



*Punta Tuna Wetlands  
Photo: Osvaldo A. Quinones, DNER  
Coastal Zone Management Program*

## **Accelerating Recovery and Increasing Resiliency of Coastal Wetlands in Punta Tuna Nature Reserve in Maunabo, Puerto Rico** *Proposal*



**Submitted to:**  
**Bureau of Reclamation**  
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## TABLE OF CONTENTS

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<b>TECHNICAL PROPOSAL AND EVALUATION CRITERIA.....</b>	<b>2</b>
1. EXECUTIVE SUMMARY.....	2
2. PROJECT LOCATION .....	2
3. TECHNICAL PROJECT DESCRIPTION .....	4
4. PERFORMANCE MEASURES .....	8
5. EVALUATION CRITERIA.....	9
<i>Evaluation Criterion A - Project Benefits .....</i>	<i>9</i>
<i>Evaluation Criterion B - Collaborative Project Planning .....</i>	<i>15</i>
<i>Evaluation Criterion C - Stakeholder Support.....</i>	<i>17</i>
<i>Evaluation Criterion D - Readiness to Proceed.....</i>	<i>18</i>
<i>Evaluation Criterion E - Performance Measures .....</i>	<i>19</i>
<i>Evaluation Criterion F - Presidential and Department of the Interior Priorities .....</i>	<i>20</i>
<b>PROJECT BUDGET.....</b>	<b>20</b>
FUNDING PLAN AND LETTERS OF COMMITMENT .....	20
BUDGET PROPOSAL.....	21
BUDGET NARRATIVE .....	23
<b>ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE.....</b>	<b>26</b>
<b>REQUIRED PERMITS OR APPROVALS .....</b>	<b>27</b>
<b>LETTERS OF SUPPORT AND LETTERS OF PARTNERSHIP .....</b>	<b>27</b>
<b>OFFICIAL RESOLUTION .....</b>	<b>32</b>

## **TECHNICAL PROPOSAL AND EVALUATION CRITERIA**

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### **1. EXECUTIVE SUMMARY**

**Proposal Submission Date:** December 9, 2021

**Applicant:** Protectores de Cuencas Inc., PO Box 1563, Yauco, Puerto Rico 00698

**Unique Entity Identifier and System for Award Management:** Protectores de Cuencas Inc. UEI is 078412518 and confirms that it is register and active on SAM.

**Project location:** Punta Tuna Natural Reserve, Maunabo Municipality, Puerto Rico

**Category:** Category C applicant. PDC is a 501(c)(3) non-profit organization. Please see Letter of Support and Letter of Commitment from the Puerto Rico Department of Natural and Environmental Resources.

**Project Summary:** Non-profit organization Protectores de Cuencas, Inc. (PDC) will collaborate with the Puerto Rico Department of Natural and Environmental Resources (DNER) and the Maunabo Pro-Development Committee (MPDC) to actively restore and increase the resiliency of highly damaged coastal wetlands in Punta Tuna Nature Reserve (PTNR) through the establishment of sustainable hydrology, reforestation of native wetlands, and restoration of coastal habitat. The project site is 107 acres in the PTNR, located in southeastern coast of Puerto Rico in the municipality of Maunabo (17°59'42.74" N, 65°52'54.06" W). In 2017, category 4 hurricane Maria caused both physical damage and blockages in the PTNR which prevented drainage and led to subsequent drowning of trees, with up to 95% mortality of the mangrove forest (Cuevas et al. 2018). As one of the areas with the highest mangrove mortality, Punta Tuna wetlands are not expected to recover naturally within the next decade and is recommended for active management. The DNER led the development of the Wetlands Course of Action for the Federal Emergency Management Agency (FEMA)-led Recovery Plan, which prioritized interventions to restore and enhance wetland functions at various wetlands around Puerto Rico, and specifically recommends active management in Punta Tuna wetlands. The DNER and the MPDC endorse this project.

**Project Length of Time:** 36 months

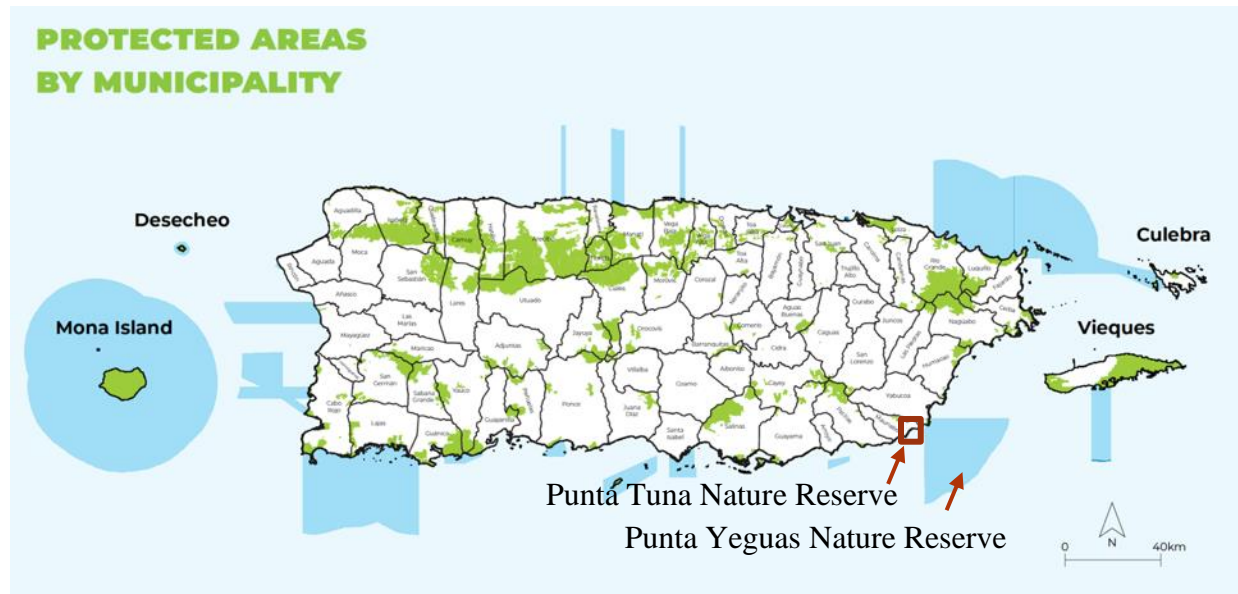
**Estimated Start and Completion Date:** April 1, 2022 - March 31, 2025. This project does not include any construction.

**The proposed project is not located on a Federal facility.**

### **2. PROJECT LOCATION**

Punta Tuna Natural Reserve (PTNR), located on the southeastern coast of Puerto Rico (*Figure 1*), is 107 acres and was designated a protected area in the year 2000. The PTNR is approximately 0.25 miles away from the closest town, Emajagua. The PTNR coordinates are 17°59'42.74" N, 65°52'54.06" W.

PTNR was designated as a Natural Reserve in year 2000 by the Legislative Assembly of Puerto Rico, and the Puerto Rico Department of Natural and Environmental Resources (DNER) was ordered the acquisition and administration of the land for its conservation in perpetuity. The DNER holds the title of the entirety of the PTNR and has held a co-management agreement with the Maunabo Pro Development Committee (MPDC) since 2008.



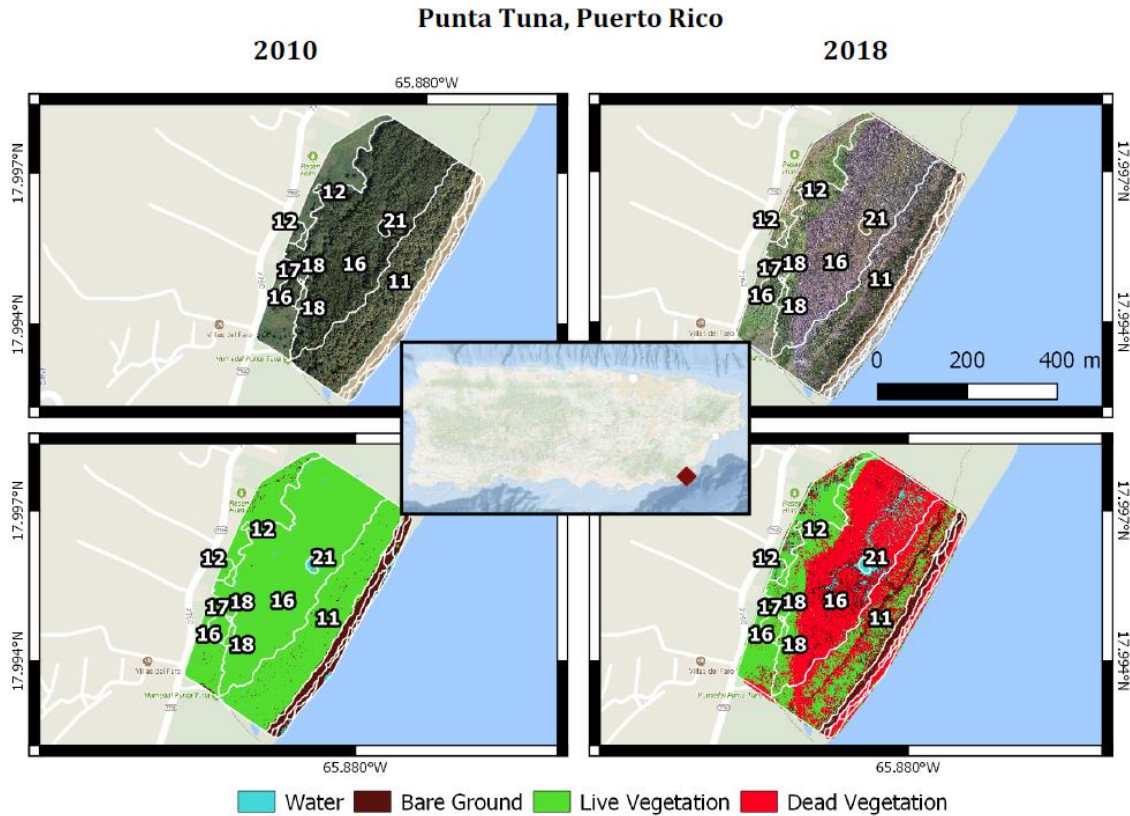
**Figure 1.** Map of Puerto Rico showing the protected areas by municipality. The red box indicates Punta Tuna Nature Reserve, while the marine protected area to the right Punta Yeguas Nature Reserve.

PTNR is composed of a mosaic of salt, brackish, and freshwater forested and grass wetlands, herbaceous swamps, coastal forests, and beach. Freshwater runs down from the highest areas of PTNR and reaches the wetland systems, and with excess rain, water accumulates in topographic depressions and these areas remain saturated (Estudios Técnicos Inc., 2009). Unique hydrological conditions, associated with the combined effect of steep mountains west of the reserve and abandoned sugar cane fields, enabled the formation of swamps and a lagoon in the mangrove forest, known as El Tablazo. The tidal channel is the main contributor of salinity to these wetlands. The channel mouth is on the beach, which leads to the interior of the wetland forest and heads north.

In 2017, category 4 hurricane María made landfall in Puerto Rico through the southeast coast and crossed to the northwest, becoming one of the most devastating hurricanes in the history of the island. Southeastern Puerto Rico was one of the areas most affected by the hurricane. María's center crossed the southeast coast of Puerto Rico near Yabucoa around 1015 UTC 20 September, with maximum winds at that time close to 135 kt, just below the threshold of category 5 intensity (National Weather Service, 2019). PTNR suffered an overall vegetative mortality of 29% after the hurricane, primarily due to hydrology (Cuevas et al., 2018; *Figure 2, Figure 3*). During the hurricane, the normal drainage creek was blocked by sand deposition, causing prolonged flooding of around 70 cm depth for up to four months, and subsequent drowning of trees. A total of eight hectares of mangroves were lost in Punta Tuna, with mortality of up to 95% of the mangrove forest. Before the hurricane, the PTNR estuarine forested wetland was rated "good" for its condition, however this dropped down two ratings to "poor" condition afterward (Ambienta Inc., 2018). As one of the areas with the highest mangrove mortality after the hurricane, PTNR is recommended for active management since it is not expected to recover naturally within the next decade (Cuevas et al., 2018). The DNER led the development of the Wetlands Course of Action for the FEMA-led Recovery Plan, which prioritized interventions to restore and enhance wetland functions at various wetlands around Puerto Rico. Punta Tuna was the top priority for wetland experts participating in the development of the Wetlands Course of Action. Additional wetland species in PTNR are also

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

threatened by saltwater intrusion, including pond apple (*Annona glabra*), which has faced unsuccessful reproduction and seed germination even before hurricane Maria. The DNER has designated bloodwood tree (*Pterocarpus officinalis*) forests as critical habitat, as this wetland has limited cover in Puerto Rico. In order to restore these important wetland areas, immediate action is necessary, and hydrology must be restored to allow for unobstructed flow in and out of the wetland system.



**Figure 2.** Aerial imagery and habitat maps from Cuevas et al. (2018) depicting changes in vegetation in Punta Tuna from before and after hurricane Maria (2010 versus 2018).

### 3. TECHNICAL PROJECT DESCRIPTION

The DNER’s Coastal Zone Management Program (CZMYP) has provided funding to non-profit organization Protectores de Cuencas Inc. (PDC) to conduct the following planning and design activities in the PTNR, which will be completed by March 31, 2022, prior to the start date of the proposed project:

**Project Site Assessment and Hydrological Analysis:** A detailed, topographic survey of the area will be conducted to better understand the elevation gradient from upstream influence areas. The topographic map will cover the 107 acres of reserve, all its wetlands, and an additional buffer which will be used to finalize schematic design plans. Based on this data, previous assessments of the reserve, and the hydrologic- hydraulic study, a final design and project work plan will be completed.



**Figure 3.** Aerial imagery of the vegetative damage in Punta Tuna in April 2018 from the Assessment of Urban Coastal Wetlands Vulnerability to Hurricanes in Puerto Rico report (Branoff et al. 2018).

***Environmental Compliance and Permitting:*** PDC will complete the environmental compliance process, including all required federal and state documentation, and submit it for approval. The federal permit process will be initiated through a consultation with the U.S. Army Corps of Engineers (USACE). It is anticipated that the project will be required to complete and file a Puerto Rico Joint Permit Application (DNER, USACE, Puerto Rico Planning Board) to meet National Environmental Policy Act, Clean Water Act (Section 404), Rivers and Harbors Act of 1899 (Section 10), Endangered Species Act, Federal Consistency with the CZMP, and Puerto Rico's Maritime-Terrestrial Zone, Submerged Lands and Territorial Waters Regulation (PR Reg. 4860, 1992). PDC will also assess any additional and necessary documentation that may be required before initiating the project. In addition, PDC will maintain close communication with the USACE and proposes to establish a memorandum of understanding (MOU), in order to allow local managers to provide channel maintenance, as deemed necessary.

***Roundtable Discussions and Final Project Design:*** PDC will engage key partners and stakeholders to discuss final project design prior to project implementation, and will hold two roundtable discussions with wetland ecologists and key stakeholders from communities, universities, organizations, and agencies to go over detailed surveys, maps, and inventories of the project site and associated coastal and marine habitats and resources, as well as to discuss the project design and environmental compliance. The information collected from the first roundtable discussion will be utilized in creating a final design for the hydrologic restoration and reforestation of the project area, which will be presented and discussed in the second discussion.

In the proposed project, PDC will complete the following tasks in a 36-month timeframe:

***A. Debris Removal:*** Trash, debris, and material deposits in the project area, as well as any dead trees or objects obstructing the channel and tidal flow into the wetland system, will be safely removed by PDC through a supervised contract. Debris removal will prepare the site for reforestation and to aid in hydrological restoration. There is a 2-3% mangrove recruiting at the tidal channel, which is encouraging. However, over 95% of dead trees, as well as any other debris found during the implementation of this phase, may need to be removed. Trees will be evaluated on a case by case basis, and some trees will remain untouched depending on current or potential habitat, shade, or refuge functions in support of wildlife conservation. PDC will also evaluate potential effects of large tree removal on wetland bathymetry and elevations.

***B. Hydrological Restoration:*** Based on Hydrological-Hydraulic study results, PDC will intervene at various critical nodes to restore hydrology, particularly reopening the channel to improve tidal flow, flushing, and hydraulic exchange. PDC will also restore and enhance as needed, freshwater channels connecting with the wetland to ensure historic water balance and hydrology and guarantee appropriate salinity for freshwater species.

***C. Wetland Reforestation:*** PDC will reforest 65.40 acres of wetland in affected areas of PTNR by planting native wetland species, including red, white, and black mangroves; pond apple; and bloodwood tree. In addition, a 20-acre buffer area with vegetative barriers of intermediate native forest will be reforested, by planting native, transitional species including fiddlewood (*Citharexylum fruticosum*) and portia tree (*Thespesia populnea*). A small greenhouse climate adaptation station will be built to promote long-term conservation and reforestation in the PTNR.

As part of the restoration activities, including debris removal and reforestation, PDC will engage local teachers and students, community groups, and NGOs in hands-on educational activities and to assist in restoration efforts within the PTNR to increase environmental stewardship and

conservation. Participants will be educated about the PTNR about the importance and function of the wetlands, the species diversity found within the area, the purpose of the restoration efforts, and their role in creating resiliency for PTNR. Participants will also be offered a recreational walking tour of the PTNR. PDC expects to hold at least five reforestation activities with volunteers. All activities will be coordinated with the MPDC, who has extensive experience engaging community groups in conservation efforts in PTNR and the region.

PDC proposes the construction of elevated boardwalks to provide public wetland and beach access and increase in-the-field educational opportunities, while protecting reforested and vegetative buffer areas and allowing for movement underneath by terrestrial species. The location and number of elevated boardwalks constructed will be determined based on the project site assessment and analyses.

***D. Coastal Habitat Restoration:*** PDC will identify and restore PTNR sand dunes which have been heavily damaged by erosion, and plant native coastal vegetation to stabilize sand dunes. To reduce sediment loads, PDC will implement best management practices (BMPs) that convey excess runoff into rain gardens and infiltration ponds.

***E. Best Management Practices and Parking Lot Stabilization:*** The PTNR forest manager has identified stormwater runoff discharge points into the PTNR. PDC will implement proven BMPs, such as bioswales, bioretention systems, and rain gardens.

The current PTNR parking area is a dirt lot used by visitors and locals to visit the reserve and the Punta Tuna lighthouse. Due to a lack of effective management practices, this parking area poses the threat of contributing land-based sources of pollution to the wetland and marine environments. PDC proposes the use of a permeable parking system, as well as regrading and designing the parking area to convey excess runoff from larger storm events into a rain garden system, an infiltration pond, and buffer vegetated areas. Cleared dirt road areas will be closed with boulder rocks and wooden bollards to ensure soil stabilization and vegetation recovery.

***F. Maintenance and Monitoring:*** PDC will perform routine maintenance after each planting section is finished, after installation of BMPs, and after hydrologic restoration tasks are completed, with special attention to maintenance after rain events and during the first six months, when most adjustments need to be made. Any tree with unhealthy growth during the irrigation, maintenance and monitoring period will be replaced. Trees will be irrigated for a period of 24 months by PDC using the following approach: five (5) times per week during the first two (2) months, three (3) times per week for the following four (4) months, and once a week for the following 18 months. PDC will conduct site visits when irrigating during these 24 months to ensure a final survival rate of 90% of the total trees planted. PDC will provide a maintenance protocol and train key stakeholders from the DNER and the MPDC on the implementation of restoration practices for long-term management and maintenance. In addition, PDC will train teachers from the local high school in Maunabo to help with the maintenance and monitoring of reforested areas.

PDC will monitor plant succession and wetland forest recovery through an assessment of vegetation structure with on-the-ground measurements of seedling and tree density, and canopy cover, and at the landscape level utilizing un-manned aerial vehicles. In order to monitor hydrology, PDC will install monitoring wells, which will record water levels and salinity, as recommended by Branoff et al. (2018).

***G. Reporting:*** PDC will submit interim financial and performance reports on a semi-annual basis, the final financial and performance reports, and additional reports as requested.



#### **4. PERFORMANCE MEASURES**

Through this project, PDC expects to accelerate the recovery of PTNR wetlands damaged by the 2017 hurricane and subsequent flooding, and to increase the wetland resiliency to future threats. PDC will work with the DNER to will engage PTNR co-manager and local community organization MPDC, and train them on monitoring and maintenance of reforested areas and wetland hydrological connectivity to ensure long-term project success. PDC expects to achieve the following goals and performance measures within the 36-month timeframe:

**Goal 1.** Increase habitat resiliency by improving hydrological connections necessary for the long-term survival of the PTNR wetlands.

**Performance measure 1.1** Remove all obstructions that block hydrologic flow within the wetland tidal channel in the PTNR.

**Performance measure 1.2** Restore wetland system connectivity with the sea by reopening the tidal channel.

**Goal 2.** Restore native wetland habitat damaged by 2017 hurricane Maria and subsequent flooding in PTNR.

**Performance measure 2.1** Restore 65.40 acres of wetland through the reforestation of red, black, and white mangrove (*Rhizophora mangle*, *Avicennia germinans*, *Laguncularia racemosa*), pond apple (*Annona glabra*), and bloodwood tree (*Pterocarpus officinalis*).

**Performance measure 2.2** Implement a 20-acre buffer area with vegetative barriers of an intermediate native forest, that will improve wetland conditions and serve as biological corridor for wildlife, including native and migratory bird species.

**Performance measure 2.3** Manage runoff from adjacent communities by implementing proven stormwater practices in discharge points already identified by the PTNR forest manager.

**Goal 3.** Reduce coastal erosion, manage saltwater intrusion, and restore coastal habitat to increase coastal resiliency and climate change adaptation.

**Performance measure 3.1** Restore the sand dunes of PTNR that have been heavily impacted by erosion, including sand dune stabilization through planting native coastal vegetation.

**Performance measure 3.2** Stabilize the PTNR dirt parking area and convey excess runoff into rain gardens and infiltration ponds to prevent direct discharge of land based sources of pollution from the parking area into the wetland and marine environments.

**Goal 4.** Increase environmental stewardship and conservation by engaging the local community, organizations, teachers, and students in long-term restoration efforts.

**Performance measure 4.1** Construct a small, permanent greenhouse climate adaptation station for native trees to use in restoration efforts.

**Performance measure 4.2** Engage at least 50 volunteers from the local and adjacent communities in restoration efforts to increase environmental stewardship and conservation.

**Goal 5.** Increase the long-term resiliency of PTNR coastal wetlands.

**Performance measure 5.1** Ensure at least 90% survival of planted trees and vegetation through irrigation and maintenance of the area for 24 months.

**Performance measure 5.2** Ensure continued hydrological connectivity based on Hydrological-Hydraulic study (Study will be funded by DNER-CZMP, and completed by April 2022), as well as through monitoring and maintenance of wetland channels for 24 months.

**Performance measure 5.3** Train at least 10 members of local leaders from community organizations and schools on PTNR wetland and coastal habitat monitoring and maintenance.

## **5. EVALUATION CRITERIA**

### **Evaluation Criterion A - Project Benefits**

#### ***Sub-Criterion A.1 - Benefits to Ecological Values***

This project will provide significant benefits to threatened habitat types, rare and declining species, and the local community. Coastal wetlands in Puerto Rico are particularly vulnerable to natural hazards such as hurricanes, extreme precipitation events, and coastal storm surges. This was demonstrated in PTNR after the impact of hurricane María in 2017. PTNR is located within a forested coastal wetland habitat type in the transition space between the urban area and the coast. After land use, climate appears to be the biggest player in driving large-scale composition and abundances of bird assemblages across Puerto Rico<sup>1</sup>. The extent of forests that share features of dry forests (e.g., excessive evapotranspiration) might increase with climate change. Species in low-lying wetland and coastal areas may have to contend with the effect of sea level rise resulting from a warmer climate.

This collaborative coastal restoration project will restore intertidal connectivity to create a more resilient ecosystem to the potential effects of climate change. Restoration efforts will reduce the time needed for natural forest growth and maturity, and as the forest continues to grow, so will the ecological services, allowing the PTNR to provide continual coastal wetland benefits even after project end. This project will also clear accumulated debris and invasive vegetation, vines and grasses, as well as prevent land-based sources of pollution from reaching coastal ecosystems from adjacent communities. This project will directly restore, improve, and protect fish and wildlife habitat on public lands, which are areas designated for conservation in perpetuity by DNER. Restoration actions will make PTNR a biologically diverse ecosystem, increase its ecological balance and functionality, benefit aquatic species, improve aquatic ecosystem integrity, and provide breeding / feeding grounds to numerous important waterfowl species and migratory birds. Effectively managing hydrological conditions is key to a successful wetland restoration project<sup>2,3</sup>. Tidal connectivity is necessary for long-term mangrove health and will allow proper drainage to reduce the possibility of another event causing prolonged flooding within the wetlands. The final project design will be based on the results of the topographic survey and a hydrologic-hydraulic study, all funded by the DNER, which have the purpose to ensure that this project will be resilient to future events.

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<sup>1</sup> Acevedo, Miguel & Restrepo, Carla. (2007). Land-cover and land-use change and its contribution to the large-scale organization of Puerto Rico's bird assemblages: Land-cover/land-use change and Puerto Rico's bird assemblages. *Diversity and Distributions - DIVERS DISTRIB.* 14. 114-122. 10.1111/j.1472-4642.2007.00435.x.

<sup>2</sup> Sullivan, Pamela L. et al. (2014) Wetland Ecosystem Response to Hydrologic Restoration and Management: The Everglades and its Urban-Agricultural Boundary (FL, USA) Wetlands, Volume 34, Pages 1-8.

<sup>3</sup> Briceño H, Miller G, Davis III SE (2014) Relating restored freshwater flow with estuarine water quality in the southern Everglades mangrove ecotone. *Wetlands.* doi:10.1007/s13157-013-0430-0

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

In addition to reforesting wetlands and restoring hydrological connectivity, this project will address land-based sources of pollution through the implementation of BMPs and parking lot stabilization. PDC expects to improve water quality by trapping runoff, and avoiding direct discharge of sediments and contaminants into the wetland and marine environments. The installation of elevated boardwalks will reduce human disturbance on sensitive vegetation, and sand dune restoration will provide coastal protection and reduce erosion.

Project design will consider Puerto Rico sea level rise projections, from the 2018 U.S. Caribbean chapter of the fourth National Climate Assessment<sup>4</sup>.

***Sub-Criterion A.2 - Qualification of Specific Project Benefits by Project Type***

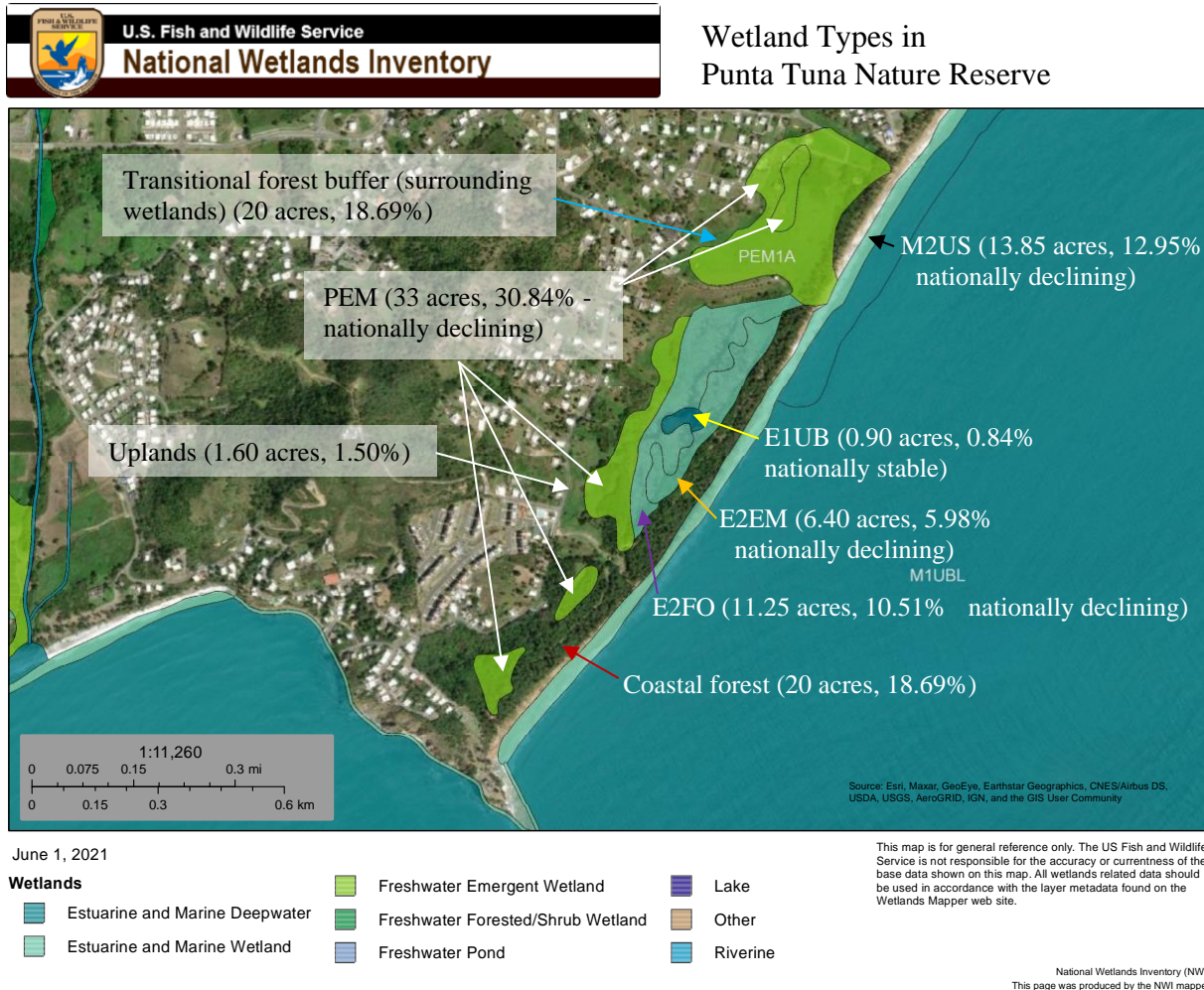
Restoration of Punta Tuna Nature Reserve (PTNR) will conserve 107 acres of priority coastal wetlands, as defined by USFWS 50 CFR 84.11, and adjacent coastal and upland habitats. Within the 107 acres, **64.50 acres, or 60.28% of the total project area, are considered nationally declining wetland types**, while 0.90, or 0.84%, are considered nationally stable wetlands (USFWS Wetlands Mapper). Restoration actions will be subdivided in three categories: buffer implementation area (20 acres), coastal forest and uplands restoration (21.60 acres), and wetland restoration (65.40 acres). A breakdown of habitat types can be found in Table 1 and Figure 4.

**Table 1.** Total acres of habitat type, including nationally declining and stable wetland types in the project area, as determined using the USFWS Wetlands Mapper.

Habitat type	Number of acres	Percentage of total project area
<b>Total declining wetland type</b>	64.50	60.28%
<b>Total stable coastal wetlands</b>	0.90	0.84%
Palustrine Emergent Persistent (PEM) <i>(Nationally declining)</i>	33.00	30.84%
Estuarine Intertidal Forested (E2FO) <i>(Nationally declining)</i>	11.25	10.51%
Estuarine Intertidal Emergent (E2EM) <i>(Nationally declining)</i>	6.40	5.98%
Marine Intertidal Unconsolidated Shore (M2US) <i>(Nationally declining)</i>	13.85	12.95%
Estuarine Subtidal Unconsolidated Bottom (E1UB) <i>(Nationally stable)</i>	0.90	0.84%
Transitional forest buffer	20.00	18.69%
Coastal forest	20.00	18.69%
Uplands	1.60	1.50%
<b>Total project acres</b>	<b>107.00</b>	<b>100.00%</b>

<sup>4</sup> Gould, W.A., E.L. Díaz, (co-leads), N.L. Álvarez-Berrios et al. 2018: U.S. Caribbean. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 809–871. doi: 10.7930/NCA4.2018.CH20

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*



**Figure 4.** Map with wetland habitat characterizations in Punta Tuna Natural Reserve. Created and adapted using the National Wetlands Inventory map from the US Fish and Wildlife Service.

*Land-based sources of pollution reduction*

This project will prevent land-based sources of pollution from reaching coastal ecosystems from adjacent communities. PTNR receives runoff from adjacent communities within Emajagua Ward with a total population of 2,739 individuals encompassing 1,093 households (2018 American Community Survey). PDC will be conducting an environmental analysis for the restoration of PTNR by April 2022 to identify sources of pollution. One of the key components of this analysis is to identify land-based sources of pollution that will be eliminated with the restoration of this property. The EPA approved Illicit Discharge Detection and Elimination Method will be used by PDC for completing this analysis. Water samples will be collected, and pollution sources tracked between and upstream of sampling points. Parameters to be assessed will include: total nitrogen, total phosphorus, optical brighteners, ammonia, turbidity, chlorophyll A, and *E. coli* bacteria. Typical sources of pollution include illicit discharges such as washwater and sewer system leaks, illicit connections, failing septic systems, and drinking water leaks. Determining sources of contamination to coastal and marine ecosystems is a critical component for the proper management and conservation of this important wetland and will guide design and management of a new 20-

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

acre buffer area and permeable parking lot. Additionally, PDC will clear accumulated debris and remove invasive vegetation from the restored areas and maintain these areas. Native vegetation will be planted and removing these invasive plants will promote the growth and expansion of native vegetation in the area.

The proposed project will address the following contaminants:

**Sediment and Nutrients:** A 20-acre buffer area with vegetative barriers is recommended to treat LBSP, including stormwater runoff, entering the wetland area and marine environment. A series of BMPs will be considered for implementation in this buffer area and are subdivided into stormwater treatment practices and nutrient reduction practices that will provide treatment runoff. Some of the practices include bio-retentions, constructed stormwater wetlands, vegetative buffers, and rain gardens, all of which capture and filter runoff. This will address the management goal *Installation of a riparian buffer* from the DNER's Critical Wildlife Areas (2016) State Plan.

**Pollutants:** The current dirt parking lot lacks effective management practices to control the flow of runoff and pollutants that may affect the wetland and represents a threat of LBSP including polycyclic aromatic hydrocarbons (PAHs) linked to the combustion of fossil fuels. The presence of PAHs combined with other potentially compounds with high toxicity, high environmental stability, and high hydrophobicity can result in negative effects to the marine environment (Nikolaou et al., 2009). The permeable parking will be designed to capture and infiltrate rainwater and runoff into the subsoil to prevent contaminants from reaching the wetland and marine environment. The parking will also be regraded and designed to convey the excess runoff produced in larger storm events into a rain garden system, an infiltration pond and buffer vegetated areas without directly discharging into the wetland and marine environments. This would significantly reduce the discharge rate of storm water throughout the beach area, therefore reducing the erosion process. This addressed the activity "Construct a parking lot for visitors" in the 2009 Punta Tuna Wetland Nature Reserve Management Plan.

**Solid waste:** PDC will remove existing trash that obstructs the channel and tidal flow into the wetland system. This will fulfill the objective to manage and adequately dispose of solid waste generated in the 2009 PTNR from the Punta Tuna Wetland Nature Reserve Management Plan.

**Debris and material deposits:** PDC will remove natural debris and material deposits in the project area, as well as any dead trees or objects obstructing the channel and tidal flow into the wetland system, through a supervised contract. Of the 95% dead trees in the wetlands, some trees may be removed if they obstruct channel and tidal flow into the wetland system. This will fulfill the activity to remove debris and materials deposited in the tidal channel and the channel that runs from the cayur swamp to the conservation area in the 2009 Punta Tuna Wetland Nature Reserve Management Plan.

*Benefits to Species and Habitats*

The PTNR provides habitat for various species of conservation importance, with details on each in *Table 2*. The reserve has a 2-km long sandy beach, Larga Beach, which is a confirmed permanent nesting area for the endangered leatherback (*Dermochelys coriacea*) and hawksbill (*Eretmochelys imbricata*) sea turtles. Coral reef habitat adjacent to PTNR contains the federally listed staghorn coral (*Acropora cervicornis*) and elkhorn coral (*A. palmata*).

This project will improve potential habitat for the threatened guajon (*Eleutherodactylus cooki*) and potential habitat for the endangered Puerto Rican boa (*Epicrates inornatus*) through reforestation

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

efforts. Seagrass beds adjacent to PTNR serve as foraging habitat for the federally threatened West Indian manatee (*Trichechus manatus*) which utilize the coastal habitat off the reserve.

Bloodwood tree (*Pterocarpus officinalis*), which will be planted in this project, is listed as an endangered and vulnerable species in the critical wildlife areas of San Miguel, La Paulina and El Convento Natural Area, Luquillo-Fajardo, and in the lakes and forests of Dorado. Once grown, these trees will provide seeds that can be germinated in the greenhouse and used to restore this species in these critical wildlife areas.

Furthermore, PTNR is also in close proximity to the Pandura Mountain Range Critical Wildlife Area, which is home to numerous Puerto Rico listed species.

**Table 2.** A list of threatened or endangered species that would benefit from the restoration of PTNR. \*Denotes those species found on PTNR or utilizing coastal habitat adjacent to the property.

<b>Common and Scientific Name</b>	<b>Status</b>	<b>Project benefit to the species</b>	<b>Recovery Plan</b>
*Leatherback sea turtle ( <i>Dermochelys coriacea</i> )	Federally Endangered  State Listed Endangered	Reducing disturbance by constructing elevated boardwalks and reducing erosion and sedimentation reaching the coast	Recovery plan for leatherback turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico ( <i>Dermochelys coriacea</i> ) (1992)
*Hawksbill sea turtle ( <i>Eretmochelys imbricata</i> )	Federally Endangered  State Listed Endangered	Reducing disturbance by constructing elevated boardwalks and reducing erosion and sedimentation reaching the coast	Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico ( <i>Eretmochelys imbricata</i> ) (1993)
*Guajon ( <i>Eleutherodactylus cooki</i> )	Federally Threatened	Habitat recovery by reforestation and reducing visitor disturbance	Recovery Plan for the Guajón or Puerto Rican Demon ( <i>Eleutherodactylus cooki</i> ) (2004)
Puerto Rican boa ( <i>Epicrates inornatus</i> )	Federally Endangered	Reforestation, as this species is primarily found in trees	Recovery plan for the Puerto Rican Boa ( <i>Epicrates inornatus</i> ) - 1986
West Indian manatee ( <i>Trichechus manatus</i> )	Federally Threatened	Reduce erosion and sedimentation reaching seagrass foraging habitat	Recovery Plan Puerto Rico Population of the West Indian (Antillean) Manatee (1986)
*Elkhorn coral ( <i>Acropora palmata</i> )	Federally Threatened	Reduce erosion and sedimentation reaching Sargento Reef	Recovery Plan for Elkhorn Coral ( <i>Acropora palmata</i> ) and Staghorn Coral ( <i>A. cervicornis</i> ) (2015)
*Staghorn coral ( <i>Acropora cervicornis</i> )	Federally Threatened	Reduce erosion and sedimentation reaching Sargento Reef	Recovery Plan for Elkhorn Coral ( <i>Acropora palmata</i> )

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

			and Staghorn Coral ( <i>A. cervicornis</i> ) (2015)
*Bloodwood tree ( <i>Pterocarpus officinalis</i> )	State listed as Endangered and Vulnerable in two critical wildlife areas in Puerto Rico	Reforestation of this species in the PTNR wetlands will restore local trees and provide seeds for potential restoration in additional areas	No recovery plan, but stated as endangered and vulnerable in the 2016 Puerto Rico State Wildlife Action Plan in two Critical Wildlife Areas outside of the PTNR

The 20-acre buffer area reforested with intermediate native forest will serve as a corridor for native and migratory bird species, as well as other refuge and nesting areas for other wildlife species. The PTNR serves as a biological corridor for coastal and migratory birds utilizing the natural protected areas of Punta Yeguas Nature Reserve, Carite State Forest, and Jobos Bay National Estuarine Research Reserve. In addition to the species listed in *Table 3* below, migratory species found in the PTNR include belted kingfisher (*Megaceryle alcyon*), blue-winged teal (*Anas discors*), northern waterthrush (*Seiurus noveboracensis*), and common snipe (*Gallinago gallinago*), which, although not listed, are expected to benefit from the project through restoration of native forest and coastal habitat.

**Table 3.** A list of bird species that would benefit from the restoration of PTNR.

<b>Common and Scientific Name</b>	<b>Status</b>
Plain pigeon ( <i>Columba inornate wetmorei</i> )	Federally Endangered; State listed Endangered
Antillean mango ( <i>Anthracothorax dominicus</i> )	FWS Bird of Conservation Concern (2008)
Brown booby ( <i>Sula leucogaster</i> )	FWS Bird of Conservation Concern (2008)
Magnificent frigatebird ( <i>Fregata magnificens</i> )	FWS Bird of Conservation Concern (2008)
Greater Antillean oriole ( <i>Icterus dominicensis</i> )	FWS Bird of Conservation Concern (2008)
Wilson's plover ( <i>Charadrius wilsonia</i> )	FWS Bird of Conservation Concern (2008)
Brown pelican ( <i>Pelecanus occidentalis</i> )	Delisted by Previously Federally and State listed as Endangered

Fishes that historically were fished in El Tablazo lagoon, but are no longer found in the area, including tarpon, snook, spinycheek sleeper (*Eliotris Pisonis*), and bigmouth sleeper (*Gobiomorus dormitor*) are expected to benefit from restored hydrology and removal of channel obstructions.

*Additional project benefits*

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

- *Strengthening capacity in local environmental organizations:* The MPDC, founded in 1996, is a community-based organization dedicated to the sustainable development and conservation of the local environment. The MPDC led efforts for PTNR to be designated and acquired as a Nature Reserve. The MPDC works on numerous community-based projects within the PTNR, focused on wetlands, sea turtles, and the preservation of the federally threatened guajon (*Eleutherodactylus cooki*). The proposed project will strengthen the ability of the MPDC to conserve PTNR and continue their mission of improving the quality of life of adjacent communities, promoting sustainable development alternatives in the municipality of Maunabo and southeast of Puerto Rico, and facilitate environmental education opportunities so that citizens are committed to conserving the natural environment. A small greenhouse climate adaptation station will be built to support native trees that will be planted as part of PTNR restoration efforts; this station will be an important component for future restoration efforts in the area.
- *Replicability:* Because coastal wetlands are vulnerable to impacts from climate change, this project provides PDC and the DNER with an example for how to complete successful wetland hydrological restoration and reforestation. The 2017 hurricanes documented high wetland mortality rates resulting from changes in hydrology and damage in the coastal habitats of Jobos, Isabela and Ciénaga la Cucharillas, Cataño; these wetland areas have since been identified as sites for future restoration. This project will serve as a model for future restoration of these damaged wetlands, and an impetus to garner additional regional partners and resources across the archipelago. This restoration can also be used to collaborate with other jurisdictions who are interested in similar projects by sharing knowledge and lessons learned.
- *Improve recreational opportunities:* PTNR is one of the most visited recreational sites due to its scenery, diverse flora and fauna, and historical value in conjunction with the lighthouse. PTNR will remain open to the public once restoration efforts are completed. Diverse recreational opportunities will be available to the local community and visitors, including hiking, biking, birdwatching, fishing and other similar activities. One of the goals related to the restoration of the proposed wetlands is to increase public visitation, outreach, and scientific research. The permeable parking lot and the boardwalk will increase the accessibility to the PTNR for the local community and visitors to learn about the reserve and participate in recreational opportunities.
- *Support to the local economy:* The main economic activities of Maunabo are related to tourism. Approximately 45.5% of the population in Maunabo lives in poverty, with a median household income of \$20,844 (US Census Bureau, accessed December 7, 2021). The improvement of infrastructure and restoration will improve visitor conditions and recreational activities, which in turn will increase the income for local recreational guides, gear rentals, and food and tourist shops, among others

### **Evaluation Criterion B - Collaborative Project Planning**

The proposed project was developed in collaboration with local government (DNER) and considers various local, state, and national plans and their goals and objectives. **The proposed project directly response to the FEMA-led Course of Action document developed in response to Hurricanes Irma and Maria in 2017.** *Table 4* lists the management plans with the goals or strategies addressed by this project.



*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

**Table 4.** A list of management plans that contain goals or strategies addressed by this project.  
\* The FEMA-led Course of Action document specifically recommends this project.

<b>Management Plan</b>	<b>Goals addressed by this project</b>
<p><b>Punta Tuna Wetland Nature Reserve Management Plan (2009) - Local Plan</b> Plan attached to proposal</p>	<p><b>Hydrological restoration</b> through the <b>removal of debris that obstructs water flow in the channels</b> will address the activity to maintain hydrological conditions to allow for natural colonization of pond apple (<i>Annona glabra</i>). <b>bloodwood tree (<i>Pterocarpus officinalis</i>) and fiddlewood (<i>Citharexylum fruticosum</i>)</b>, which will be planted and are listed as <b>recommended species to reforest in Punta Tuna</b> in the plan. Assisted restoration with native species directly addresses the recommended objective to reintroduce and control threats to native species.</p> <p>The <b>construction of elevated boardwalks</b> addresses the activity to construct boardwalks as recreational infrastructure. The <b>construction of a permeable parking lot</b> addresses the objective to offer essential infrastructure that promote recreational opportunities, and the activity to construct a parking lot for visitors.</p>
<p><b>Course of Action Proposed for Coastal Wetland Recovery, FEMA-led Recovery Plan (2018)- State Plan*</b> <a href="https://drna.pr.gov/wp-content/uploads/2018/09/FEMA-Wetlands-Report.pdf">https://drna.pr.gov/wp-content/uploads/2018/09/FEMA-Wetlands-Report.pdf</a> Plan attached to proposal</p>	<p><b>This project will follow the recommendations to address PTNR wetlands after hurricane Maria, through the active restoration of hydrology and mangrove vegetation.</b></p>
<p>Puerto Rico State Wildlife Action Plan: Ten Year Review (DNER, 2015) - State Plan <a href="http://drna.pr.gov/wp-content/uploads/2018/01/PRSWA-P2017.pdf">http://drna.pr.gov/wp-content/uploads/2018/01/PRSWA-P2017.pdf</a></p>	<p>Restoration activities will include reforestation of the bloodwood tree, a species designated as vulnerable by the DNER. The project will also control and reduce harmful effects to forests and wildlife, including hurricanes/storms, and flooding, and controlling invasive plants, listed as threats in this plan. In addition, the project will protect and enhance wildlife and fish habitat and engage communities in environmental stewardship activities.</p>
<p>Puerto Rico Forest Action Plan (2015) - State Plan <a href="http://www.drna.pr.gov/wp-content/uploads/2015/11/Puerto-Rico-Forest-State-Action-Plan.compressed.pdf">http://www.drna.pr.gov/wp-content/uploads/2015/11/Puerto-Rico-Forest-State-Action-Plan.compressed.pdf</a></p>	<p>The project will address the following goals and strategies in this plan:</p> <p>Goal 1. Conserving working forest landscapes, through the following strategies: Hazard tree mitigation, Increase use of native plant material (native tree propagation and use), Develop nursery quality standards (Work with nursery growers to provide quality nursery stock)</p> <p>Goal II. Protect forest from harm, through the following strategies:</p>

	<p><i>Hurricane/storms</i> - Perform hazard tree mitigation, Promote adequate tree selection  <i>Flooding</i> - Promote forested wetland protection, Promote riparian buffer installations  <i>Invasive plants and animals</i> - Promote usage of native and other suitable species, Apply eradication practices                  Goal III. Enhance public benefits associated with trees and forests through the following strategies: Maintain and manage existing forest focusing on riparian areas around rivers and reservoirs; <b>Maintain and manage existing forests, with a priority area of existing forested wetlands (i.e. mangrove and <i>Pterocarpus</i> or <i>Annona swamps</i>, etc.)</b></p>
<p>Department of Natural and Environmental Resources Critical Wildlife Areas (2016) - <i>State Plan</i>  <a href="http://www.drna.pr.gov/historico/oficinas/arn/recursosvivientes/costasreservasrefugios/pmzc/publicaciones/CWA_July2005.pdf">http://www.drna.pr.gov/historico/oficinas/arn/recursosvivientes/costasreservasrefugios/pmzc/publicaciones/CWA_July2005.pdf</a></p>	<p>Restoration of wetland system connectivity and coastal vegetation will address the plan’s strategies to protect forested wetlands, maintain and manage existing coastal forest, promote native plant growth and early eradication of invasive plants, encourage reforestation in coastal zones, and install a riparian buffer.</p>
<p>Puerto Rico Integrated Water Resources Plan (2007) - <i>State Plan</i>  <a href="https://www.drna.pr.gov/oficinas/plan-integral-de-recursos-de-agua-de-puerto-rico/">https://www.drna.pr.gov/oficinas/plan-integral-de-recursos-de-agua-de-puerto-rico/</a></p>	<p>This plan is a framework for the creation of subsequent environmental plans and documents. This plan states that hydrological restoration in wetlands will result in wetland preservation and facilitate restoration potential in these ecosystems.</p>
<p>USDA Forest Service Strategic Plan FY 2015 - 2020 (Note that this has not yet been updated for 2021)- <i>National Plan</i>  <a href="https://www.fs.usda.gov/sites/default/files/strategic-plan[2]-6_17_15_revised.pdf">https://www.fs.usda.gov/sites/default/files/strategic-plan[2]-6_17_15_revised.pdf</a></p>	<p>On a local scale, this project addresses the following USFS strategy plan objectives and strategies:                  Objective A. Foster resilient, adaptive ecosystems to mitigate climate change, Strategy: Maintain resilient land and water conditions at the watershed level and restore deteriorated lands and waters                  Objective F. Connect people to the outdoors, Strategy: Improve recreation facility accessibility</p>

**Evaluation Criterion C - Stakeholder Support**

This project will complement the only other known project related to Punta Tuna wetland restoration, which consists of the planning phase of this project conducted by the PDC with funding from the DNER. The proposed project is the implementation phase of the overall restoration efforts, and therefore will avoid duplication between projects. The analysis is expected to be completed by March 31, 2022 and will consist of a land and hydrological survey, identification of land-based sources of pollution, design drawings for PTNR wetland restoration, and will complete the environmental law compliance process. All restoration components and activities to be implemented as part of the proposed PTNR project will be based on the environmental analysis, final design, and roundtable discussions with project partners, including DNER, USFWS Caribbean Ecological Services Field Office, MPDC, University of Puerto Rico in Bayamon, and

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

the Municipality of Maunabo. Members of adjacent communities will be invited to participate in outreach and education activities throughout all phases of the project.

A letter of support is provided from the DNER, which supports this project and will be providing support through cost-share contributions. A letter of support is included by the MPDC from a proposal submitted to the US Fish and Wildlife Service in 2020, as the MPDC continues to support this project but was not able to provide their letter of support in time for the submission of this proposal. The DNER and MPDC are co-managers of the PTNR and are responsible for its protection and conservation, and PDC will train them in the long-term maintenance and monitoring of the PTNR after project end.

The project is not located on Federal land and there is no known opposition to this project.

**Evaluation Criterion D - Readiness to Proceed**

PDC and partners will be ready to implement the proposed project starting on April 1, 2022, as soon as the financial assistance agreement is signed. The PTNR planning and design efforts are already underway by PDC and will be completed by March 31, 2022, before the expected start date of the proposed project. This includes the project site assessment and hydrological analysis, environmental compliance and permitting, and roundtable discussions and final project design, as described under the Technical Project Description section. PDC and project partners have access to the entirety of the project site in the PTNR, as the DNER and MPDC are co-managers of the reserve.

PDC will ensure full environmental compliance and complete the required permit processes, which is expected to be completed by March 31, 2022 as part of the CZMP-funded project. PDC and DNER have not contacted the local Reclamation office for this project, however, will if necessary under the permitting and compliance process of the current CZMP funded project.

A summarized description of milestones for each task, the timeframe, and cost is provided below in Table 5. The approximate project start date is April 1, 2022 and the approximate end date is March 31, 2025, a 36-month project period. All contractor costs are in-kind contributions.

*Table 5. Project implementation timeline in months. The estimated project dates are April 1, 2022 to March 31, 2025.*

<b>Task</b>	<b>Milestone</b>	<b>Timeframe</b>	<b>Federal Cost</b>	<b>Cost-share contribution</b>
<b>A. Debris Removal</b>	Remove trash, debris, and material deposits in the area which obstruct channel and tidal flow into wetland system.	Months 1-3	\$91,745	\$110,030
<b>B. Hydrological Restoration</b>	Restore wetland system connectivity with the sea.	Months 4-8	\$86,648	\$27,508
<b>C. Wetland Reforestation</b>	Construct a small greenhouse. Restore 65.40 acres of wetland. Implement a 20-acre buffer area. Hold at least five (5) reforestation	Months 6-20	\$112,133	\$225,561

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

	volunteer activities with at least 50 local volunteers. Construct elevated boardwalks.			
<b>D. Coastal Habitat Restoration</b>	Restore heavily impacted sand dunes and stabilize native coastal vegetation.	Months 10-13	\$141,714.98	\$55,015
<b>E. BMPs and Parking Lot Stabilization</b>	Implement BMPs in areas identified as stormwater runoff discharge points. Stabilize the PTNR dirt parking area.	Months 10-14	\$40,776	\$60,518
<b>F. Maintenance and Monitoring</b>	Perform routine maintenance and monitoring after each planting section and after hydrological restoration with the approach described previously. Train key stakeholders from the DNER, MPDC, and local high school to implement long-term maintenance and monitoring.	Months 8-36	\$30,582	\$66,015
<b>G. Reporting</b>	Submit interim and final financial and performance reports, and any other reports requested, in GrantSolutions.	Months 6, 12, 18, 24, 30, and 36	\$5,097	\$5,501
<b>TOTAL</b>			<b>\$508,695.98</b>	<b>\$550,148.00</b>

**Evaluation Criterion E - Performance Measures**

PDC and project partners are committed to the long-term conservation of the PTNR and to increase the wetland’s resiliency to future threats. During the project period, PDC will maintain close communication with and will train the DNER and MPDC, co-managers of the DNER, on all aspects of maintenance of the project site, how to ensure sustainability, and how to monitor the benefits of the project over at least a five-year period after project completion. The performance measures below will be used to monitor the progress and effectiveness after project completion.

**i. Wetland system connectivity with the sea maintained within the wetland tidal channel**

Hydrological connectivity is vital for the long-term success of wetland restoration efforts, so it is extremely important to maintain this connectivity in the PTNR, especially after heavy rain events and natural disasters as they are likely to cause widespread damage. PDC will train the DNER and MPDC to monitor hydrological connectivity on the causes of blockages, and on how to restore connectivity in the case of blockages.

**ii. Long-term plant survival and natural wetland forest growth**

During project implementation, the survival rate of reforested vegetation will be at least 90%. Over the long-term, it is important to ensure continued survival and natural growth to increase wetland habitat. PDC will train the DNER and MPDC to continue to monitor plant survival after project end, following the methodology that PDC will use during the project period. This methodology involves monitoring plant succession and wetland forest recovery through an assessment of vegetation structure with on-the-ground measurements of seedling and tree density, and canopy cover, and at the landscape level utilizing un-manned aerial vehicles. In order to monitor hydrology, the monitoring wells will be monitored regularly to record water levels and salinity. Both of these methods will provide before and after measurements to determine project success.

**iii. *Lbs. of sediment captured in sediment traps***

The weight of sediment can be measured in sediment traps and used to estimate the amount of sediment that is captured rather than reaching the wetland and marine environment. This is an important measure to determine if BMPs are functioning correctly. PDC will train project partners to measure sediment when maintaining BMPs.

**iv. *Functional BMPs in the long-term***

In order for most BMPs to work over the long-term, they must be maintained. For example, sediment traps typically fill with sediment after a period of time and will fail to continue capturing sediment if without maintenance. PDC has over 10 years of experience constructing and maintaining BMPs across Puerto Rico, and will use its experience and lessons learned to train project partners on how to monitor and maintain them.

**Evaluation Criterion F - Presidential and Department of the Interior Priorities**

Climate Change: This project addresses E.O. 14008 to prioritize the conservation of lands, waters, oceans, and biodiversity. In addition to the benefits already mentioned, healthy wetlands sequester carbon from the atmosphere in soil, sediments, and plants, and are a carbon sink; however this ecosystem service is lost when wetlands are damaged, especially at the extent that the PTNR wetlands were lost. Green infrastructure, such as rain gardens, bio-retentions, and vegetative buffers, will be constructed as a management action to help reduce water pollution.

**PROJECT BUDGET**

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**FUNDING PLAN AND LETTERS OF COMMITMENT**

Funding has been provided to PDC for the planning and permitting of the proposed project, however this will be completed before the proposed project start date and is not included as a match. PDC and partner DNER will provide at least 50% non-Federal cost share contribution. PDC will contribute \$441,320 in personnel time, plants used for reforestation that will be grown in PDC's nursery, and in heavy equipment rentals which is already owned by PDC. The DNER will contribute a \$17,500 match by providing one employee to support the project for an approximate total of 350 hours. The MPDC will contribute a \$91,328 match by involving volunteers who will contribute 3,200 volunteer hours. A detailed list of match is included in the budget narrative. The Letter of Commitment from the DNER stating their cost-share contribution is included in this proposal, while the Letter of Commitment from the MPDC will be submitted to the Bureau of Reclamation after the submission of this proposal, by January 20, 2022.

No project costs have been incurred prior to the award.

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

**BUDGET PROPOSAL**

The following tables include a summary of the project cost, including Federally requested funds and cost-share contributions.

*Table 6. Total Project Cost Table*

<b>SOURCE</b>	<b>AMOUNT</b>
Costs to be reimbursed with the requested Federal funding	<b>\$509,693.89</b>
Costs to be paid by the applicant	<b>\$550,148.00</b>
Value of third-party contributions	<b>\$0.00</b>
<b>TOTAL PROJECT COST</b>	<b>\$1,059,841.89</b>

*Table 7. Summary of Non-Federal and Federal Funding Sources*

<b>FUNDING SOURCES</b>	<b>AMOUNT</b>
<b>Non-Federal Entities</b>	
1. Protectores de Cuencas Inc. (cost-share contribution)	\$441,320.00
2. Department of Natural and Environmental Resources (cost-share contribution)	\$17,500.00
3. Maunabo Pro Development Committee (cost-share contribution)	\$91,328.00
<b>Non-Federal Subtotal</b>	<b>\$550,148.00</b>
<b>Requested Reclamation Funding</b>	<b>\$507,694.18</b>

*Table 8. Budget Proposal*

<b>BUDGET ITEM DESCRIPTION</b>	<b>COMPUTATION</b>		<b>Quantity Type</b>	<b>TOTAL COST (Federal + Match)</b>
	<b>\$/Unit</b>	<b>Quantity</b>		
<b>Salaries and Wages</b>				
PDC Project Manager, Roberto Viqueira (Executive Director of PDC)	\$75.00	560	hours	\$42,000
PDC Project Coordinator, Jorge Viqueira	\$30.00	450	hours	\$13,500
PDC General Labor (10 people)	\$10.00	6,800	hours	\$68,000
Engineering Services	\$150.00	120	hour	\$18,000.00
Scientist (S)	\$100.00	256	hour	\$25,600.00
Wetland Expert (ECE)	\$30.00	250	hour	\$7,500.00
<b>Fringe Benefits</b>				

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

None	\$0.00			\$0
<b>Travel</b>				
Mileage for PDC personnel transportation	\$0.54	3,952	miles	\$2,134.08
Mileage for PDC Heavy Equipment transportation	\$1.00	2,650	miles	\$3,952
Lodging	\$800.00	4	months	\$3,200
Mileage Engineering Services Travel	\$0.54	400	miles	\$216
<b>Equipment</b>				
None	\$0.00	n/a	n/a	\$0
<b>Supplies</b>				
Stones	\$1,200.00	46	19 M truck loads	\$55,200.00
Drainage Pipe	\$563.00	12	Pipe	\$6,756.00
Soil Enhancements	\$100.00	11	50 lbs. bags	\$1,100.00
Nursery	\$46,000.00	1		\$46,000.00
Concrete	\$265.00	80	Y <sup>3</sup>	\$21,200.00
Lumber	\$26.50	120	Piece	\$3,180.00
Rebar	\$78.00	80	Quintal	\$6,240.00
Geotextiles	\$450.00	26	300' Rolls	\$11,700.00
Geotextiles	\$250.00	30	200' Rolls	\$7,500.00
Geotextiles	\$50.00	38	100' Rolls	\$1,900.00
Plant Materials	\$4.50	4,000	Vetiver	\$18,000.00
Plant Materials (Tall Trees)	\$36.00	10,000	Native Trees	\$360,000.00
<b>Contractual</b>				
DNER Personnel(1)	\$50.00	350	hour	\$17,500.00
Volunteers	\$28.54	3,200	hours	\$91,328.00
<b>Other</b>				
16 T Compacting Roller	\$3,100.00	12	Month	\$37,200.00
Water Truck	\$2,400.00	6	Month	\$14,400.00
2 4x4 Pick up trucks	\$1,000.00	12	Month	\$12,000.00
Excavator	\$3,100.00	12	Month	\$37,200.00
Dump Truck (20cy)	\$2,800.00	12	Month	\$33,600.00
Skid Loader	\$2,300.00	6	Month	\$13,800.00
Backhoe	\$2,400.00	6	Month	\$14,400.00
Crawler Dozer 750K	\$3,200.00	6	Month	\$19,200.00
<b>TOTAL DIRECT COSTS</b>				<b>\$1,013,506.08</b>
<b>Indirect Costs</b>				
Type of Rate: <i>de minimis</i>	Percentage 10%	Based on direct costs of Federal Share only		\$46,335.81
<b>TOTAL ESTIMATED PROJECT COSTS</b>				<b>\$1,059,841.89</b>

## **BUDGET NARRATIVE**

### **SALARIES AND WAGES**

#### **Personnel (Federal Request): \$130,300**

- **Protectores de Cuencas Inc. Program Manager (PM) for restoration activities:** Robert Viqueira Ríos, Executive Director of PDC, will work on a monthly basis to lead project activities in PTNR, will be in charge of the quality assurance throughout the entire project, including attend and coordinate project meetings, assist in the design and implementation of BMPs and restoration activities, supervise BMP effectiveness evaluation and monitoring activities, coordinate follow-up visits after project completion, oversight of all project activities and assist in producing reports. The PM hourly rate is \$75. The PM will invest at least 560 hours, which add to \$42,000. A total of 50 percent of the PM's time will be funded with federal funds for a total of **\$21,000**.
- **Protectores de Cuencas Inc. Project Coordinator (PC) for restoration activities:** The Project Coordinator will arrange project logistics for implementing BMPs, maintain flow of communication among partners, assist in organizing volunteer activities, contact stakeholders, assist in BMP effectiveness evaluation and assist the PM in writing reports. The PC hourly rate is \$30. The PC will invest at least 450 hours, which add to \$13,500. A total of 50 percent of the PM's time will be funded with federal funds for a total of **\$6,750**.
- **Protectores de Cuencas, Inc. General Labor for restoration activities:** General Labor (10 people) funds will cover manual labor for BMP implementation and restoration activities in PTNR. The hourly rate for general labor is \$10. Federal funds will cover for 6,800 hours, for a total of **\$68,000**.
- **Protectores de Cuencas, Inc. Engineering Services for restoration activities:** To certify project implementation with construction designs and project oversight. The hourly rate is \$150. Engineers will invest at least 120 hours, which add to **\$18,000**.
- **Protectores de Cuencas, Inc. Scientist for restoration activities:** The Scientist will provide quality assurance and technical support for all BMPs and restoration activities to be implemented in PTNR. The Scientist hourly rate is \$100. The Scientist will invest at least 256 hours during, which add to \$25,600. A total of 50 percent of the Scientist's time will be funded with federal funds for a total of **\$12,800**.
- **Protectores de Cuencas, Inc. Wetland Expert (WE) for restoration activities:** The Wetland Expert will provide quality assurance and technical support for all BMPs and restoration activities to be implemented in PTNR. The WE hourly rate is \$30. The WE will invest at least 250 hours during, which add to \$7,500. A total of 50 percent of the WE's time will be funded with federal funds for a total of **\$3,750**.

#### **Personnel (Non-Federal Match): \$44,300**

- **Protectores de Cuencas, Inc. Program Manager (PM) for restoration activities:** A total of 50 percent of the PM's time will be donated as in-kind contribution for a total of **\$21,000**.
- **Protectores de Cuencas, Inc. Project Coordinator (PC) for restoration activities:** A total of 50 percent of the PC's time will be donated as in-kind contribution for a total of **\$6,750**.
- **Protectores de Cuencas, Inc. Scientist for restoration activities:** A total of 50 percent of the Scientist's time will be donated as in-kind contribution for a total of **\$12,800**.



- **Protectores de Cuencas, Inc. Wetland Expert (WE) for restoration activities:** A total of 50 percent of the WE's time will be donated as in-kind contribution for a total of **\$3,750**.

## **FRINGE BENEFITS**

**Fringe Benefits (Federal Request), \$0.00**

**Fringe Benefits (Non-Federal Match), \$0.00**

## **TRAVEL**

**Travel (Federal Request), \$9,502.08**

- **Mileage for PDC personnel transportation:** The cost of car transportation is \$0.54 per mile, and PDC personnel will travel by car approximately 3,952 miles for a total of \$2,134.08
- **Mileage for PDC heavy equipment transportation:** The cost of heavy equipment transportation is also \$0.54 per mile, and the equipment will be transported approximately 3,952 miles for a total of \$2,134.08
- **Lodging:** PDC personnel will require lodging close to the project site for four months at \$800 per month, for a total of \$3,200
- **Mileage for Engineering Services Travel:** The cost of car transportation is \$0.54 per mile, and engineering services travel by car will be approximately 400 miles for a total of \$216

**Travel (Non-Federal Match), \$0.00**

## **EQUIPMENT**

**Equipment (Federal Request), \$0.00**

**Equipment (Non-Federal Match) \$0.00**

## **MATERIALS AND SUPPLIES**

**Supplies (Federal Request), \$236,376**

- **Supplies for restoration**
  - 46 full dump trucks of stones at \$1,200/truck = **\$55,200**
  - 12 20ft 12-inch corrugated drainage pipes at \$563/pipe = **\$6,756**
  - 11 50lbs bags of Jumpstart soil enhancements for pre-treatment plants before planting at \$100/bag = **\$1,100**
  - Greenhouse nursery for climate adaptation = **\$46,000**
  - 80 cubic yards of Concrete at \$265/cubic yard = **\$21,200**
  - 120 pieces of lumber at \$26.50/each = **\$3,180**
  - 80 Quintals of Rebar at \$78/each = **\$6,240**
  - 26 300' rolls of geotextiles at \$450/roll = **\$11,700**
  - 30 300' rolls of geotextiles at \$250/roll = **\$7,500**
  - 38 100' rolls of geotextiles at \$50/roll = **\$1,900**
  - 4,000 vetiver plants produced in PDC Nursery at \$4.50/plant (20% of its cost) = **\$3,600**

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

- 10,000 native mature trees (4ft or taller) produced at PDC Nursery at \$36/tree (20% of its cost) = **\$72,000**

**Supplies (Non-Federal Match), \$302,400**

- 4,000 vetiver plants produced in PDC Nursery at \$4.50/plant (80% of its cost) = **\$14,400**
- 10,000 native mature trees (4ft or taller) produced at PDC Nursery at \$36/tree (80% of its cost) = **\$288,000**

**CONTRACTUAL**

**Contractual (Federal Request), \$0**

**Contractual (Non-Federal Match), \$108,828**

- **DNER Personnel (1 person):** The DNER personnel will contribute 350 hours to this project at a rate of \$50 per hour, for a total in-kind contribution of **\$17,500**.
- **Volunteers engaged by Maunabo Pro Development Committee:** Volunteers include university and high school students, community members and NGOs to participate of educational activities, planting activities, and monitoring activities. A total of 3,200 volunteer hours are donated as in-kind. The hourly rate for volunteers is \$28.54 adding to a total of **\$91,328**. The rate for volunteers is based on the national average rate provided by Independent Sector ([www.independentsector.org](http://www.independentsector.org)).

**ENVIRONMENTAL AND REGULATORY COMPLIANCE COSTS**

**Environmental and regulatory compliance costs (Federal Request), \$0.00**

**Environmental and regulatory compliance costs (Non-Federal Match), \$0.00**

**OTHER**

**Other expenses (Federal Request), \$87,180**

- **Heavy equipment rental:** Federal funds will cover 50% of the cost for the rental of the following equipment for project implementation:

Water Truck at a rate of \$2,400 per month for 6 months = **\$7,200**

2 4x4 Pick-up trucks at a rate of \$1,000 per month for 12 months = **\$6,000**

Excavator at a rate of \$3,100 per month for 12 months = **\$18,600**

Dump Truck (20cy) at a rate of \$2,800 per month for 12 months = **16,800**

Skid loader at a rate of \$2,300 per month for 6 months = **\$6,900**

Backhoe at a rate of \$2,400 per month for 6 months = **\$7,200**

Crawler Dozer (750k) at a rate of \$3,200 per month for 6 months = **\$9,600**

Federal funds will cover 40% of the cost for the rental of the following equipment for project implementation:

16T Compacting Roller at a rate of \$3,100 per month for 12 months = **\$14,880**

**Other expenses (Non-Federal Match), \$94,620**

- **Protectores de Cuencas, Inc. (PDC) Heavy equipment rental**

PDC will cover the remaining 50% of the cost for the rental of the following equipment for project implementation:

Water Truck at a rate of \$2,400 per month for 6 months = **\$7,200**

2 4x4 Pick-up trucks at a rate of \$1,000 per month for 12 months = **\$6,000**

Excavator at a rate of \$3,100 per month for 12 months = **\$18,600**

Dump Truck (20cy) at a rate of \$2,800 per month for 12 months = **16,800**

Skid loader at a rate of \$2,300 per month for 6 months = **\$6,900**

Backhoe at a rate of \$2,400 per month for 6 months = **\$7,200**

Crawler Dozer (750k) at a rate of \$3,200 per month for 6 months = **\$9,600**

PDC will cover the remaining 60% of the cost for the rental of the following equipment for project implementation:

16T Compacting Roller at a rate of \$3,100 per month for 12 months = **\$22,320**

**Total Direct costs: Federal: \$463,358.08 Non-Federal: \$550,148**

**INDIRECT CHARGES**

**Indirect Charges (Federal Request), \$46,335.81**

Protectores de Cuencas uses an indirect cost of 10%. The total amount of indirect costs requested is **\$46,335.81**

**Indirect Charges (Non-Federal Match), \$0.00**

**NON-FEDERAL MATCH CONTRIBUTION DESCRIPTION**

The total Non-Federal Match Contribution for Year 1 is \$550,148, as detailed above. This contribution will be provided in the most part by **Protectores de Cuencas, Inc (PDC)** in the Contractual category for a total of \$441,320. The **DNER** will provide \$17,500 in the Contractual category. The **Maunabo Pro Development Committee** will provide \$91,328 in the Contractual category as volunteer hours. All these contributions have been secured with cooperators.

**ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE**

The responses to the Environmental and Cultural Resource Considerations questions listed in the Notice of Federal Opportunity No. R22AS00026 are below.

- Since this project involves direct implementation of BMPs and restoration efforts, it will impact the surrounding environment. The process of implementing BMPs and parking lot stabilization can create additional sediment initially and reforestation efforts involve direct disturbance to the site. PDC has over 10 years of experience implementing BMPs, green infrastructure and restoration projects in ecologically sensitive ecosystems. PDC will take steps to limit disturbance in sensitive areas and will limit heavy equipment usage to areas that are

*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands  
in Punta Tuna Natural Reserve in Maunabo, Puerto Rico - December 2021*

already disturbed. Temporary sediment control measures will be installed when implementing BMPs and stabilizing dirt roads to prevent runoff. Removal of invasive species will be conducted without heavy equipment when possible.

- There are species that are listed as Federally threatened and endangered in and around the project area. PDC and partners will take care not to disturb critical habitat in good condition and will only be working in previously disturbed areas and areas that were critically damaged from the 2017 hurricanes. The implementation of this project is expected to improve habitat conditions for Federally threatened and endangered species that were previously listed in this proposal.
- There are no wetlands or surface waters inside the project boundaries that potentially fall under CWA jurisdiction as Waters of the United States.
- There is no water delivery system in this project.
- The proposed project will not modify or effect individual features of an irrigation system.
- Punta Tuna Natural Reserve hosts the historic Punta Tuna lighthouse listed on the National Register of Historic Places, however this will not be affected by the implementation of this project.
- There are no known archeological sites in the proposed project area.
- The proposed project will not have a disproportionately high and adverse effect on low income or minority populations.
- The proposed project will not limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands.
- The proposed project will remove invasive species and will not contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species.

## **REQUIRED PERMITS OR APPROVALS**

It is anticipated that an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) and the PR Environmental Policy Act (Law 146, 2004) will be needed. The EA will be based on and include baseline information which was collected in tasks under the project site assessment. A natural resources inventory will be conducted on the project site to identify potential environmental concerns. This assessment will include a thorough inventory of available spatial data, drone surveys, and spatial analysis to determine not only immediate environmental concerns but to identify potential cumulative impacts. Informal consultations will be conducted with USFWS, NOAA, National Marine Fisheries Service (NMFS) Protected Resources Division, NMFS Habitat Conservation Division for endangered species concerns, and the US Army Corps of Engineers for potential impacts on navigable waters under Section 10 of the Rivers and Harbors Act of 1899. This assessment will establish baseline environmental conditions that could function as the benchmark for monitoring project development and will present and evaluated several alternatives to maximize the services provided as a result of the proposed intervention.

## **LETTERS OF SUPPORT AND LETTERS OF PARTNERSHIP**



# GOVERNMENT OF PUERTO RICO

Department of Natural and Environmental Resources

Roberto Viqueira Ríos  
Executive Director  
Protectores de Cuencas, Inc.  
P.O. Box 1563 Yauco, PR 00698

Dear Mr. Viqueira:

The Puerto Rico Department of Natural and Environmental Resource's is committed to effectively managing Puerto Rico's natural resources and the environment. It has been of our interest that Protectores de Cuencas, Inc. (PDC) is proposing to continue wetland restoration efforts across Puerto Rico, especially those that were heavily damaged during the 2017 hurricanes Irma and Maria. Through this letter the DNER is aware of and supports the proposal entitled "***Accelerating Recovery and Increasing Resiliency of Coastal Wetlands in Punta Tuna Natural Reserve in Maunabo, Puerto Rico***" to receive financial support from the Water Resources and Planning Office of the United States Bureau of Reclamation. The DNER has provided PDC with the funding necessary for the planning phase of this project, specifically to conduct site assessments and hydrological analysis, complete environmental compliance and permitting, and develop the final project design, which will be completed by March 31, 2022. The DNER has previously requested funding for the implementation of this project, however, has not been able to secure the necessary funding for project implementation.

A study by Cuevas et al. in 2018 documented the high mortality suffered in the Punta Tuna Natural Reserve wetlands, with a loss of 8 acres of mangrove forests or a loss of 95% of mangroves. Hydrological connectivity was blocked for an extended period of time and caused trees to flood and die. These wetlands were deemed unlikely to recover naturally. In order to restore the area, the Wetlands Course of Action for the FEMA-led Recovery Plan recommended active management of these wetlands, and the DNER recognizes the importance of following this recommendation in order to restore the wetlands.

The DNER is strongly committed to the conservation of our coastal ecosystems and has been working hand in hand with PDC to restore coastal habitats for the past five years. We recognize the commitment of PDC and fully support the proposed efforts to protect natural resources under current and potential changing climate scenarios. The DNER will provide in-kind support to PDC by providing one DNER personnel to support project implementation. We look forward to continuing working with PDC to achieve important and tangible outcomes for implementing sustainable management practices in Puerto Rico for the benefit of our citizens and the environment.

Sincerely,

Humberto Figueroa  
Punta Tuna Natural Reserve Manager  
Department of Natural and Environmental Resources





# GOVERNMENT OF PUERTO RICO

Department of Natural and Environmental Resources

Roberto Viqueira Ríos  
Executive Director  
Protectores de Cuencas, Inc.  
P.O. Box 1563 Yauco, PR 00698

## Letter of Commitment

Dear Mr. Viqueira:

The Puerto Rico Department of Natural and Environmental Resource is committed to the implementation of the proposed project entitled "*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands in Punta Tuna Natural Reserve in Maunabo, Puerto Rico.*" The DNER is a co-manager of the Punta Tuna Natural Reserve (PTNR) and is dedicated to its long-term conservation and restoration. Protectores de Cuencas (PDC) recently received funding from the DNER to conduct all planning activities related to wetlands restoration in the PTNR, which includes site assessments, hydrological analysis, environmental compliance and permitting, and a final project design, which will be completed by March 31, 2022. The DNER has previously requested funding for the implementation phase of this project once the planning activities are completed, however, has not been able to secure the necessary funding to continue with project implementation.

In support of this project, the DNER is committed to providing a non-Federal contribution valued at \$17,500, which will be contributed in the form of 350 personnel hours dedicated to support PDC in the implementation of this project, including participation in meetings and trainings, supporting reforestation efforts, and conducting monitoring and maintenance activities in collaboration with PDC during the estimated project time period of April 1, 2022 to March 31, 2025.

We look forward to the outcome of this project and in continuing our work with PDC to restore damaged coastal ecosystems in Puerto Rico for the benefit of our citizens and the environment.

Sincerely,

Humberto Figueroa  
Punta Tuna Natural Reserve Manager  
Department of Natural and Environmental Resources





**Comite Pro Desarrollo de Maunabo Inc.**  
P.O. Box 1411  
Maunabo, PR 00707-1411  
(787) 329-3131

**July 15, 2020**

**Mr. Paul Van Ryzin**  
**U.S. Fish and Wildlife Service**  
**Wildlife and Sport Fish Restoration Program**  
5275 Leesburg Pike, MS: WSFR  
Fall Church, VA 22041  
703-358-1849  
Paul\_vanRyzin@fws.gov

**Dear Mr. Van Ryzin:**

Comité Pro Desarrollo de Maunabo (Maunabo Development Committee) has reviewed the project proposal titled "*Accelerating Recovery and Increasing Resiliency of Coastal Wetlands in Punta Tuna Nature Reserve in Maunabo, Puerto Rico*" to receive financial support from the National Coastal Wetlands Conservation Grant Program of the U.S. Fish and Wildlife Service (USFWS), Wildlife and Sport Fish Restoration Program and National Wildlife Refuge System, Division of Habitat and Resource Conservation. The proposed project seeks to restore and accelerate the recovery of Punta Tuna Nature Reserve wetlands that were severely damaged by the 2017 hurricane and subsequent prolonged flooding, as well as increase the resiliency of this wetland to withstand future threats including sea level rise and additional flooding events.

Since 1996, our organization has been advocating for the conservation of natural resources and improving quality of life in southwest Puerto Rico. In 2008 we signed a co-management agreement with the Department of Natural and Environmental Resources of Puerto Rico to share responsibilities in the management of this important ecosystem. We have reviewed the above project's proposal and it is consistent with the Maunabo Development Committee priorities for the reserve. This project is of particular importance to the organization since it will advance urgent restoration efforts in the reserve to ensure it continues providing important ecosystem services to wildlife. A healthy and resilient ecosystem would provide us the opportunity of continuing our mission of engaging communities and students in the conservation of natural resources.

The Maunabo Development Committee will closely collaborate with the Department of Natural and Environmental Resources of Puerto Rico and Protectores de Cuencas, Inc. the development of this project and will assist in engaging community members, students and volunteers to participate in restoration and education activities throughout the length of the project. At least 3,200 volunteer hours will be donated as in-kind for this project at a rate of \$25.43 per hour (Estimated National value of each volunteer hour by Independent Sector). We will also support this project through meeting participation in the assessment to determine potential restoration, expansion or intervention needs.

It is our mission to work with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of our people, especially in southwest of Puerto Rico. If you have any questions or require additional information, please do not hesitate to contact us at [comitemaunabo@yahoo.com](mailto:comitemaunabo@yahoo.com).

Sincerely,



**Dr. Pedro M. Torres Morales, MD**  
**Comité Pro Desarrollo de Maunabo**



**OFFICIAL RESOLUTION**

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**Corporate Resolution**

The undersigned, Robert Viqueira Ríos, of legal age, married, resident of Yauco, Puerto Rico, in my capacity as Executive Director of the Board of Directors of Protectores de Cuencas, Inc., a non-profit Corporation duly organized under the laws of the Commonwealth of Puerto Rico and authorized to do business in Puerto Rico, with main offices in Yauco, Puerto Rico.

I CERTIFY that, at a meeting of the Board of Directors of this Corporation, duly called and held in Yauco, Puerto Rico and with a Quorum present, the following Resolution was approved:

**“We resolve to authorize our director, Mr. Robert Viqueira Ríos, of legal age, married, resident of Yauco, Puerto Rico, to carry out any management related to financial assistance from the Bureau of Reclamation, on behalf of Protectores de Cuencas, Inc., in representation of this Corporation.**

**We approve the project proposed by Protectores de Cuencas Inc. to be submitted to the Bureau of Reclamation, titled *Accelerating Recovery and Increasing Resiliency of Coastal Wetlands in Punta Tuna Natural Reserve in Maunabo, Puerto Rico.***

**We confirm that Protectores de Cuencas Inc. is able to provide a \$441,320 in-kind contribution specified in the proposal.**

**We confirm that Robert Viqueira Ríos through Protectores de Cuencas Inc. will work with the Bureau of Reclamation to meet established deadlines for entering into a grant.”**

IN WITNESS WHEREOF, I issue this Certification, under my signature in Yauco, Puerto Rico on December 7, 2021.



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Roberto A. Viqueira Ríos  
Executive Director  
Protectores de Cuencas, Inc.  
Box 1563 Yauco  
Puerto Rico, 00698  
Tel. 787-457-8803