UNIVERSITY OF GUAM
UNIBETSEDÅT GUAHAN

Administration and Finance
Business Office

November 30, 2015

Speaker Judith Won Pat
33rd Guam Legislature
155 Hessler Place Suite 21
Hagatna, Guam 96910

Dear Speaker Won Pat,

In compliance with the Legislature reporting requirements per P.L. 32-181, we are submitting the following reports and information:

A. Financial Statements (Unaudited/Draft) for the fiscal year ending September 30, 2015:
   1. Guam Aquaculture Development and Training Center
   2. WERI Comprehensive Water Resource Monitoring
   3. WERI Guam Hydrologic Survey
   4. KPRG

B. Program Annual Reports:
   1. Guam Aquaculture Development and Training Center
   2. WERI Guam Hydrologic Survey and Comprehensive Water Resource Monitoring
   3. Southern Soil and Water Conservation District Program
   4. Northern Soil and Water Conservation District Program
   4. KPRG
   5. Student Financial Aid Assistance Program

The reports will be posted at UOG website: http://www.uog.edu/dynamicdata/AdminFinanceFinancial.

Should you have any questions or concerns, please give us a call at tel. nos. 735-2943 or 735-2942.

For the University of Guam,

Zenaida Asuncion-Nace
Comptroller

UNAUDITED/DRAFT

UNIVERSITY OF GUAM
College of Natural and Applied Sciences
Aquaculture Development and Training Center
For the fiscal year ending September 30, 2015

	Cash Basis	Accrual Basis
Operating Revenue		
GovGuam Appropriations	$ 104,378	$ 125,254
Total Revenue	104,378	125,254
Operating Expenses		
Salaries	53,522	53,522
Benefits	5,038	5,038
Travel	-	-
Contractual	3,524	3,524
Supplies	27,880	27,880
Equipment	599	599
Utilities	-	-
Capital Outlay	-	-
Miscellaneous	12,625	12,625
Total Operating Expenses	103,188	103,188
Operating Income	1,190	22,066
Net Assets		
Net assets-beginning	46,321	46,321
Net assets-end	$ 47,511	$ 68,387

Note:
GovGuam appropriations/revenue recognized at $104,378 is based on cash basis of accounting. On accrual basis, appropriations/revenue is $125,254 therefore, GovGuam is $20,876 in arrears in allotment payments to UOG for FY2015.

UNAUDITED/DRAFT

UNIVERSITY OF GUAM
Water and Environment Research Institute of the Western Pacific
Comprehensive Water Resource Monitoring Program
For the fiscal year ending September 30, 2015

	Cash Basis	Accrual Basis
Operating Revenue		
GovGuam Appropriations	$ 116,719	$ 155,626
Total Revenue	116,719	155,626
Operating Expenses		
Salaries	-	-
Benefits	-	-
Travel	-	-
Contractual	154,580	154,580
Supplies	-	-
Equipment	-	-
Capital Outlay	-	-
Miscellaneous	15,563	15,563
Total Operating Expenses	170,143	170,143
Operating Loss	(53,423)	(14,517)
Net Assets		
Net assets-beginning	(1,921)	(1,921)
Net assets-end	$ (55,344)	$ (16,438)

Note:
GovGuam appropriations/revenue recognized at $116,719 is based on cash basis of accounting. On accrual basis, appropriations/revenue is $155,626 therefore, GovGuam is $38,907 in arrears in allotment payments to UOG for FY2015.

UNAUDITED/DRAFT

UNIVERSITY OF GUAM
Water and Environment Research Institute of the Western Pacific
Guam Hydrologic Survey
For the fiscal year ending September 30, 2015

	Cash Basis	Accrual Basis
Operating Revenue		
GovGuam Appropriations	$ 152,245	$ 182,694
Total Revenue	152,245	182,694
Operating Expenses		
Salaries	73,459	73,459
Benefits	22,929	22,929
Travel	127	127
Contractual	17,061	17,061
Supplies	10,797	10,797
Equipment	19,222	19,222
Utilities	-	-
Capital Outlay	-	-
Miscellaneous	18,269	18,269
Total Operating Expenses	161,863	161,863
Operating Loss	(9,618)	20,831
Net Assets		
Net assets-beginning	229,518	229,518
Net assets-end	$ 219,900	$ 250,349

Note:

GovGuam appropriations/revenue recognized at $152,245 is based on cash basis of accounting. On accrual basis, appropriations/revenue is $182,694 therefore, GovGuam is $30,449 in arrears in allotment payments to UOG for FY2015.

Guam Educational Radio Foundation
Balance Sheet
September 30, 2015

ASSETS		
Current Assets		
Checking/Savings		
Other Expenses	$	205.87
Other Income		(185.00)
00-1050 · Petty Cash (office use)		15.51
10-1020 · Cash with UOG		19,225.94
20-1041 · Bank of Guam (CPB) (CPB funds restricted)		10,099.43
50-1010 · Cash in Bank of Guam		22,782.93
50-1013 · PayPal		10,969.93
50-1015 · Cash in Bank of Hawaii		6,483.80
Total Checking/Savings		69,598.41
Accounts Receivable		
50-1120 · A/R Contributions/Charity		(365.00)
50-1130 · A/R Membership Receivable		664.16
50-1140 · A/R Services		13,132.60
Total Accounts Receivable		13,431.76
Other Current Assets		
20-1410 · Prepaid Expense- Programing		12,600.00
50-1810 · Undeposited Funds		425.00
Total Other Current Assets		13,025.00
Total Current Assets		96,055.17
Fixed Assets		
40-1600 · Property & Equipment		
40-1610 · Broadcast Equipment (Broadcast Equipment)		26,586.18
40-1620 · Broadcast Euipment - Federal		204,013.72
40-1630 · Computer		11,481.74
40-1640 · Computers - Federal		14,839.36
40-1650 · Fixed Assets Improvement		7,406.50
40-1660 · Office Equipment		10,585.96
40-1670 · Studio Equipment		26,658.96
40-1680 · Studio Equipment Federal		171,182.44
40-1710 · Broadcast Equip - Accum Depr.		(22,471.15)
40-1720 · Broadcast Equip Fed.Accum Depr.		(204,014.20)
40-1730 · Computer - Accum. Depr.		(10,526.12)
40-1740 · Computer - Fed. Accum. Depr.		(14,839.37)
40-1750 · Improvements - Accum Depr		(6,934.38)
40-1760 · Office Equipment - Accum. Depr.		(10,041.19)
40-1770 · Studio Equipment - Accum Depr.		(23,467.98)
40-1780 · Studio Equip - Fed Accum Depr		(171,182.44)
Total 40-1600 · Property & Equipment		9,278.03
Total Fixed Assets		9,278.03
TOTAL ASSETS	$	**105,333.20**

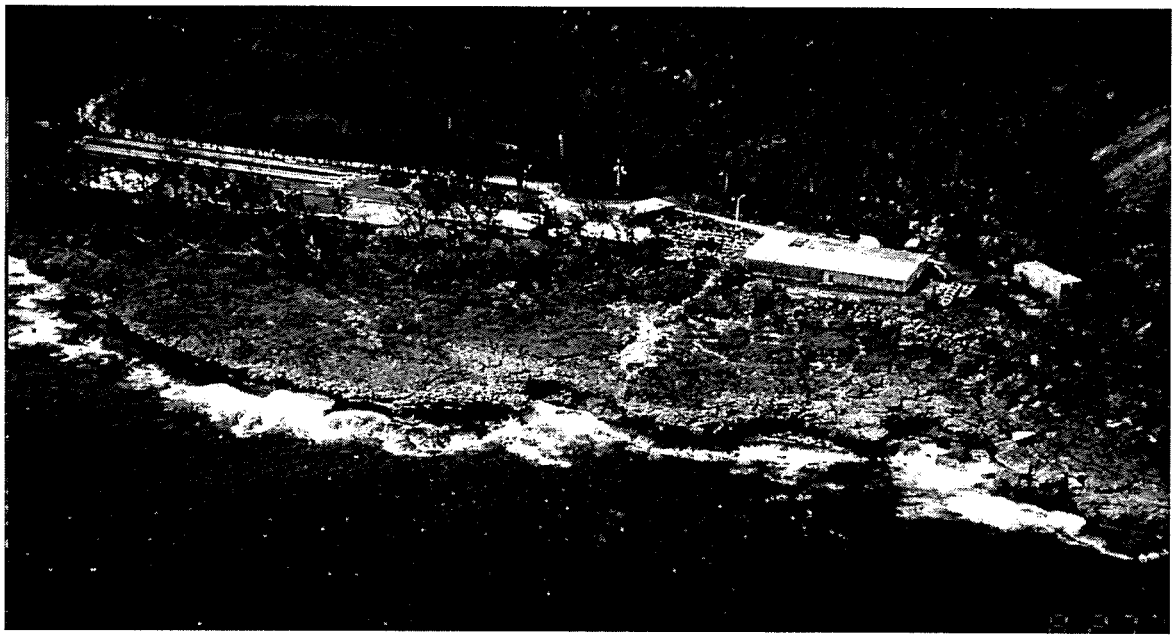
Guam Educational Radio Foundation
Balance Sheet
September 30, 2015

LIABILITIES & EQUITY	
Liabilities	
Current Liabilities	
Other Current Liabilities	
54-2220 · Latitude 13 Adventures	$ (32,063.54)
Total Other Current Liabilities	(32,063.54)
Total Current Liabilities	(32,063.54)
Total Liabilities	(32,063.54)
Equity	
10-3100 · GovGuam Funds	9,138.89
20-3200 · CSB Funds	29,464.89
40-8850 · Investment In-Plant	25,070.89
50-3000 · Unrestrict (retained earnings)	12,880.18
505-005 · Other Current Funds	58,504.00
Net Income	2,337.89
Total Equity	137,396.74
TOTAL LIABILITIES & EQUITY	**$ 105,333.20**

Guam Educational Radio Foundation
Profit and Loss Statement
As of September 30, 2015

Ordinary Income/Expense	
Income	
10-4010 · GovGuam Appropriation	$ 22,366.65
20-8751 · CPB Interest Income	4.36
54-6500 · General Membership	4,134.27
54-6511 · PayPal Sales	620.00
54-6620 · Underwriting	3,100.00
Total Income	30,225.28
Gross Profit	30,225.28
Expense	
00-7100 · Contract expense CPB	24,538.07
00-7110 · Contract - Auditor/Professional	355.00
00-7200 · Full Time Personell	29,563.53
20-7901 · Postages / Handling	8.94
21-7115 · PayPal Fees	21.60
25-8601 · Utilites CPB	1,364.64
50-7200 · FT Personell (Gen. Fund)	4,314.00
50-7551 · Equipment <$500 Other)	3,827.46
50-7800 · Misc. Expense	2,077.22
55-7113 · Website Development	131.25
55-7150 · Fund Raising Events Expenses	1,449.98
55-7410 · Bank Charges	187.85
55-7700 · Insurance	951.00
55-8300 · Supplies & Materials	1,070.23
55-8403 · Telephone Expense/Fax	100.69
55-8500 · Travel Expense	643.32
Total Expense	70,604.78
Net Ordinary Income	(40,379.50)
Net Income	**$ (40,379.50)**

GUAM AQUACULTURE DEVELOPMENT AND TRAINING CENTER



FY-2015 STATUS REPORT

Prepared by
Rachael Taitano Leon Guerrero

November 2015

The Guam Aquaculture and Development Center (GADTC) was originally built in 1980 as a private facility designed to produce fish and eel fry for the Asian market. Due to financial difficulties of the parent company, the facility was abandoned. The Government of Guam acquired the facility in exchange for tax forbearance, and control was transferred to the Guam Department of Commerce (GDOC) in 1986. The GDOC operated the facility until October 2001 when Public Law 26-35 transferred ownership of the facility to the University of Guam. The GADTC is now housed within the Agricultural Experiment Station of the College of Natural and Applied Sciences. The University of Guam was provided with a special appropriation for the GADTC of $125,254 for fiscal year 2015. Unfortunately, the GADTC received almost 50% ($62,224) of its FY2015 allotment during the last month (September 2015) of the fiscal year, making it difficult to spend its funds during the fiscal year. The facility spent $119,341.22 of the total $56,867, and carried over $68,387 to FY2016. Without the special appropriation, the University would not have been able to continue to operate the facility.

The goals of the GADTC are:

1. To produce high quality fish fry and shrimp post-larvae on-island to support a growing and promising aquaculture industry, thus reducing the reliance on imported seed stock;
2. To be a center of excellence for public information on the aquaculture industry, and provide educational programs on aquaculture;
3. To serve the needs of local aquaculture farmers regarding technology transfer and extension service;
4. To conduct research on aquaculture in support of the industry; and
5. To be financially self-supporting and independent of UOG funds.

The current objectives of the GADTC are:

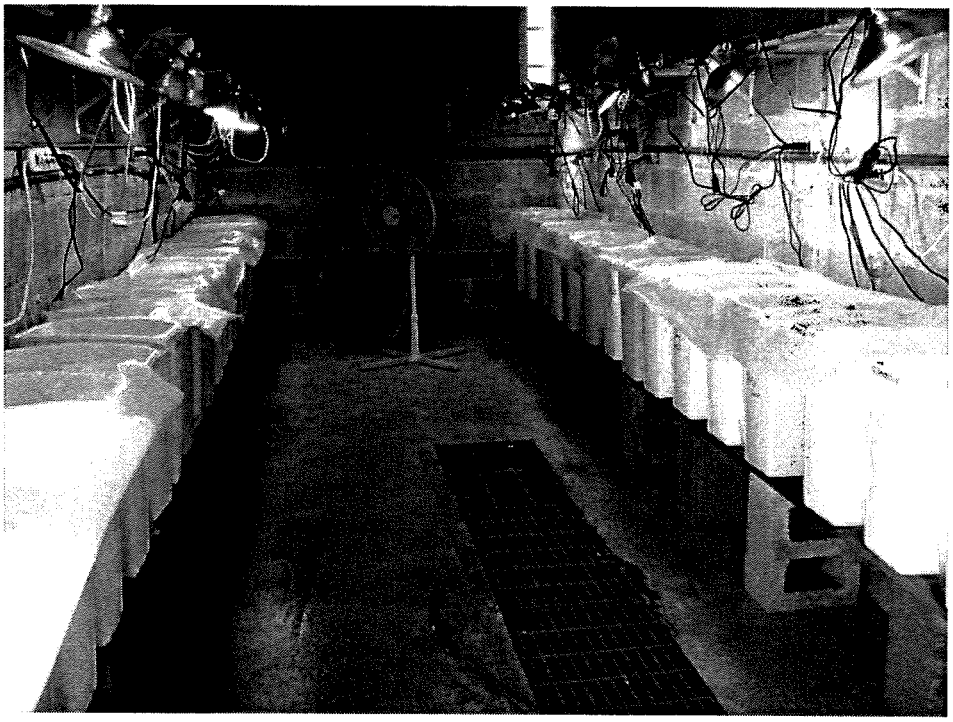
1. To produce sufficient shrimp and tilapia fry for the island to be self sufficient,
2. To serve as the lead agency for aquaculture for the Government of Guam,
3. To support the extension programs of the Guam Cooperative Extension, Service,
4. To conduct a research program on the genetic improvement of the Pacific White Shrimp, *Penaeus vannamei*, and to introduce a research program on the aquaculture of marine fish
5. To generate income from the sales of SPF *Penaeus vannamei* broodstock to support the facility.

Program accomplishments during FY 2015:

1. A disease free population of coralgroupers (*Plectropomus areolatus*) were captured in Palau and Pohnpei and imported to Guam. These animals are currently held at the GADTC, They were tested for diseases and proved to be

free of the tented pathogens. Their suitability for use as breeding base for the re-establishment of a recreational fishery on Guam is being determined.

2. The shrimp nursery has allowed the continuation of the shrimp breeding program. The shrimp breeding program has been successful in improving the growth rate of our commercial shrimp line.



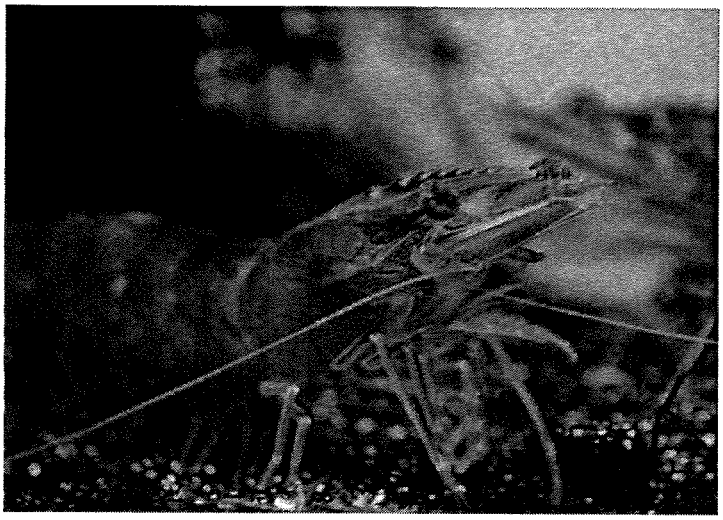
3. There continued to be limited production of shrimp and tilapia fry during FY 2013 because the lack of indoor facilities. Small batches of shrimp post-larvae have been successfully produced and there continues to be limited tilapia fry production utilizing the outdoor raceways.

4. The performance of our shrimp lines in a comparative study at the Guangxi Fisheries Research Institute in Nanning, China has lead to their inviting our staff to return to Nanning. During the visit, GFRI expressed a desire to continue our long term cooperation. Currently we are preparing visa applications for two of their staff to return to Guam to continue work on our cooperative shrimp breeding project.

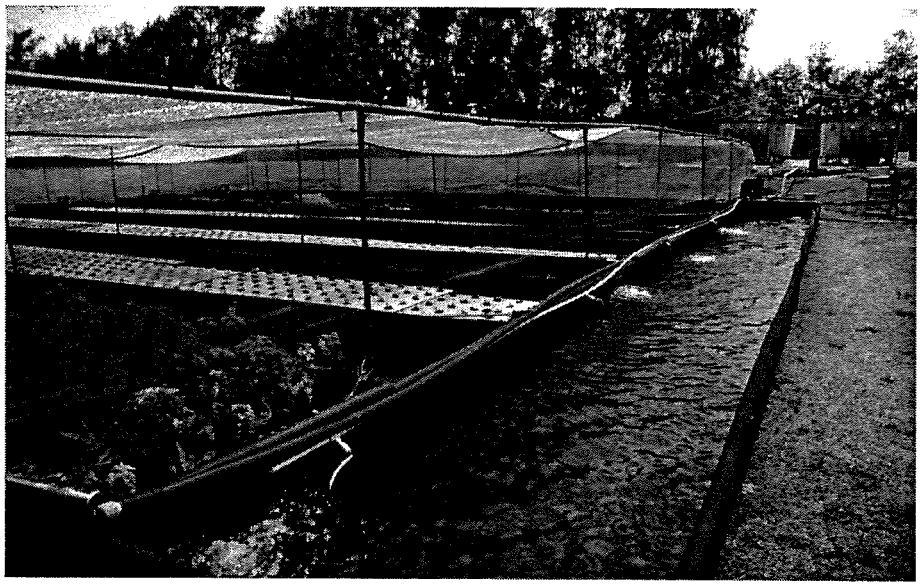
5. THE GADTC continues its cooperation with the South Pacific Community Aquaculture Division.

6. The GADTC was certified by the Government of Thailand as a SPF producer of *P. vannamei* and the first two commercial shipments of SPF shrimp were exported to Thailand.

7. There continues to be interest in the potential of the GADTC as a supplier and breeder of high value SPF shrimp broodstock and in research collaboration. Dr. Hui Gong has developed relationship with Shanghai Ocean University (SOU); and areas of specific interest are in developing a cooperative program with the GADTC in the area of shrimp breeding. The first exchange students from SOU began their 'internship' with GADTC in August 2014, and interns continue to work with Dr. Gong at the GADTC.



8. Work continues on the Center for tropical and Sub-tropical Aquaculture funded project to examine the economics of the integrated production of fish and fresh vegetables in aquaponics systems in Hawaii and Guam.



9. Research collaboration efforts continue with Agricultural AgriLife Research Mariculture Laboratory in Texas A&M University to study the relationship between nutrition and genetics

The primary problem with the Guam Aquaculture Development and Training Center continues to be the lack of suitable physical facilities since the demolition of the main hatchery building. Limited restorations have been made, but the ability of the hatchery to continue is severely constrained by a lack of funding for repairs and replacement of the lost facilities.

A second issue is the retirement of Dr. John Brown in October 2013. He has had oversight of the facility since it was transferred to the University and his retirement will leave Dr. Hui Gong as the only researcher at the facility. It would be advantageous if a second aquaculture researcher could be hired.

Number of employees:

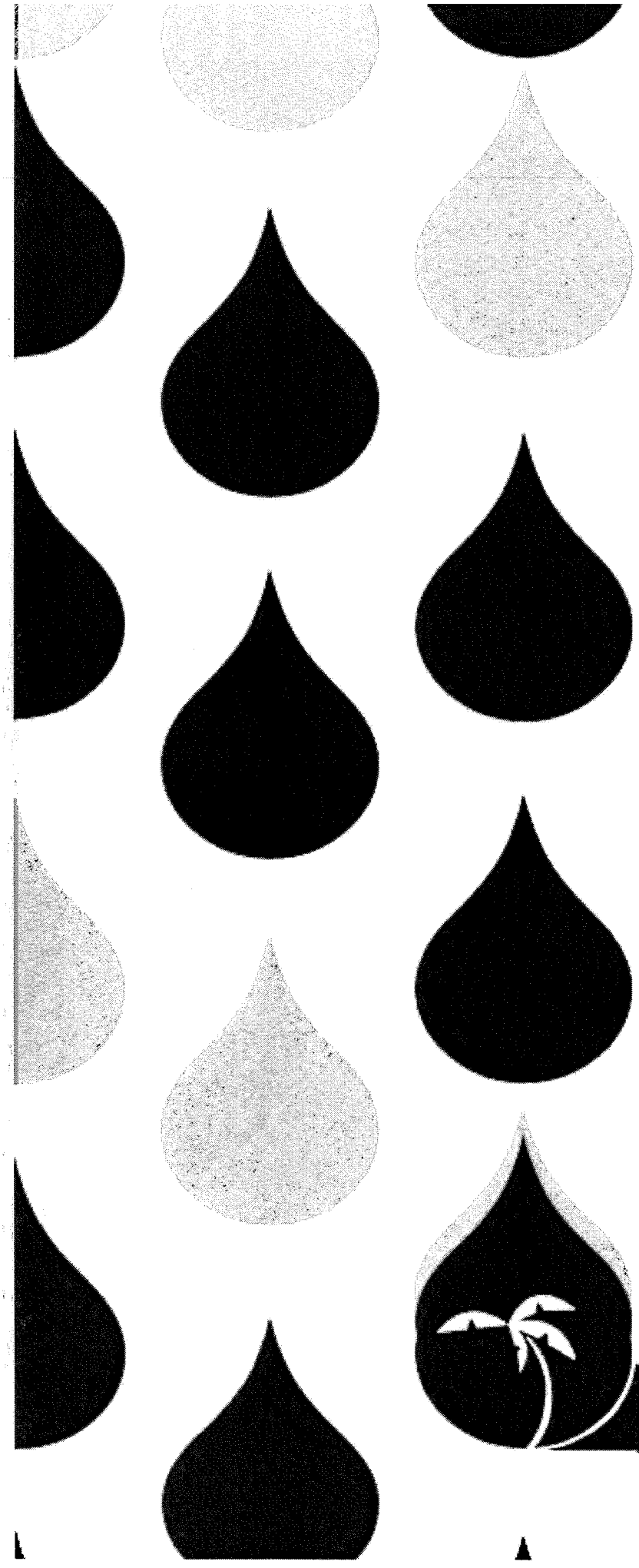
Classified (1)
Biologist IV — Franklin Alig

Part time student and research assistants (4)

Conlee Mongami
Vincent Pangelian
Matthew Damin
Rusty Rdialul

Presentations:

Gong, H., 2015. Evaluation and Dietary Protein and Energy Utilization Efficiency in Various families of *Penaeus annamei*. World Aquaculture 2015, Jeju, Korea, May 26-30.



Guam Hydrologic Survey (GHS)

&

Comprehensive Water Monitoring Program (CWMP)

FY 2015 Annual Report

WERI
WATER AND ENVIRONMENTAL RESEARCH INSTITUTE
OF THE WESTERN PACIFIC
UNIVERSITY OF GUAM

November 2015

GUAM HYDROLOGIC SURVEY (GHS)
&
COMPREHENSIVE WATER MONITORING PROGRAM (CWMP)

FY 2015
ANNUAL REPORT

Prepared by

Dr. Shahram Khosrowpanah
Director

November 2015

Water & Environmental Research Institute of the Western Pacific
University of Guam

PROGRAM MISSION STATEMENT

The Guam Hydrologic Survey (GHS) and the Comprehensive Water Monitoring Program (CWMP) were created in 1998 by the 24th Guam Legislature under Public Laws No. 24-247 and 24-161 respectively. The Water and Environmental Research Institute (WERI) was charged with administering the annual legislative appropriations necessary to drive these two programs and facilitate, direct and implement their primary objectives. Both programs are now an integral component of the WERI water resources research, information dissemination, education and training mission.

PROGRAM GOALS

The purpose of GHS is to consolidate Guam's hydrological data gathered over the years by local and federal government agencies and consultants, and to conduct research on water related issues of local importance. GHS also funds a variety of water resource educational programs in various formats, including guest lectures and seminars at UOG and in the community, informational and training workshops for teachers and professionals from other government agencies, field trips and talks for schoolchildren, and the publication and distribution of educational posters, maps, and fact sheets.

The CWMP was created to collect data on saltwater intrusion and water lens thickness in Guam's sole source aquifer in the northern part of the island and stream flow and other parameters associated with surface waters in the south. The program builds on studies previously undertaken by the US Geological Survey (USGS) that were abandoned several years earlier because of a discontinuance of matching funds from the Government of Guam. The CWMP annual appropriations from the Guam legislature have facilitated the collaborative reinstatement of these studies with USGS under their 50-50 Federal/State-Territory cost-sharing program for water resource monitoring.

The foresight of the Guam Legislature in creating these two very important programs deserves special mention here. Through their efforts and continued support, we have consolidated and interpreted several vital water resources databases for Guam and revitalized the USGS water resources monitoring program. Our understanding of the complex physical, chemical and biological processes that influence Guam's water resources has broadened considerably and the increase in graduate student research opportunities provided by the programs has substantially added to the number of highly trained water resources professionals in the island's work force.

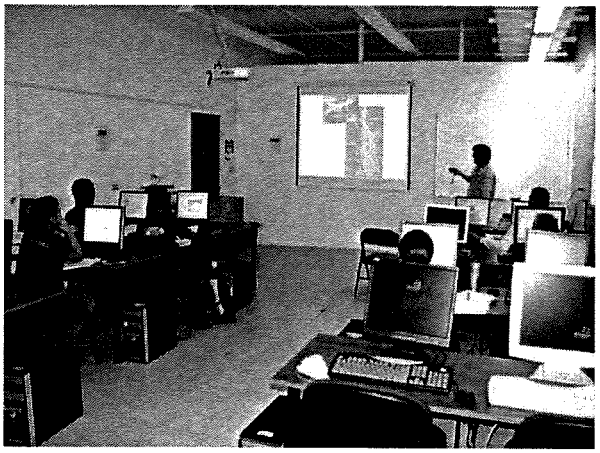
PROGRAM FUNDING

GHS and CWMP appropriations written into each public law are $204,200 and $173,948 respectively. Local budgetary constraints saw a 6% reduction in funding support for both programs in FY'09, i.e., $192, 309 and $163,817 awarded for GHS and CWMP respectively. These shortfalls continued through FY'12. An additional 5% reduction was levied against each account by Governor Calvo in FY'12 and is continuing through FY'15. This reduces the total awards to $182,694 for GHS and $155,626 for CWMP. The information presented herein summarizes all GHS and CWMP program objectives and related activities undertaken in FY'15.

PROGRAM OUTCOMES FOR FY'15

GUAM HYDROLOGIC SURVEY (GHS)

In FY'15, GHS provided funding the continued maintenance, repair and upgrading of instrumentation in the WERI *Computer Analysis and Geographic Information System* (CA-GIS) *Laboratory*. Almost every water research project carried out by WERI involves a GIS analysis and mapping component. The GIS laboratory provides the required hardware and expertise in GIS analysis and serves as a data archive for GIS generated databases. WERI also works closely with various Government of Guam and Federal Agencies in sharing GIS data that become available.

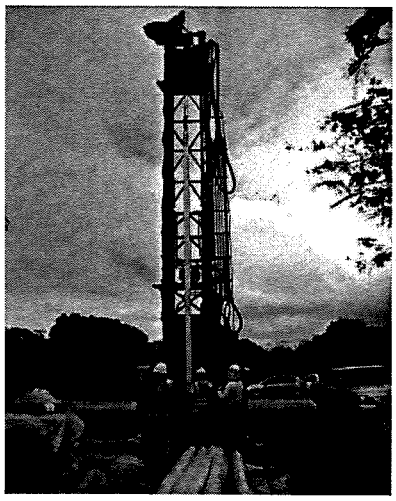


Graduate students in WERI CA-GIS Laboratory

GHS provides limited stipends for research by graduate students working on their MS degree in Environmental Science and partial summer salaries to WERI faculty advising those students. It also pays for undergraduate field and lab assistants working on water resources projects on Guam, and the salary of one full-time Staff Hydrologist charged with operating WERI's complex and sophisticated database analysis and GIS facility.

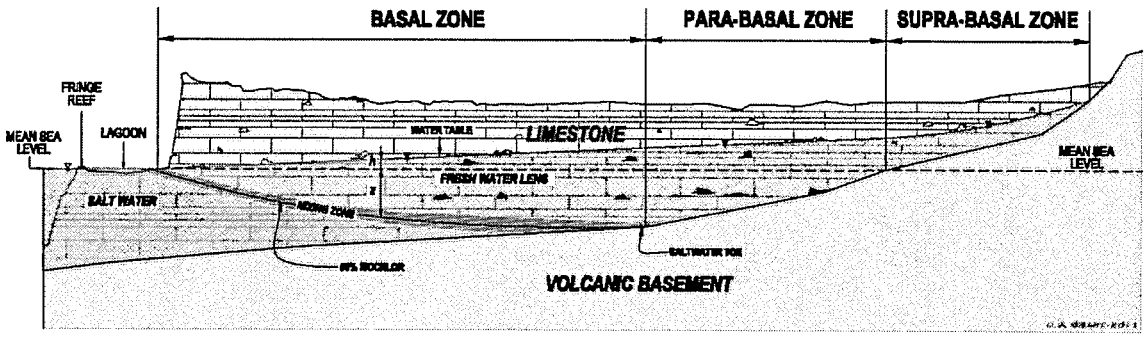
GHS Sponsored Research Projects Completed in FY'15:

1. ***Basement Map of the Northern Guam Lens Aquifer***
   By far the single most important tool for successfully locating new wells that will deliver abundant high quality water from the Northern Guam Lens Aquifer is an accurate and precise map of the volcanic basement rock that forms the floor of the aquifer. The volcanic rock beneath the water-bearing limestone partitions the aquifer into semi-contiguous subterranean catchments, or *basins*. On the slopes of the basement rock standing above sea level, where the base of the aquifer thus lies above sea level, downward percolating fresh water becomes concentrated in basement valleys and at the base of the slopes, where it enters the lip of the fresh water lens. The rim of fresh water thus concentrated along the boundary of the volcanic basement and the water-table near sea level is underlain by volcanic rock rather than sea water. This *para-basal* water is thus fresher, thicker and much less vulnerable to salt-water contamination than the *basal* water downstream, which floats on the underlying sea water and becomes progressively thinner and saltier until it discharges at coastal springs and seeps. Water flowing down the flank of the



Sinking new NGLA wells

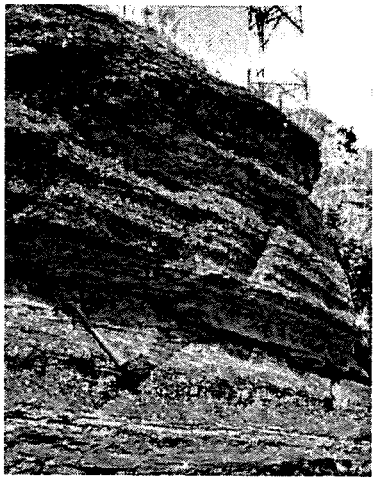
volcanic slopes above sea level, designated *supra-basal* water, is the freshest of the water in the aquifer and is completely invulnerable to contamination by sea water.



Volcanic basement beneath limestone aquifer defines three groundwater zones: 1) the basal zone, where the fresh water lens is underlain by sea water, 2) the para-basal zone, where the fresh water is underlain by the volcanic rock, and 3) the supra-basal zone, where the fresh water moving down-slope toward the para-basal zone is lies above sea level.

The first detailed map of the basement topography was produced as part of the 1982 Northern Guam Lens Study. Beginning in 1998, with the establishment of the Guam Hydrologic Survey by the 24th Legislature, WERI began updating and revising the 1982 map based on new data and insights acquired by exploratory drilling, the emplacement of new monitoring wells, and other data obtained incidental to ongoing local aquifer development and military installation environmental remediation projects.

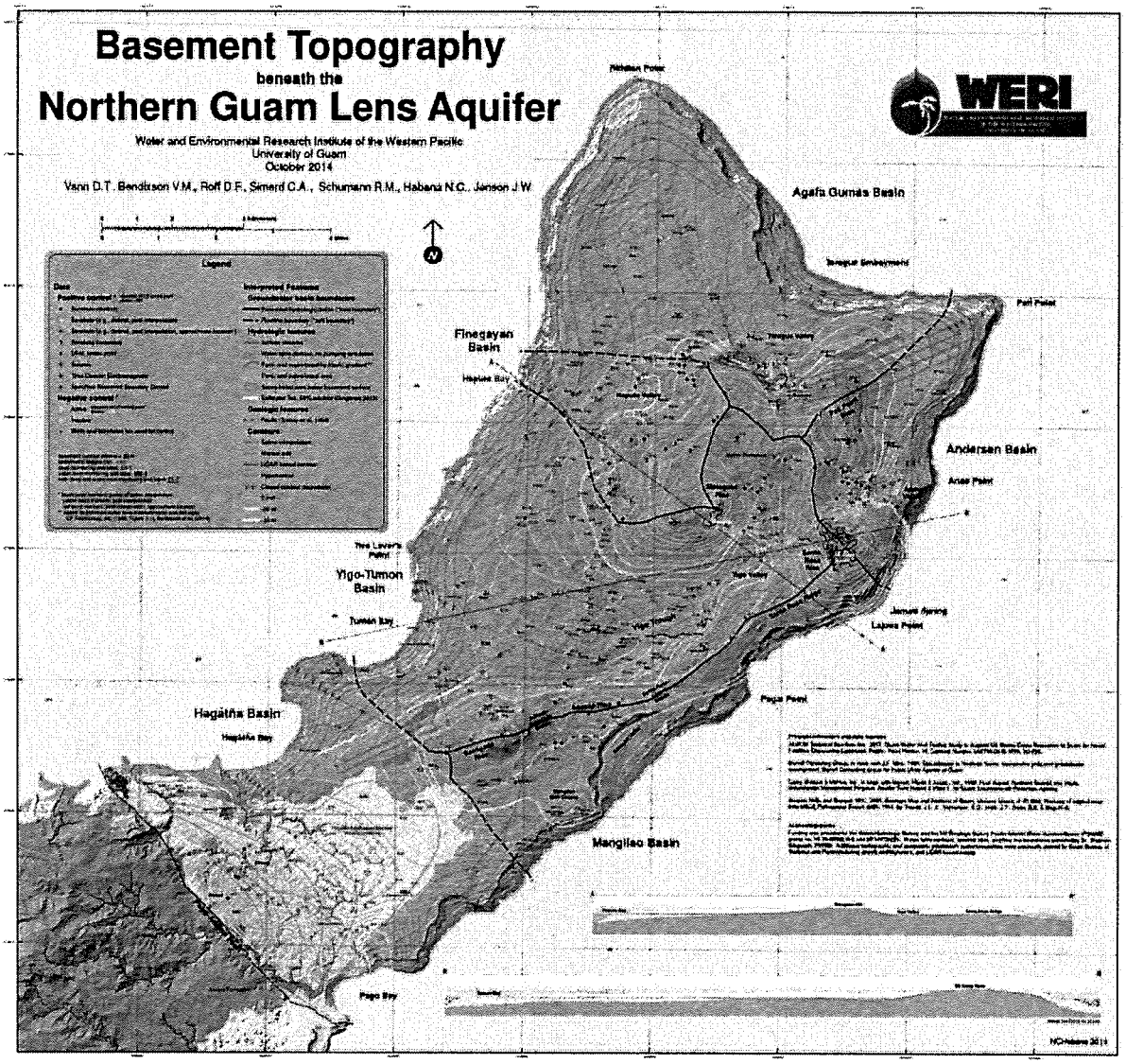
Most recently, the exploratory drilling program undertaken by the US Navy in 2010 in support of the anticipated military build-up provided additional new control on the elevation of the basement in crucial locations. Moreover, the new Guam Groundwater Availability Study led by the USGS Pacific Islands Water Science Center, in collaboration with WERI, has provided additional funding to update the database that supports the map. An accurate map of the basement topography is an essential prerequisite for building accurate and reliable groundwater models, which is one of the goals of the groundwater availability study.



Outcrop of weathered basalt on the summit of Mt Alutom, which gives its name to the entire unit of basement rock beneath the limestone plateau of northern Guam.

WERI published the latest revision of the basement map in early 2014 along with Technical Report #142, *Topography of the Basement Rock beneath the Northern Guam Lens Aquifer and Its Implications for Groundwater Exploration and Development*. The report describes the supporting data and database, explains how the data were interpreted in developing the latest revision of map, and highlights its strengths and limitations. The new map is the first of a set of maps, which will show the basement topography in relation to aquifer geology, surface topography, and the locations of

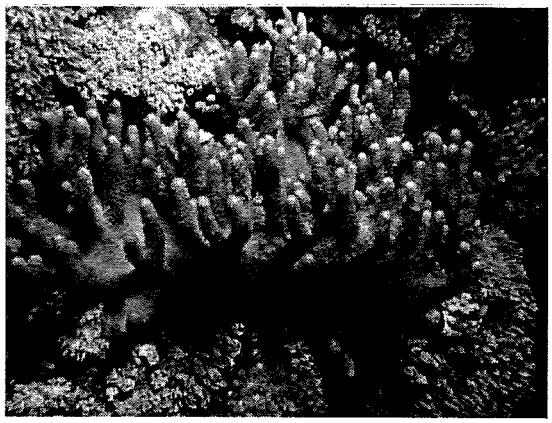
drinking water production wells and aquifer observation and monitoring wells. These maps will be available to other geologists and engineers in the public and private sectors, for which they will enhance the success and thereby reduce the cost of ongoing aquifer development. They will also be essential tools to environmental scientists, regulators, and policy-makers seeking to develop appropriate regulations for aquifer protection and sustainable management.



Revised contour map of the volcanic basement underlying the limestone plateau in northern Guam.

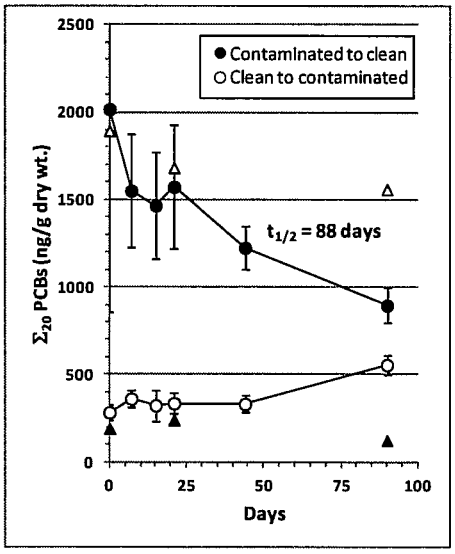
2. ***PCB Biomonitoring Strategy Development for Guam's Coastal Waters, Part II***
PCBs are a ubiquitous group of contaminants that were once widely used in industry. Considered by USEPA to be probable carcinogens, they accumulate within food chains, and are recognized endocrine disruptors. PCBs from land-based sources are transported into coastal waters via polluted rivers and streams, contaminated groundwater, urban runoff, seepage from landfills and wastewater discharges. Contaminated coastal sites on Guam exist

at Apra Harbor, Orote Point and Cocos Island. The PCB status of other nearshore waters around the island is largely unknown. Previously we examined the brown seaweed, *Padina boryana,* as a biomonitor for PCBs in Guam's coastal waters. Culturing techniques were explored and a simple, convenient and cost-effective way of transplanting the seaweed into coastal areas where it does not normally occur was developed (see FY 2013 Status Report). The work outlined here extends the scope of this research and examines the biomonitoring potential of another common and widespread resident of Guam's nearshore waters, namely the soft coral, *Sinularia polydactyla.*



***Sinularia polydactyla* soft coral colony**

Earlier WERI studies showed *S. polydactyla* accumulate PCBs to levels several orders of magnitude above ambient. However, the influence of intrinsic and extrinsic variables upon the organism's ability to do this was unknown. Within- and between-colony variations in PCB levels were thus examined in field representatives to determine the most appropriate part of coral colonies for retrieving multiple samples over multiple years. The variable effects of growth, age, sex, season and position in the water column were also examined. All uptake and depuration kinetic studies made use of wild populations of *S. polydactyla* translocated and relocated between relatively clean and contaminated coastal environments of Guam. Specimens were thus exposed to PCBs in their natural setting.



PCB uptake& loss in *S. polydactyla* transplanted between clean and contaminated waters

Spawning was found to impact PCB concentrations. Due to rapid physiological changes, within-colony differences were significant. Increases in lipid content in reproductively active portions of the colony were not matched by increases in PCBs. During spawning, the new lipids were offloaded while PCBs were not. Post-spawn, within-colony differences abated. Gender and water column position were not significant factors. Most importantly, there was little variation among colonies. Analysis by lipid weight eliminated differences between age/size groups. Overall, the comparison studies revealed that *S. polydactyla* is well suited for biomonitoring outside of the spawning season.

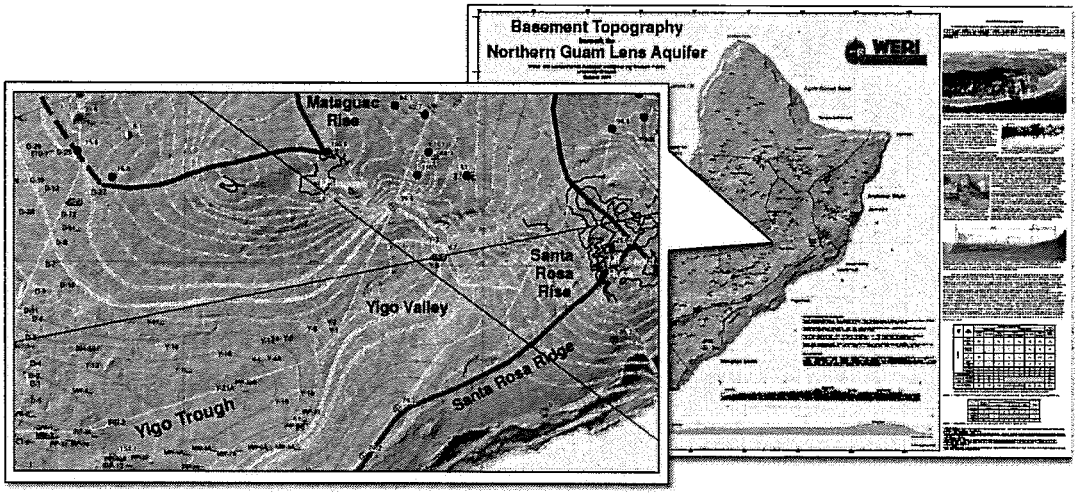
3. ***Development of a Hydrologic Map Series for the Northern Guam Lens Aquifer***

The Northern Guam Lens Aquifer is Guam's primary source of water, and if managed properly will continue to supply the island's daily water needs for generations to come. It is

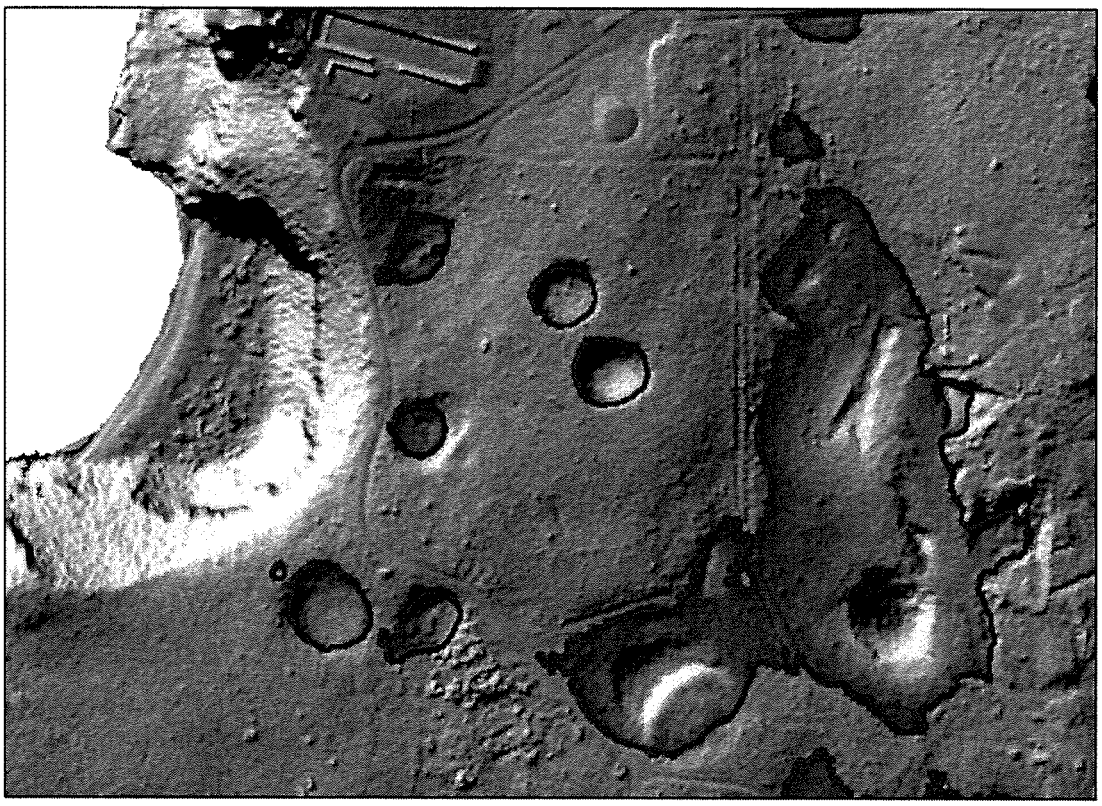
also a very complex hydrogeologic system. No simple technique or approach can characterize this aquifer. Rather, a multi-layer analysis is required to describe, model, and manage the groundwater system. The development of a series of hydrogeologic maps that captures each of the components—while also providing a means for showing their inter-relationships—is of basic and utmost importance for successful exploration, development, and management of the aquifer.

The creation of an up-to-date map of the basement topography (also described in the section, The Northern Guam Lens Aquifer Database) has provided the first step toward an integrated, multi-layered hydrologic map. The new map includes not only updates of the boundaries of the aquifer's six groundwater basins, but also provides for more accurate and detailed demarcation within each basin of its three groundwater zones: basal, para-basal, and supra-basal. This year's update incorporates new insights gained from the 2010 Exploratory Drilling Program funded by *Naval Facilities Engineering Command Pacific* (AECOM Technical Services Inc., 2011), and the 2013 *Guam Groundwater Availability Study* (Gingerich, 2013; Gingerich and Jenson, 2010).

The new map specifically shows no-pumping simulation from the modeling study to estimate the water-table, hydraulic gradients, flow lines, and basin boundaries. The modeled lens geometry shows the estimated location of boundaries of the para-basal zone. Drill-logs and contours of supra-basal waters (ICF Technology, 1995) were also incorporated in the map. Occurrence of surface streams over the Hagåtña Basin and adjacent terrain were also included. Semi-transparent surface hill-shading provide a surface elevation perspective of the limestone plateau. Other hydrologic features that will be added to the current map or included in complementary maps in the series, include hydraulic conductivities, geologic features, soils, porosities, pumping effects, groundwater locality of sustainable limit supply, land cover, and rainfall distribution.



The first complementary map, which will be published during the coming year, is a map of the sinkholes on the aquifer surface, which constitute its drainage system. Spatial analysis of LiDAR-based digital elevation model allows a precise determination of closed contour depressions on the limestone plateau.



Mapping these depressions and their relationships to other hydrologic and geologic features will be a major contribution to determining the distribution of recharge between fast vertical conduit flow channels and slow percolation through the bedrock. This is important to the refinement for accurately modeling aquifer recharge and potential contaminant entry and flow paths.

AECOM Technical Services Inc., 2011, Guam Water Well Testing Study to Support US Marine Corps Relocation to Guam: Naval Facilities Engineering Command, Pacific.

Gingerich, S. B., 2013, The effects of withdrawals and drought on groundwater availability in the Northern Guam Lens Aquifer, Guam: U.S. Geological Survey Scientific Investigations Report v. 2013–5216, p. 76.

Gingerich, S. B., and Jenson, J. W., 2010, Groundwater availability study for Guam; goals, approach, products, and schedule of activities: U.S. Geological Survey Fact Sheet 2010–3084, p. 4.

ICF Technology, I., 1995, Final Report: Groundwater dye trace program and well cluster proposal for the landfill area, Andersen Air Force Base, Guam: Archived at University of Guam Library, Mangilao, Guam, USAF-672-B.

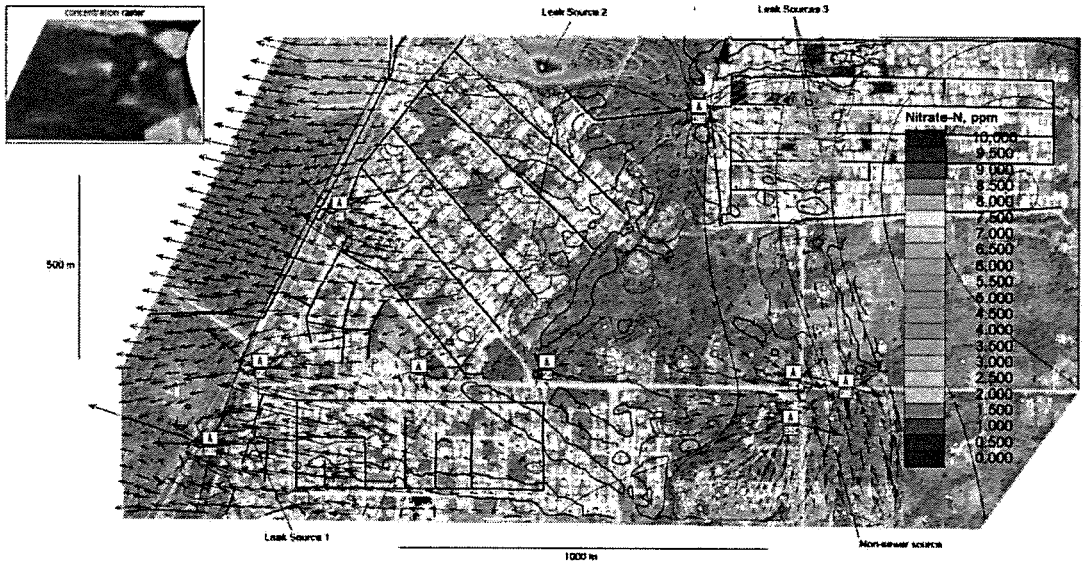
4. ***VADOCHARGE-N: a Vadose Flow and Nitrogen Transport Model for the Northern Guam Lens Aquifer***

VADOCHARGE-N is an innovative groundwater model that simulates meteoric recharge and nitrogen fate during vadose transport in the Northern Guam Lens Aquifer (NGLA). The purpose of this study is to develop a tool to evaluate and predict nitrogen contamination of the island's limestone aquifer from septic effluent and sewer line discharge. This modeling effort

contributes to environmental engineering, science, and management of water source quality by providing a novel way to elucidate the impact of domestic sewage discharge in a complex karst aquifer system.

Development over the NGLA is a sewage contaminant ion vulnerability concern. The source of nitrogen tested in production wells may be anthropogenic. Although the deep vadose zone may provide adequate filtering of fecal coliform, sewage nitrogen species percolating with the wastewater discharge is converted by nitrification to nitrate, which is transported to the water table.

VADOCHARGE-N applies the antecedent model VADOCHARGE (Habana et al. 2013) to



Nitrate-N transport from sewer leak scenarios and non-sewer resident sources, Machanao-Finegayan domain.

describe the flow of meteoric and wastewaters, using a vertical cell series routing algorithm based on USACE SSARR, method of cascading weirs. In each cell-phase, nitrogen constituents undergo conditional chemical kinetic transformations to simulate the nitrogen cycle transformations as it percolates. The model output is organic-N, ammonia-N, nitrate-N, and wastewater volume in specified source routers, and meteoric recharge to every node-cell of a phreatic model mesh. This output was coupled to USGS' SutraGUI in Argus ONE, a finite element flow and transport model, to simulate the phreatic transport of nitrate-N. Considering that the nitrate-N in production wells are truly of an anthropogenic source, the concentrations of nitrate-N that arrive at the water table via deep vadose transport, required about 12-20 ppm in 1-2 m^3 of wastewater, daily, to reach the production wells at the observed concentrations.

VADOCHARGE-N's innovativeness provides five significant contributions to Guam's water and environmental research. First, it couples vadose and phreatic solute transport models, VADOCHARGE-N and SutraGUI (USGS). It may be coupled to other phreatic flow models as well. It incorporates a fast and slow meteoric transfer through karst using a modified

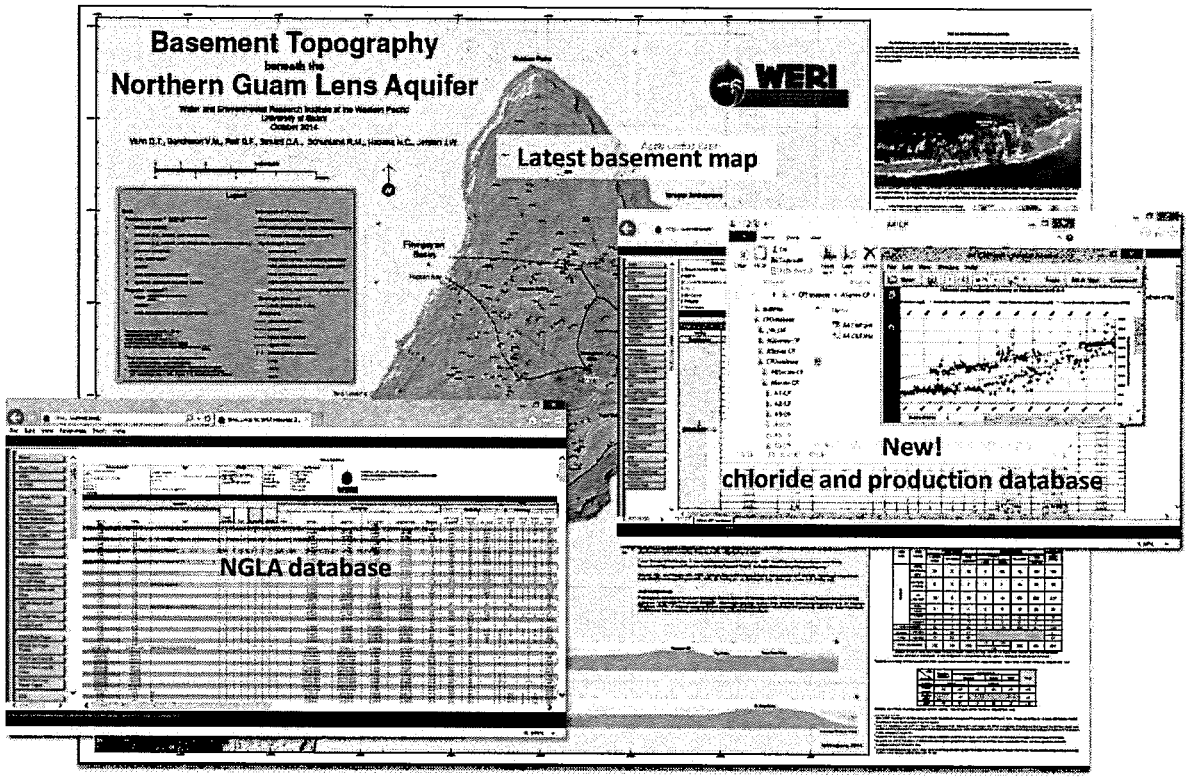
cascading weir algorithm. This unique innovation may be applicable to other similar karst aquifers. It incorporates nitrogen transport and transformation during deep vadose percolation, which is a new contribution to a poorly understood process. It extends Guam's groundwater flow models into N-transport, which is the first of its kind for this type of aquifer. Finally, this constitutes a new tool to help local civil developments above the water source, in an effort to maintain both quantity and quality.

Habana, N.C., L.F. Heitz, A.E. Olsen and J.W. Jenson (2013). VADOCHARGE: Groundwater Recharge Model for an Uplifted Island Karst Aquifer, Guam, USA, International Journal of Environmental Engineering and Science and Technology Research Volume 1(8), 141-164.

Habana, N. C., Salvacion, J. L., Jenson, J. W. and J. D. Rouse (2013) VADOCHARGE-N: a Vadose Flow and N-Transport Simulation Model for the Northern Guam Lens Aquifer, International Journal of Environmental Engineering Science and Technology Research, Volume 1(11), 268-287.

GHS Sponsored Research Projects Ongoing in FY'15:
One of the priorities of the PL24-247 is maintenance and routine update of the Guam Hydrological Database and routine trend analyses of the data. In response, is the ongoing project pertaining to the management and data analyses of the Northern Guam Aquifer Database. The significance and current status of this study is outlined below.

1. ***The Northern Guam Lens Aquifer Database***
   The *Northern Guam Lens Aquifer* (NGLA) *Database*, WERI Technical Report 141, is the first of a set of three related technical reports that provide basic information essential for successful development and management of the NGLA. In preparing the database over 4,000 pages of documents were scanned and organized into individual electronic folders for each of the 525 wells documented so far. These include 20 exploratory wells, 115 observation/monitoring wells, 212 drinking water wells, 39 agricultural/industrial wells, and 104 stormwater management wells. Each well folder is electronically linked to its corresponding record in a Microsoft Excel® spreadsheet and webpage, which contains key engineering and hydrogeological data. To organize, classify, and relate the enormous amount of disparate data required development of a classification system for the data. The technical report is thus designed as a user's manual for the database, providing a detailed description of the indexing system, along with definitions and conventions adopted or devised; data complexities, nuances, limitations; and assumptions and choices made in interpreting and classifying data.



NGLA Trilogy

The database is also the primary data source for WERI's topographic map of the basement rock beneath the aquifer, which is described in the second report in the series, Technical Report 142, *Topography of the Basement Rock beneath the Northern Guam Lens Aquifer and Its Implications for Groundwater Exploration and Development.* Creation of the map employed the latest data screening and spatial analysis techniques to evaluate 697 records, from which 173 control points were applied to the map. The new map updates the boundaries of the aquifer's six groundwater basins and provides for more accurate demarcation within each basin of its *basal zone,* where freshwater is underlain by saltwater, *para-basal zone*, where freshwater is underlain by basement rock below sea level, and *supra-basal zone*, where conduits and discontinuous patches of freshwater are underlain by basement rock above sea level. The new map also incorporates new insights regarding groundwater occurrence gained from the broad-ranging 2010 Exploratory Drilling Program funded by *Naval Facilities Engineering Command Pacific*. The report concludes with recommendations regarding groundwater exploration, aquifer development, and maintenance and improvement of the basement map

The third in the series, Technical Report 143, *Analysis of Salinity in the Northern Guam Lens Aquifer*, examined records from 118 production wells operated by Guam Waterworks Authority (GWA); 25 production wells owned and operated by the Naval Facilities Engineering Command Marianas (NAVFACMAR); 11 freshwater production wells under private ownership; 9 test borings and 2 monitoring wells recently installed in 2010 by NAVFACMAR; and 12 monitoring wells maintained and serviced by the University of Guam's Water & Environmental Research Institute of the Western Pacific (WERI) in collaboration with the U.S. Geological Survey (USGS). The study builds on the 2003 study by McDonald and Jenson, Technical Report 98, *Chloride History and Trends of Water Production Wells in the Northern Guam Lens Aquifer*, covering the 12 years from 1999 through 2010, and including records from Air Force and private freshwater production wells. It thus comprises the most comprehensive historical evaluation to date of the occurrence and factors contributing to changes in groundwater salinity in the Northern Guam Lens Aquifer. Spatial patterns and temporal trends observed in production and monitoring wells are compared with records of rainfall, sea level, and the Southern Oscillation Index, as well historical pumping rates.

The National Institutes for Water Resources (NIWR) honored the project in a 2013 with its annual National Impact Award, as the outstanding NIWR project of the year contributing to effective management of the nation's water supply. The data collected for it are now incorporated into the NGLA database. All three of these products (database, basement map, and salinity study) are available online to authorized users. This works supports and complements the groundwater model study led by USGS in collaboration with WERI. The set of reports provides information essential for successful exploration, development, and sustainable management of Guam's groundwater.

Simard, C. A., Jenson, J. W., and Lander, M. A., Analysis of Salinity in the Northern Guam Lens Aquifer, *in Proceedings Proceedings of the 16th Symposium on the Geology of the Bahamas and other Carbonate Regions*, Gerace Research Center, San Salvador Island, Bahamas, June 14-18, 2012 2015, in press.

SUMMARY OF FY'15 EXPENDITURES FOR GUAM HYDROLOGIC SURVEY APPROPRIATION

Below is a composite summary of all expenditures lodged against the GHS account during FY'15. As in past years, budgetary shortfalls arising out of austerity measures implemented by the Guam Legislature have so far been covered by carryover funds from GHS allotments received in previous years. As these reserves are limited they cannot be expected to sustain the program at its current high rate of activity for too much longer. This notwithstanding, we gratefully acknowledge the Guam Legislature for their continued interest in and support of the GHS program and all associated water resources related research, education and training activities carried out at WERI.

Guam Hydrologic Survey Expenditure Summary for FY'15

Category		*Expenditure*
1.	**Salaries and Wages:**	**$73,458.56**
2.	**Fringe Benefits:**	**$22,929.06**
3.	**Transportation Mileage:**	**$127.12**
4.	**Supplies/Materials:**	**$10,524.79**
5.	**Computer Hardware/Software:**	**$4,205.00**
6.	**Office Furniture/Equipment:**	**$34,671.20**
7.	**Projects/Consultant Fees:**	**$18,041.00**
8.	**Postage/Long Distance Phone:**	**$2,121.46**
9.	**Printing:**	**$1,474.00**
10.	**Administrative Fees*:**	**$18,269.40**
Total FY'15 Expenditures:		**$185,821.59**
Total FY'15 GHS Allotment Rec'd as of 11/15:		**$182,694.00**
Balance:		**-$3,127.59**
Total Approved GHS Budget Allotment for FY'15:		**$182,694.00**

GHS Comprehensive Monitoring Expenditure Summary for FY'15

Category	*Expenditure*
1. Projects/Consultant Fees:	**$154,580.00**
2. Administrative Fees*:	**$15,562.60**
Total FY'15 Expenditures:	**$170,142.60**
Total FY'15 GHS-CM Allotment Rec'd:	**$155,626.00**
Balance:	**-$14,516.60**

Total Approved GS-CM Budget Allotment for FY'15: $155,626.00

* University of Guam cost sharing administrative fee of 10% levied against all special appropriations received from the Guam Legislature.

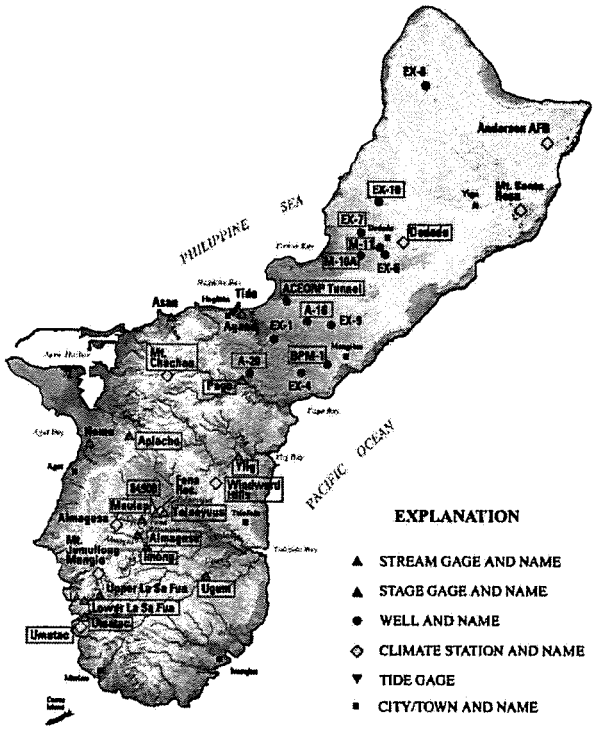
COMPREHENSIVE WATER MONITORING PROGRAM (CWMP)

The United States Geological Survey (USGS) has monitored our island's water resources since 1951. Unfortunately, during the 1990s they were forced to downsize this program because matching support from the Government of Guam was discontinued. This resulted in the abandonment of all deep monitoring wells needed to monitor saltwater intrusion in the north, and most of the stream gages in the south by the mid-1990s. In 1995, the USGS closed its field office at Naval Station, but continued to run a limited monitoring program (out of its Saipan and Honolulu offices).

In August, 1998 the CWMP was made a permanent part of WERI's program when Governor Gutierrez signed PL 24-247. This resulted in the refurbishment of the deep monitoring wells and a renewed program of water resource monitoring on Guam. The intent of PL 24-161 was to restore, and then to expand, as needed, the discontinued monitoring program in order to help Guam manage and safeguard all of its freshwater resources, now and in the future. Under PL 24-161, WERI/UOG and the USGS entered into a memorandum of understanding to administer and fund this program on a 50/50 cost-sharing basis. The CWMP is a permanent investment in Guam's future.

A well-designed long-term CWMP can save communities millions of dollars, and even human lives, by providing critical information for water-supply, culvert and bridge design, delineating flood-hazard areas, and tracking effects of climate change. The USGS started a water-resource monitoring program in Guam in 1951 with installation of stream gages at Pago, Lonfit, and Tolaeyuus and a rain gage near Fena dam. At the same time, measurements of discharge from Almagosa Springs and water levels in Fena Reservoir started. Since 1951 about 22 continuous streamflow, 8 rain, and 16 groundwater monitoring stations have been operated, providing reliable information on the water resources and hydrologic hazards of Guam.

Currently, USGS monitoring on Guam consists of 6 continuous-recording streamflow gages, 8 continuous-recording groundwater wells, 7 groundwater wells where the thickness of the freshwater lens is measured, and 8 continuous-recording rain gages. From a broad perspective, the program provides long-term information on the hydrologic cycle of Guam so that its water resources can be understood and sustainably managed. The bulk of the monitoring stations on Guam are funded as part of a Joint Funding Agreement between the USGS and WERI.

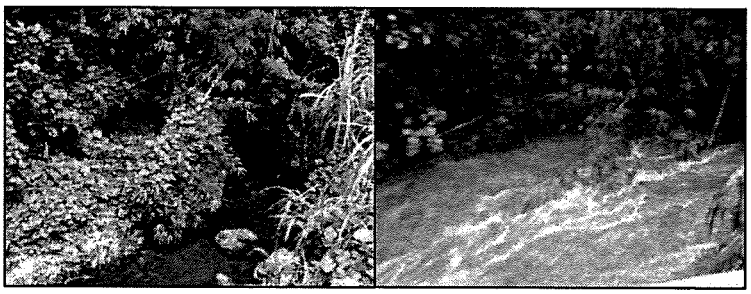


Locations of USGS monitoring stations on Guam

Stream Gages for Water Availability and Flood Planning in Southern Guam

Most freshwater used in southern Guam comes either from streamflow or wells that withdraw water from near the banks of streams. Data from USGS stream gages provide information needed by managers and engineers to properly manage the long-term sustainability of these water resources. Statistical analysis of long-term streamflow data are needed so the effects of abnormally wet or dry years can be understood and planned for. For example, USGS gages provide information that can be used to assess and manage the sustainability of surface water from the GWA Ugum Treatment Plant. Other gages, funded in cooperation with the U.S. Navy, are used to manage withdrawals from Fena Reservoir.

Long-term streamflow information is needed for flood planning. This information is used to delineate flood zones, estimate the magnitude of floods and frequency with which they could be expected to occur, and design



Geus River during low flow versus high flow conditions.

bridges and culverts. For example, information from 11 stream gages and 3 other sites was used to assess the flood peak magnitude and recurrence interval following Typhoon Chata'an in 2002. FEMA uses information from USGS stream gages to determine the level of financial aid from FEMA after storms. Currently, the WERI-USGS CWMP funds the operation of 3 stream gages at key locations in southern Guam.

Well Monitoring of the Northern Guam Lens Aquifer

A WERI research assistant and USGS hydrogeologist collecting data from a groundwater monitoring well in northern Guam.

Monitoring wells operated as part of the USGS-WERI CWMP provide information to assess the health and sustainability of the Northern Guam Lens Aquifer. This aquifer is the most important source of freshwater on the island. Currently, the program includes 8 wells where water level is continuously measured and 7 wells where the thickness of the freshwater lens is measured biannually. Collectively, this information allows scientists at WERI, GEPA, GWA, and USGS to understand the flow of water through the aquifer and refine sustainability estimates of this resource. This information is used to understand how current levels of pumpage are affecting the aquifer and how future changes in climate and groundwater production may affect the sustainability of groundwater resources. Coupled with detailed geologic mapping and modern hydrologic tools such as groundwater flow models, information from this long-term program will be invaluable as additional water is needed to support increasing economic development on Guam.

Rainfall Data to Estimate Water Supply Recharge and Flood-Water Distribution

The USGS currently operates 8 rain gages on Guam, 6 of which are funded by the WERI-USGS CWMP. Rainfall data are fundamental to understanding the water supply and threats from flooding. Information from these gages is used to evaluate the extent of drought during El Nino events and the severity of flooding during typhoons. Information from rain gages is also essential in determining how much freshwater infiltrates past the ground surface to reach the water table. This water, known as recharge, is the source of freshwater in the Northern Guam Lens Aquifer and only by measuring rainfall can its abundance be accurately estimated.

What does it cost to operate a stream flow and other gages?

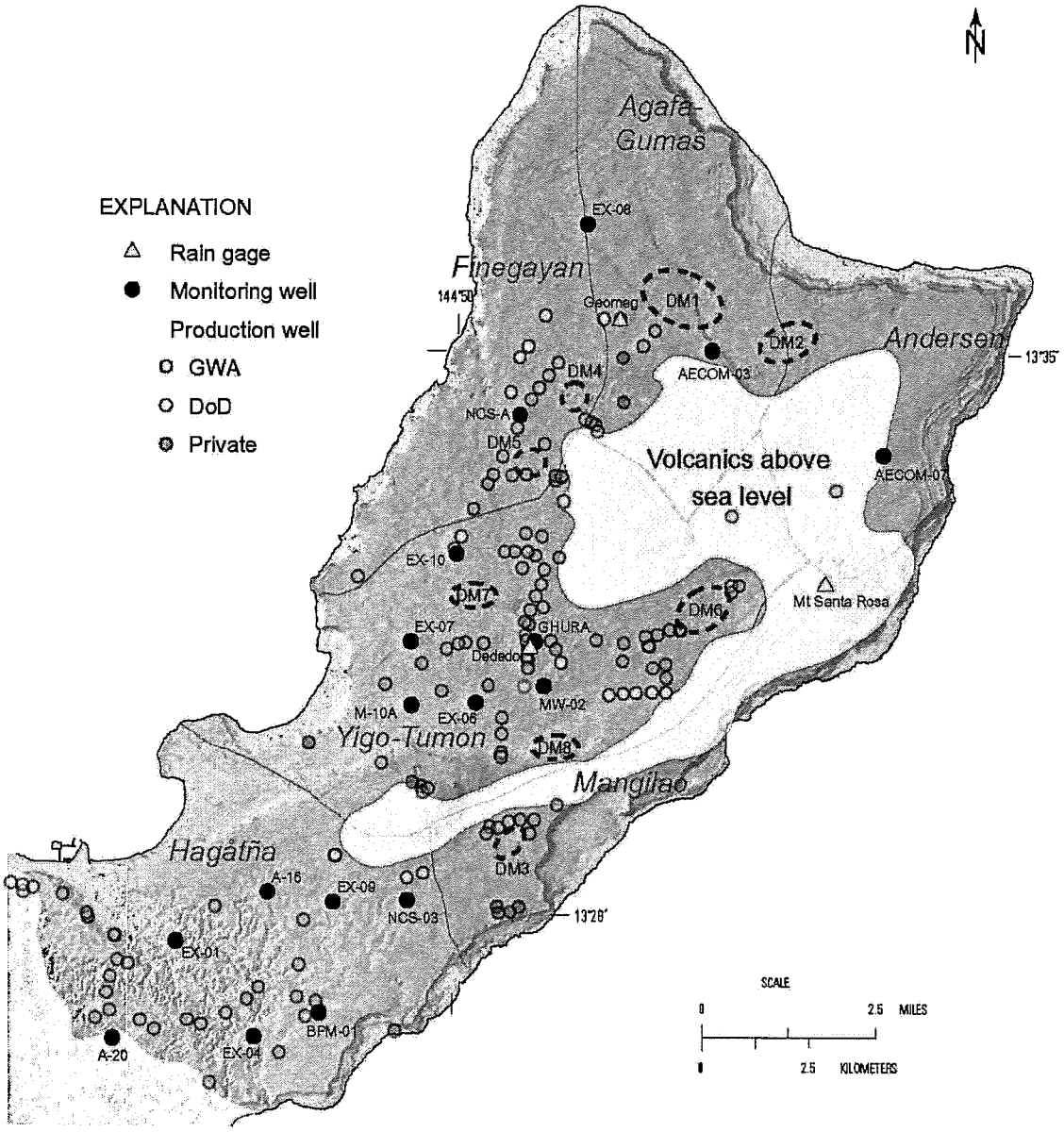
In fiscal year 2015, the cost to operate a continuous-record streamflow gage will be $21,683. This includes all operation and maintenance, site visits, field data collection, data analysis, and computation of the flow record. Gage operations are frequently reviewed and upgraded as improvements become available. Other gages, such as rainfall ($10,413) and groundwater ($6,919), require less funding. With over 100 years of experience, USGS procedures ensure that data are reliably collected, analyzed, and publicly available

How can one get USGS water resource information?

Most data from USGS gages are readily available on the internet. As part of CWMP between WERI and the USGS, historic data and other hydrologic information for Guam are consolidated and made publicly available at: http://hi.water.usgs.gov.

New deep monitor wells and expanded monitoring for the Northern Guam Lens Aquifer

Accurate and detailed data on aquifer hydrology and geology is the foundation for sustainable management of groundwater resources; especially on the island of Guam where fresh groundwater is limited and vulnerable to saltwater intrusion. Given the anticipated expansion of groundwater production from the Northern Guam Lens Aquifer during the coming decades, expansion of the existing hydrologic data collection network needs to begin in FY 2013. Baseline data are critically needed in areas targeted for development. These data will enable managers to evaluate and consider seasonal and long-term changes in rainfall, groundwater levels, and salinity in relation to sustainable groundwater production from the Northern Guam Lens Aquifer. The successful application of modern management tools, especially numerical groundwater models such as the one currently under development in cooperation with the U.S. Marine Corps, is crucially dependent on reliable aquifer-wide data on the responses of the freshwater lens to changes in the amounts and distribution of recharge and production. Proposed intensive development creates a need for additional data that the existing network cannot provide. Approximate locations where eight new deep monitor wells are needed are identified on the map below. The precise location of each new well will be constrained by landowner access, land use, and local hydrogeological factors. The cost of design and construction for each new deep monitor well is estimated to be $100,000. The prioritization and cost share agreement for well installation and monitoring will require inter-agency cooperation as defined in the Memorandum of Understanding between the Guam Waterworks Authority and the U.S. Navy dated July 16, 2011.



Location of monitoring and production wells and rain gages in the Northern Guam Lens Aquifer

WERI RESEARCH PUBLICATIONS ARISING FROM GHS & USGS SPONSORED PROGRAMS

2015

Denton, G.R.W. C.A. Emborski, R. Masga, J.A. Starmer. 2015. Impact of WWII Dumpsites on Saipan (CNMI): Heavy Metal Status of Soils and Sediments. *Journal of Waste Management and Research*, (in review).

Khosrowpanah, S., Lander, M. A., Rouse, J.D., and Whitman, W.M.C. 2015. "Assessment of Turbidity in the Geus River Watershed in Southern Guam." *WERI Technical Report No. 156*, June 2015.

McCutcheon, A. L., Raymundo, L. J., Jenson, J. W., Prouty, N. G., Lander, M. A., and Randall, R. H., 2015, Testing the Strontium/Calcium Proxy for Sea Surface Temperature Reconstruction in the Coral *Porites lutea*, in Guam, Micronesia: University of Guam Marine Laboratory, Water & Environmental Research Institute of the Western Pacific. *UOGML Technical Reoport 152*, *WERI Technical Report 159*.

Rouse, J.D. "Development of Environmentally Sustainable Methods for Treatment of Domestic Wastewater and Handling of Sewage Sludge on Yap Island." *WERI Technical Report No. 153*, February 2015.

Simard, C. A., Jenson, J. W., and Lander, M. A., Analysis of Salinity in the Northern Guam Lens Aquifer, *in Proceedings Proceedings of the 16th Symposium on the Geology of the Bahamas and other Carbonate Regions*, Gerace Research Center, San Salvador Island, Bahamas, June 14-18, 2012 2015, in press.

Sfaelou, S.; Papadimitriou, C.A.; Manariotis, I.D.; Rouse, J.D.; Vakros, J.; Karapanagioti, H.K. "Treatment of Low-strength Municipal Wastewater Containing Phenanthrene Using Activated Sludge and Biofilm Process." *Desalination and Water Treatment*. 2015, pp. 1-11.

Wallace, C. D., Bailey, R. T., and Jenson, J. W., 2015, Atoll Island Freshwater Resources: Modeling, Analysis, and Optimization: *WERI Technical Report #155*, p. 147 p.

Wen, Y. and Chambers, D. (2015). Land Cover Change in Saipan, CNMI from 1978 to 2009, *International Journal of Research In Earth and Environmental Sciences (IJREES)*, Volume 3: Issue 4, pp 6.

2014

Morrison,R.J. , G.R.W. Denton, U. Bale Tamata and J. Grignon (2014). Anthropogenic Biogeochemical Impacts on Coral Reefs in the Pacific Islands - An Overview. Deep-Sea Research II, 6: 5-12

Denton, G.R.W. and C.M. Denton (2014). Regulatory Framework and Monitoring Strategies

Adopted by GWA for the Sustainable Production of Safe Drinking Water from the Northern Guam Lens Aquifer. *Regional Islands Sustainability Conference,* Hyatt Regency, Tumon, Guam, April 15-16 2014.

Denton, G.R.W. and J.W. Jenson (2014). Wind, Weather Watersheds and Water Quality: WERI Regional Research. *Annual UOG Faculty Development Day*, Hyatt Regency, Tumon, Guam February 21, 2014.

Denton, G.R.W. and S. Namazi (2014). Indoor Radon Levels and Lung Cancer on Guam, *35th Annual Research Conference,* University of Guam, March 11, 2014.

Taboroši, D., Jenson, J. and Stafford, K.W. (2014). "Artefatos militares e uso de cavernas durante a Segunda Guerra Mundial nas Ilhas Marianas, Pacífico Oeste (World War II artifacts and wartime use of caves in the Mariana Islands, Western Pacific)." *Caderno de Geografia* **24**(42): 218-231.

Welch. P.M., Schupp, P. and G.R.W. Denton (2014). Utility of the Soft Coral, *Sinularia polydactyla* as a Biomonitor for Polychlorinated Biphenyls (PCBs) in Tropical Marine Waters. *WERI Technical Report, No.151.* 49 pp. plus appendices.

2013

Bendixson, V.M. (2013). "The Northern Guam Lens Aquifer Database." *WERI Technical Report No. 141*: 45.

Denton, G.R.W. (2013). Metal Deficiencies and Imbalances in Wetland Plants from a Manganese-Enriched Wetland in Southern Guam: A Possible Lytico-Bodig Connection? APASEEM General Meeting, November 20-21, 2013, American Memorial Park Auditorium, Saipan.

Mccutcheon, A., Raymundo, L., Prouty, N., Jenson, J., Lander, M. and Randall, R. (2014). Coral Growth Calibration of the Sr/Ca Proxy for SST Reconstruction in Guam. *17th Biennial Ocean Sciences Meeting.* Honolulu, Association for the Sciences of Limnology and Oceanography (ASLO), The Oceanography Society (TOS), and the American Geophysical Union (AGU).

Moore, M., Hardt, B., Banner, J. and Jenson, J. (2013). Program & Abstracts: Evaluation of speleothem oxygen isotope fractionation from a tropical cave on the island of Guam. *Fall Meeting, American Geophysical Union.* San Francisco: December 9-13, 2013.

Jenson, J.W., Taborôsi, D., Rotzoll, K., Mylroie, J.E., and Gingerich, S.B. (2013). Symposium Program and Abstracts: A hypothesis for carbonate island karst aquifer evolution from analysis of field observations in northern Guam, Mariana Islands. *International Symposium on Hierarchial Flow Systems*. Mádl-Szőnyi, J., Erőss, A., Mindszenenty, A. and Tóth, A.

Mccann, S., Mylroie, J.E., Jenson, J.W. and Lander, M.A. (2013). Meteorological Conditions

Affecting Speleothem Paleoclimate Record in a Tropical Cave, Guam, Mariana Islands. *National Speleological Society Convention.* Shippensburg University, PA.

Habana, N.C., Salvacion, J.L., Jenson, J.W., Rouse, J.D. "VADOCHARGE-N: a Vadose Flow and N-Transport Simulation Model for the Northern Guam Lens Aquifer." *International Journal of Environmental Engineering Science and Technology Research.* November 2013, Vol. 1, No. 11, 268-287; ISSN: 2326-3113.

GIS-based screening for cumulative and secondary impacts from development projects in northern Guam. WERI Technical Report No. 146, December 2013.

Schaible, B.C. and G.R.W. Denton (2013). Utility of the Brown Alga, *Padina boryana,* as a Biomonitor of Polychlorinated Biphenyls (PCBs) in Tropical Marine Waters: A Preliminary Assessment. *WERI Technical Report.* 34 pp.

Stafford, K.W., Taboroši, D. and Jenson, J.W. (2013). Caves and Karst Hydrology of the Mariana Islands. *Coastal Karst Landforms.* Lace, M.J. and Mylroie, J.E. Dordrecht, Springer. **5:** 277-298.

Taborosi, D., Jenson, J.W., and Mylroie, J.E., 2013, Field observations of coastal discharge from an uplifted carbonate island aquifer, northern Guam, Mariana Islands: A descriptive geomorphic and hydrogeologic perspective, Journal of Coastal Research, v. 29, no. 4, p. 926-943.

Bell, Tomoko, John W. Jenson, Mark A. Lander, Richard H. Randall, Judson W. Partin, Benjamin F. Hardt, and Jay L. Banner, 2011, Coral and Speleothem in situ Monitoring and Geochemical Analysis: Guam, Mariana Islands, USA, WERI Technical Report No. 136: Mangilao, Water & Environmental Research Institute of the Western Pacific, University of Guam, Mangilao, Guam, 70 p.

Habana, N.C., Salvacion, J.L., Jenson, J.W., and J.D. Rouse, in review. VADOCHARGE-N: a Vadose Flow and N-Transport Simulation Model for the Northern Guam Lens Aquifer. 2013 International Conference on Sustainable Environmental Technologies, Mapúa Institute of Technology, Intramuros, Manila, Philippines.

Schaible, B.C. and G.R.W. Denton (2013). Utility of the Brown Alga, *Padina boryana,* as a Biomonitor for Polychlorinated Biphenyls (PCBs) in Tropical Marine Waters: A Preliminary Assessment. *WERI Technical Report.* 34 pp.

Simard, C.A., Jenson, J.W., Lander, M.A., 2013, in review. Analysis of Salinity in the Northern Guam Lens Aquifer. In: Savarese, M., Glumac, B. (Eds.), 16th Symposium on the Geology of the Bahamas and Similar Regions, Gerace Research Center, San Salvador Island, Bahamas.

Sh. Khosrowpanah, 2013. "Watershed Management: Ugum and Piti-Asan Watersheds", Presented at 27th Pacific Islands Environment Conference, Guam, June 26-28, 2013.

2012

Jenson, J., Roff, D., Bendixson, V., Hylton, T., Simard, C. (2012). New Insights and Questions from Exploratory Drilling in the Northern Guam Lens Aquifer, *16th Symposium of the Geolgy of the Bahamas and other Carbonate Regions*, Gerace Research Center, San Salvador Island, Bahamas.

Luo, Q.C., Khosrowpanah, S. (2012). Continuing Calibration and Application of Luom in the Southern Guam Watersheds Not Covered in the Preceding Project, *Water and Environmental Research Institute (WERI) Technical Report*, No. 131, 68 pp.

Miklavič, B., Mylroie, J.E., Jenson, J.W., Randall, R.H., Banner, J.L., Partin, J.W. (2012). Evidence of the Sea-level Change Since MIS 5e on Guam, *Tropical West Pacific, NSF Workshop: Sea Level Changes Into MIS 5: From Observations to Predictions*, April 10-14, 2012, Palma de Mallorca, Mallorca, Spain.

Miklavič, B., Mylroie, J.E., Jenson, J.W., Randall, R.H., Zabukovec Logar, N., Taboroši, D. (2012). Denudation of Eogenetic Limestone During the Last Glacial Cycle in a Tropical Environment. *20th International Karstological School "Classical Karst", Karst forms and Processes*; 18th to 23rd June, 2012; Karst Research Institute, Postojna, Slovenia.

Partin, J.W., Jenson, J.W., Banner, J.L.,. Quinn, T.M.,. Taylor, F.W., Sinclair, D., Hardt, B. Lander, M.A., Bell, T., Miklavič, B.,. Jocson, J.M.U., and Taboroši, T. (2012). Relationship between Modern Rainfall Variability, Cave Dripwater and Stalagmite *Geochemistry in Guam, USA: Geochemisty, Geophysics, Geosystems,* 13 (3): 1-17.

Sinclair, D., Banner, J.L., Taylor, F.W., Partin, J.W., Jenson, J.W., Mylroie, J.E., Goddard, E., Quinn, T.M., Jocson, J.M.J., and Miklavič, B. (2012). Magnesium and Strontium Systematics in Tropical Speleothems from the Western Pacific: *Chemical Geology,* v 294-295: 1-17

Simard, C.A. (2012). Analysis of Salinity in the Northern Guam Lens Aquifer, MS Thesis, University of Guam, Mangilao, Guam, 84 pp.

Simard, C., Jenson, J.W., Lander, M.A. (2012). Salinity Trends in the Northern Guam Lens Aquifer, *16th Symposium of the Geolgy of the Bahamas and other Carbonate Regions,* Gerace Research Center, San Salvador Island, Bahamas.

2011

Bell, T., Endo, T., Jenson, J.W., Bell, R., and Lander, M.A. (2011). Pneumatic Underwater Drill for Extracting Coral Cores, *Water and Environmental Research Institute (WERI) Technical Report*, No. 135: 18 pp.

Bell, T., Jenson, J.W., Lander, M.A., Randall, R.H., Partin, J.W., Hardt, B.F., and Banner, J.L. (2011). Coral and Speleothem *in situ* Monitoring and Geochemical Analysis: Guam, Mariana Islands, USA, *Water and Environmental Research Institute (WERI) Technical Report*, No. 136: 70 pp.

Denton, G.R.W. and Sian-Denton, C.M. (2011). A Retrospective Analysis of Water Quality Data for Chemicals of Concern in Guam's Groundwater: Emerging Trends and Future Concerns, Abstract, 14-16 November, Water Resources Research Center, University of Hawaii at Manoa, National Institutes for Water Resources, Honolulu, HI.

Jenson, J.W., Lander, M.A., Randall, R.H. (2011). Vadose Flow in the Northern Guam Lens Aquifer, Water Resources Sustainability Issues on Tropical Islands, Abstract, 14-16 November, Water Resources Research Center, University of Hawaii at Manoa, National Institutes for Water Resources, Honolulu, HI.

Kottermair, M., Golabi, M., Khosrowpanah S. and Wen, Y. (2011). Spatio-temporal Dynamics of Badlands in Southern Guam: A Case Study of Selected Sites, *Water and Environmental Research Institute (WERI) Technical Report,* No. 133, 90pp.

Partin, J.W., Jenson, J.W., Banner, J.L., Quinn, T.M., Taylor, F.W., Sinclair, D., Lander, M.A., Bell, T., Miklavič, B., Jocson, J.M.U., Hardt, B., and Taboroši, D. (2011). Relationship between Rainfall Variability, Cave Dripwater and Stalagmite Geochemistry in Guam, USA: *Earth and Planetary Science Letters* (in press).

Sinclair, D., Banner, J.L., Taylor, F.W., Partin, J.W., Jenson, J.W., Mylroie, J.E., Goddard, E., Quinn, T.M., Jocson, J.M.U., and Miklavič, B. (2011). Magnesium and Strontium Systematics in Tropical Speleothems from the Western Pacific: *Chemical Geology* (in press)

Sinclair, D., Banner, J.L., Taylor, F.W., Partin, J.W., Jenson, J.W., Mylroie, J.E., Goddard, E., Quinn, T.M., and Jocson, J.M.U. (2011). Magnesium and Strontium Systematics in West Pacific Speleothems *Quatenary Science Reviews* (in press).

Wen, Y. (2011). Impacts of Human Activities on Groundwater Quality in Guam, Mariana Islands, *International Journal of Environmental, Cultural, Economic and Social Sustainability*, 7 (5): 243-256.

Wen, Y., Khosrowpanah, S., and Heitz, L. (2011). Land Cover Change of Watersheds in Southern Guam from 1973 to 2001, *Environmental Monitoring and Assessment,* 179 (1-4): 521–529 (DOI 10.1007/s10661-010-1760-5).

Wen, Y. (2011). Application of Multi-temporal and Multi-source Data for Land Cover Change Detection in Guam, USA, *Proceedings of the 19th International Conference on GeoInformatics*, June 24-26, 2011, Shanghai, China, published in IEEE Xplore in August, 2011 (DOI: 10.1109/GeoInformatics.2011.5981058, and Print ISBN:978-1-61284-849-5).

2010

Denton, G.R.W. and Sian-Denton C.M. Groundwater Monitoring on Guam (2010): Management Responses to Recent Water Quality Violations, *Journal of Groundwater Monitoring and Remediation* Spring 2010: 127-133.

Hoffman, S.M., J.W. Jenson, G.R.W. Denton, D.C. Moran and L.L. Vacher (2010). Background Fluorescence in Guam's Coastal Waters. *Proceedings American Water Resources Association (AWRA) 2010 International Specialty Conference & 8th Caribbean Islands Water Resources Congress on Tropical Hydrology and Sustainable Water Resources in a Changing Climate*, August 30 - September 1, 2010, San Juan, Puerto Rico. American Water Resources Association.

Khosrowpanah, S., Y. Wen, and M. Kottermair (2010). Spatial Distribution of Badlands in the Ugum Watershed: Characterization and Temporal Analysis. *Water and Environmental Research Institute (WERI) Technical Report*, No. 126: 29 pp

Luo, Q.C. and S. Khosrowpanah (2010). Developing the LUOM in Southern Guam Watersheds. *Proceedings of 4th International Workshop on Catchment-Scale Hydrological Modeling and Data Assimilation,* Lhasa, China, 21-23 July 2010.

Luo, Q.C., and S. Khosrowpanah (2010). Calibration and Application of LUOM in Southern Guam Watersheds With and Without Flow Data, *Water and Environmental Research Institute (WERI) Technical Report*, No. 128: 87.

Miklavič, B., Mylroie, J.E., Jenson, J.W., Randall, R.H., Banner, J.L., and Partin, J.W. (2010). Interglacial Limestone and its Geomorphic Features on Guam: Implications for Relative Sea Level Changend Flank Margin Cave Formation. **In**: Gamble, D.W., ed., 15th Symposium of the Geolgy of the Bahamas and other Carbonate Regions: Gerace Research Center, San Salvador Island, Bahamas (in press).

Wen, Y. (2011). Land Cover Change of Coastal Watersheds in Southern Guam from 1973 to 2001, *Environmental Monitoring and Assessment* (in press).

2009

Habana, N., L.F. Heitz, A.E. Olsen and J.W Jenson (2009). Vadose Flow Synthesis for the Northern Guam Lens Aquifer. *Water and Environmental Research Institute (WERI) Technical Report,* No. 127: 223 pp.

Luo, Q. C. and S. Khosrowpanah (2009). Developing the LUOM in southern Guam watersheds without flow data, *Proceedings of AWRA 2009 Annual Water Resources Conference*, Seattle, Washington, November 9-12, 2009.

Lander, M.A. and Jenson, J.W. The Post-1997 El Niño Sea-Level Highstand in Micronesia: A Bona Fide Climatic "Hockey Stick" (in prep).

Sinclair, D.J., Taylor, F.W., Banner, J.L., Jenson, J.W., Mylroie, J.E., Goddard, E. and Quinn, T.M. (2009). Speleothem Evidence for Global Changes in Atmospheric Circulation During the Early-Mid Holocene, *Quaternary Science Reviews*. (in review).

2008

Denton, G.R.W. and R.J. Morrison (2008). Impact of a Rudimentary Landfill on the Trace Metal Status of Pago Bay, Guam. *Marine Pollution Bulletin,* 58: 150-162

2007

Denton, G.R.W., M.C. Olsen and Y. Wen (2007). Solid Waste Disposal on Guam: Impact of an Unsanitary Landfill on the Heavy Metal Status of Adjacent Community Representatives. In: Wang, Y. et al. (Eds.). *Progress in Environmental Science and Technology,* vol 1. Science Press, Beijing, pp1169-1176.

Hoffman, S.M., J.W. Jenson, D. Moran, G.R.W Denton, H.R. Wood and L. Vacher (2007). A Qualitative Baseline Study of Background Fluorescence in Guam's Groundwater. *Water and Environmental Research Institute (WERI) Technical Report* 57 pp.

Khosrowpanah, S., L.F. Heitz, Y. Wen and M. Park (2007). Developing a GIS-Based Soil Erosion Potential Model of the Ugum Watershed. *Water and Environmental Research Institute (WERI) Technical Report* No. 117. 98 pp.

Wuerch, H.V., B.C. Cruz, A.E. Olsen (2007). Analysis of the Dynamic Responses of the Northern Guam Lens Aquifer to Sea Level Change and Recharge. *Water and Environmental Research Institute (WERI) Technical Report* No. 118, 47 pp.

2006

Denton, G.R.W., W.C. Kelly III, H.R. Wood and Y. Wen (2006). Impact of Metal Enriched leachate from Ordot Dump on the Heavy Metal Status of Biotic and Abiotic Components in Pago Bay. *Water and Environmental Research Institute (WERI) Technical Report* No. 113, 63 pp.

Taboroši, D., J.W. Jenson J.E. Mylroie (2006). Karst features of Guam, Mariana Island, *Micronesica,* 38: 17-46

2005

Khosrowpanah, S. and J. Jocson (2005). Environmental Assessment for Non-Point Sources of Pollution for Ugum Watershed. *Water and Environmental Research Institute (WERI) Technical Report* No. 109, 53 pp.

2004

Jenson, J.W., T.M. Keel, J.E. Mylroie, J.R. Mylroie, K.W. Stafford, D. Taboroši, and C. Wexel (2004). Karst of the Mariana Islands: The Interaction of Tectonics, Glacio-eustasy and Fresh-water/Sea-water mixing in Island Carbonates. GSA Special Paper 404. *Proceedings of the Geological Society of America,* pp. 129-138.

Taboroši, D., J.W. Jenson and J.E. Mylroie (2004), Karst features of Guam, Mariana Island, *Water and Environmental Research Institute (WERI) Technical Report* No. 104, 26 pp.

Taboroši, D., J.W. Jenson and J.E. Mylroie (2004). Karren Features in Island Karst: Guam, Mariana Islands, *Zeischrift fur Geomopholigie*, 48: 369-389.

Moran, D. C. and J.W. Jenson (2004). Dye Trace of Groundwater Flow from Guam International Airport and Harmon Sink to Agana Bay and Tumon Bay, Guam. *Water and Environmental Research Institute (WERI) Technical Report* No. 97, 32 pp.

2003

Gamble, D. W., D. Taboroši, J.E. Mylroie, J.W. Jenson, J.L. Carew, J.M.U. Jocson, J.R. Mylroie and D.T. Vann (2003) The Use of Water Temperature to Characterize Groundwater Discharge of a Coastal Fracture on Guam, U.S.A.: *Journal of Coastal Research,* 19: 462-471.

Quenga McDonald, M. and J.W. Jenson (2003). Chloride History and Trends of Water Production Wells in the Northern Guam Aquifer. *Water and Environmental Research Institute (WERI) Technical Report* No. 98, 64 pp.

Taboroši, D., J.W. Jenson and J.E. Mylroie (2003). Zones of Enhanced Dissolution and Associated Cave Morphology in an Uplifted Carbonate Island Karst Aquifer, Northern Guam, Mariana Islands: *Speleogenesis and Evolution of Karst Aquifers*, 1: (4), 16 pp.

2002

Jocson, J.M.U., J.W. Jenson and D.N. Contractor (2002). Recharge and Aquifer Response: Northern Guam Lens Aquifer, Guam, Mariana Islands. *Journal of Hydrology,* 260: 231-254.

Quenga McDonald, M. (2002). Nitrate-Nitrogen Concentrations in the Northern Guam Lens and Potential Nitrogen Sources. *Water and Environmental Research Institute (WERI) Technical Report* No. 95, 37 pp.

2001

Lander, M.A., J.W. Jenson and C. Beausoliel (2001). Responses of Well Water Levels on Northern Guam to Variations of Rainfall and Sea Level, *Water and Environmental Research Institute (WERI) Technical Report* No. 94, 36 pp.

Mylroie, J.E., J.W. Jenson, D. Taborosi, J.M.U. Jocson, D.T. Vann and C. Wexel (2001) Karst Features of Guam. *Journal of Cave and Karst Studies,* 63: 9-22.

1999

Contractor, D.N. and J.W. Jenson (1999). Simulated Effect of Vadose Infiltration on Water Levels in the Northern Guam Lens Aquifer. *Water and Environmental Research Institute (WERI) Technical Report* No. 90, 18 pp.

Jocson, J.M.U., J.W. Jocson, and D.N. Contractor (1999). Numerical Modeling and Field Investigations of Infiltration, Recharge, and Discharge in the Northern Guam Lens Aquifer. *Water and Environmental Research Institute (WERI) Technical Report* No.88, 22 pp.

Mylroie, J.L. and J.W. Jenson, J.M.U. Jocson and M.A. Lander (1999). Karst Geology and Hydrology of Guam: A Preliminary Report. *Water and Environmental Research Institute (WERI) Technical Report* No. 89, 32 pp.

1998

Jenson, J.W. and J.M.U. Jocson (1998). Hydrologic Data Collection for Guam. *Water and Environmental Research Institute (WERI) Technical Report* No. 83, 46 pp.

(BBMR PFS-1)

FUNCTION: EDUCATION & CULTURE
AGENCY: UNIVERSITY OF GUAM
PROGRAM: WATER AND ENVIRONMENTAL RESEARCH INSTITUTE (WERI)

Budget Account Allocation		FY2014		FY2015	FY2016				
FUND TITLE	**Fund**	Actual Appropriation	Percent of Program	Authorized Appropriation	Current Service	Program Plan	Governor's Recommendation	**FY2017** Projected	**FY2018** Projected
General Fund Appropriation		$926,121		$941,847	$941,847	$1,049,521		$1,154,473	$1,269,920
Guam Hydrologic Survey (Local)		$182,694		$182,694	$182,694	$204,200		$204,200	$204,200
Guam Water Monitoring Project (Local)		$155,626		$155,626	$155,626	$173,948		$173,948	$173,948
USGS Water Institute Program (Federal)		$277,005		$277,005	$277,005	$277,005		$277,005	$277,005
USGS Supplemental Program (Federal)		0		$42,288	$42,288	$42,288		0	0
USGS Pacific Islands Climate Center (Federal)		$166,016		$249,024	$249,024	0		0	0
ENSO Application Center (Federal, National Weather Service		$75,000		$100,000	$100,000	$100,000		0	0
National Science Foundation (Federal)		$164,335		$164,335	$164,335	$59,875		$59,875	0
National Park Service (Federal)		0		$21,100	$21,100	$21,100		$21,100	0
Total Program Appropriations		**$1,946,797**		**$2,133,919**	**$2,133,919**	**$1,927,937**		**$1,890,601**	**$1,925,073**
Performance Indicators	**Type**								
Undergraduate Courses Taught	WKLD					0		0	0
Graduate Courses Taught	WKLD					0		0	0
Thesis Committees served (chaired)	WKLD					0		0	0
Projects Initiated	WKLD					0		0	0
Projects completed	WKLD					0		0	0
Technical Reports	WKLD					0		0	0
Journal Articles/Conference Proceedings.	WKLD					0		0	0
Professional Presentations	WKLD					0		0	0
Workshops/Conference Presentations	WKLD					0		0	0

2015 Annual Report

Southern Guam Soil and Water Conservation District

"Good farmers, who take seriously their duties as stewards of Creation and of their land's inheritors, contribute to the welfare of society in more ways than society usually acknowledges, or even knows. These farmers produce valuable goods, of course; but they also conserve soil, they conserve water, they conserve wildlife, they conserve open space, they conserve scenery."

Wendall Berry

Board Members

Chairwoman

Angelita Mendiola

Vice Chairman

William McDonald

Directors

Benny Chargualaf

Lorenzo Flores

Brian Leon Guerrero

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Ursula Herrera

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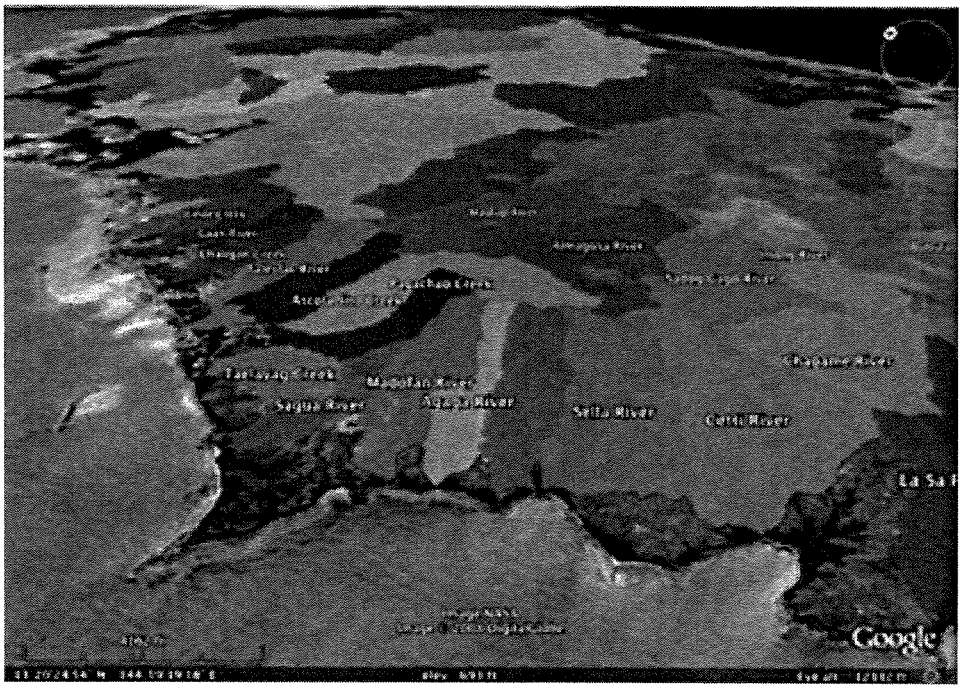


Aerial view of Southern Guam's watersheds

Mission Statement

To work in collaboration with our partners: UOG, FSA, NRCS, GEPA, Dept. of Agriculture, Mayors' Council, etc., to promote and implement conservation and preservation of our Guam's soil and water, forests, and other island natural resources. We continue to hold village outreach activities to bring conservation awareness to the community especially farmers and private landowners. We will support and foster education outreach to island teachers to help develop interest and knowledge in the importance of conservation and preservation of natural resources for island's sustainability, through educational symposium, to reach future generations of leaders.

Objectives

The Southern Guam Soil and Water Conservation District (SGSWCD) identified 5 conservation priorities for 2015:

1. *Promotion of USDA Conservation Programs*
2. *Conservation Education and District Outreach*
3. *Expand assistance to Southern Guam farmers/landowners/leaseholders regarding soil and water conservation concerns.*
4. *Collaborate with conservation partners to help remedy erosion of soil and water contamination caused by feral pigs.*

Type and amount of Contracts or Purchase Orders Executed FY 15:

- One Personnel Contract executed for $12,000.00 to fulfill the role and tasks of Administrative Assistant.
- One Personnel Contract executed for $18,000 to fulfill role and tasks of Outreach Resource Agent
- Open Purchase Order with National Office Supplies for office supplies for $500.00

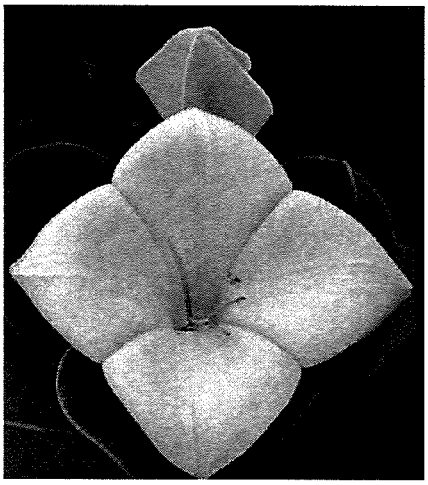
Program accomplishments achieved during fiscal year 2015:

Pig Derby

SWCD provided manpower and monetary support for the annual feral pig derby held in December 2014.The derby was held in conjunction with various community stakeholders. The purpose of this event is to help reduce feral pig population as a means to mitigate soil erosion and water pollution. Significant destruction on island farms by feral pigs is prevalent and on going.

Guåhan for Gaosåli

Southern and Northern SWCD joined efforts to promote Gaosåli (*Bikkia tetrandra*) as the territorial flower of Guam. Visits were made with Guam senators as well as village mayors and community members to discuss support for replacing the current territorial flower to the Gaosåli. Brochures and stickers were made and passed out with information about the Gaosåli. Gaosåli is endemic to Guam and was used by our ancestors as torchlight when fishing. Aside from its medicinal value, it is a beautiful ornamental flower. The present territorial flower, bougainvillea, was introduced and is found almost all over the world including California, Florida, and most US cities and is considered an invasive species.



Village Outreach

Outreach meetings were held in early February at Inarajan Middle School and Merizo Elementary School to assist with soil erosion. Major work was needed to address the flooding on sidewalks in front of Inarajan Middle School. Merizo Elementary School requested for vetiver grass to be planted by the school playground and other areas on the school grounds. With assistance from the village mayor's office and our partners, we will

continue this project to provide vetiver grass for students to plant in order to mitigate soil erosion.

Vetiver Grass Project

In partnership with University of Guam, NRCS, Environment Protection Agency (EPA) and village mayors, the Vetiver Grass Project aims to provide villages resources for soil erosion prevention. In continuation with years' prior, SWCD together with Dr. Golabi have been working in the following villages; Asan, Umatac, and Agat. *Update:* The Asan vetiver garden is being restored after vandals destroyed most of the plants. Due to the lack of maintenance, the Umatac garden will need to be restarted. And lastly, Typhoon Dolphin destroyed Agat's garden earlier this year. SWCD will continue to work with the village mayors for more vetiver grass planting with plans to include the promotion of lemongrass.

Ugum Watershed Private Land Conservation Pilot Project

On April 9th, the Ugum watershed restoration project began with collaboration with SGSWCD, Mr. Paulino (landowner), DOE educators, NOAA, Guam EPA, Department of Agriculture, NRCS and Inarajan community members planted native trees to prevent soil erosion. The goal was to implement voluntary conservation practices via cooperative agreements between landowners and agencies with programs created to protect or restore critical resource areas. Partnership with students from Simon Sanchez High School was a great success! Students and partners did an on-site assessment around the Atåtte Hills and River area and collected native tree seeds. Later, partners and students planted the seeds at the Department of Agriculture for planting in the near future.

60th Stewardship Week Proclamation

Southern Guam SWCD collaborated with the Northern District to promote the celebration of the 60th year of Stewardship Week from April 26th – May 3rd, 2015, which is sponsored by the National Association of Conservation Districts. The NACD 2015 Stewardship Week is themed, "Local Heroes – Your Hardworking Pollinators". The proclamation was read and signed by Lieutenant Governor, Ray Tenorio on May 1st and was attended by representatives from the Northern and Southern Soil & Water Conservation Districts, the Department of Agriculture, UOG Cooperative Extension, Guam EPA and other partners to help promote Stewardship Week and raise awareness island wide regarding conservation and watershed protection.

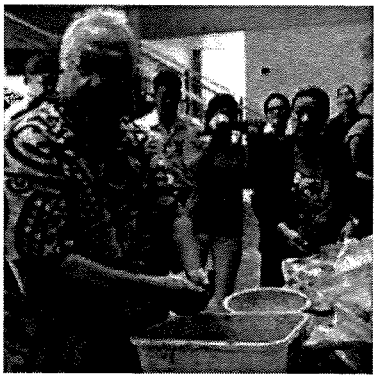
Guam EPA Watershed Planning Committee

On June 25th, SWCD met with Guam Environmental Protection Agency and partners. Guam EPA is seeking to establish a list of grant proposals (prospective funding in FY 16 and forward), which will result in maintained surface water quality (based on Guam Water Quality Standards) or restoring/improving water quality for those water bodies identified as "threatened or impaired". Our participation will assist in developing projects eligible for the Clean Water Act Nonpoint Source Funding, Section 319.

2015 August Educators Symposium

On August 10th, 11th and 12th, The Northern and Southern Guam Soil and Water Conservation Districts in collaboration with Guam Department of Education's Division of Curriculum & Instruction, Pacific Resources for Education and Learning (PREL), and community partners held it's 3rd Annual Educators Symposium: Soil Health and Conservation and Climate Change. The curriculum was provided by the National Association of Conservation Districts (NACD), which focused on pollinators. SWCD

provided educator's guides, lesson plans, activity sheets, posters, presentations, a field trip, and other resources to the educators. The Symposium focused on Soil & Water Conservation and Climate Change as it continues to build on the education and information provided during the last two symposiums. This event addressed many concerns revolving around the health, protection, and importance of our island's natural resources while also providing avenues to educate the future generations about these topics. The first two days of the symposium, agency partners spoke on Climate Change and Adopting a Watershed. Various topics ranging from the impacts of our pollinators, permaculture, ocean acidification to the preservation of traditional åmot and healing were presented. On the third day, educators were taken on a field trip to tour the Northern Guam Lens Aquifers. John Lawrence, assistant director for field office operations with the Natural Resources Conservation Service (NRCS), demonstrated to teachers how to make seed slings used to disperse native seeds into hard-to-reach areas. Lawrence said the technique would be used to teach students about ecology and reforestation. Inserting seeds into a ball made out of clay, compost, and fertilizer created the slingstones. Teachers were handed seeds to take home and compact into slingstone shapes. The final day of the symposium was a teacher work session where groups presented lesson plans they've created to teach students the information gained during the symposium. Our keynote speaker was Archbishop Anthony Apuron, who spoke on the "Encyclical on Climate Change—Care of Our Common Home" released on May 24th by Pope Francis. Next year's symposium is highly anticipated, focus being on Healthy Forests.



NOAA Native Plant Propagation Workshop

On August 29th, National Oceanic and Atmospheric Administration (NOAA) hosted a plant propagation workshop at The Humåtak Foundation, as a kickoff event to the mini grants offered. To help more people learn about growing native plants, the Coral Program, in partnership with the National Fish and Wildlife Federation and the Marianas Resource Conservation and Development Council, sponsored six, $2,000 mini-grants to get people started on native plant propagation. Preference was given to growers located in southern Guam, where most current restoration projects are occurring. In return for the funding, grant recipients were required to attend this workshop and provide the coral program with 25% of the native plant materials successfully grown within the first 12 months after the workshop. At the event, attendees and grant recipients potted up nearly 300 native plant starts of nearly 20 species and handed out hundreds of more seeds. Our district directors

attended the event and SGSWCD provided fresh local fruit.

GEPA Worker Protection Standard Training

Guam EPA held training on Sept. 16th at Holiday Resort. The training was geared to farmers who use *'agricultural-use'* chemicals. EPA's Current Agricultural Worker Protection Standard (WPS) is a regulation published in 1992 that is aimed at reducing the risk of pesticide poisoning and injury among agricultural workers and pesticide handlers. The WPS requires that owners and employers on agricultural establishments provide protections to workers and handlers from potential pesticide exposure, train them about pesticide safety, and provide mitigations in case exposures may occur. Our district assisted in farmer outreach and encouraged attendance as well as the handling of the registration table.

Veterans Health Conference

Held at Hyatt on September 19th, the Veterans Health Conference was started to provide veterans from all eras on Guam the resources they need to help maintain physical, emotional and spiritual wellness. Together with NRCS, NGSWCD and UOG (SBDC) we took surveys on veterans who were interested in farming. We also provided outreach on conservation methods and agricultural assistance.

The Veteran Sustainable Agriculture Training (VSAT)

Together with UOG and NRCS, SWCD is working to develop similar training opportunities for island veterans to engage in. This will provide therapeutic options among our island veterans suffering with PTSD and to help provide employment after retirement. It will also help increase needed farming activities for island sustainability. Planning is underway with the University of Guam and NRCS to develop training sessions for island Veterans and Beginning Farmers on best farming practices and soil and water conservation on farmlands.

Budget

Type	2015
Travel	$19,263.19
Advertising	$120
Stipends	$1,600
Administrative Staff	$11,500
Resource Outreach Assistant	$2,322.50
Resource Outreach Agent	$3,750
Office Supplies	$818.94
Miscellaneous	$6,683.96
2015 Educators Symposium	$5,014.36
TOTAL	$51,072.95

National Activities

NACD Annual Meeting, New Orleans, LA February 1st-4th. Vice Chairman McDonald and director Flores presented a 'Feral Pig Action Plan'. In an effort to look into possible program, funding, and review of existing NACD regulations to meet Guam's unique needs in addressing ungulate impact on our island natural resources.

Small Farms Conference, San Diego, CA March 7th-10th. Chairwoman Mendiola attended with objectives to promote the veteran and beginning farmers with partnerships with UOG and NRCS, and learned about farm marketing.

Hawaii Association of Conservation District Annual Meeting, Hilo, HI June 17th-19th. Vice Chairman McDonald attended with objectives to gather support for the eradication of the Coconut Rhino Beetle. Along with Hawaii, Guam has been experiencing a high mortality rate of coconut trees due to this invasive species. With coconut trees being killed around the island's coastal and alluvial areas, the Coconut Rhino Beetle has become a contributor to soil erosion due to the deaths of the trees in these areas. There was a presentation about creating perimeter fencing by planting hedgerows that that can also attract wildlife pollinators. This is a program that can possibly assist in keeping out ungulates, while stimulating the pollinator population.

NACD Annual Summer Meeting, Spokane, WA July 10th-13th. Director Flores attended with the objective to ensure that the issues of Guam farmers along with funding was heard and included into the Farm Bill of 2016. This meeting was held to formulate the Farm Bill of 2016. As well, each region came together to highlight the successful projects and issues they faced in the past year.

NORTHERN GUAM
SOIL & WATER
CONSERVATION DISTRICT

2015 Annual Report

Chairman
Roland Quitugua

Vice Chairman
Joseph Santos

Directors
Hope Cristobal
Ronald Laguaña

"When the land does well for its owner, and the owner does well by his land—when both end up better by reason of their partnership— then we have conservation."

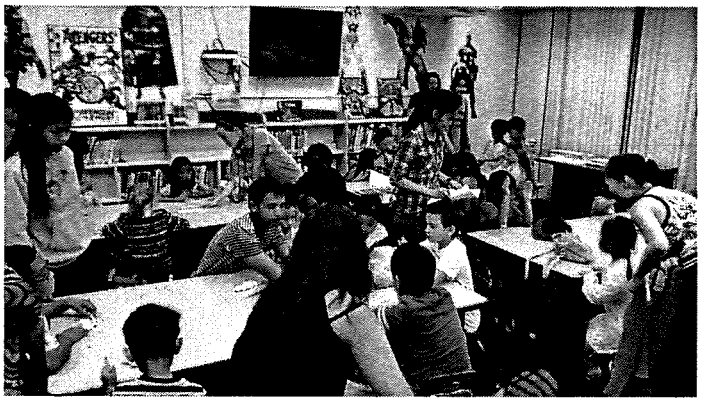
Aldo Leopold

2015 Educators Symposium

The Educators Symposium has become the highlight of the year for the Guam Soil & Water Districts. Each year the curriculum becomes more developed, includes more and more information/resources and brings in more educators. This year the Symposium was held August 10, 11, and 12 and was titled 3rd Annual Educators Symposium: Soil Health and Conservation and Climate Change. The curriculum provided by the National Association of Conservation Districts (NACD) also focused heavily on pollinators. A major highlight for this year's symposium was the opening speech done by Archbishop Apuron who discussed Pope Francis' Environmental Encyclical. This year the private schools began to get involved as well and showed a great deal of interest. Plans for next year's symposium have already begun and the plan is to focus on Healthy Forests.

Service Learning

This year the Guam Department of Education began to enforce the high school graduation requirement of completing 75 hours of community service. The NGSWCD was requested to offer students with service learning opportunities. One such project was reading to young people at the Agana Library during Children's Reading Hour. Students first had to attend a training session focused on interacting with young people through story telling and books as a prerequest to reading to others. The NGSWCD purchased a collection of books focused on the environment and environmental topics (i.e. recycling, respecting nature, saving energy, gardening, etc.) and provided these books to the high school students that were then read to the young audiences during the Saturday Children's Reading Hour during the month of May and June. Each session equated to two (2) hours of community service (1 hour of reading and 1 hour of arts and crafts) and, with the inclusion of the training session, each student received at least three (3) hours.



SeaGrant Videos

As a partner of NGSWCD, SeaGrant Guahan came to the District with the idea of creating a series of conservation videos. NGSWCD and SeaGrant staffers worked together to develop scripts and videography concepts that came together as YouTube videos on the SeaGrant Guahan YouTube Channel <https://www.youtube.com/watch?v=lZE9kQc2A94>. Currently, the two videos that are in progress right now are Mulching and Sheet Mulching with plans for more as there are many conservation topics that can be focused on and used to benefit Guam.

Lot 2098

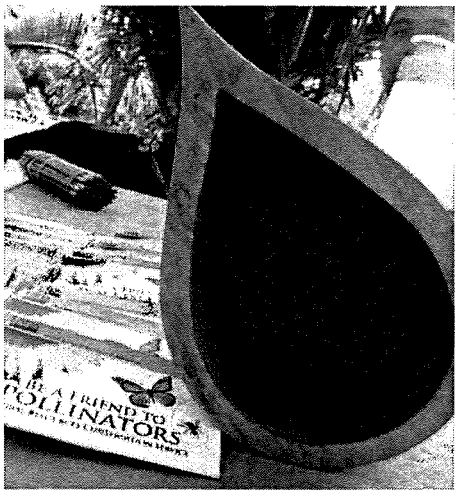
The 50 acre parcel of land in Tamuning is currently designated as a nature preserve, but the NGSWCD aims to change it into a working conservation area. The goal is to co-designate the area as a conservation area governed by NGSWCD, Department of Parks and Recreation, and Guam Department of Agriculture. This project continues to move forward and NGSWCD has recently found someone to assisting applying for a Forestry grant for this large project. The location will be used as a green space site for the local community as well as an area for service learning opportunities, a location for native flora and fauna species, and more.

Guahan for Gaosali

The NGSWCD is promoting the use of native plant species to help promote conservation and prevent the spread of invasive plants. The Guam Soil & Water Directors met with various senators to discuss their possible support for the changing the Territorial flower of Guam from the Bougainvillea to Gaosali that is native to Guam. Most senators we met with were in support of the measure but are reluctant to due to the emotional nature of the first attempt to change the flower. The district will embark on a public education program to promote native plant species.

Pollinators

As an island community, Guam relies very heavily on the importation of produce and other goods. The connection between the world's bees/pollinators and our imported goods is a very big and important one, so the NGSWCD began to delve into the issue. Recently it has been discovered that Guam has the varroha mite which is killing local bees. Teaming up with the local Natural Resource Conservation Service (NRCS) office, the District began doing education and outreach about pollinators and their importance to us as people and as an island. If we lose pollinators then our imported goods will be much more expensive, not to mention that our own local produce will also take a heavy hit if there are no pollinators around to provide pollinator services.



Veteran New Farmer Training

As a partner, University of Guam Cooperative Extension Service (UOG CES) routinely has NGSWCD participate and support various program like UOG New Farmer Training provided by Dr. Bob Barber. These trainings provide vital information to current and upcoming Guam farmers/ranchers about financial opportunities, sustainable farming techniques, and more. The next session of these trainings began with a Western Sustainable Agriculture Research and Education (WSARE) training, which provided farmers with information about available grants that they can apply for independently, in groups, or in partnership with UOG CES. This year the NGSWCD wanted to promote outreach to local veterans and were instrumental in recruiting veterans for this eight Saturday workshop.

Testifying for Conservation Officers/Forest Aids

The NGSWCD testified at a public hearing regarding the purpose and continuing status of the island's conservation officers and forest aids. The NGSWCD is in great support of these positions, and continuing them, due to the environmental situations Guam finds itself in more and more often. We find ourselves in another El Nino and this has resulted in much wetter seasons for the island, which means higher rates of erosion and damage to our lands and coasts. We have also been experiencing many more typhoons and though they have not been super typhoons they have still contributed to a great deal of green waste, which poses a problem for the island in terms of the Coconut Rhinoceros Beetle. We also rely on the conservation officers and forest aids to take care of any forest/grass fires that occur on island. They are the ones at the forefront when these natural disasters occur and, therefore, are necessary.

DUNS/SAM

The NGSWCD applied for and received a DUNS number and an account with SAM. The DUNS number is a unique nine-digit identification number for each physical location of your business. D-U-N-S Number assignment is for businesses required to register with the federal government for contracts or grants. The System for Award Management (SAM) is combining federal procurement systems and the Catalog of Federal Domestic Assistance into one new system. Both of these allow NGSWCD easier and more access to federal funding and grants.

Conservation Technician

In the beginning of this year the NGSWCD hired on Leonard-John Ventura as it's first Conservation Technician. He is the connection between NGSWCD and NRCS with the main goals of becoming educated and proficient in Conservation Planning services and heading any major projects NGSWCD assigns to him.

Recently, NGSWCD also hired on Raymond Shinohara as a secondary Conservation Technician with the same connection between NGSWCD and NRCS. Mr. Shinohara's focus will fall under Veteran Outreach with the aim of access the veteran community and providing assistance and outreach to veterans who are interested in farming and ranching.

Veteran Outreach

As more and more veterans return home there has been a push to create opportunities for them in various ways. One particular way is to bring them into farming, ranching, and gardening. Currently, the Small Business Development Center, Northern and Southern Soil and Water Districts, Natural Resource Conservation Service, Farm Service Agency, and Guam Veteran Affairs Office have begun to work together to put a program in place for this exact purpose. It is still very much in the beginning stages but with the combination of all these agencies and organizations and help from staff like Raymond Shinohara it has a very bright future.

NACD Annual Meeting

As regional representatives for much of the Pacific, the Guam Soil and Water Districts came to the forefront of the feral hog problem that many states and territories are facing today. With the push from Guam and other states, they were able to pass the Feral Swine Resolution at the 2015 National Association of Conservation Districts (NACD) Annual Meeting in New Orleans. This has led to NRCS creating a feral swine pilot test. This pilot test includes four states (Guam included) and operates under the Environmental Quality Incentives Program (EQIP) with the goal of determining if a feral swine program can be included in the list of programs available through NRCS in the future. It is still in progress. Chairman Quitugua has been appointed the chairman for the NACD Feral Hog sub committee under the Natural Resource Policy Group.

Conferences Attended:

2014 ACRES Conference – Columbus, OH December 4-6, 2014

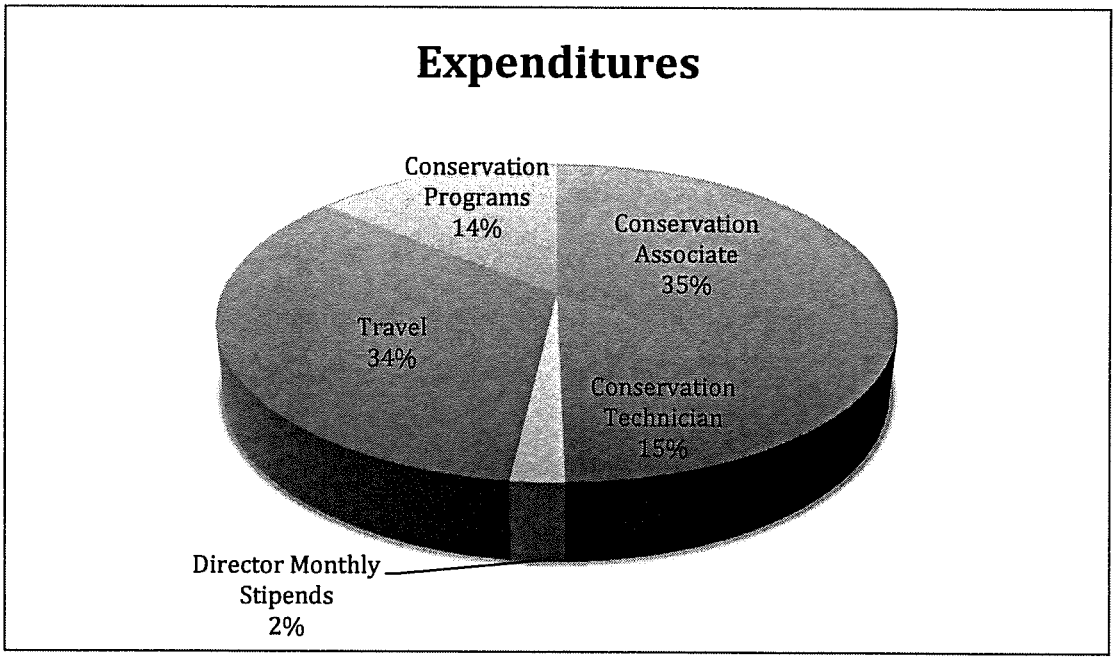
NACD Annual Meeting – New Orleans, LA February 1-4, 2015

2015 Small Farms Conference – San Diego, CA March 7-10, 2015

2015 Regional Island Sustainability Conference – Guam, April 15-16, 2015

BUDGET

TYPE	2015	2014
CONSERVATION ASSOCIATE	$30,964.68	$32,307.84
CONSERVATION TECHNICIAN	$13,464.16	-
DIRECTOR MONTHLY STIPENDS	$1,950.00	$2,850.00
TRAVEL	$30,533.05	$21,370.01
CONSERVATION PROGRAMS	$12,538.57	$9,526.65
ADVERTISING	-	$692.00
MISCELLANEOUS	$748.09	$2,514.92
TOTAL	**$90,198.55**	**$69,261.42**



Program Annual Report:

KPRG Mission Statement:

KPRG-FM 89.3 is the public radio broadcast station of the Guam Educational Radio Foundation. KPRG is licensed by the Federal Communications Commission to serve the public interest, convenience and necessity of the people on the island of Guam. KPRG is a high-quality news, information and entertainment service in a non-commercial environment. KPRG is a non-advocating entity with an obligation to give fair and impartial treatment to all sides of issues.

KPRG acquires produces and broadcasts programs carefully selected to fulfill the station's obligation to both the Federal Communication Commission and the Guam Educational Radio Foundation. KPRG's programming is designed to enrich the artistic and cultural life within its coverage area; it pioneers new concepts and techniques; it serves minority as well as majority needs and interests; it enhances the quality and texture of life on Guam.

KPRG assists the University of Guam in the achievement of its paramount objective to serve the educational and intellectual needs of the students, faculty and staff of the University as well as the residents of Guam. Furthermore, as a public service vehicle, KPRG-FM assists the University of Guam's endeavor to reach out and make itself available to the people.

Current Goals and Objectives:

1. **Financial Solvency and Independence.**

   a. **Business Underwriting:** We must increase the level of business underwriting in a manner consistent with KPRG's non-commercial nature.

   b. **Financial Management and Reporting:** Is currently debt free. Management must set and adhere to specific targets and benchmarks, and timely inform the Board of financial progress and setbacks.

KPRG 89.3FM PUBLIC RADIO GUAM
303 University Dr. Mangilao, Gu 96913
Telephone: (671)734-8930 Facsimile: (671)734-2958
Email: marketing.kprg@gmail.com / Website: www.kprgfm.com

2. **Market Development and Improving Awareness of KPRG.**

a. KPRG needs to reach beyond its established audience to attract new groups of listeners not necessarily familiar with public radio. Of course, this needs to be done consistently with our mission and without alienating our existing core audience.

3. **Member Relations, Participation and Feedback.**

a. Membership is a valuable resource which should be tapped to help foster KPRG's continued existence and growth. Keeping members happy requires careful attention to member needs. It should be a top management priority.

i. What can be done to attract more members?

4. **Technical Issues and Facilities.**

a. Explore technical options for live-remote and phone-patch broadcasts.

5. **Program Quality Issues/Community Outreach.**

a. KPRG must maintain its commitment to public service and community programming.

6. **Volunteer Development and Appreciation.**

a. Volunteers are the backbone of public radio. Appropriate measures should be taken to recruit, retain and reward volunteers for on as well as off-air endeavors.

b. We need to maintain a volunteer coordinator.

7. **Personnel Development.**

a. Develop staff pattern consistent with organizational needs and grant requirements.

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Program Accomplishments (related to Goals above)

1) Debt remains at 0
2) KPRG has improved it's outreach to the community by doing awareness programs around the island and numerous youth, non-profit organizations and social groups
3) KPRG completed a member survey in June 2015 and is in the process of analyzing the results.
4) KPRG will broadcast at full strength sometime
5) KPRG has maintained a high level of local and national programming
6) KPRG just held a volunteer party to celebrate the success of the Summer 2015 fund drive.
7) KPRG is presently fully staffed and trained.

KPRG Source of Revenue:

KPRG receives Revenue from four primary sources a appropriation from the Government of Guam, a yearly grant from the Corporation for Public Broadcasting, Membership (community) Pledges, and business underwriting.

KPRG Number of Employees:

Currently KPRG has 3 full time employees.

Chris Hartig – General Manager

Ryan Luzanta – Assistant General Manager

Robert Wang – News & Production Director

Contracts:

National Public Radio $33,360, 12 month contract, Programming

Public Radio International $9,456 12 month contract, Programming

American Public Media $7996 12 month contract, Programming

All programming contracts coincide with our fiscal year running from Oct 1, 2014 to Sept 30, 2015

MS075005.RTT

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STUDENT FINANCIAL ASSISTANCE PROGRAMS
Fiscal Year 2015 Report

TOTAL EXPENDITURES	**$ 4,029,329.13**
TOTAL STUDENTS	**587**

ACCESS TO HIGHER EDUCATION (AHEG)

YEAR	TOTAL AWARDEES	TOTAL AMOUNT
AY2014-2015; FA15 (10/01/14 - 9/30/15)	111	$ 225,500.00

DOC SANCHEZ

YEAR	TOTAL AWARDEES	TOTAL AMOUNT
AY2014-2015; FA15 (10/01/14 - 9/30/15)	49	$ 101,012.64

GOV.GUAM STUDENT LOAN (UG/GR/UOG/OFF ISLAND)

YEAR	TOTAL AWARDEES	TOTAL AMOUNT
AY2014-2015; FA15 (10/01/14 - 9/30/15)	18	$ 101,000.00

MERIT UOG/OFF ISLAND

YEAR	TOTAL AWARDEES	TOTAL AMOUNT
AY2014-2015; FA15 (10/01/14 - 9/30/15)	223 (UOG); 2 (OFF)	$ 1,918,678.88

NURSING

YEAR	TOTAL AWARDEES	TOTAL AMOUNT
AY2014-2015; FA15 (10/01/14 - 9/30/15)	45	$ 221,631.17

PROFESSIONAL/TECHNICAL AWARD (PROTECH)

YEAR	TOTAL AWARDEES	TOTAL AMOUNT
AY2014-2015; FA15 (10/01/14 - 9/30/15)	58	$ 1,194,573.55

RETENTION/COMPLETION

YEAR	TOTAL AWARDEES	TOTAL AMOUNT
FA15 (10/01/14 - 9/30/15) NEW AWARD	45	$ 45,000.00

YAMASHITA (YTC)

YEAR	TOTAL AWARDEES	TOTAL AMOUNT
AY2014-2015; FA15 (10/01/14 - 9/30/15)	36	$ 221,932.89