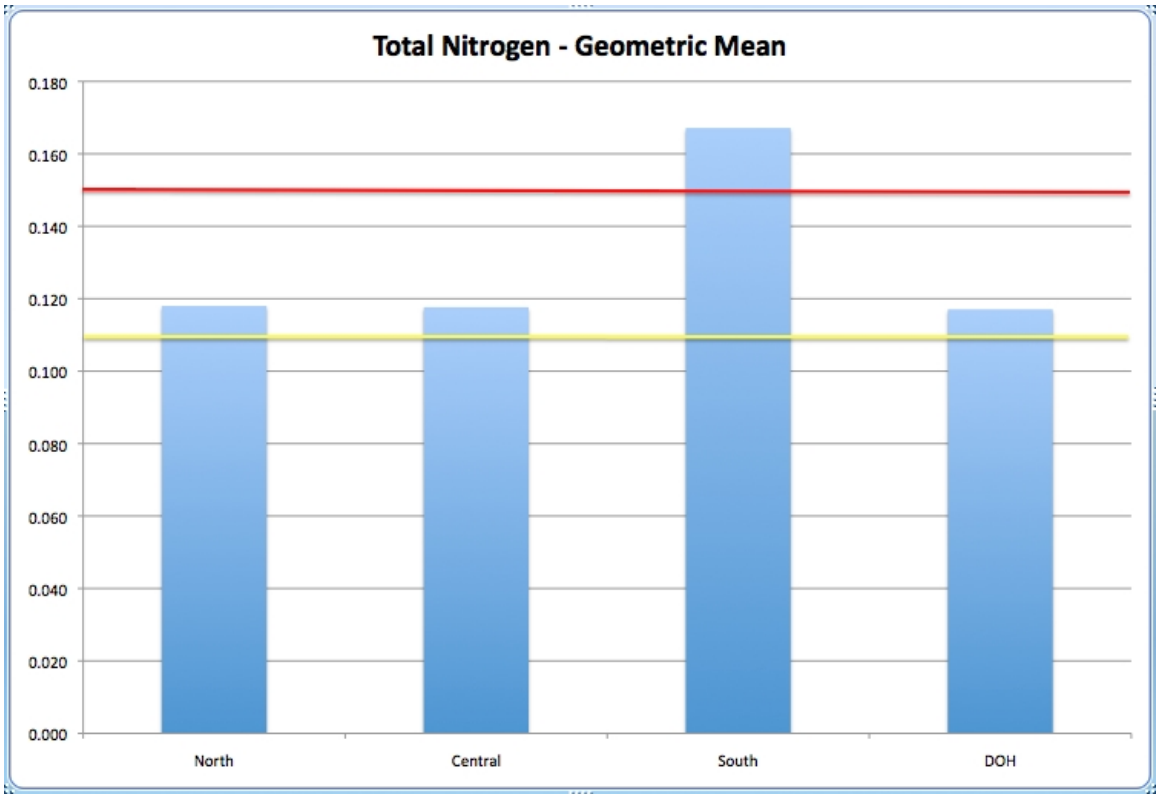

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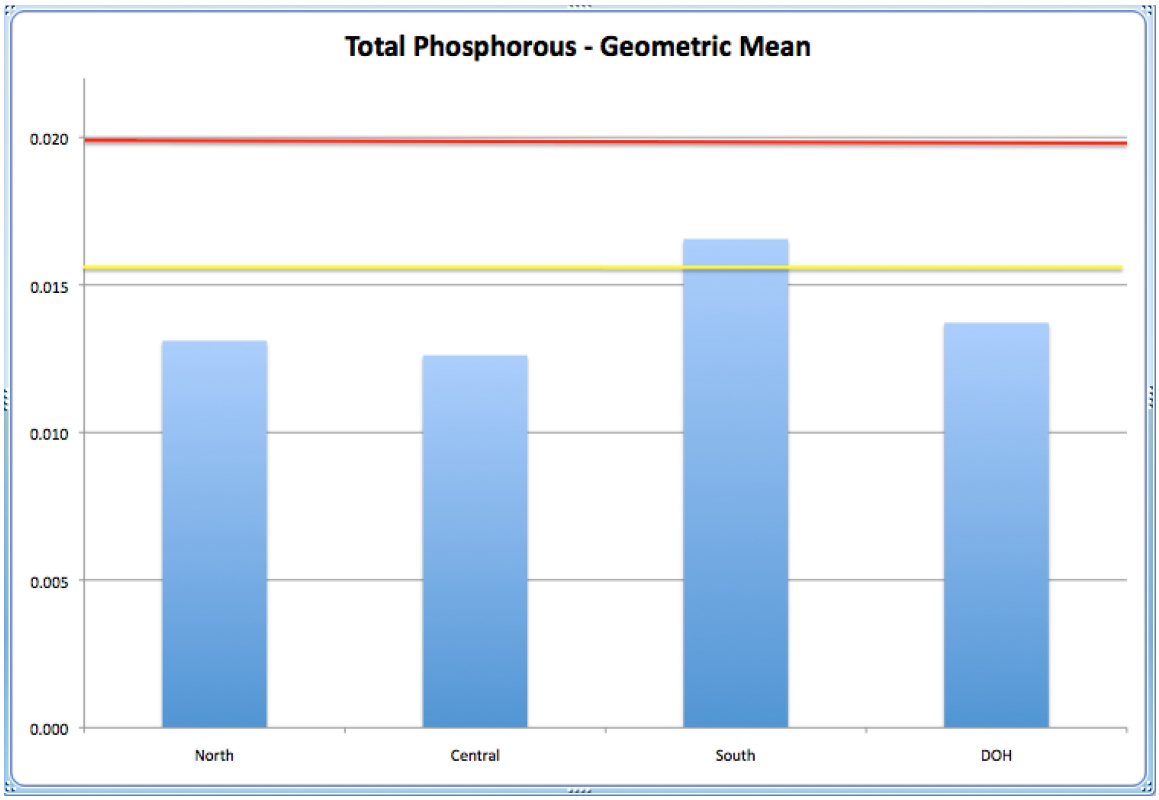

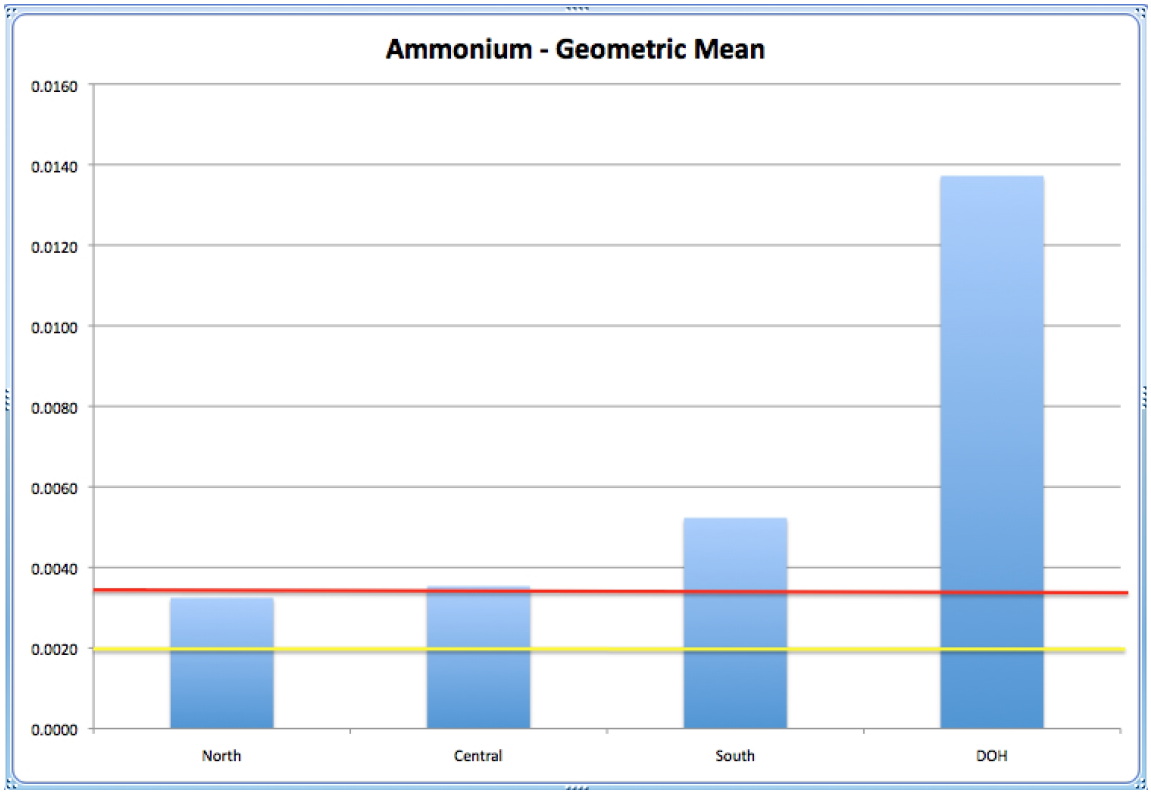

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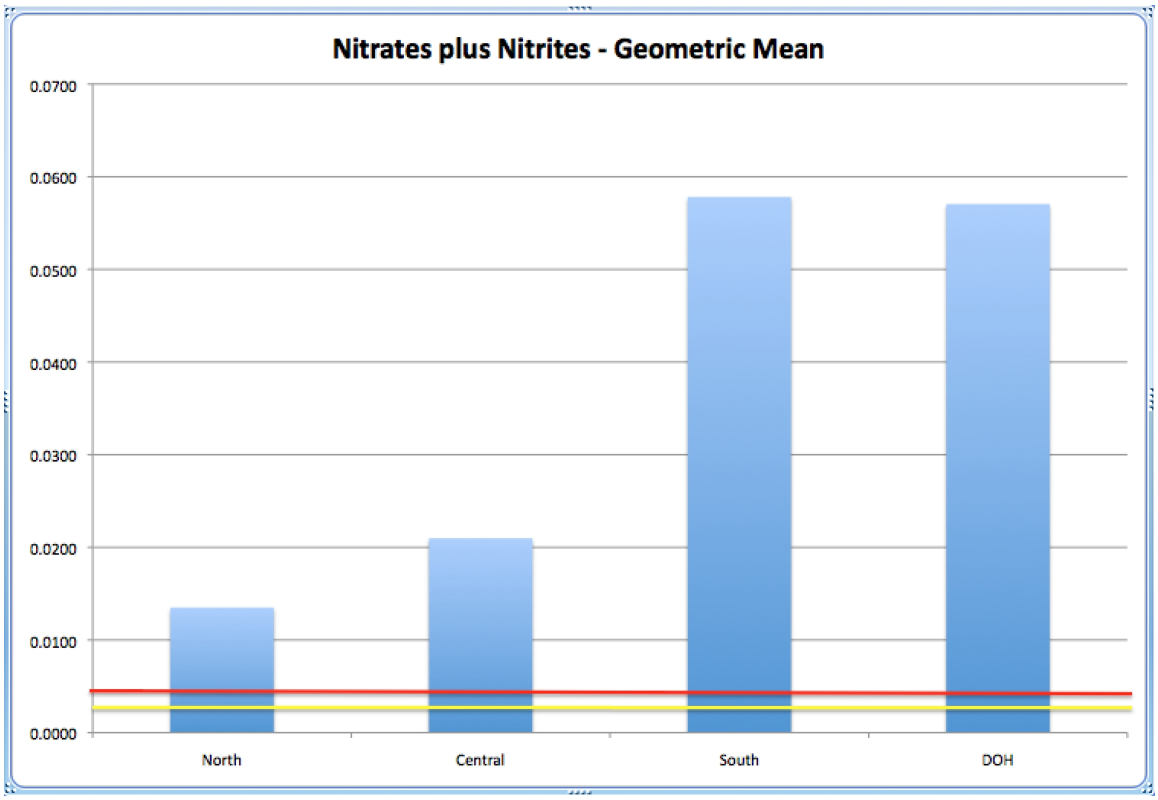

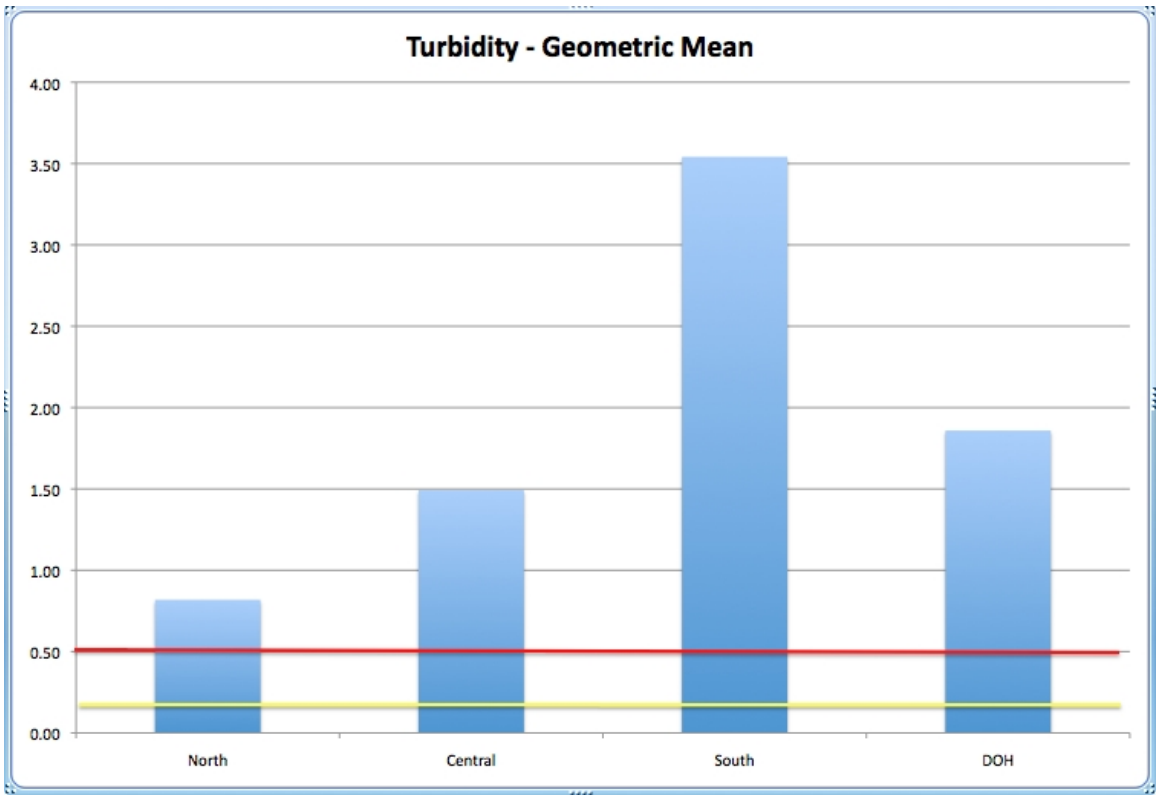

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