U.S. Forest Service International Programs
Community Mangrove Management
Technical Advisor Trip Report

In support of

the USAID-funded
Coastal Sustainable Landscapes Project (CSLP)
December 4-15, 2017

Submitted by: Nicole Cormier, Ecologist
USFS/Management and Engineering Technologies International, Inc.
109 Clementi Road, #03-04
Singapore 129791
Tel: +1 808-230-3448
Email: nxc692@gmail.com

Acronyms and Abbreviations

BMP	Best Management Practice(s)
CBO	Community Based Organization
CCC	Community Conservation Committee
CCM	Centre for Coastal Management, University of Cape Coast
CREMA	Community Resources Management Area
CRMC	Community Resources Management Committee
CSA	Climate Smart Agriculture
CSLP	Coastal Sustainable Landscapes Project
DAA	Development Action Association (DAA)
FC	Forestry Commission
FCM/FCMP	Fisheries and Coastal Management Program
FY	Fiscal (or Financial) Year
GAW	Greater Amanzule Wetland
GAWCCC	Greater Amanzule Wetland Community Conservation Committee
GHG	Green House Gases
GIS	Geographic Information System
GOG/GoG	Government of Ghana
ICFG	Integrated Coastal Fisheries and Management Project
IP	International Programs (of the USFS)
IUCN	International Union for the Conservation of Nature
LULC	Land Use/Land Cover
M&E	Monitoring and Evaluation
NGO	Non Governmental Organization
NRM	Natural Resources Management
NTFP	Non-Timber Forest Products
PES	Payment for Ecosystem Services
REDD+	Reduced Emissions from Deforestation and Forest Degradation
SFMP	Sustainable Fisheries Management Project
SWAMP	Sustainable Wetlands Adaptation and Mitigation Program
SOP	Standard Operating Procedures
UAV	Unmanned Aerial Vehicle
UCC	University of Cape Coast
URI	University of Rhode Island
USAID	United States Agency for International Development
USFS	United States Forest Service
USGS	United States Geological Survey
VSLA	Village Savings and Loan Association
WD	Wildlife Division (of the Forestry Commission)
WR	Western Region

INTRODUCTION

Coastal ecosystems in Ghana have been under considerable pressure from anthropogenic disturbance and unregulated use of many natural resources. The coastal and inland forests of Ghana's Western Region face increased land use pressures for charcoal, timber production, commercial development, agriculture, cash crop development, off-shore oil development and upstream artisanal mining. Mangrove forests in particular are vulnerable to pressures from land use change as well as changes in temperature, rainfall, storms and sea-level rise because of their location in the landscape. Local communities rely heavily on mangroves and other wetlands for fuel wood for fish drying and smoking, dye for fishing nets, and fishing habitat for key species including tilapia, crabs, shrimp and periwinkle. There has been a historical lack of understanding of the integrated nature of forest health and the availability of timber and non-timber resources provided by the forests. High unemployment rates in the Western Region compound the pressure placed on the natural resources, exacerbating unsustainable and unregulated use of the forest products and fisheries in these ecosystems. Furthermore, degradation and deforestation of these areas increases the vulnerability of coastal communities to erosion, storm surge and sea-level rise and reduces the ecosystem services provided by these natural areas. These losses also pose a significant threat to the health of ecologically significant areas and biodiversity within the region. Loss of the mangroves means a loss of natural heritage and the livelihoods of the people that depend on these habitats.

The USAID funded and US Forest Service managed Coastal Sustainable Landscapes Project (CSLP), focuses on landscape level engagement with communities, non-governmental organizations, traditional authorities, government of Ghana agencies, the private sector, and international partners, who live and work in the coastal area from the Cote d'Ivoire border east to Shama District bordering Ghana's Central Region. The CSLP staff and its partners have been working with local communities to inform them of the importance of their natural resources, define the links between resource usage and impacts and develop sustainable management strategies to support livelihoods and promote the conservation of healthy and productive forests.

This mangrove management assessment effort was undertaken as part of the US government inter-agency Sustainable Wetlands Adaptation and Mitigation Program (SWAMP) which aims to provide policymakers worldwide with data and research needed to make sound management decisions relating to the role of tropical wetlands, including mangrove and peat swamps, in climate change adaptation and mitigation strategies. The review was developed to support CSLP and partners in integrating best practices and methodologies gained through SWAMP and other global research activities with an aim to aid management planning as well as restoration and conservation efforts to ensure the best science is being used to promote mangrove conservation in the region. Specifically, the goals of the mission were to: 1) review current community engagement and management strategies/plans in mangrove areas within Ghana's Western Region from various partners which could be scaled up to work in other coastal regions of Ghana or West Africa; 2) review mangrove restoration and conservation strategies currently practiced in the Western Region and, if necessary, make recommendations for improvement based upon lessons learned from other efforts with similar species and environmental conditions; 3) review monitoring mechanisms and carbon sequestration equations currently used by the CSLP and partners in Ghana to ensure its accuracy for greenhouse gas emissions tracking efforts; and 4) review mangrove-related activities with key staff of the CSLP's two, USAID-funded, sister projects: the Sustainable Fisheries Management Project and the Fisheries and Coastal Management Capacity Building Project and make recommendations that might leverage other opportunities among the three projects or with other entities.

Prior to the mission, multiple preparatory calls were held with partners in Ghana and the USFS staff, including program managers at USFS-IP and research scientists engaged in SWAMP work elsewhere in Africa. Documents were gathered and reviewed for the assignment including existing materials relevant to mangrove restoration and management that could support on the ground efforts in Ghana.

In order to best highlight the ongoing work of the CSLP and discuss recommendations for expansion or improvement to the project, the report is structured as follows:

- A daily activity log of the mission trip listing partners met and field locations visited, a section discussing findings and suggestions,
- A list of recommendations or next steps for the CSLP and partners,
- Additional questions for exploration by the CSLP or other agencies,
- A list of the literature cited in the report, and
- Several appendices including the original scope of work and the official trip itinerary.

On-site mission accomplishments and daily activity log:

Day 1: Monday, December 4, 2017

USAID in-briefing at USAID in Cantonments and USAID West African Biodiversity and Climate Change Project (WABiCC) at WA BiCC office in Labone

Nicole Cormier arrived in Accra, Ghana. Ms. Cormier and CSLP Director, Dr. Steve Dennison, attended an in-briefing at USAID in Cantonments. Ms. Cormier and Dr. Dennison met with USAID/Ghana Energy and Natural Resources Management Team Leader Mark Newton, Mission Environment Officer Justice Odoi, and Project Management Specialist Gloria Odoom. Mr. Dennison gave the group an overview of activities planned for the trip and the USAID staff shared wetland related opportunities and concerns with Ms. Cormier.

Ms. Cormier and Dr. Dennison next met with the USAID West African Biodiversity and Climate Change Project (WA BiCC) at the WA BiCC office in Labone. WA BiCC Chief of Party, Stephen Kelleher, Knowledge and Learning Specialist Barry Greville-Eyres, and Senior Policy Specialist Adewale Adeleke were in attendance and Zebede Feka and Nouhou joined via Skype from the field. We discussed ongoing WA BiCC projects and their participation in an upcoming workshop that will provide the region with training on carbon stock assessment and coordinated monitoring for the Western Region. We also discussed their interest in coordinating with SWAMP activities and Ms. Cormier suggested that documents created by SWAMP activities for use in East Africa could be adapted for use in West Africa.

Day 2: Tuesday, December 5, 2017

Meeting with Forestry Commission Climate Change Secretariat at the Forestry Commission in West Legon; depart for Takoradi

Ms. Cormier and Dr. Dennison met with staff members from the Forestry Commission (FC) Climate Change Unit in West Legon. Ms. Roselyn Fosuah Adjei, Deputy Head REDD+ and Climate Change Unit, described the recent efforts of the FC-REDD+ National Safeguards Focus group and later shared a draft proposal for the development of REDD+ program for the sustainable management of coastal mangroves in Ghana. The group also discussed sharing data and information on wetland mapping and drone surveys. The FC expressed interest in future collaborations with the CSLP and building upon their efforts within their target communities. Mr. Jacob Amoako, GIS Specialist REDD+ Unit, was also present and contributed to the discussion. The Head of the Climate Change Unit, Mr. Yaw Kwakye, and mangrove specialist, Felix Nani, were unable to attend the meeting, but were included in follow-up emails. In the afternoon, Ms. Cormier and Dr. Dennison flew to Takoradi for field work with CSLP staff and partners.

Day 3: Wednesday, December 6, 2017

Meeting and planning with CSLP team and discussion & orientation meeting with USAID Sustainable Fisheries Management Project and "Mangrove Team" including local NGOs Hen Mpoano (a CSLP grantee) and Friends of the Nation (FoN) at CSLP office

In the morning, Ms. Cormier met with the entire CSLP team at their office in Takoradi to describe the ongoing efforts of each member of the program and to discuss opportunities and challenges with wetland monitoring and management within their working communities. In attendance were Dr. Steven Dennison, Assistant Director Emmanuel Ntiri, Administrative and Financial Specialist Perpetua Kwakuyi, Administrative Assistant Albert Dadzie, General Services Officer Mark Mordzi, Village Savings and Loan Specialist Frederick Antwi, Communications Specialist Gloria Otoo, NRM and Community Benefits Specialists Kwame Owusu and Kwame Obeng-Hinneh, Environmental Services and Spatial Planning Specialist Evelyn Asante-Yeboah, and Monitoring and Evaluation Specialist Richard Adupong.

In the afternoon, Ms. Cormier attended a discussion and orientation meeting with the USAID Sustainable Fisheries Management Project and the "Mangrove Team" including local NGOs Hen Mpoano (a CSLP grantee) and Friends of the Nation (FoN) at the CSLP office. In attendance were CSLP team members Dr. Steven Dennison, Emmanuel Ntiri, Evelyn Asante-Yeboah; SFMP Chief of Party Maurice Knight, Friends of the Nation Director Theodore Boachieyi Adom and staff member Kyei Kojo Yamoah; Hen Mpoano CEO Kofi Agbogah, Fisheries and Coastal Management Specialist Stephen Kankam, GIS Specialist Justice Mensah, and Community Specialist Balertey Gormey.

Day 4: Thursday, December 7, 2017

Field site visits in Shama District and the Pra estuary to view active mangrove restoration (Yabiw, Anlo Beach), wetland monitoring efforts, issues linked to mangrove/wetland conservation; CSLP staff, local govt. officials; interactions with FoN, community management committees at Anlo Beach

The group conducted field site visits in Shama District and the Pra estuary to view active mangrove restoration (Anlo Beach, Yabiw), wetland monitoring efforts, and discuss issues linked to mangrove/wetland conservation in the communities of Yabiw and Anlo Beach. In attendance were Ms. Cormier, CSLP team members Emmanuel Ntiri, Kwame Obeng-Hinneh, Charles Fianu and FoN staff member Theophilus Boachie-Yiadom. The group met with Michael Amekudzi, the CSLP Wetland Community Officer in Yabiw, as well as active community management group members Thomas Cobbinah and John Sabbey. We first visited Yabiw Methodist Junior High School where we met with Head Master John Abakah and local teachers Georgina Thompson and Patrick Addo who lead the local Climate Change Club and teach from the Coastal Wetlands Education Curriculum modules[1]. We discussed challenges and opportunities for their students and community. The group then visited an active mangrove rehabilitation area where community members planted 8,000 seedlings in late 2015 and early 2016. The Climate Change Club students and teachers continue to grow mangrove propagules for future out-planting. In this community, we also had the opportunity to visit examples of several of the ongoing CSLP supported activities including a climate smart agriculture plot, an apiary, traditional and improved charcoal production activities, cassia wood lots, a cocoa grove, and other agroforestry species.

[1] The modules were developed by staff and graduate students at the CCM of the UCC and are in a pilot test phase

Community resources management committee members, climate change club teachers from Yabiw Methodist Junior High School and CSLP staff at a mangrove rehabilitation site in Yabiw, Shama District. Planted saplings are visible in the background.

The CSLP and FoN group then traveled to the community at Anlo Beach where we met with Mr. John F. Kennedy. We first visited an area where 104,000 mangrove seedlings have been planted in the last two years within the watershed. Despite the large effort and successful germination of many of the planted red mangroves, many seedlings and saplings were in poor condition (dead leaves and some stems) most likely due to the significant flood that occurred in July 2017 and the subsequent road augmentation which has blocked much of the overland flow occurring in the wetland. Mr. Kennedy described the devastating effects of the flood within the community, their dependence upon local fisheries and ongoing work to designate permanent and seasonal closures of two zones within their local mangrove and wetland area.

Planted mangrove seedlings and saplings affected by the July 2017 flood in Anlo Beach.

Day 5: Friday, December 8, 2017

Field site visits in Ahanta West: Akwidaa estuary (Akyenim, Akwidaa, Ketakor)
Meet climate change club members, CREMA leaders & community members

The group conducted field site visits in Ahanta West District and the Akwidaa estuary to view the effects of active mangrove protection and restoration efforts and discuss issues linked to mangrove/wetland conservation in three local communities: Akyenim, Akwidaa, and Ketakor. In attendance were Ms. Cormier, CSLP team members Steve Dennison, Kwame Obeng-Hinneh, Richard Adupong, Evelyn Asante-Yeboah, Michael Amekudzi and local Wetland Community Officer in Akwidaa, Michael Feyi.

In Akyenim, the group met with community members and CRMC/CREMA leaders, including Mr. Samuel Intsiful, Chief Secretary of the community group and CREMA Chairperson, Nana Kumgyahene. As a result of declining fish and crab catch as well as overharvesting in the mangroves, the new local chief has implemented a complete ban of all mangrove wood harvesting for the last 6 months including enforcement by local community members and a fine of 1000 Ghana cedis (about US$ 220) for noncompliance. We discussed community participation and response to this action including the impact on the livelihood of local harvesters and charcoal makers. We then visited Akwidaa and saw the vibrant fishing village first-hand. Because of the dominance of off-shore fishing in this community, non-timber mangrove resources were not as important to the daily life of these community members. However, there is a significant need for wood to smoke the locally caught fish, so wood and charcoal were also obtained from other upland sources or other communities. In Ketakor, we met with local community management committee member and champion of the environment, Mr. Joseph Baidoo. Mr. Baidoo discussed the ongoing ban on mangrove harvesting, community participation in management activities, and plans for mangrove replanting in the surrounding forests. The local chief of these three communities has also encouraged the development of expanded ecotourism opportunities and infrastructure in the district as a means of alternative income. Lastly, we visited the community of Cape Three Points where the CSLP supports three Village Savings and Loan Associations (VSLAs) as well as a local school Climate Change Club and a Community Resource Management Committee (CRMC).

Mangrove area affected by harvesting and waste disposal in Akyenim community in the Akwidaa estuary, Ahanta West. The local chief has currently put a restriction on mangrove harvesting to alleviate the pressure on the mangroves, an effort supported by the local CRMC.

Day 6: Saturday, December 9, 2017

Report writing and visit to local sites including a market where Ms. Cormier was able to see smoked fish, crabs, snails and other organisms harvested from mangrove and other coastal environments in abundance and better understand the importance of these resources to the local economy.

Periwinkle and crabs harvested from local wetland communities and fish smoked were available in abundance at the Takoradi market.

Day 7: Sunday, December 10, 2017

Report writing and visit to an eco-lodge in the coastal community of Butre with Dr. Dennison.

Day 8: Monday, December 11, 2017

CSLP team meeting at CSLP office; discussions on mangrove and wetland-related activities of the CSLP

In the morning, Ms. Cormier met with the entire CSLP team at their office in Takoradi for their weekly meeting. The technical staff remained after the meeting to describe the ongoing efforts of each member of the program in more detail and to discuss opportunities and challenges with wetland monitoring and management within their working communities. Ms. Cormier was also given the opportunity to ask specific questions generated by discussions, readings and initial field trips. The CSLP staff was very helpful and informative in their further explanations and shared their suggestions and opinions on the successes and challenges of their current and partner efforts. In attendance were Dr. Steven Dennison, Assistant Director Emmanuel Ntiri, Village Savings and Loan Specialist Frederick Antwi, NRM and Community Benefits Specialists Kwame Owusu and Kwame Obeng-Hinneh, Environmental Services and Spatial Planning Specialist Evelyn Asante-Yeboah, and Monitoring and Evaluation Specialist Richard Adupong. In the afternoon, Ms. Cormier continued discussions with CSLP staff in individual meetings with staff members and shared reports, photographs, ideas, and maps for remaining field visits.

Day 9: Tuesday, December 12, 2017

Field visit with Hen Mpoano to Greater Amanzule Wetlands – Ankobra River/estuary; meet with Community Conservation Committee members and leaders; visit to Ankobra Beach Resort & Farm including discussions with Claus Egger, Manager

The group conducted field site visits to the Ankobra River estuary in the Greater Amanzule Wetlands with members of the CSLP and Hen Mpoano staff. In attendance were the USFS and CSLP team, including Ms. Cormier, Dr. Dennison, Emmanuel Ntiri, Gloria Otoo, and Richard Adupong;

Hen Mpoano staff including Stephen Kankam, Daniel Nortey, Alex Amoako, Justice Mensah, and Balertey Gormey; and Wildlife Division staff including their Regional Director, Dr. Moses Sam.

The group met with a large number of very supportive Ankobra Community Conservation Committee and VSLA members and leaders and discussed issues of concern in their community. Staff members from Hen Mpoano described the ongoing efforts in the community, Steve Dennison and Nicole Cormier informed the community members of their objectives, and Dr. Sam described the ongoing efforts of the Wildlife Division and the draft wildlife bill submitted to Parliament to improve mangrove legislation and enhance protection. There was a long and interactive question and answer session with the community members including a discussion of the harvesting practices used in the area. The group then visited the mangrove nursery and, in the afternoon, traveled by boat up the Ankobra River to view harvesting and replanting sites along the river. Mr. Anthony Duah, CCC chairman, and Mr. Nato Cudjoe were especially helpful and provided many insightful anecdotes throughout the day. In the evening, Ms. Cormier and Dr. Dennison visited the Ankobra Beach Resort & Farm where they learned about sustainable farming and other conservation efforts in the community through discussions with Claus Egger, Manager of the Ankobra Beach Resort and conservation activist.

Community member in the Ankobra River estuary demonstrating how mangrove wood is harvested preferenctially from the supporting prop roots and branches of the Rhizophora trees.

Day 10: Wednesday, December 13, 2017

Field visit with Hen Mpoano to Greater Amanzule Wetlands – Old Kablesuazo and Ayanzinli; meet with Community Conservation Committee members/leaders

The group conducted field site visits to Old Kablesuazo and Ayanzinli in the Greater Amanzule Wetlands with members of the CSLP and Hen Mpoano staff. In attendance were the USFS and CSLP team, including Ms. Cormier, Dr. Dennison and Richard Adupong; Hen Mpoano staff including Stephen Kankam, Daniel Nortey, Alex Amoako, Justice Mensah, and Balertey Gormey; and Wildlife Division staff including their Regional Director, Dr. Moses Sam.

In Old Kablesuazo, the group met with a group of very passionate community members and CCC leaders, including local chairman Mr. Francis Kwesi Kwaw. Here, we learned that a rule was in effect banning all cutting and harvesting of mangrove wood, even removal of dead branches. The community even banned the use of mangrove wood that was cut to allow access to agricultural plots upland of the mangroves. The community members here explained that this was a hardship to the families as there were no viable livelihood alternatives suggested as a replacement for the resource loss. The community also stated that they observed an increase in monkeys and bats as well as improved fish catch. We walked through the community and saw some of the mangroves along the waterway which were large and intact, but occupy only a narrow stretch of shoreline.

In the afternoon, the CSLP and Hen Mpoano staff traveled to Ayanzinli. We met with a large number of CCC members including Mr. Kofi McDonald, committee chairman. The entire group then took us to see their mangrove nursery and a replanting site. This community has a large, 2.5 ha, area of mangrove that was clear cut in recent years by an outsider who used the wood to make charcoal. Evidence of this degraded area was apparent on the participatory mapping effort led by Hen Mpoano and the community worked together to plant 7,200 seedlings in the area; significant rates of seedling survival were seen in the harvested area.

Stephen Kankam from Hen Mpoano opening discussions with CRMC members in Ayanzinli.

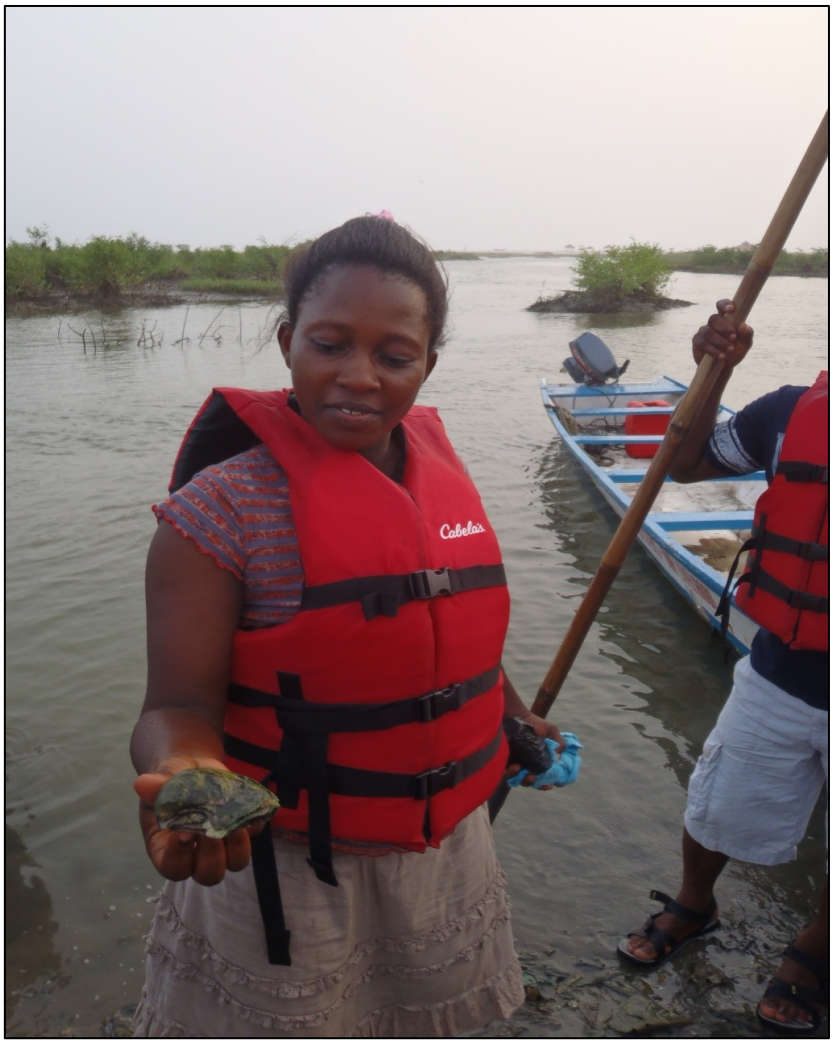
Day 11: Thursday, December 14, 2017

Special Seminar/Roundtable discussion with University of Cape Coast, Dept. of Fisheries & Coastal Management & Centre for Coastal Management staff/students and field visit at Densu Lagoon (a Ramsar site) with SFMP Development Action Association (DAA) leaders and members near Accra

Ms. Cormier and Dr. Dennison left Takoradi and traveled to Cape Coast for a special seminar and roundtable discussion at the University of Cape Coast, Department of Fisheries & Coastal Management and the Centre for Coastal Management. In attendance were UCC and CCM faculty and staff including, Dr. Noble Asare, other staff members, and undergraduate and graduate students of the Department of Fisheries & Aquatic Sciences. Dr. Dennison discussed the ongoing efforts of the CSLP and Ms. Cormier shared the objectives of her visit and some of her observations from her trip to the Western Region. A lively question and answer discussion ensued and Ms. Cormier and Dr. Dennison shared their experiences in mangrove and other freshwater wetlands in Ghana and other

countries. Ms. Cormier was able to meet and interact with Joshua Adotey, author of a relevant thesis on mangrove carbon in the Western Region and Bernard Ekumah, Principal Research Assistant and drone pilot for the CCM/UCC fisheries and coastal management project. Mr. Ekumah shared drone images from their current work and discussed future plans for mapping coastal ecosystems including mangrove areas.

In the afternoon, Ms. Cormier and Dr. Dennison traveled to the Densu Lagoon, a Ramsar site near Accra, and met with the SFMP subcontractor Development Action Association (DAA) leaders and members including CEO, Ms. Lydia Sasu, and DAA Manager, Ms. Emelia Nortey. The group participated in a field trip to planting and monitoring sites within the lagoon where members of the DAA showcased their mangrove planting efforts, demonstrated their oyster sampling techniques, and described their water quality monitoring efforts in partnership with researchers from UCC. The program has enlisted local oyster pickers from three communities surrounding the Densu Lagoon and has taught them to measure and monitor salinity, turbidity, pH, dissolved oxygen, and river and dam discharge from Weija Lake. The group collects the data and analyses them with the help of researchers from UCC. There are important lessons to learn from this group and share with CCCs in the Western Region; enhanced knowledge exchange and additional exchange visits would be beneficial to all. During our visit, it was requested that the VSLA program be extended to include the DAA oyster pickers to enhance their efforts and improve their lives.



Oyster pickers in Tsukomey, Densu Lagoon, conducting water quality monitoring and replanting efforts to enhance fisheries catch in the estuary.

Day 12: Friday, December 15, 2017

Debrief with USAID at US Embassy and report writing

Ms. Cormier and Dr. Dennison met with USAID/Ghana staff at the US Embassy to discuss the initial findings from the trip. In attendance were Energy and Natural Resources Management Team Leader, Mr. Mark Newton, Mr. Justice Odoi, Mr. Ellis Ekekpi, and Ms. Maggie McMorrow from the USAID/West Africa Regional Mission Environment Team. Ms. Cormier gave a powerpoint presentation highlighting the goals of her mission, shared successes of the CSLP, presented initial observations from her trip, and suggested opportunities for improvement and expansion of the program in Ghana.

Ms. Cormier and Dr. Dennison also attended a dinner meeting and continued discussions with Hen Mpoano CEO Kofi Agbogah and SFMP Chief of Party Maurice Knight.

Day 13: Saturday, December 16, 2017

Cormier departed from Accra

ISSUES, FINDINGS & RECOMMENDATIONS (as per USFS tasks)

The CSLP staff and its partners have been working with local communities to educate them of the importance of their natural resources, define the links between resource usage and impacts and develop sustainable management strategies to support livelihoods in the Western Region. Through organized training sessions, hands-on rehabilitation efforts and awareness campaigns, the CSLP has succeeded in changing the perceptions of local communities regarding sustainable use and the protection and management of natural resources. The CSLP and its partners have encouraged community input and participation in their natural resource management and planning, resulting in increased community participation in conservation and rehabilitation activities and engendering a sense of passion, ownership and solidarity within participating villages.

Prolific mangrove wood harvester turned conservationist, Mr. Anthony Duah, local CCC Chairman in Ankobra River estuary.

Much work has already been accomplished through the activities within the project including outreach and education provided to village teachers and students involved in climate change clubs, numerous, large-scale mangrove planting efforts in harvested and degraded areas, and increased usage of alternative fuel woods like cassia and other upland species or wood lots with rotational silviculture to reduce harvesting pressure within the mangroves.

Cassia wood stacked in preparation for charcoal production in Yabiw.

While the work of the CSLP and its partners has led to many positive outcomes, there is always room for improvement. Some observations and challenges follow as well as ideas and opportunities for improvement.

Regulation and Protection

A major impediment to improved mangrove management in the Western Region of Ghana is the lack of regulation and protection afforded these ecosystems. There is inadequate recognition of forested wetland areas and limited coordination at the national level. Mangrove forests fall under the purview of the Forestry Commission's Wildlife Division and do not currently benefit from any formal protection, governance or policy guidelines. Although we learned on the trip that a draft wildlife bill for the protection of mangroves has been proposed to Parliament, it will be imperative to formally define and recognize mangroves and peat swamps in order for restoration and conservation efforts to succeed long-term. This could further include formal protection of key wetland areas beyond the Ghana's two Ramsar sites and designation of priority ecosystems. For example, the Greater Amanzule Wetland could be designated as a protected area (with structured usage and harvesting) including protections from future development pressure. Regulations on tree and land tenure will also influence the outcome and long-term benefits from restoration efforts. Without proper recognition and protection, there are no long-term guarantees for management efforts or benefits derived from the ecosystem services provided by areas that are restored or conserved by the local communities. Long-term community support for the protection, restoration and management of mangrove and other coastal ecosystems will depend on the benefits obtained from their hard work and sacrifices.

Mapping

Large-scale mapping of the coastal and wetland areas of Ghana on a scale necessary to determine forest health or changing conditions is not available. Previously obtained satellite imagery in key coastal areas was commonly obscured by clouds. The PASCO Corporation, a Japanese consulting firm, in collaboration with the GoG produced a map delineating forest cover and defining land use categories for the entire country. The map, however, is not detailed enough to determine small areas of impact within coastal wetlands (as is common post-wood harvest) or to determine forest health and structure. Hen Mpoano has led small-scale participatory mapping efforts in their focus communities. In these areas, community members delineated local wetland areas using hand-held GPS units and created detailed maps that included an assessment of forest health (intact, harvested, replanted). These mapping efforts are useful, but do not provide the full picture of wetland health or change throughout Ghana's coastal areas. Most recently, SFMP has purchased a fixed wing unmanned aerial vehicle (UAV), or drone, that is being housed at the University of Cape Coast. It is capable of producing images with 5 cm resolution and, with support from the SFMP and the UCC's Center for Coastal Management, have three trained pilots that are ready to fly transects in southern Ghana. At this scale, it is possible to count individual trees, boats, and other structures from the high quality imagery. The UAV is also outfitted with a multi-spectral sensor that will allow for the determination of forest health as well as other factors.

High quality and frequent mapping of Ghana's coastal areas will improve many research efforts. With these data, it will be possible to determine baseline information regarding wetland area, forest or marsh type, habit condition. Repeat imagery will allow for tracking changes over time. These maps can be used to determine mangrove loss and land use change, which will be necessary for carbon accounting and scaling up schemes at the landscape scale. These data will also be useful for other assessments in and out of the coastal area including agroforestry expansion, outflow from mining activities and fishing activity. These maps could also be used to identify and develop priority areas for conservation and reduce the expansion of industry and urbanization into intact and healthy environments. All of these efforts will enhance the understanding of the extent of and impact to Ghana's natural resources and enable proper evaluation for management and planning assessments.

UAV image of Anlo Beach, a small community near the Pra estuary. Image courtesy of the Centre for Coastal Management University of Cape Coast. Contact: Mr. Bernard Ekumah, UAV pilot

Mangrove Restoration and Conservation Strategies

Communities in the Western Region rely heavily on mangrove wood collection for fuel and charcoal production as well as fish and crab collection within the mangrove, the sale or use of which contributes significantly to their household income. A lack of regulation at the local and national level has led to unchecked harvesting and unsustainable use of these areas. Large areas of mangrove are cut over time, leading to degraded and denuded areas within the forest. Current harvesting practices have led to soil slumping, ponding and the encroachment of other, less desirable wetland species including *Acrostichum*, a fern and mangrove associate with no woody parts useful for fuelwood or charcoal production.

Degraded mangrove area in the Ankobra River estuary post harvest, planted seedlings are visible in the foreground and Acrostichum spp. encroachment is visible in the background.

CCCs are making great progress and showing varying degrees of mangrove protection and management based on strategies suggested in training sessions by the CSLP and Hen Mpoano. Thanks to the dedication and involvement of the local villagers, a host of management strategies are being employed by the various communities with CCCs across the Western Region. Some communities encourage the use of alternative fuel woods including increased use of upland species and the development of wood lots (i.e. cassia sp.) to reduce harvesting pressure on the mangroves. Improved fuel consumption, including the use of more efficient smokers (as reported in Cameroon by Feka *et al*. 2009), has also been promoted by the CSLP in Ghana. More efficient smoking ovens were built in a number of communities in the Western Region, although usage appears to be low. Some management strategies implemented include a complete banning of the harvest or collection of any mangrove wood while other communities allow only dead and downed wood collection. In many communities, mangrove planting is a common management strategy to rehabilitate degraded areas. It will be important to continue to work with the local communities and learn from successful community management activities in Ghana and throughout the world to better manage mangrove resources over the long-term.

There are two main areas for improvement recommended for mangrove management in the Western Region, training and implementation of sustainable harvesting practices and improved restoration and rehabilitation strategies.

Sustainable harvesting

Harvesting techniques and plant parts preferred for harvest varied among communties despite the relatively small distance between villages. Some areas visited showed signs of small scale harvest and branch removal, other communties had landscape scars from large scale clear cutting activities. The unique nature of forestry and fisheries collection and use within each community will determine the most successful management strategy implemented. In several communities, mangrove wood is harvested preferentially from the supporting prop roots and branches of the *Rhizophora spp.* trees. These structures are the ideal size for fish smoking and easily harvested with machetes. The way in which a tree is harvested and the amount and kind of material left behind in the forest will determine the rate of decomposition of wood and above- and belowground root material. Any attempt to restrict or improve harvesting techniques will need to consider the collection methods employed by each community in order to be successful.

Example of the selective harvesting of prop roots and branches of a Rhizophora spp. tree in the Ankobra River estuary.

Some management strategies, like complete banning of the harvest and use of all mangrove wood without alternative livelihood opportunities already in place, are unsustainable. Education on sustainable harvesting techniques, including ideas for incorporating the challenges unique to each community, will be necessary for long-term success. The USFS could develop training materials for improved and sustainable harvesting strategies based on internationally recognized protocols and previous publications (D'Silva and Appanah 1993; Putz 1994; McGinley *et al*. 2017). Indicators of success could be identified and used to track and monitor mangrove health over the long term. Technical guidance on improved harvesting techniques and monitoring strategies could be provided to the CSLP staff and partners (e.g., Hen Mpoano, Friends of the Nation, the Centre for Coastal Management, community management bodies).

Some ideas or management strategies that could be implemented include: placing a ban on clear cut harvesting, placing a ban on cutting trees along rivers and tidal creeks (to reduce erosion), restricting the use of specific species, restricting the harvest of large diameter trees, restricting the harvest of supporting prop roots, encouraging partial cutting and maintenance of seed trees, and replanting harvested areas before significant soil degradation occurs. These and other least invasive, but helpful strategies could be considered for the sustainability of the resource. These strategies, coupled with other efforts to diversify livelihoods could help to reduce forest degradation, reduce the time and effort needed for rehabilitation or replanting, and improve fisheries.

Mangrove rehabilitation and replanting

Much work has been done by the CSLP and Hen Mpoano to educate local communities and rehabilitate degraded mangrove forests in the western Region. In many communities, mangrove planting is the most commonly implemented management strategy. Thousands of seedlings have been reared and planted in communities with active CRMCs; a majority of the seedlings planted are *Rhizophora* species.

Mangrove nursery in Ankobra with Rhizophora spp. seedlings planted by local CCC members.

There are many studies that document failed replanting efforts and suggest that this management strategy should be avoided (Lewis 2005; Brown 2006; Primavera and Esteban 2008). However, there are reports of successful monospecific planting efforts, including *Rhizophora* spp. planted to rehabilitate a degraded area in Brazil. The study documented high survival rates of planted propagules

in degraded areas during the first two years of study and a return of some ecological functions after five years (Ferreira and Lacerda 2016). In the Western Region of Ghana, we also saw evidence of successful plantings and early propagule survival in a number of communities. Soil structure was largely intact in many of the replanted areas visited and there is impassioned support from the communities to replant. While there has not been any monitoring or measurement of success rates to date, a visual assessment of the sites visited suggest that mature plant survival may be low compared to the number of seedlings planted in many areas; thriving seedlings and saplings were visible, but dead and dying seedlings were common. Most planted seedlings were less than two years old, so it is too soon to determine long-term rehabilitation success. If soil structure, time since harvesting, rainfall and other environmental parameter are considered, successful rehabilitation of degraded areas through planting alone may occur in the Western Region.

Further restoration and monitoring strategies should be based on knowledge gained from other local and global efforts, but appropriate to the Ghana context. Better use of available scientific information and lessons learned from other areas could improve the ongoing efforts in the Western Region. For example, Hen Mpoano, with support from SFMP, conducted a study tour of Ghana's Eastern Region in 2015. Ankobra CCC members visited communities where successful mangrove restoration efforts have been going on for a number of years. This visit motivated the Ankobra CCC members within their own community and illustrated that with better management, their mangroves could be productive on a sustainable basis. Efforts like these should be encouraged to increase awareness and idea sharing. Some questions to consider are, "How representative is the area to other areas in Ghana?" and "How likely are these efforts to work in our community?" Basic measurement, monitoring and reporting of the efforts already underway in communities with CCCs would help to determine what worked in what areas and why failures occurred. Seedling survival counts coupled with a description of environmental conditions during and post-planting would highlight best conditions and locations to maximize planting success and survival. The CSLP and Hen Mpoano could then develop lessons learned and best management practices for local habitats and conditions. These findings could then be shared among communities to avoid future failed projects, and the loss of seedlings, money and time.

Enhanced rehabilitation and replanting efforts could greatly improve the outcome of management initiatives in the region. Some strategies include: set specific design criteria and objectives; ensure locations for planting and rehabilitation are appropriate for management activity; target specific wetland functions to maximize success (soil stability, improved fisheries); and develop and implement adaptive management strategies if initial strategies fail to ensure the sustainability of the restoration/rehabilitation efforts. Some conditions to consider for improved replanting efforts include: water depth, soil condition, time since harvest (before soils collapse), seedling availability, season (wet/dry), and location of plantings. For example, seedlings planted among marsh grass species can enhance rehabilitation efforts as documented in south Florida, USA and other areas (McKee and Faulkner, 2000; Osland et al., 2012). The mangrove seedlings planted by the DAA in the Densu Lagoon are a good example of this management strategy. It will be interesting to compare their planting efforts with those in other communities in the Western Region and learn from their survival rates.

Thriving mangrove seedling planted within marsh grasses by the Development Action Association in the Densu Lagoon.

Best practices learned from mangrove restoration efforts and information from the global literature on mangrove rehabilitation and replanting should be considered. The USFS could develop training materials for restoration and planting efforts based on documentation and methodology from SWAMP and other internationally recognized protocols. Specifically, field methods to measure and monitor restoration success developed for other areas (Lewis 2005; Primavera and Esteban 2008; Ruiz-Jaen and Mitchell Aide 2008; Primavera et al. 2012; Lewis and Brown 2014) could be edited to fit the needs and conditions of Ghana's Western Region. Indicators of success could be identified and used to track and monitor restoration and replanting efforts over the long term. Technical guidance and training materials on restoration and monitoring strategies could be provided to the CSLP staff and partners.

Carbon accounting: monitoring mechanisms and carbon sequestration equations

Efforts to update the values used in reduced emissions targets and calculations for more accurate carbon reporting in the Western Region would benefit from baseline assessments of carbon stocks and fluxes and improved measurement, monitoring and reporting efforts in a variety of forest types and conditions. In Ghana, only a few studies on mangrove productivity and carbon stock assessment exist. These studies are limited in plot size, restricted to only a few wetland areas, and do not encompass the range of conditions (forest health and structure) found in the Western Region. There are no studies to date on greenhouse gas emissions from any of these systems. A preliminary look into the global literature suggests that carbon values being used for carbon sequestration by PASCO (2013) and Adotey (2015) may represent under and over estimates of the carbon stored in these systems. Because these values are being used to determine emissions reduction targets by the USAID and the USFS, success rates will vary largely by habitat type and species composition.

Varying mangrove forest stature in the Western Region, a mature mangrove forest (top left), a degraded forest (top right), a forest that has been harvested (bottom left), and a replanted mangrove wetland area (bottom right).

Much could be done to improve the carbon accounting and emissions targets in this region. Basic training on field data collection methods for forest inventory and monitoring could be provided to CSLP staff and partners. Much of the mangrove forest habitat on the currently mapped areas in the Western Region is degraded or in the process of rehabilitation post-planting. Forest health condition and status should be considered when projecting or reporting carbon sequestration and emissions values. Assessments of forest health, structure, and greenhouse gas emissions in a variety of habitat types (intact, degraded, replanted) including species composition would provide detailed baseline information on carbon stocks and fluxes. These studies, combined with detailed aerial imagery of forest cover, could further provide information on sequestration potential and emissions from LULC change over time. These studies could also help to determine how much carbon is being sequestered as a result of rehabilitation and other management efforts.

The USFS could develop training materials for carbon accounting based on documentation and methodology from SWAMP and other internationally recognized protocols (i.e. Verified Carbon Standard Program). Specifically, field methods to measure and monitor forest productivity and carbon storage developed for an East Africa SWAMP project could be edited to fit the needs and conditions of the Western Region. Simple, community-developed indicators could be identified and used to track and monitor mangrove health over the long term. Data on mangrove carbon stocks and fluxes could be culled from other locations with similar species and conditions and used to strengthen the equations and calculations used in Ghana. Technical guidance and pilot development of training materials on measurement and monitoring strategies for carbon accounting including forest structure analysis and techniques to measure GHG emissions could be provided to the CSLP staff and partners (e.g., Hen Mpoano, Friends of the Nation, the Centre for Coastal Management, the Sustainable Fisheries Management Project, and community management bodies).

Measuring and monitoring carbon stocks and fluxes will allow for a better understanding of what is present and what is changing. Proper valuation of carbon stocks and fluxes will also ready the Western Region for REDD+ and other payment for environmental services (PES) schemes; however, these schemes are infrequently funded and monetary benefits are short term and small at the individual level. Additionally, the health and size of the mangrove forests in the Western Region are not ideal candidates for these schemes. In Ghana, it may be better for communities and organizations to focus on the benefits of ecosystem goods and services provided by these forests and enhanced by protection and restoration efforts than REDD+ and other forms of payment for ecosystem services.

Carbon assessments derived from local sampling efforts, when available, are the best values to use and most accurately represent the unique ecosystems of the Western Region. However, given the program's current manpower and resources and the focus on livelihood improvement in the region, it is not my recommendation that significant time and effort be dedicated to improving carbon calculations and values at this time. Several studies evaluating the carbon density of mangrove forests in Ghana exist (PASCO 2013; Adotey 2015; Tang et al. 2015), some of which were used to determine emission reductions targets set by the USAID and USFS. There are also literature values from similar species in other locations that could be used to better estimate carbon stock and sequestration values which would be valid at the CSLP's current engagement level.

Estimates for total ecosystem carbon (C) density from the global mangrove literature range from 441-1,267 MgC ha^{-1} (Donato *et al*. 2011; Purbopuspito *et al*.; Murdiyarso *et al*. 2015). Estimates for total ecosystem carbon density from studies conducted in Ghana's mangroves range from 45-5,317 MgC ha^{-1} (PASCO 2013; Adotey 2015). Carbon density values from mangroves in Kenya are also in this range (Gress *et al*. 2017). It is important to note that the values reported by Adotey (2015) in the Amanzule estuary are significantly higher than other sites surveyed in the literature. Ajonina *et al*. 2014 also assessed the aboveground carbon density of mangrove forests within the Amanzule wetland area and report a range of 59-383 MgC ha^{-1}, much lower than the aboveground only value reported by Adotey (2015) in Amanzule (3771 MgC ha^{-1}). Tang *et al*. 2015 also report a lower range (36-124 MgC ha^{-1}) of aboveground carbon density from mangroves in West Africa, including sites from Ghana. These differences may be driven by the methods used to assess forest biomass and carbon content, or they may be representative of the range of values derived from the broad array of habitat types and forest structures (intact, degraded) found in the Western Region.

An in-depth assessment of the literature and further analysis of forest structure and carbon content in other forests in Ghana would be necessary to understand fully the range of values possible in this region. It is advisable to revisit the carbon values used to determine emissions reduction targets set by the USAID and the USFS to improve the efforts of the project and more accurately evaluate success. Using carbon literature values and mapping data with information on forest structure, carbon sequestration estimates and greenhouse gas emissions formulas used by the CSLP could be improved so that emissions tracking efforts could be more reasonable, accurate and representative of the unique mangrove ecosystems found in Ghana and the Western Region.

Community engagement and management strategies

There is considerable opportunity relative to community engagement in sustainable utilization and restoration of mangroves in Ghana. Due to the hard work, education and outreach provided by the CSLP, Hen Mpoano and other partners, communities are engaged and participation in environmental management is increasing. It is important to build upon these efforts, continue ongoing community assessments, improve draft wetland management plans and expand this work to other communities. Much of the success lies in the program's incorporation of community input and local knowledge in the management process, including the development and implementation of management practices.

Much has been accomplished together, and there is a lot of good information available. There is also documentation of proposed work, but some ideas are not implemented due to time, finances and

manpower. For example, the CSLP and partners have a plan in place to monitor and measure seedling survival from planting efforts in communities with active CCCs; however, no monitoring has taken place at the time of this report. It would be helpful to scientifically assess the current successes of the program and implement adaptive management strategies that focus time and resources more effectively. It would also be helpful to continue and to intensify efforts to bring neighboring community members together to share stories and ideas and learn from successes and failures from the various management strategies applied. In addition to CCC working groups, there are valuable lessons to be learned from upland areas and other wetland types that could be applied to mangrove ecosystems. For example, there is much to learn from the successes of the Densu Lagoon oyster pickers including their training and data collection efforts, their understanding of the ecological significance of the data and analyses, their direct links to local policy makers and management to influence the dam outflow and enhance oyster other fisheries production, and the direct impacts to their livelihoods.

Leveraging opportunities among projects and partners

There are a number of ways to enhance collaboration with and leverage opportunities among the CSLP's two, USAID-funded, sister projects: the Sustainable Fisheries Management Project and the Fisheries and the Coastal Management Capacity Building Project and other NGO and government agencies. It is important to encourage data sharing and information exchange. There is evidence of overlapping proposals and project ideas among environmental practitioners in the region. Data sharing and resource pooling could reduce replication of efforts and enhance ongoing efforts among agencies. One way to do this is to support more frequent workshops with natural resource managers and community advocates and encourage data and information exchange. Another way to enhance community and practitioner support is to participate in events that underscore the importance of the natural resources in the region. For example, the SFMP, Hen Mpoano and the CSLP are supporting World Wetland Day activities on February 2, 2018. The partners will highlight CCC management successes using the Greater Amanzule Wetland as Ghana's national focal point for this awareness building event.

A website for disseminating data and maps within the Western Region of Ghana, or throughout the entire Western Region of Africa, would enhance the efforts of many organizations. For example, the website FishComGhana, (https://fishcomghana.com) launched by the UCC could be a useful example to follow for data archiving, sharing and dissemination. Alternatively, FishComGhana or a similar site could be edited to include mangrove and other wetland data and mapping. In order to maximize efforts and enhance the efficacy of data exchange, it is also important to standardize field data collection methods among working groups when possible. Sharing lessons learned and methodology from East Africa SWAMP projects in similar habitats would also enhance mangrove management in the Western Region.

Another idea is to encourage multi-agency partnerships to financially sponsor and scientifically support students associated with the Coastal Management Capacity Building Project at UCC. Some data collection and analyses are beyond the abilities of the agencies or communities whether it is due to manpower or training. Detailed and time-consuming projects could be conducted in collaboration with the students and faculty of UCC, see description below for specific examples.

Another pathway for partnerships is to explore the linkages between mangroves and fisheries since exploitation issues are similar and the conservation and sustainable use of both resources are intrinsically connected. Mangroves and coastal fisheries in Ghana suffer the same fate - poor legislation and protection as well as unregulated use and exploitation. Entities such as the Sustainable Fisheries Management Project, the Development Action Association Fisheries Training Center and the CSLP and Hen Mpoano could combine data to create powerful narratives regarding the fate of the Western Region's natural resources and their importance to local livelihoods. Mangrove management

efforts are directly linked to future food security; stories of success could be used to encourage national support for further funding, regulation and protection.

Additional opportunities in the Western Region

Natural resource protection and management commonly come at a price to the local economy. Successful and sustainable mangrove management will not be possible if the people of the community cannot support themselves through some other source of income. In order to reduce reliance on the natural resources long-term, it is imperative that alternative sources of livelihood are available to balance the immediate individual needs of the community. Hen Mpoano plans to initiate another set of pilot programs for alternative livelihood and training for small business owners. These programs would strengthen the ability of individuals to support themselves through other business ventures, diversify local income sources, slow the destruction of forest habitat and allow for the sustainable management of forest resources.

In addition to enhancing ongoing efforts of the program, mangrove management and protection in the Western Region could potentially benefit from other, more creative approaches. Expanded ecotourism, even small scale and pilot efforts in communities that have chosen more restrictive protection of their mangroves and wetland habitats, could benefit from tourists paying to visit their forests. Anlo Beach and Ankobra or Old Kablesuazo in the Greater Amanzule Wetland area, for example, have intact mangrove areas and meandering rivers to explore by boat or canoe. Akwidaa is a picturesque and vibrant fishing village that may be an interesting location for that could attract ecotourists; the surrounding villages in Cape Three Points are dependent on mangroves for fuelwood and fisheries and some have strict management conservation actions currently in place. Ecotourism could offer additional income sources to individuals or communities and further encourage ecosystem protection, coastal management, reduction in solid waste dumping along waterways, and improved fisheries. Expanded activities could require large-scale change including improved accessibility, lodging and other amenities, or it could require boats with tour guides to give educational tours to local students funded by their schools or the GoG. An evaluation by an environmental economist comparing the costs and benefits should be undertaken to determine the suitability of these and other activities in the region prior to their implementation.

The picturesque fishing village of Akwidaa, Cape Three Points.

Another way to highlight the importance of wetlands and the products they provide is to conduct an economic valuation of the goods and services derived from the region. A rapid assessment of 18 mangrove sites within the Greater Amanzule Wetland area approximated the economic value of mangroves as a source of fuelwood at US$2,765/ha (Ajonina *et al*. 2014). This assessment also identified the importance of other ecosystem services including carbon sequestration potential and the benefits of ecotourism; however, monetary values were only assigned to fuelwood. Gordon *et al*. 2009 reported that the increase in fisheries as a result of the presence of mangroves in the Volta region is $165 USD per hectare. A more complete economic valuation would include an assessment of the ecosystem services provided by wetland habitats and provide a monetary value for all significant ecosystems services, especially fish and shellfish harvest and consumption, wood harvest for fuelwood (smoking and charcoal), construction materials, and other products as well as services such as carbon storage, storm protection and water quality improvement. A cost to benefit analysis of expanded ecotourism could also be included in this evaluation. The Gordon *et al*. 2009 and Ajonina *et al*. (2014) studies offer a good starting point to value ecosystem goods and services, but wood consumption, fisheries catch and forest health will differ among communities; a more complete and diverse assessment could benefit the region. While the dollar value of wetland ecosystem goods and services will not offset other high profit industries such as high-value timber resources or oil and gas infrastructure and development, having a known value and quantity of these natural resources may help policy makers and legislators at all levels of government realize the importance of wetlands to the local economy, particularly to an individual household where GDP is so modest. These values may also resonate within local communities, highlight linkages between resources and income and encourage the protection and sustainable use of these systems.

PROPOSED NEXT STEPS FOR PARTNERS AND USFS

Recommendation Support national recognition and regulation for mangroves and other wetlands and improve governance, policy and protection of these areas at the regional and national level. Without proper recognition and protection, there are no long-term guarantees for forest protection or benefits of the ecosystem services provided by areas that are restored or conserved by the local communities.

Recommendation Prioritize support for ongoing mapping efforts. Support (in-kind or financially) the efforts led by SFMP and UCC to map the coastal areas with UAVs (drones) and encourage other agencies' purchase and use of UAV technology. Use the detailed maps created by Hen Mpoano and CSLP participatory mapping effort as ground-truthing of the UAV imagery. Support the suggestion from the CSLP to produce a "State-of-the-Coast" report whereby UAV surveys by UCC and URI could be re-flown annually or semi-annually to give a detailed view of the narrow coastal strip that encompasses many wetland ecosystems in Ghana. These images would highlight changes in the landscape and enhance many future mangrove management activities.

Recommendation Encourage data sharing. Support more frequent workshops with all natural resource managers and community advocates. Encourage data and information and especially inform others of ongoing projects to reduce replicated efforts and foster collaborations. On a broad scale, design a web portal for data sharing within West Africa to enhance efforts along the entire coastline. Standardize field data methods among working groups when possible.

Recommendation Community engagement. A significant strength of the current program is the support of the local communities. Continue to include local community ideas and input in the entire

process, including management scenarios and planning to ensure long-term resource management that can continue after projects and programs end. Incorporate lessons learned and new ideas from neighboring communities and programs.

Recommendation Develop training materials for better mangrove management and expertise building among staff and partners. Coordinate and provide technical guidance for the CSLP staff and partners on key issues including the pilot development of training materials on community management planning including 1) carbon monitoring strategies, 2) sustainable harvesting methods and 3) improved restoration efforts.

Recommendation Carbon accounting. Basic training on field methods and baseline carbon assessments for C stock and C flux in various levels of forest health (intact, degraded, restoring) could be beneficial. Draft a measuring and monitoring protocol for carbon stock assessment for mangrove and other wetland environments using the SWAMP pilot protocol for semi-deciduous forests from East Africa. In any evaluation or method developed, it is important to use locally derived allometric equations for mangrove species in Ghana (as seen in PASCO 2013 and Adotey 2015). It is also important to recommend method adaptations that meet the goals and abilities of the wetland communities in the Western Region. Until the support for these measurements can be made, make good use of the previously available carbon assessments in Ghana and, if necessary, other locations with similar species composition, to better estimate carbon sequestration and fluxes including avoided losses from conservation efforts.

Recommendation Continue to support alternative livelihood training. Build upon the successes of the CSLP's Climate Smart Enterprise groups and VSLAs and expand livelihood training in other fields. Work with Hen Mpoano, for example, with their plans to offer training for small business efforts. Expanded opportunities for diversified income would alleviate some of the pressure on the natural resources and empower local individuals.

Recommendation Enhance mangrove module information for climate change clubs. Mangrove education modules and training materials in the "Coastal Wetlands Education Curriculum" were developed by the UCC's CCM with USAID funding. These are currently being tested in a pilot phase at six schools with for teachers and students participating with support from the UCC, Hen Mpoano and the CSLP. These materials could benefit from added information including photographs, videos and other visual materials. Some schools may not have computers or projectors available, so laminated hardcopies of these materials could be very useful.

Other questions to consider for the future of wetland management in Ghana - CSLP or other agencies

While there was not enough time during this brief trip to explore all areas of interest or conduct research or data collection, some ideas and comments brought up on the trip should be captured by this report and considered for future in-depth exploration by CSLP, its partners, or UCC graduate students to enhance future wetland management efforts in Ghana:

- Evaluate the potential of ecotourism as an additional source of income and as an incentive to conserve and protect mangroves and other natural resources where infrastructure and community support are possible.
- Conduct an ecosystem valuation. Enlist an economist and conduct an assessment of the ecosystem services provided by wetland habitats and provide a monetary valuation of all significant services, including fish harvest and consumption, and wood harvested for fuelwood (smoking and charcoal), construction materials, and other products to enhance the efforts of Ajonina and Gordon in other communities and for other ecosystem services not yet evaluated. Carbon storage and value could also be estimated if mapping and sampling efforts were complete.
- Proper evaluation and consideration for the freshwater and inter-tidal swamps that sit behind the mangroves, these appear to be large systems that are overlooked although they are productive forests, relevant for REDD+ activities, important for fisheries, and threatened in a manner similar to mangroves forests. Are the inter-tidal swamps behind the mangroves in the Western Region playing significant roles in mangrove health and carbon sequestration that are unique to this area?
- Quantify mangrove loss caused by erosion or natural factors as opposed to those anthropogenic causes
- Improve fisheries (fish, crab, shrimp, oysters, periwinkle) regulation and policies either at the local or national level to curb unchecked catch and lack of proper reporting for proper valuation and measurement of the resource; consider ban on collecting females, closure during breeding season, etc. for BMP and determine least invasive but helpful strategies for sustainability of the resource
- Conduct carbon assessments of the sequestration potential of other systems, i.e. forested peat swamps, cassia and other replacement trees, rubber and oil palm plantations
- Inventory and survey the health of wetland areas with drone imagery as well as ground truthing
- Measure GHG efflux in various wetland communities including intact, degrading, restoring and healthy ecosystems
- Conduct forest and soil surveys to assess baseline carbon stocks
- Map the entire coast including LULC change, using historical photos where available. Assess change over time and incorporate data from drone imagery in the future
- Determine the effects of solid waste on coastal forests and fisheries
- Determine the effects of water quality and contamination on coastal ecosystems resulting from upstream activities including agroforestry and mining.

Literature Cited

Ajonina, G.N., A. Tundi, W. Lau, K. Agbogah, and B. Gormey. 2014. Mangrove Conditions as Indicator for Potential Payment for Ecosystem Services in Some Estuaries of Western Region of Ghana, West Africa *in* S. Diop *et al*. (eds.), The Land/Ocean Interactions in the Coastal Zone of West and Central Africa, Estuaries of the World.

Adotey, J. 2015. Carbon stock assessment in the Kakum and Amanzule estuary mangrove forests, Ghana. PhD dissertation submitted to Dept. of Fisheries and Aquatic Sciences, School of Biological Sciences, University of Cape Coast. 123p.

Brown, B. 2006. 5 Steps to Successful Ecological Restoration of Mangroves. Mangrove Action Project, Indonesia.

Donato, D.C., J.B. Kauffman, S. Kurnianto, M. Stidham, and D. Murdiyarso. 2011. Mangroves among the most carbon-rich forests in the tropics. *Nature Geoscience* **4**, 293-297.

D'Silva, E. and S. Appanah. 1993. Forestry management for sustainable development. ED1 Policy Seminar Report 32, The World Bank, Washington, D.C

Feka, N.Z., G.B. Chuyong, and G.N. Ajonina. 2009. Sustainable utilization of mangroves using improved fish-smoking systems: a management perspective from the Douala-Edea wildlife reserve, Cameroon. *Tropical Conservation Science* **2**, 450-468.

Ferreira, A.C., and L.D. Lacerda. 2016. Degradation and conservation of Brazilian mangroves, status and perspectives. *Ocean & Coastal Management* **125**, 38-46.

Gordon, C., E.T. Lawson, A.M. Mensah and J.S. Ayisor. 2009. The application of the ecosystem approach to mangrove management: Lessons for Ghana. *Nature & Faune* **24**, 30-41.

Gress, S.K., M. Huxham, J.G. Kairo, L.M. Mugi and R.A. Brier. 2017. Evaluating, predicting and mapping belowground carbon stores in Kenyan mangroves. *Global Change Biology* **23**, 224–234

Lewis, R.R. 2005. Ecological engineering for successful management and restoration of mangrove forests. *Ecological Engineering* **24**, 403-418.

Lewis III R.R. and B. Brown. 2014. Ecological Mangrove Rehabilitation – a Field Manual for Practitioners. Mangrove Action Project, USA.

McGinley, K.A., G.C. Robertson, K.S. Friday and C.A. Carpenter. 2017. Assessing forest sustainability in the tropical islands of the United States. Gen. Tech. Rep. IITF-GTR-48. San Juan, PR: U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry. 115 p.

McKee, K.L. and P.L. Faulkner. 2000. Restoration of biogeochemical function in mangrove forests. *Restoration Ecology* **8**, 247-259.

Murdiyarso, D., J. Purbopuspito, J.B. Kauffman, M.W. Warren, S.D. Sasmito, D.C. Donato, *et al*. 2015. The potential of Indonesian mangrove forests for global climate change mitigation. *Nature Climate Change* **5**, 1089-1092.

Osland, M.J. *et al.* 2012. Ecosystem development after mangrove wetland creation: plant-soil change across a 20-year chronosequence. *Ecosystems* **15**, 848-866.

PASCO. 2013. Mapping of forest cover and carbon stock in Ghana. FC-RMSC, CSIR-FORIG and CSIR-SRI, Ghana. 218p.

Primavera J.H. and J.M.A. Esteban. 2008. A Review of Mangrove Rehabilitation in the Philippines: Successes, Failures and Future Prospects. *Wetlands Ecology and Management* **16**, 345-358.

Primavera J.H., Savaris J.P., Bajoyo B.E., Coching J.D., Curnick D.J., Golbeque R.L., Guzman A.T., Henderin J.Q., Joven, R.V., Loma R.A. and H.J. Koldewey. 2012. Manual on Community-based Mangrove Rehabilitation. Mangrove Manual Series No.1 London, 240p.

Purbopuspito, J., D. Murdiyarso, M. Warren , J.B. Kauffman, K. Haruni, S. Taberima, S. Manuri, and S.Sasmito. Mangrove Soil Properties and their Carbon Pools among Large Islands in Indonesia.

Putz, F.E. 1994. Approaches to sustainable forest management. CIFOR. Working Paper No. 4. 7p.

Ruiz-Jaen M.C. and T. Mitchell Aide. 2008. Restoration Success: How Is It Being Measured? *Restoration Ecology* **13,** 569–577.

Tang, W., W. Feng, M. Jia, J. Shi, H. Zuo, and C.C. Trettin. 2015. The assessment of mangrove biomass and carbon in West Africa: a spatially explicit analytical framework. *Wetlands Ecology and Management* doi: 10.1007/s11273-015-9474-7

Appendix A. Scope of work

USFS Terms of Reference

US Forest Service International Programs

USFS Community Mangrove Management Technical Advisor
October 2017

Introduction and Background
Ghana's Western Region faces multiple land use pressures in its six coastal districts. Inland and coastal forests including mangroves are being cleared for commercial development, agriculture, cash crop development, charcoal, timber production, and artisanal mining. In all, these forces are posing significant threats to ecologically significant areas and biodiversity, including in-shore fisheries. High unemployment rates compound these pressures, exacerbating unsustainable natural resource management practices and reducing ecosystem services provided by the Western Region's natural areas. Ghana's small pelagic fisheries are on the verge of collapsing due to high rates of illegal fishing and the lack of political will to enforce existing laws.

Coupled with the human pressures on the landscape, a warming climate caused by increased atmospheric carbon dioxide poses significant risk to the landscape. In addition to increased temperatures, climate change is associated with jet stream fluctuations causing irregular, more extreme, and unusual weather patterns and events. Changing rainfall patterns and intensities can lead to droughts in some areas and floods in others. In addition to storm events, other adverse impacts to the region from climate change include rising sea levels, salt water intrusion producing higher salinity rates of coastal water sources, changes in marine and terrestrial biological life cycles, and the likely extirpation of species.

USAID/Ghana's Environmental Threats and Opportunities Assessment of 2011 identified the need for the Feed the Future (FTF) programs to mitigate any possible negative effects on forests and other natural areas from agriculture expansion. That threat, together with increased demand for fuel wood and charcoal production, are the dominant drivers of deforestation. Moreover, health risks increase as the quality and quantity of water resources for human and productive uses declines as a result of the hydrologic functions of watershed catchment areas being disrupted by agricultural expansion, deforestation and mining.

To address these numerous threats to sustainability, USAID/Ghana's Economic Growth office has developed natural resource interventions in Ghana's Western Region. The US Forest Service managed Coastal Sustainable Landscapes Project (CSLP), focuses on landscape level engagement with communities, non-governmental organizations, traditional authorities, government of Ghana agencies, the private sector, and international partners, who live and work in the coastal area from the Cote d'Ivoire border east to Shama District bordering Ghana's Central Region. The project promotes coastal and inland forest conservation while promoting sustainable livelihood activities that support associated forest conservation efforts.

One key component of CSLP's efforts includes support for wetland and mangrove monitoring with the assistance of community associations, wetland monitoring programs linked to climate change clubs at junior and senior high schools, and work in the Greater Amanzule Wetlands (with CSLP grantee Hen Mpoano) to develop co-management approaches for the valuable resources contained therein. Leveraging grassroots approaches is gaining momentum as some local communities focus on

important conservation practices. Two dozen communities across two districts have formal conservation committees and are detailing management practices/actions for their wetlands. In another district a community has adopted a formal management plan for its wetland, and in a third district a new and dynamic chief is a champion of the environment and wetlands of his community.

Overview and objective of USFS support to the Coastal Sustainable Landscapes Project
The USFS technical expertise will support CSLP and partners in integrating best practices and methodologies gained through global activities and research undertaken as part of the inter-agency Sustainable Wetlands Adaptation and Mitigation Program (SWAMP) initiatives into community and local government efforts to better manage mangrove and wetland areas in the Western Region. This support will review both management planning efforts as well as restoration and conservation efforts to ensure the best science is being used to promote mangrove conservation. In addition, the USFS will aid the CSLP in reviewing greenhouse gas emissions formulas to ensure their applicability for the specific environmental conditions of Ghana.

Activities
Review current community engagement and management strategies/plans in mangrove areas within Ghana's Western Region
The USFS will provide technical assistance to support the development/clarification of the management strategies currently used or under development with community groups and non-governmental organizations involved with mangrove areas within Ghana's Western Region. Outputs resulting from this pilot activity should assist community groups in sustainably managing their mangrove/wetland areas with possible support from local NGOs or government agencies and could be scaled up to work in other coastal regions of Ghana or West Africa.

Review mangrove restoration and conservation strategies currently practiced in the Western Region and, if necessary, make recommendations for improvement
USFS will review current mangrove restoration and conservation efforts and provide recommendations for areas of improvement based upon lessons learned from other efforts with similar species and environmental conditions. Applying and adapting such tools as developed under the SWAMP program will allow the CSLP to integrate best practices while further disseminating knowledge to communities and partners in the Western Region of Ghana.

Review monitoring mechanisms and carbon sequestration equations currently used by the CSLP and partners in Ghana to ensure its accuracy for greenhouse gas emissions tracking efforts
Based upon the latest science developed by SWAMP, USFS technical assistance will review and support any updates to ensure the carbon sequestration estimates and equations used by CSLP are reasonable, accurate and representative of the unique mangrove ecosystems found in Ghana and the Western Region.

Review mangrove-related activities with key staff of the CSLP's two, USAID-funded, sister projects: the Sustainable Fisheries Management Project and the Fisheries and Coastal Management Capacity Building Project and make recommendations that might leverage other opportunities among the three projects or with other entities. The three projects meet formally each quarter, and on an as needed basis, to coordinate and collaborate on activities related to mangrove and wetland use and management. Relationships are very good but an outside perspective specifically looking at mangroves are likely to bring added benefits, both collectively and to the projects individually.

USFS Community Mangrove Management Technical Advisor

Profile:
The USFS advisor will possess the following:

- Greater than 10 years' experience working with wetlands, aquatics or mangrove forest issues;

- Knowledge of community engagement, forest planning, inventory and monitoring, and carbon tracking efforts in the United States and internationally, if possible;
- Ability to adapt knowledge and processes to the context of a country with limited human, financial and material resources and with a different legal, social and economic context;
- Demonstrated ability to provide technical leadership to effectively work with a very broad range of interested parties, across cultures, languages and varying capacity levels; and,
- Flexibility to work under often unpredictable and uncontrollable circumstances.

Location, Timing, and Level of Effort: The USFS technical advisor will provide limited remote support to include a desktop review of documents prior to the two-week mission to Ghana. Subsequent report writing and follow up will be required following the mission that may require a few more days' effort.

The advisor will conduct a 20-day assignment that will cover the following phases.

Pre-mission:
- Multiple preparatory calls will be held with partners in Ghana and USFS staff, including program managers at USFS-IP and research scientists engaged in SWAMP work elsewhere in Africa;
- Document gathering and review for the assignment will likewise be necessary;
- Gathering some existing materials relevant to mangrove restoration and management that could support on the ground efforts in Ghana;
- Other preparation and initial coordination communication with other elements of the project.

During mission:
The Advisor is expected to be in Ghana for two weeks during a to-be-determined timeframe late in 2017.

Post-mission:
- Trip report and copies of other deliverables should be shared with USFS-IP within two weeks of return to the Technical advisor's duty station.

USFS Technical Advisor Tasks:
1. Technical support to the CSLP and its partners in convening, coordinating, and providing technical guidance to mangrove management activities;
2. Technical input specifically on development of best practice guidelines for community management planning, restoration and monitoring strategies in the Western Region as well as comments and advice regarding the use of carbon sequestration coefficients/equations valid at the CSLP's engagement level ;
3. Mentoring the CSLP staff and partners on this issue (e.g., Hen Mpoano, Friends of the Nation, the Centre for Coastal Management, the Sustainable Fisheries Management Project, community management bodies) including the pilot development of training materials on mangrove management and restoration;
4. Recommend adaptations or inputs to key SWAMP Africa products, developed from work in East Africa, to ensure their applicability to the West Africa context.
5. Development of related deliverables (see below).

USFS/CSLP Tasks:
1. Identify point(s) of contact who will interact with the USFS Technical Advisor in preparation to and throughout the mission and be available for follow up on information exchanges after the Advisor has departed.
2. Provide the USFS Technical Advisor with all support needed during the mission.
3. Gather all available and relevant information and documentation for the USFS Technical Advisor to review to allow adequate preparation for the work to be done while in-country.

4. Facilitate working relations between the USFS Technical Advisor and the various stakeholders involved in some manner in mangrove (Gov. of Ghana Forestry Commission Wildlife Division, local government offices, Hen Mpoano, Friends of the Nation and other NGOs, other development projects, etc.).
5. Facilitate the preparation and holding of meetings with stakeholders.
6. Review and provide timely feedback on any USFS technical assistance inputs.
7. Other specific in-country logistical support:
    a. Inform any local officials as necessary of the USFS Technical Advisor arrival, itinerary, and purpose of engagement in region.
    b. Arrange for meetings with appropriate key officials and partners.
    c. Arrange for in-country transportation and necessary lodging reservations.

Deliverables:

1) *Draft best practice guidelines:* The USFS Technical Advisor will contribute to developing best practice guidelines to support communities and local governments in developing management plans, restoration and monitoring strategies based on knowledge gained from global SWAMP efforts but appropriate to the Ghana context.

- *Potential questions/issues to explore:*
    i. Are current restoration activities being conducted in the right locales for success?
    ii. What best practices have been learned from mangrove restoration efforts in Ghana's Western Region that should be shared (given the often regionally-specific challenges to such efforts)?
    iii. How much carbon is being sequestered with restoration and better management efforts; what simple, community-developed indicators could be used to track and monitor this and overall mangrove health over the long term? (Aim to use this to help answer the question as to why communities want to support restoration and management of these sites)
    iv. How much mangrove loss is being caused by erosion or natural factors as opposed to those anthropogenic causes?
    v. Can historic inventory data (i.e. aerial maps from 1980s) be located to leverage with up to date information being gathered by CSLP and partners to monitor change of mangroves in the Western Region?
    vi. Are the inter-tidal swamps behind the mangroves in the Western Region playing significant roles in mangrove health and carbon sequestration that are unique to this area?

2) *Trip Report*: the USFS Technical Advisor will produce a report detailing activities during the mission. This report will include, but not be limited to:

a. Executive summary
b. Introduction
c. Issues, findings, & recommendations (per above USFS tasks)
d. Proposed next steps for partners and USFS
e. Appendices
    a. Scope of work
    b. Itinerary
    c. List of contacts made

Read ahead / background documents:

- USFS CSLP most recent annual and quarterly reports
- Mangrove monitoring documents used for trainings with communities and youth clubs
- Ghana Environmental Threats and Opportunities Assessment, 2011

- University of Cape Coast/Centre for Coastal Management training course syllabus
- USAID-sponsored 2014 West Africa Mangroves Workshop Report v5
- CSLP 2015. Assessing Metric Tons Of CO_2e Sequestered On Areas Receiving CSLP Assistance
- Key global and East Africa SWAMP documents, including: Mangrove carbon measurement protocols (CIFOR global and East Africa adaptation); and Best Practices for Mangrove Restoration.
- SFMP and FCMCBP documents related to mangroves (CSLP will query and forward)

Tentative Agenda:

Date	**Activity**	**Persons/Organizations Involved**
Monday, December 4, 2017 Lodging: Holiday Inn, Accra	AM: Cormier arrives in Accra (Director Steve Dennison meets her at hotel) PM: USAID briefing Meeting with Forestry Commission Climate Change and Mangrove points of contact	USFS: Nicole Cormier, Steve Dennison USAID: Justice Odoi FC: tbd SFMP: Maurice Knight, C. Damon
Tuesday, December 5, 2017 Lodging: Petit Palais, Takoradi	Meeting with USAID Sustainable Fisheries Management Project Meeting with USAID West African Biodiversity and Climate Change Project (WABiCC) PM: Depart for Takoradi	USFS: Cormier, Dennison WA BiCC: S. Kelleher, B. Greville-Eyres
Wednesday, December 6, 2017 Lodging: Petit Palais, Takoradi	AM: Meeting and planning with CSLP team PM: Meeting with Hen Mpoano	USFS and CSLP team Hen Mpoano: S Kankam, B. Gormey, J. Mensah
Thursday, December 7, 2017 Lodging: Petit Palais, Takoradi	AM: Travel to field site to see active mangrove restoration Meetings with community management committees, CSLP staff, local govt. officials	USFS and CSLP team
Friday, December 8, 2017 Lodging: Petit Palais, Takoradi	AM: Meet climate change club members and leaders	USFS and CSLP team
Saturday, December 9, 2017 Lodging: Petit Palais, Takoradi	Report writing, day visit to local beach	USFS and CSLP team

Sunday, December 10, 2017 Lodging: Petit Palais, Takoradi	Free day	
Monday, December 11, 2017 Lodging: Petit Palais, Takoradi	AM: CSLP team meeting PM: Field visit to Anlo Beach and meeting with Friends of the Nation	USFS and CSLP team
Tuesday, December 12, 2017 Lodging:	Field visit with Hen Mpoano to Greater Amanzule Wetlands	USFS and CSLP team
Wednesday, December 13, 2017 Lodging: Petit Palais, Takoradi	Field visit with Hen Mpoano to Greater Amanzule Wetlands PM: Return to Takoradi	USFS and CSLP team
Thursday, December 14, 2017 Lodging: Holiday Inn, Accra	AM: Cormier and Dennison travel to Cape Coast, meeting with University of Cape Coast Centre for Coastal Management PM: Cormier and Dennison travel to Accra	USFS: Cormier, Dennison UCC/CCM: Denis Aheto
Friday, December 15, 2017	AM: Debrief with USAID PM: Cormier departs	USFS: Cormier, Dennison

Appendix B. Itinerary

Time	Activity	PoC Persons & Organizations Involved
Monday, December 4, 2017		
11:10 14:00 – 15:00 16:00	Cormier arrives in Accra (CSLP Director Steve Dennison meets her at hotel) USAID in-briefing at USAID in Cantonments USAID West African Biodiversity and Climate Change Project (WABiCC) at WA BiCC office in Labone ***Lodging***: Holiday Inn, Accra	USFS: Cormier, Dennison USAID: Justice Odoi WA BiCC: S. Kelleher, B. Greville-Eyres & staff
Tuesday, December 5, 2017		
11:00 16:00	Meeting with Forestry Commission Climate Change Secretariat & Wildlife Division climate change program head at Forestry Commission in West Legon Depart for Takoradi ***Lodging***: Petit Palais, Takoradi	FC: Roselyn Fousah Adjei, Deputy Dir REDD+ Unit; Jacob Amoako, GIS Specialist REDD+ Unit USFS: Cormier, Dennison
Wednesday, December 6, 2017		
09:00 14:00	Meeting and planning with CSLP team Discussion & orientation meeting with USAID Sustainable Fisheries Management Project and "Mangrove Team" including local NGOs Hen Mpoano (a CSLP grantee) and Friends of the Nation (FoN) at CSLP office ***Lodging***: Petit Palais, Takoradi	USFS and CSLP team SFMP: Maurice Knight Hen Mpoano: S Kankam, B. Gormey, J. Mensah FoN: Theodore Boachieyi Adom
Thursday, December 7, 2017		
09:00 ETD	Field site visits in Shama District and the Pra estuary to view active mangrove restoration (Yabiw, Anlo Beach), wetland monitoring efforts, issues linked to mangrove/wetland conservation; CSLP staff, local govt. officials; interactions with FoN, community management committees at Anlo Beach CSLP resources: Vehicle & driver ***Lodging***: Petit Palais, Takoradi	USFS and CSLP team FoN: Theodore Boachieyi Adom
Friday, December 8, 2017		
09:00 ETD	Field site visits in Ahanta West: Akwidaa estuary (Akyenim, Akwidaa, Ketakor) Meet climate change club members, CREMA leaders & community members CSLP resources: Vehicle & driver ***Lodging***: Petit Palais, Takoradi	USFS and CSLP team

Saturday, December 9, 2017		
TBD	Report writing and local site visits CSLP resources: Vehicle & driver**??** ***Lodging***: Petit Palais, Takoradi	USFS and CSLP team
Sunday, December 10, 2017		
	Free day ***Lodging***: Petit Palais, Takoradi	
Monday, December 11, 2017		
10:00	CSLP team meeting at CSLP office; discussions on mangrove and wetland-related activities of the CSLP CSLP resources: Vehicle & driver ***Lodging***: Petit Palais, Takoradi	USFS and CSLP team
Tuesday, December 12, 2017		
All day; depart TKD at 08:00	Field visit with Hen Mpoano to Greater Amanzule Wetlands – Ankobra River/estuary; meet with Community Conservation Cttee members and leaders CSLP resources: Vehicle & driver, cooler ***Lodging***: Ankobra Beach Resort & Farm (discussions with Claus Egger, Manager)	USFS and CSLP team Hen Mpoano staff Wildlife Division: Dr. Moses Sam, Reg. Dir.
Wednesday, December 13, 2017		
All day; depart Esiama at 08:00	Field visit with Hen Mpoano to Greater Amanzule Wetlands – Old Kablesuazo and Ayanzinli; meet with Community Conservation Cttee members/leaders Lunch at Yabah Hotel CSLP resources: Vehicle & driver ***Lodging***: Petit Palais, Takoradi	USFS and CSLP team Hen Mpoano staff Wildlife Div.: Dr. Moses Sam, Reg. Dir.
Thursday, December 14, 2017		
08:30 11:00 13:30 16:00	Cormier and Dennison depart Takoradi for travel to Cape Coast with CSLP vehicle CSLP resources: Vehicle & driver Special Seminar/Roundtable discussion with University of Cape Coast, Dept. of Fisheries & Coastal Management & Centre for Coastal Management staff/students Cormier and Dennison travel to Accra Field visit at Densu Lagoon (a Ramsar site) with SFMP Development Action Association (DAA) leaders and members ***Lodging***: Holiday Inn, Accra	USFS: Cormier, Dennison UCC/CCM: Dr. Denis Aheto; Dr. Noble Asare & staff; undergraduate & graduate students of the Dept of Fisheries & Aquatic Sciences USFS: Cormier, Dennison DAA: Lydia Sasu, CEO; Emelia Nortey, Manager
Friday, December 15, 2017		
10:00	Debrief with USAID at US Embassy	USAID/Ghana: Justice

	Report writing CSLP resources: Vehicle & driver return to Takoradi ***Lodging***: Holiday Inn, Accra	Odoi, Mark Newton USAID/West Africa: Maggie _____ USFS: Cormier, Dennison
Saturday, December 16, 2017		
12:10 ETD	Cormier departs Accra	