



State of Louisiana

**Coastal Protection and Restoration Authority
of Louisiana**

Monitoring Plan

for

**Bayou Dupont Sediment Delivery Marsh
Creation #3 and Terracing (BA-0164)**

State Project Number BA-0164
Priority Project List 22

February 2018



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Monitoring Plan for Bayou Dupont Sediment Delivery Marsh Creation #3 and Terracing (BA-0164)

Priority Project List 22

The Coastal Protection and Restoration Authority of Louisiana (CPRA) and the United States Environmental Protection Agency (EPA) agree to carry out the terms of this monitoring plan for Bayou Dupont Sediment Delivery Marsh Creation #3 and Terracing (BA-0164). As outlined in this plan, monitoring data will be collected using standardized data collection techniques and will be analyzed to determine whether the project is achieving the anticipated benefits. Operations, Maintenance and Monitoring (OM&M) reports will be written to document the condition of project features, present and interpret monitoring data, and if needed, make recommendations for adaptive management of the project. This monitoring plan, forthcoming OM&M reports, and additional documents pertaining to BA-0164, can be accessed through CPRA's Coastal Information Management System (CIMS) website at <http://cims.coastal.louisiana.gov>.

Construction of BA-0164 was authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) enacted on November 29, 1990, as amended.

1. PROJECT DESCRIPTION, GOAL, OBJECTIVES and FEATURES

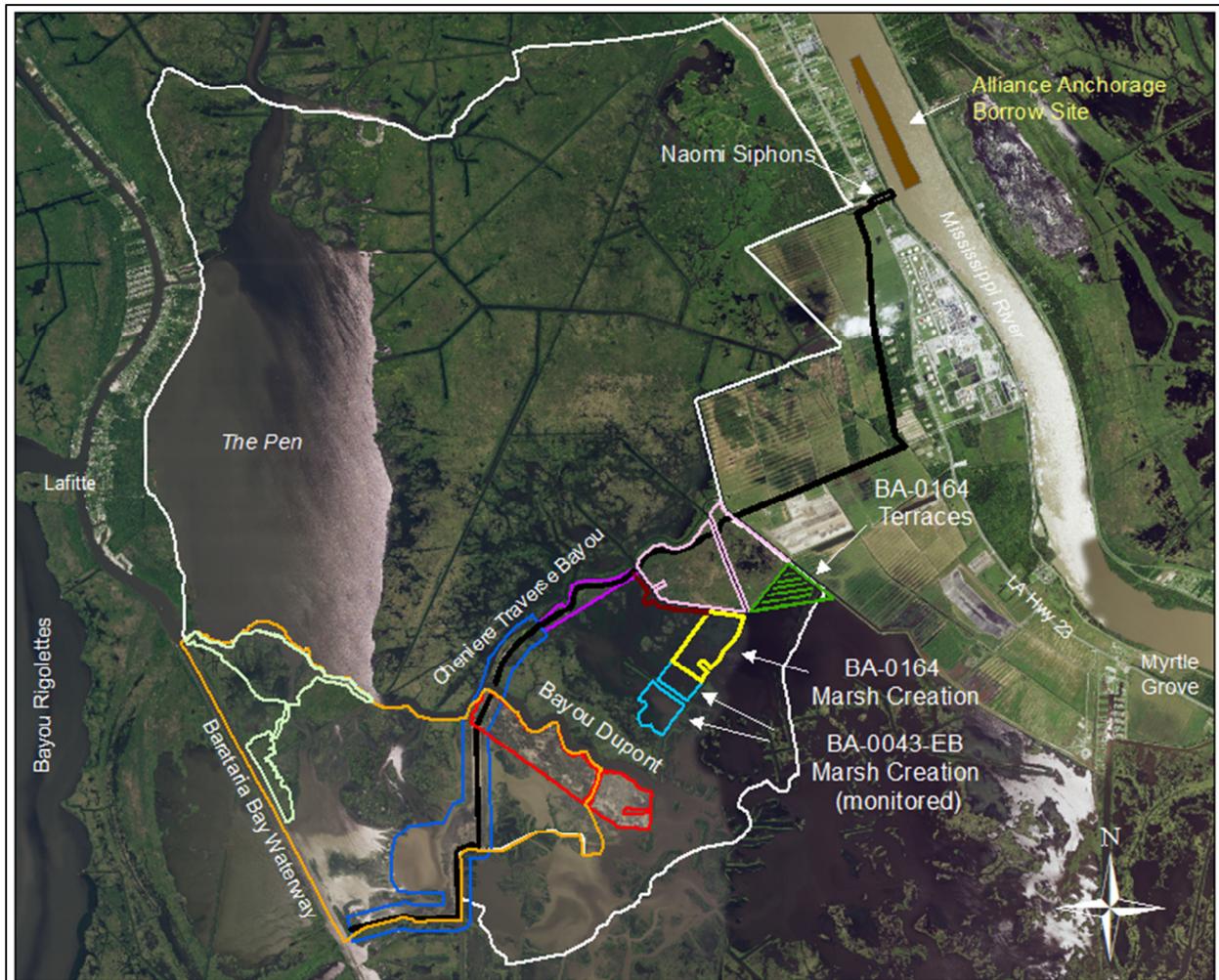
Description

The Bayou Dupont Sediment Delivery Marsh Creation #3 and Terracing (BA-0164) project used sediment hydraulically dredged from the Anchorage Alliance borrow site in the Mississippi River to build a 144-acre marsh platform in an area of the Barataria Basin that had converted from marsh to shallow open water (Figure 1). The Long Distance Sediment Pipeline (BA-0043-EB) was used to transport the dredged sediment from the river to the project area. The pipeline is supported with Coastal Impact Assistance Program and state funds and is sponsored by local governments and CPRA. One terrace field, containing 14 earthen terraces, was also constructed as part of the BA-0164 project using sediment dredged from within the project area.

An additional neighboring 128 acres of marsh were constructed with Mississippi River sediment using surplus contingency funds from the BA-0043-EB project (Figure 2). This additional acreage was originally included in the footprint for BA-0164, but the size of the project area was ultimately reduced for construction due to budget constraints. The CPRA intends to monitor this adjacent BA-0043-EB acreage because it was included in the originally-approved monitoring budget. Also funded through the BA-0043-EB project was the construction of a pipeline access corridor for BA-0164 and BA-0043-EB that created 20 acres of marsh (Figure 2). The corridor is not being monitored as part of this plan.

A combination of factors have resulted in the conversion of healthy marsh habitat to open water and degraded marsh within the project area. Some of the primary influencing factors include subsidence, lack of riverine sediment input, (Baumann et al. 1984), the alteration of hydrology resulting from the dredging of oil and gas canals (Sasser et al. 1986) and sea-level rise (Penland and Ramsey 1990).





Bayou Dupont Sediment Delivery Marsh Creation #3 and Terracing (BA-0164) and Neighboring Restoration Projects

Data Source:
 2015 NAIP TC Imagery
 Coastal Protection and Restoration Authority
 of Louisiana
 New Orleans Regional Office
 Map produced February 16, 2018
 Scale 1:85,000



Legend

- BA-0164 Marsh Creation
- BA-0164 Terraces
- BA-0003c Outfall Management
- BA-0026 Shoreline Protection
- BA-0039 Marsh Creation
- BA-0039 Increment 2 Marsh Creation
- BA-0041 Shoreline Protection and Marsh Creation
- BA-0043-EB (Long Distance Sediment Pipeline)
- Pipeline Corridor Extension & BA-0043-EB Marsh Creation
- BA-0043-EB Marsh Creation (included in monitoring)
- BA-0043-EB Marsh Creation (not included in monitoring)
- BA-0048 Marsh Creation and Ridge Restoration

Figure 1. Location of Bayou Dupont Sediment Delivery Marsh Creation #3 and Terracing (BA-0164), neighboring restoration projects, and the Alliance Anchorage borrow site.



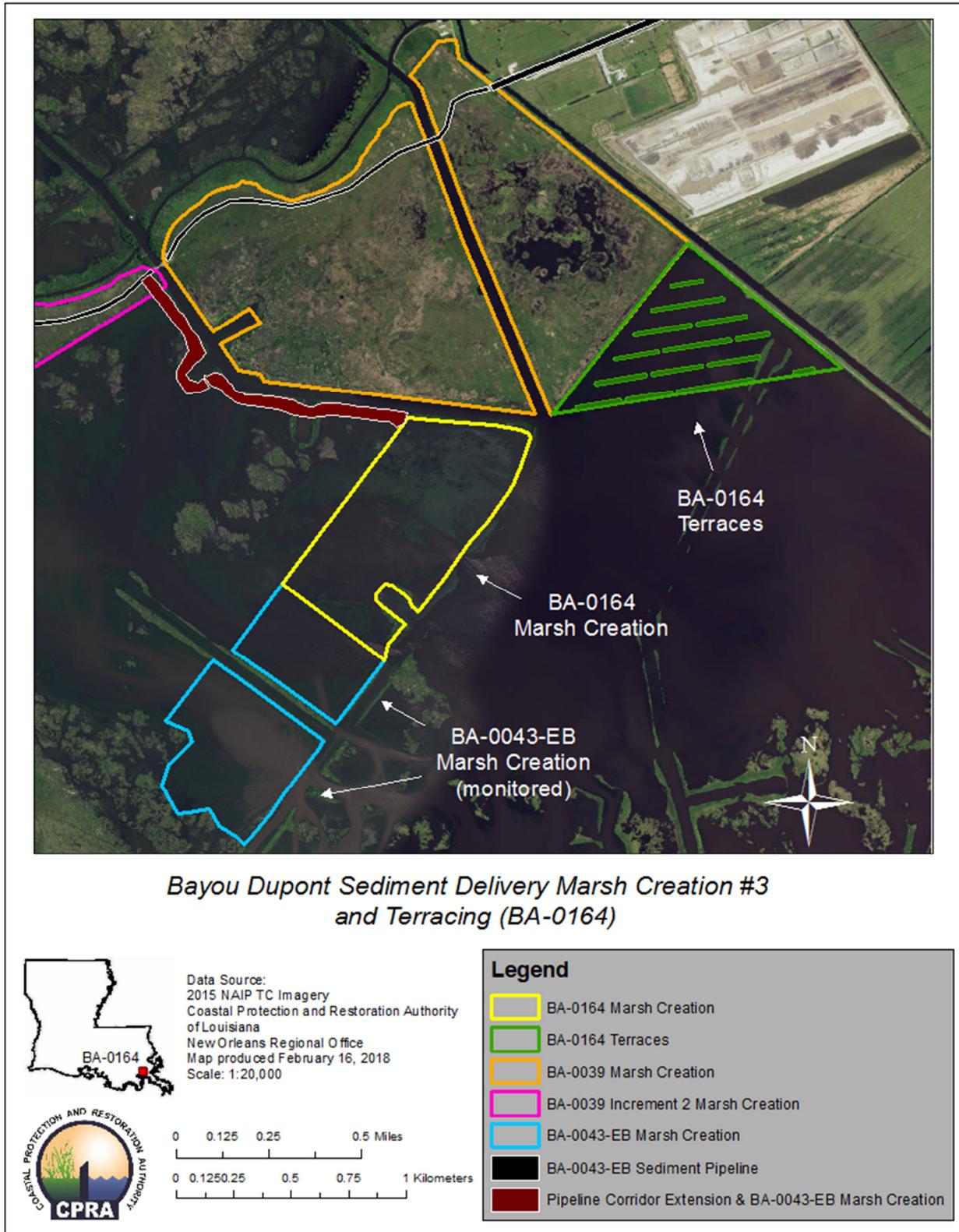


Figure 2. Bayou Dupont Sediment Delivery Marsh Creation #3 and Terracing (BA-0164). The adjacent BA-0043-EB marsh creation cells will also be monitored as part of this plan.

The BA-0164 project area is located on the west bank of the Mississippi River in Jefferson and Plaquemines Parishes, west-northwest of the town of Myrtle Grove, Louisiana (Figure 1). The project area lies between the Plaquemines Parish flood protection levee to the east and Bayou Dupont to the southwest. The northern boundary of the marsh creation and the northwest boundary of the terraces are adjacent to the CWPPRA-funded Mississippi River Sediment Delivery System–Bayou Dupont (BA-0039) marsh creation project, which is also sponsored by the EPA.

The BA-0164 project area is located within the project boundary for Naomi Outfall Management (BA-0003c), another CWPPRA-funded project that is sponsored by the US Natural Resources Conservation Service. Additional restoration projects that include marsh creation, ridge restoration and shoreline protection strategies have been constructed in the vicinity of BA-0164 (Figure 1). Information about these projects is available at <http://cims.coastal.louisiana.gov>.

Construction of the BA-0164 project began in April 2016 and was completed in August 2016 for the marsh creation platform and in June 2017 for the terraces. Prior to construction of the marsh creation platform, the existing spoil bank along the northern, eastern and southern project boundary was fortified and elevated with insitu sediment to contain the dredged river sediment as it dewatered and consolidated. This containment was designed to a height of $+3.5 \text{ ft} \pm 0.5 \text{ ft}$ NAVD88 (Geoid03)* with a five-foot wide crown and side slopes of 1(V):5(H) (Moffatt & Nichol 2014). The western boundary of the project area was left uncontained to provide a more natural shoreline and facilitate hydrologic exchange. The marsh creation platform was designed to an elevation of $+2.5 \text{ ft} \pm 0.5 \text{ ft}$ and it is predicted to settle to approximately $+0.8 \text{ ft}$ at year 20 (GeoEngineers 2014). Construction of the BA-0043-EB marsh creation area that will be monitored in conjunction with BA-0164 was completed in September 2016 and was designed to the same marsh creation specifications as BA-0164.

The terraces were constructed to a height of $+2.5 \text{ ft} + 0.5 \text{ ft}$ using sediment that was dredged from within the terrace field. The 14 terraces have variable lengths, but are all constructed with a 10-foot wide crest and side slopes of 1(V):5(H) (Moffatt and Nichol 2017a). The terraces are predicted to settle to $+1.78 \text{ ft}$ at year 20; however, this elevation only takes into account consolidation settlement. Additional settlement from shrinkage due to drying could occur, potentially resulting in an elevation as low as $+1.45 \text{ ft}$ at year 20. The construction of terraces will not only result in the direct creation of marsh habitat, but may also facilitate marsh building by trapping suspended sediments in the shallow open water areas adjacent to the terraces. The terraces will also reduce erosive wave energy, thereby adding protection for the neighboring Plaquemines Parish flood protection levee and BA-0039 project area. Vegetative plantings of the terraces with *Spartina alterniflora* (smooth cordgrass) and *Paspalum vaginatum* (seashore paspalum) are scheduled to occur within the year post-construction to help stabilize the sediment and enhance colonization by native vegetation.

**All elevations cited in this plan are NAVD88, Geoid03*



Goal and Objectives

The goal of Bayou Dupont Marsh Creation #3 and Terracing (BA-0164) is to create marsh and terraces in an area adjacent to the Mississippi River Sediment Delivery System–Bayou Dupont (BA-0039) project that is composed of primarily open water and degraded marsh habitat. The anticipated benefits provided by the project include the creation of important wetland habitat and a localized reduction in wave energy and coastal erosion. The created marsh and terraces are anticipated to be sustainable and provide ecological and storm-buffering benefits through the project’s 20-year CWPPRA lifespan. The objectives of BA-0164 have been updated to include revisions to the constructed project features and are as follows (LCWCR Task Force 2017):

- 1) Create and nourish approximately 137 acres of intermediate marsh using pipeline delivery of sediment dredged from the Mississippi River.
- 2) Create approximately 9,679 linear feet of earthen terraces using sediment dredged from within the project area.

The BA-0164 project is included in Louisiana’s Comprehensive Master Plan for a Sustainable Coast under the Large-Scale Barataria Marsh Creation–Component E, 1st Period Increment (CPRA 2012).

Features

The principal project features covered by this monitoring plan are as follows:

BA-0164 Marsh Creation (Moffatt & Nichol 2017a)

- 144 acres
- 1,135,893 cubic yards of river sediment
- +2.5 ft ± 0.5 ft design elevation
- 6,855 linear feet of earthen containment dikes (insitu sediment)

BA-0164 Earthen Terraces (Moffatt & Nichol 2017a)

- 14 terraces
- 9,666 total linear feet
- Terrace lengths: 248–1052 linear feet
- +2.5 ft + 0.5 ft design elevation
- 10-foot crest width
- Side slopes of 1(V):5(H)

BA-0043-EB Marsh Creation (Moffatt & Nichol 2017)

- 128 acres (148 acres including access corridor)
- 1,001,697 cubic yards of river sediment (1,140,520 cubic yards including access corridor)
- +2.5 ft ± 0.5 ft design elevation
- 18,900 linear feet of earthen containment dikes (insitu sediment; includes access corridor containment dikes)

2. ITEMS REQUIRING MONITORING

Monitoring for BA-0164 includes the collection and analysis of data that will be utilized to measure project success as based on project goals. Project-specific data will be collected and analyzed over time to document the physical and biotic changes that are occurring in the created marsh and terraces. Data will also be utilized from Coastwide Reference Monitoring System-*Wetlands* (CRMS-*Wetlands*) sites surrounding the project area to compare characteristics between the created marsh and local, natural marsh. Operations, Maintenance and Monitoring Reports will be written in years 5, 11, and 20 to summarize and analyze all project-related data. Monitoring years correspond to the federal fiscal year, which runs from October 1 – September 30.

A. Land-Water Analysis

Land-water analysis will be used in conjunction with topographic surveys of the project area to evaluate the project's success of creating a marsh platform and terraces that are sustainable at least through the project's 20-year CWPPRA life. Land to water ratios in the project area will be determined using CRMS aerial photography (Z/I Imaging digital mapping camera) with 1-meter resolution. The photography will be georectified using standard operating procedures described in Steyer et al. (2000). Aerial photography is tentatively scheduled for years 3, 9 and 18, based on the scheduling of CRMS coastwide flights.

B. Vegetation

Vegetation surveys will be conducted to assess whether the project area has been successfully colonized by intermediate marsh vegetation. The colonization, transition, and maturation of the vegetative community will be analyzed for the marsh creation areas and the terraces. The vegetation community in the project area will also be compared to that of local, natural marsh and to that of nearby marsh creation projects.

Vegetation monitoring in the marsh creation area and in the terrace field will each consist of a minimum of ten 2 m x 2 m stations. Data collection at vegetation stations will follow CRMS methodology and will include total percent cover, species present, percent cover of each species, percent cover and height of each vegetation layer, and the depth of water on the marsh surface (Folse et al. 2014). In addition to the stations surveyed in the terrace field, a general assessment of cover and species assemblages will be noted for each terrace (14 terraces) to identify any significant differences and



possible causative elements. Porewater salinity, specific conductivity and temperature will also be recorded at each vegetation station at 10 cm and 30 cm depths. Vegetation sampling is scheduled for years 2, 5, 10, and 19.

C. Topographic Surveys

Data from topographic surveys are used to determine if project features are constructed to the specified heights and are settling at the predicted rate. The as-built topographic surveys for the marsh creation areas and the terraces were conducted in 2016 and 2017, respectively. A final topographic survey of the marsh and terraces is tentatively scheduled for year 5. The as-built survey costs are included in the construction budget, while the year 5 survey costs are included in the operations and maintenance budget.

3. MONITORING BUDGET

The cost associated with monitoring BA-0164 for its twenty-year project life is summarized in the monitoring budget in Appendix I.

4. RESPONSIBILITIES

A. CPRA will:

1. Coordinate and oversee all scientific data collection.
2. Ensure that all data go through quality control procedures and are entered into the public database.
3. Summarize and analyze project data and publish OM&M reports according to the schedule included in this monitoring plan. If the data indicate that the project is not meeting its goals and objectives, adaptive management recommendations will be made to improve the response.
4. Review the monitoring plan and budget annually with the EPA to determine that the data being collected adequately evaluate the project and that funding is suitable to fulfill monitoring requirements.

B. EPA will:

1. Review the monitoring plan and budget annually with CPRA to determine that the data being collected adequately evaluate the project and that funding is suitable to fulfill monitoring requirements.
2. Review OM&M reports.



5. REFERENCES

- Baumann, R.H., J.W. Day, and C.A. Miller. 1984. Mississippi deltaic wetland survival-sedimentation versus coastal submergence. *Science* 224: 1093–1095.
- Coastal Protection and Restoration Authority of Louisiana. 2012. *Louisiana's Comprehensive Master Plan for a Sustainable Coast*. Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA. 189 pp. plus appendices.
- Folse, T.M, L.A. Sharp, J.L. West, M.K. Hymel, J.P. Troutman, T.E. McGinnis, D. Weifenbach, L.B. Rodrigue, W.M. Boshart, D.C. Richardi, W.B. Wood, and C.M. Miller. 2008, revised 2014. A Standard Operating Procedures Manual for the Coastwide Reference Monitoring System-Wetlands: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control. Louisiana Coastal Protection and Restoration Authority. Baton Rouge, LA. 228 pp.
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- Louisiana Coastal Wetlands Conservation and Restoration Task Force. 2017. Bayou Dupont Sediment Delivery-Marsh Creation #3 (BA-164) project fact sheet. 2 pp.
- Moffatt & Nichol. 2017. Mississippi River Long Distance Sediment Pipeline BA-43 (EB) Project Completion Report. Prepared for Louisiana Coastal Protection and Restoration Authority. 65 pp. plus appendices.
- Moffatt & Nichol. 2017a. Bayou Dupont Sediment Delivery Marsh Creation #3 and Terracing (BA-164) Project Completion Report. Prepared for Louisiana Coastal Protection and Restoration Authority. 32 pp. plus appendices.
- Moffatt & Nichol. 2014. Bayou Dupont Sediment Delivery Marsh Creation #3 (BA-164) 95% Design Report. Report prepared for the Coastal Protection and Restoration Authority of Louisiana, Baton Rouge, Louisiana. 40 pp. plus appendices.
- Penland, S. and K.E. Ramsey. 1990. Relative sea-level rise in Louisiana and the Gulf of Mexico: 1908–1988. *Journal of Coastal Research* 6(2): 323–342.
- Sasser, C.E., M.D. Dozier, and J.G. Gosselink. 1986. Spatial and temporal changes in Louisiana's Barataria Basin marshes, 1945–1980. *Environmental Management* 10 (5): 671–680.
- Steyer, G.D., R.C. Raynie, D.L. Steller, D. Fuller, and E. Swenson. 2000. Quality management plan for the Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no. 95-01. Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division. 97 pp.



APPENDIX 1

BA-0164 Monitoring Budget



Bayou Dupont Sediment Delivery-Marsh Creation 3 and Terracing (BA-0164)																					
Monitoring Budget																					
PPL 22																					
Years are federal fiscal years (October 1–September 30)																					
Price Level: 2015																					
	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Monitoring Items	Rates																				
Vegetation Surveys *	\$14,875	15,415			16,359					18,061										22,017	
Land/Water Analysis	\$15,000			16,173						18,213										21,767	
Reports	\$12,000					13,461						15,159									30,228
Monitoring Administration	\$3,120	3,233	3,298	3,364	3,431	3,500	3,570	3,641	3,714	3,788	3,864	3,941	4,020	4,101	4,183	4,266	4,352	4,439	4,527	4,618	4,710
Annual Total		18,649	3,298	19,537	19,790	16,961	3,570	3,641	3,714	40,063	3,864	19,101	4,020	4,101	4,183	4,266	4,352	4,439	26,294	26,635	34,938
Running Total		18,649	21,947	41,483	61,274	78,234	81,804	85,445	89,160	129,223	133,087	152,187	156,208	160,308	164,491	168,757	173,109	177,548	203,842	230,476	265,415
Total	\$265,415																				
Topographic Survey **						67,305															

* The monitoring budget includes the originally scheduled years for the Vegetation Surveys. The revised schedule is noted in Section II. B of the monitoring plan.

** The topographic survey cost is included in the operations and maintenance budget and is not factored into the \$265,415 total monitoring cost.

