UNIVERSITY OF GUAM
UNIBETSEDÅT GUAHAN

Administration and Finance
Business Office

November 25, 2014

32-14-2284
Office of the Speaker
Judith T. Won Pat, Ed.D
Date: 11-26-14
Time: 9:48am
Received By:

Speaker Judith Won Pat
32nd Guam Legislature
155 Hessler Place
Hagatna, Guam 96910

Dear Speaker Won Pat,

In compliance with the Legislature reporting requirements per P.L. 32-068, we are submitting the following reports and information:

A. Financial Statements (Unaudited/Draft) for the fiscal year ending September 30, 2014:
   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

2284

UNAUDITED/DRAFT

UNIVERSITY OF GUAM
College of Natural and Applied Sciences
Aquaculture Development and Training Center
For the fiscal year ending September 30, 2014

	Cash Basis	Accrual Basis
Operating Revenue		
GovGuam Appropriations	$ 110,632	$ 125,254
Total Revenue	110,632	125,254
Operating Expenses		
Salaries	57,281	57,281
Benefits	4,382	4,382
Travel	-	-
Contractual	5,673	5,673
Supplies	20,171	20,171
Equipment	3,019	3,019
Utilities	-	-
Capital Outlay	-	-
Miscellaneous	12,525	12,525
Total Operating Expenses	103,052	103,052
Operating Income	7,581	22,202
Net Assets		
Net assets-beginning	(19,079)	(9,059)
Net assets-end	$ (11,498)	$ 13,143

Note:
GovGuam appropriations/revenue recognized at $110,632 is based on cash basis of accounting. On accrual basis, appropriations/revenue is $125,254 therefore, GovGuam is $14;622 in arrears in allotment payments to UOG for FY2014.

UNAUDITED/DRAFT

UNIVERSITY OF GUAM
Water and Environment Research Institute of the Western Pacific
Guam Hydrologic Survey
For the fiscal year ending September 30, 2014

	Cash Basis	Accrual Basis
Operating Revenue		
GovGuam Appropriations	$ 161,375	$ 182,694
Total Revenue	161,375	182,694
Operating Expenses		
Salaries	101,823	101,823
Benefits	6,257	6,257
Travel	-	-
Contractual	2,619	2,619
Supplies	8,946	8,946
Equipment	7,389	7,389
Utilities	208	208
Capital Outlay	-	-
Miscellaneous	18,269	18,269
Total Operating Expenses	145,512	145,512
Operating Income	15,863	37,182
Net Assets		
Net assets-beginning	183,212	197,827
Net assets-end	$ 199,075	$ 235,009

Note:

GovGuam appropriations/revenue recognized at $161,375 is based on cash basis of accounting. On accrual basis, appropriations/revenue is $182,694 therefore, GovGuam is $21,319 in arrears in allotment payments to UOG for FY2014.

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, 2014

	Cash Basis	Accrual Basis
Operating Revenue		
GovGuam Appropriations	$ 137,461	$ 155,626
Total Revenue	137,461	155,626
Operating Expenses		
Salaries	-	-
Benefits	-	-
Travel	-	-
Contractual	144,580	144,580
Supplies	-	-
Equipment	-	-
Capital Outlay	-	-
Miscellaneous	15,563	15,563
Total Operating Expenses	160,143	160,143
Operating Loss	(22,681)	(4,517)
Net Assets		
Net assets-beginning	(5,175)	7,275
Net assets-end	$ (27,856)	$ 2,758

Note:
GovGuam appropriations/revenue recognized at $137,461 is based on cash basis of accounting. On accrual basis, appropriations/revenue is $155,626 therefore, GovGuam is $18,165 in arrears in allotment payments to UOG for FY2014.

Guam Educational Radio Foundation
Balance Sheet
As of September 30, 2014

	Sep 30, 14
ASSETS	
Current Assets	
Checking/Savings	
00-1050 · Petty Cash (office use)	15.51
10-1020 · Cash with UOG	8,454.90
20-1041 · Bank of Guam (CPB)	193.28
50-1010 · Cash in Bank of Guam	32,105.94
50-1013 · PayPal	7,039.77
50-1015 · Cash in Bank of Hawaii	6,483.80
Total Checking/Savings	54,293.20
Accounts Receivable	
50-1120 · A/R Contributions/Charity	-725.00
50-1130 · A/R Membership Receivable	-1,480.51
Total Accounts Receivable	-2,205.51
Other Current Assets	
20-1410 · Prepaid Expense- Programing	12,600.00
50-1810 · Undeposited Funds	105.00
Total Other Current Assets	12,705.00
Total Current Assets	64,792.69
Fixed Assets	
40-1600 · Property & Equipment	
40-1610 · 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	74,070.72

Guam Educational Radio Foundation
Balance Sheet
As of September 30, 2014

	Sep 30, 14
LIABILITIES & EQUITY	
Liabilities	
Current Liabilities	
Accounts Payable	
50-2010 · Accounts Payable Fund 5	-3,187.51
Total Accounts Payable	-3,187.51
Other Current Liabilities	
54-2220 · Latitude 13 Adventures	-32,063.54
Total Other Current Liabilities	-32,063.54
Total Current Liabilities	-35,251.05
Total Liabilities	-35,251.05
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)	-1,297.77
505-005 · Other Current Funds	58,504.00
Net Income	-11,559.13
Total Equity	109,321.77
TOTAL LIABILITIES & EQUITY	74,070.72

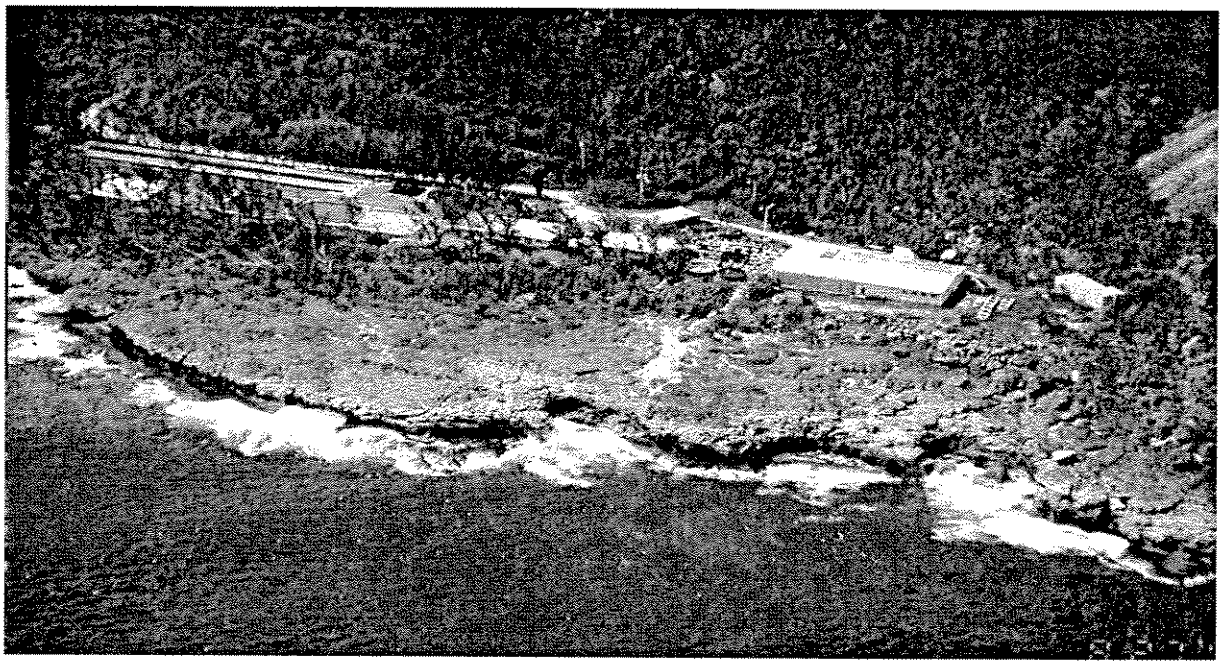
Guam Educational Radio Foundation
Profit & Loss
October 2013 through September 2014

	Oct 2013 - Sep 2014
Ordinary Income/Expense	
Income	
10-4010 · GovGuam Appropriation	2,919.60
20-8751 · CPB Interest Income	5.06
54-6000 · Fundraising	3,975.00
54-6500 · General Membership	14,477.03
54-6511 · PayPal Sales	2,240.00
54-6620 · Underwriting	6,362.50
Total Income	29,979.19
Gross Profit	29,979.19
Expense	
00-7100 · Contract expense CPB (CPB program contract)	
21-7106 · National Public Radio(program)	17,291.00
21-7112 · American Public Media	5,449.14
22-7103 · Inter-Island Communications Inc	5,628.00
22-8105 · Management Communication Servic	1,500.00
25-7101 · G4 Security Services (Guam) Inc	385.00
Total 00-7100 · Contract expense CPB	30,253.14
00-7110 · Contract - Auditor/Professional	3,187.51
00-7200 · Full Time Personnel	
11-7210 · News Reader (morning)	6,240.00
11-7215 · FICA Employers Share News host	477.36
11-7216 · FICA Employer Share Pro. Asst.1	56.90
11-7217 · FICA Employer Share Pro. Asst.2	45.52
14-7201 · Asst. GM	8,769.24
14-7211 · FICA Employer's Share Asst. GM	670.86
14-7224 · Benefits (Ins.) Asst. GM	40.98
15-7203 · Admin (General Manager)	12,692.28
15-7215 · FICA Employer's Share Admin GM	970.92
15-7223 · Benefits (Ins.) Admin GM	40.98
Total 00-7200 · Full Time Personell	30,005.04
21-7115 · PayPal Fees	147.34
25-8601 · Utilites CPB	4,092.57
50-7200 · FT Personell (Gen. Fund)	
50-7500 · Retirement Benefits	1,500.00
54-7450 · Commission	937.50
55-7580 · Part-Time Employee	
55-7581 · Development & Relations Salary	1,500.00
55-7582 · Part-Time Production Asst. 1	743.75
55-7583 · Part-Time Production Asst. 2	595.00
Total 55-7580 · Part-Time Employee	2,838.75
Total 50-7200 · FT Personell (Gen. Fund)	5,276.25

Guam Educational Radio Foundation
Profit & Loss
October 2013 through September 2014

	Oct 2013 - Sep 2014
50-7800 · Misc. Expense	3,511.37
55-7113 · Website Development	87.50
55-7150 · Fund Raising Events Expenses	1,491.34
55-7410 · Bank Charges	186.39
55-7902 · Postage (General)	125.19
55-8200 · Promotion for Fundraiser	37.90
55-8300 · Supplies & Materials	59.98
55-8403 · Telephone Expense/Fax	304.08
55-8500 · Travel Expense	449.53
Total Expense	79,215.13
Net Ordinary Income	-49,235.94
Net Income	**-49,235.94**

GUAM AQUACULTURE DEVELOPMENT AND TRAINING CENTER



FY-2014 STATUS REPORT

Prepared by
Rachael Taitano Leon Guerrero

November 2014

The Guam Aquaculture and Development Center (GADTC) was originally built about 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 Western Pacific Tropical Research Center 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 2014. Unfortunately, the GADTC received almost 40% ($49,053) of its FY2014 allotment during the last month (September 2014) of the fiscal year, making it difficult to spend its funds during the fiscal year. The facility spent $80,930 of the total $125,254, and carried over $44,324 to FY2015. 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.

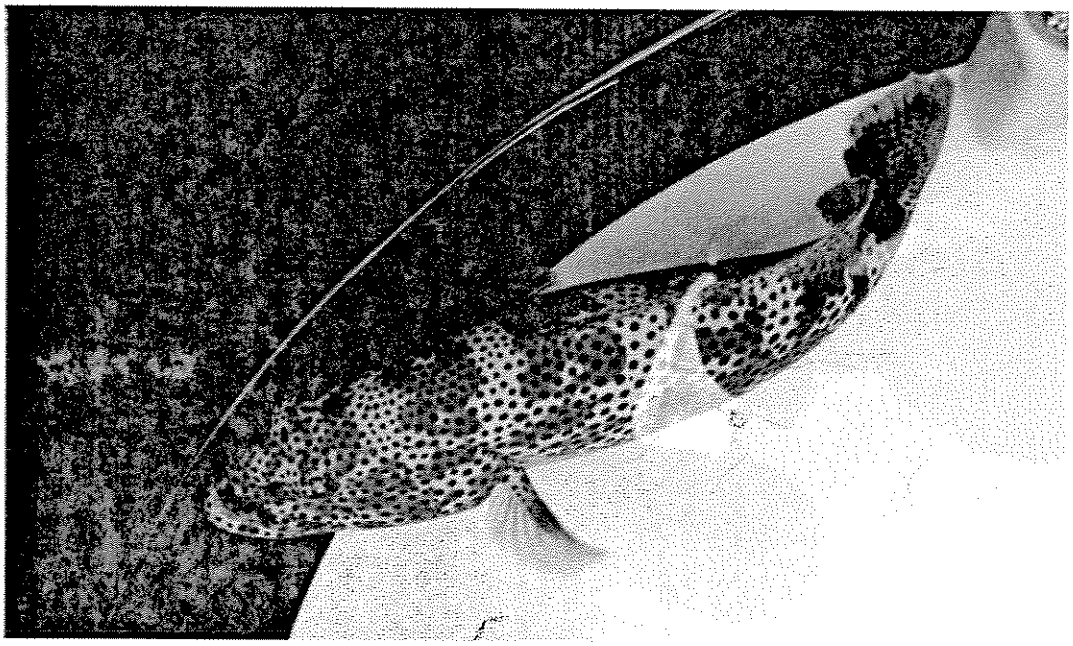
The current objectives of the GADTC are:

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.

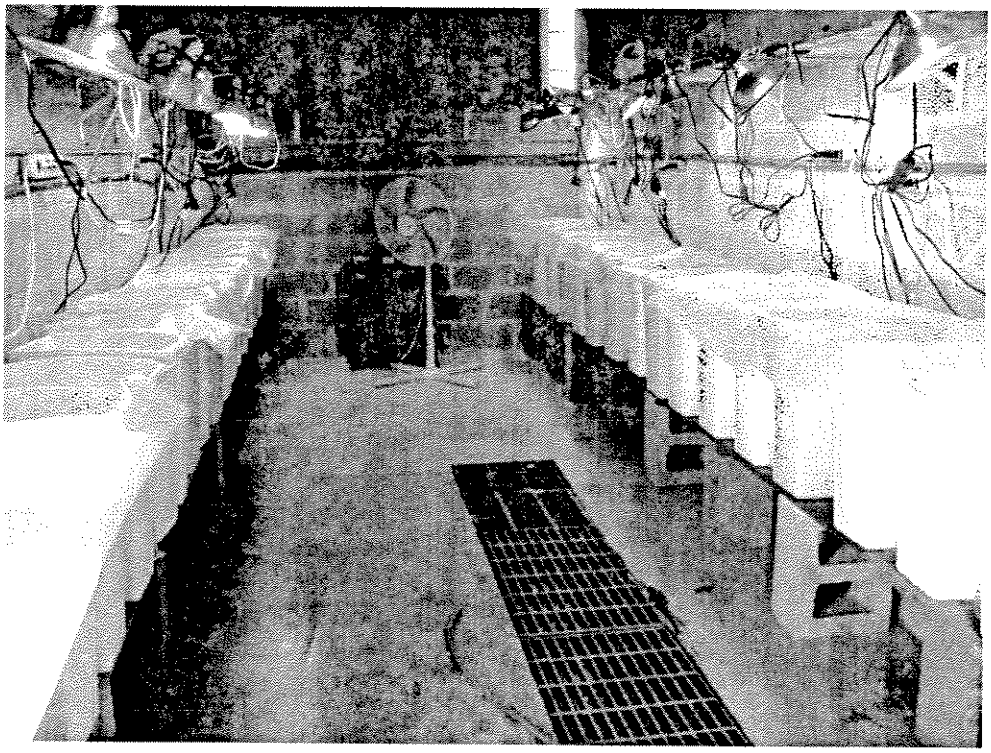
Program accomplishments during FY 2014:

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.

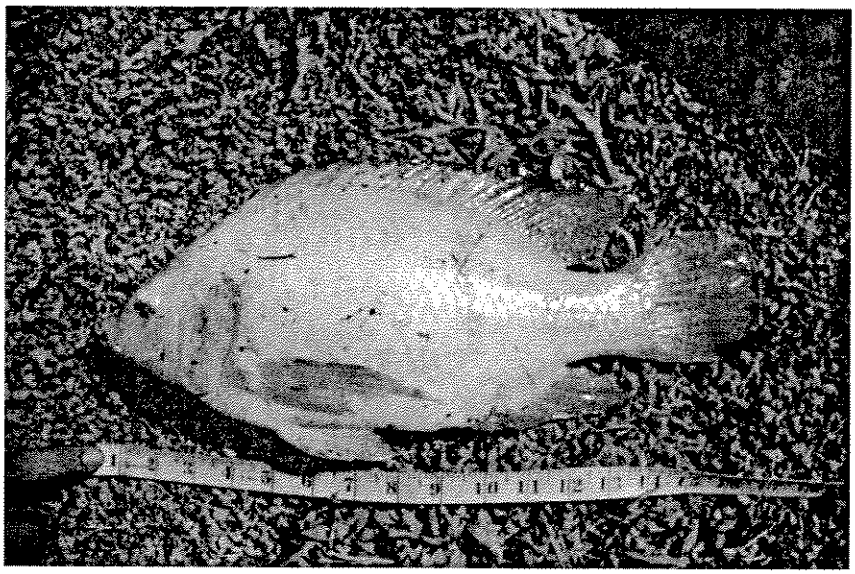


2. The shrimp nursery has allowed the continuation of the shrimp breeding program. The shrimp breeding program has been successful in improving the growth rate of our commercial shrimp line.



3. There continued to be limited production of shrimp and tilapia fry during FY 2014 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.

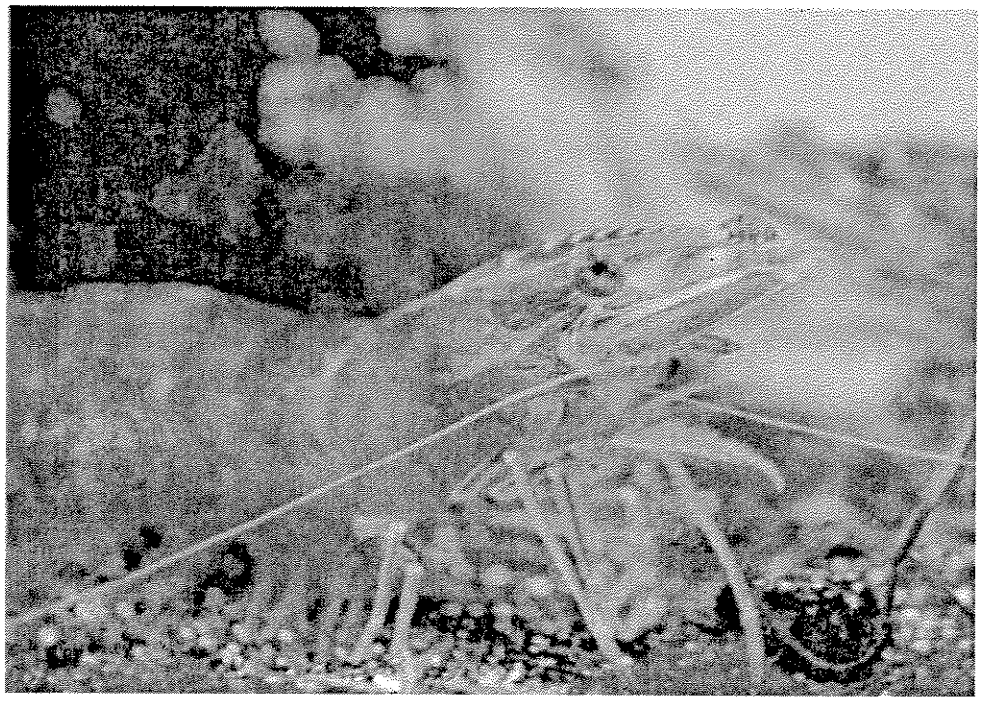
4. The performance of our shrimp lines in a comparative study at the Guangxi Fisheries Research Institute in Nanning, China has lead to their inviting our staff to return to Nanning. During the visit, GFRI expressed a desire to continue our long term cooperation. Currently we are preparing visa applications 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 is certified by the Government of Thailand as a SPF producer of *P. vannamei* and commercial shipments of SPF shrimp are being exported to Thailand in an ongoing basis.

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. In November 2013, the UOG President, Dr. Underwood, and Dr. Hui Gong, visited Dr. Pan of the Shanghai Ocean University. On of areas specific interest was in developing a cooperative program with the GADTC in the area of shrimp breeding and scholarly exchange. The first exchanges students from SHOU began their 'internship' with GADTC in August 2014.



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

Continuing Grants/Contracts:

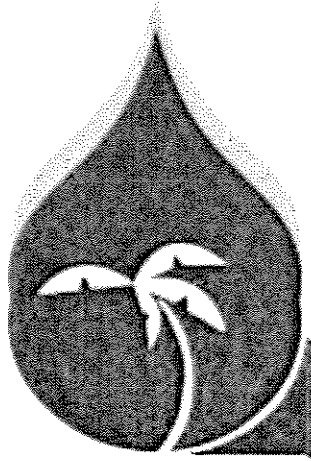
Economic analysis of aquaponics in Hawaii and Guam. USDA Center for Tropical and Subtropical Aquaculture. Guam P.I. Mari Marutani. October 2012 - September 2014. **$68,000**

Guam Hydrologic Survey (GHS)

&

Comprehensive Water Monitoring Program (CWMP)

FY 2014 Annual Report



WERI

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

November 2014

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

FY 2014
ANNUAL REPORT

Prepared by

Dr. Shahram Khosrowpanah
Director

November 2014

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.

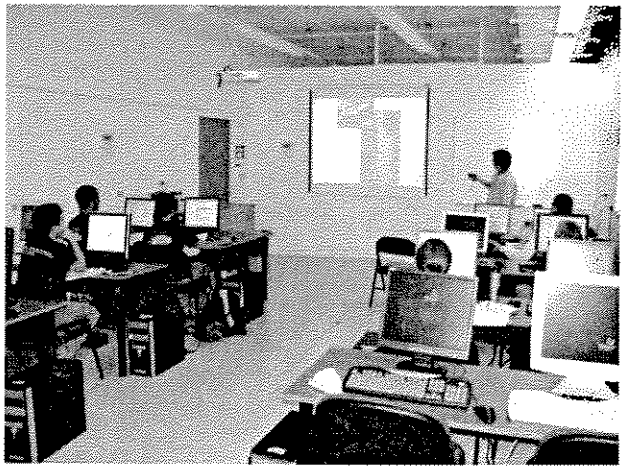
PROGRAM FUNDING

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'14. 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'14.

PROGRAM OUTCOMES FOR FY'14

GUAM HYDROLOGIC SURVEY (GHS)

In FY'14, 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.

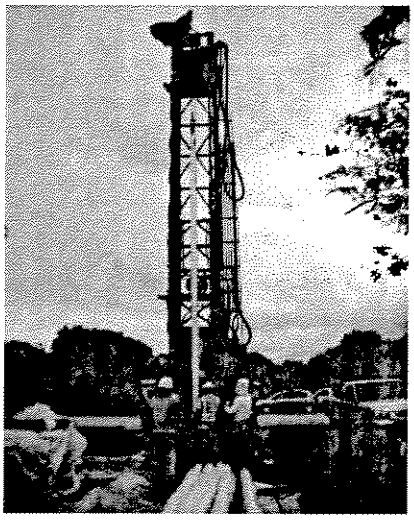


Graduate students in WERI CA-GIS Laboratory

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.

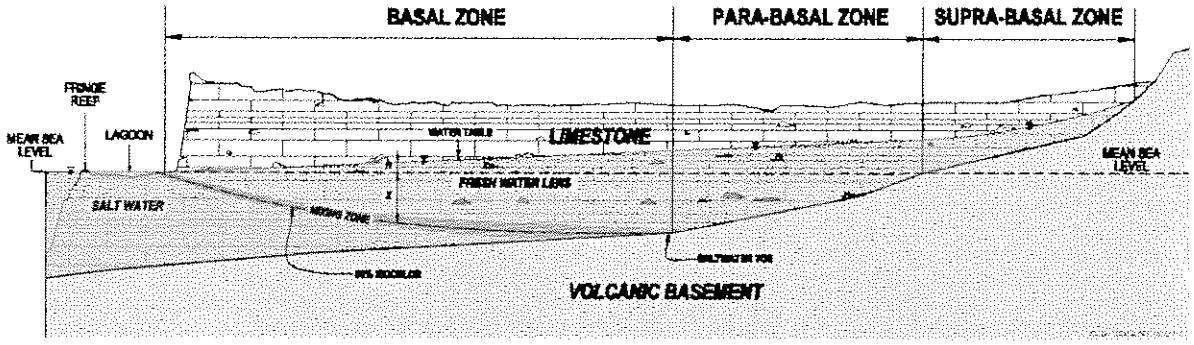
GHS Sponsored Research Projects Completed in FY'14:

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

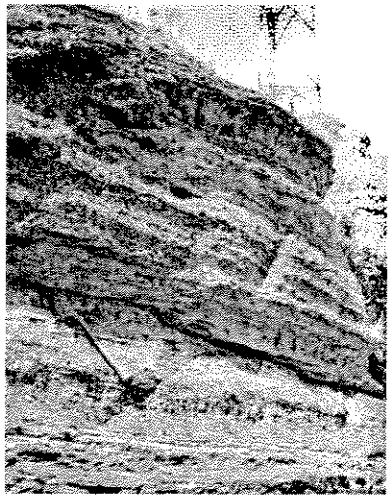
volcanic slopes above sea level, designated *supra-basal* water, is the freshest of the water in the aquifer and is completely invulnerable to contamination by sea water.



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.

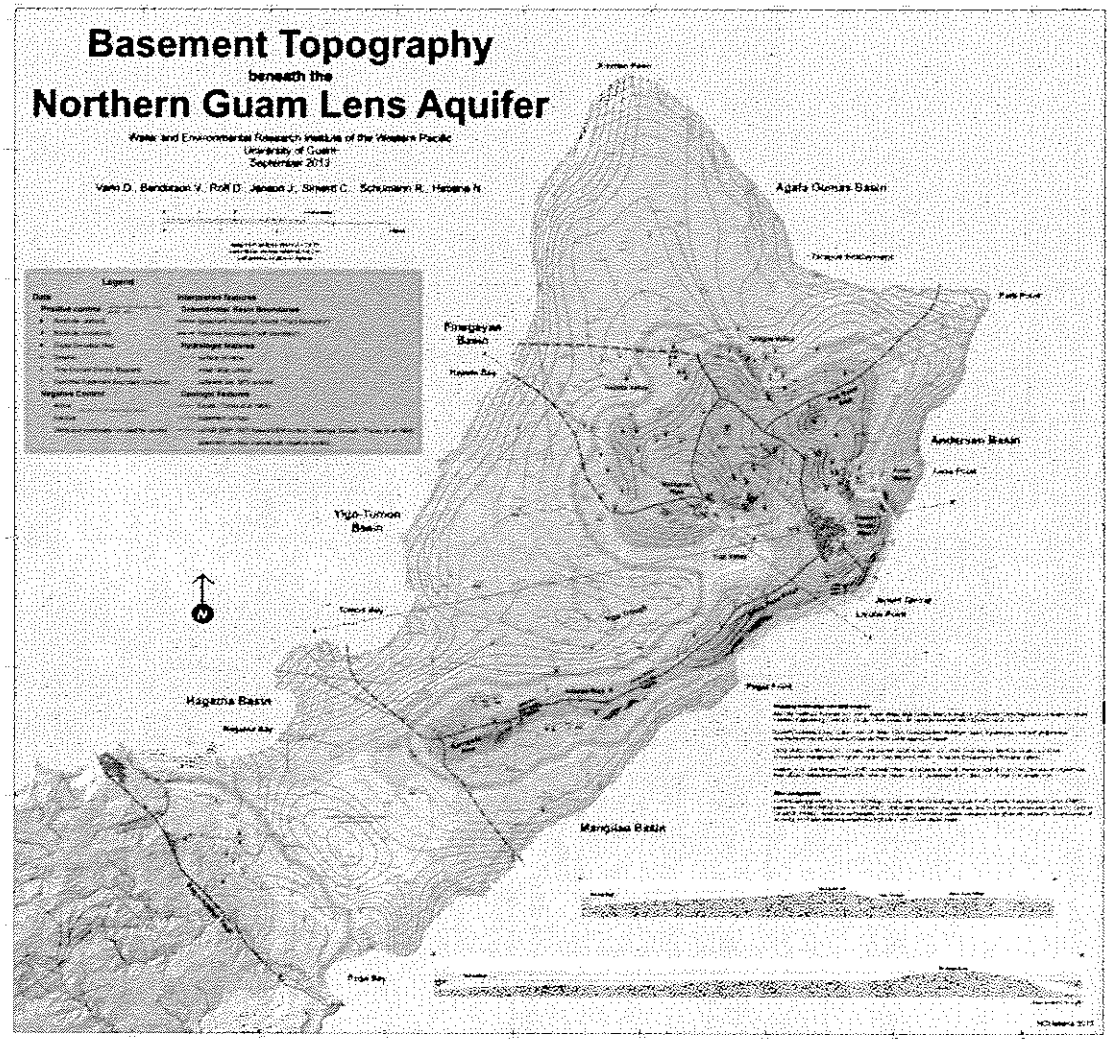
Most recently, the exploratory drilling program undertaken by the US Navy in 2010 in support of the anticipated military build-up provided additional new control on the elevation of the basement in crucial locations. Moreover, the new Guam Groundwater Availability Study led by the USGS Pacific Islands 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 anticipates publishing the latest revision of the basement map in early 2013 along with technical reports that will describe the supporting data and database, explain how the data were interpreted in developing the latest revision of map, and highlight its strengths and limitations. The new map will actually consist 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

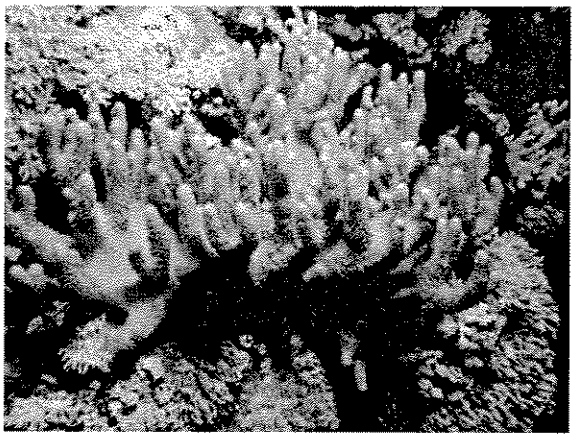
engineers in the public and private sectors, for which they will enhance the success and thereby reduce the cost of ongoing aquifer development. They will also be essential tools to environmental scientists, regulators, and policy-makers seeking to develop appropriate regulations for aquifer protection and sustainable management.



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

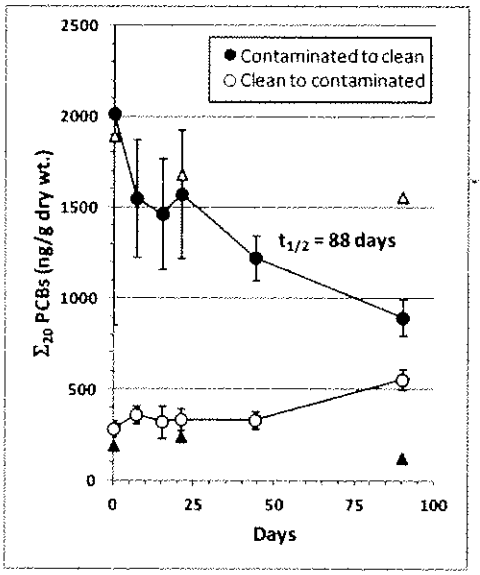
2. ***PCB Biomonitoring Strategy Development for Guam's Coastal Waters, Part II***
PCBs are a ubiquitous group of contaminants that were once widely used in industry. Considered by USEPA to be probable carcinogens, they accumulate within food chains, and are recognized endocrine disruptors. PCBs from 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.

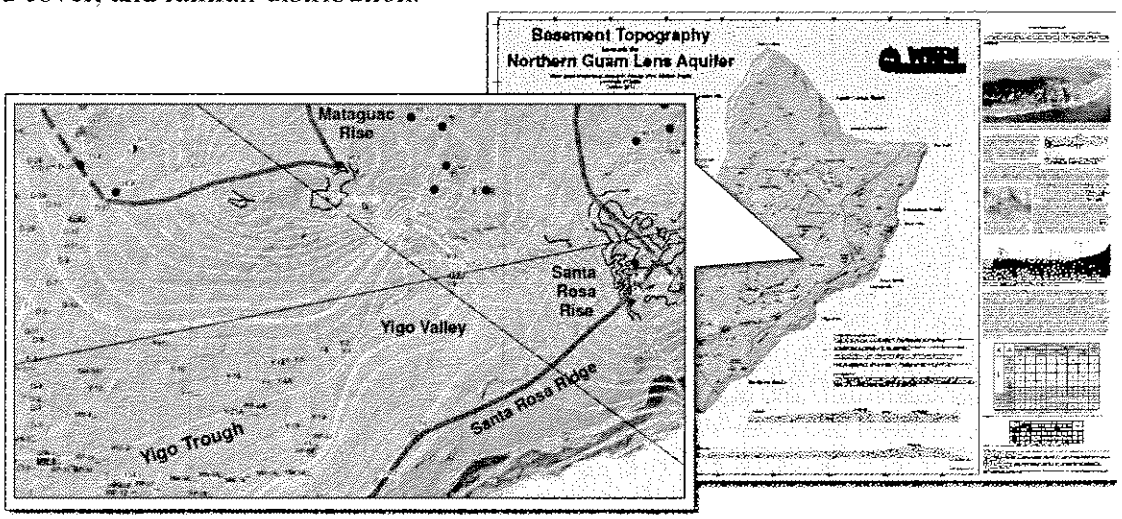
3. ***Development of a Hydrologic Map Series for the Northern Guam Lens Aquifer***

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

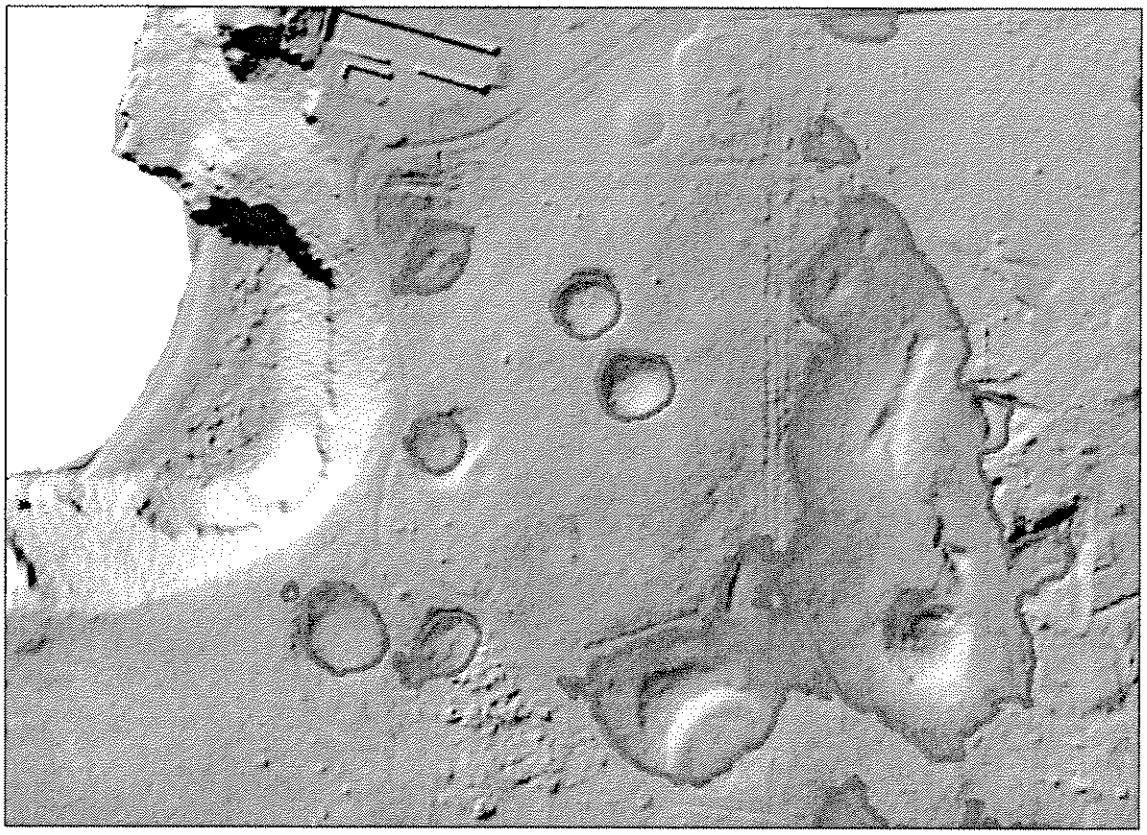
manage the groundwater system. The development of a series of hydrogeologic maps that captures each of the components—while also providing a means for showing their inter-relationships—is of basic and utmost importance for successful exploration, development, and management of the aquifer.

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.

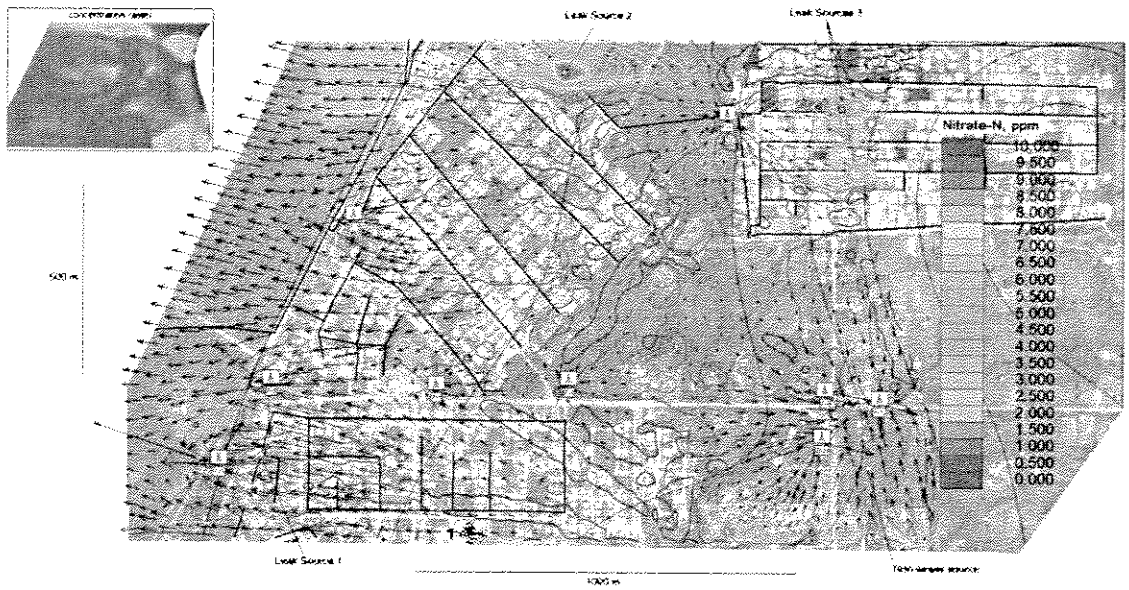
4. ***VADOCHARGE-N: a Vadose Flow and Nitrogen Transport Model for the Northern Guam Lens Aquifer***

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

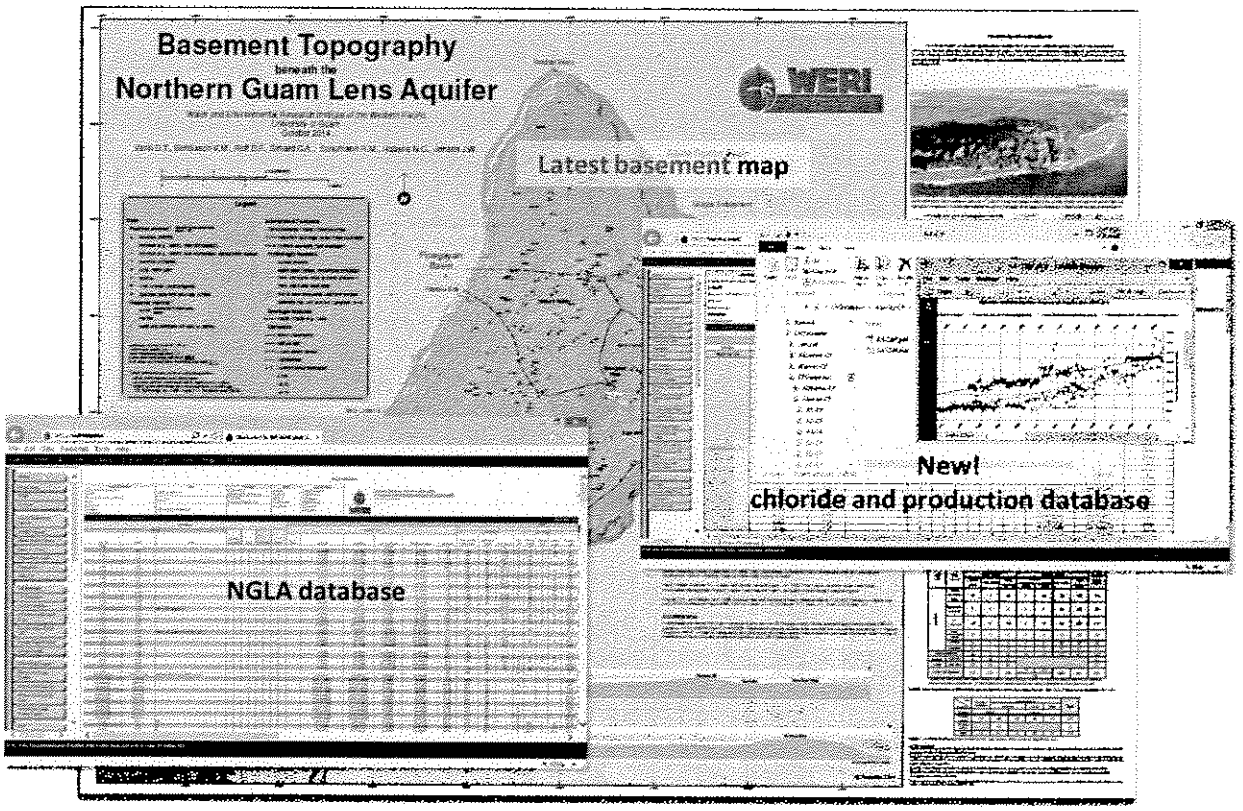
cascading weir algorithm. This unique innovation may be applicable to other similar karst aquifers. It incorporates nitrogen transport and transformation during deep vadose percolation, which is a new contribution to a poorly understood process. It extends Guam's groundwater flow models into N-transport, 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'14:
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) will soon be 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.

SUMMARY OF FY'14 EXPENDITURES FOR GUAM HYDROLOGIC SURVEY APPROPRIATION

Below is a composite summary of all expenditures lodged against the GHS account during FY'14. 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'14

Category	*Expenditure*
1. Salaries and Wages:	**$75,655.98**
2. Fringe Benefits:	**$24,415.34**
3. Tuition Fees	**$0.00**
4. Supplies:	**$5,963.03**
5. Computer Hardware/Software:	**$2,775.00**
6. Equipment:	**$5,367.55**
7. Projects/Consultant Fees:	**$9,262.50**
8. Postage/Long Distance Phone:	**$436.34**
9. Printing:	**$1,959.00**
10. Utilities/Subscription/Dues:	**$208.00**
11. Administrative Fees*:	**$18,269.40**
Total FY'14 Expenditures:	**$144,312.14**
Total FY'14 GHS Allotment Rec'd as of 10/14:	**$138,538.40**
Balance:	-$5,773.74
Total Approved GHS Budget Allotment for FY'14:	**$182,694.00**

GHS Comprehensive Monitoring Expenditure Summary for FY'14

Category	*Expenditure*
1. Projects/Consultant Fees:	**$144,580.00**
2. Administrative Fees*:	**$15,562.60**
Total FY'14 Expenditures:	**$144,580.00**
Total FY'14 GHS-CM Allotment Rec'd:	**$118,008.80**
Balance:	-$26,571.20

Total Approved GS-CM Budget Allotment for FY'14: $155,626.00

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

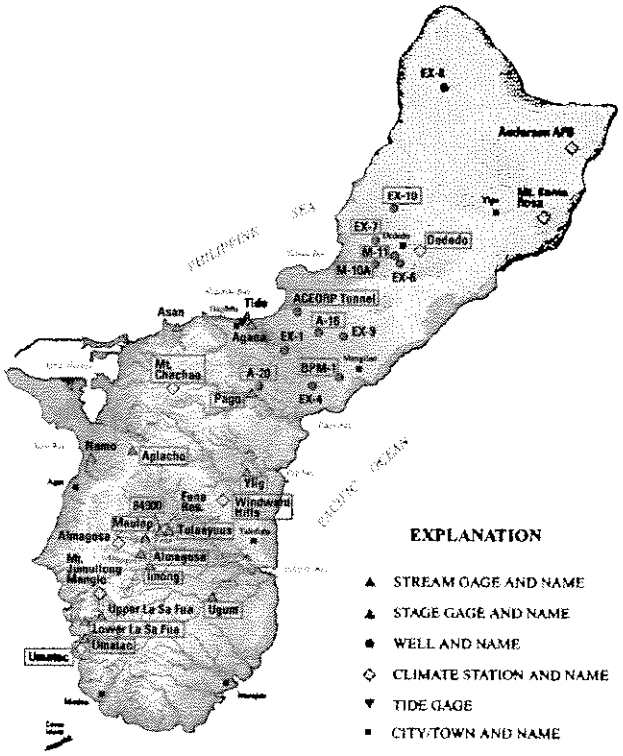
COMPREHENSIVE WATER MONITORING PROGRAM (CWMP)

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.

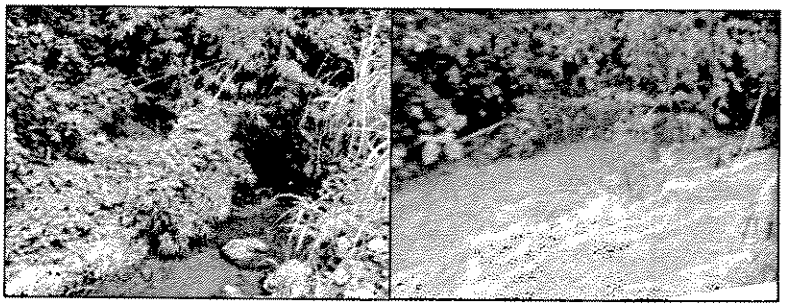


Locations of USGS monitoring stations on Guam

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?

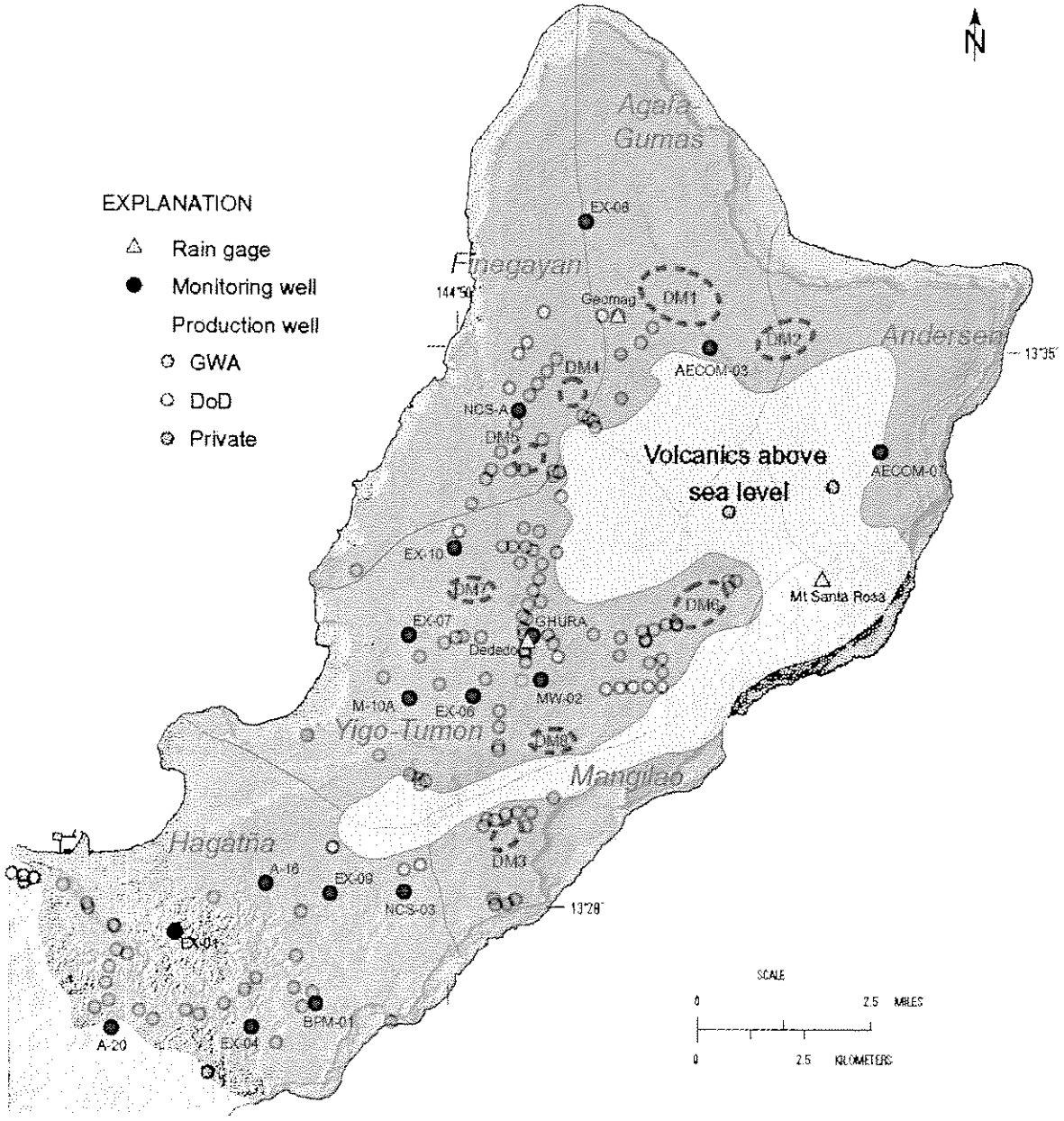
In fiscal year 2015, the cost to operate a continuous-record streamflow gage will be $21,683. This includes all operation and maintenance, site visits, field data collection, data analysis, and computation of the flow record. Gage operations are frequently reviewed and upgraded as improvements become 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 SPONSORED PROGRAMS

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

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.

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.

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.

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.

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

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., Taborosi, 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.

2013

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

Budget Account Allocation		FY2012		FY2013	FY2014				
FUND TITLE	**Fund**	Actual Appropriation	Percent of Program	Authorized Appropriation	Current Service	Program Plan	Governor's Recommendation	**FY2015** Projected	**FY2016** Projected
General Fund Appropriation		$850,036		$922,781	$922,781	$995,781		$1,068,781	$1,141,781
Guam Hydrologic Survey (Local)		$192,309		$182,694	$182,694	$182,694		$204,200	$204,200
Guam Water Monitoring Project (Local)		$163,817		$155,626	$155,626	$155,626		$173,948	$173,648
USGS Water Institute Program (Federal)		$277,005		$166,575	$166,575	$166,575		$166,575	$166,575
USGS Supplemental Program (Federal)		$24,963		$19,976	$19,976	0		0	0
USGS Pacific Islands Climate Center (Federal)		$83,008		$83,008	$83,008	0		0	0
ENSO Application Center (Federal, National Weather Service		$259,248		$50,000	$50,000	0		0	0
National Science Foundation (Federal)		$164,335		$164,335	$164,335	0		0	0
GWUDI Program (Local)		$69,219		$69,219	$69,219	0		0	0
GWUDI Program (Federal)		$44,870		$44,870	$44,870	0		0	0
Total Program Appropriations		**$2,128,810**		**$1,859,084**	**$1,859,084**	**$1,460,676**		**$1,613,504**	**$1,686,204**
Performance Indicators	**Type**								
Undergraduate Courses Taught	WKLD	3		1		0		0	0
Graduate Courses Taught	WKLD	8		9		0		0	0
Thesis Committees served (chaired)	WKLD	15(9)		11 (9)		0		0	0
Projects Initiated	WKLD	12		13		0		0	0
Projects completed	WKLD	12		13		0		0	0
Technical Reports	WKLD	5		11		0		0	0
Journal Articles/Conference Proceedings.	WKLD	10		9 (7)		0		0	0
Professional Presentations	WKLD	10		12		0		0	0
Workshops/Conference Presentations	WKLD	2		1		0		0	0

Southern Guam Soil and Water Conservation District
2014 Annual Report

Mission Statement:

The Southern Guam Soil and Water Conservation District is committed to the protection, preservation and restoration of our natural resources through stakeholder advisement to local and federal agencies, peer education, and technical assistance to Southern Guam landowners and leaseholders.

Objectives:

The Southern Guam Soil and Water Conservation District (SGSWCD) identified 4 conservation priorities for 2014:

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.*

Sources of Revenue:

Government of Guam General Fund FY 2014 funds of $74,692.00 with a $112,804.30 carryover funds from FY 2013. Total operating funds are $187,496.30.
Note: By the end of FY 2013 (in September, SGSWCD's carryover was $17.57 (Savings) and $112,786.73 (Checking) = $112,894.30.

Expenditure by Budget Classification

Category	Description	Amount
Salary & Benefits		
Travel	National & Regional Meetings	$17,285.10
Contractual	1 Administrative Staff -Salary ($12,000.00) 1 Resource Outreach Agent Salary ($18,000.00) 1 Resource Outreach Asst. Salary ($12,000.00) National Association of SWCD's Annual Dues ($775) Marianas Variety Ads ($792) *June, August, September (360.00) – not paid yet*	$43,927.00
Supplies	Office Supplies	$500.00

Miscellaneous	Stipends ($1,700.00) ***Outreach: Education Symposium 2014 – subject to change on 50/50 cost*** • Certificates & 2 Paper Rims; Reimbursement Casiera Cruz ($131.18) • Sabina Perez ($1,000.00) Farmer's Record Keeping Workshop ($141.85) Gaosali Stickers ($504.00) 50/50 Cost of Northern & Southern District Banner ($150.00) Sea Grant ($5,000.00) 50/50 NGSWCD Outreach: Education Symposium 2013 Share ($2,800.00) • 50/50 NGSWCD Education Symposium 2013 Thank You Ad ($250.00) • Reimbursement Angelita Mendiola Paper Cups Ed Symposium 2013 ($11.55) Swearing in Expense Reimbursement Linda Reyes ($9.57) Pumpkin Contest Aware Recipient ($100.00) Wattle Demo ($225.00)/Workshop Menu ($225.00) Umatac Planting ($119.00) Partner Event Support: Pig Derby/Pork in the Park – ($142.00) Business Card Orders ($58.00) Layon Tree Planting – ($170.00) 2013 NACD Auction item-shared cost w/Northern, 50/50 share with decals, logo, and door ($310.00)	$13,046.75
Total Expenses		$74,758.85

Type and amount of Contracts or Purchase Orders Executed FY 12:

- One Personnel Contract executed for $12,000.00 to fulfill the role and tasks of Office Clerk.
- One Personnel Contract executed for $18,000 to fulfill role and tasks of Outreach Resource Agent
- One Personnel Contract executed for $12,000 to fulfill role and tasks of Outreach Resource Assistant

- Open Purchase Order (PO) was maintained/renewed/executed with Marianas Variety Guam for announcements of Board and/or Member meetings.

- Open Purchase Order with National Office Supplies for office supplies for $500.00

Program accomplishments achieved during Fiscal Year 2014:

Promotion of USDA Conservation Programs

The USDA Natural Resource Conservation Service (NRCS) was unable to conduct the annual Local Working Group (LWG) meeting this year due to staff being assigned to Hawaii office, but input was provided by the Southern Guam SWCD via a questionnaire that was sent out to the districts by NRCS requesting their input regarding water and soil quality/conservation issues. NRCS advised that this input would be used in the prioritization of USDA conservation programs.

Feral Pigs

The issue of feral pigs is still of major concern to the districts due to the significant erosion and water contamination impacts created by the activities of feral pigs. Fencing and trapping options are still being explored, and fencing around croplands has been approved for the NRCS EQIP program. In an effort to reduce the feral pig population island wide, the Southern Guam SWCD assisted with the 3rd Pig Hunting Derby held on December 14 and 15, 2013. Produce from local farmers was provided to the southern hunting derby stations in Talofofo and Merizo.

Umatac Cemetery

The Southern SWCD continued to work with Guam EPA, NRCS, Public Health, Land Management, and the Umatac Mayor's Office to address major soil erosion issues at the Umatac Cemetery. This year it was decided to plant vetiver and lemongrass above the cemetery in an effort to reduce runoff from the hillside above the cemetery and thus lessen the impact of runoff on the cemetery itself and on into the coastal area. Unfortunately, there was a lack of communication between the mayor's office and the contracted maintenance crew which bush cut the vetiver and lemongrass along the edge of the hillside apparently thinking they were weeds. The Southern SWCD will reschedule planting with the Department of Agriculture and the Umatac Mayor's Office to replant the vetiver and lemongrass in order assess the effectiveness of this effort.

Promoted 59th Stewardship Week

Southern Guam SWCD collaborated with the Northern District to promote the celebration of the 59th year of Stewardship Week from April 27th – May 4th, 2014, which is sponsored by the National Association of Conservation Districts. The 2014 Stewardship Week was themed, "DIG DEEPER: Mysteries in the soil." A press conference was held with Governor Eddie Calvo and 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.

Chalan Layon Tree Planting

In October 2013, the Southern SWCD assisted Guam EPA and other partners and numerous volunteers with a tree-planting project along Chalan Layon, the road leading to the Layon Landfill located in Inarajan. The district donated a variety of fruits for all the participants.

Conservation Education and District Outreach

From August 13-14, 2014 the Southern and Northern SWCDs collaborated for the second annual Educators' Symposium for K-12 Guam school teachers. This symposium provided them with tools to increase awareness and promote conservation, to enhance networking, and to create Guam relevant lesson plans in topic areas such as soil health and conservation. The educators' symposium was facilitated by Sabina Perez and Eloise Sanchez and about 35 to 40 educators participated in the two-day event. The symposium was also rated extremely favorable and participants are committed and motivated to bring valuable lessons on soil health and conservation into the classrooms.

Farmer's Record Keeping Workshop

On July 9, 2014, the Southern and Northern SWCD co-sponsored a Farmer's Record Keeping Workshop to provide farmers with a simple but effective method for maintaining proper records for tax purposes as well as proper documentation in the case of typhoons or other disasters that can severely impact farmers' harvests and consequently their income. The training was conduced by Frank Cruz, retired UOG Cooperative Extension Agent, and was very well received. Over 40 individuals attended, and the group was comprised of SWCD directors, extension agents, farmers and others related to farming. The feedback was very positive and the Southern SWCD will likely promote more training events such as this in the future.

Training for SARE grants for Southern farmers

On September 11, 2014, an informal training was held at the home of Southern SWCD Director Benny Chargualaf to assist farmers who are interested in pursuing SARE grants. The basic requirements of SARE grant proposals were presented and possible projects ideas that could be pursued by farmers were discussed. Participants welcomed the opportunity to learn more about grant proposals in general and the response was very positive.

Wattle Demonstration by NRCS

In November 2014, a wattle demonstration was conducted by NRCS Assistant Director Western Pacific PIA Bart Lawrence for a group of southern farmers. The demonstration was designed to provide easy methods to address storm water runoff issues on farmers' properties by using natural materials easily found in most areas of southern Guam. The demonstration was well attended by a variety of natural resource employees as well as several farmers from the area.

Erosion control measures promoted and adopted by mayors of southern Guam villages

In an effort to assist the mayors of some of the southern villages of Guam with erosion issues, the Southern SWCD partnered the Department of Agriculture, NRCS and Guam EPA to promote the creation of propagation sites for vetiver and lemongrass near the mayors' offices in the villages of Umatac, Asan and Agat. Plant material was provided by the Department of Agriculture, and a demonstration of appropriate plant preparation and planting was given to the mayors' and their respective staff members to promote the implementation of the propagation sites. The propagation site for the village of Agat was right on the coast and was severely impacted by the salt spray. A new site will be identified that hopefully will be more successful. As described above, the village of Umatac was using the hillside above the cemetery as their propagation site and this site was destroyed by maintenance. The Asan propagation site was vandalized but was replanted and appears to be successful. The Southern SWCD will continue to work with these villages as well as other southern villages to promote the propagation of these two grasses that are highly successful in erosion control.

Asan Mayor assisted with stormwater flooding in village

Over 20 Navy Chief-Selects assisted with clearing a residential lot that causes serious flooding every year in the village of Asan. The Southern SWCD, with the assistance of NRCS and Guam EPA, initially conducted an assessment of the site, and it was determined that an aggressive clearing of vegetation and trash would be the appropriate first steps in addressing this flooding issue. Once this was determined, the Southern SWCD worked with the chief-selects to, first, conduct an inspection of the site and then do an aggressive clearing of the vegetation and trash on the lot. With the assistance of the Department of Agriculture, we were able to mulch all the green waste and use it onsite, and an entire truckload of recyclables and other trash were hauled away as well. Follow-up work will be conducted with earth-moving equipment to level the site and create an appropriate berm to prevent the storm water from flooding the neighboring residential lot.

National Activities

In December 2013, two Southern District Board Director's Angelita Mendiola and Bill McDonald attended the ACRES USA Conference in Springfield, Illinois. The conference consisted of various seminars, workshops, eco-consultants, trade shows, and farmers and consultants from every side of agriculture. The main focus of the conference was ecological farming and its mission was to help farmers, ranchers, and gardeners grow food organically and sustainability without harmful toxics. Many topics were discussed such as fertile soil, elimination of synthetic fertilizers, increased natural fertilizers, and the usage of the "American Keyline Method." Other important topics included cover crops, minimal plowing, rotating crops, and the importance of insects and weeds for farming elements.

Southern Guam Soil and Water District continues to be engaged at the national level to ensure that conservation programs are extended to Guam and the Pacific region. Four district board members (two from Northern and two from Southern) joined other Pacific Island Districts representatives and attended the National Association of Conservation Districts Annual Meeting in Anaheim, California in February 2014. In the various meetings and breakout groups they were able to present many of the Pacific islands' soil and water conservation concerns, particularly that of feral pigs, and learn of programs and information sources that are relevant to the region and Guam. General sessions promoted increased networking with partners and community outreach.

In February 2014, Southern District Board Vice-Chair Bill McDonald attended the 2014 World Agriculture Expo in Tulare, California. In attendance were inclusive of the public, NGO's, various businesses, and local and national agencies. Through demonstration, soil tillage and landscapes were used to promote conservation practices. In addition, new farm equipment showed promise in lessening damage from soil erosion, green waste composting/mulching, and animal waste recycling.

Key issues that must be addressed:

Is it imperative that the Southern SWCD continue to collaborate with Off-Roading organizations in order to more effectively address soil erosion exacerbated by off-roading activities.

Continue to expand the use of vetiver grass and lemongrass as an erosion control method in areas impacted by feral pigs, off-roading, arson and other activities.

Work with UOG 4-H Club Department on school outreach program and special projects.

/S/Angelita Mendiola, Chairwoman

Guam Southern Soil and Water Conservation District

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a8783@hotmail.com

NORTHERN
GUAM
SOIL & WATER
CONSERVATION
DISTRICT

2014 Annual Report

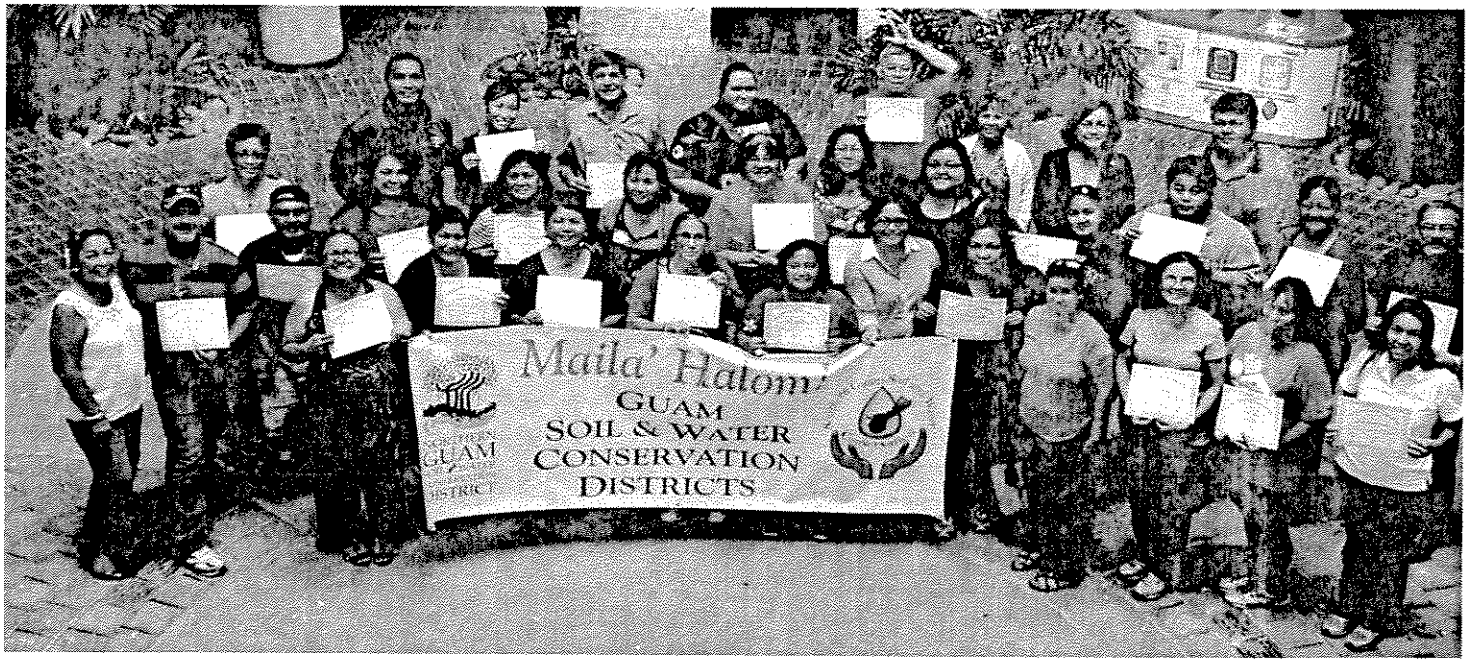
"When the land does well for its owner, and the owner does well by his land—when both end up better by reason of their partnership— then we have conservation."

Aldo Leopold

Chairman
Roland Quitugua

Vice Chairman
Joseph Santos

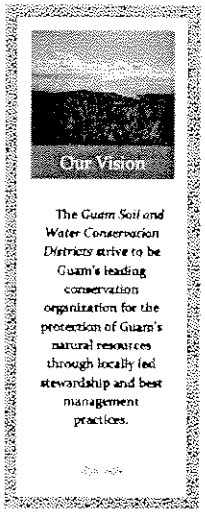
Directors
Hope Cristobal
Ronald Laguaña

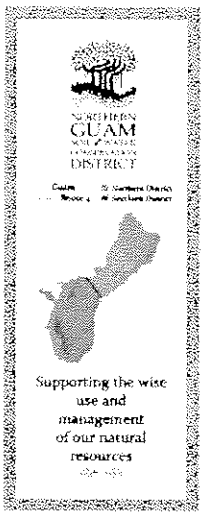


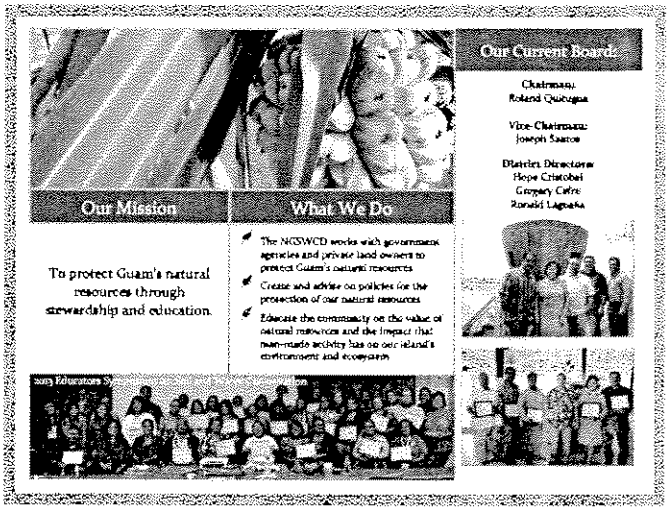
2014 ANNUAL REPORT

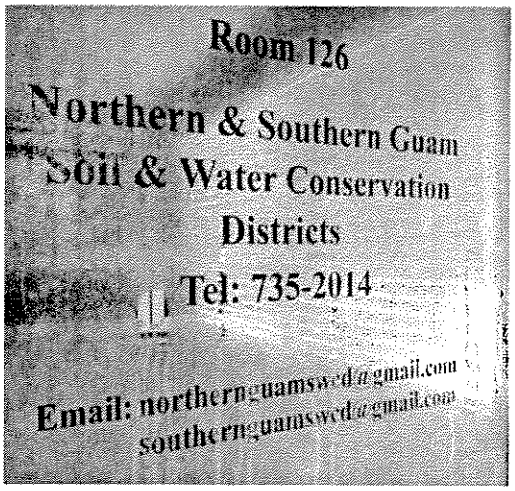
NGSWCD Tri-fold

The NGSWCD has created an informational tri-fold document for outreach and education. It has been mass distributed and provides information regarding the District's mission, vision, goals and contact information for the general public to better understand the role of the Northern Distict.







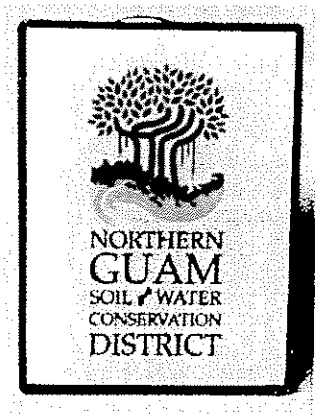


NGSWCD Office

The Guam SWCD's now has an official office space located at the University of Guam's Agriculture and Life Sciences building. This space is currently utilized for District meetings and other official/unofficial meetings with District partners and others.

NGSWCD Pins

Due to the heavy interest in the Guam seal pin while attending conferences and meetings, the Northern District created official pins with the District's logo. These limited pins are reserved for our stakeholders and partners both locally and at the national level to show their pride in supporting the conservation of Guam's natural resources.



Conservation Innovation Grant: Carbon to Soil

NGSWCD works with UOG CES to determine the feasibility of a commercial composting /Mulching operation on Guam/ for many years a number of people and companies have investigated the economic feasibility to open such a operation but non have truly gone commercial. There are currently 4 permitted green waste sites on Guam but non are operating as a true composting facility. Over the course of the project the SCWD was able to work with all of the local companies who run mulching or chipping services. Commercial green waste operators learned lessons of the Guam market demand for mulch and compost (see attachment #1)

Island-Wide Green Waste Management Plan

NGSWCD, in conjunction with CES, performed a variety of interviews with local hard-fill site owners, village mayors, Cooperative Extension Agents, and local utilities in order to determine the current state of the island's green waste situation. This report is aimed at assisting in the development of an island-wide green waste management plan and identify gaps in policy and roles of various green waste stakeholders. Report is still in draft form.

Lot 2098

A 50 acre parcel in the Tamuning area (stretching from across Home Depot to East Agana) is currently designated as a nature preserve, but the NGSWCD aims to change it into a working conservation area. The area is envisioned to be the "Central Park of Guam" in an area where urban sprawl is reducing the total green space in in favor of development. A plan to create a nature walking and biking trail, environmental education, service learning and other ecological uses are planned. The Guam SWCD's are working on an MOU between the NGSWCD and Department of Parks and Recreation (as the location currently resides under DPR).

Chalan La Chanch Rain Garden

Under the request of Yigo Mayor Rudy Matanane, the Northern Guam SWCD, along with Adrienne Loerzel of NOAA have evaluated the flooding problem on Chalan La Chanch. Recient development in the area has resulted in the road becoming impassable to some cars as the water extends across the road and a foot deep n one area. A plan has been developed and cost estimate developed. Guam EPA and DPW agencies have conducted site visits with the northern District and determined that gaps in Guam law need to be revisited. Project is slated to for early 2015.

Boardsmanship/Board Ethics Training

The Guam Office of the Governor decreed that all Government of Guam boards are required to take Boardsmanship and Board Ethics training in order to be officially recognized. The NGSWCD completed their training on April 24, 2014 and the documents were turned into the Governor's Legal Office.

Stewardship Week Proclamation

In observance of the NACD Stewardship Week (April 27 – May 4, 2014), the NGSWCD developed a proclamation specifically for Guam's Stewardship Week. The proclamation was read and signed by Governor Calvo on April 21, 2014 and the event was attended by both the Northern and Southern Districts as well as their partners.

Guahan for Gaosali

The current territorial flower of Guam is the Bougainvillea, but this flower is not recognized as a native flower. In an effort to bring all the territorial symbols into the native realm, The NGSWD has partnered with the Micronesian Challenge to promote the Guahan for Gaosali project.

To spread the word and garner support for this project, the Northern and Southern Districts created a bumper sticker campaign that reads "Guahan para Gaosali". This sticker has proven very popular (over 1,000 have been printed and passed out) and

is currently being distributed throughout the community to provide information and gain supporters.

DoAg Forest Stewardship Program

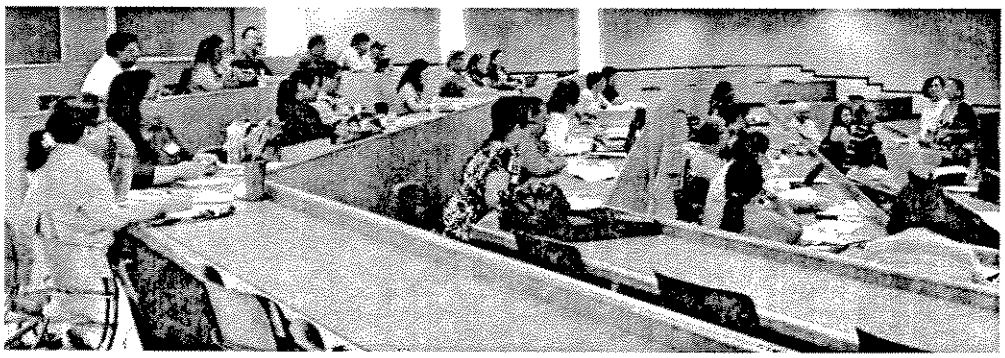
The Guam Department of Forestry currently runs a program that provides local farmers and land owners with local trees to assist in soil stabilization and the like for their area. It was the feeling of both the Northern and Southern Districts that native fruit trees should also be included on the list of trees for the program. A letter was drafted and sent into the Department of Forestry for review and consideration. Whether or not fruit trees will be added onto the list has yet to be decided.

Reconnecting with Chamorro Land Trust Commission

The Chamorro Land Trust Commission (CLTC) is an official partner to the Guam Soil and Water Districts, but has been absent from many of both Districts' meetings. In an attempt to reconnect the NGSWCD and UOG CES met with the Director and other representatives of CLTC to discuss current issues and ways to resolve them. Questions and concerns from both CLTC and NGSWCD/CES were expressed, followed up by deliverables for all parties to follow through with in order to reestablish a strong partnership. CLTC has since attended the last several SWCD meetings and deliverables will be followed up with.

2014 Educators Symposium

The popularity of the 2013 Educators Symposium with Guam's teacher community, resulted in a second Symposium held on August 13 and 14, 2014. This year's focus/theme was on soil health and conservation. A total of 32 educators attended the symposium, with a handful of them being repeats from the previous year's symposium. Evaluations at the end of the event demonstrated a very high rating for the topics taught, the instructors that presented, and resources/supplies that were provided. A 2015 symposium has been requested and is planned to take place around the same time next year.



National SWCD efforts:

The NGSWCD sits on the National Association of Conservation Districts (NACD) Natural Resource Policy Group and work via face to face meetings and monthly conference calls on national and regional conservation issues.

Feral Ungulates: The Northern District is leading the effort in the Western states and Pacific region to engage the federal agencies in addressing the feral swine issue as a national level. While President Obama has designated APHIS Wildlife Services as the lead federal agency to handle feral ungulates, NGSWCD proposes to submit a resolution at the 2015 annual meeting to engage all feral swine stakeholder agencies in order to control this spreading epidemic.

Waters of the U.S.
http://www.nacdnet.org/dmdocuments/NACD-Comment-Letter-IR-6-13-14.pdf

http://www.nacdnet.org/news/newsroom/2014/nacd-expresses-concerns-on-waters-of-the-u-s-proposed-rule

Conferences (ACRES, NACD Annual Meeting, CIS, EPA, WSARE)

- The 2013 ACRES U.S.A. conference was held in Springfield, Illinois from December 12-14, 2013. The conference was focused on various aspects of sustainable agriculture and farming including topics such as: Eco-Farming, Organic farming, cover crops, and more. This conference was attended by Director Hope Cristobal and Vice Chair Joseph Santos.
- The National Association of Conservation Districts (NACD) held it's annual meeting in Anaheim, California from February 2-5, 2014. Presentations included invasive species, natural resource concerns such as storm water issues, conservation practices, and the like. The Northern Guam District was represented by Chairman Roland Quitugua and Director Ron Laguana.
- The University of Guam's Center for Island Sustainability (CIS) held its 5th Regional Conference on Island Sustainability April 15 and 16, 2014 with a focus on Concept to Implementation: Achieving a Sustainable Community. Speakers included Seychelles Ambassador for Climate Change, Mr. Ronald Jumeau, who discussed the inner-workings of what it means to be a sustainable island community. Chairman Roland Quitugua, Vice Chair Joseph Santos, Director Ronald Laguana, and Conservation Associate Alison Hadley were all in attendance.
- The Guam Environmental Protection Agency (GEPA) held its first Zero-Waste Pacific Conference May 8 and 9, 2014. The conference focused on zero waste through trash and green waste management, as well as focusing on capacity building and community-based environmental protection. This conference

was attended by all Directors of the Northern District, while Chairman Roland Quitugua and Conservation Associate Alison Hadley also participated in a panel focused on composting.

- The Western Sustainable Agriculture Research and Education (WSARE) held a sub-regional conference on Pacific Infrastructure May 19-21, 2014. WSARE participants and representatives came from all over the region to present on successful projects, completed research, and produced a great deal of conversation focused on assisting the Pacific region with many agriculture infrastructure needs and issues. Chairman Roland Quitugua, Vice Chair Joseph Santos, Director Hope Cristobal, and Conservation Associate Alison Hadley were all in attendance.

Attachment #1:

CONSERVATION INNOVATION GRANTS

Progress Report

Grantee Name: University of Guam	
Project Title: Carbon to Soil, Not to Landfill: Building the Island's Soils Though a Sustainable Organic Matter Capture and Distribution System (69-9251-10-888)	
Project Director: L. Robert Barber, Jr.	
Contact Information:	**Phone Number:** 671.735.2087 or 671.787.7391 **E-Mail**: bbarber@uguam.uog.edu
Period Covered by Report: October 2011 to September 2013, activities continued until December 2013	
Project End Date: September 30, 2013	

Summarize the work performed during the project period covered by this report:

Project activities within the funded years encompassed the following major areas: 1) Site preparation, green waste collection, green waste processing, and mulch distribution, 2) Demonstration plot establishment, 3) Education and outreach, and 4) Interviews into the sustainability of future green waste processing and distribution systems.

From September 2011 to December 2013, the following was accomplished:
Site preparation, green waste processing, and mulch distribution.
A faculty project manager began oversight in February of 2012, who subsequently completed plans for the processing, treatment, and mulch distribution activities. UOG obtained, prepared, and submitted site permitting forms and other paperwork to the Environmental Protection Agency (EPA). EPA reviewed the documents with no resulting negative feedback.

In the preliminary year and a half, project partners (Northern Soil and Water Conservation District, northern mayoral offices, RC&D) collected green waste and telephone books, stockpiling them at the Kato Farm site. Project partners were extremely active in green waste accumulation, site clean-up activities, and were compliant with site access and use protocols. The project thus received high quality green waste that was mostly free of trash.

In 2011, 65 cubic yards of green waste was collected and staged for mulching. By mid-June 2012, UOG estimated that it shredded in excess of 210 cubic yards (cy) of green waste. In addition to the general public, UOG and the mayors received mulch for their community gardening and sheet mulching demonstration efforts.

During 2012 and 2013, UOG and project partners oversaw five mulch distributions or deliveries to: the NOAA-funded Fouha Watershed Restoration Project (15 cy in 2012), Chamorro Land Trust Commission lease holding farmers (280 cy in 2012), the general public (at least 59 cy on May 19, 2013; at least 33 cy on June 1, 2013), the Talofofo Senior Center, UOG demonstration plots, Center for Island Sustainability, and St. Francis School (62 cy on December 19, 2013). In 2013 another distribution day had been scheduled for September 21 but was cancelled due to unusually stormy weather. Subsequent heavy equipment breakdowns precluded another major distribution before the project end. However, the project leaders, using UOG CES and local funds, were able to process the final green waste and distribute the mulch at village demonstration sites (Yona, Mangilao, and Talofofo); UOG Cooperative Extension resources also funded final site clean-up.

Demonstration plot establishment.
In 2012, UOG removed dead limbs, cleared the perimeter road, spread approximately 225 cubic yards of mulch, and established the fruit tree orchard at Kato Farm. In the same year Extension field agents also established two on-campus vegetable gardens and agroforestry demonstration plots (based on sheet mulching) as a result of their training in soil building methods. As of December 2013 these plots are still in active production and several of them are growing in size.

Part of the partnership agreement with the Chamorro Land Trust Commission was to utilize mulch to improve the Kato site's soil and to establish an agroforestry demonstration. Significant headway was done on this objective during earlier reporting periods. A core skeleton of fruit trees were planted in this area during two rain seasons. The site does not have water for irrigation so some of the trees were lost during the dry seasons. Also, the perimeter fencing has holes in it and feral ungulates entered and dug up approximately 30% of the other trees. During the final year fruit trees for replacement and expansion of the plantings were started in an on-campus nursery and planted out. The site now has the largest sheet mulch demonstration that we know of on island.

Education and outreach.
During project and site development planning, project members promoted mulch use by including lectures on the importance of mulch in building Guam's soils (30 minutes) and sheet mulching (30 minutes) in UOG Cooperative Extension workshops. During 2011, the workshop series included:
Backyard Fruit Trees (June 18), Soil and Water Conservation (June 25), Organic Soil Practices (July 2), and Backyard Fruit Trees (July 5). These efforts served to start the development of curriculum for use through the project period. A major effort was to conduct public education on the need for organic matter in Guam's soils and the benefits of mulch in order to increase the demand for mulch by farmers and gardeners, island wide. In this effort the project was very successful.

From September 2011 to March 2012, UOG led two workshops on soil building and sheet mulching using curriculum materials prepared in earlier periods. At the same

time five new field agents were trained in a standardized gardening curriculum for use with schools and community gardening efforts. Mulch and sheet mulching lectures developed by this project are a core component (3 hours) of this 16 hour curriculum. The five-member cohort of new Extension field agents then set up an on-campus demonstration sheet mulch, vegetable garden and an agroforestry establishment using sheet mulch demonstration on campus for use in trainings.

UOG finalized its gardening curriculum and in 2012 and in 2013 delivered additional sessions on sheet mulch, mulch, and compost to different audiences, including the general public (February 2), teachers and the general public at St. Francis School in Yona (May 11), counselors and participants at the Yona Mayor's Office/Haya Foundation Summer Camp (July 2-25), UOG 4-H staff (October 1-3), and public school teachers and students implementing school gardens at Upi Elementary (October 22) and Simon Sanchez High School (November 9). Approximately 160 people total in 2013 received training at these workshops. These efforts have become a core part of the UOG CES ANR New Farmer Curriculum and the Children's' Healthy Living Projects home and school gardening curriculum.

The curriculum incorporates a variety of publications from Extension, NRCS, and Power Point presentations on mulch, sheet mulching and plant nutrients derived from the soil. The soil and mulching workshops run to about four hours and include a 2-3 hour lecture plus one hour of hands-on practice.

Additionally, the curriculum was distributed to members of the Guam Non-Communicable Disease Consortium (NCD), a group headed by the Guam Department of Public Health and Social Services. A NCD Consortium initiative includes the promotion of fruit/vegetable intake through gardening and has accordingly implemented a gardening mini-grant program, which helps to fund 15 to 20 different garden projects at village mayors' centers and nonprofit organization sites. Through outreach UOG has established linkages to a nontraditional Extension audience to whom it can promote soil building practices and conservation efforts.

As for media, UOG Sea Grant enlisted faculty assistance in drafting an editorial about mulch use on May 29, 2013. Faculty also made radio appearances which generated significant positive feedback. Our returned evaluations suggest that future publicity should include more morning radio interviews.

Research into the sustainability of future green waste processing and distribution systems.

Project members distributed surveys and conducted interviews with participants on the mulch distribution days. From these communications and the overwhelming demand we experienced on these days, we were able to identify that home and market gardeners, and small farmers are willing to pay from $25 to $50 for mulch if it is clean. The more composted and fine the particulate size is the higher they are willing to pay. For true compost several indicated that they would be willing to pay even higher than $50 a truck load. Farmers, if they must provide the dump truck

and hauling cost, appear only willing to pay up to $100 a dump truck load, and possibly $200 if delivered. Farmers are less concerned with particulate size but are very concerned that it be clean (free of non-organic matter waste). Prior to this project, many earlier efforts included contaminates from construction and other debris. Many of the gardeners and small farmers indicated they would like compost that met organic certification (this was beyond the scope of this project). It should be noted that no tipping fee was collected for the green waste, and that this could significantly reduce costs. It is also the current practice in the private sector for green waste disposal.

From this project we learned that the equipment costs are by far the most significant in the collection, shredding and distribution of green waste to mulch. Even using contracted equipment from the private sector, delays were common due to equipment maintenance issues. Heavy seasonal rains caused the green waste to be too wet to process forcing more delays and additional cost in materials (plastic sheeting) and labor to cover the mulch to prevent rain penetrating the green waste wind-rows. Cost of producing mulch using local contracts (we worked with several local contractors using a variety of equipment) varied from $20 a cubic yard to over $50 depending on the equipment used and size of the batch. Smaller batches were more costly as equipment transport costs become a significant portion of the overall cost. Sustainability is more likely if future efforts place the collection and distribution efforts where the equipment is located.

The project team convened a stakeholder meeting on September 25, 2013 with two senators and representatives from EPA, Department of Public Works (DPW), and private industry hard fill/heavy equipment operators. UOG also conducted follow-up interviews with legislative staff whose office oversees the landfill and solid waste receivership (October 14), hard fill/heavy equipment operators (late October), EPA (November 12), and DPW (October 29, December 12).

From these meeting a strong interest in a public private partnership was expressed. The public sector has the need to process the green waste and the private sector currently has the available equipment and a better history of equipment maintenance. Siting future operations needs to consider the distance for delivery and distribution. As a result of these meetings, UOG Cooperative Extension Service, Agriculture and Natural Resources Program was invited to provide input into DPW's master debris management plan and the development of a master green waste management strategic plan. The private operators

Describe significant results, accomplishments, and lessons learned. Compare actual accomplishments to the project goals in your proposal:

Goal 1: Document the permitting requirements and process.

In 2012, UOG obtained, prepared, and submitted site permit forms and other paperwork to Guam EPA. EPA reviewed the documents with no resulting negative feedback.

Since the CIG project began in 2010, three commercial hard fill operators applied for and received mulch/compost processing permits from EPA. Between October to November 2013, UOG and NSWCD staff conducted semi-structured interviews with two hard fill operators and EPA (representatives from the Solid Waste and Green Waste Permitting divisions). UOG also conducted site visits at two hard fill operations.

UOG has made the following significant findings: 1) That the public can review approved permits at EPA through Freedom of Information Act requests, 2) Wait times for permits can range from 45 days to one year, 3) EPA most often rejects permit applications because of incompleteness or inadequate planning for typhoons or other contingencies, and 4) Fees associated with green waste permits—while nominal at $200 (specifically payable to EPA for processing)—can reach upwards of $55,000 if engineering assessments are deemed necessary.

Goal 2: Identify cost recovery charge for organic matter that is high enough to allow economic sustainability but low enough to attract farmers and gardeners. Also, maintain records of the volume of organic matter distributed for evaluation purposes.

As noted earlier we experienced a wide variation in the cost of producing mulch from green waste due to different types and sizes of machines used, size of the batch relative to the machinery transport costs, and rhino beetle treatment when needed. This price ranged from a cost of $20 a cubic yard to a little over $50 a cubic yard (small batch with small machinery). But we also interviewed some of the local private operators and found that their maintenance cost range between $15,000 to $28,000 a year for the grinding or shredding machines. One operator estimated if done at his site he could sell it for $15 to $18. This estimate did not account for possible treatment of mulch/compost for rhino beetle control. We estimate the cost of this treatment at approximately $5.00 a cubic yard for labor and materials.

During two of our distribution days participants were surveyed. On the May 18 mulch distribution 36 surveys were collected from 39 individual who picked up mulch. Of those, 30 individuals wanted the mulch for raised beds, 14 for pots/nursery, and another 6 for the farm. The average ranking of the perceived quality of the mulch averaged 4.6 (range 1-5, 5 being best possible quality.) Out of the 28 respondents, 10 indicated they were willing to pay $20-$30 per cubic yard, with another 9 were willing to pay $41-60 per cubic yard. Nineteen (19) indicated they would like to purchase1-4 times a year, while fifteen (15) indicated that they would like to purchase 5-12 times a year.

On the June 1 mulch distribution day 22 individuals came to pick up mulch all 22 completed portions of the surveys. Of these, 15 individuals wanted for raised beds, 5 for pots and 5 for farms (some individuals wanted for more than one purpose). The average perceived quality of the mulch was 4.4. All of these respondents paid $20 a truckload and four indicated that they would be willing to pay from $20 to $40 per cubic yard. Four (4) indicated that they would like to purchase 1 truckload 1-4

times year, five (5) participants indicated they would like from 5-12 times year, and five (5) indicated that they would like more frequently than this.

If the production compost was consistently produced the commercial landscapers will represent a very large market. Currently one PIC brings in a 40 ft. container every 2-3 months filled with Sunshine mix ($30 a bag retail) local compost would be a direct substitute for this product.

During this project we were able to discuss with key large farm innovators the amount they are willing to pay per dump truck load of mulch. It appears that $100 per dump truck load (about 9-14 cubic yards) is the maximum any are willing to pay for mulch. They note that in addition to mulch price they have to pay for the dump truck rental and operation. This preliminary information indicates that for a project to move from serving gardeners and other small plot production areas to commercial farms, a tipping fee for disposal of green waste may be required to insure the sustainability of future operations. Also key to this will be a fast turnaround from shredding to distribution to avoid rhino beetle infestation, as treating for rhino beetle involves turning and spraying of the mulch (many gardeners don't want treated mulch). Farmers would welcome their farms being drop off points for mulch following typhoons when large amounts must be disposed of (this needs to be included in Public Works master plan). Farmers' willingness to pay is directly related to their awareness of the importance of mulch/organic matter in building their soils. Education can increase the demand for mulch on Guam's farms.

Goal 3: Document the necessary management and processing protocols to ensure success and to guide replication efforts on other parts of the island.
Site management and access protocols were basic but they worked well for the collection and distribution of green waste under the project. Protocols for the on-site handling of mulch and public distribution worked well. Only the mayors' offices had access (combination to the gate lock) to the site for drop off of green waste. Communications on the protocols included:

1) Importance of only green being delivered to the site.
2) Project regularly (initially weekly) visiting the site and in the few cases early on where non-green waste was dropped off following up immediately with the mayors' offices.
3) The office that left non-green waste was required to remove it.
4) The mayors provided mowing and other maintenance of the site as part of their partnership with the project.
5) Public distribution of mulch was only on preannounced days and hours when staff and a frontend loader were present.
6) Many other groups were interested in being included in the project to provide additional green waste. When others beyond the mayor participants were allowed unsupervised green waste drop off on a trial basis problems with large amounts of non-green waste being left on site. It is clear that green waste delivery must be

supervised when working with the public beyond the small core of project mayors. This will increase the cost of the mulch operation.

7) The protocols we have set up with the mayors for exclusion of all non-greenwaste materials were effective after the initial corrections were made. No infractions were recorded over last year of the project. Key in site management is restricted access to the collection site.

Goal 4: Conduct farmer workshops on building soil organic matter to include mulching, use of compost, but also to cover crop rotations, green manures, and use of nitrogen fixing trees.

From September 2011 to March 2012, UOG led two workshops on soil building and sheet mulching using curriculum materials prepared in earlier periods. The five-member cohort of new Extension field agents then set up an on-campus sheet mulch vegetable garden and agroforestry establishment demonstration to use in future trainings.

UOG finalized its farming curriculum and in 2013 delivered sessions on sheet mulch, mulch, and compost to different audiences, including the general public (February 2), teachers and the general public at St. Francis School in Yona (May 11), counselors and participants at the Yona Mayor's Office/Haya Foundation Summer Camp (July 2-25), UOG 4-H staff (October 1-3), and public school teachers and students implementing school gardens at Upi Elementary (October 22) and Simon Sanchez High School (November 9). Approximately 160 people total in 2013 received training at these workshops. These school and community workshop continued and increased in number in the final quarter of 2013 and the first two quarters of 2014.

The curriculum incorporates a variety of publications from Extension and NRCS, with Power Point presentations on mulch, sheet mulching and plant nutrients derived from the soil. Workshops run to about four hours and include a 2-3 hour lecture plus one hour of hands-on practice.

Additionally, the curriculum was distributed to members of the Guam Non-Communicable Disease Consortium (NCD), a group headed by the Guam Department of Public Health and Social Services. A NCD Consortium initiative includes the promotion of fruit/vegetable intake through gardening and has accordingly implemented a gardening mini-grant program, which helps to fund 15 to 20 different garden projects at village mayors' centers and nonprofit organization sites. Through outreach UOG has established linkages to a nontraditional Extension audience to whom it can promote soil building practices and conservation efforts.

As for media, UOG Sea Grant enlisted faculty assistance in drafting an editorial about mulch use on May 29. Faculty also made radio appearances which generated significant positive feedback. Our returned evaluations suggest that future publicity should include more morning radio interviews.

Lessons Learned.

Equipment constraints

The abundance of palm and other highly fibrous common green waste products limit the type of large scale machinery that can be used, and this equipment cannot handle waterlogged products. The project leaders explored a system to protect the collection piles from rain, which involved covering the piles with 20 x 100 ft. sheets of 6 mm plastic before shredding. Initial efforts were effective so long as the covers stayed in place. Over time, project managers increased the weights so as to protect against wind.

In 2013, green waste processing was delayed by two months on two separate occasions due to machinery malfunction; in previous years, the grinders also failed on more than one occasion. UOG learned of other green waste processing jobs handled by a company in which $30,000 of equipment damage was incurred. While a segment of these costs might be mitigated through the proper training of personnel in green wastes separation (as per EPA's recommendation), the on-going maintenance costs were cited by both DPW and EPA as prohibitive in the implementation of their own green waste processing.

Initial and recurring capital outlays are a severe constraint on private sector involvement in starting green waste processing operations. This could be mitigated by a private/government sector collaboration that involved accurate estimates of annual volume of greenwaste the government will need disposed of and 3-5 year funded contracts to handle this stream. Such a contract would enable a private operator to make the necessary capital investment.

Site control and acquisition

In the first months of the project, green waste separation was an initial problem that was eventually resolved through training of people who had access to the sites and vigilant monitoring. When new participants were allowed to bring greenwaste on a trial basis this again became a problem. This too, has been cited as a challenge within the private sector, as trash mixed in with green waste can cause machinery failures or require extra labor to conduct separation.

In separate interviews with DPW and EPA, the oversight of green waste staging locations are fundamental to speedy processing (again, to separate green waste from trash). Unlike private hard fill operators who already own land, however, DPW is in the process of identifying available staging sites for their own use in the regular removal of debris from their jurisdictions.

Invasive species control

The invasive coconut rhinoceros beetle (CRB) was identified in the pilot site, adding to costs and processes associated with green waste staging. The current treatment protocol involves turning the pile of mulch with a backhoe and spraying the material with an insecticide cypermethrin, then covering the pile with plastic sheeting. Mulch

needs to be processed—ideally within a week—and moved into the market immediately so as to lessen the potential for beetle reinfestation and breeding.

Despite the CRB breeding problem, the existence of CRB itself poses a legitimate reason to sustain green waste processing projects so as to prevent invasive species via organic materials importation. Indeed, law on the books bans such import. It is possible that through the coordinated efforts of green waste processor companies and government support, this will provide stronger incentive for the legislature to enforce existing policies against organic matter import.

Client outreach and demand
To increase the numbers of people picking up mulch, UOG staffers learned that in addition to newspaper ads, and email announcements though a carefully cultivated and updated client database, morning radio is an effective medium through which to reach the general public.

At the project's inception, UOG staff found that initially clients wanted "pretty wood chips" for aesthetic purposes. However, throughout the project's duration, anecdotal client experience bore out that mulch dramatically increased the health of their plants. Between the low-cost mulch distribution and information provided at each session, UOG staff noticed a demonstrably increased buy-in from hobbyists and part-time farmers.

Clients are willing to pay more for finely ground mulch and/or compost, and this feedback is also confirmed by an industry level provider. A power screen should be sourced for future projects to increase the availability of a more desirable product.

An alternative beyond the scope of the current project is to go one step further and process the mulch into compost following standards similar to the USDA National Organic Program rules and regulations for compost. These require frequent turning, nitrogen/carbon balancing and monitoring of compost temperature. According to clients, organic compost or mulch is a much more desirable product, although the premium that could be charged was not estimated beyond anecdotal comments that some would be willing to pay more than $50 a truck load.

Describe the work that you anticipate completing in the next six-month period:
The project partners will continue to conduct education/outreach on the importance of mulch and building soil organic matter using curriculum developed by this project. This curriculum has been embedded in the UOG CES New Farmer program curriculum materials and will be used for years to come.

In the space below, provide the following in accordance with the Environmental Quality Incentives Program (EQIP) and CIG grant agreement provisions:

a. A listing of EQIP-eligible producers involved in the project, identified by name and social security number or taxpayer identification number;

b. The dollar amount of any direct or indirect payment made to each individual producer or entity for any structural, vegetative, or management practices. Both biennial and cumulative payment amounts must be submitted.

c. A self-certification statement indicating that each individual or entity receiving a direct or indirect payment for any structural, vegetative, or management practice through this grant is in compliance with the adjusted gross income (AGI) and highly-erodible lands and wetlands conservation (HEL/WC) compliance provisions of the Farm Bill.

During the project no EQIP-eligible producers were involved in the project in terms of resource sharing other than obtaining mulch on the distribution days. A list of those paying $20 a truckload is available on request. Farmers' groups, in particular the Northern and the Southern Soil and Water Conservation Districts, Guam Farmers Cooperative Association and key farm innovators served on an advisory/steering committee. Many farmers purchased mulch under the project.

The focus was shredding the greenwaste into mulch, treating the mulch for rhino beetle and maintenance of the sheet mulch and agroforestry demonstration, finalizing the projects curriculum on use of mulch, and developing a contact list of individuals interested in picking up mulch on distribution days. No payments direct or indirect were made to agriculture producers during this period.

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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.

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.

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 at conferences and Naval Station
3) KPRG completed a member survey in June 2014 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 2014 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, 2013 to Sept 30, 2014

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KPRG 89.3FM PUBLIC RADIO GUAM
UOG Station Mangilao, Gu 96923
Telephone: (671)734-8930 Facsimile: (671)734-2958
Email: marketing.kprg@gmail.com / Website: www.kprgfm.com

Student Financial Assistance Programs

Fiscal Year 2014 Report

Total Expenditure	**3,877,375.88**
Total Students	**509**

MERIT AWARD

AY 2013-2014		
# Of Students		AMOUNT
UOG	179	$ 1,877,857.55
OFF ISLAND	5	$ 10,216.26

ACCESS TO HIGHER EDUCATION GRANT

AY 2013-2014		
# Of Students	AMOUNT	
110	$	147,250.00

GOVERNMENT OF GUAM STUDENT LOAN

AY 2013-2014		
# Of Students	AMOUNT	
35	$	227,000.00

NURSING TRAINING SCHOLARSHIP

AY 2013-2014	
# Of Students	AMOUNT
39	$ 322,551.85

YAMASHITA TEACHER CORPS

AY 2013-2014	
# Of Students	AMOUNT
43	$ 265,872.61

PEDRO "DOC" SANCHEZ SCHOLARSHIP

AY 2013-2014		
# Of Students	AMOUNT	
52	$	169,792.32

PROTECH

AY 2013-2014	
# Of Students	AMOUNT
46	$ 856,835.29