

Chapter 5 - Environmental Setting of Juan Diaz Area

5.1 Background

The location of a regional wastewater treatment plant serving the City of Panamá has been identified in the vicinity of the Río Juan Diaz since 1976. Siting of the regional in the general vicinity of the Río Juan Diaz has been confirmed in the 2002 Consolidated Masterplan. To better understand the environmental setting of potential Juan Diaz sites, a Habitat Assessment has been prepared of the general area in accordance with Operational Policy (OP) 4.01 of the World Bank.

5.2 Site Description and Location

The site is located along the Corredor Sur east of Panamá City, Republic of Panamá. The site is bounded by a residential community Costa del Este to the west, the Corredor Sur to the north, the Río Juan Díaz to the east, and the Bahía de Panamá to the south. The site may be accessed via the exit at Calle 125 Este, which bisects the site. Please see Figure 5-1 for a location map of this site.

Historically, the entire site was most likely part of a large, tidally influenced mangrove area on the Bahía de Panamá. A berm and canal system running parallel to the shoreline approximately 15 meters inside the tree line at the shore prevents all but extremely high storm tides from reaching inland. More recently, a large portion of the site has been used for rice cultivation and cattle grazing. Currently, portions of the site are being used for a variety of industrial types such as solid waste disposal, a commercial marina and maintenance facility, and the land based operations of a sand dredge facility with associated storage and loading areas. There is significant truck traffic utilizing Calle 125 Este on a daily basis for all of these operations.

5.3 Methodology

Aerial photography for the site was analyzed for common vegetative signatures indicating the presence of wetland and upland habitats. A general land cover classification map was developed and field verified. Field verification was completed by CZR Incorporated biologists on 26 February 2003. The work was performed on foot utilizing Trimble GPS equipment to map the limits of habitat types and other key features. Indicators were used to develop the habitat boundaries: vegetation, soils, and hydrology.

The functional analysis methodology used for wetland habitats in this site evaluation was the Wetland Rapid Assessment Procedure (WRAP). The Wetland Rapid Assessment Program (WRAP) is a rating index developed by the South Florida Water Management District in 1997 to assist the regulatory evaluation of wetlands and wetland mitigation sites. The procedure has shown itself to be highly repeatable, and has been adopted by the U.S. Army Corps of Engineers for use in their wetland permitting program. WRAP can be used in combination with professional judgment to provide an accurate and consistent evaluation of wetland sites.

WRAP assesses, on a 0 to 3 basis, each of six major criteria, including wildlife utilization, wetland overstory/shrub canopy, vegetative ground cover, adjacent upland support/wetland

buffers, field indicators of hydrology, and water quality input and treatment system. A matrix provided in the WRAP manual assists the rating biologist in arriving at an appropriate score for each of the indices. These scores are then added, and the result divided by the highest possible score to obtain a comparison number between 0.0 and 1.0. Each wetland type is rated according to its attributes; WRAP is not intended to compare different wetland community types to each other (i.e., marsh to wet prairie), rather, it is an evaluative method by habitat type.

Generally speaking, wetlands with a rating above 0.66 are considered to be high quality wetland; those with a score between 0.33 and 0.66 of medium quality; and those with a score below 0.32 of low quality. Multiplying the WRAP score obtained times the acreage of the wetland can provide a numerical value of functional quality. This can then be compared with a similar numerical value for mitigation areas to determine possible net loss/gain of wetland function and value for a particular project.

5.4 Summary

The site contains upland habitats (managed grass areas and tropical forests) and wetland habitats (seasonally wet prairie and mangrove forests). The site has been separated into thirteen distinct habitat areas, shown graphically in Figure 5-2. Table 5-1 summarizes the WRAP analysis. Table 5-2 details the observed plant species.

Overall, mangrove forests dominate the site, especially toward the Bahía de Panamá and Río Juan Díaz. Areas C, E, G, and I are high quality mature forested wetlands. It is apparent from the height and maturity of these areas that despite the lack of regular tidal over-wash and the extended dry season, subterranean hydrologic factors are sufficient to maintain them as wetlands.

The “open” areas were created for either rice cultivation or grazing and have been maintained regularly. Of these open areas, Area A, B, L, and M are wetlands dominated by herbaceous species. The quality of these wetlands is generally very low, and the maintenance regime (regular burning and cattle grazing) appears to be forcing the succession of these areas.

The remaining Areas D, F, and H are uplands that are dominated by shrubby species and thick grasses. They are low quality upland habitats. Areas J and K are former rice growing areas that were probably natural wetlands at some time in the past, and currently have few wetland characteristics. They are currently being managed as pasturelands, with management techniques including annual burning as a means of vegetation control. They are not presently wetlands.

**Table 5-1
Habitat Area Wrap Analysis Summary**

Area	Habitat Description	Wrap Score	Wetland Acres	Wetland Hectares	Upland Acres	Upland Hectares
A	Seasonally Wet Prairie	0.42	20.88	8.451		
B	Seasonally Wet Prairie	0.48	6.67	2.701		
C	Forested Mangrove	0.42	27.56	11.151		
D	Rangeland	NA/NW			29.17	11.805
E	Forested Mangrove	0.69	205.59	83.300		
F	Mixed Rangeland	NA/NW			14.21	5.750
G	Forested Mangrove	0.72	237.34	96.050		
H	Mixed Rangeland	NA/NW			34.55	13.983
I	Forested Mangrove	0.45	32.08	12.981		
J	Improved Pasture	NA/NW			63.61	25.744
K	Improved Pasture	NA/NW			121.52	49.179
L	Shrubby Mangrove/ Seasonally Wet Prairie	0.39	25.08	10.149		
M	Seasonally Wet Prairie	0.68	60.06	24.306		
	:	TOTALS	615.26	248.989	263.06	106.461

Table 5-2
Observed Plant Species – Juan Díaz Site

Common Name	Scientific Name
Almendro	<i>Andira inermis</i>
Balo	<i>Gliricidia sepium</i>
Balsa	<i>Ochroma pyramidalis</i>
Black Mangrove	<i>Avicennia germinans</i>
Buttonwood	<i>Conocarpus erectus</i>
Chirimoya	<i>Annona spraguei</i>
Coinwort	<i>Centella erecta</i>
Corotú	<i>Enterolobium cyclocarpum</i>
Guachapalí	<i>Samanea saman</i>
Guácimo	<i>Guazuma ulmifolia</i>
Gumbo limbo	<i>Bursera simaruba</i>
Jobo	<i>Spondias mombin</i>
Lantana	<i>Lantana camara</i>
Leather fern	<i>Acrostichum danaeifolium</i>
Mango	<i>Mangifera indica</i>
Palm	<i>Elaeis oleifera</i>
Panamá tree	<i>Sterculia apetala</i>
Panicum	<i>Panicum</i> sp.
Papaya	<i>Carica papaya</i>
Paspalum	<i>Paspalum fimbriatum</i>
Plantain	<i>Plantago</i> sp.
Poison ivy	<i>Toxicodendron radicans</i>
Red Mangrove	<i>Rhizophora mangle</i>
Sea grape	<i>Coccoloba uvifera</i>
Spanish plum	<i>Spondias radlkoferi</i>
Sedges	<i>Rhynchospora</i> spp.
Smilax	<i>Smilax</i> sp.
Spartina	<i>Spartina bakeri</i>
Strangler fig	<i>Ficus aurea</i>
Teak	<i>Tectona grandis</i>
Tropical almond	<i>Terminalia catappa</i>
Uvita	<i>Bactris major</i>
Verbena	<i>Verbena vigida</i>
White Mangrove	<i>Laguncularia racemosa</i>
Wild coffee	<i>Psychotria</i> sp.

5.5 Habitat Descriptions

5.5.1 Area A

Approximate Size: 20.88 Acres, 8.451 Hectares

Habitat Type: Wetland – Seasonally Wet Prairie

WRAP Score: 0.42

Photopoint 1

Observed Vegetation – This is a seasonally wet grass area dominated by *Panicum* sp. It appears to be maintained by periodic burning (not burned at the time of the field survey), and contains several scattered upland species such as very large corotú trees, plantain, and uvita. The area is not forested and there is no evident shrub canopy, although the grass species were observed to be as tall as 2 meters in several places.

Soil Characteristics – The soils in this area appear to be mostly clay. The soils were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or gleying (i.e., presence of bluish or greenish colors through the soil mass as a result of the reduction of iron due to prolonged soil saturation) to the soils observed.

Hydrologic Characteristics – The soils did not exhibit any evidence of a long (more than 2 months) period of inundation. There were no other indicators observed such as high water marks on trees or algal mats to indicate that this area is seasonally inundated. However, its proximity to the Juan Díaz River and its sloping topography indicate that this area is part of the floodplain for the river.

5.5.2 Area B

Approximate Size: 6.67 Acres, 2.701 Hectares

Habitat Type: Wetland – Seasonally Wet Prairie

WRAP Score: 0.48

Photopoint 2

Observed Vegetation – This area is comprised of wetland grasses dominated by *Spartina* sp. Other species observed include coinwort and other small verbena. There was evidence of use by small crustaceans.

Soil Characteristics – The soils in this area appear to be mostly clay. They were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or gleying to the soils observed.

Hydrologic Characteristics – The soils exhibited strong evidence of a long period of inundation. There were no indicators observed such as high water marks on trees or algal mats to indicate that this area is sustained inundated. However, the soils did exhibit a significant amount of

cracking. The cracking was regular with pieces averaging 30 cm. The cracks averaged 7 cm with a depth up to 15 cm. The area appears to be part of a floodplain for the Juan Díaz River.

5.5.3 Area C

Approximate Size: 27.56 Acres, 11.151 Hectares

Habitat Type: Wetland – Forested Mangrove

WRAP Score: 0.42

Photopoint 3

Observed Vegetation – This area is forested mangrove dominated by small white mangrove and black mangrove (height ranging from 1 to 3 meters). There appears to be several small *Spartina* dominated inclusions within and surrounding this area.

Soil Characteristics – The soils in this area appear to be mostly clay. They were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or staining to the soils observed.

Hydrologic Characteristics – The soils exhibited some evidence of a seasonal period of inundation. Though no high water marks were observed, there were small areas that appeared to be old algal mats. The area appears to be a floodplain, depressional toward the center, and flowing to the east where it culminates in a small channel.

5.5.4 Area D

Approximate Size: 29.17 Acres, 11.805 Hectares

Habitat Type: Upland – Rangeland

WRAP Score: Not Applicable – Not a Wetland (NA/NW)

Photopoint 4

Observed Vegetation – This area is comprised of upland grasses dominated by *Panicum* sp. It appears to be maintained by periodic burning, and contains several large corotú trees, plantain, and uvita. The area is not forested and there is no evident shrub canopy, although the grass species were observed to be as tall as 2 meters in several places.

Soil Characteristics – The soils in this area appear to be a mixture of sand and clay. The topography of this area suggests that it may contain fill material. There did not appear to be any hydric characteristics to the soils observed.

Hydrologic Characteristics – The soils did not exhibit any evidence of a seasonal period of inundation. There were no other indicators observed such as high water marks on trees or algal mats to indicate that this area is seasonally inundated. This area is currently being used as a low level landfill area.

5.5.5 Area E

Approximate Size: 205.59 Acres, 83.200 Hectares

Habitat Type: Wetland – Forested Mangrove

WRAP Score: 0.69

Photopoint 5-7

Observed Vegetation – This area is dominated by large white mangroves and black mangroves, ranging in height from 7 to 20 meters. Other observed species include red mangrove and leather fern. In addition, strong evidence of use by small crustaceans was observed.

Soil Characteristics – The soils in this area appear to be mostly clay. The soils were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or staining to the soils observed.

Hydrologic Characteristics – The soils exhibited strong evidence of a seasonal period of inundation. There were seasonal high water marks noted on the trunks (@ ± 0.2 meters). The detrital leaf litter also suggested seasonal ponding. The area surrounds a small channel that flows from Area C toward the Bahía de Panamá, and does not appear to be tidally influenced.

5.5.6 Area F

Approximate Size: 14.21 Acres, 5.750 Hectares

Habitat Type: Upland – Mixed Rangeland

WRAP Score: NA/NW

Photopoint 8-9

Observed Vegetation – This is an upland area of grass dominated by *Panicum* sp. It appears to be maintained by periodic burning, and contains tree species such as corotú, jobo, Panamá tree, and shrubby species such as wild coffee, guácimo, and uvita. The area is not densely forested, there is an intermittent shrub canopy, and the grass species were observed to be as tall as 2 meters in several places. At the south and east edges of this area, there is an upland forested band approximately 12 meters wide. Dominant species observed within this band include Panamá tree and mango. This area is also topographically elevated approximately 0.5 meter above the grassland.

Soil Characteristics – The soils in this area appear to be a mixture of sand and clay. The topography of this area suggests that it may contain fill material. There did not appear to be any hydric characteristics to the soils observed.

Hydrologic Characteristics – The soils did not exhibit evidence of a seasonal period of inundation. There were no other indicators observed such as high water marks on trees or algal mats to indicate that this area may be seasonally inundated.

5.5.7 Area G

Approximate Size: 237.34 Acres, 96.050 Hectares

Habitat Type: Wetland – Forested Mangrove

WRAP Score: 0.75

Photopoint 10-11

Observed Vegetation – This area consists of a mature mangrove forest dominated by white mangrove. There are several bands of black mangrove woven throughout and on the edges of this area. In the depressional areas, large leather ferns become thick. However, this is a very homogenous system with very little sub-canopy, and virtually no herbaceous layer. Leaf litter is thick throughout.

Soil Characteristics – The soils in this area appear to be mostly clay. The soils were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or gleying to the soils observed.

Hydrologic Characteristics – The soils exhibited strong evidence of a seasonal period of inundation. There were seasonal high water marks noted on the trunks (@ ± 0.4 meters). The detrital leaf litter also suggested seasonal ponding.

5.5.8 Area H

Approximate Size: 34.55 Acres, 13.983 Hectares

Habitat Type: Upland – Mixed Rangeland

WRAP Score: NA/NW

Photopoint 12-13

Observed Vegetation – This area is a mixed upland with fire-maintained *Panicum* sp. and large corotú trees throughout. Also observed were more shrubby species such as uvita, plantain, and small mango. In addition, vines such as poison ivy and smilax were widespread.

Soil Characteristics – The soils in this area appear to be a mixture of sand and clay. The topography of this area suggests that it may contain fill material. There did not appear to be any hydric characteristics to the soils observed.

Hydrologic Characteristics – The soils did not exhibit any evidence of a seasonal period of inundation. There were no other indicators observed such as high water marks on trees or algal mats to indicate that this area is seasonally inundated. The topography fluctuates as much as 1 meter throughout.

5.5.9 Area I

Approximate Size: 32.08 Acres, 12.981 Hectares

Habitat Type: Wetland – Forested Mangrove

WRAP Score: 0.55

Photopoint 14-16

Observed Vegetation – This mangrove forest consists of 2 large depressional areas with no apparent flow pattern. The strata consists of a 10-15 meter wide band of large black mangroves (12-15 meters in height) with an interior of very large (20-25 meters in height) white mangroves. There is virtually no sub-canopy or herbaceous layer. Leaf litter is prevalent along with mangrove rhizomes up to 0.2 meters in height. Evidence of small crustaceans was observed throughout.

Soil Characteristics – The soils in this area appear to be mostly clay. The soils were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or gleying to the soils observed. A residual layer of salt was observed on the exposed soils and on some areas of matted leaf litter.

Hydrologic Characteristics – The soils exhibited strong evidence of a seasonal period of inundation. There were seasonal high water marks noted on the trunks (@ ± 0.2 meters), and the grouped composition leaf litter also suggested seasonal ponding.

5.5.10 Area J

Approximate Size: 63.61 Acres, 25.744 Hectares

Habitat Type: Upland – Improved Pasture

WRAP Score: NA/NW

Photopoint 17

Observed Vegetation – This area was historically part of a rice plantation that was most likely a wetland system at some time in the past. It is currently being managed as a pastureland. Management techniques include annual burning as a means of vegetation control and seasonal grazing. As such, this area no longer exhibits natural wetland characteristics and thus cannot be identified as a wetland. The grass was observed to be as high as 2.5 meters in some areas. The area also contains widely scattered upland tree species such as corotú and shrub species such as plantain.

Soil Characteristics – The soils in this area appear to be mostly clay, and were extremely parched at the time of the field survey, requiring moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be other hydric characteristics such as organic bodies or gleying to the soils observed.

Hydrologic Characteristics – The soils exhibited evidence of a seasonal period of inundation, however, there were no indicators observed such as high water marks on trees or algal mats to

indicate that this area is inundated for more than a short period (up to 1 month) of time. Notwithstanding, the soils exhibited a significant amount of cracking. The cracking was regular with pieces averaging 30 cm, and the cracks averaged 7 cm with a depth up to 15 cm. There is a man-made ditch that borders this area to the west, which appears to have influenced hydrology significantly.

5.5.11 Area K

Approximate Size: 121.52 Acres, 49.179 Hectares

Habitat Type: Upland – Improved Pasture

WRAP Score: NA/NW

Photopoint 18-19

Observed Vegetation – This area was historically part of a rice plantation that was most likely part of a wetland system at some time in the past. This area is currently being managed as a pastureland. Management techniques include annual burning as a means of vegetation control along with seasonal grazing. As such, this area no longer exhibits strict wetland characteristics and thus cannot be readily identified as a wetland. The grass was observed to be as high as 2.5 meters in some areas. The area also contains widely scattered upland tree species such as corotú and several pockets of shrubby plantain.

Soil Characteristics – The soils in this area appear to be mostly clay. The soils were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or staining to the soils observed.

Hydrologic Characteristics – The soils did not exhibit any evidence of a long period of inundation. There were no other indicators observed such as high water marks on trees or algal mats to indicate that this area may be seasonally inundated.

5.5.12 Area L

Approximate Size: 25.08 Acres, 10.149 Hectares

Habitat Type: Wetland – Shrubby Mangrove / Seasonally Wet Prairie

WRAP Score: 0.39

Photopoint 20-21

Observed Vegetation – This is a shrubby mangrove area dominated by very small black mangroves (no individuals taller than 1.5 meters), with an herbaceous layer of *Panicum* sp. There is a pocket of mangrove concentration along Calle 125 Este at the western edge of this area. The area appears to be transitional and not able to sustain a large population of mangroves.

Soil Characteristics – The soils in this area appear to be mostly clay. They were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or gleying to the soils observed.

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Hydrologic Characteristics – The soils did not exhibit any evidence of a long period of inundation. There were no other indicators observed such as high water marks on trees or algal mats to indicate that this area is seasonally inundated.

5.5.13 Area M

Approximate Size: 60.06 Acres, 24.306 Hectares

Habitat Type: Wetland – Seasonally Wet Prairie

WRAP Score: 0.73

Photopoint 22

Observed Vegetation – This area consists of a seasonally inundated grass prairie dominated by *Panicum* sp. It appears to be maintained by periodic burning. The area is not forested and there is no evident shrub canopy. The grass species were observed to be as tall as 2 meters in several places. This area is surrounded by a large mangrove forest with the exception of an upland hammock area along the southern edge. This hammock strand, 20 meters in width, contains tree species such as corotú, Panamá tree, mango, guachapalí, and sea grape.

Soil Characteristics – The soils in this area appear to be mostly clay. The soils were extremely parched at the time of the field survey and required moistening to gauge composition. After moistening, the soil was friable, and stained when rubbed. There did not appear to be any other hydric characteristics such as organic bodies or gleying to the soils observed.

Hydrologic Characteristics – The soils exhibited strong evidence of a seasonal period of inundation. There were no indicators observed such as high water marks on trees or algal mats to indicate that this area is sustained inundated. However, the soils did exhibit a significant amount of cracking. The cracking was regular with pieces averaging 30 cm; cracks averaged 7 cm with a depth up to 15 cm.