PO-17

Bayou La Branche Wetland Creation Summary Data and Graphics

05/23/03

Boshart, W. 2003. *Bayou La Branche Wetland Creation Summary Data and Graphics, Louisiana Department of Natural Resources, Coastal Restoration Division, Baton Rouge, Louisiana. 36pp.*

PO-17 Bayou La Branche Wetland Creation

Project Overview

The Bayou La Branche Wetland Creation Project was the first project built through the Coastal Wetlands Planning, Protection, and Restoration Act.

The project area is 435 acres (174 hectares) located along the shores of Lake Ponchartrain in the SW corner of the La Branche Wetlands complex.

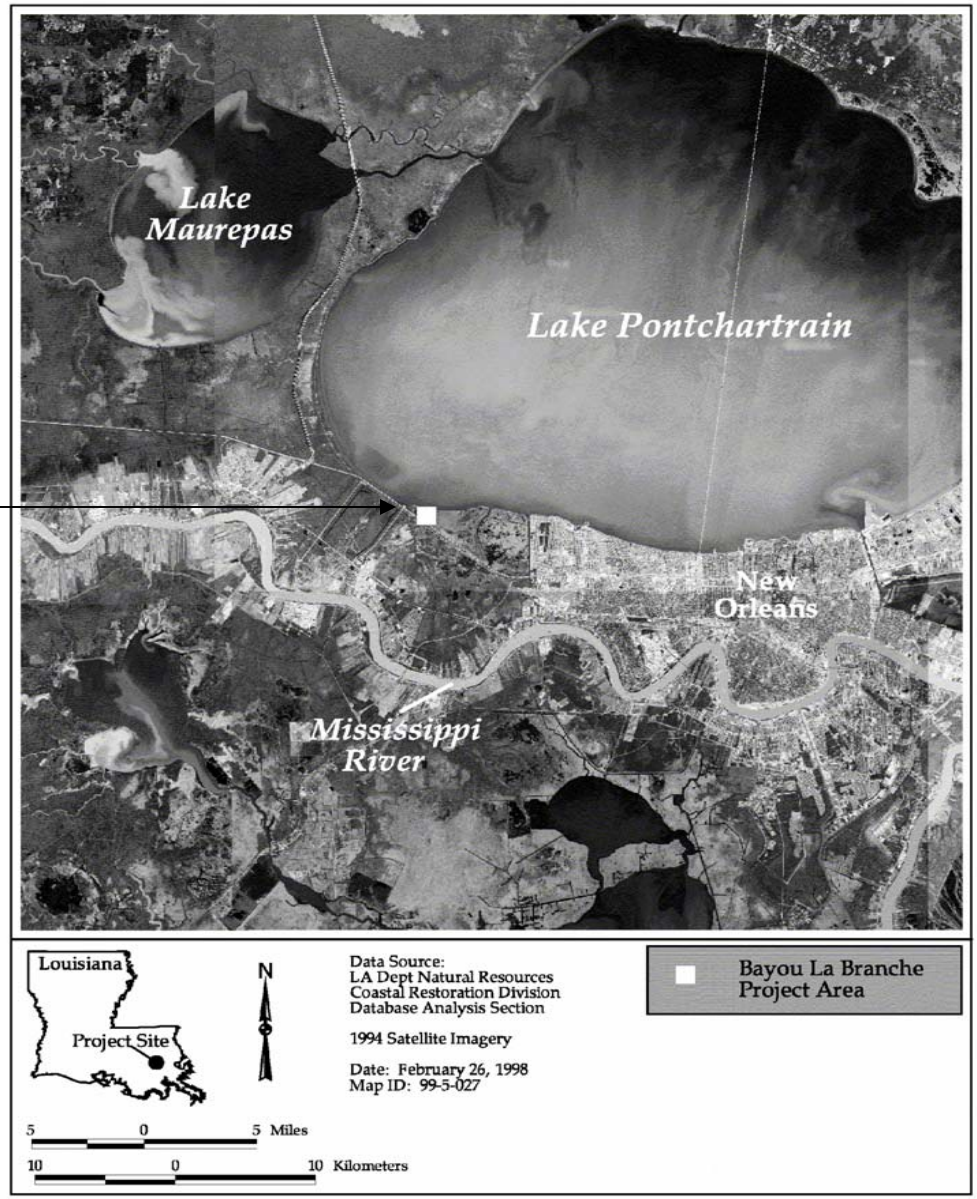
Due to significant land loss, the project area was mostly shallow, open-water habitat, and only a narrow band of marsh along the shoreline separated the project area from the lake.

Thus, the aim of the project was not just to create marsh, but to create marsh in an area of critical need within the landscape – to prevent shoreline breaching and subsequent exposure of interior wetlands to wave energy and other influences from Lake Pontchartrain.

Construction included dedicated dredging and placement of 2.7 million cubic meters of sediments, which were confined by retention dikes built around the project area perimeter. Water control structures were placed in the dikes to de-water sediments after construction and to regulate water levels thereafter.

Construction of this project was completed in April 1994.

PO-17 project is located in the southwest corner of Lake Ponchartrain.



PO-17 Bayou La Branche Wetland Creation

Project Objective

- Create new vegetated wetlands in the Bayou La Branche area utilizing dredged sediments.

Specific Goals

- Create approximately 305 acres (123ha) of shallow-water habitat conducive to the natural establishment of emergent wetland vegetation.

- Increase the marsh:open-water ratio in the project area to a minimum of 70% emergent marsh to 30% open water after 5 years following project completion.

PO-17 Bayou La Branche Wetland Creation

Monitoring Elements

Habitat Mapping: To document vegetated and non-vegetated areas, color-infrared aerial photography (1:12,000 scale with ground controls) was obtained and analyzed following procedures outlined in Steyer et al. (1995). The photography was obtained in 1993 (pre-construction), 1994, 1997, and will again be obtained 2012 post-construction.

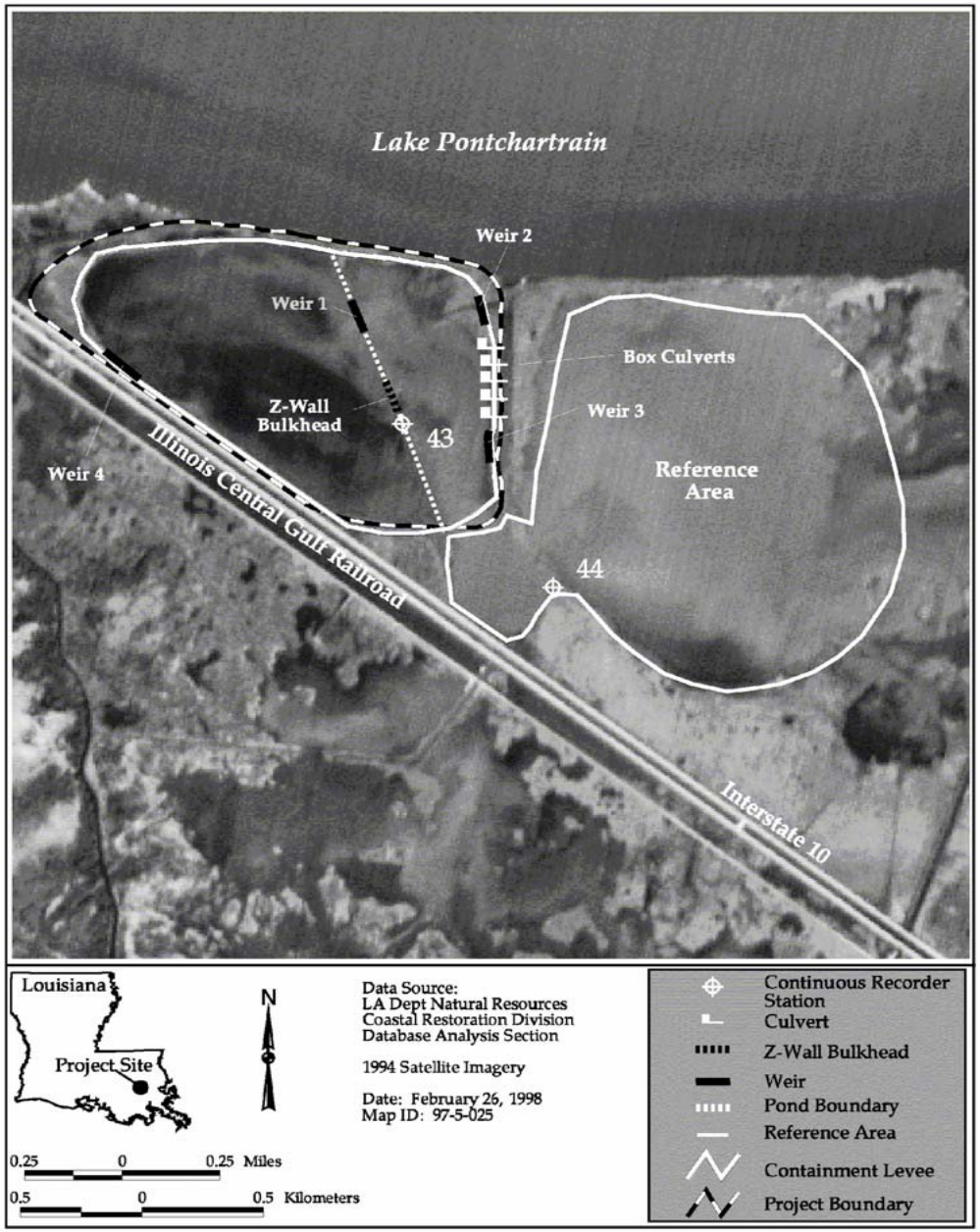
Sediment and water elevation: Data were collected using 19 staff gauges located at the intersections of transects and correlated with two continuous recorders located in the project and reference areas. The recorder in the project area will be be compared to the reference area recorder and used to determine frequency and duration of inundation events. The continuous recorders have collected hourly data from 1994 - 2002. The 19 staff gauges were monitored monthly from May 1996 – April 1998 and thereafter during each vegetation sampling period.

Soil Properties: Sampling location and frequency correspond with the vegetation monitoring and include measurements of percent organic matter, bulk density, soil salinity and percent moisture.

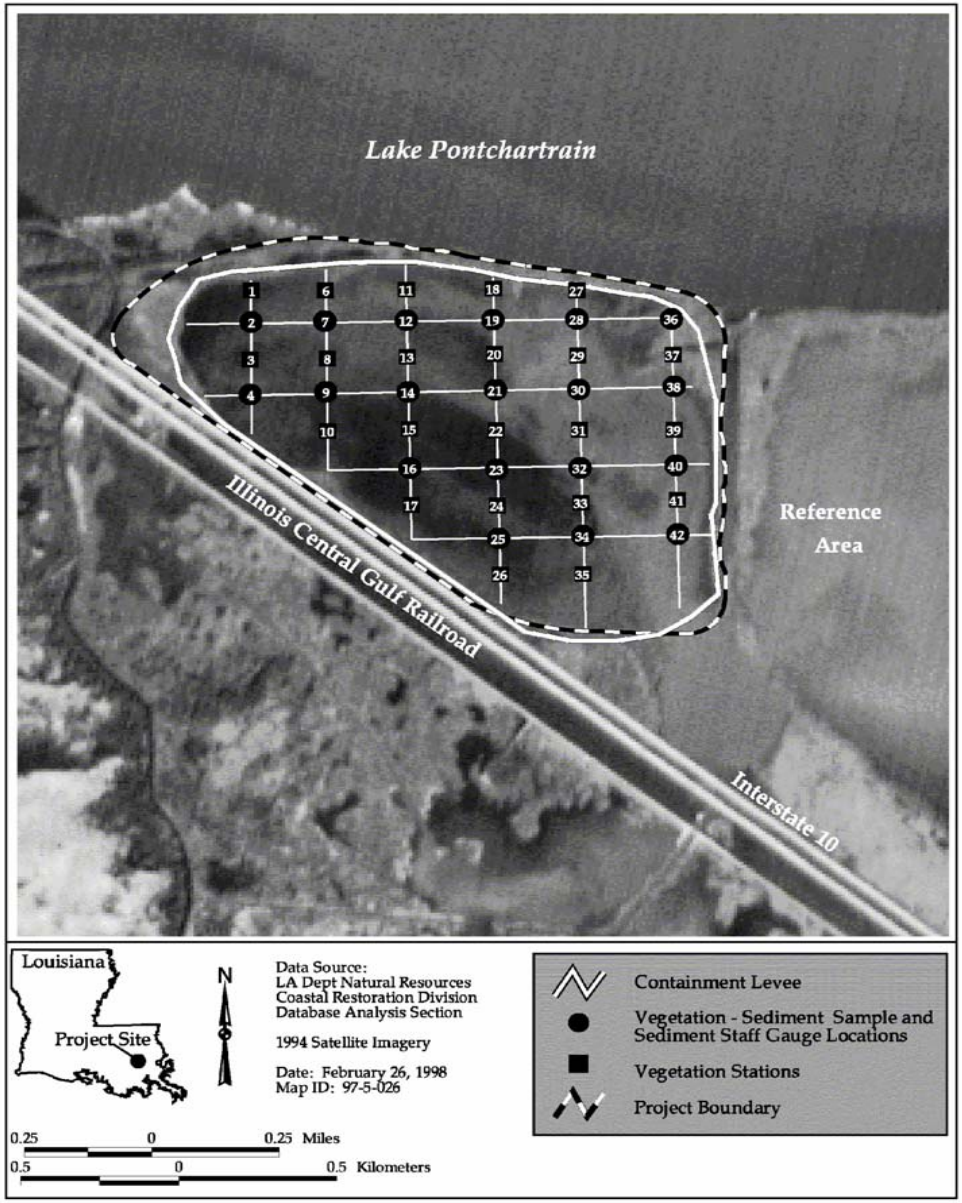
Salinity: Although salinity monitoring is not a goal of this project it was recorded in conjunction with water level by the two continuous recorders.

Vegetation: To quantify species composition and relative abundance of emergent vegetation, vegetation was monitored in 1994, 1996, 1997, 1998, 2001, and will be sampled in 2004, 2007, 2010, and 2012.

Project Features and Continuous Recorder Station (PO17-43 and PO17-44R) Locations



Project area, sediment staff gauges, vegetation and soil properties station locations



PO-17 Bayou La Branche Habitat Mapping

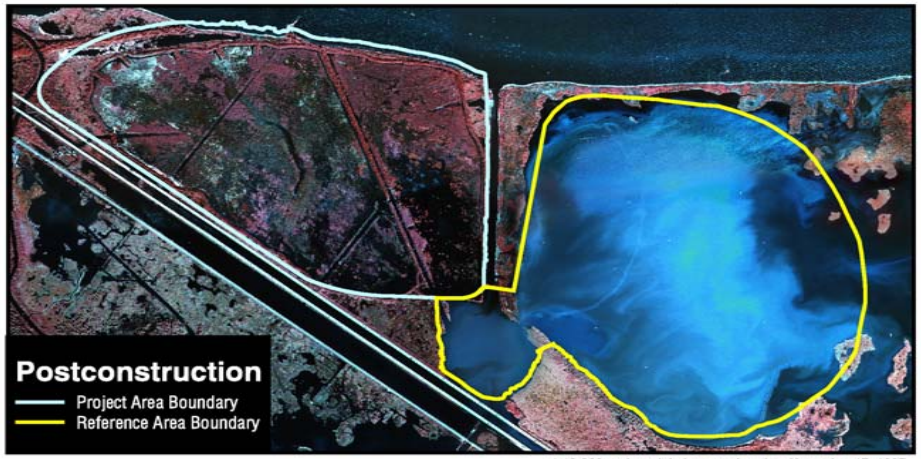
Aerial photography was collected in Nov 1993, Nov 1994 and Dec 1997.

Figures:

- 1993 and 1997 pre-construction and post-construction aerial photography
- 1994 post-construction aerial photography
- 1993 and 1997 Land:Water.
- 1993 and 1997 Habitat types.
- 1993 through 1997 Habitat change.

Bayou La Branche (PO-17): Aerial Photography from 1993 and 1997

1:12,000 scale aerial photography taken November 7, 1993, shown here at 1:23,000 scale.



1:12,000 scale aerial photography taken November 17, 1997, shown here at 1:23,000 scale.

U.S. Department of the Interior
United States Geological Survey
National Wetlands Research Center
Lafayette, Louisiana

Federal Sponsor:
U.S. Army Corps of Engineers

1000 0 1000 2000 Feet
250 0 250 500 Meters

Louisiana Department of Natural Resources
Coastal Restoration Division
New Orleans Project Office

Map ID: 98-2-020

USGS
science for a changing world

Bayou La Branche (PO-17): 1994 Aerial Photography

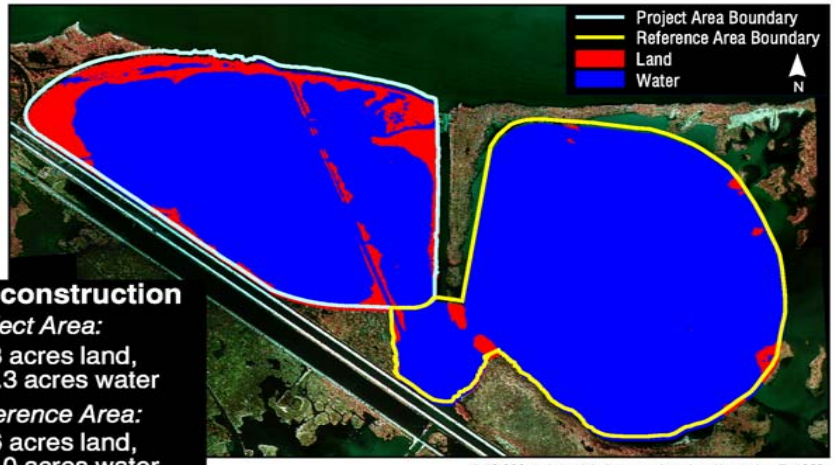
U.S. Department of the Interior
United States Geological Survey
National Wetlands Research Center
Lafayette, Louisiana
and
Louisiana Department of Natural Resources
Coastal Restoration Division
New Orleans Project Office

1:12,000 scale aerial photography taken December 19, 1994, shown here at 1:23,000 scale.

1000 0 1000 2000 Feet
250 0 250 500 Meters
N

Map ID: 99-2-002

Bayou La Branche (PO-17): GIS Land/Water Analysis

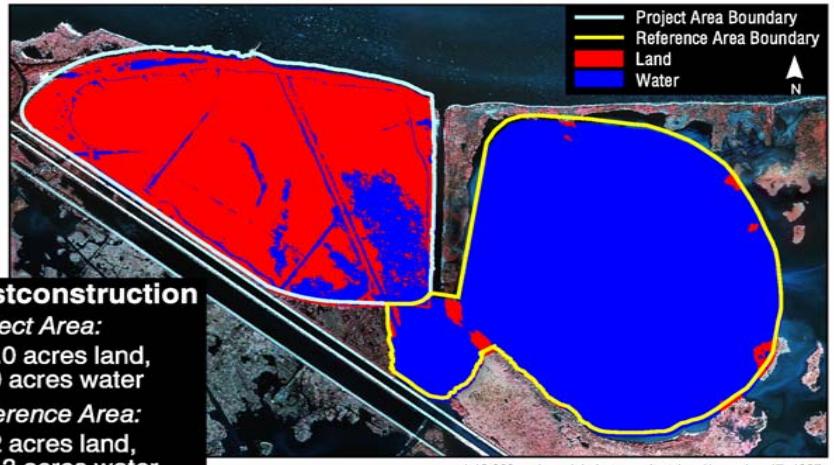


Preconstruction

Project Area:
80.8 acres land,
355.3 acres water

Reference Area:
11.6 acres land,
504.0 acres water

1:12,000 scale aerial photography taken November 7, 1993, shown here at 1:25,000 scale.



Postconstruction

Project Area:
356.0 acres land,
80.0 acres water

Reference Area:
11.2 acres land,
504.3 acres water

1:12,000 scale aerial photography taken November 17, 1997, shown here at 1:25,000 scale.

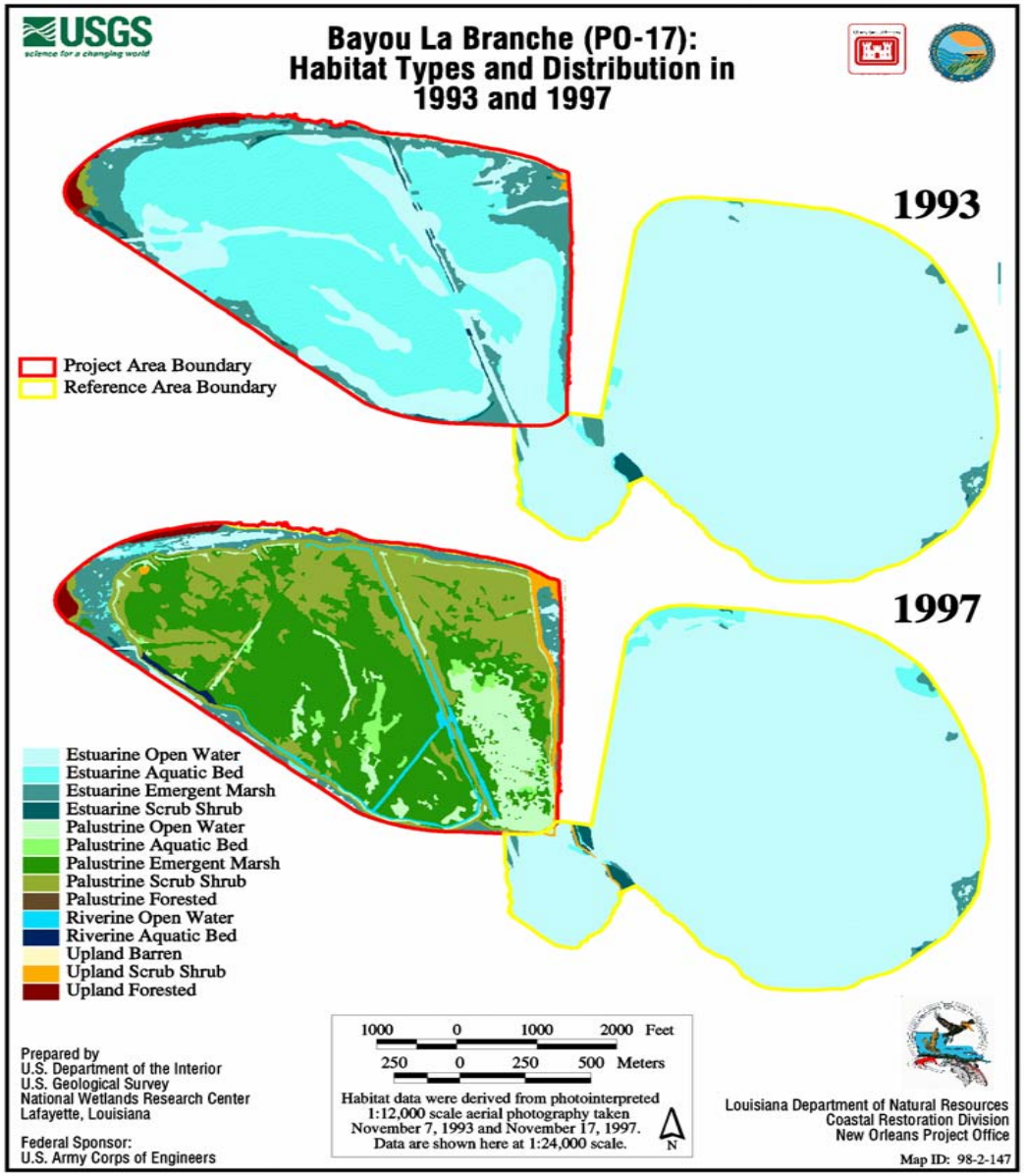
U.S. Department of the Interior
United States Geological Survey
National Wetlands Research Center
Lafayette, Louisiana

Federal Sponsor:
U.S. Army Corps of Engineers

1000 0 1000 2000 Feet
250 0 250 500 Meters

Louisiana Department of Natural Resources
Coastal Restoration Division
New Orleans Project Office

Map ID: 98-2-019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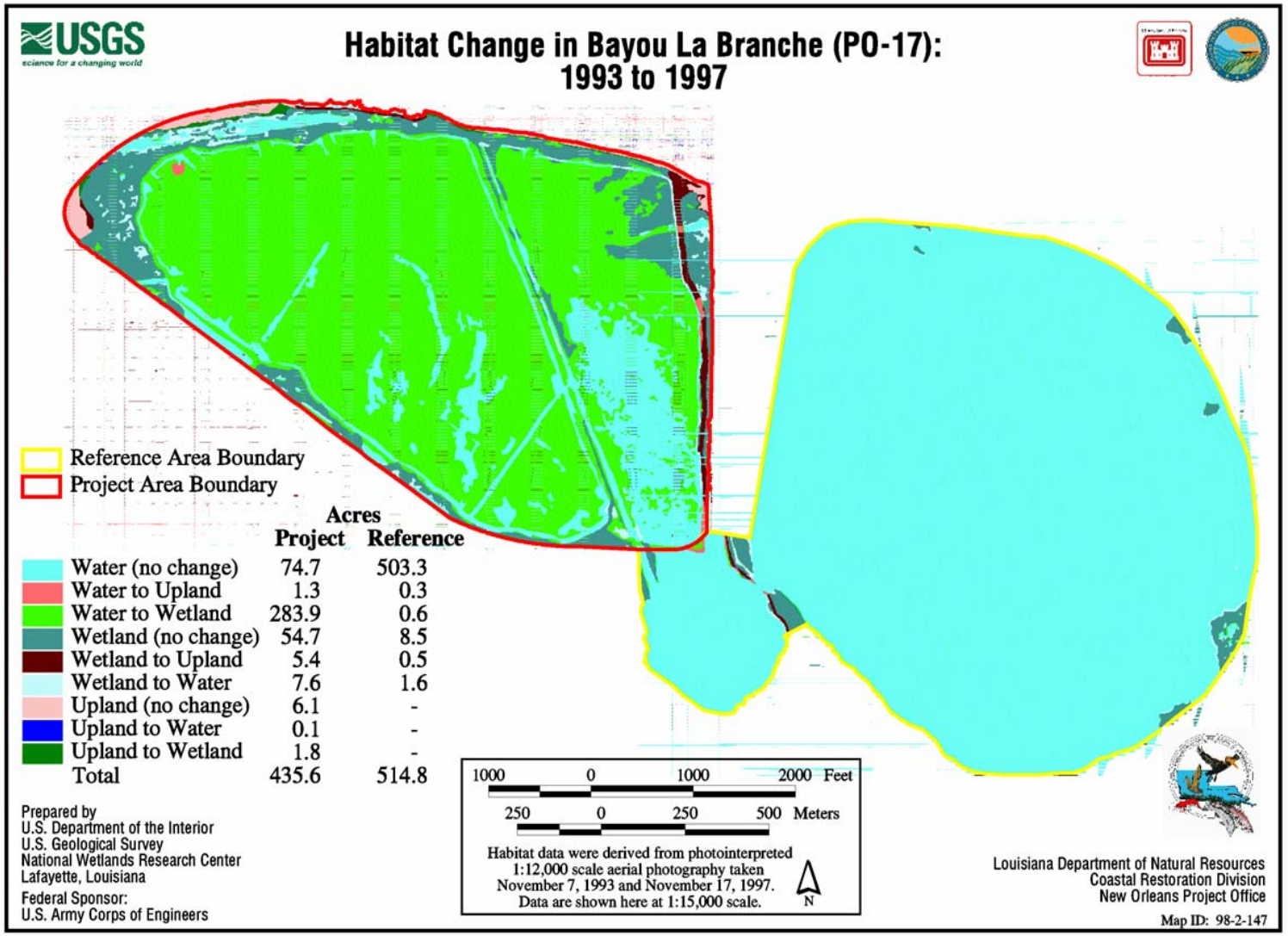
Bayou La Branche (PO-17):
Habitat Types and Distribution in
1993 and 1997
1993
1997
Project Area Boundary
Reference Area Boundary
Estuarine Open Water
Estuarine Aquatic Bed
Estuarine Emergent Marsh
Estuarine Scrub Shrub
Palustrine Open Water
Palustrine Aquatic Bed
Palustrine Emergent Marsh
Palustrine Scrub Shrub
Palustrine Forested
Riverine Open Water
Riverine Aquatic Bed
Upland Barren
Upland Scrub Shrub
Upland Forested
1000 0 1000 2000 Feet
250 0 250 500 Meters
Habitat data were derived from photointerpreted
1:12,000 scale aerial photography taken
November 7, 1993 and November 17, 1997.
Data are shown here at 1:24,000 scale.
N
Prepared by
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Lafayette, Louisiana
Federal Sponsor:
U.S. Army Corps of Engineers
Louisiana Department of Natural Resources
Coastal Restoration Division
New Orleans Project Office
Map ID: 98-2-147


USGS
science for a changing world
Habitat Change in Bayou La Branche (PO-17):
1993 to 1997
Reference Area Boundary
Project Area Boundary
Acres
Project Reference
Water (no change) 74.7 503.3
Water to Upland 1.3 0.3
Water to Wetland 283.9 0.6
Wetland (no change) 54.7 8.5
Wetland to Upland 5.4 0.5
Wetland to Water 7.6 1.6
Upland (no change) 6.1 -
Upland to Water 0.1 -
Upland to Wetland 1.8 -
Total 435.6 514.8
Prepared by
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Lafayette, Louisiana
Federal Sponsor:
U.S. Army Corps of Engineers
1000 0 1000 2000 Feet
250 0 250 500 Meters
Habitat data were derived from photointerpreted
1:12,000 scale aerial photography taken
November 7, 1993 and November 17, 1997.
Data are shown here at 1:15,000 scale.
N
Louisiana Department of Natural Resources
Coastal Restoration Division
New Orleans Project Office
Map ID: 98-2-147

PO-17 Bayou La Branche Sediment Elevation and Soil Properties

Six temporary staff-gauges were monitored from 1994-1995. Nineteen permanent staff gauges were monitored from 1996-2002.

- Histogram: Mean staff gauge sediment elevation by year for 1994-2002 (feet)
- Histogram: Mean staff gauge sediment elevation by year for 1994-2002 (meters)

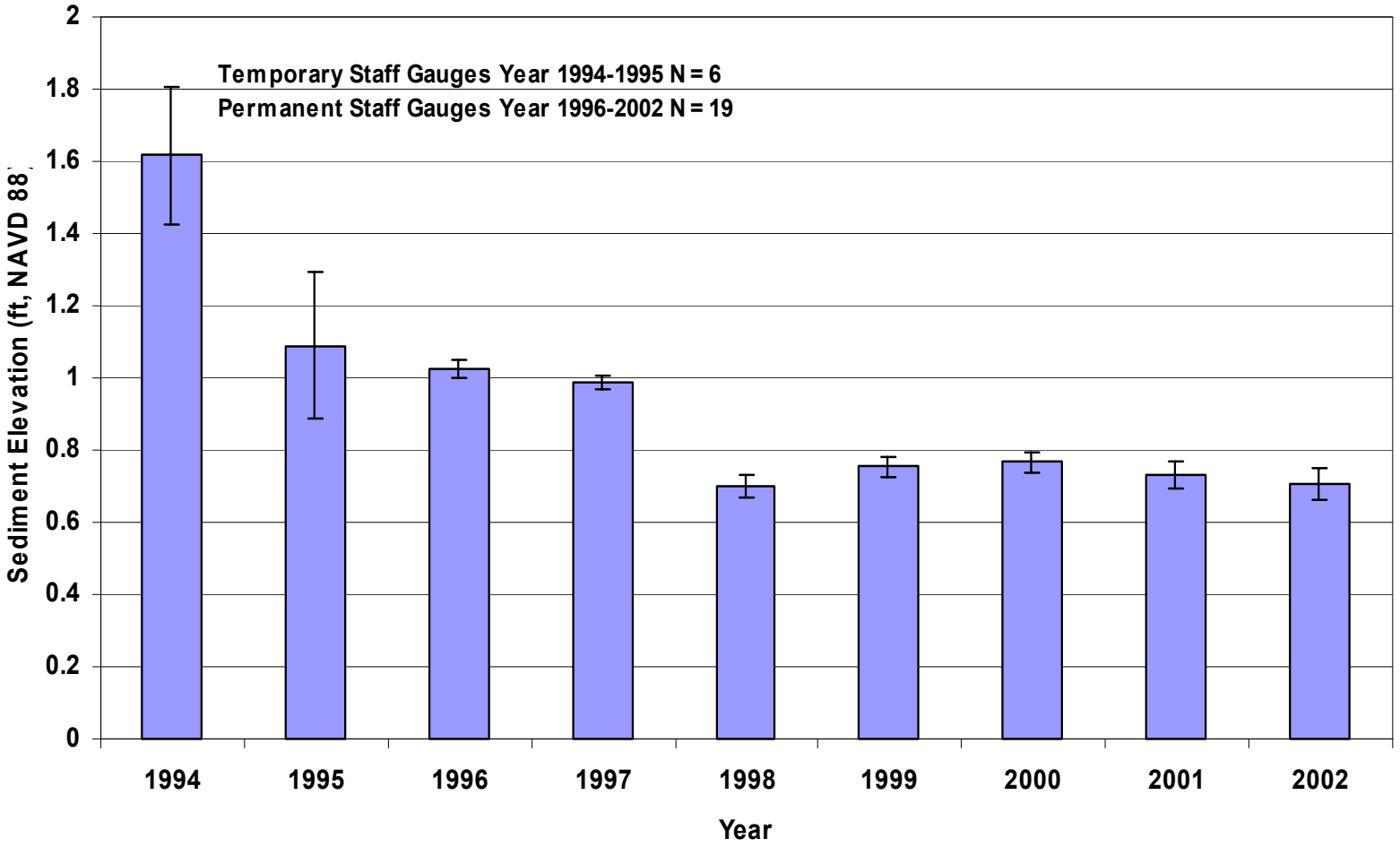
Professional elevational surveys of the entire project area were conducted in 1996 and 2002. A reference area was also surveyed in 2002

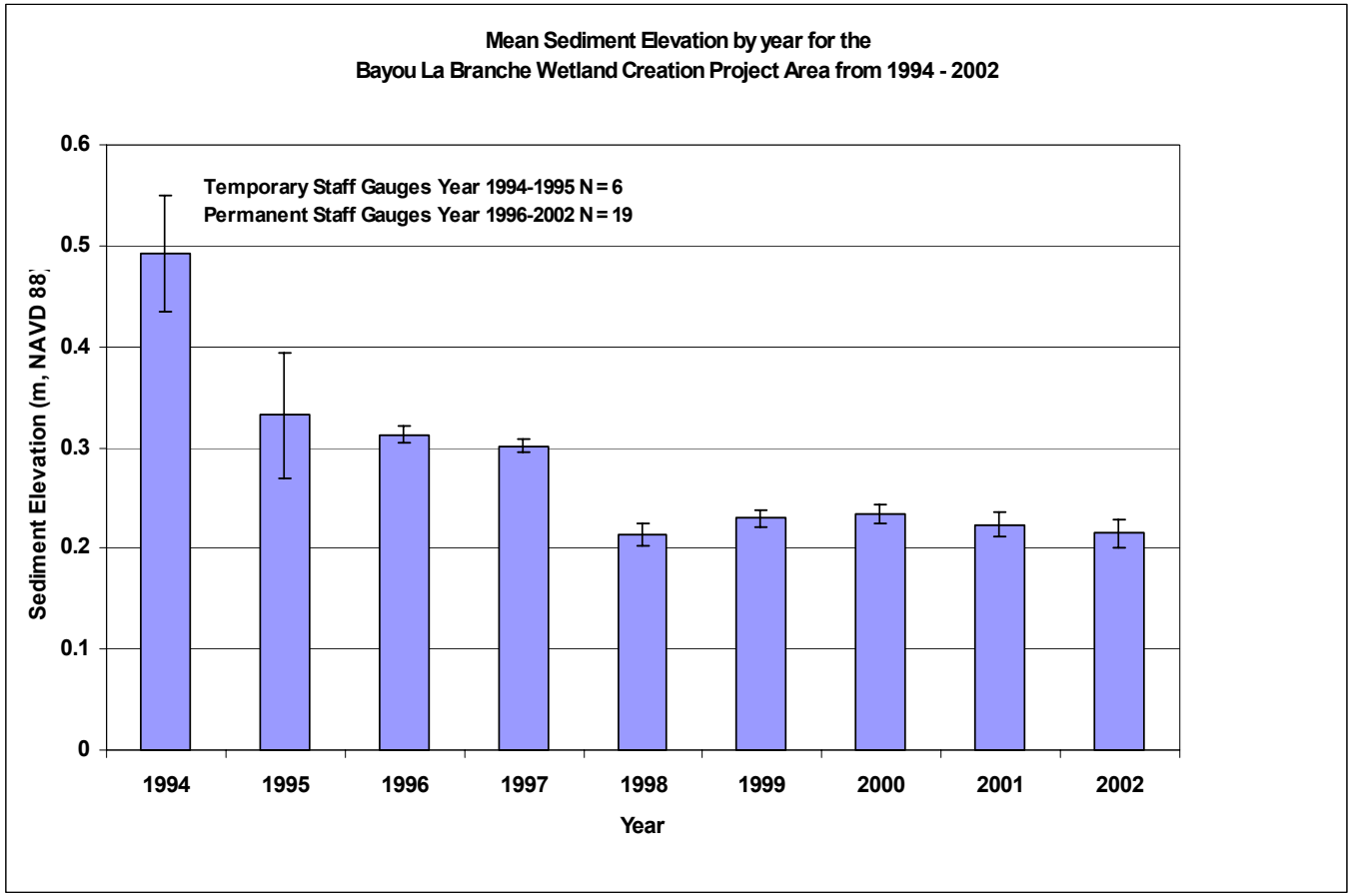
- Histogram: Mean sediment elevation of survey for 1996 and 2002 (feet)
- Histogram: Mean sediment elevation of survey for 1996 and 2002 (meters)

Soil organic matter, bulk density, and percent moisture were monitored from 1994 –2002. The reference area was also monitored in 2002

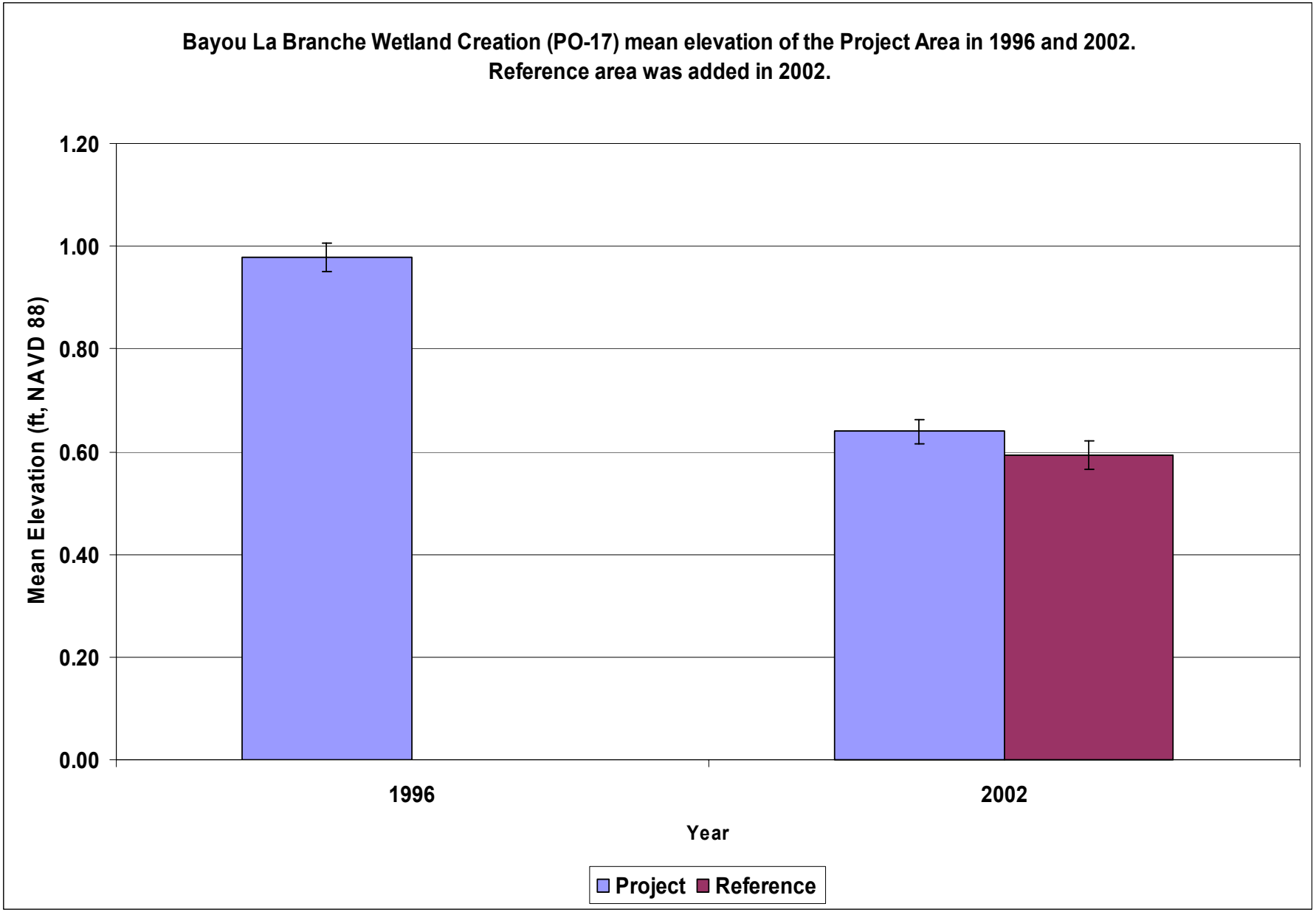
- Histogram: Mean % organic matter by year
- Histogram: Mean % bulk density by year
- Histogram: Mean % moisture by year

Mean Sediment Elevation by year for the Bayou La Branche Wetland Creation Project Area from 1994 - 2002

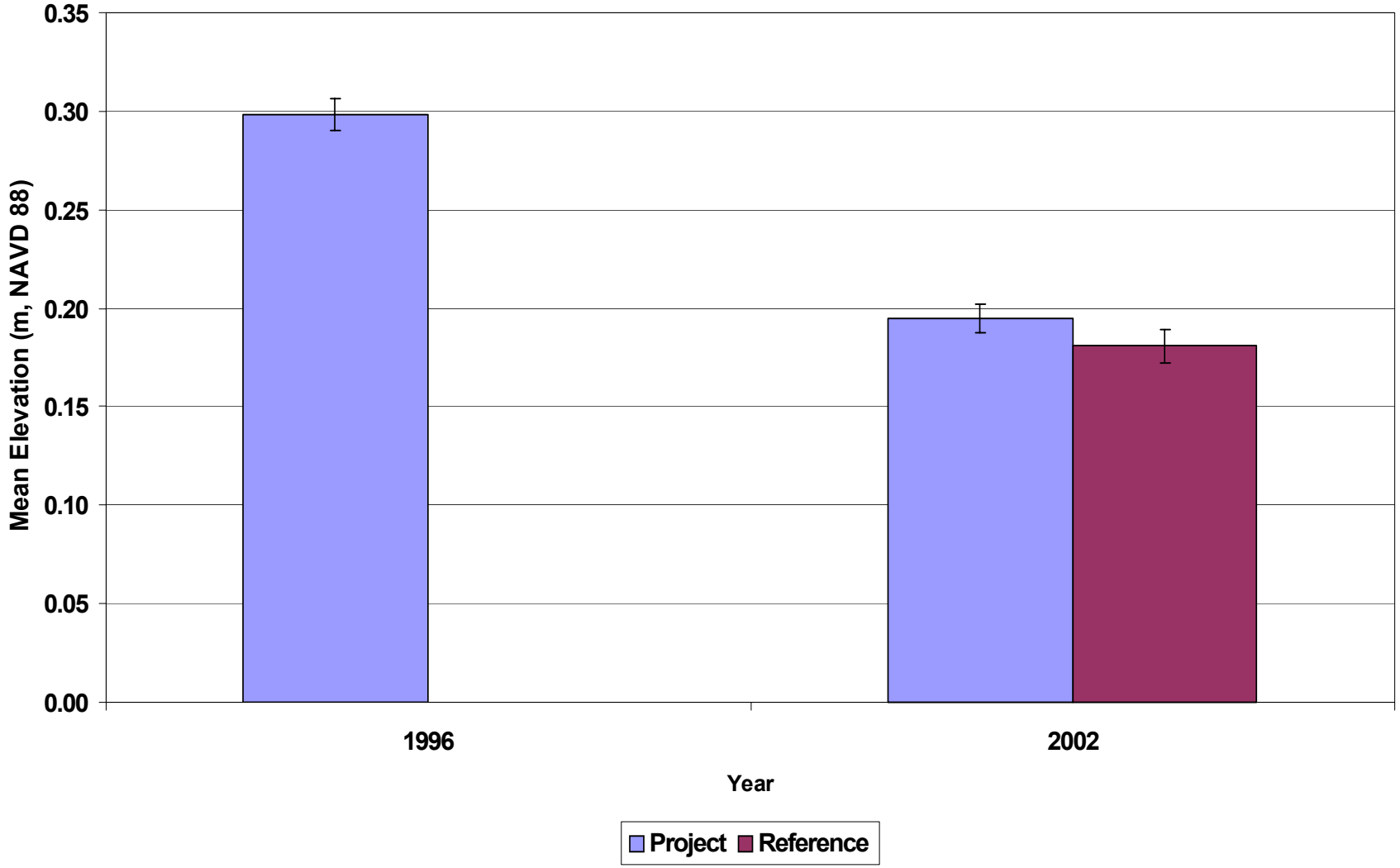


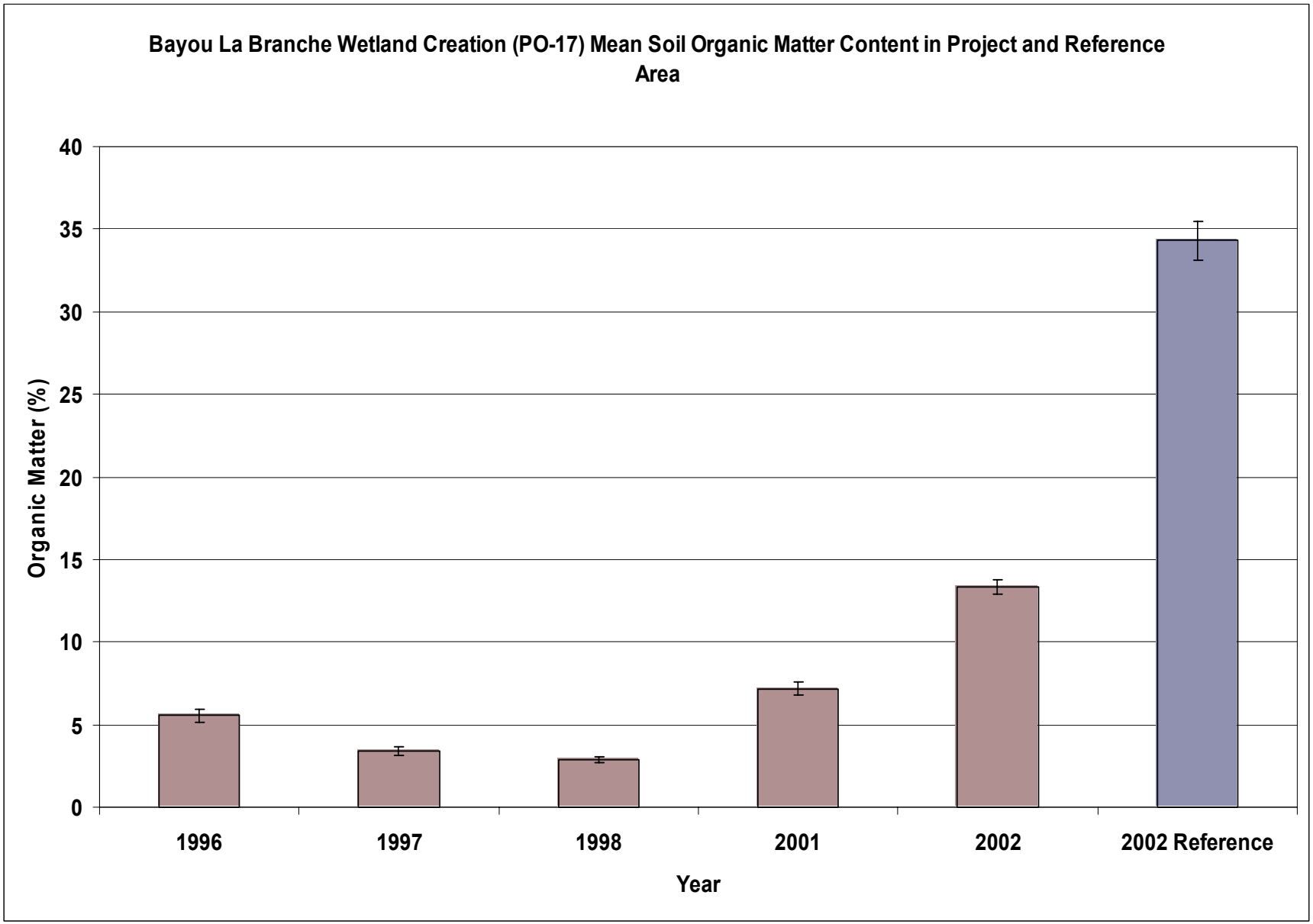

Mean Sediment Elevation by year for the
Bayou La Branche Wetland Creation Project Area from 1994 - 2002
Temporary Staff Gauges Year 1994-1995 N = 6
Permanent Staff Gauges Year 1996-2002 N = 19
Sediment Elevation (m, NAVD 88)
0.6
0.5
0.4
0.3
0.2
0.1
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year

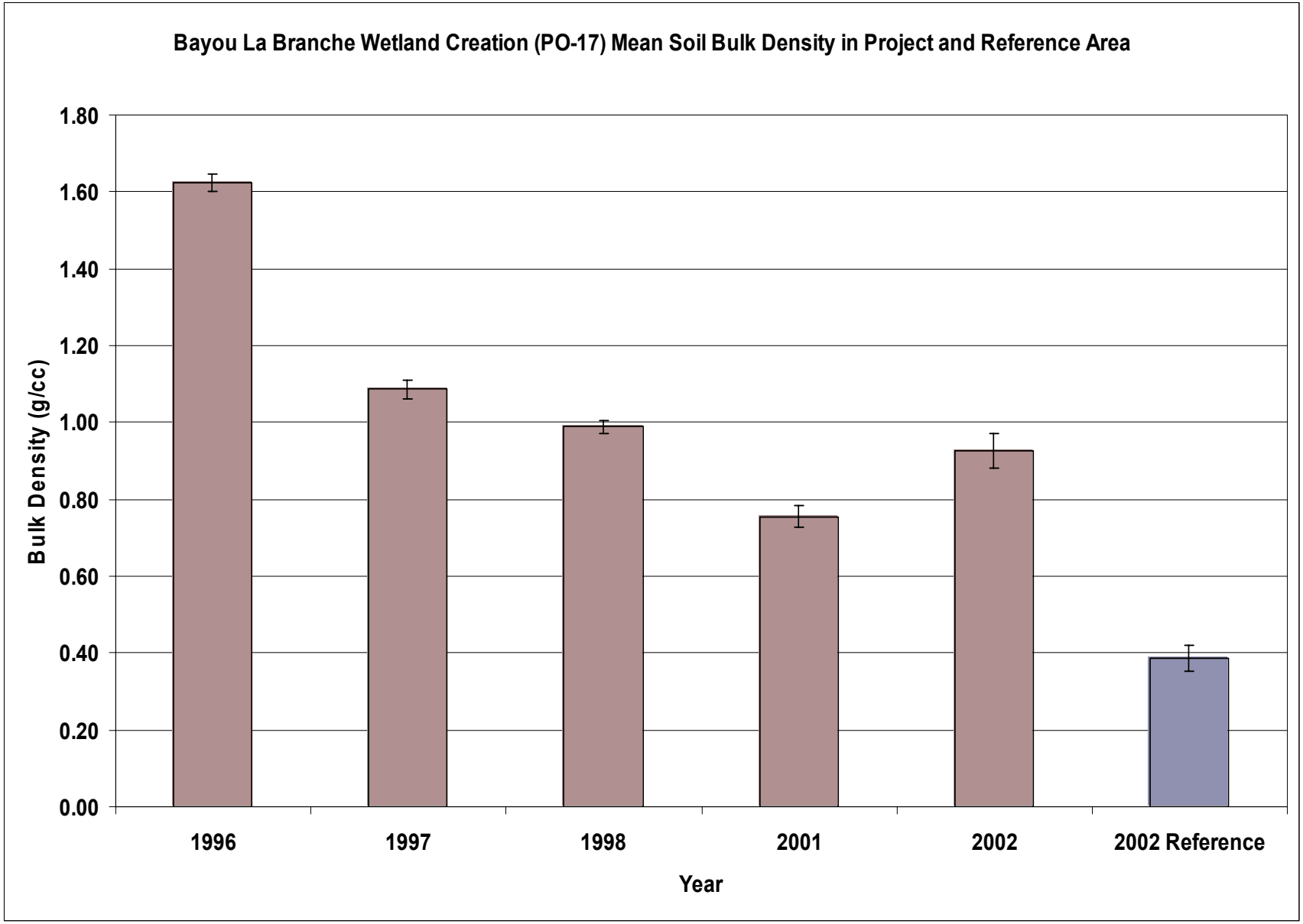
Bayou La Branche Wetland Creation (PO-17) mean elevation of the Project Area in 1996 and 2002.
Reference area was added in 2002.

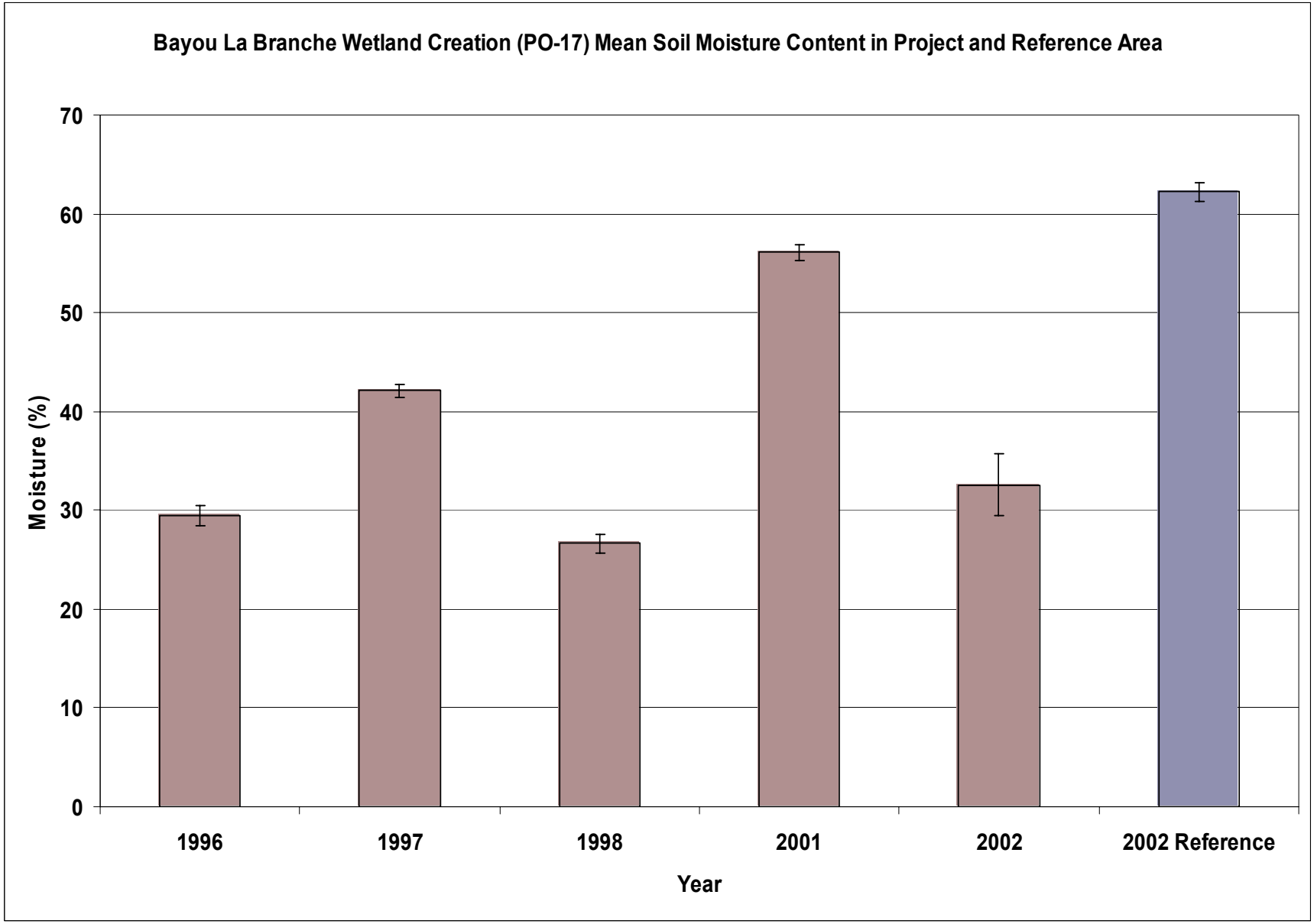


Bayou La Branche Wetland Creation (PO-17) mean elevation of the Project Area in 1996 and 2002. The Reference Area was added in 2002.




Bayou La Branche Wetland Creation (PO-17) Mean Soil Organic Matter Content in Project and Reference Area
Organic Matter (%)
40
35
30
25
20
15
10
5
0
1996
1997
1998
2001
2002
2002 Reference
Year

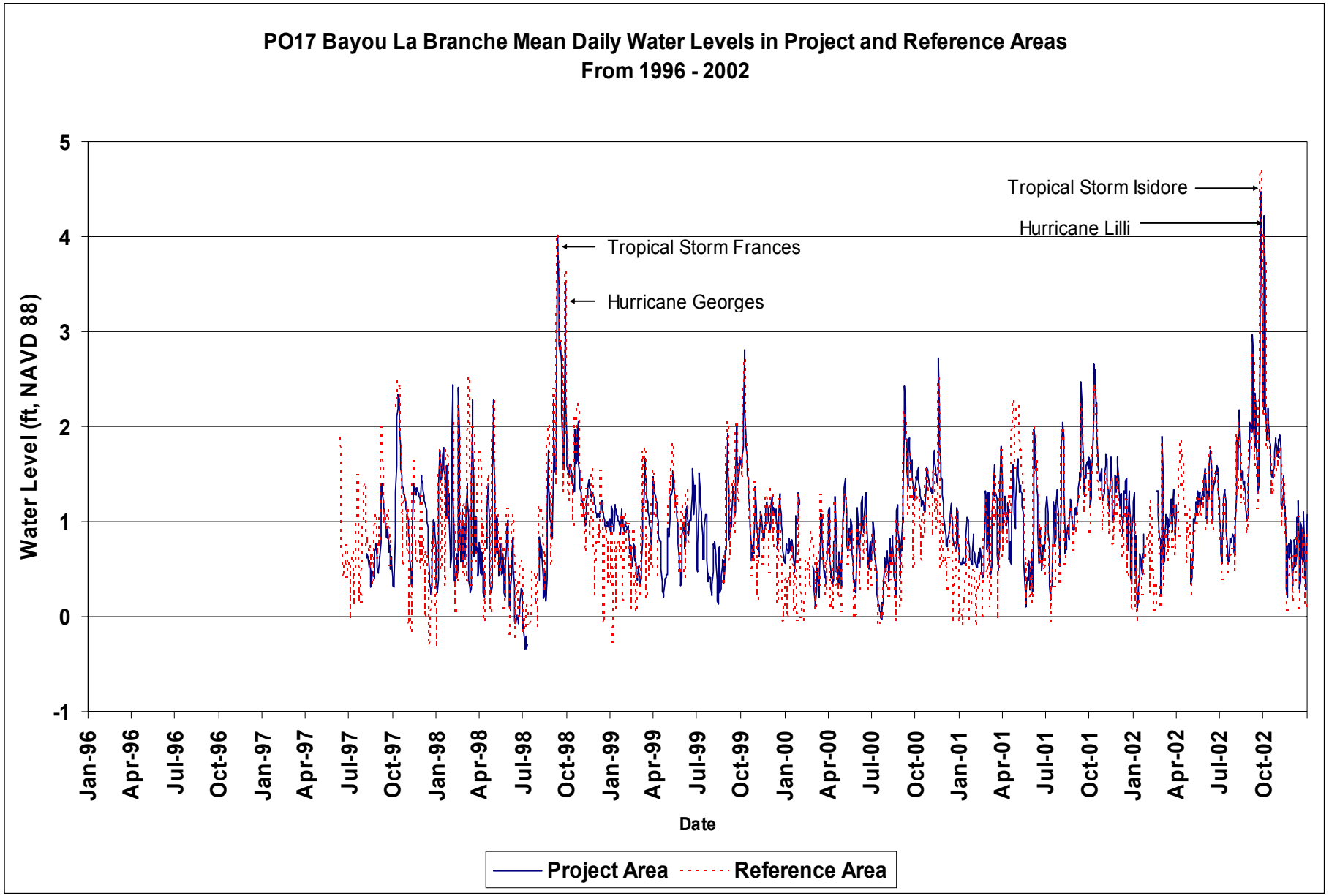

Bayou La Branche Wetland Creation (PO-17) Mean Soil Bulk Density in Project and Reference Area
Bulk Density (g/cc)
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1996
1997
1998
2001
2002
2002 Reference
Year

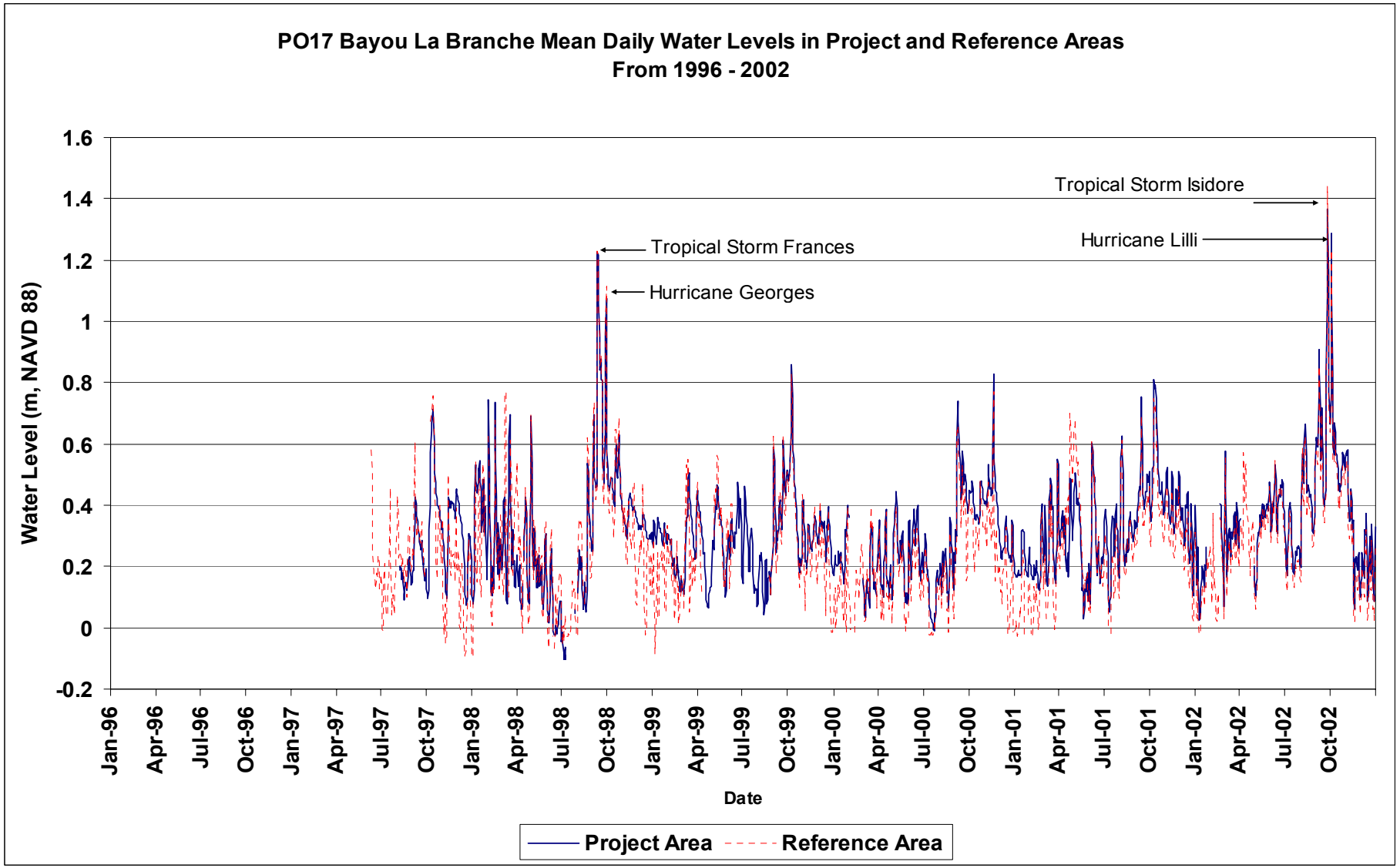

Bayou La Branche Wetland Creation (PO-17) Mean Soil Moisture Content in Project and Reference Area
Moisture (%)
70
60
50
40
30
20
10
0
1996
1997
1998
2001
2002
2002 Reference
Year

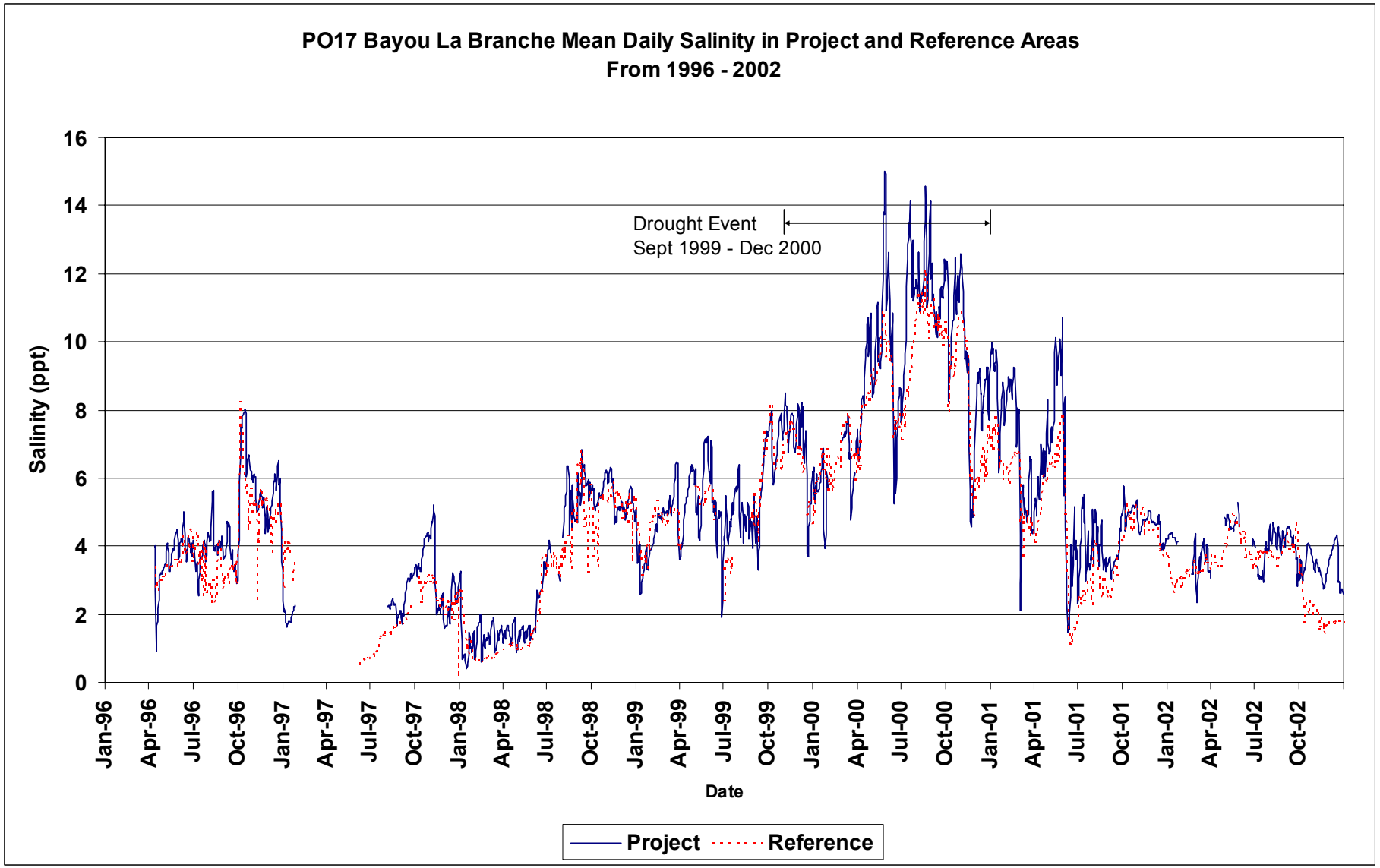
PO-17 Bayou La Branche Water Level and Salinity Data

Continuous recorder data were collected from 1994-2002

- Hydrograph: Mean Daily Water Level NAVD 88 (feet)
- Hydrograph: Mean Daily Water Level NAVD 88 (meters)
- Hydrograph: Mean Daily Salinity ppt
- Table: Frequency, Depth and Duration of Marsh Inundation (feet)
- Table: Frequency, Depth and Duration of Marsh Inundation (Meters)


PO17 Bayou La Branche Mean Daily Water Levels in Project and Reference Areas
From 1996 - 2002
Water Level (ft, NAVD 88)
5
4
3
2
1
0
-1
Tropical Storm Isidore
Hurricane Lilli
Tropical Storm Frances
Hurricane Georges
Jan-96
Apr-96
Jul-96
Oct-96
Jan-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Date
Project Area
Reference Area


PO17 Bayou La Branche Mean Daily Water Levels in Project and Reference Areas
From 1996 - 2002
Water Level (m, NAVD 88)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
Tropical Storm Isidore
Hurricane Lilli
Tropical Storm Frances
Hurricane Georges
Jan-96
Apr-96
Jul-96
Oct-96
Jan-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Date
Project Area
Reference Area


PO17 Bayou La Branche Mean Daily Salinity in Project and Reference Areas
From 1996 - 2002
Salinity (ppt)
16
14
12
10
8
6
4
2
0
Drought Event
Sept 1999 - Dec 2000
Jan-96
Apr-96
Jul-96
Oct-96
Jan-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Date
Project
Reference

PO-17 Bayou La Branche Frequency, Depth and Duration of Flooding

	Project Area				Reference Area			
Year	# Flood Events	% Time Flood	Mean Depth (ft)	Mean Duration (Days)	# Flood Events	%Time Flood	Mean Depth (ft)	Mean Duration (Days)
1997*	3	35.37	1.25	17.3	12	17.19	0.93	2.75
1998	14	58.48	1.12	14.28	26	36.13	0.99	4.96
1999	21	54.79	0.96	9.52	17	30.48	0.85	4.8
2000	14	43.36	0.96	10.5	17	16.57	0.79	2.88
2001	18	61.64	1.04	12.5	21	36.29	0.87	6
2002	9	73.08	1.12	19	16	43.16	0.90	7.68

PO17 Bayou La Branche Frequency, Depth and Duration of Flooding

	Project Area				Reference Area			
Year	# Flood Events	% Time Flood	Mean Depth (m)	Mean Duration (Days)	# Flood Events	% Time Flood	Mean Depth (m)	Mean Duration (Days)
1997*	3	35.37	0.38	17.3	12	17.19	0.28	2.75
1998	14	58.48	0.34	14.28	26	36.13	0.30	4.96
1999	21	54.79	0.29	9.52	17	30.48	0.26	4.8
2000	14	43.36	0.29	10.5	17	16.57	0.24	2.88
2001	18	61.64	0.32	12.5	21	36.29	0.26	6
2002	9	73.08	0.34	19	16	43.16	0.27	7.68

PO-17 Bayou La Branche Vegetation Data

Vegetation surveys were conducted in 1996, 1997, 1998, 2001 and 2002. The Reference area vegetation survey was added in 2002. Vegetation was surveyed using Braun-Blanquet 4-m^2 plots following procedures outlined in Steyer et al. (1995).

- Table: Mean % cover for all vegetation species by year
- Histogram: Sum of % mean cover value of vegetation species for all plots by year
- Histogram: Mean % cover of dominant vegetation species for 1996
- Histogram: Mean % cover of dominant vegetation species for 1997
- Histogram: Mean % cover of dominant vegetation species for 1998
- Histogram: Mean % cover of dominant vegetation species for 2001
- Histogram: Mean % cover of dominant vegetation species for 2002

PO-17 Mean % Cover for all Vegetation Species by Year

Scientific Name	Common Name	1996	1997	1998	2001	2002	2002 R
Alternanthera philoxeroides (Mart.) Gris	Aligatorweed	.	.	0.13	.	.	.
Amaranthus australis (Gray) Sauer	Southern amaranth	.	.	.	0.05	.	.
Amaranthus L.	Pigweed	0.42	.	0.45	.	.	.
Azolla caroliniana Willd.	Carolina mosquitofern	.	1.47	.	.	.	.
Baccharis halimifolia L.	Eastern baccharis	6.21	5.32	14.46	4.53	1.95	0.27
Baccharis L.	Baccharis	.	.	.	.	.	.
Bacopa monnieri (L.) Pennell	Coastal waterhyssop	2.79	0.86	33.93	1.71	11.42	.
Cyperus compressus L.	Poorland flatsedge	.	.	0.13	.	.	.
Cyperus odoratus L.	Fragrant flatsedge	0.16	.	.	0.03	0.05	.
Distichlis spicata (L.) Greene	Seashore saltgrass	.	.	4.58	5.58	2.74	0.15
Echinochloa Beauv.	Cockspur grass	0.16	.	.	.	.	.
Echinochloa walteri (Pursh) Heller	Coast cockspur	.	.	5.58	.	.	.
Eleocharis parvula (Roemer & J.A. Schult	Dwarf spikesedge	9.79	5.15	0.28	13.13	0.63	.
Ipomoea sagittata Poir.	Saltmarsh morninglory	.	.	.	.	.	4.08
Iva frutescens L.	Bigleaf sumpweed	.	.	1.25	0.03	0.05	0.23
Lemna minor L.	Common duckweed	.	2.62	.	.	.	.
Leptochloa fusca (L.) Kunth	Malabar sprangletop	.	.	.	.	4.68	.
Packera glabella (Poir) C. Jeffrey	Jeffery butterweed	0.16	.	.	.	.	.
Panicum capillare L.	Witchgrass	.	.	6.28	.	.	.
Panicum L.	Panicgrass	.	.	0.75	.	.	.
Panicum repens L.	Torpedograss	.	0.12	0.60	6.35	6.26	.
Paspalum L.	Crowngrass	.	.	5.00	.	.	.

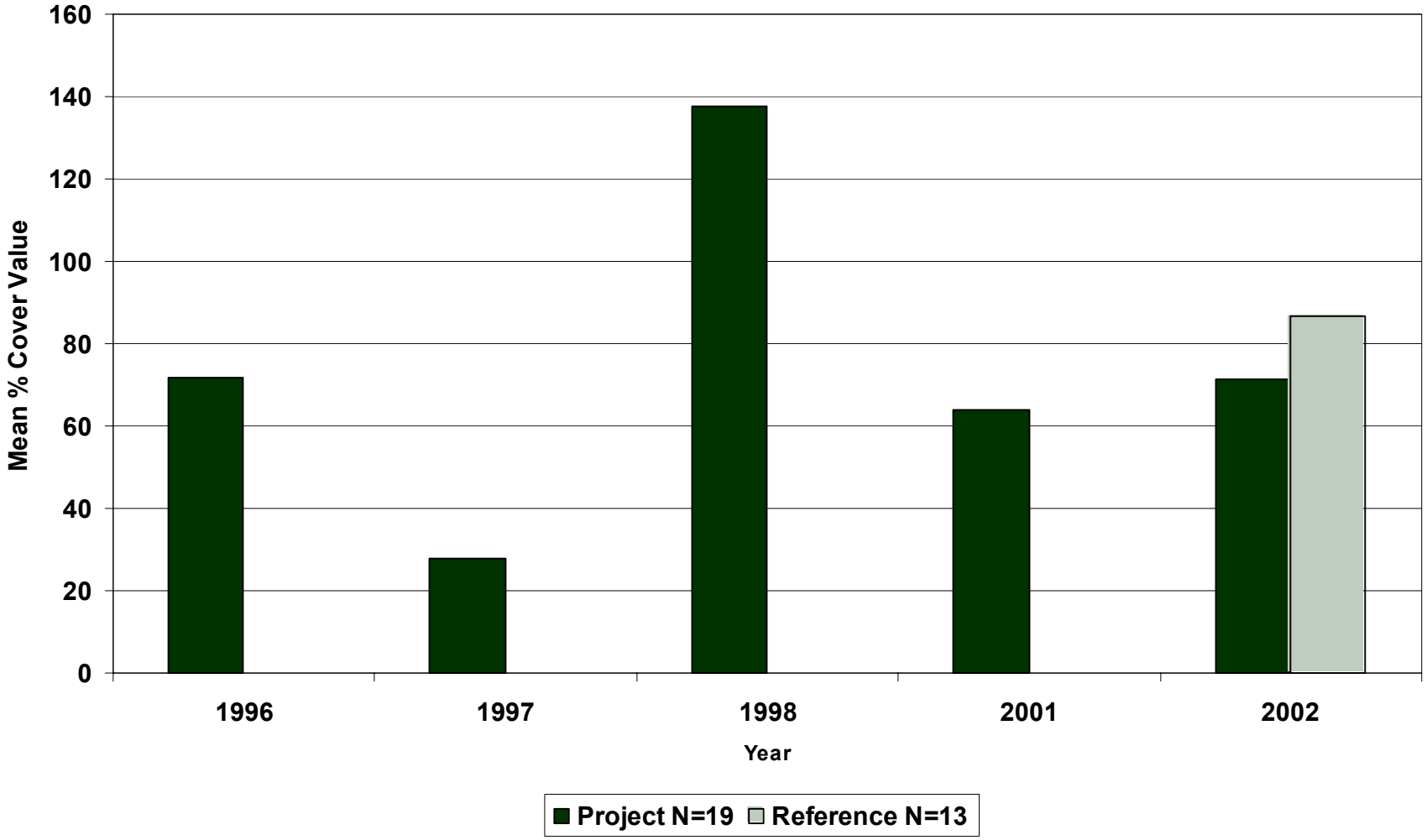
2002 R is the reference area

PO-17 Mean % Cover for all Vegetation Species by Year cont.

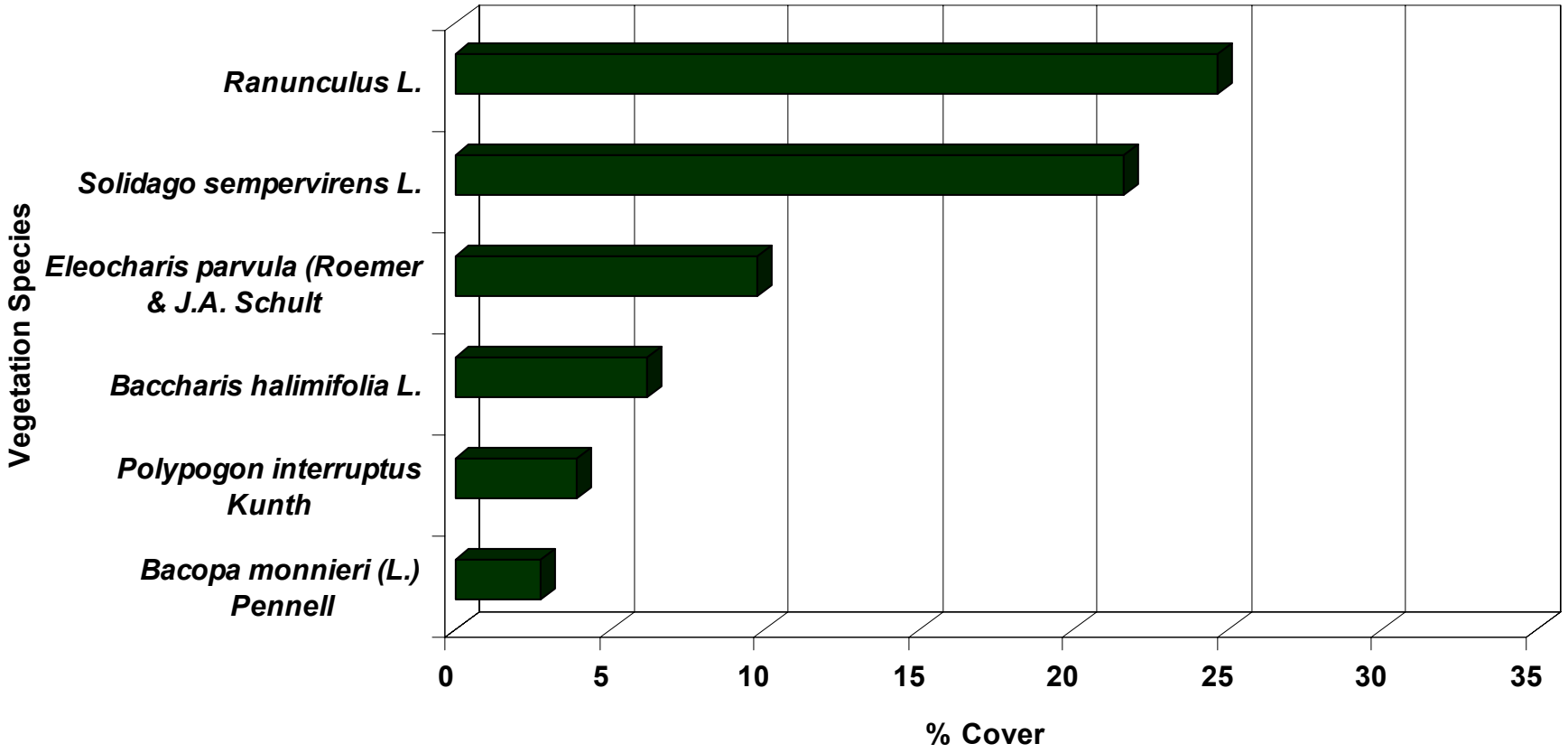
Scientific Name	Common Name	1996	1997	1998	2001	2002	2002 R
Paspalum vaginatum Sw.	Seashore paspalum	0.16	.	.	.	.	.
Pluchea camphorata (L.) DC.	Camphor pluchea	0.26	.	32.06	.	0.11	0.62
Polygonum punctatum Ell.	Dotted smartweed	0.16	.	.	.	.	1.77
Ranunculus L.	Buttercup	24.68	.	.	.	.	.
Salix nigra Marsh.	Blackwillow	.	.	1.30	.	.	.
Schoenoplectus californicus (C.A. Mey.)	California bulrush	.	.	1.00	.	.	.
Schoenoplectus pungens (Vahl) Palla	Common threesquare	.	.	2.03	6.22	10.79	0.23
Schoenoplectus robustus (Pursh) M.T. Str	Sturdy bulrush	.	3.88	0.80	.	.	.
Sesbania drummondii (Rydb.) Cory	Poisonbean	.	.	9.81	.	.	.
Sesbania herbacea (P. Mill.) McVaugh	Bigpod sesbania	0.16	.	.	.	.	.
Sesuvium maritimum (Walt.) B.S.P.	Slender seapurslane	.	.	0.01	.	.	.
Setaria pumila (Poir.) Roemer & J.A. Sch	Yellow bristlegrass	.	0.03	.	.	.	.
Solidago L.	Goldenrod	.	.	.	.	.	0.08
Solidago sempervirens L.	Seaside goldenrod	21.63	1.06	0.11	.	.	.
Sorghum halepense (L.) pers.	Johnson grass	.	.	.	.	0.05	.
Spartina alterniflora Loisel.	Smooth cordgrass	.	0.24	.	.	.	.
Spartina cynosuroides (L.) Roth	Big cordgrass	.	.	1.25	10.79	19.79	0.08
Spartina patens (Ait.) Muhl.	Marshay cordgrass	.	.	4.25	4.47	4.74	78.85
Symphyotrichum subulatum (Michx.) Nesom	Coastal Waterhyssop	.	.	11.59	10.26	.	.
Symphyotrichum tenuifolium (L.) Nesom	Perennial saltmarsh aster	1.21	.	.	0.84	7.89	0.08
Typha L.	Cattail	.	.	0.05	.	.	.
Vigna luteola (Jacq.) Benth.	Hairypod cowpea	.	.	0.03	.	.	0.31

2002 R is the reference area

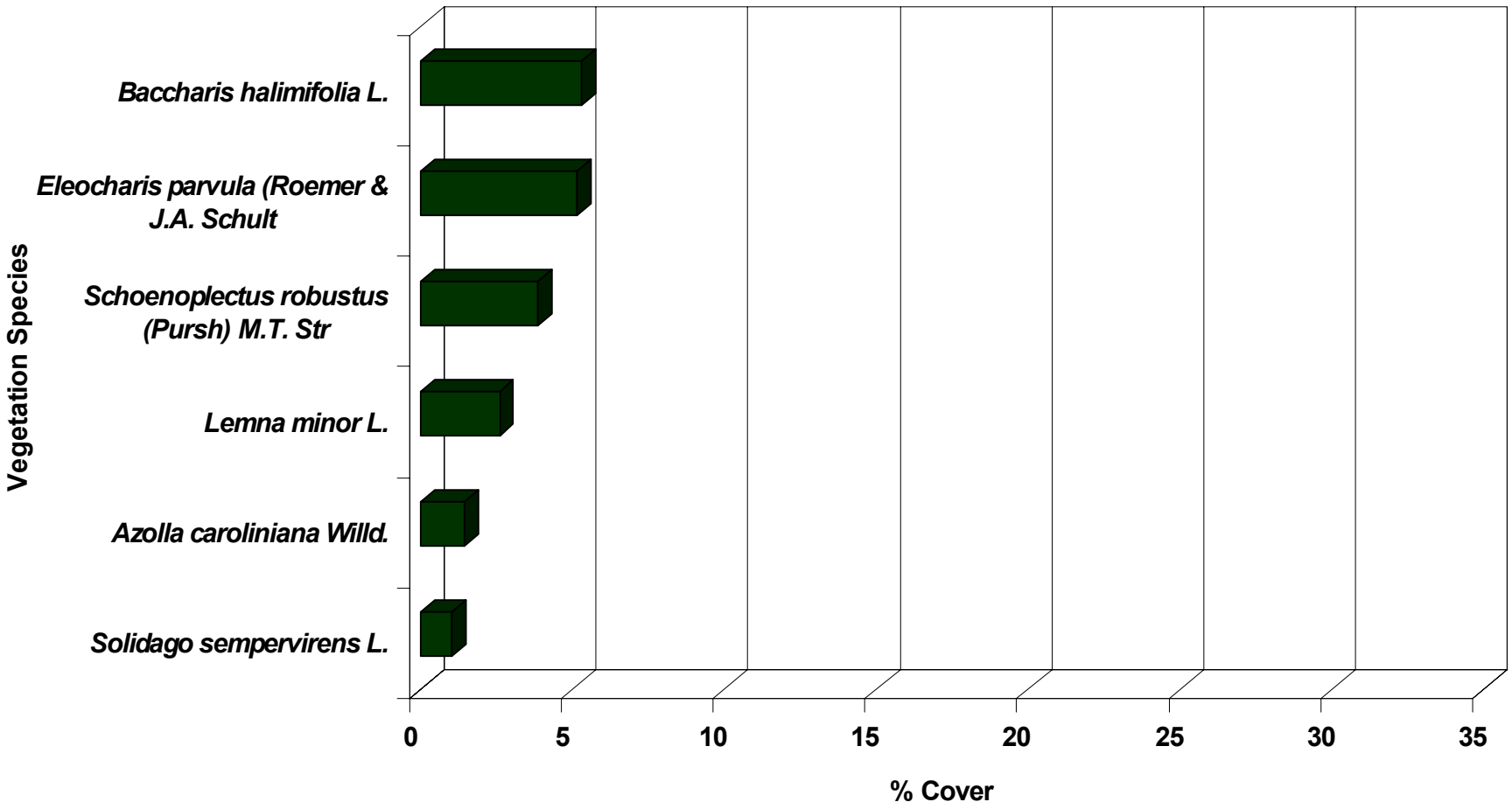
Mean Combined Percent Cover for all Vegetation Species by Year in the Bayou La Branche Wetland Creation (PO-17) Project and Reference Areas

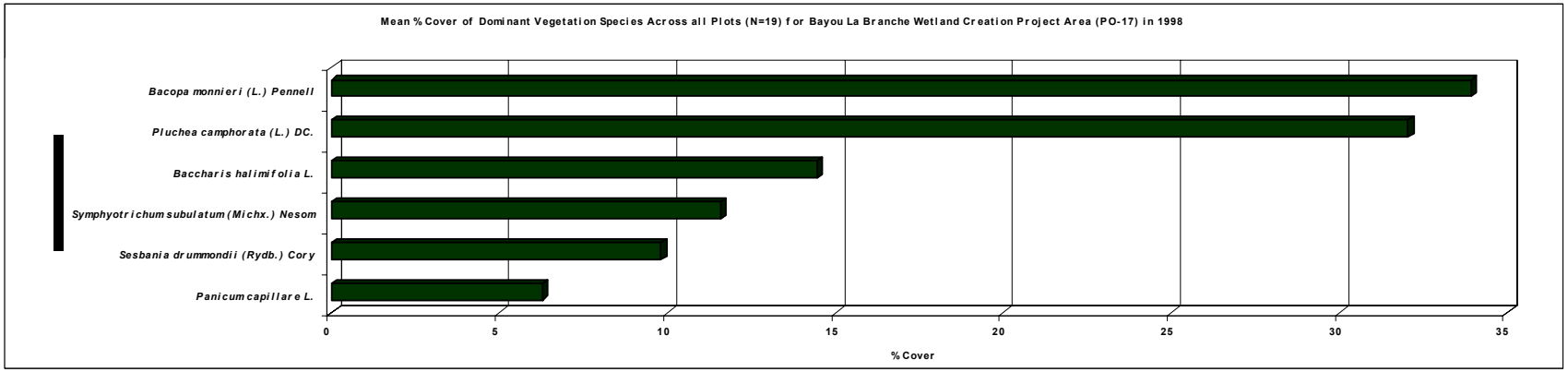


Mean % Cover of Dominant Vegetation Species Across All Plots (N=19) for Bayou La Branche Wetland Creation Project Area (PO-17) in 1996

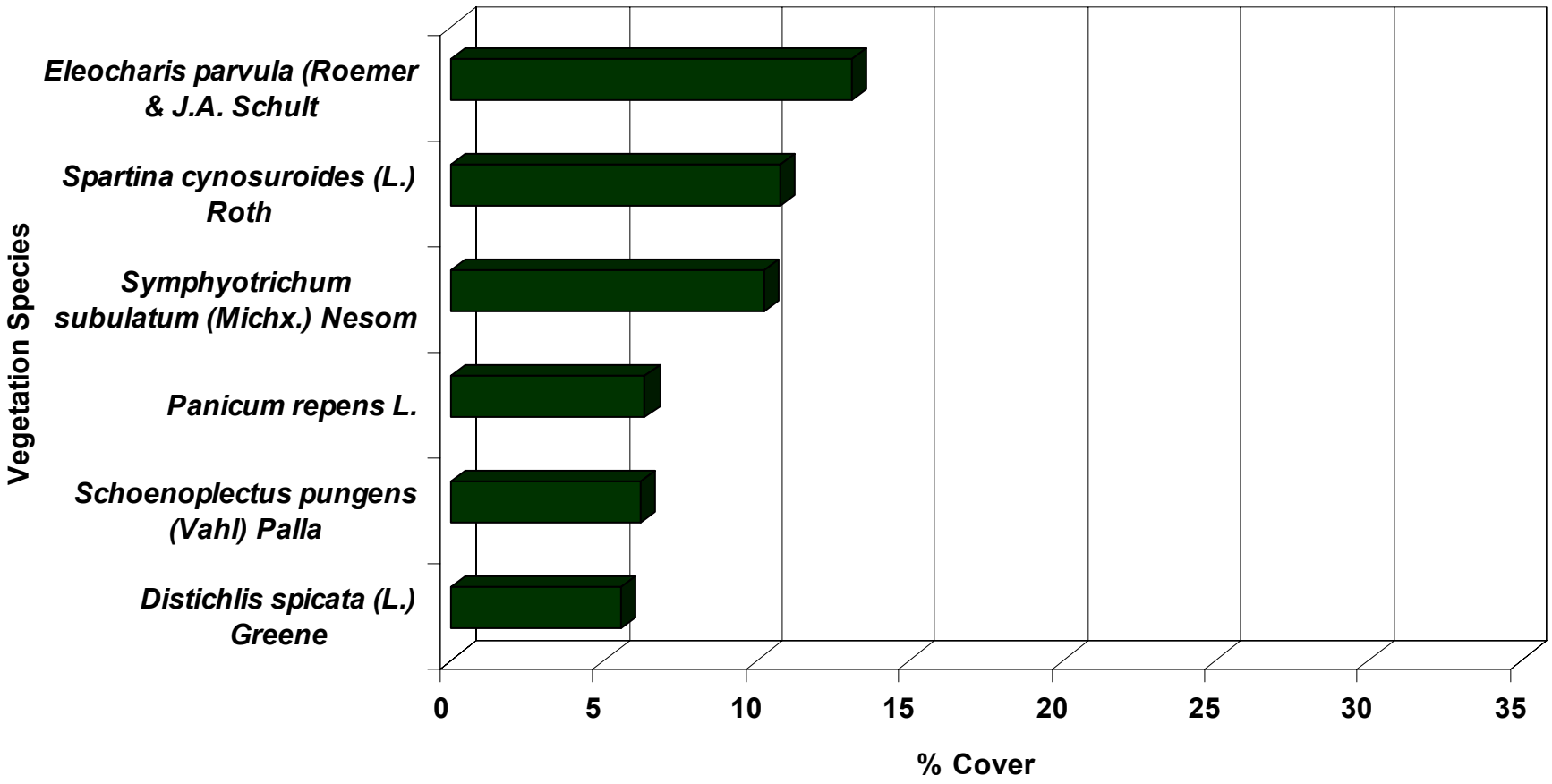


Mean % Cover of Dominant Vegetation Species Across All Plots (N=19) for Bayou La Branche Wetland Creation Project Area (PO-17) in 1997

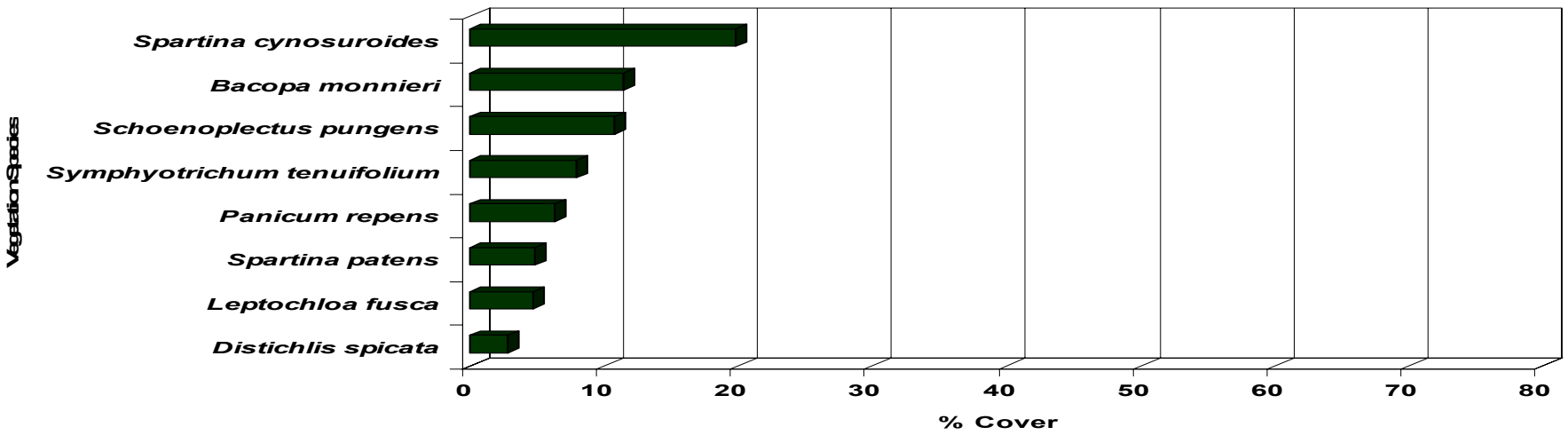



Mean % Cover of Dominant Vegetation Species Across all Plots (N=19) for Bayou La Branche Wetland Creation Project Area (PO-17) in 1998
Bacopa monnieri (L.) Pennell
Pluchea camphorata (L.) DC.
Baccharis halimifolia L.
Symphyotrichum subulatum (Michx.) Nesom
Sesbania drummondii (Rydb.) Cory
Panicum capillare L.
0
5
10
15
20
25
30
35
% Cover

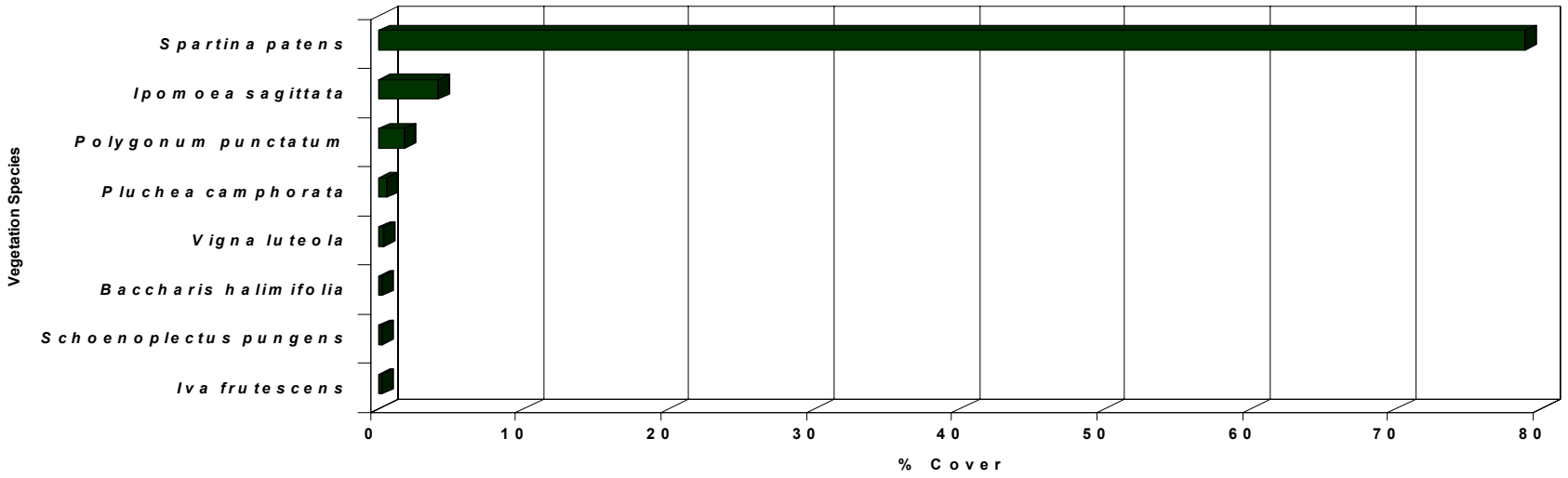
Mean % Cover of Dominant Vegetation Species Across all Plots (N=19) for Bayou La Branche Wetland Creation Project Area (PO-17) in 2001



Mean % Cover of Dominant Vegetation Species Across all Plots N=19 for Bayou La Branche Wetland Creation Project Area (PO-17) in 2002



Mean % Cover of Dominant Vegetation Species Across all Plots N=13 for Bayou La Branche Wetland Creation Reference Area (PO-17) in 2002



PO-17 Bayou La Branche Wetland Creation

Preliminary Findings

Habitat Mapping:

- Analysis of aerial photography indicated a land:water ratio of 18.5% land and 81.5% water in 1993 (preconstruction) and a ratio of 81.7% land and 18.3 water in 1997. Land area in the reference area remained constant at 2.2% land and 97.8% water between 1993 and 1997.
- Habitat in the project area changed from predominantly open water preconstruction to predominantly palustrine emergent marsh and scrub-shrub four years after construction.

Sediment Elevation:

- Sediment elevation decreased over time due to dewatering and compaction of dredged sediments. The largest and most rapid elevation changes occurred during the first four years (1994-1998) after placement of dredged materials. Between 1999 to 2002 elevation stabilized in the project area has remained close to the elevation of the reference marsh in 2002.

Soil Profile:

- Soils in the project area have increased in % organic matter and decreased in % bulk density from 1996 to 2002. Reference area soils had higher organic matter content and lower bulk density. Changes in soil % moisture have varied over time due to inundation of the project soils at the time samples were collected.

PO-17 Bayou La Branche Wetland Creation

Preliminary Findings

Water Level:

- Average water level for the project area [1.03 ft (0.31 m) NAVD 88] was significantly higher ($F_{1,3599}$=59.55, P<0.001) than water level in the reference area [0.88 ft (0.27m) NAVD 88].
- The project area flooded less frequently than the reference area; however, duration and depth of flooding was greater in the project area.
- Differences in water level and frequency and duration of flooding were likely due to the semi-impoundment of the project area.

Salinity:

- Average salinity for the project area (5.3 ppt) was statistically higher ($F_{1,4178}$=75.97, P<0.0001) than reference area salinity (4.6 ppt). Differences in salinity were likely due to the semi-impoundment of the project area - less tidal flushing and concentration of salts due to evaporation.

Vegetation:

- Dominant vegetation changed from upland to wetland types over time. Differences were likely the result of changes in sediment elevation, since decreased elevation has occurred each year since project construction. The reference area was dominated by *Spartina patens*, which has begun to show up inside the project area in later surveys.