

A group of people, including children and adults, are gathered in a shallow body of water, likely a mangrove area. They are focused on planting saplings. One person in the foreground is using a tool to secure a sapling in the water. The scene is bathed in a warm, orange light, suggesting a sunset or sunrise. The background shows a blurred view of buildings and a body of water.

Public Education & Involvement

Mangrove Restoration Project at San José Laguna

CHAPTER SIX: PUBLIC EDUCATION AND INVOLVEMENT ACTION PLAN

Maximize public involvement in the implementation of the CCMP.

OBJECTIVE

1

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

Action PI-1 Develop and promote low-impact recreational activities within selected areas of the SJBE. **Page 204**

Action PI-2 Post educational and interpretive signs at highly visible, heavy traffic areas throughout the SJBE watershed (bridges, roads, parks, marinas, ports, waterfronts, etc.) to educate the public on the system's components, functions, and values. **Page 207**

Action PI-3 Establish a program to provide citizens with effective and organized volunteer opportunities to support the SJBE's restoration projects (water quality monitoring, education, etc.). **Page 209**

Action PI-4 Develop a long-term public education and outreach program. **Page 211**

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PI-5** Develop an ecotourism program to promote sustainable, low-impact enjoyment of SJBE’s natural resources as a means to further their conservation. **Page 214**
- Action
PI-6** Develop an Environmental Education Program to target young audiences at schools and other non-formal educational institutions throughout the SJBE watershed. **Page 219**
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PI-7** Develop a Memorandum of Understanding between public and private entities and the SJBE Program to expand the scope of the Program’s public education and outreach activities. **Page 222**
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PI-8** Promote better understanding of estuarine resources among regulatory enforcement agencies and personnel. **Page 224**

PI-1

Develop and Promote Low-Impact Recreational Activities within Selected Areas of the SJBE.

BACKGROUND

The SJBE system offers a grandiose natural landscape for the enjoyment of outdoor recreational activities. Natural areas are intermingled with urban structures, creating a mosaic of diverse sites ideal for a wide range of activities, including fishing, canoeing, birdwatching, sailing, hiking, and snorkeling.

Increasing environmental awareness and a desire to balance modern working life with leisure activities have led to the expanded popularity of outdoor recreational activities in recent years. The 1994-1998 Puerto Rico Statewide Comprehensive Outdoor Recreation Plan (SCORP) study, conducted by the Recreation and Sports Department of Puerto Rico, revealed that 76 percent of interviewed citizens considered regular participation in outdoor recreation to be “very important.” Getting away from the city, enjoying tranquil, beautiful scenery, and improving physical and emotional health were identified as some of the main motives behind the preference for outdoor recreational activities.

The SCORP study found that the demand for outdoor recreational activities is expected to increase in upcoming years. This will be of particular concern in highly urbanized areas, such as the San Juan Metropolitan Area (SJMA), whose present population density ranks among the highest in the United States. Its 1.3 million inhabitants (37% of the Island’s total population) are expected to increase by 20 percent by the year 2010 (1990 Census).

The SJBE could provide the SJMA with a much needed natural retreat for the growing recreational needs of residents and visitors alike. Its lagoons, wetlands, coral communities, sandy beaches, and other natural sites offer scenic areas where citizens can interact with nature through water-based and other low-impact activities. The development of recreational facilities and activities should be encouraged in selected areas of the SJBE, where compatible with the conservation of resources and contingent on safe water quality standards. Specific suggestions include the following:

- Extend the “Paseo Lineal” of Parque Central from its present limits at the Aquaexpreso facilities to the shores of the San José Lagoon (or beyond).
- Develop a boardwalk trail system and bird observation towers at Las Cucharillas Marsh.
- Develop a San Juan Bay Estuary education/information center.
- Develop a horse-back riding trail at the Torrecilla Alta area to complement the Piñones bicycle trail.
- Develop a system of linear parks along those tributaries that discharge into the SJBE.

STRATEGY

- 1.1** Identify, evaluate, and enhance existing recreational facilities located within the SJBE to promote ecotourism, low-impact activities, and recreational uses of the resources. Ecologically sensitive areas not compatible with recreational uses will be identified at this stage. Suggested sites include Parque de La Esperanza, Isla de Cabra, Piñones State Forest, San Juan Bay waterfront, Condado Lagoon, and La Torrecilla Lagoon.
Implementing partners: DSR (lead), DNER, PRPB, Local Communities, Municipalities
Schedule: Mid-term
Cost: \$100,000 to \$125,000
- 1.2** Survey and identify appropriate areas for the development of new recreational facilities to serve various or specific passive and low-impact recreational uses. Ecologically sensitive areas not compatible with recreational uses will be identified at this stage. Suggested areas for potential development include the San José Lagoon waterfront, Guachinanga Island, Martín Peña Channel, Cataño-Guaynabo waterfront, Suárez Canal, San Juan Bay waterfront, Las Cucharillas Marsh, Vacía Talega - Torrecilla Alta area, and SJBE tributaries.
Implementing partners: DSR (lead), DNER, PRPB, EQB, Local Communities, Municipalities
Schedule: Mid-term
Cost: \$150,000 to \$200,000
- 1.3** Design and develop recreational facilities for low-impact and nature-oriented activities within selected sites of the SJBE. Suggested recreational facilities include waterfront linear parks, mangrove fringing boardwalks, docks, interpretative trails, fishing facilities, visitor centers, bike trails, and birdwatching towers.
Implementing partners: DSR (lead), DNER, Local Communities, Municipalities
Schedule: Mid-term
Cost: Available data are insufficient to determine costs at this time.
- 1.4** Build incentives for and encourage development of local businesses based on recreation-oriented activities, such as bicycle, kayak, and sailboat rentals and sightseeing boat tours.
Implementing partners: DSR (lead), EQB, Local Communities, Municipalities
Schedule: Mid-term
Cost: Available data are insufficient to determine costs at this time.
- 1.5** Promote the use of existing facilities and low-impact recreational activities in accordance with each site's potential. Suggested activities include birdwatching, hiking, bicycling, kayaking, fishing, sailing, swimming, snorkeling, and sightseeing by boat.

Implementing partners: DSR (lead), DNER, Local Communities, Municipalities
Schedule: Mid-term
Cost: \$200,000 to \$300,000

EXPECTED BENEFITS

Establishing permanent, low-impact recreational facilities will provide residents and visitors with a wide variety of options for enjoying and learning about the SJBE system. This action will increase stewardship and a desire to support efforts to enhance and maintain resources in the selected area. Other benefits include:

- Direct benefits to the local economy;
- Enhanced habitat and water quality; and
- Increased awareness about the estuary's values and the need for conservation.

MONITORING ENVIRONMENTAL RESPONSE/PROGRAMMATIC IMPLEMENTATION

A plan to evaluate environmental quality, resource abundance, and habitat condition should be established in order to monitor changes associated with promoted activities.

REGULATORY NEEDS

None.

ACRONYMS

SJBE = SAN JUAN BAY ESTUARY

SCORP = PUERTO RICO STATEWIDE COMPREHENSIVE OUTDOOR RECREATION PLAN

SJMA = SAN JUAN METROPOLITAN AREA

DNER = DEPARTMENT OF NATURAL AND ENVIRONMENTAL RESOURCES

PRPB = PUERTO RICO PLANNING BOARD

DSR = DEPARTMENT OF SPORTS AND RECREATION

EQB = ENVIRONMENTAL QUALITY BOARD

PI-2

Post Educational and Interpretive Signs at Highly Visible, Heavy Traffic Areas throughout the SJBE Watershed (Bridges, Roads, Parks, Marinas, Ports, Waterfronts, etc.) to Educate the Public on the System's Components, Functions, and Values.

BACKGROUND

The public's understanding of the interconnected, interdependent nature of the estuary system, particularly the linkages between upland watershed areas and the coastal system, is very limited (Vega-Gerena, 1997; Diaz de Jesús, *et al.*, 1995). San Juan Bay and the coastal lagoons, canals, and channels are well known components of the estuary system. But the wetlands, marshes, sandy beaches, reefs, seagrasses, urban forests, and tributaries form another important part of the system that is not as well recognized. Safeguarding the integrity of each one of these elements, and the complex dynamics existing between them, is vital to the estuary's survival (Beller, *et al.*, 1999).

Major threats (such as deforestation, erosion, and trash generation) to the SJBE can be found throughout the system's entire drainage basin and coastal areas. Unless urgent measures are taken to control these problems at the source, they will ultimately affect estuarine waterbodies and related marine habitats.

Residents and businesses, particularly in upland watershed areas, are far removed from the estuary's immediate surroundings and often do not realize the impacts that their activities may have on the estuary system. Educating citizens to see their community as a part of the major system will greatly encourage public support of SJBE's integrated watershed management effort. Educational and informational signs can be used as an effective and simple strategy for facilitating this process. Tributaries, marshes, wetlands, beaches, and reefs throughout the watershed and estuary system can be identified as components of the SJBE in this way. In addition, signage can provide a medium for educating the public about the natural values and functions of different habitats within the SJBE. Signs should be posted in the municipalities of San Juan, Carolina, Loíza, Cataño, Guaynabo, Toa Baja, Bayamón, and Trujillo Alto wherever lagoons, tributaries, waterways, beaches, and other components of the estuary system are visible or exposed at roads, bridges, parks, or boardwalks.

STRATEGY

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

Implementing partners: SJBE Program (lead), DNER, SJBE CAC, Municipalities

Schedule: Mid-term

Cost: Administrative costs

- 2.2** Design and produce educational and informational signs which identify components of the SJBE system, highlight the functions and values of the system, and encourage conservation. Signs should differ in content according to the specific characteristics of each particular area.

Implementing partners: SJBE Program (lead), SWMA, EQB, Municipalities

Schedule: Mid-term

Cost: \$300 to \$600 per sign

- 2.3** Install signs at selected sites and provide maintenance or replacement as required.

Implementing partners: SJBE Program (lead), SWMA, EQB, DTPW, Municipalities, ARPE

Schedule: Mid-term

Cost: \$250 to \$400 per sign

- 2.4** Publicize the presence of the signs and promote their use as educational resources and as supplements to recreational and ecotourism activities.

Implementing partners: SJBE Program (lead), Municipalities, EQB, SWMA, Puerto Rico Tourism Company, DSR

Schedule: Mid-term

Cost: \$100,000

EXPECTED BENEFITS

Educational signs will increase awareness of the SJBE's components, natural functions, and values and will encourage public support of watershed management measures in the SJBE.

MONITORING ENVIRONMENTAL RESPONSE/PROGRAMMATIC IMPLEMENTATION

Public perception surveys will be conducted to assess increased public awareness and knowledge related to the SJBE as well as levels of involvement in restoration activities. Results will be compared to the SJBE Program's public perception survey conducted in 1995.

REGULATORY NEEDS

None.

ACRONYMS

SJBE = SAN JUAN BAY ESTUARY

DNER = DEPARTMENT OF NATURAL AND ENVIRONMENTAL RESOURCES

EQB = ENVIRONMENTAL QUALITY BOARD

CAC = CITIZENS ADVISORY COMMITTEE

SWMA = SOLID WASTE MANAGEMENT AUTHORITY

ARPE = PERMIT AND REGULATIONS ADMINISTRATION

DTPW = DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS

DSR = DEPARTMENT OF SPORTS AND RECREATION

PI-3

Establish a Program to Provide Citizens With Effective and Organized Volunteer Opportunities to Support the SJBE's Restoration Projects (Water Quality Monitoring, Education, etc.).

BACKGROUND

Long-term public support and participation in estuary protection and restoration activities are necessary and critical for the successful implementation of the CCMP. Hands-on participation in the SJBE's restoration and protection will directly involve citizens in the improvement of the estuary's natural resources and will instill a strong sense of stewardship. As such, providing the means and opportunities for encouraging and facilitating active involvement by citizens in this process is essential.

Each of the action plans included in this document recognizes this need and provides the foundations for encouraging citizen advocacy, support, and active involvement. Development of a SJBE Volunteer Program will bring together these efforts and will help coordinate effective and organized opportunities for hands-on participation in estuary conservation projects. Projects which potentially could incorporate citizen participation include water quality monitoring, mangrove and riparian reforestation, seagrass bed restoration, bird censuses, storm drain stenciling, beach clean-ups, educational activities, and the SJBE's speakers bureau.

PI-3

STRATEGY

- 3.1** Identify potential restoration and monitoring projects within the SJBE where volunteer participation would be effective.
 Implementing partners: SJBE Program (lead)
 Schedule: Short-term
 Cost: Administrative costs
- 3.2** Coordinate volunteer activities with sponsoring agencies or communities.
 Implementing partners: SJBE Program (lead)
 Schedule: Short-term
 Cost: Administrative costs
- 3.3** Promote volunteer opportunities and recruit volunteers at schools, universities, environmental groups, clubs, associations, and communities.
 Implementing partners: SJBE Program (lead)
 Schedule: Short-term
 Cost: Administrative costs

3.4 | Train and match volunteers with hands-on activities around the SJBE.

Implementing partners: SJBE Program (lead)

Schedule: Short-term

Cost: Administrative costs (does not consider equipment needs). The SJBE Program will have full time staff responsible for coordinating the volunteer program.

EXPECTED BENEFITS

The hands-on involvement of volunteers will serve both to educate the public and enhance interest in the SJBE. Volunteer participation will also supplement existing monitoring programs.

MONITORING ENVIRONMENTAL RESPONSE/PROGRAMMATIC IMPLEMENTATION

Public perception surveys will be conducted to assess increased public awareness and knowledge related to the SJBE as well as levels of involvement in restoration activities. Results will be compared to the SJBE Program's public perception survey conducted in 1995.

REGULATORY NEEDS

None.

ACRONYMS

SJBE = SAN JUAN BAY ESTUARY

CCMP = COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN

PI-4

Develop a Long-Term Public Education and Outreach Program.

BACKGROUND

An informed and supportive public, including business and industry, is vital to achieve the SJBE Program's long-term goals. A public that understands its relationship to the natural system and the impacts of its actions on nature's delicate balance can make sensible choices about sustainable management. Educating the public on ecosystem functions and values and building awareness and appreciation of natural resources are necessary actions for meeting these conditions.

The SJBE Program will enhance its educational efforts during the implementation of the CCMP. Informing the public and encouraging stewardship, support, and active involvement in the protection and restoration processes are the main objectives. Existing efforts and materials will be used along with newly developed resources to fully address the multiple and often conflicting interests and uses of the estuary system. Annual events and other educational activities for the general public will offer additional strategies for attracting public attention, building awareness, and delivering important educational messages. The use of the media and its coverage of SJBE's activities and related issues will be encouraged as a powerful tool for reaching the public.

STRATEGY

4.1 Evaluate and distribute existing educational and informational materials (brochure, poster, bumper sticker, and newsletter) and develop new resources to fully address the interests of the SJBE's various user groups (boaters, fishermen, industry, business, communities, etc.). These materials should include the following:

- A booklet on "Things that you can do to help restore and conserve the SJBE;"
- A "Code of Conduct" for boaters, fishermen, industry, businesses, and other users of the SJBE;
- A guide on habitats, recreational facilities, and activities within the SJBE and guidelines for habitat preservation;
- Periodic progress reports on CCMP implementation and the environmental status of the SJBE (Costa Viva); and
- An estuary information center.

Implementing partners: SJBE Program (lead), USEPA, DOE, DNER, DNER Rangers, State Police, Municipal Guards

Schedule: Short-term

Cost: \$100,000 to \$150,000

4.2 Continue educational activities such as presentations and talks (for communities, special interest groups, industry, business, etc.) and participation in exhibitions, conferences, and special events related to the SJBE.

Implementing partners: SJBE Program (lead), USEPA, DOE, DNER, DNER Rangers, EQB, USGS

Schedule: Short-term

Cost: Administrative costs

4.3 Develop other educational projects tailored to meet specific needs of targeted audiences, including community environmental and sustainable development projects and environmental education workshops for industry, businesses, communities, and special interest groups.

Implementing partners: SJBE Program (lead), USEPA, DOE, DNER Rangers

Schedule: Short-term

Cost: Administrative costs

4.4 Develop educational activities for public participation, including:

- Celebrating SJBE Day (Costa Adentro) and Estuary Clean-up Day (simultaneous clean-ups within the estuary);
- Celebrating a SJBE symposia;
- Promoting citizen participation in the volunteer program; and
- Promoting citizen use of SJBE's recreational facilities and participation in the SJBE ecotourism program.

Implementing partners: SJBE Program (lead), DOE, DNER, DNER Rangers

Schedule: Short-term

Cost: \$150,000 to \$200,000

4.5 Promote effective use of the media by encouraging coverage of SJBE issues, activities, or special events and producing television and radio PSAs, television, radio, and movie theater advertisements, media presentations, and interviews.

Implementing partners: SJBE Program (lead), DNER Rangers

Schedule: Short-term

Cost: Administrative costs

EXPECTED BENEFITS

A long-term public education and outreach program will assist in building the necessary public support for CCMP implementation and restoration activities.

MONITORING ENVIRONMENTAL RESPONSE/PROGRAMMATIC IMPLEMENTATION

Public perception surveys will be conducted to assess increased public awareness and knowledge related to the SJBE as well as levels of involvement in restoration activities. Results will be compared to the SJBE Program's public perception survey conducted in 1995.

REGULATORY NEEDS

None.

ACRONYMS

SJBE = SAN JUAN BAY ESTUARY

CCMP = COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN

USEPA = UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

PSA = PUBLIC SERVICE ANNOUNCEMENT

DOE = DEPARTMENT OF EDUCATION

EQB = ENVIRONMENTAL QUALITY BOARD

USGS = UNITED STATES GEOLOGICAL SURVEY

PI-5

Develop an Ecotourism Program to Promote Sustainable, Low-Impact Enjoyment of SJBE's Natural Resources as a Means to Further their Conservation.

BACKGROUND

Ecotourism, the fastest growing sector in global tourism, is gaining grounds in Puerto Rico (Puerto Rico Ecotourism Law, 1998). Both local and international tourists on the Island are expressing a growing preference for outdoor and nature-oriented activities. The rich diversity of natural sites within the SJBE and their tremendous potential for various low-impact, nature-oriented activities make the estuary an ideal location for the development of an ecotourism program to satisfy new market trends.

During fiscal year 1999, Puerto Rico received approximately 4.2 million tourists (Puerto Rico Tourism Company, 2000). Most of these tourists are short-term visitors (such as business travelers) that stay in the main tourist districts at Old San Juan, El Condado, and Isla Verde. However, a lack of recreational facilities and services in these areas leaves visitors with few recreational opportunities other than those associated with traditional tourism, such as shopping and sightseeing.

The development of low-impact, nature-oriented ecotourism initiatives will diversify the amenities currently provided within the San Juan Metropolitan Area and present attractive alternatives to local visitors, tourists, and ecotourists alike. This will increase the competitive capacity of the local tourism market and benefit the local economy by encouraging the creation of related enterprises (e.g., kayak rentals and tour guide services). Hiking, canoeing, kayaking, and birdwatching are examples of low-impact, nature-oriented activities that are compatible with the development of an ecotourism program.

On December 31, 1998, the Government of Puerto Rico passed the Ecotourism Law (Law No. 340), which established the Island's public policy on ecotourism and provided guidelines for the development and regulation of ecotourism activities. Ecotourism, as defined by the Ecotourism Law, is the industry that promotes the recreational and cultural enjoyment of natural areas and historic interest zones in Puerto Rico. The use and enjoyment of these locations should be conducted without compromising the protection of natural resources. The Ecotourism Law created a Consultive Board composed of government agencies, environmental organizations, and tourism experts. The Board is responsible for developing a strategic plan to create and promote ecotourism areas in order to diversify the island's traditional tourism attractions (Article 4 and 5 of Law No. 340). This strategic plan has to identify ecotourism zones, which are defined as areas that have a strong ecotourism potential because of their natural, ecological, cultural, and social values (Article 3). Based on this definition, the SJBE Program can recommend a number of areas within the estuary that have unique ecological, historical, and cultural importance to be considered as ecotourism zones. These include the Piñones region, specifically the Piñones State Forest (the largest mangrove forest in the island); the Piñones Lagoon (seasonally bioluminescent), its dune formations and beaches; the herbaceous

wetlands and hay stack hills located in the Torrecilla - Alta area; and Las Cucharillas Marsh (refuge for various rare and endangered bird species).

All potential ecotourism zones in Puerto Rico must be zoned as such by the DNER and the Planning Board in all Land Use Plans (Article 12, section c) after conducting pertinent scientific evaluation, ecotourism criteria analysis, and involving the local community (Article 5, section e and Article 11). Cooperative agreements with municipalities, non-profit entities, or private entities can be established for the development of these ecotourism zones (Article 9). The SJBE Program could establish a cooperative agreement with the Ecotourism Consultive Board to study the ecotourism potential of the above-mentioned areas in the SJBE system and plan, design, and develop the criteria and requirements for infrastructure and installations in these ecotourism zones.

Ecotourism activities support the sustainable use of natural resources and serve as powerful educational resources about the components, functions, and values of the estuary system. Visitors will leave with a sense of appreciation for the estuary system and residents will be encouraged to support the restoration and protection of the SJBE.

This Action contains a two-tiered strategy, focusing on both planning initiatives and the promotion of low-impact ecotourism activities.

STRATEGY

PLANNING

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

Implementing partners: DNER, SJBE Program (lead parties), Puerto Rico Tourism Company, Ecotourism Consultive Board, Local Communities, Ecotourism/Adventure Tour Operators, USFS, USFWS

Schedule: Short-term

Cost: Administrative costs

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

Implementing partners: DNER (lead), Puerto Rico Tourism Company, PRPB, SJBE Program, Municipalities, Local Communities

Schedule: Short-term

Cost: Administrative costs

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

Implementing Partners: EQB (lead), DNER, Puerto Rico Tourism Company, Ecotourism Consultive Board, PRPB, SJBE Program, Municipalities, Local Communities

Schedule: Short-term

Cost: Administrative costs

IMPLEMENTATION

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

Implementing partners: DNER (lead), SJBE Program, USFWS, Puerto Rico Tourism Company, Tour Operators, Land Owners, Local Communities

Schedule: Mid-term

Cost: Costs included under Action PI-1

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

- Audiences (students, children, teachers, clubs, families, etc.);
- Interests (birdwatching, kayaking, sightseeing, and others); and
- Performance skills (children, seniors, adults, etc.).

Implementing partners: DNER (lead), SJBE Program, Puerto Rico Tourism Company, Tour Operators, Local Communities

Schedule: Mid-term

Cost: \$50,000

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

Implementing partners: DNER (lead), Puerto Rico Tourism Company, DSR, SJBE Program, Tour Operators, Local Communities, Municipalities

Schedule: Mid-term

Cost: Costs depend on results of steps 5.4 and 5.5

- 5.7** | Hire and train local guides to coordinate and conduct guided tours.
 Implementing partners: DNER (lead), SJBE Program, Puerto Rico Tourism Company, Tour Operators, Local Communities
 Schedule: Mid-term
 Cost: \$265,000 to \$300,000 per year
- 5.8** | Encourage the development of small, low-impact, community-based business enterprises that offer recreational services and other amenities to visitors (e.g., kayak rentals, guided tours, boat tours, food stands).
 Implementing partners: DNR (lead), SJBE Program, Puerto Rico Tourism Company, Small Tour Operators, Local Communities, Government Development Bank
 Schedule: Mid-term
 Cost: \$150,000 per year
- 5.9** | Develop and distribute tourism advertisements and information packets to bring ecotourists to the area.
 Implementing partners: Puerto Rico Tourism Company (lead), DNER, SJBE Program
 Schedule: Mid-term
 Cost: \$50,000 to \$70,000
- 5.10** | Promote the SJBE’s Ecotourism Program as a recreational and educational opportunity for schools, college students, environmental groups, clubs, etc.
 Implementing partners: DNER (lead), SJBE Program, Puerto Rico Tourism Company, DOE, Tour Operators, Local Communities
 Schedule: Mid-term
 Cost: \$25,000 per year

EXPECTED BENEFITS

Establishing ecotourism opportunities in the estuary will provide residents and visitors with a wide variety of options for enjoying and learning about the SJBE system. This action will increase stewardship and a desire to support efforts to enhance and maintain resources in the selected area. Other benefits include:

- Direct benefits to the local economy;
- Enhanced habitat and water quality; and
- Increased awareness about the estuary’s values and need for conservation.

MONITORING ENVIRONMENTAL RESPONSE/PROGRAMMATIC IMPLEMENTATION

DNER, the Ecotourism Consultive Board, and the SJBE Program will develop an environmental monitoring program for all ecotourism projects in the SJBE system once the Board has established requirements and parameters for all ecotourism activities.

REGULATORY NEEDS

Ecotourism projects must comply with the requirements and parameters to be established by the Ecotourism Law (Law No. 340).

ACRONYMS

SJBE = SAN JUAN BAY ESTUARY

CCMP = COMPREHENSIVE CONSERVATION MANAGEMENT PLAN

USEPA = UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

USFWS = UNITED STATES FISH AND WILDLIFE SERVICE

DNER = DEPARTMENT OF NATURAL AND ENVIRONMENTAL RESOURCES

SJMA = SAN JUAN METROPOLITAN AREA

USFS = UNITED STATES FOREST SERVICE

PRPB = PUERTO RICO PLANNING BOARD

EQB = ENVIRONMENTAL QUALITY BOARD

DSR = DEPARTMENT OF SPORTS AND RECREATION

DOE = DEPARTMENT OF EDUCATION

PI-6

Develop an Environmental Education Program to Target Young Audiences at Schools and other Non-Formal Educational Institutions throughout the SJBE Watershed.

BACKGROUND

Children and young audiences are among the most ardent defenders of the environment. Even though the power of decision making resides in adults, children can exert considerable influence on their family's commitment towards environmental conservation and restoration. Their sensitivity and passion about environmental protection can often cause adults to reevaluate their positions on environmental issues and decision-making.

Children are the future stakeholders of the SJBE system. It is, therefore, of utmost importance to instill in young audiences an early sense of appreciation for the estuary system and a notion of the public's role in the natural system. With this objective, the SJBE Program developed an environmental education curriculum (focusing on the SJBE system) to be distributed and used at schools throughout the SJBE watershed. Educating children about the system's components, functions, values, and natural balance will ensure that, as adults, they will be more willing to support the environmental causes of the SJBE. The SJBE's Environmental Education Program will reach not only the targeted children, but their parents, families, friends, and educators, thereby supporting other ongoing public education efforts.

Preparing future generations for the task ahead is an obligation and a critical step for reaching SJBE Program goals in the long-term. Educating our children now constitutes an environmental investment in future decision-making and sustainable management of the SJBE system.

STRATEGY

6.1 Encourage the use and implementation of the SJBE's School Curriculum at private and public schools throughout the SJBE watershed.

Implementing partners: DOE (lead), SJBE Program

Schedule: Mid-term

Cost: \$170,000 to \$200,000 per year

6.2 Develop environmental education materials appropriate for children and young audiences to teach them about the SJBE's natural components, functions, and values. These materials should be regularly updated and redistributed to assure their frequent use as fun and educational tools. Suggested materials include:

- A SJBE activity and coloring book;
- A SJBE cartoon video for children; and

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- A SJBE system puzzle map poster depicting the different natural communities within the system and its biological components.

Implementing partners: DOE (lead), SJBE Program

Schedule: Mid-term

Cost: \$75,000

6.3 | Develop an Environmental Educator's Workshop Program to train teachers and other non-formal educators in the effective use of the SJBE School Curriculum and other related educational material.

Implementing partners: DOE (lead), SJBE Program

Schedule: Mid-term

Cost: \$50,000

6.4 | Develop and encourage the use of other related environmental education sources by teachers and non-formal educators. Suggested materials include an Environmental Education Activities Guide.

Implementing partners: DOE (lead), SJBE Program

Schedule: Mid-term

Cost: Administrative costs

6.5 | Develop a School Excursions Program to facilitate and encourage student field visits to the SJBE system as a conservation education tool. Teachers could guide interpretative routes or solicit the services of qualified personnel. Different routes can be designed to guide students through the diverse components and natural communities of the SJBE. Restoration projects in progress could serve as additional tools for educating students about public impacts on the natural system and its restoration process.

Implementing partners: DOE (lead), SJBE Program

Schedule: Mid-term

Cost: \$60,000 per year

6.6 | Encourage an annual celebration of the SJBE at all schools located within the SJBE watershed. Suggested activities include the following:

- Environmental Education Field Day;
- Environmental Christmas Card Contest;
- Local clean-up events and field trips; and
- Local storm drain stenciling projects.

Implementing partners: DOE (lead), SJBE Program

Schedule: Mid-term

Cost: Administrative costs

- 6.7** | Continue delivering talks and presentations about the SJBE at schools and related special events.
Implementing partners: DOE (lead), SJBE Program
Schedule: Mid-term
Cost: Costs included in Step 6.1

EXPECTED BENEFITS

The SJBE's School and Environmental Education Program will educate the future stakeholders of the estuary system about the need for long-term planning as well as restoration and sustainable management. In the process, educators, parents, and teachers will become involved, which will reinforce the SJBE Program's efforts in reaching adult audiences and will increase support for CCMP implementation.

MONITORING ENVIRONMENTAL RESPONSE/PROGRAMMATIC IMPLEMENTATION

Public perception surveys will be conducted to assess increased public awareness and knowledge related to the SJBE as well as levels of involvement in restoration activities. Results will be compared to the SJBE Program's public perception survey conducted in 1995.

REGULATORY NEEDS

None.

ACRONYMS

SJBE = SAN JUAN BAY ESTUARY

CCMP = COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN

DOE = DEPARTMENT OF EDUCATION

PI-7

Develop a Memorandum of Understanding between Public and Private Entities and the SJBE Program to Expand the Scope of the Program's Public Education and Outreach Activities.

BACKGROUND

Many of Puerto Rico's public agencies, such as the EQB, the DNER, and the SWMA, as well as private entities, such as Bacardí Corporation and Coors Light "Haciendo Ambiente," have a number of environmental educators and/or programs targeted at specific environmental issues. These educators conduct presentations and provide guidance on environmental issues to a large number of schools, businesses, government agencies, and communities in the metropolitan area.

To assist the SJBE Program in its public involvement and education efforts, a Memorandum of Understanding (MOU) should be established between interested public and private entities and the Program. By combining education efforts, a wider audience will be reached and educated about the issues that affect the estuary system. For example, presentations by these public and private entities to communities and other parties located within the SJBE could be tailored to provide specific information on the qualities and benefits of the estuary and the different threats to the estuary system. This will help bring these presentations "closer to home" by including discussions of specific conditions found in the audience's local surroundings.

STRATEGY

7.1 | Develop and sign a Memorandum of Understanding (MOU) between interested public and private entities and the SJBE Program regarding collaboration on education efforts.

Implementing partners: SJBE Program (lead), Interested Public and Private Entities

Schedule: Mid-term

Cost: Administrative costs

7.2 | Train environmental educators about the SJBE's components, natural functions, values, and threats. This training should be specifically designed to fit the needs and scope of work of the entity participating in the MOU. Exchange educational materials, photographs, brochures, and other necessary items.

Implementing partners: SJBE Program (lead), Interested Public and Private Entities

Schedule: Mid-term

Cost: Administrative costs

7.3 Maintain a log of the presentations that have been conducted. Every month, exchange copies of this log with participating entities to assure that future presentations are not conducted at similar locations or, if at the same location, do not touch upon the same subject.

Implementing partners: SJBE Program (lead), Interested Public and Private Entities

Schedule: Mid-term

Cost: Administrative costs

EXPECTED BENEFITS

A Memorandum of Understanding between the numerous agencies conducting public education activities and the SJBE Program will avoid duplication of efforts and ensure that the widest possible audience is reached. Education efforts will increase knowledge, awareness, and sensitivity about the SJBE's components, natural functions, values, and threats and will encourage public support of watershed management measures in the SJBE.

MONITORING ENVIRONMENTAL RESPONSE/PROGRAMMATIC IMPLEMENTATION

The SJBE Program tracking system will be used to monitor implementation of this action (programmatic in nature). Please see Volume II for details.

REGULATORY NEEDS

None.

ACRONYMS

SJBE = SAN JUAN BAY ESTUARY

CCMP = COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN

EQB = ENVIRONMENTAL QUALITY BOARD

DNER = DEPARTMENT OF NATURAL AND ENVIRONMENTAL RESOURCES

SWMA = SOLID WASTE MANAGEMENT AUTHORITY

MOU = MEMORANDUM OF UNDERSTANDING

PI-8

Promote Better Understanding of Estuarine Resources among Regulatory Enforcement Agencies and Personnel.

BACKGROUND

The laws of the United States, except those which are locally inapplicable, apply to Puerto Rico. Since U.S. environmental statutes have been extended by Congress to Puerto Rico (Fiddler, *et al.*, 1990), by delegation, Commonwealth environmental agencies are obligated to follow and enforce those laws unless Puerto Rico has more restrictive laws and applicable regulations.

Environmental protection laws and regulations in Puerto Rico cover terrestrial and subaquatic archaeological sites, natural resources, caves, the coastal zone, water resources, wildlife, and many other issues (Seguinot-Barbosa, 1998). Unfortunately, enforcement of these laws has not proven effective in stopping the negative impacts associated with modern development and human uses of the SJBE system. Most of the time, the uneven balance between development and environmental protection arises as a consequence of factors such as weak implementation and enforcement of applicable laws and regulations, insufficient personnel, and lack of expertise within enforcement agencies.

Successful enforcement of habitat and species protection measures requires education and understanding of the entire estuarine ecosystem by both law enforcement officers and citizens. Because of a lack of education and awareness, estuarine habitats have traditionally been viewed as useless, wasted space full of mosquitoes and pests. As a consequence, some citizens have developed the attitude that estuaries are better used as landfills than as natural areas. This situation makes the task of DNER law enforcement officers very difficult. Part of the solution could be the creation of a specialized curriculum where DNER Rangers, other enforcement agents, and other interested personnel receive mandatory basic training on environmental issues applicable in Puerto Rico and, in particular, the SJBE system. In addition to enhancing scientific knowledge of estuarine habitats, such a program could be used to enhance communication skills for community outreach and education.

Topics to be covered in these courses should include basic knowledge and legal aspects of environmental laws and regulations, enforcement procedures, basic knowledge on ecological concepts and fish and wildlife species, and identification of endangered and threatened species of plants and animals. The course could be developed in modules, and, depending on time and available funds, it could be delivered in a three-day workshop or a five-day mini course, including intensive fieldwork.

STRATEGY

8.1 Identify the essential concepts needed to understand the ecology of the SJBE system and the legal components established for resource protection.

Implementing partners: SJBE Program (lead), UPR Sea Grant Marine Education and Marine Advisory Programs, Caribbean Management Council, DNER Legal Section

Schedule: Draft outline already developed.
Cost: \$10,000

8.2 Produce a teaching/learning resource book and instructional materials on estuarine concepts for Rangers and other enforcement personnel.

Implementing partners: DNER Legal Section (lead), UPR Sea Grant Marine Education and Marine Advisory Programs, Caribbean Management Council
Schedule: Mid-term
Cost: \$30,000

8.3 Conduct training workshops on estuarine concepts, the legal framework, and communication skills for DNER Rangers in the SJBE system as well as other sensitive areas in Puerto Rico.

Implementing partners: DNER Legal Section (lead), UPR Sea Grant Marine Education and Marine Advisory Programs, Caribbean Management Council
Schedule: Mid-term
Cost: \$50,000

EXPECTED BENEFITS

Implementation of this action will result in greater awareness of the estuary’s values and the need for conservation among enforcement officers and members of the public. Dialogue between enforcement officers and the public will improve, and community stewardship towards SJBE resources will increase.

This type of curriculum will provide trainees with the necessary tools to adequately perform their duties and will bolster the weak points in environmental rights in Puerto Rico. This action will benefit the quality of the SJBE system as well as the whole Island.

MONITORING ENVIRONMENTAL RESPONSE/PROGRAMMATIC IMPLEMENTATION

A record of enforcement violations related to SJBE priority issues should be kept. Refresher courses will be developed that highlight changes in environmental laws and regulations and address new related topics.

REGULATORY NEEDS

None.

ACRONYMS

- DNER = DEPARTMENT OF NATURAL AND ENVIRONMENTAL RESOURCES
- SJBE = SAN JUAN BAY ESTUARY
- UPR = UNIVERSITY OF PUERTO RICO
- U.S. = UNITED STATES

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