CS-18

Sabine Refuge Protection
Summary Graphics

9-25-03

Sharp, L. A. 2003. *CS-18 Sabine Refuge Protection Summary Data and Graphics, Louisiana Department of Natural Resources, Coastal Restoration Division, Baton Rouge, Louisiana. 16 pp.*

Sabine Refuge Protection (CS-18)

Project Overview:

The project is located approximately 20 mi (32 km) west-southwest of Hackberry, Louisiana (figure 1) on the east levee of the Burton-Sutton Canal (BSC) adjacent to the Sabine National Wildlife Refuge Impoundment 3, a 27,000 ac (10,927 ha) freshwater impoundment that provides habitat for freshwater game fish, alligator, furbearers, and migratory and resident waterfowl. The impoundment supports freshwater vegetation including *Zizaniopsis aquatica* (giant cutgrass) and *Nelumbo lutea* (American lotus). The existing west levee along Impoundment 3, which was constructed in 1951, has already deteriorated due to boat wake erosion and subsequent sloughing of levee material into the BSC. Continued erosion will result in multiple breaches of the levee, allowing higher salinity waters from the Calcasieu Ship Channel and Sabine Lake to enter the impoundment via the BSC. Since much of the freshwater marsh within the impoundment is highly organic and floating, saltwater intrusion and increased tidal exchange would likely convert as much as 13,000 ac (5,261 ha) of the impoundment to shallow open water (LCWCRTF 1991; USFWS 1991). The loss of floating and submersed vegetation would result in greater wind-induced wave erosion of the remaining marsh within the impoundment.

To prevent further bank erosion, 5.5 mi (8.9 km) of free-standing rock breakwater was constructed on the canal side of the east levee of the BSC (figure 1) and the levee was restored where it had been degraded using dredge material from the canal in January, 1995.

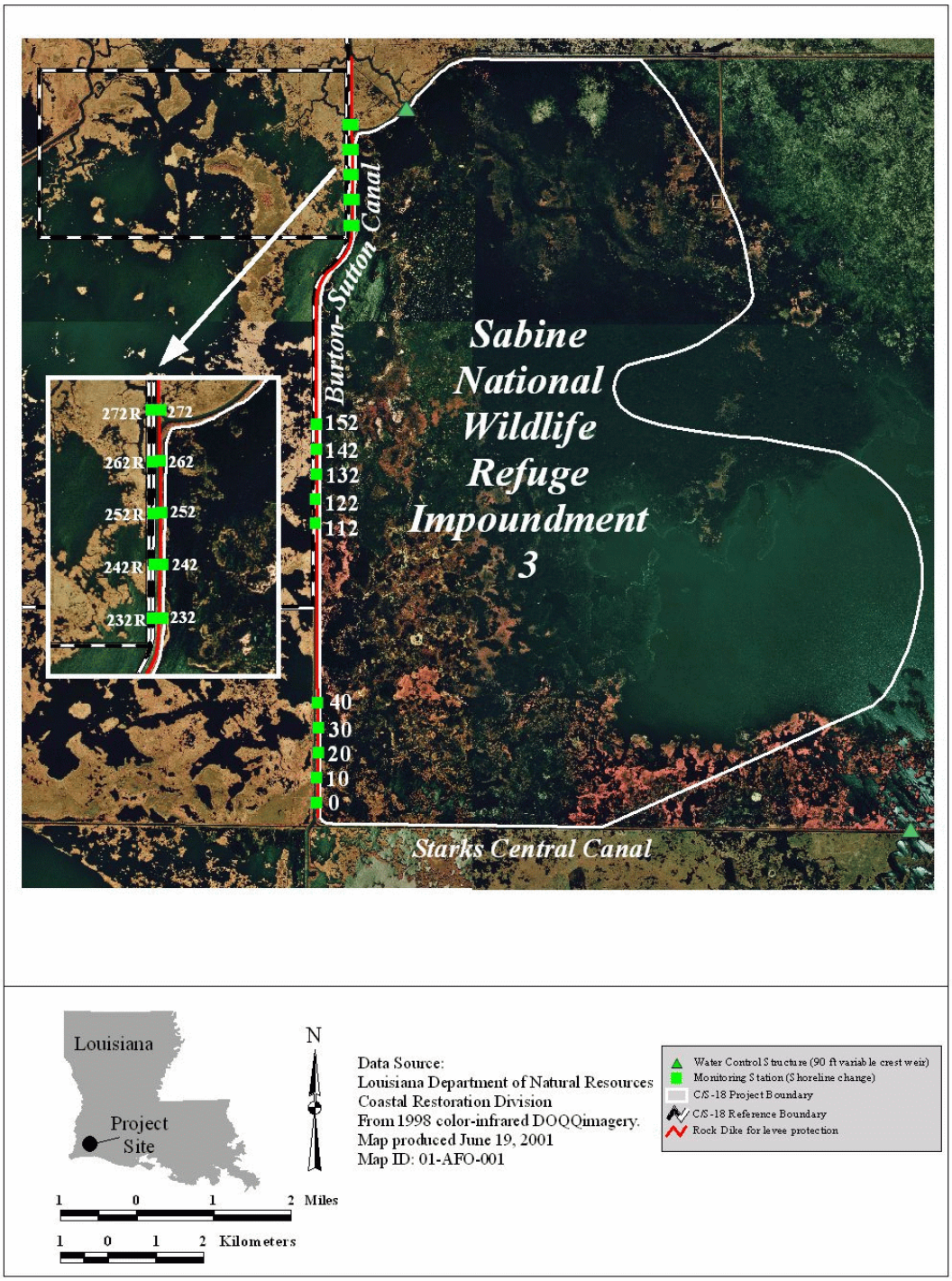

Figure 1. Sabine Refuge Protection (CS-18) project boundary, reference boundary, rock dike along the Burton-Sutton Canal, and shoreline change monitoring station locations.

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Project Objective:

Protect the existing freshwater vegetation within Impoundment 3 of Sabine NWR adjacent to the Burton-Sutton Canal. Prevent the encroachment of the Burton-Sutton Canal into the impoundment.

Specific Goals

The following goals will contribute to the evaluation of the above objective:

1 Restore and protect the west levee of Impoundment 3 using dredge material and a free-standing rock breakwater.

2. Protect existing freshwater vegetation in Impoundment 3 from saltwater intrusion via the Burton-Sutton Canal.

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Monitoring Elements:

Aerial Photography: Near-vertical color-infrared aerial photography (1:24,000 scale) was used to measure vegetated and non-vegetated areas for the project and reference areas. The photography was obtained on November 1, 1993 prior to construction and on January 7, 1997, 2 yr following project construction. The original photography was checked for flight accuracy, color correctness, and clarity and was subsequently archived. Aerial photography was scanned, mosaicked, and georectified by USGS/NWRC personnel according to standard operating procedures (Steyer et al. 1995, revised 2000).

Shoreline Change: To document shoreline movement, shoreline markers were placed on the vegetated marsh edge along the east bank of the BSC (and in a reference area along the west bank of the BSC, opposite the northernmost mile of the rock dike) adjacent to the northernmost, central, and southernmost miles of the rock dike, at 1,000 ft (305 m) intervals. Shoreline position relative to the shoreline markers was documented by direct measurement in 1995 (pre-construction), and post-construction in 2000. Shoreline position will be monitored in 2005, 2010, and 2014. Aerial photography and GPS measurements were also be used to document shoreline movement.

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Aerial Photography

Aerial photography was flown in November 1993 and January 1997.

Figures:

Figure 2. Sabine Refuge Protection (CS-18) GIS analysis of project and reference area pre-construction aerial photography (1993).

Figure 3. Sabine Refuge Protection (CS-18) GIS analysis of project and reference area post-construction aerial photography (1997).

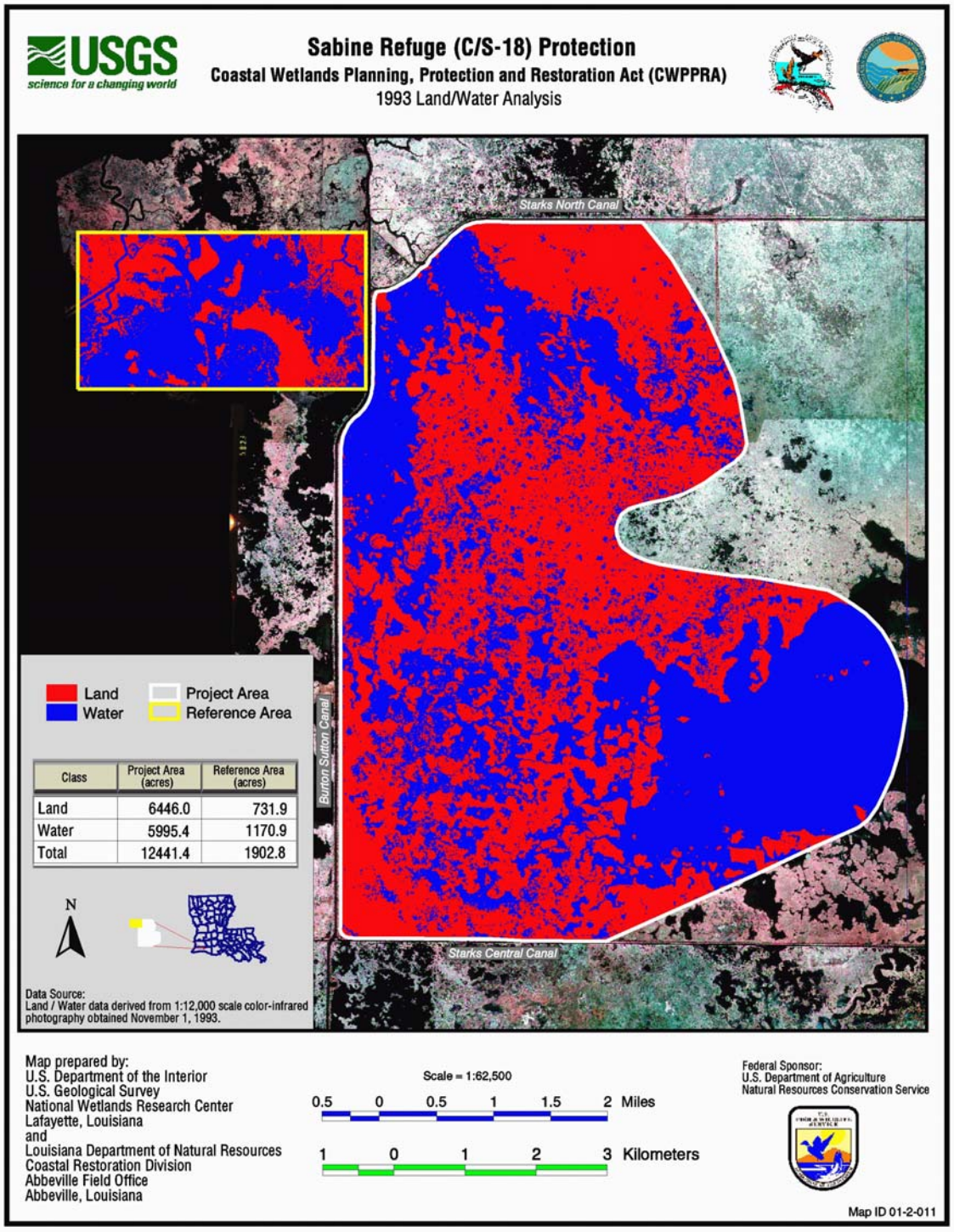

Figure 2. Sabine Refuge Protection (CS-18) GIS analysis of project and reference area pre-construction aerial photography (1993).

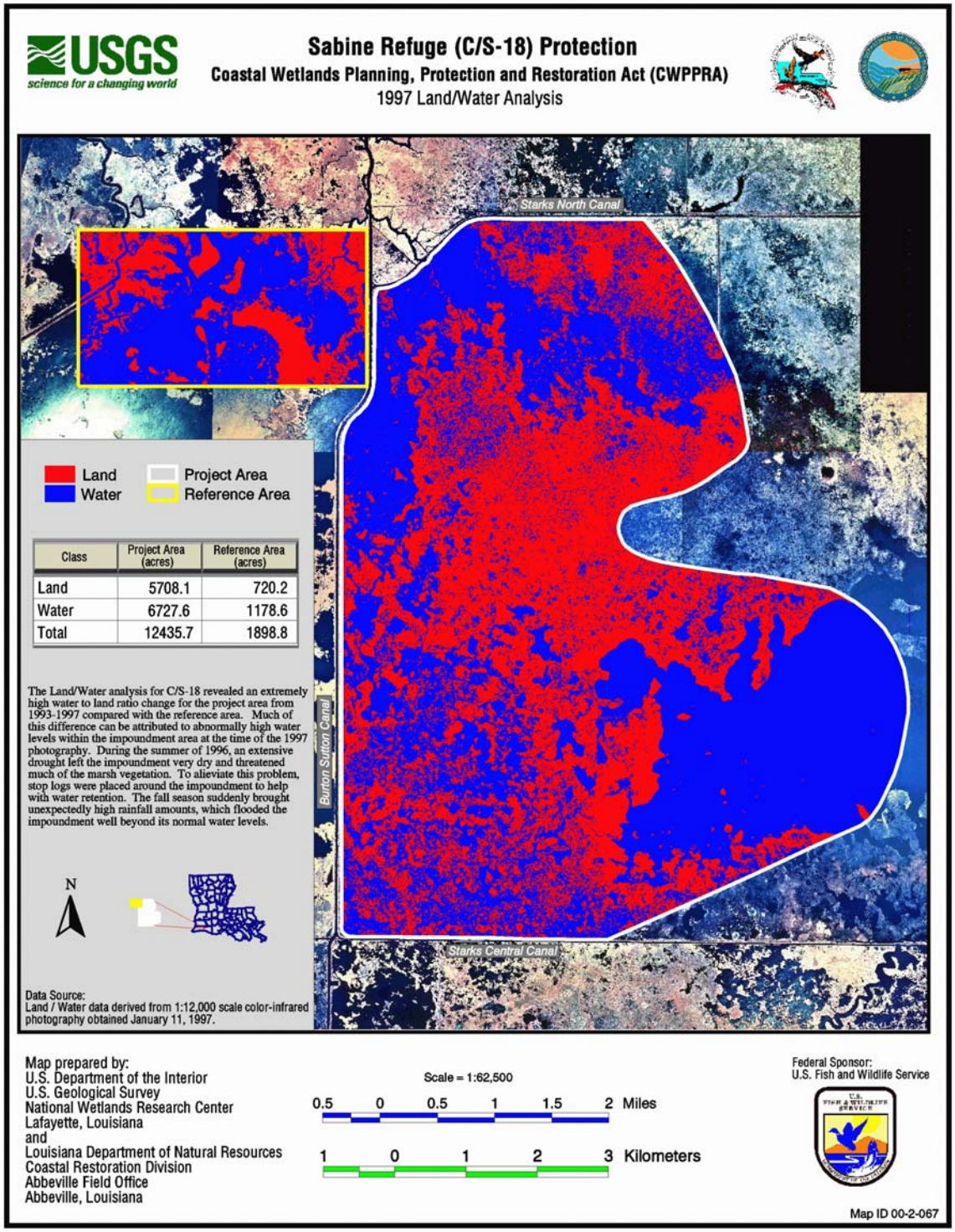

Figure 3. Sabine Refuge Protection (CS-18) GIS analysis of project and reference area post-construction aerial photography (1997).

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Shoreline Change

Shorelines were measured from shoreline markers on the the vegetated edge of the canal both in the project and reference area in October 1995 and August 2000. Rates of shoreline change were calculated in both feet and meters.

Tables:

Table 1. Sabine Refuge Protection (CS-18) shoreline change data (ft).

Table 2. Sabine Refuge Protection (CS-18) shoreline change data (m).

Figures:

Figure 4a. Sabine Refuge Protection (CS-18) shoreline change for the project and reference area from 1995 to 2000 (ft/yr).

Figure 4b. Sabine Refuge Protection (CS-18) shoreline change for the project and reference area from 1995 to 2000 (m/yr).

Figure 5a. Sabine Refuge Protection (CS-18) shoreline change (ft) at project and reference area monitoring station locations between October 1995 and August 2000.

Figure 5b. Sabine Refuge Protection (CS-18) shoreline change (m) at project and reference area monitoring station locations between October 1995 and August 2000.

CS-18 Shoreline Marker Data

Project Number	Station #	Group	1995 Center (ft)	2000 Center (ft)	Difference (ft)
C/S-18	C/S18-00	Project	10.8	17.4	6.6
C/S-18	C/S18-10	Project	20	25.3	5.2
C/S-18	C/S18-20	Project	15.1	19.4	4.3
C/S-18	C/S18-30	Project	14.1	19	4.9
C/S-18	C/S18-40	Project	11.2	13.8	2.6
C/S-18	C/S18-112	Project	22.6	16.7	-6.2
C/S-18	C/S18-122	Project	12.1	16.4	4.3
C/S-18	C/S18-132	Project	10.8	14.1	3.3
C/S-18	C/S18-142	Project	22	24.3	2.3
C/S-18	C/S18-152	Project	14.8	16.4	1.3
C/S-18	C/S18-232	Project	17.7	24.9	7.2
C/S-18	C/S18-242	Project	7.9	11.8	3.9
C/S-18	C/S18-252	Project	8.5	13.5	4.9
C/S-18	C/S18-262	Project	7.9	9.8	2.3
C/S-18	C/S18-272	Project	13.5	17.4	4.3
C/S-18	C/S18-232R	Reference	20.3	23.6	3
C/S-18	C/S18-242R	Reference	19.4	20	0.6
C/S-18	C/S18-252R	Reference	18.4	18.4	0.0
C/S-18	C/S18-262R	Reference	16.4	24.9	8.5
C/S-18	C/S18-272R	Reference	8.9	11.2	2.3

Table 1. Sabine Refuge Protection (CS-18) shoreline change data (ft).

CS-18 Shoreline Marker Data

Project Number	Station #	Group	1995 Center (m)	2000 Center (m)	Difference (m)
C/S-18	C/S18-00	Project	3.3	5.3	2.0
C/S-18	C/S18-10	Project	6.1	7.7	1.6
C/S-18	C/S18-20	Project	4.6	5.9	1.3
C/S-18	C/S18-30	Project	4.3	5.8	1.5
C/S-18	C/S18-40	Project	3.4	4.2	0.8
C/S-18	C/S18-112	Project	6.9	5.1	-1.9
C/S-18	C/S18-122	Project	3.7	5.0	1.3
C/S-18	C/S18-132	Project	3.3	4.3	1.0
C/S-18	C/S18-142	Project	6.7	7.4	0.7
C/S-18	C/S18-152	Project	4.5	5.0	0.4
C/S-18	C/S18-232	Project	5.4	7.6	2.2
C/S-18	C/S18-242	Project	2.4	3.6	1.2
C/S-18	C/S18-252	Project	2.6	4.1	1.5
C/S-18	C/S18-262	Project	2.4	3.0	0.7
C/S-18	C/S18-272	Project	4.1	5.3	1.3
C/S-18	C/S18-232R	Reference	6.2	7.2	0.9
C/S-18	C/S18-242R	Reference	5.9	6.1	0.2
C/S-18	C/S18-252R	Reference	5.6	5.6	0.0
C/S-18	C/S18-262R	Reference	5.0	7.6	2.6
C/S-18	C/S18-272R	Reference	2.7	3.4	0.7

Table 2. Sabine Refuge Protection (CS-18) shoreline change data (m).

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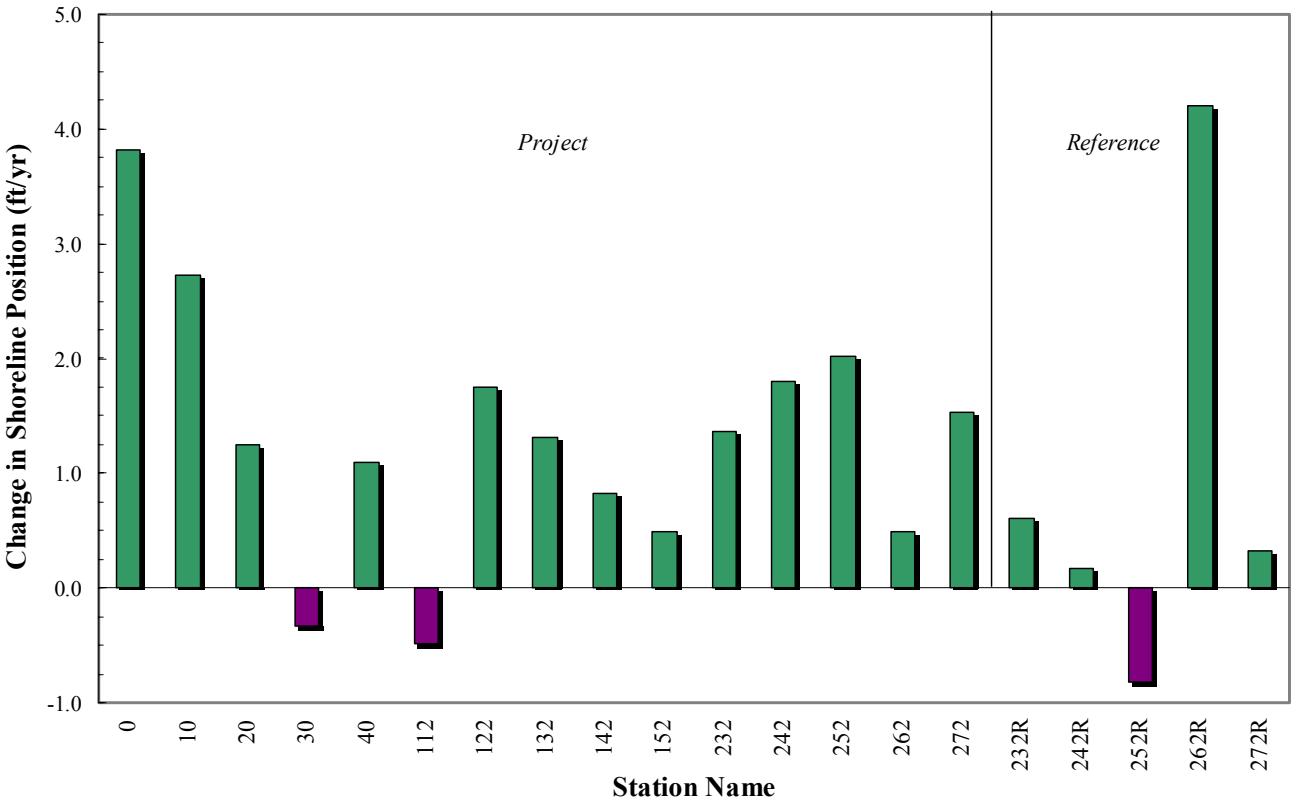

Figure 4a. Sabine Refuge Protection (CS-18) shoreline change for the project and reference area from 1995 to 2000. Rates are calculated in ft/yr.

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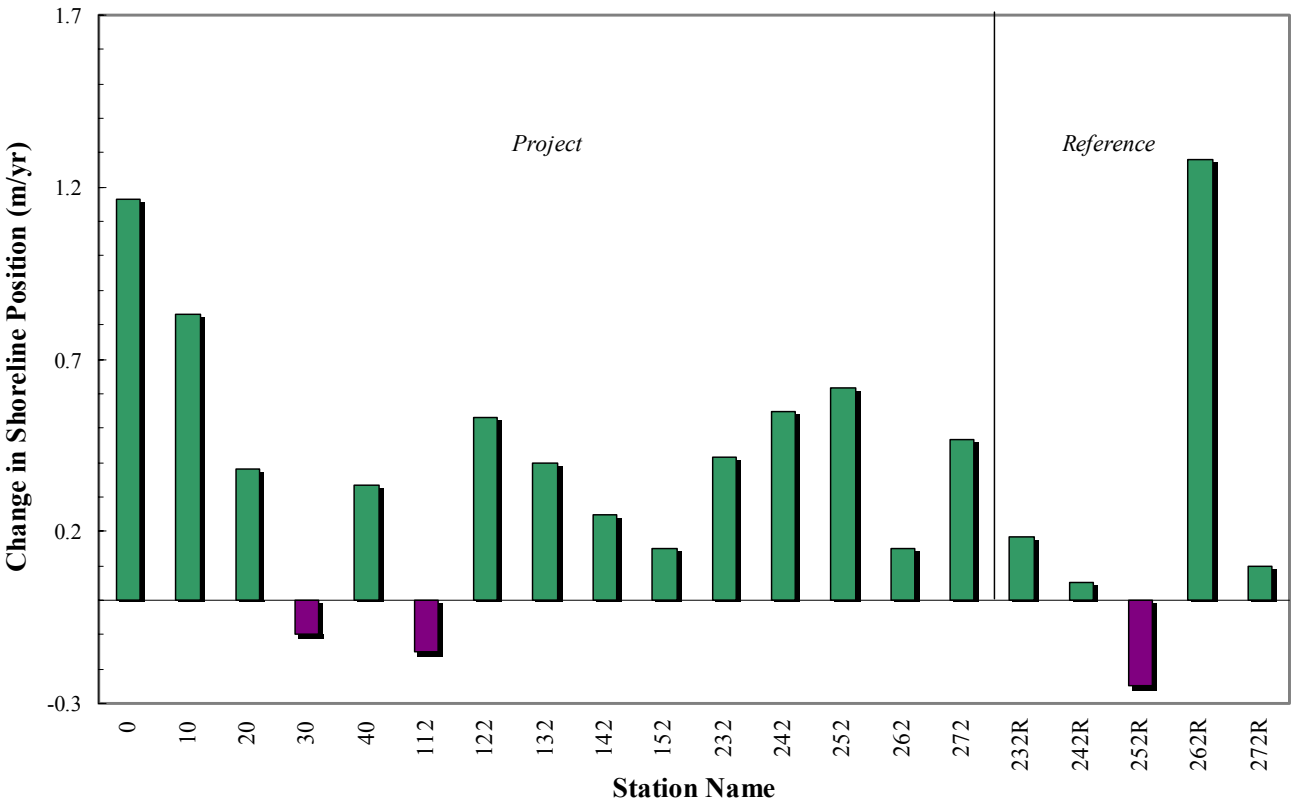

Figure 4b. Sabine Refuge Protection (CS-18) shoreline change for the project and reference area from 1995 to 2000. Rates are calculated in m/yr.

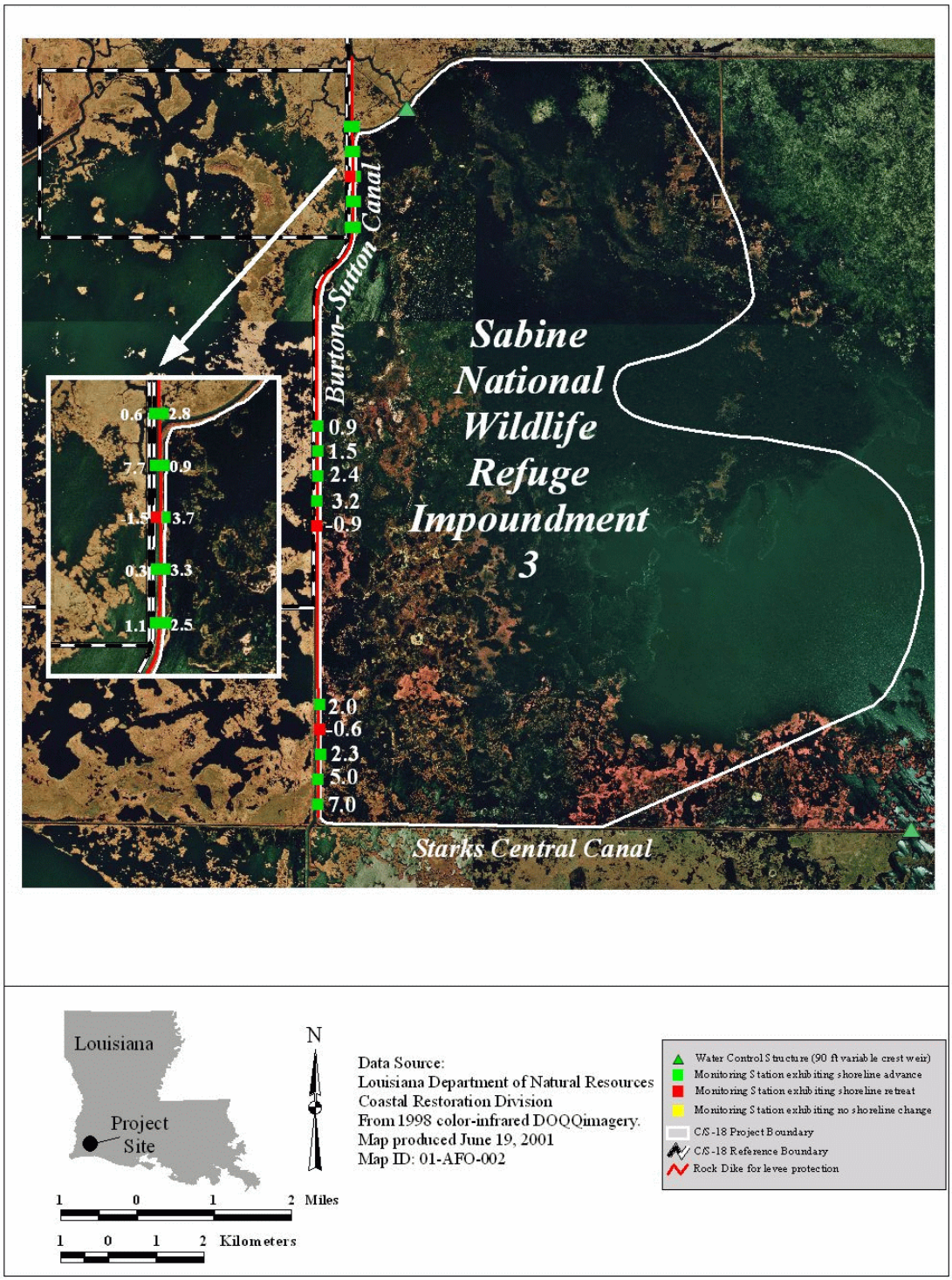

Figure 5a. Sabine Refuge Protection (CS-18) shoreline change (ft) at project and reference area monitoring station locations between October 1995 and August 2000.

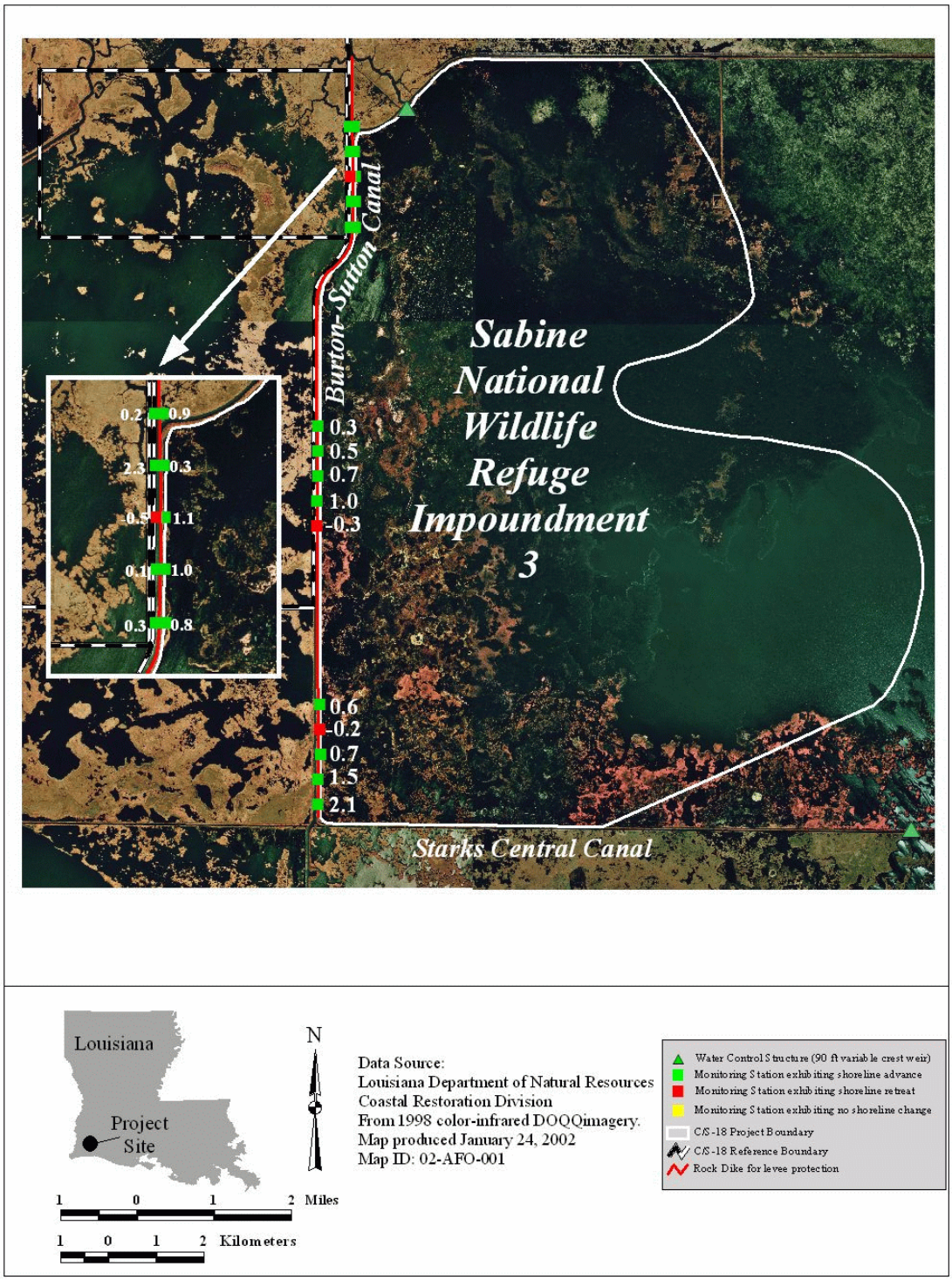

Figure 5b. Sabine Refuge Protection (CS-18) shoreline change (m) at project and reference area monitoring station locations between October 1995 and August 2000.

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Preliminary Findings

Aerial photography: It was determined that the 1997 post construction aerial photography was flown when water levels in Impoundment 3 were much higher than during pre-construction photography (1993). The landloss in Impoundment 3 (Figures 2 and 3) is not as high as it appears. Field observations suggest that little or no landloss is according.

Shoreline change: Shoreline survey results, presented in figures 4a and 4b, show shoreline position change during the study period differing by less than 8.5 ft (2.6 m) at any one station for both the project and reference areas. Shoreline advance was detected at all project stations except stations 30 and 112 and for all reference stations except 252R during the period between 1995 and 2000 (figure 5). Mean shoreline advance rates were calculated to be 1.3 $\pm$ 1.1 ft/yr (0.4 $\pm$ 0.3 m/yr) and 0.9 $\pm$1.9 ft/yr (0.3 $\pm$ 0.6 m/yr) for the project and reference areas, respectively. The results of the two-sample t-test indicated that there was no significant difference in shoreline change rate detected between the project and reference areas ($\boldsymbol{P} = 0.90$).

Examination of the engineers' first annual inspection report (October 1996) and inspection by LDNR monitoring personnel in December 1997 and August 2000 provided evidence that the Sabine Refuge Impoundment 3 levee and the protective rock dike are in good condition.

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Preliminary Findings

Shoreline change (cont'd):

Scheduled shoreline change surveys (for years 2005, 2010, and 2014), and comprehensive monitoring reports for years 2006, 2011, and 2015 will be completed and will provide further monitoring documentation for this shoreline protection project. Future inspections of the project area by CRD engineers will be conducted at regular intervals to document the condition of the rock breakwater and any required maintenance.