

Final Evaluation Findings

Jobos Bay

National Estuarine Research Reserve

February 2011 to June 2017

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Summary of Key Findings

The Coastal Zone Management Act requires the National Oceanic and Atmospheric Administration to conduct periodic evaluations of the performance of states and territories with federally approved coastal management programs. This evaluation conducted by the Office for Coastal Management examined the operation and management of the Jobos Bay National Estuarine Research Reserve for the period from February 2011 to June 2017. The evaluation focused on three target areas: enforcement, agency support, and coastal training program implementation, in addition to basic program implementation.

The findings in this evaluation document will be considered by the NOAA Office for Coastal Management in making future financial award decisions concerning the reserve. The evaluation came to these conclusions:

Accomplishment: The Jobos Bay Research Reserve has jointly developed plans and implemented new strategies with the Marine Patrol and the federal agencies to resolve long-standing deficiencies related to enforcement and encroachment.

Accomplishment: The Jobos Bay Research Reserve has continued to make improvements in the area of engaging and educating the public about the coastal and marine resources near the reserve.

Accomplishment: The Jobos Bay Research Reserve's coastal training program has become an increasingly valuable resource for the local community, since it has been implemented by internal reserve staff members. Its visibility, integration, and effectiveness have made it a key component of the reserve since the hiring of a full-time program coordinator. The coordinator has developed trainings on a variety of new topics that are important to the community, such as coastal resilience and community adaptation to climate change.

Accomplishment: Despite losing the roof of the visitor center during Hurricane Maria, the Jobos Bay Research Reserve functioned as a refuge for local community members during and after the storm.

Accomplishment: The Jobos Bay Research Reserve's education program has been active in establishing a Certified Interpretive Guide program. Certifications were available for community members as well as ecotourism guides as part of a community empowerment initiative, in collaboration with the National Association for Interpretation. The coastal training program coordinator managed logistics and resources, while the education program coordinator identified the type of information to be included in the workshops, as well as potential participants.

Accomplishment: The Jobos Bay Research Reserve has implemented a school certification program that requires the teachers to be certified before their participation in reserve activities. The certification program is being coordinated with the Green Flag Eco-Schools movement in Puerto Rico.

Accomplishment: Coordinators from the research, stewardship, and training sectors of the Jobos Bay Research Reserve travelled to educational institutions around the commonwealth to promote participation in joint research efforts. Their efforts have expanded the level of interest in undertaking research in or sharing data with other colleges and universities.

Recommendation: The NOAA Office for Coastal Management recommends that the Puerto Rico Department of Natural and Environmental Resources consider establishing a task force to coordinate activities associated with the removal of illegal structures in Las Mareas and Camino del Indio.” The task force might be composed of representatives of the Department of Natural and Environmental Resources, the Department of Justice, the Office of Permit Management, the Puerto Rico Planning Board, the Puerto Rico Electric Power Authority, the Puerto Rico Aqueduct and Sewer Authority, and other agencies deemed appropriate by the Secretary. The task force should also coordinate with federal agencies with jurisdiction over the illegal activities occurring in and adjacent to the reserve, including the U.S. Army Corps of Engineers and the U. S. Environmental Protection Agency.

Recommendation: The NOAA Office for Coastal Management recommends that the Puerto Rico Department of Natural and Environmental Resources improve enforcement at the Jobos Bay Research Reserve. Given the increased use of reserve waters and cays by the public outside of normal working hours, department leadership should 1) direct the Ranger Corps to increase surveillance and enforcement in the reserve on evenings and weekends; and/or 2) provide additional reserve staff support on weekends to help improve public safety and awareness that the reserve is a protected area.

Recommendation: The NOAA Office for Coastal Management strongly recommends that the Puerto Rico Department of Natural and Environmental Resources consider realigning oversight for Jobos Bay Research Reserve to the Office of Coastal Zone Management and Climate Change to better leverage resources and partnerships between two complementary coastal programs and to improve the efficiency of routine administrative activities.

Recommendation: The NOAA Office for Coastal Management strongly recommends that the Puerto Rico Department of Natural and Environmental Resources fill all required core positions outlined in the cooperative agreement (manager, sector leads, and administrative staff members) with full-time staff members, whether as department employees or through arrangements with partner universities or nongovernmental organizations.

Recommendation: The NOAA Office for Coastal Management recommends that the Jobos Bay Research Reserve continue to pursue the rehabilitation of the adjacent former restaurant building to serve as a regional training and education center.

Recommendation: The NOAA Office for Coastal Management recommends that the Jobos Bay Research Reserve evaluate the possibility of allowing the reserve solar panels to be disconnected from the power grid when the grid goes down so that the reserve can continue to support necessary functions. The ability to use solar energy could not only support key reserve functions, but also provide a more accommodating refuge for members of the community.

Necessary Action: The Puerto Rico Department of Natural and Environmental Resources must ensure that the illegal structures within the Las Mareas and Camino del Indio areas of the reserve are removed and the land is restored to its natural condition. Structures are defined to include, but not be limited to, buildings, docks, piers, wharves, fences, utilities, and pavement. As a first step, within three months of the date of this evaluation, the department is required to submit a plan to NOAA for the removal of all public utilities from the properties encroaching within the reserve boundaries within 18 months of the date of these findings. The plan shall include a brief description of the laws and regulations that were violated in the construction of these encroachments and proposed mechanisms to guard against future encroachments. The department shall also submit, as a part of routine biannual operations reports to NOAA, information on the progress of legal actions taken and the removal of utilities. In addition, the biannual reports shall include up-to-date aerial photography of the subject area to illustrate whether any new land-disturbing activity is occurring or new structures are being built.

The NOAA Office for Coastal Management will conduct a reevaluation of the Jobos Bay Research Reserve one year after the date of these findings to evaluate progress on the satisfaction of this necessary action and to determine next steps to meet the broader goal of removing illegal structures.

Necessary Action: Within six months of the date of these findings, the Puerto Rico Department of Natural and Environmental Resources shall submit a boundary amendment to NOAA requesting approval to include in the boundary all lands added to the reserve since the last boundary amendment.

Conclusion: This evaluation finds that the Puerto Rico Department of Natural and Environmental Resources is not fully adhering to the requirements of section 312(a) of the Coastal Zone Management Act, 16 U.S.C. § 1458(a), in the operation of the Jobos Bay National Estuarine Research Reserve.

Program Review Procedures

The NOAA Office for Coastal Management evaluated the Jobos Bay National Estuarine Research Reserve in fiscal year 2017. The evaluation team consisted of Ralph Cantral, evaluation team lead, Nina Garfield, site liaison, and Heidi Stiller, coastal management specialist, all from the NOAA Office for Coastal Management; Kristen Goodrich, coastal training program coordinator, Tijuana River Research Reserve, California; and Michael DeLuca, manager, Jacques Cousteau Research Reserve, New Jersey. The support of the Jobos Bay Research Reserve staff was crucial in conducting the evaluation, and their support is most gratefully acknowledged.

NOAA sent a notification of the scheduled evaluation to the Honorable Tania Vazquez Rivera, Secretary, Department of Natural and Environmental Resources, on March 7, 2017, and published a notice of “Intent to Evaluate” in the *Federal Register* on April 21, 2017. The Jobos Bay Research Reserve posted a notice of the public meeting and opportunity to comment in *El Nuevo Dia*.

The evaluation process included a review of relevant documents and a survey of stakeholders, which helped identify three target areas for the evaluation: enforcement, coastal training program, and agency support. Before the site visit, the evaluation team discussed the target areas with reserve staff members who helped identify issues and workable solutions to improve the implementation of the reserve’s programs. A site visit was conducted June 5-8, 2017, and the evaluation team held group discussions with stakeholders, program staff members, and Secretary Vazquez Rivera. In addition, a public meeting was held on Wednesday, June 7, at 5:00 p.m. at the Jobos Bay Visitors Center, Road 705, Kilometer 2.3, Main Street, Aguirre, Puerto Rico, to provide an opportunity for members of the public to express their opinions about the implementation of the reserve.

Stakeholders and members of the public were also given the opportunity to provide written comments via email or U.S. mail through Friday, June 23, 2017. No written comments were received from the public or interested parties.

On September 20, 2017, Hurricane Maria struck Jobos Bay Research Reserve as a category 4 hurricane. The reserve facilities sustained significant damage. Because of this event, recommendations related to preventing or reducing this type of damage in the future were prepared after consultation with the reserve manager and staff.

Final evaluation findings for all national estuarine research reserves highlight the reserve’s accomplishments in the target areas and include recommendations that are of two types:

Necessary Actions address programmatic requirements of the implementing regulations of the Coastal Zone Management Act and of the reserve’s management plan approved by NOAA.

These must be carried out by the dates specified. Failure to address necessary actions may result in a future finding of non-adherence and the invoking of interim sanctions, as specified in the Coastal Zone Management Act §312(c).

Recommendations are actions that the office believes would improve the program, but which are not mandatory. The reserve is expected to have considered the recommendations by the time of the next evaluation or by the dates specified.

Evaluation Findings

Enforcement

The issue of enforcement has two different dimensions with regard to operations at the Jobos Bay Research Reserve. First are the issues related to the continuing encroachment of development into the reserve property in the Las Mareas and Camino del Indio areas. The second concern is related to enforcement of boating and fishing regulations within the reserve.

Key Findings Related to Encroachment

Although the vast majority of the reserve's lands are well managed, private development continues to encroach upon several parcels in the Camino del Indio area. The issue of encroachment of private development onto lands owned by the government of Puerto Rico and that is included in the reserve boundary has been an issue for many years and a topic of several federal evaluations. In 2015-16, the reserve contracted with a professional surveyor to conduct a detailed survey and permanently mark the reserve boundary. This action was a direct result of a necessary action in the 2011 NOAA evaluation requiring the boundaries to be surveyed in response to illegal construction in Camino del Indio. At the time of the evaluation site visit in 2017, land clearing and subdivision of property within the marked reserve boundaries was still occurring, and several of the boundary markers were missing or destroyed.

In addition to clarifying the boundary, the reserve director and the stewardship coordinator worked with the Department of Natural and Environmental Resources legal office to develop plans and strategies for the removal of illegal structures and to improve surveillance and enforcement within the research reserve. The intent was to pursue all available legal measures to address violations and avoid future infringements.

In May 2017, immediately before the site visit for this evaluation, an administrative hearing was held on a cease and desist order on one of the key encroachment cases. Because there is once again an active effort by the department to resolve this matter in the courts, the evaluation team believes that a necessary action should focus on shorter-term concrete steps that can be taken that will demonstrate progress in the removal of structures from the now well-defined boundary.

Recommendation: The NOAA Office for Coastal Management recommends that the Puerto Rico Department of Natural and Environmental Resources consider establishing a task force to coordinate activities associated with the removal of illegal structures in Las Mareas and Camino del Indio. The task force might be composed of representatives of the Department of Natural and Environmental Resources, the Department of Justice, the Office of Permit Management, the Puerto Rico Planning Board, the Puerto Rico Electric Power Authority, the Puerto Rico Aqueduct and Sewer Authority, and other agencies deemed appropriate by the Secretary. The task force should also coordinate with federal agencies with jurisdiction over the illegal

activities occurring in and adjacent to the reserve, including the U.S. Army Corps of Engineers and the U. S. Environmental Protection Agency.

Necessary Action: The Puerto Rico Department of Natural and Environmental Resources must ensure that the illegal structures within the Las Mareas and Camino del Indio areas of the reserve are removed and the land is restored to its natural condition. Structures are defined to include, but not be limited to, buildings, docks, piers, wharves, fences, utilities, and pavement. As a first step, within three months of the date of this evaluation, the department is required to submit a plan to NOAA for the removal of all public utilities from the properties encroaching within the reserve boundaries within 18 months of the date of these findings. The plan shall include a brief description of the laws and regulations that were violated in the construction of these encroachments and proposed mechanisms to guard against future encroachments. The department shall also submit, as a part of routine biannual operations reports to NOAA, information on the progress of legal actions taken and the removal of utilities. In addition, the biannual reports shall include up-to-date aerial photography of the subject area to illustrate whether any new land-disturbing activity is occurring or new structures are being built.

The NOAA Office for Coastal Management will conduct a reevaluation of the Jobos Bay Research Reserve one year after the date of these findings to evaluate progress on the satisfaction of this necessary action and to determine next steps to meet the broader goal of removing illegal structures.

Key Findings Related to Lack of Enforcement

Resource protection issues within the reserve are primarily related to lack of enforcement capacity, and threats to sensitive areas and species. Some of the more persistent violations affecting the reserve include illegal cutting of mangroves, illegal fishing, and vandalism. Most of these violations occur in the Mar Negro area, but illegal fishing activities also occur in Jobos Bay and near the cays. The reserve staff routinely documents violations but does not have the authority to prosecute offenders. Additional surveillance has been accomplished through concerned citizens and community members, who contact the reserve or rangers if they observe or encounter a violation.

Weekends tend to see a major increase in boat traffic, fishing, and picnicking on the waters of Jobos Bay and its cays. The evaluation team noted that there was no visible presence of the Ranger Corps on the weekends. When reserve staff members meet with the recreational users on weekends, there is little knowledge that the bay is a protected natural area and that there are restrictions on boat speed and other regulations. Greater Marine Patrol presence could lead to a better public understanding. Because of the large areal extent of the reserve and its growing popularity as a recreational destination for the region, regular patrols by the Marine Patrol of the Ranger Corps on weekends and holidays, in addition to routine weekday patrols, are necessary to raise the visibility of enforcement personnel and educate recreational users that they are in a protected area.

Currently, there is only one ranger assigned to the reserve. He reports to the reserve manager through his supervisor at the Natural Resources Ranger Corps. His primary duties include

responding to complaints and conducting patrols. Because his patrols are primarily focused on areas where violations have historically occurred, the vast majority of the reserve receives little attention. This represents a major challenge for the reserve, since the reserve's large area requires additional resources for enforcement and surveillance.

The reserve has also developed and submitted to NOAA a "Surveillance and Prevention Enforcement Strategic Plan of the Puerto Rico Department of Natural and Environmental Resources at Jobos Bay National Estuarine Research Reserve." The purpose of this plan is to (1) eliminate illegal fishing activities, such as the capture of the blue land crab and other protected species during their closed seasons, and also the use of prohibited fishing gear; (2) prevent illegal construction of ramps and piers and filling in the submerged lands within the reserve boundaries; and (3) eliminate the unauthorized use of vehicles and horses within the reserve.

The implementation of this plan includes (1) the design of biweekly work plans coordinated by the reserve director, the stewardship coordinator, and the Rangers Corps maritime unit supervisor to address identified surveillance needs; (2) the identification of the resources required by the department and the reserve for the appropriate implementation of the plan; (3) the identification of marine and terrestrial areas that require patrols and the frequency of patrols; and (4) the coordination with the Puerto Rico Police Department and the municipalities of Salinas and Guyama to assist in the implementation of the biweekly work plans. The reserve has also made additional efforts to improve security, such as installing cameras for remote surveillance of both high trafficked and remote areas.

The reserve also coordinates with federal agencies such as the U.S. Coast Guard, U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers to enforce their laws within and adjacent to the reserve. Some of the issues addressed with the assistance of the federal agencies relate to threats to specific sensitive areas and species, such as boating and fishing activities that disrupt sensitive habitats, including a nurse shark reproduction area.

Beyond the pursuit of violators, there is a need for more education and awareness among the public about the sensitive nature of these habitats and the impacts of their actions. The reserve's education and coastal training programs continue to focus on these topics.

Accomplishment: The Jobos Bay Research Reserve has jointly developed plans and implemented new strategies with the Marine Patrol and the federal agencies to resolve long-standing deficiencies related to enforcement and encroachment.

Accomplishment: The Jobos Bay Research Reserve has continued to make improvements in the area of engaging and educating the public about the coastal and marine resources near the reserve.

Recommendation: The NOAA Office for Coastal Management recommends that the Puerto Rico Department of Natural and Environmental Resources improve enforcement at the Jobos Bay Research Reserve. Given the increased use of reserve waters and cays by the public outside

of normal working hours, department leadership should 1) direct the Ranger Corps to increase surveillance and enforcement in the reserve on evenings and weekends; and/or 2) provide additional reserve staff support on weekends to help improve public safety and awareness that the reserve is a protected area.

Agency Support

The Jobos Bay Research Reserve has been administered by the Department of Natural and Environmental Resources since its creation in 1981. As part of a reorganization of the department, the reserve was moved from the Sanctuaries Division, which was eliminated, to the Bureau of Protected Natural Areas and Forest Services, which is a part of the Division of Protected Natural Reserves. The Puerto Rico Office of Coastal Zone Management and Climate Change is also located in the department, and is a separate office under the secretary.

Key Findings Related to Agency Support

Moving the reserve administration to the Bureau of Protected Natural Areas and Protected Services within the Division of Protected Natural Reserves has continued a situation where the research reserve and the coastal zone management program are not managed in a way in which they can best build from their strengths. The Office for Coastal Management has found that having two programs operate under a single management structure, although not a specific requirement, has been beneficial to both programs. Placing both programs within the same organizational structure can simplify routine administrative actions such as procurement, contracting, and personnel actions.

Because the principal purpose of the reserve is to provide research, education, and training activities to support coastal zone management, there are good reasons to manage the two programs together. Currently, the Office of Coastal Zone Management and Climate Change is a separate office under the secretary of the department. The office contracts with the research reserve to provide education and training programs. NOAA recognizes the value of these collaborations and suggests that combining the programs within one administrative structure would create enhanced opportunities for both programs. While the research reserve is a protected area program, its research, education, and coastal resource management missions are aligned more closely with the coastal zone management mission than the mission of the natural reserves program.

Recommendation: The NOAA Office for Coastal Management strongly recommends that the Puerto Rico Department of Natural and Environmental Resources consider realigning oversight for Jobos Bay Research Reserve to the Office of Coastal Zone Management and Climate Change to better leverage resources and partnerships between two complementary coastal programs and to improve the efficiency of routine administrative activities.

As stated above, the mission of the reserve is to provide a range of services related to Jobos Bay. Education, research, training, and stewardship are all key elements of the reserve's

management plan. During the review period, the reserve sought and received capital funding from NOAA to improve the facilities at the reserve. With the completion of the dormitories, the potential of the reserve to attract researchers, educators, and trainers has increased to a level where there may not be enough dedicated staff members to support these new levels of service. Each of the reserve's core functions requires dedicated staffing.

At the time of this evaluation site visit, there was still some question as to how the Financial Oversight and Management Board for Puerto Rico would support staffing needs. Following the site visit in June 2017, Hurricane Irma and Hurricane Maria also created great fiscal difficulties for the commonwealth and for the reserve.

It is clear that the department has provided strong staffing for the reserve in recent years. The high quality of the services that staff members provide was mentioned by numerous stakeholders, as were the cohesiveness and collaboration of the reserve team. The stakeholders and community members who attended the public meeting also spoke very highly of the staff of the reserve. Concerns were voiced about the impact of any necessary funding cuts by the government of the commonwealth on the staffing levels. Concerns were also expressed about the temporary nature of several of the staff positions at the reserve.

The guidance for the National Estuarine Reserve System requires that each reserve provide dedicated staffing of the four core positions: reserve manager, research coordinator, education coordinator, and coastal training program coordinator. Providing a full-time permanent position for a stewardship coordinator is also encouraged as a use of NOAA funding.

During the site visit, the evaluation team learned that an administrative secretary position for the reserve had been requested but had not yet been approved for hiring. The team also learned that there might be a need for an additional technician position to support the System-Wide Monitoring System, which is a requirement of the NOAA-supported system. Because all of these positions may be filled using NOAA cooperative agreement funding, NOAA recommends that they be filled as expeditiously as possible.

Recommendation: The NOAA Office for Coastal Management strongly recommends that the Puerto Rico Department of Natural and Environmental Resources fill all required core positions outlined in the cooperative agreement (manager, sector leads, and administrative staff members) with full-time staff members, whether as department employees or through arrangements with partner nongovernmental organizations or universities.

Coastal Training Program Implementation

Before 2010, the coastal training program was administered by the Puerto Rico Sea Grant program at University of Puerto Rico at Mayaguez. During the evaluation period, the reserve staff has assumed full responsibility for managing the coastal training program and has hired a

full-time coordinator to run the program. For several years during this evaluation period, the training program coordinator position was unfilled, and the program languished.

Key Findings Related to Coastal Training Program Implementation

Since 2015, the coastal training program coordinator position has been staffed by a temporary contract employee. Under this new leadership, the program has made great strides; diverse audiences are being reached, and the program has succeeded in undertaking training in new areas such as environmental law, dive safety, marine debris, coastal resilience, and hurricane preparation and recovery strategies. The coastal training program also pursued a participatory mapping project that involved soliciting local ecological knowledge of key stakeholders to determine environmental issues to strengthen the reserve's management plan. An online map was developed as a tool for local communities and agencies.

The reserve has worked extensively with the U.S. Environmental Protection Agency to train local municipalities in developing municipal stormwater management plans and obtaining the required permits to support such plans. The Environmental Protection Agency provided collaboration and technical information for the coordination and implementation of the training series.

During this evaluation period, the reserve also worked with key decision makers to undertake community resilience and adaptation planning. The training program carried out participatory mapping workshops with local coastal communities in order to assess their vulnerability. At the time of the evaluation, final maps were being prepared. In addition, some of the training offered, such as rainwater harvesting, was targeted toward enabling local homeowners to implement sustainability principles and empower them to adapt and become more resilient in the face of climate change.

Another innovative training program project that has shown great promise involves beekeeping. The project was developed by a local beekeeper and is an effective demonstration of sector integration (training and research) within the reserve, since the beekeeper needed to develop a research plan to study various aspects of the mangrove environment to be able to conduct the research within the reserve. The project has already seen results because community members who were unemployed or underemployed can now earn income from beekeeping, thus adding to the economic sustainability of the community. Other communities have also reached out to learn about the techniques employed to enhance productivity of the specially designed hives used in this project. A key resilience concept has been built into this effort, since new beekeepers commit to not harvesting honey during hurricane season so that if a storm occurs, there will be honey in the hives to sustain the bees until the mangrove environment recovers.

Demand for the coastal training program is quite high; however, the reserve is limited by a lack of space to conduct the trainings. The long-term plan for the reserve calls for the adjacent restaurant buildings to be rehabilitated and turned into training rooms and office space for the coordinator. The reserve has successfully received NOAA Procurement, Acquisition, and

Construction funding for architectural and engineering design and is seeking funding for design studies and construction.

Accomplishment: The Jobos Bay Research Reserve's coastal training program has become an increasingly valuable resource for the local community, since it has been implemented by internal reserve staff members. Its visibility, integration, and effectiveness have made it a key component of the reserve since the hiring of a full-time program coordinator. The coordinator has developed trainings on a variety of new topics that are important to the community, such as coastal resilience and community adaptation to climate change.

Recommendation: The NOAA Office for Coastal Management recommends that the Jobos Bay Research Reserve continue to pursue the rehabilitation of the adjacent former restaurant building to serve as a regional training and education center.

Hurricane Recovery and Resilience

Before Hurricane Maria, the reserve had worked with the surrounding community to introduce the concept of resilience and adaptation to climate change and sea level rise. During the storm, a number of local community residents took shelter in the reserve dormitories, which received minimal damage. Although the roof of the reserve office and visitor center was badly damaged, the staff implemented hurricane preparedness plans and was successful in minimizing damage to key resources such as computers and office equipment.

Accomplishment: Despite losing the roof of the visitor center during the storm, the Jobos Bay Research Reserve functioned as a refuge for local community members during and after Hurricane Maria.

One resilience strategy that the reserve had pursued was the placement of solar panels on the roof of the dormitory. Although these solar panels survived the hurricane, they could not be decoupled from the electric grid, and thus could not provide energy to the reserve while the grid was inoperable.

Recommendation: The NOAA Office for Coastal Management recommends that the Jobos Bay Research Reserve evaluate the possibility of using solar panels to disconnect from the power grid when the grid goes down so that the reserve can continue to support necessary functions. The ability to use solar energy could not only support key reserve functions, but also provide a more accommodating refuge for members of the community.

Implementation of General Requirements

The final management plan approval was listed in the *Federal Register* on May 14, 2018.

Recent additions of lands to the reserve purchased by the commonwealth have not been submitted to NOAA for approval of a boundary amendment.

Necessary Action: Within six months of the date of these findings, the Puerto Rico Department of Natural and Environmental Resources shall submit a boundary amendment to NOAA requesting approval to include in the boundary all lands added to the reserve since the last boundary amendment.

Accomplishment: The Jobos Bay Research Reserve's education program has been active in establishing a Certified Interpretive Guide program. Certifications were available for community members as well as ecotourism guides as part of a community empowerment initiative, in collaboration with the National Association for Interpretation. The coastal training program coordinator managed logistics and resources, while the education program coordinator identified the type of information to be included in the workshops, as well as potential participants.

Accomplishment: The Jobos Bay Research Reserve has implemented a school certification program that requires the teachers to be certified before their participation in reserve activities. The certification program is being coordinated with the Green Flag Eco-Schools movement in Puerto Rico.

Accomplishment: Coordinators from the research, stewardship, and training sectors of the Jobos Bay Research Reserve travelled to educational institutions around the commonwealth to promote participation in joint research efforts. Their efforts have expanded the level of interest in undertaking research in or sharing data with other colleges and universities.

Evaluation Metrics

Beginning in 2012, national estuarine research reserves began tracking their success in addressing three metrics specific to their programs. These evaluation metrics include a five-year target and provide a quantitative reference for each program about how well it is meeting the goals and objectives it has identified as important to the program.

Metric 1

Goal 2 – Research and Monitoring: Increase the use of reserve science and sites to address priority coastal management issues.

Objective: The reserve will be a sentinel site within the National Estuarine Research Reserve System network.

Strategy: The reserve’s Research and Monitoring Program will establish sentinel site infrastructure components to monitor the impacts of sea level change on mangrove and submerged aquatic vegetation ecosystems. Permanent monitoring transects for mangroves, following National Estuarine Research Reserve System vegetation monitoring protocols, will be chosen with the research advisory committee recommendations, acknowledging existing long-term transects established by the International Institute of Tropical Forestry. Parameters to be measured will be associated with vegetation structure, and some aspects to be considered are the boundary effect and ecotones that are more likely to experience changes in shorter time spans. Transects will be tied to a local network with vertical control points in order to monitor water level and its effects on vegetation. A network of vertical control points will be established within the reserve, and System-Wide Monitoring Program water-quality monitoring stations will be tied to this network. Similarly, submerged aquatic vegetation monitoring stations will be established within Jobos Bay Research Reserve boundaries to track short-term trends and long-term changes. Groundwater monitoring along previously established water wells will be incorporated as part of the program.

The information will be used to improve projections of sea level rise and its impact on ecosystems, as well as human communities adjacent to them. The reserve will reach out to researchers and community leaders to understand how and what data will be useful, and how they want the data delivered. Further discussion can be found in the *Draft Jobos Bay Management Plan 2012-2017*, under revision, in “Research and Monitoring” sections 4.4.0 to 4.4.4, which complements goal 2 of this section. The reserve will address three required components, which can be found in the final guidance document, *National Estuarine Research Reserve System Sentinel Sites Program for Understanding Climate Change Impacts on Estuaries*. These components are 1) development of a sentinel site program plan, 2) establishment of a vegetation monitoring program, and 3) establishment of a vertical control network.

Performance Measure: Number of sentinel site required components that will be completed or implemented by 2017.

Target: By 2017, 3 sentinel site required components will be completed or implemented.

Cumulative Data: The reserve completed the installation of 3 SETs and permanent plots within the vegetation transect. The reserve also installed stable poles at the System-Wide Monitoring Program stations in order to use them as stable water level references for the sentinel sites. The reserve could not complete the GPS campaign to tie the stations and the SETs to the local vertical network because of the impacts of Hurricane Maria. Reserve staff members have met with the surveyor to work on the connection of the stations and SETs to the local network.

Discussion: One sentinel site was on line at the time of the site visit. Two more are expected soon.

Metric II

Goal 3 – Education: Enhance people’s ability and willingness to make informed decisions and take responsible actions that affect coral and coral-related systems.

Objective: The impact of island-wide environmental education that addresses climate change and anthropogenic stressors on coastal habitats will be strengthened through a coordinated network of environmental education providers.

Strategy: Expand and continue offering teacher training workshops based on the application of reserve science and the needs assessments of math and science teachers. The new education coordinator will identify science and math teachers from local schools in the Municipalities of Guayama and Salinas to identify opportunities to integrate Jobos Bay and research reserve system curricula in their work plans. Once identified, workshops will be developed to train teachers as needed. These will also train teachers to use the reserve facilities and trails to become an integral part of their classroom. Our education coordinator will also incorporate one-to-one interactions with the teachers to provide support when implementing classroom activities. Teachers from outside our watershed will also have the opportunity to participate in these trainings. Further discussion can be found in the *Draft Jobos Bay Management Plan 2012-2017* under section 5.3.2, “Current Education Program Priorities,” which complements goal 3 of this section and FY2011 National Estuarine Research Reserve System Performance Measurement Guidance.

Performance Measure: Number of new local schoolteachers using Jobos Bay and/or National Estuarine Research Reserve System curricula in their classrooms.

Target: By 2017, 25 new local schoolteachers have used Jobos Bay and/or National Estuarine Research Reserve System curricula in their classrooms.

FY 2011 Annual Data: 9 teachers trained and using materials in classroom.

FY 2012 Annual Data: 36 teachers

FY 2013 Annual Data: 55 teachers

FY 2014 Annual Data: 94 teachers

FY 2015 Annual Data: 163 teachers

Cumulative Data: 357 teachers

Discussion: Jobos reserve's education program has been very active in reaching out to teachers and school groups, far exceeding initial goals.

Metric III

Goal 1 – Coastal Training Program: Strengthen the protection and management of the Jobos Bay Research Reserve to advance estuarine conservation, research, and education.

Objective: Coastal decision makers will implement strategies that will effectively protect coral and coral-related ecosystems.

Strategy: Work with local municipalities, agencies, industries, and communities to develop and incorporate green design and sustainable principles in infrastructure plans or operational procedures. Examples of these are sustainable technologies, energy-efficient landscaping, recycling, alternative energy sources, coastal planning and zoning for sea level rise and inundation, habitat protection and enhancement, and others. During the first year, coastal training program and other reserve staff members will identify these local audiences at a local scale. A series of climate awareness activities will be developed to introduce green and sustainable principles. Then a needs assessment will be completed to identify training or capacity-building opportunities. The coastal training program coordinator will provide trainings or support with the collaboration of other identified partnerships, on a one-to-one basis, to help develop and implement the plan or procedures. Ongoing follow-up will be provided. Online surveys, as well as onsite personal visits, are part of the strategies that will be used to document and track implementation of green and sustainable principles. Further discussion can be found in the *Draft Jobos Bay Management Plan 2012-2017* under section 6.3.2, "Climate," which complements goal 1 of this section and FY2011 National Estuarine Research Reserve System Performance Measurement Guidance.

Performance Measure: Number of state agencies, local municipalities, industries, and community entities that have incorporated in their infrastructure or operational procedures green design or sustainable principles as a result of a coastal training program workshop or technical assistance support in Jobos Bay Watershed.

Target: During the period 2012-2017, ten state agencies, local municipalities, industries, or community entities incorporate green design or sustainable principles in their infrastructure or

operational procedures as a result of a coastal training program workshop or technical assistance support in Jobos Bay Watershed.

Fiscal Year (FY) 2012 Annual Data: N/A

FY 2013 Annual Data: N/A

FY 2014 Annual Data: N/A

FY 2015 Annual Data: N/A

FY 2016 Annual Data: N/A

Cumulative Data: Green design or sustainable principles were incorporated into workshops and have offered technical assistance for these purposes. A video was produced under the award NA15NOS4200135, titled “Rainwater Collection System.” The reserve completed this video and made it available through the coastal training program and multimedia sections of the reserve’s webpage.

Discussion: The objective of the “Rainwater Collection System” video was to promote the use of rainwater collection systems and focus on techniques to meet non-potable water needs, and yet be easy to install by homeowners. Many factors can determine the installation or the incorporation of green design or practices, including funding. The reserve staff has observed that as homeowners attempted to rebuild after Hurricane Maria many were installing solar panels and rainwater collection systems on their homes. Data for the extent of these initiatives is not available at this writing.

Conclusion

For the reasons stated herein, I find that the Puerto Rico Department of Natural and Environmental Resources is not fully adhering to the programmatic requirements of the Coastal Zone Management Act and its implementing regulations in the operation of the Jobos Bay National Estuarine Research Reserve.

These evaluation findings contain two necessary actions and six recommendations. The necessary actions must be completed as prescribed. The recommendations must be considered before the next regularly scheduled program evaluation, but they are not mandatory at this time. Program recommendations that must be repeated in subsequent evaluations may be elevated to necessary actions.

This is a programmatic evaluation of the Jobos Bay National Estuarine Research Reserve that may have implications regarding the reserve's financial assistance awards. However, it does not make any judgment about or replace any financial audits.

signed by Keelin S. Kuipers
Keelin S. Kuipers
Deputy Director
NOAA Office for Coastal Management

dated November 2, 2018
Date

Appendix A: Response to Written Comments

No written comments were received.