ESTUARIO

PROGRAMA DEL ESTUARIO DE LA BAHÍA DE SAN JUAN

EPA Work Plan & Budget
October 1, 2021 - September 30, 2022

Prepared by the Corporation for the Conservation of the San Juan Bay Estuary

estuario.org

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Table of Contents

EXECUTIVE SUMMARY

The outbreak of the COVID-19 pandemic during the past year severely affected communities worldwide, including many in the study area of the San Juan Bay Estuary system and its 97 square mile watershed. Determined to continue reaching communities and improving the quality of our waters, the San Juan Bay Estuary Program (Estuario) decided to shift to virtual operations. It began developing a plan of action to continue projects that implement the Comprehensive Conservation Management Plan (CCMP) under the mandates and protocols that existed, while keeping our communities safe and healthy. With the support of its creative and proactive team members, the Estuario continued to offer educational programming, provide the public with resources and information virtually through platforms such as Facebook Live, Instagram, and the Estuario website as well as to conduct its technical and scientific work under the government mandated protocols and social distancing requirements.

This year the Estuario will develop a COVID-19 safety protocol for some in-person activities, and will operate in a hybrid manner, hosting in person events when it is safe for our communities and the public, and continuing to reach out to communities virtually. This work plan describes our planned efforts for Estuario's Fiscal Year 2022 (FY22), which covers the period from October 1, 2021, through September 30, 2022. Estuario's work plan priorities each move forward all CCMP goals in a concerted effort:

Environmental Justice: The Estuario has launched a platform to offer long term community resilience support. These efforts are part of a comprehensive watershed-based Mitigation Plan to reduce stressors that the most disadvantaged watershed communities face, supporting environmental justice communities through community driven solutions. All activities, programs, and initiatives in this work plan take into consideration the vital interests and concerns of environmental justice communities in the surrounding areas of the SJBE system.

Reduce Nutrient Pollution: The Estuario will focus on actions to reduce nutrient pollution to protect water quality through its systematic strategy for identifying and correcting illicit discharges that integrate water quality monitoring and socio-ecological resilience initiatives for coastal communities into its methods.

Marine Litter Reduction: Because of the impact and success of the Estuario's solid waste program and oil recycling campaign, Fundación Segarra granted funds to expand the oil recycling campaign to Calle Loíza and integrate local businesses along with residents, and community-based organizations working in the area. The Estuario aims to use this campaign as a model to expand into other communities within the watershed so its focus in 2021 will be to refine and systematize the strategy.

Green Infrastructure and Resiliency: Through the Water Community Network's participation in the development of the hazard mitigation strategy, along with the development of the Green Infrastructure Master Plan for Stormwater Management in the SJBE watershed, the Estuario will focus on incorporating green infrastructure strategies that are validated by communities. Additionally, the Estuario will focus on strengthening various coastal ecosystems in an integrated manner and supporting defense against extreme events by developing curriculum for its Citizen Science Certification Program to add new modules on mangrove restoration and coral reef restoration.

In addition to these priorities, the Estuario will be undertaking a series of strategic initiatives that will set the course for the next decade of our work. This includes the NEP Program Evaluation conducted by the USEPA, continuing the development of Puerto Rico's first-ever Multijurisdictional Hazard Mitigation Plan, revision of the Estuario Comprehensive Conservation and Management Plan (CCMP), and development of a Five-Year Strategic Plan. Each of these initiatives will ensure that the Estuario's work throughout the years continues to be relevant and necessary for our communities and our waters.

INTRODUCTION

In 2020, the San Juan Bay Estuary Program (Estuario) focused on facilitating long-term risk reduction and smarter building decisions across the watershed, using funds from Section 320 of the Clean Water Act to launch a series of initiatives that build on the National Estuary Program's (NEP) comprehensive approach to community-based watershed management.

The San Juan Bay Estuary Program (Estuario) puts communities at the center of its work to restore and conserve the quality of natural waters within the San Juan Bay Estuary watershed. Estuario's strategy for public participation includes not only outreach but also focuses on empowering communities to engage actively and contribute to efforts that will improve the health of water bodies and related ecosystems in their communities. Estuario's efforts bring science to mostly underserved communities, centering environmental justice in our work.

Since the arrival of the COVID-19 pandemic to Puerto Rico in March 2020, Estuario has successfully continued to support its five Community Resilience Hubs by providing programming through virtual platforms. Ongoing sessions with social workers and community coordinators ensure these hubs stay active, culturally relevant and offer residents opportunities for capacity building. Estuario's education program has hosted over 15 virtual discussions and webinars on environmental education since March 2020, as well as the annual Christmas Bird Census. The Citizen Scientists Certificate Program offered twelve certification workshops that collectively summed over 1,000 participants also since the beginning of the pandemic. These virtual platforms have allowed Estuario to expand the reach of its public involvement and education efforts, hosting interlocking education campaigns, health fairs, artists-in-residence initiatives, used cooking oil recycling, solid waste management, renewable energy workshops and emergency management workshops.

Estuario has three main vehicles for fostering public participation: the *Red Comunitaria de Agua* or Water Community Network, Resilient Community Hubs and its education programs. Through these three vehicles, the Estuario has been collecting and validating data from our projects in illicit discharges, green infrastructure, and mitigation planning as inputs to the hazard mitigation plan.

With the support of other funding sources, the Estuario kicked off the development of Puerto Rico's first-ever Multijurisdictional Hazard Mitigation Plan, with 9 other municipalities - Bayamón, Canóvanas, Carolina, Cataño, Guaynabo, Loíza, San Juan, Toa Baja and Trujillo Alto. By partnering, these nine jurisdictions intend to develop a plan that will maximize their collaborative impact and rebuild a more resilient watershed in the face of a changing climate. Additionally, the Estuario began developing and implementing the Green Infrastructure Master Plan for Stormwater Management in the San Juan Bay Estuary Watershed. In collaboration with multiple sectors and communities, the project is employing participatory mapping activities to identify priority areas to focus on. The Master Plan will offer support to municipalities in complying with their permits for municipal separate storm sewer systems (MS4). Both of these projects will inform new strategies of action across the CCMP.

Also through the support of other funding sources, the Estuario's illicit discharges detection and elimination (IDDE) program was expanded to other regions in the watershed basin region of the Rio Grande de Loíza, coming to a total of 200 diagnostic stations, which enabled us to effectively localize and solve **85%** of the illicit critical sanitary discharges found throughout the watershed. Additionally, the Estuario expanded the Water Community Network, engaging residents as part of a 'watchdog' network to preserve the strategies identified to eliminate critical sanitary discharges across the watershed.

The Estuario will continue to gather and validate data from its communities to develop the hazard mitigation plan. In addition, we will be focusing on a series of strategic initiatives to ensure that our goals remain relevant to our communities, the health of our ecosystem, given the new challenges we face through climate change and the recent pandemic. In addition, the Estuario will focus on a strategic plan to ensure the sustainable growth of the organization and ensure effective implementation of the CCMP.

GOALS FOR CCMP IMPLEMENTATION IN FISCAL YEAR 2021-2022

The National Estuary Program's approach to comprehensive community-based watershed management incorporates:

-Establishing governance structures according to watershed boundaries
-Using science to develop and implement a management plan
-Fostering collaborative problem solving
-Informing and involving stakeholders to sustain a commitment

Continuing to build on this, approach for the fiscal year 2021, Estuario will focus on the following areas:

Environmental Justice: The Estuario has launched a platform to offer long term community resilience support. These efforts are part of a comprehensive watershed-based Mitigation Plan to reduce stressors that the most disadvantaged watershed communities face, supporting environmental justice communities through community driven solutions. All activities, programs, and initiatives in this work plan consider the vital interests and concerns of environmental justice communities in the surrounding areas of the SJBE system. Estuario fosters in its agenda the national significance of community involvement and participation in the decision-making process and access to information. The Estuario actively participates in the National Estuary Program's Environmental Justice/Diversity, Equity and Inclusion Working Group. Two Estuario team members regularly attend meetings which allow us to share ideas and network with other NEPs around integrating environmental justice in the execution of the CCMP. This year's CCMP revision and strategic planning will place environmental justice at the forefront of the actions and strategies we identify in the process.

Reduce Nutrient Pollution: The Estuario will focus on reducing nutrient pollution to protect water quality through its systematic strategy for identifying and correcting illicit discharges that integrate water quality monitoring and socio-ecological resilience initiatives for coastal communities into its methods. The Estuario aims to expand the Water Community Network, anchoring its work through Estuario's Resilient Community Hubs, in order to preserve the strategies identified to eliminate critical sanitary discharges across the watershed.

Marine Litter Reduction: Because of the impact and success of the Estuario's solid waste program and oil recycling campaign, Fundacion Segarra granted funds to expand the oil recycling campaign to Calle Loiza and integrate local businesses along with residents, and community-based organizations were working in the area. The Estuario aims to use this campaign as a model to expand into other communities within the watershed so its focus in 2021 will be to refine and systematize the strategy. Additionally, the program results will provide key input to an analysis of the capacity for a recycling program in the San Juan metro area to develop recommendations for public policy in support of this initiative and the development of a pilot program.

Green Infrastructure and Resiliency: Through the Water Community Network's participation in the development of the hazard mitigation strategy, and the development of the Green Infrastructure Master Plan for Stormwater Management in the SJBE watershed, the Estuario will focus on incorporating green infrastructure strategies that are validated by communities. Additionally, the Estuario will focus on strengthening various coastal ecosystems in an integrated manner and supporting defense against extreme events by developing a curriculum for its Citizen Science Certification Program to add two new modules on mangrove restoration and coral reef restoration.

MANAGEMENT CONFERENCE STRUCTURE AND MEMBERSHIP

The Corporation for the Conservation of the Estuary of the Bay of San Juan, Inc. (Corporación para la Conservación del Estuario de la Bahía de San Juan), the not-for-profit entity incorporated in 2005, is headed by a Board of Directors that includes Pedro Gelabert, a hydrogeology expert and retired EPA' Caribbean office Director in Puerto Rico, as its President. The Corporation has fiduciary responsibility for the Program's assets and budget. In addition, the Program works with several volunteer committees, including a Scientific and Technical Advisory Committee (STAC); and a Citizens' Advisory Committee (CAC). The Environmental Protection Agency is currently the principal source of federal support for the Estuary program.

The Management Conference of the San Juan Bay Estuary Program, consists of a President named by the Governor of Puerto Rico, as well as the Secretary of the P.R. Department of Natural and Environmental Resources, the Director of the EPA's Caribbean Environmental Protection Division, the President of the Planning Board of Puerto Rico, Executive Director of the Aqueduct and Sewer Authority (PRASA), President of the Bank and Finance Sector, as well as representatives from the STAC and CAC. The Management Conference works at the macro level of the Program. For example, it approves the annual Work Plan and the strategies proposed to help further the implementation the Comprehensive Conservation & Management Plan of the San Juan Bay Estuary.

Key stakeholders include the eight municipalities, community members and organizations for the Community Water Network, Urban Forests Network, University of Puerto Rico, FEMA, the Clinton Global Initiative of the Clinton Foundation, Enlace del Caño Martin Peña, Capetillo, Arrecifes Pro Ciudad, Fundación Luis Muñoz Marín, 7 Quillas, CESAM, SAM, Sierra Club, Basura Cero, OPAS, Scuba Dogs Society, Corredor del Yaguazo, Caras de la Américas, Para La Naturaleza, Cooperativa de Pescadores –Piñones, International Institute for Tropical Forestry, Excursiones ECO, La Paseadora, San Juan Paddle, Aqua Fitness, Club Nautico, Centro Sor Isolina Ferré, MAC, Colectivo del Ancon, Taller Comunidad La Goyco, Caimito Cultural Center and Comunidad de Puente Blanco.

SOURCES OF FUNDING

Funding from FY 2021-2022 will be provided to support the implementation of projects included in the following section. Such funds come in the form of a grant from the EPA and non-federal matches.

Section 320 of the Clean Water Act (CWA), as amended, requires that funds awarded by EPA be matched on a 1:1 ratio. To comply with this mandate, PRASA will provide $770,000 (in-kind matching funds) for the fiscal year 2021-2022.

Program office and staff: In FY 2022, the Program Office will consist of a group of eight (8) full-time employees who will lead the implementation of all activities in the Work Plan, and the implementation of the CCMP. A job description for each employee is included in the Grant Application.

Collaboration with other watersheds: The Estuario will continue working with other watersheds. This will be accomplished through the Relief and Recovery efforts, which are being carried out in regions outside of the study area. This effort is centered on education about the processes which the Estuario conducts to move forward its restoration and conservation agenda. Additionally, the Estuario will coordinate for the thirteenth year the Puerto Rico Water Quality Monitoring Day. The coordination and empowerment of over 1,000 volunteers make this day the most influential citizen science event in Puerto Rico.

Environmental Justice Communities: All activities, programs, and initiatives in this work plan take into consideration the vital interests and concerns of underserved communities in the surrounding areas of the SJBE system. Estuario fosters in its agenda the national significance of community involvement and participation in the decision-making process and access to information. Estuario establishes working relationships with stakeholders geared towards building successful collaborative efforts.

STRATEGIC INITIATIVES FOR THE EXECUTION OF THE CCMP

The San Juan Bay Estuary Program (Estuario) promotes initiatives and projects directed at executing the actions established in the Comprehensive Conservation and Management Plan (CCMP). The CCMP divides these actions into five core focus areas:

(1) Water Quality,
(2) Habitat and Wildlife,
(3) Aquatic Debris,
(4) Public Education and Involvement, and
(5) Green Infrastructure.

As per the area of Special Interest in the EPA's FY 2021-2024 Funding Guidelines, this work plan focuses activities under these five areas while undertaking a series of strategic initiatives this year that will set the course for the next decade of our work. This includes evaluating the progress of the past five years through the NEP Program Evaluation conducted by the USEPA, continuing the development of Puerto Rico's first-ever Multijurisdictional Hazard Mitigation Plan, revising our Comprehensive Conservation and Management Plan (CCMP), and developing a Five-Year Strategic Plan. Each of these initiatives will ensure that the Estuario's work throughout the years continues to be relevant and necessary for our communities and our waters throughout the years.

NEP Program Evaluation
Every five years, the EPA evaluates each NEP's progress implementing its CCMP. The program evaluation is an opportunity to understand how we have been effective and where we need to improve. The evaluation's findings will prove critical in determining which actions the Estuario will include in the CCMP revision. Furthermore, it will ensure our goals remain relevant and sustainable for our organization's growth.

Hazard Mitigation Plan
This past year, Estuario launched the development of Puerto Rico's first-ever Multijurisdictional Hazard Mitigation Plan. The municipalities of Bayamón, Canóvanas, Carolina, Cataño, Guaynabo, Loíza, San Juan, Toa Baja, and Trujillo Alto convened as part of the Steering Committee to begin coordinating their ongoing and future mitigation efforts to maximize their impact and rebuild a more resilient watershed in the face of a changing climate. In the coming months, with the support of Estuario's Scientific and Technical Advisory Committee (STAC) and the Water Community Network, the Steering Committee will identify risks and vulnerabilities associated with natural disasters and develop comprehensive, watershed-based long-term mitigation strategies that align with community objectives, focus resources on the greatest risks, and communicate priorities to potential funders. Once completed, the Steering Committee will submit the plan to FEMA to qualify for non-emergency disaster assistance, including funding for mitigation projects.

Estuario also launched the development and implementation of the Green Infrastructure Master Plan for Stormwater Management in the San Juan Bay Estuary Watershed. In collaboration with multiple sectors and communities, the project is employing participatory mapping activities to identify priority areas to focus on. The Master Plan will support eight municipalities complying with their permits for municipal separate storm sewer systems (MS4). All the green infrastructure strategies in the Master Plan will also feature as mitigation projects in the Multijurisdictional Hazard Mitigation Plan, which will in turn inform which actions to include in the CCMP revision.

CCMP Revision
In 2000, the Governor of Puerto Rico submitted the CCMP for Estuario to the EPA Administrator, determining the priorities and actions for each annual work plan and guiding the organization's work for the foreseeable future. Estuario updated the document in 2010 to ensure "that the plan is still very relevant and the work done by the San Juan Bay Estuary Program (SJBEP) is as necessary as ever." Considering the new challenges the estuary system is facing due to the climate crisis, especially after the impact of hurricanes Irma and María in 2017, it is time to perform an ambitious and thorough review of our

CCMP.

Any revision to a CCMP requires an extensive analysis of the proposed actions, their status, and effectiveness. The new version is expected to update, amend, and offer further actions, based on current and projected threats to the ecosystem. The Estuario will contract an external consultant to develop a framework to analyze the CCMP actions and ensure they are still the most relevant, efficient, and effective to achieve the NEP's mission. The framework will be based on a comprehensive analysis of the fellow 27 NEP programs and their CCMPs to identify lessons learned. The goal is for the framework to yield specific, actionable recommendations for how improving the CCMP and ensuring the greatest integration possible of all programs and projects Estuario undertakes to restore and conserve the natural waters of the San Juan Bay Estuary and related ecosystems.

Strategic Five-Year Plan

The Estuario will develop a five-year plan to ensure all strategic initiatives serve a common purpose: the sustainable growth of our organization and its impact. The plan must lay out how current and programmed projects will work in concert to advance Estuario's mission, coordinating the NEP evaluation with the Hazard Mitigation Plan and Green Infrastructure Master Plans and ensure the final recommendations and strategies inform the actions identified in the CCMP revision.

ESTUARIO ACCOMPLISHMENTS AND COMPLETED 2021 MAJOR PROJECTS

12th Puerto Rico Water Quality Monitoring Day (PRWQMD) 2018: Despite the challenges brought about by the pandemic, the Estuario celebrated the 12th annual PRWQMD August 2020, the largest citizen science water quality monitoring event in Puerto Rico in. About 350 volunteers participated in the main event using social distancing measures and monitored 135 stations across the island.

Urban Forest Network: Expanded the Urban Forest Network to a total of five urban forests in the watershed and launched a virtual version of the Urban Forest Network Passport so visitors may collect stamps from each forest, document the birds they observe and take part in activities offered through the network amidst the pandemic, along with a webinar to introduce the passport.

Vivero Estuario: Collaborated with residents to develop a community nursery which grows species of coastal plants that support Estuario's reforestation efforts throughout the watershed and serves as an educational, cultural and training center. Once the COVID-19 pandemic is over, Estuario hopes to host in-person outreach and training efforts on green-area management best practices currently offered on-line. The goal is to transform the nursery into a business opportunity for the community.

Development of a Watershed Ecosystems Services Index & Health Indicator: Launched the development of an ecosystem index and health indicator that will measure the condition and health of watershed ecosystems and provide information to evaluate environmental considerations, status and trends. The index and indicator will provide a baseline for evaluating and prioritizing protection, mitigation, adaptation and restoration projects throughout the watershed. A set of watershed indicators that will be integrated into the watershed index has been selected. By August 2021, the Estuario expects to have developed a watershed indicator index that represents the maximum sustainable benefits and services from the SJBE ecosystem along with a model program to quantify the watershed index through time.

Oil Recycling Program: Distributed over 200 funnels that residents can use to recycle used oil. The Estuario expanded the oil recycling program to a total of three community resilience hubs and one condominium, which have collected approximately 50 gallons of used oil to properly dispose of and recycle, conserving our water infrastructure and the bodies of water it is connected to.

Co-Management of the Condado Lagoon Estuarine Reserve: Despite the pandemic, the Estuario continues CineEstuario through virtual showings via Facebook Live. We completed two virtual showings so far in the fiscal year 2020-2021 with a total audience engagement of approximately 100 participants.

Solid Waste Management Activities [On Going]: 16 commercial businesses have been actively participating in the solid waste prevention campaign to correct disposal and improve recycling in participating areas. As part of the storm water system protection campaign, Estuario conducted 3 water monitoring samplings on calle Loiza as part of the storm water system protection campaign.

Citizen Science Certification Program [Ongoing]: During the second quarter of 2021, Estuario offered the first round of introductory workshops in three modules for the fiscal year 2020-2021. A total of 453 participants enrolled in this cohort, taking part in the following workshops; Introduction to Participatory Bird Census (150 participants), Introduction to Microplastics and Aquatic Waste (157 participants), Introduction to Water Quality Monitoring (146 participants)

Estuarine Education Program [Ongoing]: Completed a Scouts Merit Badge Workshop Series, offering young scouts and scout leaders a two-day workshop for the Sustainability Merit Badge to Scout Units. This merit badge is required for the rank of Eagle Scout and as part of educating on the goals of sustainable development in the Estuary basin and included over 60 participants in each session. The Estuarine Education program participated in the Migratory Festival celebration to educate and celebrate migratory birds in collaboration with Centro Ambiental De Santa Ana (CASA), which had a total of 32

participants. We also maintain agreements with eight schools to be part of the Guardians of the Estuary, which encourages schools to adopt a nearby body of water within the SJBE watershed and monitor the water quality. Encouraging schools to adopt a nearby body of water within the SJBE watershed and monitor the water quality. In addition, we completed five curricular lessons in topics such as microplastics, climate change in Puerto Rico, and birds endemic to Puerto Rico with five organizations or educational institutions, and over 130 participants.

Communications Program [Ongoing]: Estuario's long range communications program has developed 162 new social media contents, including education information about Estuario activities and initiatives and developed 5 new educational videos to inform the public about topics such as International Day of Forests, microplastics, and other Estuario activities. The communications program has been instrumental in developing and hosting programmatic activities in a virtual format to we may continue empowering our stakeholders amidst a COVID-19 pandemic.

Bird Census: While in-person bird census activities are restricted to volunteers and participants of the citizen science program, the Estuario team continues conducting participatory bird census under the health safety measures under COVID-19 restrictions and is able to share and enter data into the eBird database and the Audubon Society in Puerto Rico. A bird biodiversity index is currently being developed with bird census data collected since 2017 and will perform other population data analysis reflecting environmental conditions and trends. The index and data analysis are scheduled to be completed by the end of the fiscal year 2020-2021.

WORK PLAN ACTIVITIES

ACTIVITY 1: ESTUARIO WATER QUALITY VOLUNTEER MONITORING PROGRAM

CCMP Action(s)

WS-17: Determine the areas of highest sewage discharges in the SJBE watershed
WS-18: Continue and strengthen the Estuario's monitoring program, including its public-science component, paying particular attention to the Río Piedras, Juan Méndez Creek, San Antón Creek, and their tributaries.
PI-3: Identify potential restoration and monitoring projects within the SJBE where volunteer participation would be effective. Establish a Program to Provide Citizens with Effective and Organized Volunteer Opportunities to Support the SJBE's Restoration Projects (Water Quality Monitoring, Education, etc.).

CWA Relevant Program(s)

Identifying polluted waters and developing plans to restore them

Work Plan Priorities

Reduce Nutrient Pollution

Objective(s)

- ✓ Establish baseline information to better measure, prioritize, and manage restoration effort
- ✓ Continue to be a reliable and sound source of water quality data of the San Juan Bay Estuary system and its watershed.

Description

The Estuario Water Quality Volunteer Monitoring Program is the backbone of the San Juan Bay Estuary Program. Thanks to the water quality monitoring initiatives and volunteers, valuable data is produced, allowing the Estuario to measure the progress of the CCMP implementation. The projects impact several audiences including school students, citizen scientists, university students and scholars. Furthermore, the data collected is provided to the Department of Natural and Environmental Resources (DNER) to complete the CWA sections 305(b)/303(d) Integrated Report that is submitted to EPA. In addition, an annual audit of the procedures and results will be performed as stated in the QAPP, and a "pass" in the evaluation is expected.

The Estuario will continue with its Citizen Science Certification Program. Volunteers who opt to become certified by the Estuario will carry out fieldwork exercises and participate in workshops or webinars to focus on strengthening skills such as critical thinking, laboratory skills, and the development of environmental management tools. The Water Quality Volunteer Monitoring Program Coordinator will choose the subjects to be presented in these workshops or talks, with the option of bringing in outside speakers. These subjects will be chosen based on needed skills by the volunteers, and themes of ongoing environmental importance.

Outputs / Deliverables

1.1 Eleven (11) monthly sampling events to obtain water quality in-situ measurements in twenty-five (25) monitoring stations, which are part of the Estuario WQVMP.
1.2 Two sampling events will be conducted to collect water samples for lab-based analysis of (4) parameters. The sampling events will cover both wet and dry seasons.

Outcomes

Short term: Water Quality Volunteer Monitoring Program Data will be available for students, the PR DNER Water Quality Area, the public compliance office, and to academia for research and publication purposes. An annual audit of the procedures and results will be performed as stated in the QAPP, and a "pass" in the evaluation is expected.
Intermediate: (1) To continue the Estuario's role of providing the official water quality monitoring data of the main bodies of water for the economic activity of the island and its most threatened ecosystems. (2) To maintain partnerships and knowledge exchange with academia and other organizations in the assessment and monitoring of the SJBE.
Long term: Improve actions for clean waters and sediments in the SJBE.

Milestones

1st Quarter: Begin Monthly sampling events. Schedule webinars and education workshops (The proposed workshops will be scheduled depending on the volunteers' availability.).
2nd quarter: Continue monthly and weekly sampling events. First lab-based analysis sampling event (The lab-based analysis is performed during the wet and dry seasons of the year).
3rd quarter: Continue monthly and weekly sampling events.
4th quarter: Perform second series of webinars and workshops. Second lab-based analysis sampling event (The lab-based analysis is performed during the wet and dry seasons of the year). Conclude sampling events. The sampling events will be conducted monthly and completed in September 2022.

** The estimated milestones are subject to weather conditions and safety matters.*

Staff

These activities will be led by the Water Quality Monitoring and Citizen Science Coordinator, with the support and supervision of the Scientific Director. The Water Quality Monitoring and Citizen Science Coordinator manages sampling trip-specific needs including volunteers' availability, training, equipment care, calibrations, equipment preparation and data handling. The Scientific Director is the QAPP Manager for the Estuarine Water Quality Volunteer Monitoring Program. He is responsible for the overall implementation and management of the QAPP, allocating necessary resources to meet the project objectives, distributing sampling's results, and ensuring that technical and schedule objectives are met. The QAPP Manager is responsible for the correspondence with outside groups, including agencies responsible for approving the QAPP and the users of the collected data. The QAPP Manager will resolve any procedural deficiencies identified during the data audits.

Partners and their role(s)

Academia: Provide a platform for science students to do research and participate in the water quality monitoring projects. The University of Puerto Rico, Inter American University, Metropolitan University, and the Caribbean University have shown interest in this effort.

US Geological Survey (USGS): The USGS and Estuario have an ongoing working relationship that includes data and information exchange.

Department of Natural and Environmental Resources (DNER): As stated by the Constitution of Puerto Rico, the waterbodies are managed by DNER. It is crucial to be in communication with the agency in order to keep it abreast of the ongoing activities and seek required permits.

Estimated budget: $17,473

Budget Detail

Product or Services	Cost	Category	Description
Lab analysis for the following parameters: Fecal Enterococcus, Total Phosphorous, Nitrate/Nitrite, and Oil and Grease.	$10,473	Other	Lab analysis for the following parameters: Fecal Enterococcus ($54.75), Total Phosphate ($15.75), Nitrate ($19.20), and Oil and Grease ($35.70). These costs include all the services provided by EQ Lab ($346 for pick up for 8 sampling days and sales tax.) Total cost for two sampling events for 25 monitoring stations.
Field materials and supplies	$1,000	Supplies	Calibration standards (approx. $1,250) plus other monitoring supplies such as gloves, distilled water, batteries, and/or protective supplies
Boat Rental (24 trips)	$6,000	Other	24 boat trips at $250 per trip for monitoring events

ACTIVITY 2: ENVIRONMENTAL DATA ANALYSIS

CCMP Action(s)

HW-14: Protect existing populations of endangered and threatened bird species and protect and restore their habitat within the SJBE System.
PI-1: Develop and promote low-impact recreational activities within selected areas of the SJBE.
PI-3: Establish a program to provide citizens with effective and organized volunteer opportunities to support the SJBE's restoration projects.
PI-4: Develop a long-term public education and outreach program.

CWA Relevant Program(s)

Protecting wetlands
Protecting coastal waters through the National Estuary Program Protecting Large Aquatic Ecosystems

Work Plan Priorities

Environmental Justice
Resiliency

Objective(s)

- ✓ Document bird species, presence and abundance, within the San Juan Bay Estuary Watershed
- ✓ Increase participation from the public in the Estuary's citizen science initiatives
- ✓ Increase public awareness of the presence and function of watershed bird fauna

Description

Birds are bio-indicators of the health of ecosystems. Conducting a participatory census within the San Juan Bay Estuary Watershed helps document the presence and abundance of certain native, endemic and migratory species that use the estuary to live, eat, shelter and reproduce. The project aims to document bird species, presence and abundance, within the San Juan Bay Estuary Watershed. The project aims to increase public participation in the Estuary's citizen science initiatives and increase public awareness of the presence and function of watershed bird fauna.

Since 1999, the Estuario has sponsored a Christmas bird count in different areas in the San Juan Bay Estuary Watershed. The bird census is performed in coordination with the Christmas Bird Count sponsored by the National Audubon Society (http://birds.audubon.org/christmas-birdcount). All Christmas Bird Counts are conducted from December 14th until January 5th each season. The data collected by Christmas Bird Count participants across the US and beyond over the past century have become one of only two large pools of information indicating to ornithologists and conservation biologists how the birds of the Americas are faring over time. Since 2012, the Estuario has been sharing the data with the Cornell Lab of Ornithology through the eBird project (http://ebird.org/content/ebird/acerca/afiliados/el-laboratorio-de-ornitologiacornell) also the data is shared with the DNER and is posted in the Estuary Atlas, so is an open source to the public.

After the passing of Hurricane María in September 2017, understanding the recovery process of the Estuary's wildlife is of great importance and interest. During the 2017-2018 fiscal year, the Estuario began its Citizen Science Certification Program and incorporated bird censuses as one of the modules that citizens could become certified in. Using this bird census data collected since 2017, during the 2020-2021 fiscal year, a Bird Biodiversity Index to perform population data analysis that translates field observations into information useful for population dynamic tracking, and including numerical indicators that capture and reflect general environmental conditions and trends.

This fiscal year, this activity will be a follow-up to the Bird Biodiversity Index initiatives and the Estuario will focus on developing a QAPP to identify and monitoring protocols to calculate the Bird Biodiversity Index and conduct data analysis on an annual basis, and identify deliverables to include in subsequent work plan activities.

Outputs / Deliverables

2.1 Development of a QAPP to properly develop the monitoring protocols of the Bird Biodiversity Index and Data Analysis

Outcomes

Short-term: Bird census data collected in different sites within the SJBE watershed, with volunteer participation or collected from various activities that take place from participants homes
Intermediate: Calculation of bird diversity index and species richness to identify relevant bird habitat using eBird citizen science project. Increase the participation of citizen scientists and community volunteers
Long-term: Analysis of bird population and trends in the SJBE ecosystems due to environmental or climatic changes and more recently after hurricane Maria hit Puerto Rico ecosystems, including the Urban ones in the San Juan Bay Estuary Watershed region

Milestones

1st Quarter: Present Bird Biodiversity Index STAC to discuss results and observations; STAC then offers their recommendations

2nd Quarter: Develop QAPP with the protocols

3rd Quarter: Send QAPP for approval

4th Quarter: Work with US EPA to finalize QAPP based on their feedback/recommendations

Staff

The Education Manager and Scientific Director develop the monitoring protocols and associated activity to include in future work plans under the supervision of the Executive Director.

The Water Quality and Citizen Science Coordinator will support this activity.

Partners and their role(s)

Department of Natural and Environmental Resources: Will provide access to their Protected Natural Areas and use of the facilities.
Corredor del Yaguazo, Inc: Will provide volunteers and experts in the identification of birds.
Department of Geography, University of Puerto Rico, Interamerican University, & Metropolitan Campus: Will provide volunteers.
National Audubon Society: Will provide guidelines and bird census database.
Cornell Lab of Ornithology: Will provide a data-base system known as eBird.
Santa Ana Nature Center: Will provide volunteers and experts in the identification of birds.

Estimated budget: $6,240

Budget detail:

Product or Services	Cost	Category	Description
Education Manager	$6,240	Contractual	260 hours @ $24/hour for one year

ACTIVITY 3: CO- MANAGEMENT OF THE CONDADO LAGOON

CCMP Action(s)

HW-24 Ensure implementation of Law No. 112 of 2013, which created the Condado Lagoon Estuarine Natural Reserve

CWA Relevant Program(s)

Protecting coastal water through the National Estuary Program

Work Plan Priorities

Mitigation Plan
Green Infrastructure/Resiliency

Objective(s)

- ✓ Implementation of the Conservation Management Plan for the Condado Lagoon Estuarine Reserve through diverse activities

Description

Over the past decades, the Estuario has restored the Condado Lagoon from what used to be referred to as the cesspool of San Juan into what is now the only protected non-beach body of water in the metropolitan area. This beautiful body of water received for decades the illegal raw sewage discharges from most of the buildings located on its borders. In 2009, the last of these discharges were eliminated, and the health of the lagoon has been partially restored when illicit discharges are not occurring.

In 2013, the Estuario supported the passage of Law No. 112 of September 30, 2013 by the Government of Puerto Rico, which designated the Condado Lagoon an estuarine reserve. This critical piece of legislation includes creating the commission for community co-management, a prohibition on fishing and the use of motorized watercraft in the Lagoon, and the production of a management plan, among other essential provisions. Since then, the Condado Lagoon has continued to become a crucial outdoor hub for recreational and economic activity based on low- impact non-motorized aquatic sports, attracting residents and tourists alike.

On September 20, 2017, the direct impact of catastrophic Hurricane Maria disturbed the achievements of the Condado Lagoon and its surroundings. The hurricane's destruction harmed the recreational areas. It made the quality of water of the Lagoon vulnerable through sanitary discharges, placing at risk the health of the community and its visitors, and putting a hold on the variety of economic recreational and tourist activities that depend on it. In the 2017-2018 fiscal year, the Estuario promptly responded by launching the Friends of the Condado Lagoon (Amigos de la Laguna) initiative as part of the #EstuarioRevive campaign, conducting reforestation activities, debris removal, and incorporating stakeholders from the local and federal government to correct sanitary and stormwater infrastructure problems.

The Estuario will continue to focus on activities supporting of the implementation of the Conservation Management Plan for the Condado Lagoon Estuarine Reserve, such as education and restoration activities. The last year, the Estuario installed (7 seven) informational and advisory signs, where needed, to communicate general information and behavioral rules and expectations.

The Program will also be convening residents and users of the Lagoon for meetings to raise awareness on the area's ecological and economic importance. The Estuario will carry out passive recreation to inform the public on the interagency work being carried out in the marine reserve.

During the fiscal year 2020-2021, the Cine Estuario events were carried out virtually due to the COVID-19 pandemic and government mandated safety protocols. This year, the Estuario will focus on developing COVID-19 protocols to

return to hosting Cine Estuario events in person. The protocol requires purchasing materials for sanitizing and a functionality on the website to limit space according to safety protocols for in-person events.

Outputs / Deliverables

3.1 2 in person or virtual meetings with operators and Amigos de la Laguna
3.2 9 Cine Estuario Showings that are streaming so that participants can view from home or on site at Condado Lagoon
3.3 2 tabling events at the Condado Lagoon to reach out to residents and park goers
3.4 Coordinate with Department of Natural Resources Commissioner of Police Patrol to increase frequency of marine patrol at Laguna de Condado

Outcomes

Short term: Ensure implementation of Law No. 112 of 2013, which created the Condado Lagoon Estuarine Natural Reserve
Intermediate: Active public participation in improving the Condado Lagoon
Long term: Protection of the Condado Lagoon's biodiversity

Milestones

1st Quarter: 1 meeting with Amigos de la Laguna; Initial meeting with Condado Lagoon Department of Natural Resources Commissioner of Police Patrol to begin coordination to increase frequency of marine patrol
2nd Quarter: 1 meeting with Amigos de la Laguna, continue coordination with police patrol
Estuarine Reserve; Three (3) Cine Estuario screenings; 1 tabling event at the Condado Lagoon;
3rd Quarter: Three (3) Cine Estuario screenings
4th Quarter: Three (3) Cine Estuario screenings; 1 tabling event at the Condado Lagoon

Staff

Assistant Project Manager for Stakeholders and Aquatic Debris will ensure the outputs are carried out with support from other team members including Scientific Director, Water Quality Monitoring and Citizen Science Coordinator, and others as needed.

Partners and their role(s)

DNER, San Juan Muncipality, DTOP: The Estuario will work closely with the DNER, the other entity which co-manages the Condado Lagoon Estuarine Reserve, along with the San Juan Municipality and DTOP as needed

Environmental and Community Organizations: Organizations and initiatives which operate in the Condado area will support the co-management of the Condado Lagoon.

Friends of the Condado Lagoon: This initiative of the Estuario will be the link between the Program and organizations representing businesspeople, residents and organizations operating in the area

Estimated budget: $5,848

Budget detail

Product or Services	Cost	Category	Description
Cine Estuario Screening	$1,620	Contractual	9 screenings @ $180.00 per function
Movie Permits	$2,700	Other	$300 per movie permit @ 9 screenings
Materials for COVID-19 protocols	$198	Supplies	Hand sanitizer (15 spray alcohol bottle approx. @ $6); alcohol refill (4 refills @ $12); surface disinfectant (5 bottles @ $12/bottles) approx.
Printing of safety boards	$50	Other	Printing for COVID-19 safety boards
Outreach and Educational Materials for tabling events	$1,280	Other	Printing of advisory signs (10 signs @ approx. $50), brochures (digital to be uploaded on website + printing of 1,000 brochures @ approx. $630 and Estuario banner (1 @ $150)

ACTIVITY 4: WASTE POLLUTION REDUCTION AND OIL RECYCLING CAMPAIGN (EXPAND)

CCMP Action(s)

AD-1: Develop and implement community-based solid waste management and recycling programs in coordination with municipalities.
AD-4: Conduct periodic aquatic debris clean-up activities at suggested SJBE locations.
AD-5: Establish Solid Waste Pollution Prevention Pilot Programs at different SJBE locations.
AD-6: Implement measures to detect, correct, and control illegal dumping activities and enforce Puerto Rico's Anti-Littering Law (Law No.11 of 1995)
AD-7: Enforce the Law for the Management of Used Tires (Law. No. 171) and other regulatory measures related to the illegal dumping of used tires within the estuary system and its drainage basin.

CWA Relevant Program(s)

Addressing diffuse, nonpoint sources of pollution

Work Plan Priorities

Environmental Justice
Marine Litter Reduction

Objective(s)

- ✓ Reduce and eliminate the detrimental impact of used oil on the sanitary and storm water infrastructure through behavior modification of residents, business owner and those who use the estuary and its watershed
- ✓ Reduce the amount of pollution reaching our waterways, reduce the amount of oil affecting the grey infrastructure within the San Juan Bay Estuary Reduce the amount of solid waste disposed incorrectly

Description

The SJBE system faces a significant impact on its gray infrastructure and environment due to improper management of solid waste and disposal of used oil. The development of awareness campaigns, correct disposal, and recycling waste are fundamental measures for a healthy sewer system and aquatic resources in the estuary.

Recyclable materials are an untapped resource in Puerto Rico. The potential of these materials could be optimized by generating awareness and developing markets around them. The solid waste prevention and recycling program designed by the Estuario in the past few years allows the community to be more responsible for correctly handling solid waste material.

To order to continue addressing the threat of solid waste material on communities and the Estuario's watershed waterbodies, the Estuario will conduct a waste characterization analysis of trash produced within the basin to first understand current use patterns of solid debris within the watershed. Using the results of this analysis, a proposal for an integrated waste management plan across the municipalities of the watershed will be developed. This waste management plan will provide useful information and resources regarding the risks related to improper waste management. The analysis results and recommendations will also be integrated into the hazard mitigation plan with the intention to reduce the amount of waste making it to our waters and will be implemented over the next few years.

The waste management plan will also intend to incorporate a recycling plan adapted for the new realities as a cornerstone of action for the San Juan Bay watershed to reduce debris and stimulate economic activity in the Estuario communities.

Outputs / Deliverables

4.1 Support for 1 Waste Characterization study for the watershed
4.2 Provide requested data and evidence related to Aquatic Debris to support the CCMP Revision Process and

Program Evaluation processes

Outcomes

Short term: Understand the current use patterns of solid debris and capacity for recycling initiatives programs among municipalities across the watershed. Reduce the amount of the solid waste and increase the recollection of the materials with potential to be recycled.

Intermediate: Develop a waste management and/or recycling plan for the designated area. Raise awareness on the environmental consequences of improper oil disposal and how to properly dispose of oil through citizen and business action. Monitor the storm water system protection campaign

Long term: Reduce the amount of waste or debris entering all bodies of water in the SJBE watershed. Raise awareness on the environmental consequences of improper oil disposal and how to properly dispose of oil through citizen and business action. Reduce the amount of waste or debris entering all bodies of water in the SJBE watershed. Support the development of policy that will detect, correct, and control illegal dumping activities

Milestones

1st Quarter: Publish RFP and select external firm that will conduct Waste Characterization Study
2nd Quarter: Conduct Waste Characterization Study- Evaluate Waste Management Plans of the municipalities
3rd Quarter: Conduct Waste Characterization Study
4th Quarter: Develop proposals for a waste management plan; present study and proposals

Staff

Assistant Project Manager for Stakeholders and Aquatic Debris and Resilient Community Coordinator will be in charge of overseeing the Solid Waste Management plan and implementing or continuing volunteer solid waste education activities. Water Quality Monitoring and Citizens Science Coordinator will support the water monitoring aspect of this activity.

Partners and their role(s)

DNER, EPA, PRASA and Municipalities- provide endorsements and integrate their programs into Estuario's efforts

Estuario Resilient Hubs- provide community engagement support and space to hold meetings Recycling companies- align their services to the created demand

Other NGOs- complement efforts.

EPA, PRASA, Fundación Segarra, Loíza street community, local businesses, hotels

Estimated budget: $38,000

Budget detail

Product or Services	Cost	Category	Description
Waste Characterization Study	$35,000	Contractual	An external firm will conduct a characterization analysis of trash produced across the basin, and also develop a proposal for an integrated waste management plan across the municipalities of the watershed
Water Bottles	$3,000	Supplies	Reusable, stainless steel water bottles to promote recycling and reuse of materials approximately 750 bottles

ACTIVITY 5: ESTUARIO EDUCATION AND EMPOWERMENT INITIATIVES

CCMP Action(s)

PI-1: Develop and promote low-impact recreational activities within selected areas of the SJBE.
PI-4: Develop a long-term public education and outreach program.
PI-5: Develop an ecotourism program to promote sustainable, low-impact enjoyment of SJBE's natural resources as a means to further their conservation.
PI-6: Develop an Environmental Education Program to Target Young Audiences at Schools and other Non-Formal Educational Institutions throughout the SJBE Watershed.
PI-8: Promote better understanding of estuarine resources among regulatory enforcement agencies and personnel.

CWA Relevant Program(s)

-Protecting wetlands
-Protecting coastal waters through the National Estuary Program
-Protecting Large Aquatic Ecosystems

Work Plan Priorities

Environmental Justice

Objective(s)

- ✓ Reach school populations (students and educators) as well as communities throughout the watershed, engaging them through facilitated educational lessons, activities, guided tours, citizen science activities, interpretive programs and special educational projects opportunities.
- ✓ Increase the recreational and sustainable enjoyment of the SJBE Watershed.
- ✓ Educate and empower residents to be prepared for emergencies and disasters.

Description

The Estuario Education Program is comprised of the following activities: Educational Field trips; Facilitation of Curricular Lessons; Guardians of the Estuary; Summer Educational Program; Professional Development Workshops; and Estuarine Professional Development Workshop and Field Trips for Environmental Interpreters and non-formal educators.

The Education program will serve as a platform to allow for further community empowerment and continual involvement in mitigation planning and resilience activities at the subbasin level. Community Resilience encompasses a community's capacities, skills, and knowledge that allows them to recover from disasters fully. Community resilience allows education and citizen activities to better understand our environment and our shared space, from the forests to the city to the coast. Education activities will expand community tools to face extreme situations and help disseminate and integrate Mitigation Plan feedback and activities.

Outputs / Deliverables

5.1 Provide requested data and evidence related to Education and Public Involvement to support the CCMP Revision process and Program Evaluation processes.

Empower communities with capacity building and training in key areas that will increase resilience and preparedness for natural disasters with activities such as:

5.2 One (1) Scouts Merit Badge Workshop or Webinar Series: The Estuario will offer young scouts and scout leaders at least one merit badge related with any of the topics related to our Estuary ecology, biodiversity and its ecosystems; such as (Bird Study, Oceanography, Nature, Soil and Water Conservation, Environmental Science, Forestry, Fishing, Sustainability, among other merit badges from the Scouts BSA movement)

5.3 One (1) Weeklong Summer Workshop or Webinar Series: This weeklong summer workshop will be offered to a group of young people living within the SJBE watershed. Through a variety of creative, participatory and hands-

on or virtual activities, all related to the environment and human health, participants will learn firsthand about the SJBE, its fauna, flora and ecosystems, and what actions, as young citizens and leaders, they can take to take part in restoration and conservation of the SJBE watershed

Systematically provide educational opportunities in schools (and other communities) that are located in critical areas of the watershed using a subbasin approach with:

5.4 One (1) Christmas bird count either on-site or promoting the activity from participants' homes as backyard bird watching. The Estuario will conduct a participatory bird census between December 14th and January 5th across the SJBE watershed as part of the Audubon Christmas Bird Count. Estuario's Christmas Bird Count is named Gamaliel Pagán Hernández and promotes the participation of scout youth. Participants become citizen scientists, gain skills and take action towards conservation of estuarine biodiversity and its ecosystems.

5.5 One (1) Caribbean Water Bird Census: The Estuario will conduct a water bird census at one transect in a wetland of the SJBE watershed. The census will consist in four different counts in the same transect by boat, as part of a region-wide count in the winter where everyone counts at the same time during the middle of winter (when birds are most stationary) to get a "snapshot" of waterbird population numbers and habitat use throughout the Caribbean. Two water bird count events will be conducted through the Christmas Bird Count events.

5.6 Five (5) facilitation of Curricular Lessons: Facilitation of Curricular Lessons or webinars with Schools and Communities of Learning: The Estuario will continue providing students and teachers and other communities of learning within its watershed to the acquisition of knowledge about the estuary watershed, water quality, climate change, flora and fauna, green infrastructure, stormwater and storm sewers among other topics.

5.7 Five (5) Schools participating in Guardians of the Estuary: Guardians of the Estuary (Guardianes del Estuario): The Estuario uses education as a useful tool for adequate restoration and conservation of the SJBE's watershed. Guardians of the Estuary consists of encouraging schools to adopt a nearby body of water within the SJBE watershed and monitor the water quality. The Program provides students and teachers the opportunity to become scientific researchers in their schools by offering webinars and workshops to foster education in the STEM fields. The Estuario will provide the webinars related to water quality sampling for students.

Empower educators with strategies to lead their communities in adaptation to extreme weather events as part of a watershed-based mitigation strategy by:

5.8 Participate in the Regional Center for Expertise in Sustainability Education Committee monthly meetings.

5.9 One (1) Estuario Professional Development Workshop/ Field Trip or Webinar Series for Environmental Interpreters and non-formal educators: Using the SJBE watershed as a living laboratory, the Estuario will partner with the National Association for Interpretation (NAI) to offer workshops or webinars for environmental interpreters and non-formal educators to gain knowledge on topics related to interpretation. The sessions will support community groups in the San Juan Bay Estuary Region to promote the best practices of guided tours and ecotourism's activities. These workshops or webinars will also count as credit hours for the recertification requirements of the Certified Interpretive Guides and will be held during the summer months (3rd and 4th quarter)

Outcomes

Short term: The Estuario Education Program expects to reach an average of 1,000 participants through in person or virtual activities during the fiscal year.

Intermediate: For the Estuario Education Program to have a thematic, organized, relevant, entertaining and meaningfully events programming, with a calendar of recurring events open to public and private schools, homeschoolers, scouts, environmental clubs, senior citizens, families and the public.

Long term: To increase the visibility, diverse and level-adequate of Estuary Education Program as a valuable resource to the community, community and schools-focused estuarine education programming from talks to forest and nature-based education and build it as a resource to help increase resilience in communities

Milestones

1st Quarter: Virtual or in-person meeting and agreement signing with the 5 schools to continue to be part of the Guardians of the Estuary School Program, coordination of the curricular lessons and/or workshops with schools and/or other communities of learning, coordination of the educational field trips
2nd Quarter: Will complete the 25% of the curricular lessons and field trips or webinar series, coordinate the Scouts Merit Badge Workshop or webinar, coordinate the Estuarine Professional Development Workshop/ Field Trip or webinar series for Environmental Interpreters and non-formal educators
3rd Quarter: Will complete the 50% of the curricular lessons, organize the San Juan Bay Estuary Weeklong Summer Workshop or Webinar Series, coordinate the Estuarine Professional Development workshops or webinar series for teachers and educators.
4th Quarter: Will complete 100% of the curricular lessons and field trips or webinar series and all other outputs

Staff

The Education Manager will be implementing these activities and projects from October 2021 to September 2022 with the aid of the Water Quality Coordinator. The Education Manager will oversee this activity, in coordination with the Scientific Director and Water Quality Monitoring Coordinator, under the direction of the Executive Director.

The Education Coordinator will provide support as needed by the Education Manager

Partners and their role(s)

Puerto Rico Department of Education: The DE will allow students and teachers from public schools to participate in the Estuario's education projects and activities.

University of Puerto Rico, Rio Piedras Campus (Department of Geography and the Department of Environmental Sciences): The UPR will allow co-coordinating teachers workshops and field trips and use of the facilities as rooms or amphitheaters.

Interamerican University, Metropolitan Campus (CECIA): CECIA will allow the students to participate and support the educational efforts with schools and/or other communities of learning.

Private schools: These schools will allow us access to their students and teachers to collaborate in the development of estuarine educational projects and activities.

Home Schoolers Networks: These Parent Education Based Groups will allow us access to their children to collaborate in the development of estuarine educational projects, field trips and environmental education activities.

Community-based organization within the SJBE watershed: These community organizations will help the Estuario access the people in their communities for the Estuario to facilitate estuarine educational experiences.

Department of Natural and Environmental Resources: The DNER will give access to use and deliver workshops, bird census and field trips in the States Forest or National Parks Sites.

National Association for Interpretation (NAI): Will be a partner for the Professional certification "Certified Interpretive Guide" That the Estuary offer to promote the best practices in Ecotourism, Nature Guide and Environmental Education and Interpretation through the San Juan Bay Estuary Ecosystems and Urban Forest Network

Guaitiao District 1, Scouts BSA: Will promote the Estuario's Activities among the Scouts units in the Metropolitan area and Puerto Rico, also will provide volunteers to work in different service and conservation projects.

Birds Caribbean: Will promote our bird education activities and provide educational materials for bird education.

Environment for the Americas: Will promote our bird education activities and provide educational materials for bird

education.

Estimated budget: $42,844

Budget detail

Product or Services	Cost	Category	Description
Education Manager	$28,704	Contractual	1,196 hours @ $24/hour for one year
Education Coordinator	$8,840	Contractual	520 hours @ $17/hour for one year
Educational supplies and Bird Education Materials for the Bird Census events and teacher workshops	$1,350	Supplies	Thematic educational materials for the Bird Census events and teachers workshops (Posters, Stickers, Bird Booklets, tote bags, birds caller, bird masks)
Digital or web-based tools	$150	Other	Subscriptions to digital or web-based tools, ie Kahoot
Summer Camp/ Workshop Transportation	$1,200	Other	Summer Camp/ Workshop Bus Transportation $350 per bus @ 2 buses) and 2 boats trips for 20 students @ $250 per trip
Guardians of the Estuary monitoring materials	$700	Supplies	Reagents refill (4 refills approx. $700)
Guardians of the Estuary/ Volunteer Students Memorabilia	$600	Supplies	Purchase of hats for volunteers (50 hats @ $12/each)
CBC Bird Census Volunteer Patch	$300	Supplies	A commemorative patch for the Audubon participatory and Christmas bird censuses to recognize the volunteers participating in the Christmas Bird Count (150 patches @ approximately $2.07/each)
Boat trips	$1,000	Other	2 Boat Trips for Christmas Bird Count 2 Boat Trips for Water Bird Census @ $250 per trip

ACTIVITY 6: CITIZEN SCIENCE CERTIFICATION PROGRAM [ONGOING]

CCMP Action(s)

PI-3 Establish a program to provide citizens with effective and organized volunteer opportunities to support the SJBE's restoration projects.
PI-4: Develop a long-term public education and outreach program.
PI-7: Develop a Memorandum of Understanding between public and private entities and the SJBE Program to expand the scope of the Program's public education and outreach activities.

CWA Relevant Program(s)

Identifying polluted waters and developing plans to restore them (total maximum daily loads),
Protecting wetlands,
Protecting coastal waters through the National Estuary Program, and
Protecting Large Aquatic Ecosystems.

Work Plan Priorities

Reduce Nutrient Pollution
Environmental Justice

Objective(s)

- ✓ Expand and enhance the citizen science program across the watershed, using the successful three modules: Water Quality Monitoring Program Citizen Science, Participatory Bird Census and Reduction and Characterization of Microplastics
- ✓ Continue expanding the curriculum of the Citizen Scientist Certification Program

Description

The Estuario successfully established its Citizen Science Certification Program in Fiscal Year 2018, creating a Volunteer Water Quality Monitoring Program curriculum. The Estuario used the example of its successful Volunteer Water Quality Monitoring Program to create the module for Participatory Bird Censuses and the Reduction and Characterization of Microplastics. Each of these modules is comprised of an introductory theory component, fieldwork, and additional workshops to deepen understanding of specific topics. The Estuario also achieved the endorsement of this curriculum by the Rio Piedras Campus of the University of Puerto Rico (UPR). The Department of Environmental Sciences of the UPR agreed to house the curriculum as a seminar included in its course offerings. An internship elective course was developed with both the Department of Environmental Sciences and the Department of Geography at UPR-RP. The Estuario will also continue to build partnerships with other educational institutions and other organizations to continue recruiting students and citizens interested in becoming certified.

This year with the support of other funds, the Estuario will develop the curriculum for a new module focused on tropical coastal ecosystems, including mangroves, seagrasses, and coral reefs and highlight the interactions between these coastal ecosystems. The Estuario Project Coordinator will provide coordination for this new module and current modules.

Outputs / Deliverables

6.1 Offer three (3) introductory workshops or webinars, one for each of the three modules
6.2 Offer six (6) enrichment workshops or webinars, two for each of the three modules
6.3 Six (6) microplastic monitoring events throughout the rest of the year that are part of the Estuario's Citizen Science Certification Program.
6.4 Continue partnership with an organization or University with the objective of enhancing and improving the monitoring program as part of the Citizen Science Certification Program.

Outcomes

Short-term: An Estuario Citizen Science curriculum that includes modules related to priority areas for the Estuario, and the recruitment of citizen scientists
Intermediate: An Estuarine Citizen Science curriculum that includes engagement, training, field experience and reporting for each of the restoration projects included in the work plan, and the recruitment of citizen scientists.
Long-term: Green workforce developed; empowered citizens and sustainable management of the SJBE watershed. Healthy and resilience tropical coastal ecosystems.

Milestones

1st Quarter: Volunteers recruited

2nd Quarter: Introductory workshops provided

3rd Quarter: Enrichment workshops and webinars completed

4th Quarter: Certify volunteers

Staff

The Water Quality Monitoring and Citizens Science Coordinator, and the Scientific Director will oversee the overall certification program coordination with the support of the Estuario Project Coordinator who will manage logistics, scheduling, volunteers, and other related tasks.

Assistant Project Manager for Stakeholders and Aquatic Debris will coordinate the Reduction and Characterization of Microplastics module

The Education manager will coordinate the Participatory Bird Census Module

Partners and their role(s)

University of Puerto Rico Department of Environmental Science – Río Piedras Campus: Will include the Citizen Science curriculum in its course offerings as a seminar or as an Internship Course.

The Capítulo Estudiantil de la Sociedad Ambiente Marino (CESAM) from UPR-Río Piedras Campus will provide training and support for the volunteer field capacitation regarding to the Tropical Coastal Ecosystems module.

CECIA Environmental Education Center of the Interamerican University – Metro Campus: Will partner with the Estuario to recruit and offer workshops to students interested in becoming certified.

Institutions of learning: The Estuario will also continue to build partnerships with other institutions of learning and other organizations to continue to recruit students and citizens interested in becoming certified

Estimated budget: $14,350

Budget detail

Product or Services	Cost	Category	Description
5 Boat trips	$1,250	Other	3 boat trips for Microplastic Modules + 2 boat trips for Bird Census module at $250 per trip
Estuario Project Coordinator	$11,900	Contractual	Project Coordinator responsible for logistics, scheduling, managing participants, etc; 700 hours @ $17/hr

ACTIVITY 7: 14TH PUERTO RICO WATER QUALITY MONITORING DAY [ANNUAL EVENT]

CCMP Action(s)

PI-3: Establish a Program to Provide Citizens with Effective and Organized Volunteer Opportunities to Support the SJBE's Restoration Projects (Water Quality Monitoring, Education, etc.).
PI-4, 4.4: Develop educational activities for public participation.
PI-6, 6.6: Encourage an annual celebration of the SJBE at all schools located within the SJBE watershed.
PI-6, 6.7: Continue delivering talks and presentation about the SJBE at schools and related special events.
PI-7: Develop a Memorandum of Understanding between Public and Private Entities and the Estuario to expand the scope of the Program's public education and outreach activities.
WS-18: Continue and strengthen the Estuario's monitoring program, including its public-science component, paying particular attention to the Río Piedras, Juan Méndez Creek, San Antón Creek, and their tributaries.

CWA Relevant Program(s)

-Identifying polluted waters and developing plans to restore them

Work Plan Priorities

Reduce Nutrient Pollution
Environmental Justice

Objective(s)

- ✓ Provide citizens with opportunities in citizen science through water quality monitoring activities. This activity serves as means of educating on the importance of conservation and water quality and fostering long term citizen science projects with the Estuario.

Description

The Puerto Rico Water Quality Monitoring Day is the largest citizen science event of the Estuario and the only water quality monitoring island-wide event. Since 2009 more than 10,000 citizens have participated in the game, where hundreds of monitoring stations are visited during the year. The main event, which is celebrated between March and May of each year and attracts hundreds of participants, is followed by individual water monitoring activities during the rest of the year. The Estuario coordinates the island-wide event with the collaboration and alliances of other watershed management organizations, academia, government agencies, and private corporations. Water quality monitoring kits are loaned to the participants and all the necessary documentation and tools for the event. Workshops on the use of the equipment and the methodology to follow during the event are given in different locations around the Island and will support groups that want to continue monitoring during the year. The data from this event is included in the World Water Monitoring Challenge Organization database. The Estuario will create a short educational video about the initiative and will continue to feature the event on social media events. Volunteers will be provided with educational and promotional materials such as t-shirts, bags, water bottles, or caps, which will serve to encourage further participation and support throughout the year.

Last year, because of the COVID-19 pandemic, the 13th Puerto Rico Water Quality Monitoring Day could not be celebrated as usual due to the government mandated protocols of social distancing. The Estuario was able to develop a creative solution and held the event under social distancing measures, distributing monitoring kits through drive-in stations and emphasizing that participation in the event was to be in small groups, abiding by safety protocols. The Estuario will continue following social distancing protocols in this fiscal year's event.

This year, the Estuario will seek additional funding sources and sponsorships by private corporations to obtains more kits and resources to recruit a higher number of participants and make this island-wide initiative self-sustaining, while keeping new pandemic developments in mind and maintaining flexibility.

Outputs / Deliverables

7.1 Monitoring of at least 150 stations around the Island.
7.2 Approximately 700 participant visits to these monitoring stations.
7.3 Four (4) web-based or in-person workshops or capacity building activities to prepare volunteers in the four cardinal areas of the Island, North, South, East and West.
7.4 Submit collected data to the World Water Monitoring Challenge organization.
7.5 Social media coverage and postings.

Outcomes

Short term: Monitoring of at least 150 stations around the U.S. Commonwealth of Puerto Rico. Approximately 700 participant visits to these monitoring stations. Four (4) workshops or capacity building activities to prepare volunteers in the four cardinal areas of the island, North, South, East and West. Volunteers will participate in data gathering and analysis. Submit the local data of the Territory to the World Water Monitoring Challenge organization.
Intermediate: To further engage citizens in the restoration and conservation of their urban and rural waters.
Long term: For citizens to become agents of change to help improve water quality in their communities. For the Estuario to have a better understanding of the changes of the water bodies through the long- term records of monitoring stations. For citizens to become guardians of the areas they monitor each year and provide valuable information about the ecosystem.

Milestones

1st Quarter: Collaborators are identified and contacted.
2nd Quarter: Workshops and kits distribution take place. Island wide coordinator identified and contracted.
3rd Quarter: Main event, data analysis and activity report
4th Quarter: Submit data to World Water Monitoring Challenge Organization

Staff

The Estuario Project Coordinator will coordinate this event (volunteer recruitment, workshops, lab analysis, equipment, data gathering, and reporting) under the supervision of the Water Quality Monitoring and Citizen Science Coordinator and Assistant Project Manager for Stakeholders and Aquatic Debris. Other Estuario staff time will be invested to provide the necessary support to this activity.

Partners and their roles (s)

Department of Natural and Environmental Resources: The government agency assigned to support this event in collaboration with the Estuario. The DNER offers its facilities to provide workshops to the group leaders and recruit volunteer groups. With the active participation of the Jobos Bay National Estuarine Reserve and the Humacao Natural Reserve, the DNER has contributed a considerable number of the event's participants.

Public/private schools and universities provide support through student groups.

The private sector has an important role in providing volunteers with monitoring and outreach materials.

Estimated budget: $13,660

Budget detail

Product or Services	Cost	Category	Description
Water quality monitoring supplies	$1,960	Supplies	Water Quality Monitoring Kits ($18.75/Kit, 80 kits) Reactants- phosphate test strip (6 kits @$50/kit), test tubes (200 for $40/each), paper bags (200 @ approx. $120)
Lab Analysis	$600	Other	Lab Analysis at EPA- Certified lab for nutrients, oils and enterococcus; 4 labs analysis @ $150/ each
Educational and Outreach materials	$5,000	Other	T-shirts, stainless steel water bottles, and printing of other educational materials
Day of event coordination	$1,000	Other	Renting of sound, tables, chairs, tents, boat (1 boat if required)
Estuario Project Coordinator	$5,100	Contractual	300 hours @ $17/hour

ACTIVITY 8: COMMUNITY RESILIENCE THROUGH ARTS AND CULTURE

CCMP Action(s)

PI-3: Establish a program for providing citizens with effective and organized volunteer opportunities to support the SJBE's restoration projects
PI-4: Develop a long-term community outreach and public education program.

CWA Relevant Program(s)

Identifying polluted waters and developing plans to restore them (total maximum daily loads),
Protecting wetlands,
Protecting coastal waters through the National Estuary Program, and
Protecting Large Aquatic Ecosystems.

Work Plan Priorities

Environmental Justice

Objective(s)

- ✓ Engage citizens in meaningful ways by integrating cultural vibrancy through community participation and artistic expression. Establish one exhibit using the Estuario Center as a Hub to further anchor our role as a community and Estuarine information hub.
- ✓ Establish one creative workshop in each resilient hub community.

Description

Conservation through Arts and Culture: The San Juan Bay Estuary Program recognizes the need to come up with creative ways to further engage its citizens in the process of developing a resilient watershed. After Hurricane Maria, the metropolitan region has had to deal with issues not directly linked to the restoration of the water bodies surrounding their homes and recreational areas. Furthermore, it has been documented that a high percentage of the residents of Puerto Rico are struggling with mental illness after hurricane Maria and the recent earthquakes. Given the importance of our work, and the experience of the FY19 and FY20, the Estuario put together an engagement strategy that offers its audience creative ways to be involved. During FY19, Estuario completed three artistic campaigns yielding great results, as the community showed an increased interest in water conservation initiatives.

During FY21, Estuario completed two artistic campaigns virtually due to the COVID-19 pandemic. Because this initiative continued to be effective in engaging communities in the process of coastal resilience, particularly in the midst of a pandemic, the Estuario will continue its resident artist initiative. During FY22, Estuario will sponsor two artist-in-residents campaigns, focusing on artists working in climate change adaptation and integrating blue economy initiatives and ideas into the program.

Outputs / Deliverables

8.1 Two workshops or webinars promoted at Estuario's Community Resilient Hubs
8.2 Two Artists in Residence virtual, in-person or hybrid campaigns
8.3 One exhibit or virtual exhibit based on the Artist in Residence artworks in the Communities or web- based
8.4 One creative/artistic workshop or webinar

Outcomes

Short term: Increase awareness of the San Juan Bay Estuary system and its particular interest areas. Increase community engagement to familiarize themselves with alternatives within their communities.
Intermediate: Continue to raise awareness on the environmental consequences of use of the Watershed.
Long term: Environmental and socioeconomic outcomes of this project will be improved social engagement, the improvement of the water quality of the estuarine ecosystems, community disaster recovery, and resilience of the watershed.

Milestones

1st Quarter: Form a proposal evaluation and selection committee. Release RFP and select two Artist in Residence
2nd Quarter: First Artistic Campaign
3rd Quarter: Second Artistic Campaign
4th Quarter: Opening of the exhibits

Staff

Community Resilience Coordinator for Arts and Culture will carry out this activity

Partners and their role(s)

Estuario's Resilient Hubs will host artists in-residents campaign and serve as sites to host workshops and other activities, taking into consideration social distancing protocols as needed

Workshop givers, educators, artisans, and volunteers (can be from institutions such as Escuela de Artes Plásticas (EAP) Escuela de Artes Culinarias (UAGM) will offer workshops, with the support of the Estuario's volunteers and continue working in partnership to provide workshops for which both the workshop- givers and the Estuario benefit.

Estimated budget: $21,500

Budget Detail:

Product or Services	Cost	Category	Description
Resident Artists per theme (2)	$10,000	Contractual	$5,000 / per artist
Exhibit Created by Resident Artist	$3,000	Supplies	Materials for exhibit to be created by resident artist; materials will vary by project
Community Resilience Coordinator	$8,500	Contractual	Arts & Culture $17 / hour for 500 hours

ACTIVITY 9: CAÑO MARTÍN PEÑA - RESILIENT COMMUNITIES SUPPORT

CCMP Action(s)

PI-3: "Establish a program for providing citizens with effective and organized volunteer opportunities to support the SJBE's restoration projects"
PI-4: “Develop a long-term community outreach and public education program.”

CWA Relevant Program(s)

Identifying polluted waters and developing plans to restore them (total maximum daily loads), Protecting wetlands, Protecting coastal waters through the National Estuary Program, and Protecting Large Aquatic Ecosystems.

Work Plan Priorities

Environmental Justice

Objective(s)

- ✓ Further engage citizens in meaningful ways through community participation.
- ✓ Establish one exhibit using the Estuario Center as a Hub to further anchor our role as a community and Estuarine information hub.

Description

In the aftermath of Hurricane María, the Estuario engaged in an immediate relief approach to support the most affected communities within the Estuary’s watershed. EPA’s support was used to amplify work conducted under the Urban Water Ambassador Program, supporting thus, the Caño Martín Peña and additional environmental justice communities through community driven solutions. Estuario launched a platform to offer long term community resilience support. These efforts are part of a comprehensive watershed-based Mitigation Plan to reduce stressors that the most disadvantaged watershed communities face. Estuario will continue building upon the Urban Waters Ambassador and Community Coordinators’ work, maintaining active participation with Caño Martín Peña and Hubs communities.

During FY 2021, due to the pandemic, the Estuario began engaging with communities on a virtual basis, with the support of a new virtual hub on the website and other tools such as social media. The Estuario plans to continue the work with the Cantera communities on a virtual basis as needed.

Outputs / Deliverables

9.1 Continue virtual or in person engagement with communities within the CMP district and Resilient community hubs

Outcomes

Short-term: Identification and implementation of community-based ecosystem restoration and mitigation efforts.
Intermediate: Increased community participation, trust and stewardship in the conservation of water resources.
Long-Term: Improved community and ecosystem health.

Milestones

Community resilience activities will be supported throughout the year.

Staff

The Community Resilience Coordinator will ensure the outputs are carried out and the Executive Director will oversee this activity

Partners and their role(s)

Compañía para el Desarrollo Integral de la Península de Cantera
Corporación del Proyecto ENLACE del Caño Martín Peña

Estimated Budget: $70,000

Budget detail

Product or Services	Cost	Category	Description
Urban Waters Ambassador	$50,000	Contractual	$76.04/hour for 657 hours
Community Resilience Coordinator	$20,000	Contractual	$20/hour for 1,000 hours

ACTIVITY 10: LONG-RANGE COMMUNICATIONS PROJECT

CCMP Action(s)

PI-11 Create a long-range communications project on the San Juan Bay Estuary, to include social media and a method to measure knowledge about the ecosystem

CWA Relevant Program(s)

Identifying polluted waters and developing plans to restore them Addressing diffuse, nonpoint sources of pollution
Protecting wetlands
Protecting coastal waters
Protecting Large Aquatic Ecosystems

Work Plan Priorities

All

Objective(s)

- ✓ To increase knowledge among the general population of what is an Estuary, and the implementation of community resilience strategies produced by Estuario
- ✓ Identify and educate about critical watershed areas
- ✓ To recruit volunteers for weekly water quality monitoring, Citizen Scientists Certification Program, Water Community Network, Water Quality Monitoring Day, coastal cleanups, and other activities.
- ✓ To serve as a direct communication tool between Estuario and watershed citizens (through Facebook messenger and comment sections across all relevant social networks).
- ✓ To raise awareness of the bodies of water surrounding communities, and their influence in the population's overall health.

Description

The communications strategy is fundamental to disseminate the efforts of the Estuario. Storytelling is used to develop creative stories to get closer to our audience. The Estuario has an infinitenumber of stories to share. Such was the case of the community resilience unit in El Ancón, Loíza. Through the distribution of a desalination plant, we tell the story of El Ancón, the efforts of the students of "Nuestra Escuela," and the work that the Estuario is developing in that community. We were able to appear on the front page of the largest circulation newspaper in Puerto Rico. These are the stories the Estuario tells through its Communications efforts. The relationship with the media is essential, to make a good "pitch" to reporters seeking a unique story. This involves researching, writing, and monitoring those media.

Social media efforts are essential to share our message. Networks are recognized as a leading communications tool, and thus the key to our efforts. A communication strategy is implemented and includes announcements, events, arts, communities, shared posts, videos and educational material. This consists of three active social networks of the Estuario, Facebook, Instagram, and Twitter.

Visual communication is equally relevant. For this reason, short videos are produced to draw the attention of the audience. The production of these videos involves strategy, identification of highlights and messages we want to showcase, work on the site, and editing of videos. Live videos also require site coordination and direction and drafting of talking points and guidelines.

Outputs / Deliverables

10.1 Three communication pieces related to the 14th Water Quality Monitoring Day
10.2 One communication piece about Estuario's community resilience
10.3 One communication piece about solid waste management; reduction and recycling
10.4 One communication piece about Citizen Science Certification Program
10.5 Educational campaign (including advertising) about how communities can help restore bodies of

water

10.6 100 new social media contents, including educational information about the SJBE species, activities of the organization included in this work plan, and other information.

10.7 24 new educational videos or Facebook Lives of 30s to 3min to inform the public about the initiatives of the Estuario, coverage of the activities, volunteer recruitment, and activities with students.

10.8 Work with website contractor to develop new content and graphic design.

10.9 In person or virtual training for volunteers on how to use Estuary tools on the web.

Outcomes

Short term: Communicate Estuario's efforts on a monthly basis; serve as subject expert in areas of revitalization, restoration, and water conservation

Intermediate: Increase social media engagements

Long-term: Sustain content generations of both phases. Strengthen public recognition and engagement

Milestones

Throughout the Fiscal Year: Communications Program will provide support for each of the activities outlined in this work plan

Staff

The Communications Consultant and her team (Graphic Artist & Social Media and Educational Campaigns Assistant, Website Contractor, Professional Photographer), and Graphic Designer will work directly with the Executive Director

Partners and their role(s)

Media, Volunteers, Communities

Estimated budget: $40,194

Budget Detail

Product or Services	Cost	Category	Description
Communications Consultant	$26,000	Contractual	$50/hour total 520 hours for one year
Graphic Artist & Social Media and Educational Campaigns Assistant	$10,800	Contractual	$18/hour total 600 hours
Online Ads	$250	Other	Social Networks and targeted online ads.
Graphic Designer	$3,144	Contractual	Approximately 209 hours @$15/hour

ACTIVITY 11: ESTUARIO DATABASE: WEBATLAS AND LIBRARY

CCMP Action(s)

Create an ongoing project to compile information and make it available via alternatives such as the WebAtlas and the Estuario library.

CWA Relevant Program(s)

Monitoring

Work Plan Priorities

All

Objective(s)

- ✓ Increase knowledge among the general population of what is an Estuary
- ✓ Increase and share knowledge of how to implement resiliency strategies designed by the Estuary. Identify and educate about critical watershed areas.

Description

Website, database, and geospatial data servers will be used as a tool for students, "academia" and communities. With this activity, Estuario will maintain and update the San Juan Bay Estuary website and social media outlets to become a sources of information and resources. Repository of alternatives for watershed activities. Maintain web atlas as a source of frequency and abundance of species in the estuary to better feed indicators and to measure the success of the implementing the mitigation plan. Maintain the website Estuario.org working effectively, add new content drafted by the communications contractor to the website, as well as the announcements of the entity, and keep improving it to serve as the recipient of all the electronic publications of the Estuario.

In collaboration with the webmaster, the communication strategy is developed, which involves keeping the page active with events, updating the page with new information and promoting its use.

Outputs / Deliverables

11.1 Maintain the website Estuario.org working effectively, add new content drafted by the communications contractor to the website, as well as the announcements of the entity, and keep improving it to serve as the recipient of all the electronic publications of the Estuario.
11.2 In person or virtual trainings for volunteers on how to use Estuary tools on the web.
11.3 Ensure proper functioning of website features and capabilities, including maps, databases, resource uploading/downloading and forms and booking system.
11.4 Website, database, Atlas, email site member accounts and control spam and geospatial data server's maintenance and backup.
11.5 Ensure web sites notifications are working properly.
11.6 Develop functionality on the Estuario.org website to designate a limited number of spaces as per COVID-19 safety protocol for in-person events such as Cine Estuario, restoration activities, educational events, etc

Outcomes

Short term: Maintain proper functioning of the website, database, and geospatial data servers. Development of functionality to reserve spaces for in-person events.
Intermediate: People will learn to use Estuario Web for original data.
Long term: Estuario Web will become a hub of reliable information regarding water quality.

Milestones

1st Quarter: Identify status and website needs.
2nd Quarter and 3rd Quarter: Update information on all platforms

4th Quarter: Prepare recommendations for next year's web management.

Staff

Website Contractor will carry out the deliverables related to this activity.

Partners and their role(s)

Estuario Team

Estimated budget: $23,400

Budget detail

Product or Services	Cost	Category	Description
Website Contractor	$23,400	Contractual	468 hours @$50/ hour for one (1) year

ACTIVITY 12: WASTEWATER INFRASTRUCTURE IMPROVEMENT PROJECT

CCMP Action(s)

WS-3.2: Eliminate overflows and bypasses through adequate operation and maintenance of the pumping stations and collection systems leading to the Puerto Nuevo Sewage Treatment Plant.
WS-4: Eliminate Illegal Commercial and Residential Sewage Discharges into the Stormwater Sewer System.

CWA Relevant Program(s)

All

Work Plan Priorities

Mitigation Plan

Objective(s)

- ✓ During 2021-2022, PRASA will keep improving its sanitary sewer infrastructure in the Metropolitan Area with a capital investment of several million dollars. With this action, the agency will be implementing two priority actions and cornerstones of our CCMP

Description

The discharge of untreated wastewater is a major source of pollution in the estuarine system. The discharge of raw sewage significantly impacts wildlife and other living resources. It could pose a serious health hazard to people who live near the estuarine system or use its waters for recreation and navigation. Historical problems with the operation and maintenance of the Puerto Rico Aqueduct and Sewer Authority's sanitary sewer system include: obstructions of sanitary sewer lines which lead to system back-ups and overflows at manholes; infiltration of stormwater into the sanitary system, leading to overflows at manholes; the existence of combined or interconnected sewage and stormwater conveyances; and pumping station overflows.

Outputs / Deliverables

Improve the Metro Region wastewater infrastructure.

Outcomes

Short term: Repairs, maintenance and improvement to the waste water sanitary sewer lines of the PRASA's Metro Region.

Estimated budget: $770,000 in-kind match to be reported as leverage

ACTIVITY 13: COMPLIANCE/REPORTING AND PROPOSAL WRITING TO SUPPORT CCMP TRACKING

CCMP Action(s)

All

CWA Relevant Program(s)

All

Work Plan Priorities

All

Objectives

- ✓ To further the implementation of ESTUARIO's CCMP and annual work plan with funding from federal, state, local, and private (for profit and non-profit) grantors and guaranteeing proper implementation of received funds.
- ✓ Incorporate compliance, reporting and actions' tracking in all Work Plan and proposed activities.

Description

The CCMP establishes the importance of obtaining the necessary resources to execute the established actions and complying with the requirements of these resources. In this way, we also achieve the restoration and conservation of the San Juan Bay Estuary System. Therefore, the research and writing of proposals is a fundamental piece. The compliance of grant requirements and regular reporting of projects are fundamental pieces in order to comply with the CCMP actions.

The Estuario's CCMP implementation is one of the most ambitious environmental restoration plans in the history of Puerto Rico. The plan includes public works of hundreds of millions of dollars, such as the dredging of the Martín Peña Channel, the relocation of hundreds of families, and the elimination of all raw sewage discharges into the ecosystem. It will be beneficial to track the grant portfolio requirements and streamline the reporting process and compliance actions.

Responsibilities related to compliance include: grant award reporting activities; oversee compliance with federal regulations during award project activity implementation; develop strategies with the Executive Director, and support Executive Director in communicating with program officers from the different funding agencies as well as with grantors from local government, private institutions or foundations; and update and upkeep of the DUNS, sam.gov, grants.gov, e-grants, and NOAA grants online accounts. Other responsibilities include developing all letters of support and memorandums of understanding as required by grantors, monthly newsletters to keep funders up to date on CCMP action/ maintain an updated username/password sheet and provide it upon each update to the Executive Director (AOR/POC). The grants are linked to Estuario's mission and advance the CCMP and work plan.

Responsibilities related to proposal research and writing include: funding identification; eligibility determination; grant writing; grant submittal; grant award reporting activities; oversee compliance with federal regulations during award project activity implementation; maintain communication with program officers from the different funding agencies as well as with grantors from local government, private institutions or foundations; and update and upkeep of the DUNS, sam.gov, grants.gov, e-grants, and NOAA grants online accounts. Other responsibilities include developing all letters of support and memorandums of understanding as required by grantors. The grant writer will maintain an updated username/password sheet and provide it upon each update to the Executive Director (AOR/POC). The grants are linked to ESTUARIO's mission and advance the CCMP and work plan.

Outputs / Deliverables

13.1.1 Meet with Executive Director every two months to identify program priorities, updating on activities including funding

availability, status of grant writing efforts, and related subjects

13.1.2 Submit mid-year reports
13.1.3 Submit technical reports/annual reports
13.1.4 Support drafting of work plans
13.1.5 Provide updated username/password list on a monthly to AOR/POC with expiration dates
13.1.6 Support Program Evaluation process
13.1.7 Support CCMP Revision process

Outcomes

Short-Term: Continue Estuario's compliance and reporting actions by completing required reports and continue to track progress of projects and contractor activities.
Intermediate: Estuario expects to choose a grant reporting software that will streamline the compliance and reporting process and maintain a grant portfolio
Long-term: Through grant compliance and reporting, the Program expects to be able to remain in compliance with all grant requirements throughout the fiscal year.

Milestones

Compliance and Reporting will continue throughout the year

Staff

The Grants Writer & Compliance Manager will be responsible for carrying out the deliverables of this activity.

The Executive Director will work hand in hand with the Grants Management team to identify needs and requirements to remain in compliance with all funds the Estuario receives.

Partners and their role(s)

Private foundations, federal agencies, and state and municipal agencies will be the main source of potential funding of CCMP actions and activities

Estimated Budget: $34,000

Budget detail

Product or service	Cost	Category	Description
Grants Writer & Compliance Manager	$34,000	Contractual	$30/hour for a total of approx. 1,133 hours

ACTIVITY 14: CCMP TRACKING AND IMPLEMENTATION [ONGOING]

CCMP Action(s)
All

CWA Relevant Program(s)
All

Work Plan Priorities
All

Objective(s)
- ✓ To support the Estuario tracking and CCMP implementation on other activities during the period.

Description

Every year the Estuario participates in a myriad of activities and projects that result from the collaboration of the organization with its partners. Through this general activity we recognize this daily reality of our organization that at the same time offers the opportunity to further CCMP implementation.

Outputs / Deliverables

14.1 General reports for all activities carried out by CCMP personnel and supporters.
14.2 Documentation and systematization of Estuario's work to serve as a model for other watersheds within the archipelago.

Outcomes

Short Term: Immediate documentation of all CCMP activities.
Mid Term: CCMP staff and volunteers become familiarized with proper documentation of Estuario activities. improve leverage capacity for Estuario and NEP through baseline data.
Long term: Growing and strengthening of long term Estuario projects and leverage documentation. Keep developing the partnerships and networks needed to implement the SJBEP'sCCMP. Become a model to other watersheds in the archipelago and the Caribbean

Milestones

Activities documentation and tracking throughout the fiscal year.

Staff

All staff is involved in this activity

Partners and their roles(s):

We will be working with all main stakeholders of the Estuario

Estimated Budget: $0

ACTIVITY 15: SAN JUAN BAY ESTUARY PROGRAM CCMP REVISION

CCMP Action(s)

All

CWA Relevant Program(s)

All

Work Plan Priorities

CCMP Revision

Objective(s)

- ✓ Revise the Estuario's CCMP to reflect environmental changes in the watershed and recent atmospheric events that bring about emerging challenges to the restoration and conservation of the San Juan Bay Estuary watershed.

Description

In 1992, the San Juan Bay Estuary system became part of the National Estuary Program, and in 2000, its first Comprehensive Conservation Management Plan (CCMP) was approved by the EPA and published. In 2004, the SJBEP performed the first official evaluation of the implementation progress of the CCMP actions through a tracking system and submitting the Implementation Review to the USEPA. In 2007, a large-scale review process was activated following CCMP protocols, in which the SJBEP Management Conference was an integral part of. During this review, it was established that the CCMP would be revisited and revised at least every five years and would be the first step towards a five-year strategic planning exercise. In 2016 the updated CCMP, which included 19 new recommended actions, was published and shared publicly.

Although many of the problems the SJBE system faces while working to restore water quality in the San Juan Bay watershed still exist today, catastrophic events such as Hurricane Maria have brought about a myriad of additional challenges to the watershed ecosystem. In 2018 the Estuario completed the Vulnerability and Risk Assessment Report, which evaluates the San Juan Metro region's response to the hurricane, estimates its vulnerability to the impacts of climate change events, and presents adaptation measures. Estuario is also developing the first watershed-based Multi-jurisdictional Hazard Mitigation Plan in close coordination with stakeholders and community leaders. Using the Vulnerability Assessment Report results and from the mitigation planning, the SJBEP will commence a CCMP revision process. The new version is expected to update, amend and propose further actions, based on current and projected risks. Estuario began the review process by conducting a background analysis to revise the CCMP, which will include collecting information from the SJBEP's mitigation planning, green infrastructure, and illicit discharges detection initiatives in the first year.

To support the CCMP revision process and ensure our organization's sustainable growth and its impact, the Estuario will develop a five-year plan to ensure all strategic initiatives serve a common purpose. The plan will lay out how current and programmed projects will work in concert to advance Estuario's mission, coordinating the NEP evaluation with the development of the Hazard Mitigation Plan and Green Infrastructure Master Plans to ensure the final recommendations and strategies inform the actions included in the CCMP revision.
During FY 2022, a list of recommendations will be compiled through public meetings, meeting with stakeholder committees, as well as presented through the Estuario website and local news publications. EPA's program officer will be substantially involved in the CCMP revision process.

Outputs / Deliverables

15.1 Final report with strategic plan for the next 5 years along with recommendations related to the CCMP's implementation approaches including responsible parties, and recommendations of metrics
15.2 Hold public meetings, meetings with stakeholder committees

15.3 Report with list of recommendations that will be presented through the Estuario website and local news publications
15.4 Present quarterly reports to CCMP revision steering committee

Outcomes

Short-term: Increased awareness by the general public and responsible agencies and stakeholders about progress towards implementing the CCMP
Medium-term: Establish a process to assess progress on CCMP implementation
Long-term: Protection of critical habitat in the San Juan Bay Estuary; Become a model to other watersheds in the archipelago and the Caribbean

Milestones

1st quarter: Publish RFP and selection of service provider who will develop the strategic plan
2nd quarter: Development of strategic plan
3rd Quarter: Hold public meetings and meetings with stakeholder committees; Conduct analysis of combability of the current CCMP actions with the vision and recommendations identified in the strategic plan
4th Quarter: Generate report

Staff

The Executive Director will oversee and guide the entire CCMP revision process. Support will be provided by the Science Director, Strategic Project Manager and Executive Assistant.

Partners and their role(s)

State and municipal agencies, community-based organizations, community- based committees, general public, local publications will be involved in providing input and recommendations

Estimated budget: $55,800

Budget detail

Product or Services	Cost	Category	Description
Estuario Project Coordinator	$20,800	Contractual	Coordinator to conduct analysis and report that will lead to revision of the current Estuario CCMP ($20/ hour for 1040 hours)
Five-Year Strategic Plan	$35,000	Contractual	External contractor will develop of strategic plan for the next 5 years, including recommendations for the CCMP implementation, implementation approaches, and metrics

ACTIVITY 16: PROGRAM EVALUATION [NEW]

CCMP Action(s)

Pass the Program Evaluation

CWA Relevant Program(s)

All

Work Plan Priorities

Program Evaluation

Objective(s)

- ✓ Revise the Estuario's CCMP to reflect environmental changes in the watershed and recent atmospheric events that bring about emerging challenges to the restoration and conservation of the San Juan Bay Estuary watershed.
- ✓ To comply with the US Environmental Protection Agency (EPA) regulations regarding National Estuary Program (NEP) accountability with demonstrated results.

Description

Every 4 - 5 years, the EPA engages in the Program Evaluation (PE) to determine whether the National Estuary Program is making adequate progress in implementing the Comprehensive Conservation and Management Plan (CCMP) of each program. Therefore merit continued funding under §320 of the Clean Water Act (CWA). Continued financing for each NEP under §320 of the CWA is contingent upon Congress appropriating sufficient funds to the EPA to implement the NEP. The PE is broad and comprehensive, overseeing the following areas: research; reporting; outreach; financial management; assessment and monitoring; and administration. The evaluation includes tables to fill in as well as specific narrative answers. The PE usually ends with a field visit with representatives from EPA, and an ex-officio NEP director.

The last PE evaluated the five yeartime period from Summer 2011 to Summer 2016. This year the PE will assess the 5 years from Fall 2016 to Fall 2021.

Outputs / Deliverables

16.1 Comply with the program evaluation schedule as set by EPA in the PE guidelines
16.2 Full report complying with the requirements of the PE accompanied by strong evidence supporting the continuation of the SJBEP under EPA's National Estuary Program for the 2022-2027 period.
16.3 Participate on conference calls as required
16.4 Address the PE team comment and provide any additional information requests by the PE team.
16.5 Host will site visit to educate the Program Evaluators about the work we do on the field and with the residents of the San Juan Bay Estuary

Outcomes

There are three (3) possible outcomes of the PE process: "pass", "conditional pass", and "fail". SJBEP expects to receive a "pass" from the Evaluation Committee to continue eligibility for funding under the 320 of Clean Water Act.

Milestones

1ST quarter: Publish RFP and select service provider who will lead this activity
2nd quarter: Hold conference call with EPA Program Evaluation Team leader
3rd quarter: Submit Program Evaluation package (due March 2022); Conference call between the NEP Director and the PE team to discuss strengths and challenges of the NEP; discuss additional documentation needed to address any information gaps identified by the PE team

4th quarter: Conduct on-site visits within two months after receiving the PE package. Hold a conference call with The EPA PE team within two weeks after the on-site visit to allow the NEP Director the opportunity to address any concerns raised during the on-site visit.

Staff

Service Provider will be chosen to lead this activity as the Program Evaluation Coordinator and ensure deliverables are completed on schedule, work with staff and other team members as needed to obtain necessary information.

Staff and time devoted to the activity: Estuario will be working on this assignment. A specific row in all staff's time sheets will be included. A maximum of 20% of the staff's time and effort will be allocated to this activity. The accountability for the successful completion of the activity relies on the Executive Director.

Partners and their roles(s):

Some significant partners that contribute to further the CCMP implementation and strengthen the SJBEP, for the past five years, by providing significant matching funds will provide information and technical support during the PE process. These include the following:

-All municipalities in the Estuario
-Puerto Rico Aqueduct and Sewer Authority
-Company for the Comprehensive Development of the Cantera Peninsula
PR Environmental Quality Board
-PR Department of Natural and Environmental Resources
-Titin Foundation
-National Oceanic and Atmospheric Administration
-Puerto Rico Climate Change Council

Estimated budget: $24,250

Budget detail

Product or service	Cost	Category	Description
Program Evaluation Coordinator	$24,250	Contractual	Coordinator who will oversee the Program Evaluation 970 hours @ $25/hr for 6-8 months

ACTIVITY 17: MONITORING AND CORRECTIVE PROGRAM

CCMP Action(s)

WS-17 Determine the areas of highest sewage discharge in the SJBE watershed
WS 17.4 Evaluate public health issues in the areas of greatest sewage wastewater discharge.
WS-18: Continue and strengthen the Estuario's monitoring program, including its public-science component, paying particular attention to the Río Piedras, Juan Méndez Creek, San Antón Creek, and their tributaries.
PI-3: Identify potential restoration and monitoring projects within the SJBE where volunteer participation would be effective. Establish a Program to Provide Citizens with Effective and Organized Volunteer Opportunities to Support the SJBE's Restoration Projects (Water Quality Monitoring, Education, etc.).

Work Plan Priorities

Reduce Nutrient Pollution
Environmental Justice

Objective(s)

Support the Estuario CCMP implementation of the other activities in this work plan by:

-Implement a water quality restoration strategy at the San Juan Bay Estuary Watershed and the Río Grande de Loíza (below dam) Estuary contributing zone in order to identify and correct critical sanitary discharges from inland waters draining into the San Juan Bay Estuary and its contributing areas and ultimately significantly improve the water quality of estuary.
-Outreach/Education program to achieve sustainability through the training and empowering of local-based (ie subbasin level) community groups with the tools to evaluate the quality of waters -Communicate improvements of waters to community to motivate community involvement, and eventually the preservation of a sustainable community led water quality restoration program.
-Close the gap between public health data and information and access to healthcare using the data from illicit discharges team

Description

This project is funded by the Clean Water State Revolving Fund (SRF), a federal-state partnership that provides low-cost financing for a wide range of water quality infrastructure projects. This activity will be carried out in support of this SRF project.

For ten consecutive years, the San Juan Bay Estuary Water Quality Volunteer Monitoring Program has been one of the critical projects of our organization. This is a long-term water-quality monitoring program to help ascertain the effectiveness of implemented CCMP conservation/restoration efforts. Since the beginning of this program, the data collected has been used by academia, the community, environmental agencies, NGOs, etc. Currently, it is the most trusted water quality monitoring effort performed continuously in the SJBE system in the last years. For example, the EQB uses the data collected from this program in the development of the Puerto Rico 305(b)/303(d) Integrated Report to comply with Section 303 (d) of the CWA and EPA regulations and 40 CFR 130.7 requirements. These constitute the main mechanism for defining waterbodies that are impaired from a water-quality perspective. In the face of what the watershed is currently facing after Hurricane Maria, the Estuario is expanding the scope of the monitoring program's scope and implement a systematic strategy to pinpoint (i.e., identify at the lowest scale possible) major contaminant areas at a subbasin scale. This strategy includes three components; detection and correction of illicit discharges, public health, and community empowerment, which includes an outreach/education program in order to achieve sustainability through the training and empowering of local-based (i.e., subbasin level) community groups. Identified cases of illicit discharges will be referred to concerning agencies (i.e., AAA, corresponding municipality for corrective action) for corrective action. Each subbasin (or subbasin segment) within a major area is divided into a number of sampling stations based on relevant landcover, topographic and hydrographic features. Each station is periodically sampled for Enterococci

counts, dissolved phosphorus and dissolved ammonium analyses. It is expected that an effective remediation strategy can be established by concentrating on the most critical stream segments an effective remediation strategy can be established. The approach is supplemented by a subbasin water quality assessment component whereby a battery of water quality tests is performed on a quarterly basis at the drainage outlet of all subbasins within the catchment zone. All progress is quantitatively documented at the subbasin level. Critical contributing subbasins (i.e., "hot zones") are thus identified to allocate priority in watershed restoration efforts. Based on the significant success of the previous initiative, the Estuario has extended coverage to a 123 km2 area, west of the coastal most section of the Rio Grande the Loíza. The addition of this significant land portion will enable the restoration of all major contributing zones of the San Juan Bay Estuary. We will follow the same conceptual framework and systematic strategy established in phase III of the project (with additional diagnostic stations and monitoring subbasins).

A community engagement component of this project will be crucial in involving the communities in identifying and monitoring of illicit discharges. The community will also be informed and educated regarding sampling at diagnostic stations, and when identified cases are referred to AAA and relevant municipalities for correction as needed. The community resilience coordinators will facilitate educational programs regarding illicit discharges and how they affect communities.

The Red Comunitaria de Agua, or The Water Community Network is a network that will work towards continuing to facilitate watershed residents' organization for the creation of actions that will result in the restoration and protection of their bodies of water.

With the development of a systematic stratified diagnostic strategy for 12 critical subbasins with significant sanitary infrastructure, the Estuario seeks to begin generating information for addressing the gap that almost always exists between environmental water-quality monitoring systems and their relationship to people's health, and access to healthcare support, which includes the integration of the element of citizen participation in the GIS systems. The water pollution risk maps will identify areas where people's health is at higher risk due to the existence of a greater amount of pollution and/or contamination. The maps will also consider people's perception of the space they live in and their interpretation of their body and their illness; the social context in which people live; and, in the specific case of health, the public-policy apparatus within which all this occurs.

Outputs / Deliverables

Provide support for the detection and correction of illicit discharges as well as community empowerment and education through the Estuario programming platform which carries out strategies through the 5 action areas of the CCMP.

Staff

The Project Manager for the State Revolving Funds will oversee this project.

Illicit Discharges Assistant Project Manager will carry out the public health initiative

Estuario Community Resilience Coordinators: The Estuario's Resilient Community Coordinators will serve as the liaison between the communities and UPR illicit discharge team. The coordinators will manage the Red Comunitaria de Agua, or The Water Community Network, a network that facilitates watershed residents' organization for the creation of actions that will result in the restoration and protection of their bodies of water. In addition, they will foster relationships and work directly with community leaders to create awareness around environmental consequences of not eliminating discharges, and importance of reporting them, and they will work with communities and enhance participation of the community in the Estuario activities regarding water monitoring and illicit discharges detection and correction.

Estuario Education Team: Education Manager and Education Coordinator will serve as a resource for the community resilience team to carry out outputs for this activity and will work towards integrating and presenting materials around illicit discharges as part of current education platform.

Partners and their role(s)

-AAA and municipality of San Juan and other municipalities of the watershed will be referred cases where illicit discharges are identified and correct the case

-Communities that are affected by project: The Estuario's Resilient Community Coordinator will maintain partnerships with communities and promote the Estuario as a resource to improve water quality within the community

-University of Puerto Rico will provide the group of experts and professionals to run the implementation of the water quality restoration strategy

Estimated Budget: $0

ACTIVITY 18: MITIGATION PLANNING

CCMP Action(s)

HW-22 Estimate or model the SJBE's vulnerability to the impacts of climate change, and present adaptation measures

PI-3: Establish a program for providing citizens with effective and organized volunteer opportunities to support the SJBE's restoration projects

PI-4: Develop a long-term community outreach and public education program.

Work Plan Priorities

Environmental Justice

Objective(s)

Support the Estuario CCMP implementation of the other activities in this work plan by:

-Working with communities to identify long-term strategies for risk reduction that are aligned with community objectives, focus resources on the greatest risks, and communicate priorities to potential funders.

-Capacity Building and Infrastructure Development through management of Community Resilience hubs and development of new hubs in high- risk communities.

-Management of Community Resilience centers by elements that define a community including culture and arts, education, economic development, and green infrastructure

-Provide support for watershed- based mitigation plan through management of Community Resilience hubs

Description

This project is funded by the Clean Water State Revolving Fund (SRF), a federal-state partnership that provides low-cost financing for a wide range of water quality infrastructure projects. This activity will be carried out in support of this SRF project.

After Hurricane Maria in 2017, the Estuario focused its work on immediate work, reducing vulnerability and monitoring environmental conditions by focusing on work with those communities that were most isolated during the hurricane. In 2018, Estuario launched the community resilience platform focused on community wellbeing as central to environmental health and began working through existing community centers to provide the immediate relief that was needed, such as access to drinking water. The community organization and leadership during this initiative proved to be the key to lowering stressors, increasing survival, decreasing environmental damage, and increasing recovery. Therefore, Estuario transformed the active community centers into Resilient Community Hubs, providing each with emergency response materials, including solar panels, and community gardens to guarantee access to food. Ongoing sessions with social workers and community coordinators establish these hubs as active, culturally relevant, and capacity building spaces for all watershed residents. The Hubs offer self-sustaining electricity and water and but also provide essential emergency equipment and training, which empowers communities to respond directly to immediate needs and build on local human capital.

Through these hubs, the Estuario has been working with communities in building capacity for emergency response and recovery phases, to rehabilitation and reconstruction phases, and recently, prevention and preparedness strategies, a cycle that represents solid steps towards creating the baseline needed for mitigation planning while simultaneously addressing immediate needs for local human and ecological communities through its Community Resilience Hubs. The San Juan Bay Estuary Program understands that long-term forward thinking through mitigation planning is the key to breaking the cycle of disaster damage, reconstruction and repeated damage and therefore has embarked on developing the multijurisdictional hazard mitigation plan, the first plan of this nature to be implemented in Puerto Rico. The plan will be prepared by the jurisdictions that make up the watershed basin of the San Juan Bay Estuary. In the process, it will allow the Estuario to guide the eight (8) municipalities in their processes of rebuilding a more resilient estuary watershed and system.

This past year, the municipalities of Bayamón, Canóvanas, Carolina, Cataño, Guaynabo, Loíza, San Juan, Toa Baja, and Trujillo Alto convened as part of the Steering Committee to begin coordinating their ongoing and future mitigation efforts to maximize their impact and rebuild a more resilient watershed in the face of a changing climate. In the coming months, with the support of ESTUARIO's Scientific and Technical Advisory Committee and the Water Community Network, the Steering Committee will identify risks and vulnerabilities associated with natural disasters and develop comprehensive, watershed-based long-term mitigation strategies that align with community objectives, focus resources on the greatest risks, and communicate priorities to potential funders. Once completed, the Steering Committee will submit the plan to FEMA to qualify for non-emergency disaster assistance, including funding for mitigation projects.

Outputs / Deliverables

- ✓ Provide support as needed for the development of the FEMA approved multijurisdictional hazard mitigation plan

Outcomes

Short: Empower communities with capacity building and training in key areas that will increase resilience and preparedness for natural disasters, establish/equip two new resilience hubs, gather information and data from community resilience hubs and activities to inform mitigation planning.
Medium: Draft of a FEMA ready hazard mitigation plan
Long: Begin implementation of a watershed- based hazard mitigation plan; Improvement of the water quality of the estuarine ecosystems, community disaster recovery plan and awareness, increased resilience of the watershed and its communities, improved community and ecosystem health

Staff

Project Manager for the State Revolving Funds: Responsible for overseeing the project and reporting project status to the Executive Director regularly.

Hazard Mitigation Planner will carry out the technical aspects and facilitate the development of hazard identification and risk analysis. They will lead and coordinate trainings and workshops related to hazard mitigation activities, and communicate the Estuario's intentions and process for the development and implementation of a multijurisdictional watershed-based hazard mitigation plan to all 8 municipalities, and other municipalities if necessary. The planner will work closely with Estuario's Resilience coordinators who will facilitate the collection of data and information from the communities

Intergovernmental Relations Coordinator: Serve as a representative of the Estuario for working with federal agencies, alliances, as well as serving as a point of contact for the 8 municipalities in the watershed and their community leaders.

Community Resilience Coordinator team: Continue to work towards gathering the baseline needed from communities for mitigation planning while simultaneously addressing immediate needs for local human and ecological communities through their respective Community Resilience Hubs. The coordinators will focus on empowering communities through their respective Resilience Hubs by (a) through the continued arts and culture programming in key resilient hubs and (b) continued support and training for use of the resilient hubs as emergency and data collection centers (c) expanded volunteer networks (d) increased educational opportunities (e) capacity building and training In areas such as emergency management and response, youth leadership programs, wellness programs

Estuario Education Manager and Coordinator: Serve as a platform to allow for further community empowerment and continual involvement in mitigation planning and resilience activities at the subbasin level and increase participation in resilience hubs.

Partners and their role(s)

-9 Municipalities: Bayamón, Canóvanas, Carolina, Cataño, Guaynabo, Loíza, San Juan, Toa Baja, and Trujillo Alto
-Representatives of the Community Advisory Committee of the Estuary Program;
-Representatives of the Department of Natural and Environmental Resources (DNER);
-Representatives of the Puerto Rico Planning Board (JP);
-Representatives of the Bureau of Emergency Management and Disaster Administration (NMEAD);
-Representatives of FEMA, Mitigation Division
-Representatives Office of Planning and Municipal Land Management;
-Representatives of the Municipal Office of Emergency Management (OMME);
-Puerto Rico Aqueduct and Sewer Authority
Department of Natural and Environmental Resources
-FEMA
-Clinton Global Initiative Commitment to Action – CGI will act as a partner in providing resources or other partnerships to secure resources to carry out mitigation planning
-University of Puerto Rico, Agriculture Experimental Station, Gustavo Martínez: Managing and advising on the hydrology aspects of project.

Estimated Budget: $0

ACTIVITY 19: GREEN INFRASTRUCTURE AND REFORESTATION

CCMP Action(s)

GI-1 Create a master plan for green infrastructure in the SJBE watershed and develop pilot projects for rain gardens and green rooftops, dunes and other ecosystems

Work Plan Priorities

Green Infrastructure and Resiliency
Environmental Justice

Objective(s)

Support the Estuario CCMP implementation of the other activities in this work plan by:

-Developing a Green Infrastructure Master Plan to support nature-based initiatives to manage stormwater discharges throughout eight coastal jurisdictions encompassing the Estuary: Bayamón, Carolina, Cataño, Guaynabo, Loíza, San Juan, Toa Baja, Trujillo Alto.

Description

This project is funded by the Clean Water State Revolving Fund (SRF), a federal-state partnership that provides low-cost financing for a wide range of water quality infrastructure projects. This activity will be carried out in support of this SRF project.

The San Juan Bay Estuary will be supporting the municipalities that are part of the San Juan Bay Estuary watershed in making substantial upgrades to its storm sewer systems throughout the city. Stormwater in the study area of the San Juan Bay Estuary study area is collected through separate storm sewer systems and is discharged into local waterways. When rain falls on roofs, streets and parking lots, the water cannot soak into the ground and carries trash, bacteria, heavy metals and other pollutants into streams, threatening public health. In addition, property and infrastructure can be damaged by storm water runoff due to erosion.

The Program expects to support the municipalities of San Juan, Loíza, Carolina, and Bayamon through green infrastructure projects. Green infrastructure is an environmentally sustainable technique to manage storm water that uses vegetation, soils, and natural processes to manage water and create healthier, more resilient urban environments. Specific projects will be guided by a Green Infrastructure Master Plan in the SJBE watershed. The cost of designing and piloting the plan is estimated at 2.0M. This depends on the alliances that can be forged as part of the process, on the alternatives chosen to complete the initiative, and on studies available (vs. need for additional studies).

The Green Infrastructure Master Plan for the metropolitan region of Puerto Rico incorporates architectural planning and design at several different scales, following the participatory-process model. It seeks to identify and access financial and technical resources in order to promote the concept of green infrastructure and to implement it at state and municipal levels. A green infrastructure expert will be hired to coordinate the overall project.

Outputs / Deliverables

- ✓ Provide support as needed for the development of a green infrastructure master plan that integrates diagnostic data and strategies for implementation.
- ✓ Continue providing supporting Urban Forests that are part of the Estuario Urban Forest Network

Staff

The Project Manager for the State Revolving Funds will oversee this project.

Green Infrastructure Coordinator will coordinate all field efforts and provide the technical knowledge/expertise as necessary

Green Infrastructure Assistant Manager will oversee green infrastructure projects and develop the green infrastructure master plan.

Community Resilience Coordinators will provide support in content creation, facilitation of workshops, and documentation of meetings, and follow-up with communities as needed

Education coordinator will develop educational content in green infrastructure for community engagement

Partners and their role(s)

Municipalities, PRASA, DNER, DTOP, Estuario's Urban Forest Network

Estimated Budget: $500

Budget detail

Product or service	Cost	Category	Description
Educational signs	$500	Other	Signs with QVC code to access the Urban Forest Passport- 2 for each Estuario Urban Forest Network (approx. $50/each)

ADMINISTRATIVE & OPERATIONAL SUPPORT

LIST OF STAFF AND DESCRIPTION OF RESPONSIBILITIES

The SJBE Program Office is responsible for providing information on the implementation status and coordinating the progress of the forty-nine (49) CCMP actions, as well as the 2015 CCMP Update. The group is also responsible for reporting on the results of programmatic and environmental monitoring, and for aiding federal, state, and local stakeholders in the implementation of the CCMP. During this FY the staff funded under this grant is as follows:

FULL TIME PERSONNEL

Executive Director: [Brenda Torres Barreto, MEM, LEED AP] Responsible implementing of decisions adopted by the Board, management of the office, coordination of tasks of the ad hoc committees, developing partnerships, and conducting public awareness and participation functions.

Science Director: [Jorge Bauzá Ortega, PhD, QEP] Responsible for the development, identification, and recommendation of opportunities to help fulfill the action plans included in the CCMP, with special emphasis on those related to water and sediment quality, and fish and wildlife habitats. Oversees coordinating the Water Quality and Environmental Indicators Program, as well as all current work plan activities involving technical and scientific components.

Assistant Project Manager for Stakeholders and Aquatic Debris: [Cristina Ramírez Colón] Responsible for managing, coordinating, organizing, and executing all stakeholders and public outreach activities related to the Program. This position coordinates aquatic debris related activities and they will have expertise in solid waste management. Responsibilities include: organizing workshops and seminars, promoting volunteer engagement strategies, overseeing waste management analysis and developing action plans to address aquatic debris problems in the watershed and estuarine system. Additionally, this position works with the Citizen Advisory Committee, and is the person in charge of keeping its minutes and attendance list.

Water Quality Monitoring and Citizen Science Certification Program Coordinator: [Harold Manrique Hernández] Responsible for coordinating the Water Quality Monitoring Program with volunteers, and the Scientific Citizen Certification Program. This position helps develop and communicate data related to baseline conditions through habitat, restoration projects, volunteer monitoring and other data sets. The coordinator is responsible for responding to common inquiries or complaints from citizens, government agencies, or academia.

Operations Officer [Cathy Ortiz Gómez]: Responsible for proactively developing policies and procedures and improved operations measures that will ensure and promote Estuario operations' efficiency in order to effectively achieve the organization's objectives. The support the Executive Director in day-to-day operations and work with all internal staff and contractors, while maintaining a safe and secure working environment. In addition, they will handle stakeholders' inquiries and serve as a point of contact. They will be responsible for coordinating and scheduling meetings and appointments, supporting the recruitment process, and facilitating internal communication. They will resolve or escalate any issues or anomalies in order to ensure on-going stewardship of resources in keeping with the policies and procedures that the Estuario establishes.

Assistant Project Manager for Strategy [TBD]: Responsible for refining the organization's strategy, identifying opportunities to advance initiatives, and coordinating the implementation of strategic projects. This position will ensure the implementation of the CCMP by ensuring the organization's strategy and collaboration infrastructure is clearly defined to internal and external stakeholders, aligns with current standard operating procedures and enables the team to take advantage of opportunities as they present themselves in an orderly manner. This will include supporting the

implementation of processes and procedures, KPI's, and technology that facilitate collaboration and strategy implementation.

Office Manager: [Carmen Rosa Valentín Del Río] Performs administrative and clerical duties in support of the Program's Executive Director using Work and Excel, among others. Reviews contracts to ensure compliance with EPA grant and/or state requirements in coordination with the Operations Officer. Also provides support in the preparation of the required documentation for audits.

Project Manager, State Revolving Funds: [Yulianna de la Cruz] Responsible for all project direction, planning, completion, and financial outcome of projects that are financed by State Revolving Funds.

FISCAL YEAR 2021-2022 BUDGET

TABLE 1: BUDGET SUMMARY FISCAL YEAR 2021-2022

CATEGORY	AMOUNT
PROGRAM OFFICE BUDGET	$359,441.00
TRAVEL	$2,500.00
IMPLEMENTATION ACTIVITIES	$408,059.00 $770,000.00 (in-kind) **$1,178,059.00**
TOTAL	**$1,540,000.00**

TABLE 2: PROGRAM OFFICE BUDGET DETAIL

CATEGORY	AMOUNT
Salaries and Fringe Benefits	$282,786.00
Utilities	$2,674.00
Rent	$23,520.00
Accountants and Annual Auditing	$21,600.00
Human Resources Specialist	$7,000.00
Office Insurance and Officers' and Directors' Insurance	$4,500.00
Supplies	$2,100.00
Miscellaneous Office Expenses	$10,321.00
Office Maintenance	$4,940.00
TOTAL	**$**359,441.00

TABLE 3: TRAVEL BUDGET DETAIL

Date	Activity	Place/Staff	Purpose	Expense
February-March 2022	Executive Director attendance to NEP Annual Meeting	Washington, DC	Required travel under EPA Funding Guidance for NEPs	$2,500.00
			TOTAL	$2,500.00

TABLE 4: ACTIVITIES DETAIL FOR FISCAL YEAR 2021-2022

Activity	AMOUNT
1. Estuario Water Quality Volunteer Monitoring Program	$17,473.00
2. Estuario Bird Biodiversity Index and Data Analysis	$6,240.00
3. Co-Management of The Condado Lagoon Estuarine Reserve	$5,848.00
4. Waste Pollution Reduction and Oil Recycling Campaign	$38,000.00
5. Estuario Education Program and Empowerment Initiatives	$42,844.00
6. Citizen Scientist Certification Program	$14,350.00
7. 14th Puerto Rico Water Quality Monitoring Day	$13,660.00
8. Community Resilience through Arts and Culture	$21,500.00
9. Resilient Communities Support	$70,000
10. Long-Range Communications Project	$40,194.00
11. Estuario Database: Web Atlas and Library	$23,400.00
12.Wastewater Infrastructure Improvement Project (in-kind)	$770,000.00 (in-kind match)
13. Compliance and Reporting and Proposal Writing Support CCMP Tracking	$34,000
14. CCMP Tracking and implementation	$0
20. San Juan Bay Estuary Program CCMP Revision	$55,800.00
16. Program Evaluation	$24,250.00
17. Monitoring and Corrective Program	$0
18. Mitigation Planning	$0
19. Green Infrastructure and Reforestation	$500
	$
TOTAL	**$1,178,059.00**

APPENDICES

MATCHING FUNDS LETTER FROM PUERTO RICO AQUEDUCT AND SEWER AUTHORITY

GOVERNMENT OF PUERTO RICO
PUERTO RICO AQUEDUCT AND SEWER AUTHORITY I PRESIDENCY
Executive President I Ing. Doriel I. Pagán Crespo I doriel.pagan@acueductospr.com

May 13, 2021

Mr. Pedro Gelabert, President
Corporation for the Conservation
of the San Juan Bay Estuary Program
PO Box 9509
San Juan, PR 00908

Matching Funds Grant CE 99206927

Dear Mr. Gelabert:

It is a pleasure to inform you that the Puerto Rico Aqueduct and Sewer Authority (PRASA) will continue its collaboration with the San Juan Bay Estuary Program to improve the water quality of the San Juan Bay Estuary.

PRASA will continue improving the sanitary sewer infrastructure of its Metro Region, particularly those areas within the boundaries of the San Juan Bay Estuary, as it is one of the Program's Comprehensive Conservation and Management Plan's (CCMP's) priority actions.

Our agency will provide an additional in kind contribution of $900,000 for EPA Grant CE 99206927. The funds are not part of any administrative action or mitigation required from any federal regulatory agency or any other federal grant, but state government investments related to improvements in the Metro Region.

If you have any questions or need any additional information, please contact our office at (787) 620-8549 at your earliest convenience.

Cordially,

Eng. Luis González Delgado
Acting Executive Vicepresident of Operations

C: Irma M. López Santos, Executive Compliance Director
Eng. José J. Rivera Sanabria, Infrastructure Director

#604 Barbosa Avenue, Hato Rey - PO Box 7066, San Juan, PR 00916-7066
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WATER AND SEDIMENT QUALITY (WS)

GOAL: Improve the water and sediment quality of the San Juan Bay Estuary to ensure it is suitable for fishing and swimming and to promote other compatible recreational and commercial activities.

Objective 1 - Eliminate direct and indirect sewage discharges to the various canals and lagoons of the San Juan Bay Estuary to reduce nutrient and pathogen loadings and increase human uses of estuarine waters.

1. WS-01 Design and construct a storm and sanitary sewer system for the communities fringing the eastern section of the Martín Peña Channel and other areas adjacent to the SJBE.
    - 1.1. Complete an analysis of the infrastructure needs that will result as part of the improvements to the Martín Peña Channel sewage system, including an assessment of the existing stormwater system (storm sewer location and condition).
    - 1.2. Improve existing storm sewer system by implementing recommendations from step 1.1.
    - 1.3. Relocate families near the Martín Peña Channel that will be affected by the infrastructure improvements, including those affected by the channel's dredging.
    - 1.4. Verify that the Puerto Nuevo Wastewater Treatment Plant has the capacity to receive additional wastewaters from the eastern half of the Martín Peña Channel.
    - 1.5. Design and construct a sanitary sewer system and stormwater sewer system for those communities that will be adjacent to the channel after the dredging is completed.
    - 1.6. Develop and implement a storm sewer management plan for the Martín Peña Channel.
    - 1.7. Identify those areas in other communities fringing the SJBE that have no sanitary sewer collection system and are prone to severe floods. This information will be used to identify structures eligible for future infrastructure improvements, such as connection to a sanitary sewer and storm sewer system.

2. WS-02 Relocate families living adjacent to the Martín Peña Channel.
    - 2.1. Conduct a public poll in the communities to learn people's concerns about the relocation of families. Communities affected by the relocation may include sectors of Buena Vista, Las Monjas, Parada 27, Barrio Obrero, Israel, Bitumul, and Cantera.
    - 2.2. Approach community residents to explain how the dredging project will affect their community, including the benefits of such a project on quality of life. Psychological and emotional support should be available from the Puerto Rico Family Department for those families affected by the relocation. In addition, environmental justice assessments may need to be performed as implementation proceeds.
    - 2.3. Identify those houses located next to the Martín Peña Channel that will be affected by the dredging of the channel. At this stage, a socioeconomic study will be conducted to assess residents' income and the conditions of the structures to be removed.
    - 2.4. Study the different alternatives and procedures for relocating families within the community.
    - 2.5. Identify and/or acquire lands for the relocation of families. Efforts should focus on relocating displaced families within their community or in the nearest area available to reduce adverse impacts and disruption to the social composition of the community and its members.
    - 2.6. Complete a land ownership subdivision study and purchase or expropriate (as applicable) private property next to the channel which is not public domain. It is also important that a land ownership-subdivision study be undertaken first.
    - 2.7. Implement selected relocation alternatives from step 2.4.
    - 2.8. Relocate families to the new facilities.

3. WS-03 Eliminate unauthorized raw sewage discharges (bypasses) from PRASA's collection system and pump stations into the SJBE.
    - 3.1. Conduct a preliminary engineering evaluation of the sewer lines and approximately sixty (60) pump

stations in the SJBE watershed prior to any major action or investment from PRASA to eliminate unauthorized discharges. USEPA will incorporate compliance schedules into consent administrative orders based upon the engineering evaluation document recommendations. The engineering evaluation also will be a useful tool for PRASA to determine connection capabilities of new or proposed projects. This strategy follows PRASA's private administrator (Puerto Rico Water Company [PRWC]) policies.

3.2. Eliminate overflows and bypasses through adequate operation and maintenance of the pumping stations and collection systems leading to the Puerto Nuevo Sewage Treatment Plant.

3.3. Determine the origin of the sanitary wastes from PRASA's system reaching storm sewers by cleaning (flushing) sewer and storm drain segments. In the past, EQB has requested the cleaning of sewer and storm line segments with limited response from PRASA and the Municipality of San Juan. Regarding the connection between the Los Corozos pumping station and the Baldorioty stormwater station, PRASA, PRWC, and DNER are attempting to identify, isolate, and resolve the problem in coordination with EQB and USEPA.

3.4. Verify compliance of auxiliary or backup equipment, i.e. alternate power units for pumping stations, as necessary. USEPA and EQB will report on compliance during periodic follow-up inspections of PRASA's facilities.

3.5. Increase surveillance and decrease the response time at locations where sewer and manhole spills are frequent occurrences. At the present time, the discharge of sanitary wastes into surface water bodies due to sewage overflows or bypasses are reported to PRASA either when employees observe the overflow condition or when a citizen files a complaint. PRASA is required by regulations to report the existence of overflows or bypasses within 24 hours of their occurrence. When an overflow or bypass occurs, PRASA must initiate appropriate actions to correct the condition. Monitoring improvements in the PRASA system, including the implementation of a new telemetry system, will help to improve the surveillance and decrease the response times to resolve the overflow and bypass conditions.

3.6. Use the frequency of reported overflows and bypasses as a tool for targeting sewer line problems and manhole overflows for corrective action. A master plan study has been proposed by the PRWC to review the Condado, Hato Rey, and Old San Juan collection systems.

3.7. Address reported and non-reported discharges via administrative orders with corresponding compliance schedules. This is currently performed on an "as-needed basis". Schedules are completed by and coordinated with regulatory agencies.

4. WS-04 Eliminate illegal commercial and residential sewage discharges into the stormwater sewer system.

4.1. Conduct a field survey to identify all residential, commercial, and industrial sanitary connections to the storm sewer system that lead to stormwater pumping stations and eventually discharge into the SJBE.

4.2. Issue short-term compliance notifications to violators.

4.3. Connect violators to the existing sanitary sewer system.

4.4. Provide follow-up to force those parties illegally connected to the storm sewer to cease their discharges and connect their wastewater discharges to the sanitary system. EQB must periodically monitor the area to require compliance with applicable environmental regulations.

Objective 2 - Improve water circulation in the San Juan Bay Estuary to enhance its flushing capacity resulting in an improvement of its waters and sediments.

5. WS-05 Improve flow in the Martín Peña Channel.

5.1. Conduct alternatives analysis. Concerned agencies have evaluated various channel dimensions in terms of their overall cost, including, but not limited to, real estate, construction, operation and maintenance, as well as flushing capacity and overall environmental impact. The USACE, as part of the hydrodynamics/water quality model developed for the SJBE Program, evaluated channel

dimensions which would provide the most environmental benefits. Based on both efforts, a channel of 150 to 230 feet (45.7 to 70.1 m) in width, dredged to 10 feet (3.0 m) in depth was selected as the alternative to be constructed for restoring the Martín Peña Channel.

5.2. Prepare a Design Memorandum and Environmental Impact Statement for the selected channel alternative. Detailed design plans for the construction of the selected channel alternative will be developed, including information identifying those residences, buildings, and other infrastructure that will need to be relocated. Other information that will be provided includes sampling and laboratory analysis of dredged materials, selection of a disposal site for the dredged material, and the costs for replacing the bridges at Muñoz Rivera Avenue, Ponce de León Avenue, and Barbosa Avenue.

5.3. Relocate affected families. Begin construction of housing and relocation of those families located in the selected channel pathway. Several community organizations such as the Cantera Peninsula Project (CPP) and the Israel-Bitumul Community Housing Development Organization (IBCHDO) have already started the process of relocating those families along the banks of the Martín Peña Channel that will be directly impacted by the dredging. Acquisition of lands for new housing has already started.

5.4. Construct sewage laterals and other infrastructure improvements. Many of the structures that will not be affected by the channel pathway and that will remain in the area lack adequate utilities such as storm and sanitary sewers and proper solid waste disposal facilities. The bridges that cross the Martín Peña Channel will have to be raised or reconstructed to allow the passage of the machinery involved in the dredging. Construction of utility improvements will have to begin prior to initiating the dredging of the new channel. See related Action WS-1.

5.5. Dredge the Martín Peña Channel.

6. WS-06 Fill artificial depressions at the Suarez Canal and at Los Corozos, San José, and La Torrecilla Lagoons.

6.1. Conduct a detailed survey of the present extension and depth of the depressions to determine the volume of fill material needed. The USACE, as part of the hydrodynamics/water quality model project for the SJBE Program, developed a bathymetric map of the estuary. If this map has enough detail, no further survey will be required.

6.2. Identify source(s) for suitable fill material. Perform sampling and laboratory analysis of fill material to assess contaminant concentrations and toxicity. Potential sources of fill include dredged material from the construction of the Río Puerto Nuevo Flood Control Project, the material to be dredged from the Martín Peña Channel, and the dredged material from San Juan Bay's Navigational Channel Project.

6.3. Initiate filling of dredged depressions up to the historical average depth once the necessary permits have been obtained.

7. WS-07 Improve the flow of water between La Esperanza Peninsula Cove and San Juan Bay.

7.1. Conduct an environmental study to evaluate and recommend alternatives that will improve the flow of water in La Esperanza Peninsula Cove. This study should present information about the cost estimates of the proposed alternatives as well as their effectiveness in enhancing water circulation. It also needs to address the concerns of various government agencies and the general public.

7.2. Select the most environmentally-sound alternative that will be implemented based on the report completed under step 7.1. Concurrence and comments from regulatory and resource agencies will be sought during public circulation of the report and as part of the alternative selection process.

7.3. Commence the project after authorization and funding has been received. This would include developing plans and specifications, issuing a contract for completion of related works, and initiating construction.

8. WS-08 Assess the feasibility of opening the causeway to Isla de Cabras to increase water flow.

8.1. Evaluate the need to increase the flow of water between San Juan Bay and Ensenada Boca Vieja. The USACE hydrodynamic/water quality model should be used to assess the benefits of performing this action. A discussion of the potential impact of this action on marine resources will form part of this step.
8.2. Select the location and size of the new opening. Alternatives for evaluation include placing culverts across the causeway or building a bridge on piles.
8.3. Begin construction once necessary permits have been granted.

Objective 3 - Reduce nutrient and toxics loadings from nonpoint sources which result in an impairment of the estuary's habitats and uses.

9. WS-09 Minimize sediment loadings into the San Juan Bay Estuary system.
   9.1. Define the spatial and temporal scale of the study.
   9.2. Contract personnel and purchase equipment and materials.
   9.3. Implement sampling and testing periodically.
   9.4. Determine the relative contribution of sediments to overall water quality and light extinction curves.
   9.5. Require implementation of erosion and sediment control best management practices through NPDES construction and Control of Erosion and Sedimentation (CES) Plan permits.
   9.6. Implement management actions.
   9.7. Periodically monitor and evaluate results of management strategy.

10. WS-10 Develop toxics criteria for sediment in the SJBE.
   10.1. Analyze historical information on sediment quality in the SJBE. A literature study should be conducted which includes an annotated review of existing documents pertaining to sediment quality, loadings, and land use studies in the SJBE.
   10.2. Perform a general screening of sediment samples to identify contaminants in the following categories in accordance with the National Status and Trends Program and use impairments (sediment toxicity, fish advisories, etc.) specific to San Juan Bay:
      10.2.1. DDT and its metabolites (e.g., 2,4'-ddd)
      10.2.2. Chlorinated pesticides other than DDT (e.g., Aldrin, cis-Chlordane)
      10.2.3. Polychlorinated biphenyls (e.g., PCB congeners)
      10.2.4. Toxaphene (at some sites)
      10.2.5. Polycyclic aromatic hydrocarbons (e.g., Biphenyl, Naphtalene)
      10.2.6. Major elements (e.g., aluminum, iron, silicon)
      10.2.7. Trace elements (e.g., arsenic, cadmium, mercury, copper)
      10.2.8. Related Parameters (e.g., grain size, Total Organic Carbon)
   10.3. Perform sediment toxicity and bioaccumulation tests, benthic community structure, microtox, and other assays/tests as necessary.
   10.4. Select the parameters of interest. The basis for the selection of the parameters of interest will include one or more of the following: the nature of the contaminant (some are more toxic than others), the concentration of the contaminant, the frequency at which the contaminant is found, the biological availability of the contaminant, and the location where the contaminant is found.
   10.5. Develop sediment quality criteria for each of the parameters of interest. The development of sediment quality criteria will be conducted jointly with NOAA's Office of Ocean Resources Conservation and Assessment (ORCA) and USEPA. Since USEPA has been developing sediment quality criteria, it is identified as the lead agency. New approaches developed by USEPA include developing equilibrium-based sediment quality guidelines for screening problem sediments.

11. WS-11 Enforce the Used Motor Oil Management Law in the estuary's watershed (Law No. 172).
   11.1. Evaluate the possibility of increasing the enforcement of Law No. 172 by using existing human resources of EQB and DNER, as well as state and municipal police.

11.2. Develop additional enforcement mechanisms.
11.3. Modify existing regulations, if necessary.

12. WS-12 Establish a policy to restore and protect riparian corridors along SJBE tributaries.
    12.1. Convene a legal/technical task force to review existing statutes and guidelines related to the creation and protection of riparian corridors, their suitability, financing sources, and any management measures needed to properly attend to current needs. Using the SJBE watershed as a demonstration project area, identify those sites subject to these statutes where the protection and enhancement of riparian functions could be immediately enforced and implemented. This would serve as an interim measure until the task force completes a riparian corridor public policy.
    12.2. Develop an educational program that highlights the social benefits of riparian corridors. This program would attempt to change the common public misconception that riparian corridors are dangerous and unkempt public areas that encourage the dumping of trash and litter.
    12.3. Define setback or riparian corridor widths. Although several widths have been proposed in the literature, a final definition applicable to Puerto Rico should be established to achieve specific and desirable water quality and habitat protection and enhancement objectives.
    12.4. Adopt the new riparian corridor public policy developed by the task force. Incorporate the policy into the Objectives and Public Policies section of the Land Use Plan for Puerto Rico and into any applicable laws and regulations, including municipal territorial plans.
    12.5. Implement the new riparian corridor public policy within the SJBE watershed.
    12.6. Develop enhancement and restoration measures, such as instream practices, streambank treatments, or channel reconstruction, if needed, based on the condition of selected riparian corridors.

Objective 4 - Avoid the detrimental effects of oil and other contaminants on water and sediment quality, habitats, estuarine species, and socioeconomic activities.

13. WS-13 Develop a plan for creating a Board of Pilot Commissioners to focus exclusively on harbor safety issues.
    13.1. Introduce the bill and vote the bill into law before the end of the next legislative session.
    13.2. Appoint members to the Board of Pilot Commissioners.
    13.3. Activate the Board. The Board's primary purpose will be to oversee Pilot training appointments and action. The Board will also oversee operation of Port Control and harmonize its operations with local pilotage so that the processes and decision-making criteria used to bring vessels into and out of port are designed to minimize the risk of marine disasters.
    13.4. Evaluate and refine procedures at Port Control.

14. WS-14 Create a task force to monitor docks and other watercraft facilities within the SJBE system and ensure regulatory and permit compliance.
    14.1. Create a task force to 1) conduct an inventory of all docks, marinas, and associated structures within the SJBE system and establish trends and 2) determine the legal status of existing structures. Make recommendations to the DNER regarding necessary measures to control the proliferation of docks and other watercraft facilities within the SJBE system.
    14.2. Recommend enforcement action against illegal structures.
    14.3. Recommend the development of public docks and other facilities in areas where the natural resources will not be adversely impacted.
    14.4. Coordinate with the DNER Rangers Office to continue enforcing illegal dock sittings.

15. WS-15 Assess the establishment of non- commercial watercraft special use areas in the SJBE.
    15.1. Create a task force and convene a series of meetings to establish regulations concerning appropriate areas for the use of non-commercial watercraft within the SJBE system.

15.2. Conduct public hearings on draft regulations. Modify regulations as a result of public comments.
15.3. Adopt and implement regulations.

Objective 5 - Reduce levels of oil and grease, nutrients, sediments, toxics, and other pollutants in municipal storm sewer point source discharges which result in the degradation of estuary habitats and uses.

16. WS-16 Develop and issue NPDES permits to regulate stormwater discharges in urbanized areas of the San Juan Bay Estuary watershed that contribute stormwater point source discharges to the system and its tributaries.
    16.1. Prepare and issue NPDES permits for urbanized areas in the San Juan Metropolitan area.
    16.2. Evaluate and implement municipal storm water management plans based on NPDES permit requirements.

CCMP Update 2010

17. WS-17 Determine the areas of highest sewage discharge in the SJBE Watershed.
    17.1. Implement the research protocols based on the EPA's Quality Assurance Project Plan that have been approved for the research project to identify sewage wastewater discharge, as approved by the PREQB under the State Revolving Fund.
    17.2. Seek public participation as part of the creation and publication of the study, with socio-ecological methods that can be complemented by methodologies from cultural anthropology, ethnography, and oral history.
    17.3. Identify areas of greatest sewage wastewater discharge in the SJBE watershed.
    17.4. Evaluate public health issues in the areas of greatest sewage wastewater discharge.
    17.5. Integrate data using geospatial analysis provided by GIS with a number of other maps and map types.
    17.6. Ensure that the maps and images generated using GIS can be used and interpreted by the greatest number of publics possible, such as residents in these communities and the volunteer force.
    17.7. Publish the results of the study and publicize the existence of data and maps.
    17.8. Use the results of the study as a guide to beginning to eliminate sewage wastewater discharges in the SJBE watershed.

18. WS-18 Continue and strengthen the SJBEP's monitoring program, including its public-science component, paying particular attention to the Río Piedras, Juan Méndez Creek, San Antón Creek, and their tributaries.
    18.1. Continue the Program for Water Quality Monitoring with Volunteers (PMCAV) following the quality-control protocols established by the Quality Assurance Project Plan (QAPP) as approved by the EPA for this initiative.
    18.2. Every three to (maximum) four years, repeat the studies on sediments and mojarra and blue crab tissue as indicators for the SJBE.
    18.3. Continue periodic publication of data on the SJBEP website as one of the ways of making the data gathered known to a wide public.
    18.4. Publish the report card on bodies of water at least once every two years, and ideally once a year. One alternative is to print the grade on the monitoring points on the map available at estuario.org, so that people might have an immediate idea of the condition of the water in the SJBE system.
    18.5. Publish the database of indicators to complement the database already existing on the SJBEP website, so that the general public may have access to the data gathered.
    18.6. Continue to publish Report on the Condition of the SJBE and organize conference for making the data public.
    18.7. Continue search for an environmental indicator that will be easier for volunteers to identify.
    18.8. Continue educational and volunteer initiatives related to water quality monitoring, such as Guardians of the Estuary and Puerto Rico Water Quality Monitoring Day. These activities can be

complemented with participatory mapping exercises (to make clear people's relationship to their immediate surroundings) and the placement of educational markers in the storm drain system.

18.9. Present the results of all the strategies included in this action on the Estuary website.

18.10. Define quantifiable objectives associated with environmental indicators in order to measure or evaluate environmental improvement. Establish an alliance with the PREQB, which publishes an annual Environmental Report (Law No. 416 of 2014) and can integrate environmental indicators from the SJBEP into its reports.

19. WS-19 Document the location and length of the freshwater tributaries in the watershed of the San Juan Bay Estuary, with special attention to the Río Piedras, Juan Méndez Creek and San Antón Creek and their tributaries.

19.1. Do a historical review of the hydrographic databases available for the SJBE drainage basin and compare, with a GIS, the differences between them. This will allow determination of the level of impact urban sprawl has had/ is having on the on the SJBE watershed.

19.2. Develop a pilot study on Order 1 streams in the SJBE watershed in order to define their hydrological regime. This study will allow development of a spatial model that will allow us to extrapolate the results of the pilot study for other sub-basins within the SJBE drainage basin.

19.3. Generate an updated map of the rivers and streams of the watershed. This map should redefine the concepts of permanent and intermittent streams and rivers used for USGS maps on the base of the result of the flow frequency study to be carried out. In addition, it should incorporate the PRDNER's efforts to define the concept "stream/creek." The new map of the SJBE watershed should be compatible with the geographic information systems available commercially. It should also be included in the Estuary's WebAtlas that started being created in 2013.

19.4. Do an analysis of land use compatibility in areas in the SJBE watershed where there are Order 1 streams. This analysis will lay the foundation for a land use plan for the SJBE watershed compatible with the SJBEP's restoration objectives.

19.5. Begin a pilot project for water quality monitoring and pollution prevention on one of the freshwater tributaries of the SJBE, preferably the Río Piedras or one of its effluents.

HABITAT, FISH, AND WILDLIFE (HW)

GOAL: Enhance and maintain an ecosystem which supports an optimum diversity of living resources on a sustained basis.

Objective 1 - Preserve and restore ecologically important habitat.

1. HW-01 Plant mangroves along the western shoreline of San Juan Bay.

1. Identify those areas with suitable conditions (depth, substrate, wave energy, etc.) for mangrove forestation.
2. Coordinate the integration of a mangrove planting project with the Cataño Waterfront Development Project. The same effort should be coordinated with the Guaynabo municipality.
3. Initiate the mangrove planting project.
4. Monitor mangrove survival rate and replace seedlings as necessary.

2. HW-02 Restore seagrass beds in the Condado Lagoon.

1. Conduct a survey of the depression to determine the presence of biological communities that could be affected by the filling of the area. A study to identify the benthic communities found in the estuary, including those found in the Condado Lagoon, is being conducted as part of the characterization process of the SJBE Program. Further actions will depend on the findings of this study.
2. Conduct a detailed survey of the present extension and depth of the depression to determine the volume of material needed to fill it. The USACE, as part of the hydrodynamics/water quality model project for the SJBE Program, developed a bathymetric map of the estuary. If this map has enough

detail, no further survey should be required.
3. Identify source(s) for suitable fill material. Perform sampling and laboratory analysis to evaluate toxicity of fill material. Potential sources of fill include dredged material from San Juan Bay's Navigational Channel Project and the navigational channel that will be constructed for the Convention Center to be located in Isla Grande, as part of the Golden Triangle project.
4. Initiate filling of the dredged depression once the necessary permits have been obtained.

3. HW-03 Plant mangroves along the shores of the Condado Lagoon.
1. Identify those areas along the Condado Lagoon with conditions (depth, substrate, wave energy, etc.) suitable for mangrove forestation.
2. Coordinate the integration of a mangrove planting project with the government agencies involved with the extension of the Parque Laguna del Condado.
3. Initiate the mangrove planting project.
4. Monitor mangrove survival rate and replace seedlings as necessary.

4. HW-04 Designate a section of the Martin Peña Channel and lands adjacent to the Puerto Nuevo River as a nature reserve.
1. Compile the necessary information (i.e., proposed limits, natural resources inventory, land ownership, and acquisition costs) to designate the Martín Peña Channel-Puerto Nuevo River Complex as a Nature Reserve.
2. Seek endorsement by government agencies that have land ownership rights in the proposed area.
3. Designate the Martín Peña Channel-Puerto Nuevo River Complex as a Nature Reserve.
4. Manage the nature reserve. This should include establishing the carrying capacity of the nature reserve and creating buffer zones as transition areas between urban areas and the reserve.

5. HW-05 Plant mangroves along the shores of the San José and Los Corozos Lagoons.
1. Coordinate the integration of a mangrove planting project with the urban renewal project, known as the New Gate of San Juan and the CPP.
2. Identify those areas along the southwest shore of the San José Lagoon and the western shore of Los Corozos Lagoon with conditions (depth, substrate, wave energy, etc.) suitable for mangrove forestation.
3. Initiate the mangrove planting project.
4. Monitor mangrove survival rate and replace seedlings as necessary.

6. HW-06 Designate the Torrecilla Alta-Vacia Talega area as part of the Piñones State Forest Nature Reserve.
1. Compile the necessary information (i.e., proposed limits, natural resources inventory, land ownership, and acquisition costs) to designate the area comprised by the Torrecilla Alta and Vacía Talega areas as part of the Piñones State Forest Nature Reserve.
2. Seek endorsement by government agencies and private citizens that have land ownership rights in the proposed nature reserve. It will be preferable to purchase land subject to designation.
3. Expand the Piñones State Forest Nature Reserve through designation of the Piñones-Torrecilla-Vacía Talega Nature Reserve. The proposed area is shown on the map in Appendix A. The area currently zoned as Desarrollo Turistico Selectivo (DTS) is not included.
4. Manage the nature reserve. A plan should be developed that incorporates the community's needs and ensures its participation in the management of the reserve.

7. HW-07 Restore seagrass beds within the SJBE.
1. Determine areas within the SJBE historically associated with seagrasses.
2. Monitor seagrass growth once the water quality is sufficient to support the continued existence of seagrasses.
3. Determine what, if any, factors other than water quality could be inhibiting seagrass growth.

4. Correct factor(s) inhibiting seagrass development identified in Step 7.3 (if applicable).
5. Repeat step 2 (if applicable).
6. Conduct an artificial restoration pilot study (if applicable).

8. HW-08 Designate Las Cucharillas Marsh as a nature reserve.

1. Compile the necessary information (i.e., proposed limits, environmental impact of air pollutants, natural resources, land ownership, and acquisition costs) to designate the area as a nature reserve. As part of this step, a detailed study of the Ciénaga de las Cucharillas flora and fauna will be performed to assess the possible impact of pollution on this ecosystem.
2. Seek endorsement by government agencies and private citizens that have land ownership rights in the proposed nature reserve. It would be preferable to purchase the lands subject to designation. Urban development in the Cucharillas wetland area should not be allowed.
3. Designate Las Cucharillas Marsh as a nature reserve.
4. Manage the nature reserve. A plan should be developed that incorporates the community needs and their participation in the management of the reserve. Recommendations from the action plan demonstration project, once completed, could be implemented through this step. A native species wetland restoration program should be initiated at this stage.

Objective 2 - Protect species relative abundance and diversity.

9. HW-09 Establish management measures within the SJBE system for the land crab Cardisoma guanhumi.

1. Identify alternatives for management measures for land crabs in the SJBE system.
2. Implement selected management measures.
3. Post signs in land crab reserve and non-reserve areas to educate crabbers and the general public about crabbing prohibitions and /or regulations and the fines for violations.

10. HW-10 Implement a sea turtle recovery plan.

1. Identify all areas within or associated with the SJBE that are currently used or that have the potential to be used by marine turtles as nesting areas.
2. Monitor identified areas in Step 10.1 throughout the year. Additional personnel are needed in order to monitor nesting areas throughout the year. This approach will provide more accurate information regarding the nesting biology of the different sea turtle species.
3. Coordinate the design, manufacture, installation, and maintenance of signs in order to inform the general public about sea turtle nesting areas, threats associated with humans, turtle protection laws, and the fines associated with violating those laws. Signs should be posted near known and potential nesting areas.
4. Coordinate with marine turtle conservation entities to develop and conduct workshops to train volunteer groups to assist in the protection of these species during nesting season.
5. Coordinate with municipal authorities to ensure that urban development plans avoid habitat destruction and adverse impacts to turtle nesting behavior.
6. Coordinate with USFWS to survey turtle nesting areas within the SJBE and associated beaches to determine present and future violations based on specific recovery plans affecting present and potential nesting areas, sea turtles, and their hatchlings.

11. HW-11 Assess the impacts of power plant entrainment on fishery resources.

1. Conduct a joint workshop involving regulatory agencies, fisheries scientists, and PREPA to evaluate the need, costs, cost/benefit ratios, and ramifications of conducting a study of the impacts of power plant operations on fishery resources. (In coordination with HW-12.1.)
2. Design the scope of the study, identify potential data needs and funding sources, and conduct an impact study (if deemed necessary under Step 11.1). Based upon the results of the study, a plan should be developed and implemented to control the adverse impacts associated with the intakes, if needed.

12. HW-12 Assess the impact of thermal discharges on biological communities in San Juan Bay.

1. Conduct a joint workshop involving regulatory agencies, fisheries scientists, and PREPA to evaluate the need, costs, cost/benefit ratios, and ramifications of conducting a study of the impacts of power plant operations on fishery resources. (In coordination with HW-11.1.)
2. Design the scope of the study, identify potential data needs and funding sources, and conduct a thermal effluent impact analysis (if deemed necessary under Step 12.1). Based upon the results of the study, a plan should be developed and implemented to lower the temperatures of the discharges.

13. HW-13 Enhance and protect critical plant species within the SJBE.

1. Develop measures for the protection of existing populations and habitats in addition to the those addressed by the Endangered Species Act.
2. Develop and implement management plans for existing populations of critical species. Existing USFWS Recovery Plans recommendations should be followed as appropriate.
3. Establish protection zones around areas of existing populations of flora species catalogued as critical elements. These zones should be designed to prevent human disturbance by limiting recreational uses, posting informational signs, and assigning regular patrols.
4. Evaluate the necessity and feasibility of propagation for each species.
5. Conduct research on the species' methods of propagation and possible introduction sites within the estuary system.
6. Conduct a species propagation process to enhance existing populations. (Dependent on results of Steps 13.4 and 13.5.)
7. Conduct an educational campaign for the general public directed towards conservation of endangered species and regulations pertaining to the survival of these species.

14. HW-14 Protect existing populations of endangered and threatened bird species and protect and restore their habitat within the SJBE system.

1. Enforce existing regulations concerning habitat and bird species found within the SJBE.
2. Develop and implement management plans for existing populations of endangered and threatened bird species. USFWS Recovery Plan recommendations should be followed as appropriate based on existing regulations.
3. Enhance biodiversity by protecting breeding and nesting areas through limiting access and recreational use, posting signs, and conducting regular patrols.
4. Develop and implement alternative management measures to increase nesting in natural habitats.
5. Develop alternative measures to control the introduction of exotic species into the estuary system.
6. Conduct educational campaigns for the general public to increase awareness about management measures and regulations for the protection and conservation of endangered species.

15. HW-15 Estimate the population and habitat use of the West Indian manatee within the SJBE and establish manatee protection zones.

1. Continue manatee salvage program to assess mortality factors.
2. Perform aerial surveys with the use of helicopters to establish the population of the West Indian manatee and other protected marine mammals and sea turtles within the SJBE and associated areas.
3. Perform boat surveys and utilize a network of public informers to document sightings and to establish the total number of West Indian manatees and other protected marine mammals and sea turtles within the estuary and areas associated with the SJBE system.
4. Establish a radio telemetry study of West Indian manatee movements in areas within and associated with the SJBE.
5. Establish restrictive measures concerning fishing activities as well as boat and jet ski entries and speed limits in designated manatee protection zones.

6. Coordinate the design, manufacture, installation, and maintenance of signs to identify manatee protection zones.
7. Establish an education and public outreach program.

16. HW-16 Substitute cayeput trees (Melaleuca quinquenervia) with native species and prohibit planting of the tree in the SJBE.

1. Issue an administrative order to prohibit the importation, planting, and propagation of cayeput trees in the SJBE. Initiate a program to buy those Melaleuca trees available in nurseries when the administrative order takes effect.
2. Begin a public education campaign about the dangers of cultivating Melaleuca and efforts to eliminate the tree within the SJBE.
3. Initiate a demonstration project to remove the stand of cayeput trees found in the Suárez Canal wetlands. This project will not only eliminate the progressive invasion of Melaleuca trees in this area but will also produce information to be incorporated in a control program in the SJBE, including information on effective control methods and proper disposal. The coordination initiated among the different entities in charge of developing the demonstration project should facilitate the control program.
4. Identify and establish a buffer zone of 1,640 feet (500 m) adjacent to the wetlands of the SJBE to establish a control program for cayeput trees once the stand of cayeput trees in the Suárez Canal has been eliminated. The removal of cayeput trees in this area will eliminate nearby sources of seeds and prevent an immediate invasion of the SJBE freshwater wetlands.
5. Identify those species of trees, preferably native to Puerto Rico, that could be grown in the same conditions (mostly urban) where cayeput trees are normally planted. The selected species would be used to replace those cayeput trees that would be cut.
6. Initiate the cultivation of the selected replacement species if the variety and quantity of native trees currently available at public and private nurseries are not sufficient to replace the cayeput trees that would be removed.
7. Begin replacing the cayeput trees with native species in the wetlands buffer zone. Private land owners with cayeput trees should be compensated for the removal of the cayeput trees by providing native replacement trees.
8. Continue the control program in the rest of the SJBE's watershed, beginning with those areas adjacent to its tributaries once the wetlands buffer zone has been established and cayeput trees are removed from the buffer zone.

Objective 3 - Enhance economically valuable fisheries resources and ensure their sustainability.

17. HW-17 Determine historic and present recreational fishing areas in the SJBE and develop a plan to adequately manage recreational fishery resources.

1. Identify areas within the SJBE historically and currently used by sportfishers.
2. Identify the main sportfishing resources in the areas determined in Step 17.1.
3. Determine if USEPA fish and shellfish quality standards for toxics are met by targeted species.
4. Compile the necessary data that will provide information regarding the relative abundance, fecundity, annual reproductive cycle, minimum size of sexual maturation, and spawning frequency of the most important recreational fish and shellfish species.
5. Based on the collected information, prepare and implement a management plan, if necessary.

18. HW-18 Support enactment of the new fisheries law by the legislature and the governor.

1. Obtain the approval of the Legislature and the Governor for the new bill.
2. Approve the final version of the regulations once the Bill is signed into law by the Governor.

CCMP Update 2010

19. HW-19 Identify areas in the SJBE to be designated marine protected areas and continue SJBEP reef and

corals restoration projects.

1. Gather and assess relevant available information on marine and coastal resources within the SJBE and their spatial distribution via the PRDNER's recent CMZP inventories, NOAA maps of benthic habitats, characterization of types of beds and benthic communities in the northern SJBE, the Inventory of the Puerto Rican Coral Reefs (1979), and any update of that report done by the PRDNER.
2. Create an interdisciplinary advisory committee for marine and coastal nature areas in the SJBE, with representatives from the SJBEP, government agencies with interest in the subject (PRDNER, NOAA, Planning Board), the University of Puerto Rico, fishermen and other users of the zone (e.g., surfers), and community and environmental groups.
3. Based on the results of the first strategy (19.1), the advisory committee will identify the areas of priority for designation as protected nature areas. It will also determine the type of classification suggested for each MPA (nature reserve, marine reserve, no-take area, special planning area). The committee will file a report with the SJBEP with its recommendations.
4. The advisory committee will identify the legal basis and the most effective administrative and legislative mechanisms for achieving designation of protected natural areas on the ocean and estuarial shoreline of the SJBE.
5. Designate high-priority areas as "Marine Protected Areas," with the recommended classification.
6. Establish a mechanism to monitor the condition of reefs, seagrasses, populations of fish and other organisms in the areas designed PMAs, following the guidelines in the reef monitoring program carried out by the PRDNER as part of the Coral Reef Task Force initiative (http://www.coralreef.gov).
7. Establish management agreements or understandings with those government agencies and/or bona fide non-profit organizations committed to conservation and development of designated areas, such as the Estuary Program itself, for joint management and custody of the areas.
8. Develop a management plan for each of the MPAs. Specifically, the SJBEP, with the help of the PRDNER, should ensure that a management plan for the Condado Lagoon Estuarine Reserve is drafted and published.
9. Integrate the already-existing MPAs and the newly-designated ones into NOAA's National System of Marine Protected Areas (http://oceanservice.noaa.gov/ecosystems/mpa/).
10. Investigate the possibility of putting out more artificial reef underwater trails such as those created by the SJBEP in the sandy beach area of the Condado Lagoon.

20. HW-20 Approve a management plan and continue to buy land in the San Juan Ecological Corridor.

1. Inform and educate elected officials and heads of agencies about the importance of the SJEC and the need for funds for land purchase.
2. Seek approval of the SJEC Management Plan, which has been in the hands of the PRDNER since 2005.
3. Provide office and document-storage space for the work of the SJEC Special Commission.
4. Encourage land purchase for the SJEC, closely following the Purchase Plan mentioned earlier.
5. Perform an analysis that will identify existing and potential sources of recurrent and non-recurrent funds for land purchase for the SJEC. The analysis should also identify strategies for acquiring funds in addition to those provided by law. It should also consider other mechanisms for conserving private land not entailing purchase.
6. Finalize boundary definition for the Cupey Arboretum, the southern branch of the SJEC.
7. Revise the San Juan Zoning Code for the area of the Las Curías dam to ensure protection of adjacent green areas.
8. Create an educational and public-participation project within the SJEC, to include: (a) tours through various parts of the Corridor; (b) educational talks in schools in the area; (c) reforestation and cleaning projects; (d) habitat restoration projects on private land to benefit species under the

jurisdiction of the USFWS.

9. Encourage the implementation of management plans and projects with owners of private land within or adjacent to the Corridor, where sustainable-use and conservation practices for resources can be implemented.

21. HW-21 Update the land-use map for the SJBE.

1. Identify the uses made of land in the SJBE watershed by using satellite imaging technology and aerial photographs. This information should be georeferenced and integrated into a layer of information in GIS. Also, identify impacted land that might be restored, especially land in areas of high environmental vulnerability. To do this, one might use, for example, data on vegetation coverage compiled by the International Institute for Tropical Forestry (IITF) in 2011.
2. Utilizing the information compiled in strategy 21.1, prepare an inventory of the various areas with their geographic location and their bodies of water, land-use category, zoning category, degree of protection, principal values and uses, title, administration and policy, and management instrumentation and directives. As a reference, the report "Puerto Rico Gap Analysis," prepared by the U.S. Forestry Service and the PRDNER, should be studied.
3. Prepare an inventory of all the land currently classified as protected nature area, urban forest, and/or SPA in the municipalities that make up the SJBE drainage basin.
4. Initiate a participatory process, led by the SJBEP, in which individuals, community and environmental organizations, and local, state, and federal agencies can provide ideas on areas that should be protected and restored, and strategies for doing so.
5. Perform an analysis of each of these properties' ecological value to the SJBEP, its social value, purchase cost, and risk of development, and create a ranking system using these criteria to help prioritize interventions on the various properties.
6. Integrate monitoring strategies into the green areas so identified, in order to determine the health of these areas and the changes they are undergoing over time, following the model of, or in alliance with, the Conservation Trust's Map of Life project.
7. Analyze the results of strategies 21.4, 21.5, and 21.6 in order to determine which land has priority for being integrated into conservation strategies, whether as new protected nature area, forested park, special planning area, conservation easement, or other related strategy.

22. HW-22 Estimate or model the SJBE's vulnerability to the impacts of climate change, and present adaptation measures.

1. Organize a multisectoral workshop of experts to develop a Coastal Vulnerability and Risk Analysis for the SJBE, in order to identify the expected impacts of climate change on the Estuary and on at-risk areas within the Estuary.
2. Analyze the information discussed in the workshop and prepare a report summarizing the principal findings. Share the report with participants.
3. Prepare a Vulnerability Assessment Handbook to guide the analysis of the Estuary's vulnerability to climate change.
4. Organize a workshop to discuss the draft handbook proposed in strategy 22.3.
5. Design and implement a program to monitor climate change for the SJBE and analyze the impact of these effects on the ecosystem. This monitoring should include measurements of coastal erosion, temperature of bodies of water, and increase in sea levels at different points in the Estuary.
6. Using existing data and studies, develop a model of expected impacts of climate change on the SJBE.
7. Following the Handbook proposed in strategy 22.3 and using the results of the model of climate-change impacts in 23.6, develop a Vulnerability Analysis for the SJBE that will identify the risks to and impacts on the ecosystem, the economy, and society.
8. Using the results of foregoing strategies (22.1–22.7), organize a multisectoral workshop of experts

to discuss strategies for adaptation to climate change for the SJBE.

9. Develop a Climate Change Adaptation Plan for the Estuary. This plan should detail specific actions and strategies, the agencies and organizations participating in implementation, costs, and potential sources of financing/funding.
10. Encourage taking (1) the effects of climate change and (2) adaptive strategies into account in planning for new infrastructure (e.g., houses, storm drain systems) and land use in the SJBE.
11. Educate interest groups in the SJBE on the effects of climate change and on mitigation and adaptation measures that should be taken, and involve these groups in finding solutions/ actions.

23. HW-23 Study and control undesired invasive species in the SJBE.

1. Identify areas within the SJBE where impacts from the green iguana (Iguana iguana) and spectacled caiman (Caiman crocodilis) have been observed and documented.
2. Develop and implement strategies for controlling the population of the green iguana (Iguana iguana) and spectacled caiman (Caiman crocodilus) in areas identified in strategy 23.1.
3. Implement an educational campaign on the impacts to marine fauna from the lionfish (Pterois volitans), including strategies for the species capture and consumption.
4. Compile needed information on the presence of undesired aquatic invasive species in the SJBE and invasive land species undocumented as of the date of the CCMP revision. As part of this study, identify impacts, or possible impacts, to the SJBE's flora and fauna.
5. Develop and implement strategies for controlling the population of species identified in strategy 23.4 if significant impacts to SJBE flora and fauna are shown to be occurring.
6. Carry out a detailed study on undesired aquatic species that arrive via ballast tanks on ships docking in San Juan harbor. It is estimated that some seven thousand species of organisms, including fish, algae, crustaceans, mollusks, virus, and bacteria are transported in the ballast tanks of ships around the world.

24. HW-24 Ensure implementation of law no. 112 of 2013, which created the Condado Lagoon Estuarine Nature Reserve.

1. Post Law No. 112 of September 30, 2013 on the SJBEP web page and ensure that a large number of people become aware of the designation of the Condado Lagoon as an estuarine nature reserve. To do this, the SJBEP should use social media, the press, and all other means at its disposal.
2. Carry out an opinion study or convene a focus group on the environmental problems in the Condado Lagoon area, using the means of communications noted in the prior strategy.
3. Ensure creation of the Condado Lagoon Estuarine Nature Reserve Co-Management Commission.
4. Install educational signs in strategic places in the area to inform the community of users of the Condado Lagoon about the designation and uses of the Estuarine Reserve. These signs should clearly state the prohibition on fishing and the capture of species in the area and on the use of motorized watercraft.
5. Jointly with the Condado Lagoon Estuarine Reserve Co-Management Commission, prepare and publish a management plan that includes community members and representatives of public organizations, non-profit organizations, and area businesses. The actions included in the management plan should include a wide array of recommended actions to improve the Lagoon's ecosystem. It should also include measures aimed at adaptation to climate change

AQUATIC DEBRIS (AD)

GOAL: Improve habitat quality and enhance the aesthetic, recreational, and economic values of the SJBE by ensuring that the watershed is free of aquatic debris.

Objective 1 - Significantly reduce the amount of aquatic debris that reaches all estuarine waters.

1. AD-01 Develop and implement community-based solid waste management and recycling programs in

coordination with municipalities.

1. Assure that the eight municipalities that are part of the estuary's drainage basin develop their Solid Waste Management and Recycling Plans as required by Law No. 70. These plans should include measures to mitigate some of the major problems associated with solid waste management, aquatic debris, and illegal dumping in the SJBE. The state government (EQB and SWMA) should create compliance plans, with notices of violation and penalties, for those municipalities that have not developed their plans.
2. Determine specific waste management and recycling strategies for identified critical areas where large amounts of aquatic debris are found ("hot spots"). Identify deficiencies in the waste management services provided by local governments to communities adjacent to the estuary system (such as delayed waste collection services or nonexistent service) as well as any deficiencies in the enforcement of solid waste disposal laws.
3. Launch an educational campaign (initially in communities adjacent to critical areas) stressing the importance of the SJBE system and the need to establish and support effective solid waste management and recycling initiatives as a step to restore the quality and health of the local environment and the estuary system as a whole. Such a program should include information about the interconnectedness between the estuary system and local areas and promote the establishment of community-based solid waste management and recycling programs.
4. Meet with community members and local government representatives to identify leaders willing to organize a waste management and recycling program. In communities where programs already have been established, meet with program representatives to assess the need for additional support.
5. Assist and support local communities in the development of waste management and recycling programs designed to meet their particular needs. This will include identifying recyclable materials, determining when, where, and how the material will be collected, and coordinating transportation of the material to recycling centers.
6. Conduct regular monitoring and evaluation of the ongoing waste management and recycling activities in each community. Study the feasibility of using the Municipality of San Juan's Solid Waste Monitoring Program as an example for other municipalities. All recycling data collected (quantity of materials collected, reused, or recycled [tons], type of material, transportation costs, final disposal) should be submitted in a quarterly report to the SWMA's Recycling Division.

2. AD-02 Continue to implement the Action Plan Demonstration Project developed in Piñones, Loíza.

1. Conduct a series of forums or surveys in which business owners, residents, visitors, and other stakeholders can evaluate the current waste reduction and recycling APDP. This information can be used to help identify the problems and successes related to the pilot project.
2. Develop a guidebook that can serve as a reference tool for communities that wish to develop similar waste management programs. Document the strategies used in the implementation of this APDP and its results in the guidebook. Share the success of this demonstration project with the local community, and, if requested, provide assistance and training in the development of similar initiatives. Expand the initiative conducted in "El Redondel" to other commercial areas in Piñones.
3. Study the feasibility of developing a self-sufficient community recycling center in the community of Piñones. This study should consider financial and infrastructure needs (i.e., location availability, building renovations).
4. If feasible, assist and support the development of the community recycling center.

3. AD-03 Continue the annual aquatic debris clean-up event held in Islote de la Guachinanga.

1. Continue educational campaigns to increase public awareness about the natural and recreational values of Islote de la Guachinanga and the importance of keeping it trash free.
2. Assist the Neighbors' Council of Cantera in the organization and operation of its annual clean-up event. The Council welcomes assistance in different areas, such as securing sponsors for the

event and ensuring participation by local volunteer groups.

4. AD-04 Conduct periodic aquatic debris clean-up activities at suggested SJBE locations.

1. Conduct educational and publicity campaigns to increase public awareness about the natural and recreational values of particular SJBE locations and the estuary system as a whole and the importance of keeping these areas trash free.
2. Organize aquatic debris clean-up events at suggested SJBE sites. Encourage and support local groups of volunteers with their own independently organized clean-ups at SJBE locations.

Objective 2 - Develop, promote, and implement voluntary compliance and pollution prevention initiatives.

5. AD-05 Establish Solid Waste Pollution Prevention Pilot Programs at different SJBE locations.

1. Gather data about solid waste minimization, reuse, recycling, and disposal practices at chosen sites.
2. Evaluate the impact, if any, of these practices on the SJBE system.
3. Assist participating entities in conducting self-assessments to identify methods for voluntarily minimizing solid waste generation and disposing of waste in a cost-effective manner.
4. Conduct routine inspections to monitor the effectiveness of the P2 pilot program.
5. Maintain detailed records of all the data collected, recommendations provided, and changes in operational practices in order to develop resource guides that could potentially be used by similar entities in the SJBE (or on the island) that are interested in pollution prevention initiatives.
6. Evaluate and create adequate incentives to compel future voluntary compliance in the business, industry, agricultural, and commercial sectors.

Objective 3 - Strengthen the enforcement of littering laws and regulations.

6. AD-06 Implement measures to detect, correct, and control illegal dumping activities and enforce Puerto Rico's Anti-Littering Law (Law No. 11 of 1995).

1. Study how municipalities within the SJBE system, the State Police, the Municipal Guards, and the DNER Rangers Corps are implementing Law No. 11, what problems are occurring, and what improvements can be made in law enforcement. Verify that all provisions of Law No. 11 are being met, particularly the reassignment of funds acquired from fines to specific jurisdictions. Make any legal or judicial changes that are needed for the Law's effective implementation. Require legal staff at different agencies to pursue prosecution of significant cases. Evaluate the effectiveness and use of DNER's Clandestine Dump Hotline (1-800-981-7888).
2. Train municipal and state government staff from pertinent departments (public works, utilities, street cleaning, parks and recreation, sewer maintenance, community and industrial waste inspection, hazardous waste inspection, etc.) to recognize and report illegal dumping activities. Train and provide incentives for the State Police, Municipal Guards, and the DNER Rangers Corps in the enforcement of Law No. 11.
3. Identify and evaluate critical areas ("hot spots") within each municipality where illegal dumping grounds and large quantities of debris are found. Prioritize and target those critical areas that are having a direct negative effect on the health of the estuary system and the quality of life of surrounding communities. Establish a system for tracking illegal dumping activities to help determine trends and identify who, what, when, and where efforts should be concentrated. At a minimum, this tracking system should include the following:
    1. Locations of illegal dumping "hot spots" (map, pictures, etc.);
    2. Types and quantities of materials;
    3. Dates and times of occurrence;
    4. Methods of disposal (abandoned containers, midnight dumping, direct dumping of materials, accidents or spills, etc.);
    5. Responsible parties; and
    6. Actions taken/status.

4. Take necessary remedial actions to remove debris and clean up critical areas. Establish physical barriers (such as fences or walls) to prevent further dumping and contamination after these areas are cleaned. Post signs or other printed materials stating the possible consequences of violating littering laws (see Action PI-2). Notify police officials, Municipal Guards, the DNER Rangers Corps, and EQB's environmental specialists of the location of these critical areas so they can conduct inspection and surveillance activities and fine polluters.
5. Study how communities can take a more active role in the enforcement of Law No. 11, and make any legal or judicial changes needed for the Law's effective implementation, focusing in particular on community involvement during the prosecution phase. Conduct a public education and awareness campaign in communities adjacent to critical areas that focuses on illegal dumping. Provide these communities with mechanisms (such as a flyer or a hotline number (see step 6.1)) and incentives (such as reward programs) for reporting incidents. Help communities establish neighborhood watch programs. Incorporate mechanisms for public reporting of illegal dumping into volunteer water quality monitoring initiatives.

7. AD-07 Enforce the Law for the Management of Used Tires (Law No. 171) and other regulatory measures related to the illegal dumping of used tires within the estuary system and its drainage basin.

1. Identify existing illegal used tire dumping grounds within the estuary drainage basin and waterbodies. Conduct an inventory of the number of discarded tires. Identify critical areas where inadequate used tire disposal is significantly affecting the health of the estuary system and the livability of its surrounding communities. Prioritize mitigation activities within these critical areas. Study the need and feasibility of removing the used tires located at the bottom of San Juan Bay Harbor, especially in the San Antonio Channel. If feasible, develop a detailed Action Plan to conduct an effective strategy for removal.
2. Evaluate deficiencies in the management and disposal processes for used tires and, if possible, identify which entity is responsible for inadequate/illegal disposal practices (for example, tire dealers, tire managers, tire processing or recycling facilities, and, at a more difficult level, individuals). Update the inventory of registered tire establishments in each municipality and conduct an investigation to identify those which are not registered.
3. Launch an educational campaign in the local communities stressing the need to establish and support effective used tire management and recycling initiatives as a step toward restoring the quality and health of the local environment and the estuary system as a whole. Communities should be aware of the health risks related to the inadequate disposal of used tires (i.e., vectors, fires, etc.) Local communities can serve as a policing entity and inform local authorities of illegal dumping activities. Communities should also be aware of the proper notification channels that can be used in order to inform authorities about illegal littering activities (i.e., who, where, and when to inform). See Action AD-6 for detailed steps regarding illegal dumping controls.
4. Conduct community-based used tire collection and recycling initiatives. Volunteer activities, such as clean-ups, could be organized in interested communities once a year. Action AD-4 calls for the development of periodic aquatic debris clean-up activities at suggested SJBE locations. These clean-up events should include the collection of large-sized wastes such as used tires in addition to smaller debris.
5. Evaluate the feasibility of implementing preventive measures, such as sign posting and the installation of fences to control access into abandoned areas (Action AD-6), to discourage the creation of clandestine and illegal dumping grounds.
6. Enforce Law No. 171 at the municipal and community levels. It is recommended that municipalities adhere to Law No. 171 and ratify policies and develop programs to improve used tire disposal and management processes in their jurisdictions.

CCMP Update 2010

8. AD-08 Develop a project to reduce and prevent pollution in marinas, fishing villages, and yacht clubs in the

San Juan Bay Estuary.

1. Establish a permanent channel of communication, whether through a memorandum of understanding or another type of agreement, between the SJBEP and representatives of marinas, fishing villages, and yacht clubs within the Estuary to allow a constant flow of information and ideas and help develop trust between the parties.
2. Study the current situation of the principal marinas, fishing villages, and yacht clubs in the SJBE in terms of their practices and needs for the handling of pollutants. This could be done through an anonymous volunteer questionnaire for users.
3. Develop a Clean Marinas Handbook or Guide detailing actions that can be taken by users and managers of marinas and yacht clubs to reduce levels of aquatic pollution, similar to the Blue Flag Program for marinas administered by the Organization for a Sustainable Environment (OPAS, for its initials in Spanish).
4. Develop an educational and training campaign for users and administrators of marinas, fishing villages, and yacht clubs, based on distributing information via the handbook/guide developed in Action 9.3, pamphlets, talks, and signs.
5. Investigate the possibility of setting up monitoring points for coliforms, oils, and lubricants at the SJBE's main marinas and yacht clubs.
6. Analyze the feasibility of installing pumping stations and stations for cleaning portable and fixed toilets, containers for used oil, etc., in marinas and yacht clubs.

PUBLIC EDUCATION AND INVOLVEMENT (PI)

GOAL: Maximize public involvement in the implementation of the CCMP.

Objective 1 - Increase the public's awareness of the estuary's functions and values.

1. PI-01 Develop and promote low impact recreational activities within selected areas of the SJBE.

1. Identify, evaluate, and enhance existing recreational facilities located within the SJBE to promote ecotourism, low-impact activities, and recreational uses of the resources. Ecologically sensitive areas not compatible with recreational uses will be identified at this stage. Suggested sites include Parque de La Esperanza, Isla de Cabra, Piñones State Forest, San Juan Bay waterfront, Condado Lagoon, and La Torrecilla Lagoon.
2. Survey and identify appropriate areas for the development of new recreational facilities to serve various or specific passive and low-impact recreational uses. Ecologically sensitive areas not compatible with recreational uses will be identified at this stage. Suggested areas for potential development include the San José Lagoon waterfront, Guachinanga Island, Martín Peña Channel, Cataño-Guaynabo waterfront, Suárez Canal, San Juan Bay waterfront, Las Cucharillas Marsh, Vacía Talega - Torrecilla Alta area, and SJBE tributaries.
3. Design and develop recreational facilities for low-impact and nature-oriented activities within selected sites of the SJBE. Suggested recreational facilities include waterfront linear parks, mangrove fringing boardwalks, docks, interpretative trails, fishing facilities, visitor centers, bike trails, and birdwatching towers.
4. Build incentives for and encourage development of local businesses based on recreation-oriented activities, such as bicycle, kayak, and sailboat rentals and sightseeing boat tours.
5. Promote the use of existing facilities and low-impact recreational activities in accordance with each site's potential. Suggested activities include birdwatching, hiking, bicycling, kayaking, fishing, sailing, swimming, snorkeling, and sightseeing by boat.

2. PI-02 Post educational and interpretive signs at highly visible, heavy traffic areas throughout the SJBE watershed (bridges, roads, parks, marinas, ports, waterfronts, etc.) to educate the public on the system's components, functions, and values.

1. Identify areas where SJBE's tributaries and waterbodies are visually exposed and frequented by the public (such as waterfronts, bridges, roads, marinas, fishermen centers, recreational parks, or boardwalks).

2. Design and produce educational and informational signs which identify components of the SJBE system, highlight the functions and values of the system, and encourage conservation. Signs should differ in content according to the specific characteristics of each particular area.
3. Install signs at selected sites and provide maintenance or replacement as required.
4. Publicize the presence of the signs and promote their use as educational resources and as supplements to recreational and ecotourism activities.

3. PI-03 Establish a program to provide citizens with effective and organized volunteer opportunities to support the SJBE's restoration projects (water quality monitoring, education, etc.).
1. Identify potential restoration and monitoring projects within the SJBE where volunteer participation would be effective.
2. Coordinate volunteer activities with sponsoring agencies or communities.
3. Promote volunteer opportunities and recruit volunteers at schools, universities, environmental groups, clubs, associations, and communities.
4. Train and match volunteers with hands-on activities around the SJBE.

4. PI-04 Develop a long-term public education and outreach program.
1. Evaluate and distribute existing educational and informational materials (brochure, poster, bumper sticker, and newsletter) and develop new resources to fully address the interests of the SJBE's various user groups (boaters, fishermen, industry, business, communities, etc.). These materials should include the following:
    1. A booklet on "Things that you can do to help restore and conserve the SJBE;"
    2. A "Code of Conduct" for boaters, fishermen, industry, businesses, and other users of the SJBE;
    3. A guide on habitats, recreational facilities, and activities within the SJBE and guidelines for habitat preservation;
    4. Periodic progress reports on CCMP implementation and the environmental status of the SJBE (Costa Viva); and
    5. An estuary information center.
2. Continue educational activities such as presentations and talks (for communities, special interest groups, industry, business, etc.) and participation in exhibitions, conferences, and special events related to the SJBE.
3. Develop other educational projects tailored to meet specific needs of targeted audiences, including community environmental and sustainable development projects and environmental education workshops for industry, businesses, communities, and special interest groups.
4. Develop educational activities for public participation, including:
    1. Celebrating SJBE Day (Costa Adentro) and Estuary Clean-up Day (simultaneous clean-ups within the estuary);
    2. Celebrating a SJBE symposia;
    3. Promoting citizen participation in the volunteer program; and
    4. Promoting citizen use of SJBE's recreational facilities and participation in the SJBE ecotourism program.
5. Promote effective use of the media by encouraging coverage of SJBE issues, activities, or special events and producing television and radio PSAs, television, radio, and movie theater advertisements, media presentations, and interviews.

5. PI-05 Develop an ecotourism program to promote sustainable, low-impact enjoyment of SJBE's natural resources as a means to further their conservation.

Planning

5.1 Establish a cooperative agreement with the Ecotourism Consultive Board to study the ecotourism potential of the above-mentioned areas in the SJBE system and plan, design, and develop criteria and requirements for infrastructure and installations at these ecotourism zones. All plans, criteria, and requirements shall comply with the indications provided in the Ecotourism Law.

5.2 Establish ecotourism zoning for potential ecotourism projects or activity areas. These zones should be evaluated on a yearly basis as indicated in Article 5, section e of the Ecotourism Law.

5.3 Require that all Environmental Impact Statements for development projects in areas of potential ecotourism development study in detail the alternative of establishing ecotourism infrastructure and recreational attractions, as required by EQB's Environmental Impact Statement regulation (section 5.3.7.). The Ecotourism Law requires that any ecotourism infrastructure be located, designed, and constructed with minimal impacts to the environment and existing infrastructure. It also states that ecotourism facilities should comply with the parameters and requirements of the U.S. National Park Service's *Guiding Principles for Sustainable Development*.

Implementation

5.4 Survey existing recreational facilities and identify areas where the development of low-impact ecotourism activities will be suitable and appropriate. At this stage, areas that should be preserved as undisturbed habitats should be identified.

5.5 Design routes for guided and self-guided tours that can be combined by users based on their preferences. Provide adequate alternatives by considering the following:

5.5.1 Audiences (students, children, teachers, clubs, families, etc.);

5.5.2 Interests (birdwatching, kayaking, sightseeing, and others); and

5.5.3 Performance skills (children, seniors, adults, etc.).

5.6 Provide the necessary infrastructure to support activities at chosen sites (docks, trails, signs, observation platforms, etc.) and to coordinate ground and aquatic transportation (boats, kayaks, buses).

5.7 Hire and train local guides to coordinate and conduct guided tours.

5.8 Encourage the development of small, low-impact, community-based business enterprises that offer recreational services and other amenities to visitors (e.g., kayak rentals, guided tours, boat tours, food stands).

5.9 Develop and distribute tourism advertisements and information packets to bring ecotourists to the area.

5.10 Promote the SJBE's Ecotourism Program as a recreational and educational opportunity for schools, college students, environmental groups, clubs, etc.

6. PI-06 Develop an Environmental Education Program to target young audiences at schools and other non-formal educational institutions throughout the SJBE watershed.

1. Encourage the use and implementation of the SJBE's School Curriculum at private and public schools throughout the SJBE watershed.
2. Develop environmental education materials appropriate for children and young audiences to teach them about the SJBE's natural components, functions, and values. These materials should be regularly updated and redistributed to assure their frequent use as fun and educational tools. Suggested materials include:
    1. A SJBE activity and coloring book;
    2. A SJBE cartoon video for children; and
    3. A SJBE system puzzle map poster depicting the different natural communities within the system and its biological components.
3. Develop an Environmental Educator's Workshop Program to train teachers and other non-formal educators in the effective use of the SJBE School Curriculum and other related educational material.
4. Develop and encourage the use of other related environmental education sources by teachers and non-formal educators. Suggested materials include an Environmental Education Activities Guide.
5. Develop a School Excursions Program to facilitate and encourage student field visits to the SJBE system as a conservation education tool. Teachers could guide interpretative routes or solicit the services of qualified personnel. Different routes can be designed to guide students through the diverse components and natural communities of the SJBE. Restoration projects in progress could serve as additional tools for educating students about public impacts on the natural system and its restoration process.

6. Encourage an annual celebration of the SJBE at all schools located within the SJBE watershed. Suggested activities include the following:
    1. Environmental Education Field Day;
    2. Environmental Christmas Card Contest;
    3. Local clean-up events and field trips; and
    4. Local storm drain stenciling projects.
7. Continue delivering talks and presentations about the SJBE at schools and related special events.

7. PI-07 Develop a Memorandum of Understanding between public and private entities and the SJBE Program to expand the scope of the Program's public education and outreach activities.

1. Develop and sign a Memorandum of Understanding (MOU) between interested public and private entities and the SJBE Program regarding collaboration on education efforts.
2. Train environmental educators about the SJBE's components, natural functions, values, and threats. This training should be specifically designed to fit the needs and scope of work of the entity participating in the MOU. Exchange educational materials, photographs, brochures, and other necessary items.
3. Maintain a log of the presentations that have been conducted. Every month, exchange copies of this log with participating entities to assure that future presentations are not conducted at similar locations or, if at the same location, do not touch upon the same subject.

8. PI-08 Promote better understanding of estuarine resources among regulatory enforcement agencies and personnel.

1. Identify the essential concepts needed to understand the ecology of the SJBE system and the legal components established for resource protection.
2. Produce a teaching/learning resource book and instructional materials on estuarine concepts for Rangers and other enforcement personnel.
3. Conduct training workshops on estuarine concepts, the legal framework, and communication skills for DNER Rangers in the SJBE system as well as other sensitive areas in Puerto Rico.

CCMP Update 2010

9. PI-09 Promote public access to the SJBE's bodies of water and sandy beaches.

1. Take an inventory of all existing accesses to beaches and rivers in the estuary watershed. Also inventory existing and proposed projects that offer access to bodies of water and beaches within the SJBE, or that limit such access.
2. Georeference these accesses and projects in order to integrate them into a GIS.
3. Using the data from strategy 9.2, create a map allowing visual analysis of the location and other relevant information on existing accesses and projects that provide or limit access to bodies of water in the SJBE watershed.
4. On the basis of these inventories, identify priority areas within the SJBE watershed where new accesses to bodies of water can be developed (through alliances between the public and private sectors), and post signs at existing points of access.
5. Examine the possibility of rebuilding the dock at the "Piñones se Integra" Corporation (COPI), and building or rebuilding other docks, to increase public access to SJBE areas.
6. Create an information and education component on the SJBEP webpage, including a map (strategy 9.3) and descriptions of places in the SJBE with public access to bodies of water and beaches offering opportunities for passive recreation.

10. PI-10 Do a study on the economic values of the environmental assets and services of the San Juan Bay Estuary System.

1. Analyze the stakeholders in the SJBE to determine who should take part in the economic valuation studies.
2. Do an inventory identifying and quantifying all the assets and services provided by the SJBE. This should include, as a minimum, tourism and ecotourism, exports and imports, fishing resources, marinas, recreation, port/docking resources, parks, water purification, community micro-

businesses.

3. Carry out valuation studies of various SJBE assets and services, using appropriate methodologies, such as:
    1. a. travel cost analysis to determine the recreational value of the estuary's services
    2. b. tourism value of the estuary based on income generated by micro-businesses engaged in, e.g., kayaking (plus rentals), bicycling (plus rentals), snorkeling, tours, etc.
    3. c. property values in the area of the estuary and other areas of San Juan, to measure the aesthetic and "pleasantness" values of the estuary
    4. d. ecological productivity, to analyze the economic value of the estuary as a habitat for birds and fishes
    5. e. damage control/prevention, to analyze the estuary's value in terms of protection from flooding and storms/hurricanes and mitigation of their economic damage
    6. f. contingent valuation (survey) to measure the amount of money residents and visitors would be willing to pay to conserve and improve various components of the estuary
    7. g. examine and follow the recommendations in the Tourism Company's handbooks to certify ecotourism projects
4. Develop a database for the results of these studies and others carried out in the future.
5. Disseminate the results of these studies to interested parties and the general public.

11. PI-11 Create a long-range communications project on the San Juan Bay Estuary, to include social media and a method to measure knowledge about the ecosystem.

1. Hire a full-time person dedicated to designing new social-media strategies for the SJBEP and to implementing those strategies.
2. Carry out a needs study to identify the attitudes, perceptions, and scope of knowledge held by interest sectors and the public as to the San Juan Bay Estuary, its values, resource management, environmental protection and improvement. The study will include a survey, focus groups, and a multi-sectoral dialogue. This action should be implemented so that it will be representative of the attitudes, etc., of the various communities within the SJBE.
3. After the study is complete, a report should be generated with an analysis of the results and a proposal for a plan for strategic communication, for approval by the SJBEP.
4. Revise and implement the strategic plan for social communication on the Estuary based on the Estuary Program's objectives. This plan should include both traditional and non-traditional media (web-pages, viral campaigns in the social media, radio and TV spots, newspaper ads, etc.). It should also include strategies for managing crisis situations that strike the Estuary (e.g., oil spills).
5. Incorporate social media into the SJBEP's current communications channels in order to strengthen the Program's efforts and attract younger segments of the population who prefer these media.
6. Create an interactive space on the SJBEP webpage to answer questions, take suggestions from members of the community, organizations, or elected officials.
7. Create/design public service campaigns that can be adapted to a range of communications media, audiences, and communications channels, to encourage conservation and restoration of estuary resources.
8. Use the watercraft and/or docks of the Marine Transport Authority (ATM, for its initials in Spanish) in San Juan Bay as a vehicle for the SJBE's conservation message.
9. Develop a pilot project to use the arts (theater, music, dance, painting and sculpture, etc.) as a method for exposing the various publics in the SJBE watershed to the subjects/problems of the ecosystem.

12. PI-12 Keep elected officials and heads of agencies informed as to progress on the restoration of the estuary, its challenges and accomplishments.

1. Send elected officials in the estuary watershed a report each year with relevant data on the condition of the SJBE, activities carried out, results of scientific research and investigation, the Program's main needs, and any other information that might contribute to decision-making.
2. Create and update a list of functionaries interested in being kept up to date on progress in

conserving the SJBE.

3. Develop alliances with volunteers and university organizations interested in this type of process.
4. Give workshops on the SJBE, its importance, and progress in implementation to agencies and representatives of agencies at least every other year.

13. PI-13 Develop a series of handbooks for the public to promote the concept of watershed and project the SJBE's bodies of water, including the ecosystem's main rivers and creeks.

1. Do an extensive review of programs offering education and orientation on watersheds in other jurisdictions and Puerto Rico, in order to identify common elements that the SJBE educational program can use.
2. Design and publish, with input from the communities, a series of handbooks on the most important bodies of water in the SJBE watershed. Some of the information to be included would be: What is a watershed? What are the components of the SJBE watershed, the services and benefits it provides?; Suggestions for living in an environmentally responsible way in the watershed, and specifically in the body of water adjacent to the community; and Activities for schools and communities. The handbooks should be developed in alliance with, and with the participation of, the communities in the watershed and government agencies. In addition, each handbook should adapt its information to the different bodies of water addressed.
3. Validate the handbook and train people in the communities to act as volunteer facilitators for implementing the handbook in talks, guided tours, and other activities in their community.

14. PI-14 Create an ongoing project to compile information and make it available via alternatives such as the web Atlas and the SJBEP library.

1. Gather and incorporate into the database a collection of some hundred Environmental Impact Statements (EISs), legislative bills, site consultations, and research projects on the SJBE.
2. Recruit either a contractor or one/several volunteer university students in environmental sciences or other disciplines to review the literature over the last five years and document and annotate this literature to produce an annotated bibliography. Publish the annotated bibliography on the SJBEP's webpage. This might be integrated into a university course and/or volunteer internship at the SJBEP.
3. Hire one or two librarians and recruit one or several volunteer university students to create a digital database of the studies identified in strategy 14.1 and do a periodic search of legislative bills and site consultations in the process of being evaluated. The database could be divided by the same subjects that the Management Plan is divided into.
4. Post the database and the digitized studies on the SJBEP website.
5. To keep the database up-to-date, create formal agreements with the island's main academic institutions, government agencies, and community and environmental organizations to keep the SJBEP informed of all research/investigation projects, site consultations, and bills relating to the Estuary.
6. Continue the process of creating the WebAtlas and complete the first stage with the objectives included in the Background section of this action.

GREEN INFRASTRUCTURE (GI)

CCMP Update 2010

1. GI-01 Create a Master Plan for Green Infrastructure in the SJBE watershed and develop pilot projects for rain gardens, green rooftops, and dunes.

1. Create a green infrastructure internship or position to coordinate this action's strategies and others in the GI category.
2. Create a geo-referenced database on proposed and existing green infrastructure in the SJBE watershed, including the data on green areas gathered in Action HW-21 "Prepare an inventory on green areas", laws, topographic maps, survey maps, aerial photographs, satellite images, and vegetation cover maps.

3. Using information in Strategy 1.2, identify existing green infrastructure and areas of opportunity for expansion and improvement of this infrastructure.
4. Organize a collaboration of interested parties to design a Green Infrastructure Master Plan in the SJBE watershed.
5. Perform an economic analysis to identify mechanisms at the municipal, state, and federal level for public and private financing of green infrastructure projects in the SJBE watershed.
6. Establish strategic alliance with professional groups that can promote implementation of green infrastructure projects in the SJBE watershed.
7. Promote development of a pilot project for a demonstration green roof on some building in the watershed, to be used for educational activities and future research. This green roof should include use of fertilizers and pest control materials with the least possible impact on water quality in the rainwater runoff that might reach bodies of water in the SJBE system.
8. Promote construction of a demonstration rain garden in a place of high visibility and document it with photographs and video to use as an educational resource.
9. Create a dunes restoration pilot project.
10. Increase the amount of green coverage in the SJBE's watershed, and study the possibility of using impervious surfaces as an ecosystem health indicator.

2. GI-02 Create a pilot project for reversing the channelization by concrete of a segment of a river, creek or freshwater tributary within the SJBE.

1. Take an inventory of the largest-scale channelizations in the SJBE watershed, based on length and size. The inventory will consider including factors such as the characterization of the type of channelization, distinguishing channelizations with concrete on only the banks from those completely cased in concrete, including the bed. The inventory will be represented on a map that will allow one to determine the total length of channelizations in the watershed.
2. Provide information to the general public, government agency personnel, and elected officials on the negative impacts from channelizations on bodies of water.
3. Consider implementing a pilot project to reverse the channelization of Juan Méndez Creek—one of the most negatively impacted waterways in the SJBE watershed—in order to restore the creek bank's interaction with the water. This should include removal of the concrete that has broken off from the walls of the channel and replacing it with plantings of native plants to mitigate erosion and filter pollutants.

3. GI-03 Promote the use of alternate means of transportation, such as bicycles, in the context of smart growth.

1. Publicize the "Complete Streets" alternative in the SJBE watershed.
2. Develop an educational campaign on the benefits of bicycling and walking and on bike routes related to the Estuary.
3. Collaborate with governmental agencies to develop educational tours for cyclists in areas such as Old San Juan, the Condado, the San Juan Ecological Corridor, and the Enrique Martí Coll Park.
4. Develop alliances with existing cycling groups to better integrate/coordinate these groups' activities with SJBEP activities. This could include development of a bike route along points of interest in the SJBE.
5. Encourage greater integration of bicycles into public transportation (buses and Tren Urbano) in San Juan, including installation of bike racks on city buses.
6. Encourage installation of bike racks at strategic points in San Juan to allow use of bicycles throughout the estuary. The Puerto Rico Tourism Company, under the Green Hotel Program, promotes bike racks.
7. Encourage expanding the Transit Safety Commission's campaigns to share roadways with cyclists, and development of other educational campaigns on the benefits of cycling.
8. Encourage establishment of an interpretive route or path through the SJBE watershed that can be traveled on bicycle.