U.S. Department of the Interior
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VEGETATIVE RESISTANCE TO FLOW IN SOUTH FLORIDA: SUMMARY OF VEGETATION SAMPLING AT SITES NESRS3 AND P33, SHARK RIVER SLOUGH, APRIL, 1996

Open-File Report 99-187

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By VIRGINIA CARTER, HENRY A. RUHL, NANCY B. RYBICKI, JUSTIN T. REEL, AND PATRICIA T. GAMMON

U.S. GEOLOGICAL SURVEY

Open-File Report 99-187

Reston, Virginia

1999

U. S. DEPARTMENT OF THE INTERIOR
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U. S. GEOLOGICAL SURVEY
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Virginia Carter, Henry Ruhl, Nancy B. Rybicki, Justin Reel, and Patricia T. Gammon

ABSTRACT

The U.S. Geological Survey is one of many agencies participating in the effort to restore the south Florida Everglades. We are sampling and characterizing the vegetation at selected sites in the Everglades as part of a study to quantify vegetative flow resistance. The objectives of the vegetative sampling are (1) to provide detailed information on species composition, vegetative characteristics, vegetative structure, and biomass for quantification of vegetative resistance to flow, and (2) to use this information to classify the vegetation and to improve existing vegetation maps for use with numerical models of surface-water flow. Vegetative sampling was conducted in the Shark River Slough in April, 1996. The data collected and presented here include live, dead, and periphyton biomass, vegetation characteristics and structure, and leaf area index.

INTRODUCTION

The Florida Everglades is a vast, diverse wetland ecosystem characterized by small ground-surface slopes, slowly moving surface waters, and dense aquatic vegetation. The south Florida ecosystem has been greatly altered during the last 100 years. A complex water-management system that includes levees, canals, pumps, and additional water-control structures regulates flooding and provides a steady supply of fresh water to urban areas and agriculture. Drainage projects have diverted much of the water that originally flowed slowly southward from Lake Okeechobee through the Everglades. Restoration and management of the Everglades ecosystem requires understanding and manipulating the amount and timing of water flows throughout the ecosystem.

The spatial and temporal distribution of water and water-borne contaminants in the Everglades must be understood if degradation of the ecosystem is to be halted and reversed. To understand how water moves through the Everglades ecosystem, it is necessary to quantify the forces affecting the flow. The resistance exerted on the flow by the vegetation is a dominant but little understood force affecting Everglades surface-water flows. The aquatic vegetation affects both the depth of water and the rate at which it moves. The presence of living and dead plant material in the water column creates drag forces on the moving water. Water flows most slowly and the surface-water slope is largest in areas where the vegetation is the most dense.

We are sampling and characterizing the vegetation at selected sites in the Everglades as part of a study to quantify vegetative flow resistance. This information will be used to improve numerical models of surface water flow. The objectives of the vegetative sampling are:
(1) To provide detailed information on species composition, vegetative characteristics, vegetative structure, and biomass for quantification of vegetative resistance to flow, and

(2) To use this information to classify the vegetation and to improve existing vegetation maps for use with models of surface-water flow.

STUDY METHODS

NESRS3 and P33 sites in the Shark River Slough were selected to provide sawgrass communities of varying densities for the purpose of making water velocity and surface slope measurements (Figure 1). At both sites a grid composed of 15 m x 15 m squares was established on the first sampling trip in April, 1996—the grid at the NESRS3 site had 12 squares and the grid at P33 had 16 squares (Figures 2 and 3). Vegetation was sampled in 12 of the grid cells at NESRS and 14 of the grid cells at P33 (Table 1).

Vegetation was sampled at sites where velocity measurements were made (Lee and Carter, 1996). A 0.5m x 0.5m quadrat was delimited by poles and the vegetation was cut and bagged in layers starting with the layer >100 cm above the sediment/water interface. Layers were 20 cm in height from 40 to 100 cm and were 10 cm in height between 0 and 40 cm above the sediment/water interface. All periphyton was collected in layers below the water surface.

Plant material in each layer was sorted by species after all dead material and periphyton were separated out. Sawgrass was separated into leaves and culms: leaves were separated into small, medium, and large leaves and culms into small and large culms and counted. The widths of six leaves in each group was measured. Live rush and grass stems were counted and their width estimated. All other plants were counted as individual stems with attached leaves. Numbers of leaves, culms, or stems were normalized to a square meter. Leaf area index (LAI) was calculated for each layer as meters squared of plant material per square meter using the formula:

$$LAI = LL \times AW_{LL} + ML \times AW_{ML} + SL \times AW_{SL} + LC \times AW_{LC} + SC \times AW_{SC} \times \text{height of layer},$$

where AW = average width in meters, LL = number of large leaves, ML = number of medium leaves, SL = number of small leaves, LC = number of large culms, and SC = number of small culms. In this case, LAI accounts only for the resistance of the live leaves. In order to account for the resistance of the dead leaves, we determined the ratio of dead/live dry weight biomass for each layer and then multiplied the LAI by the ratio to calculate a dead LAI. This second dead LAI was added to the live LAI to form a corrected LAI for each layer.

The live and dead plant material and the periphyton were dried at 105 °C for 8 to 12 hours and then weighed. Biomass was expressed as grams dry weight per square meter (gdw/m^2).

Quadrats were sorted into vegetative communities based on biomass and species composition. Plant communities were further subdivided into density classes based on total biomass minus periphyton: sparse = 0-500 gdw/m^2; medium = 500-1000 gdw/m^2; dense = 1000-2000 gdw/m^2; and very dense = >2000 gdw/m^2.

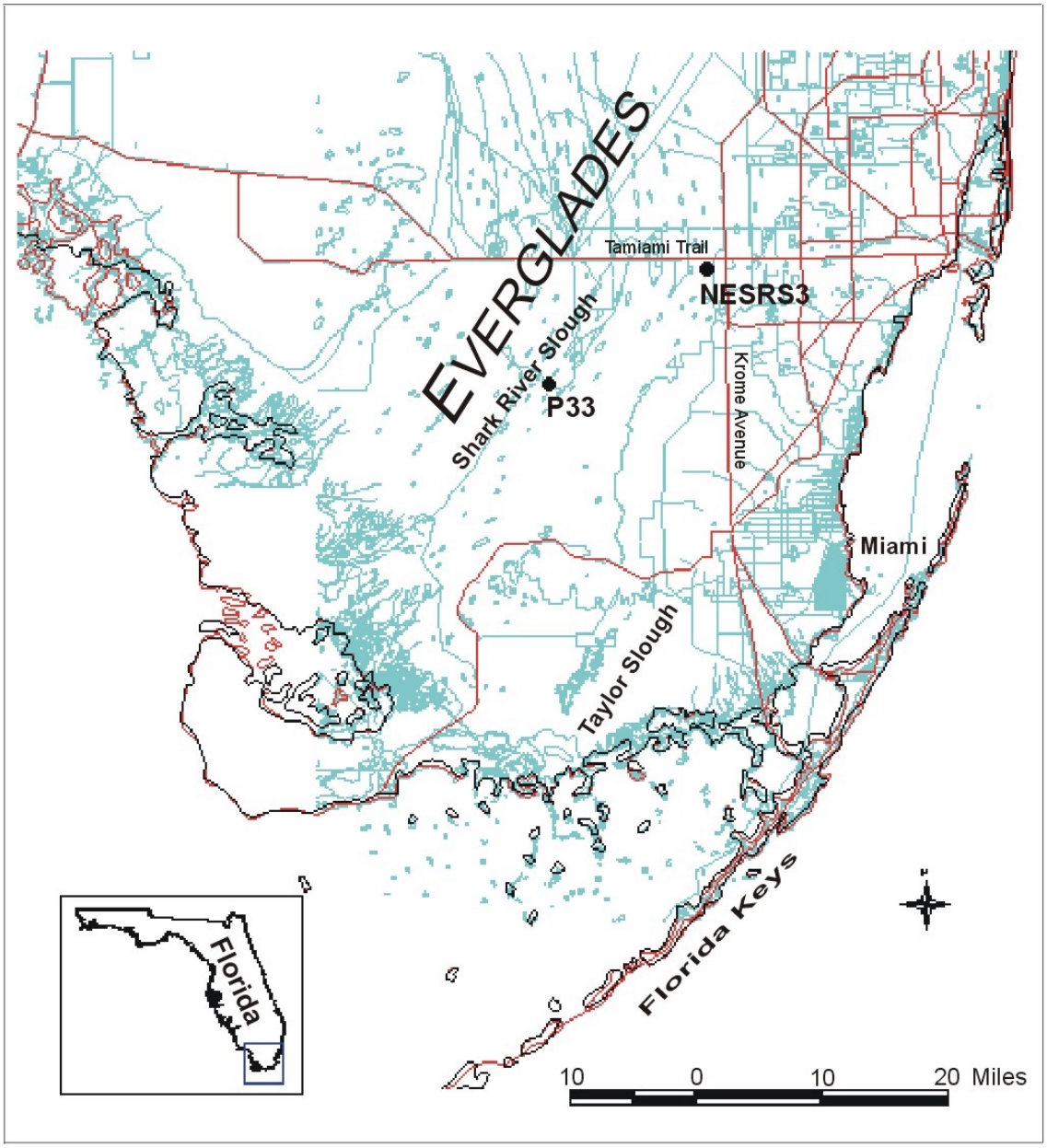


Figure 1. Site map showing the locations of sites P33 and NESRS3 in Shark River Slough, South Florida Everglades.

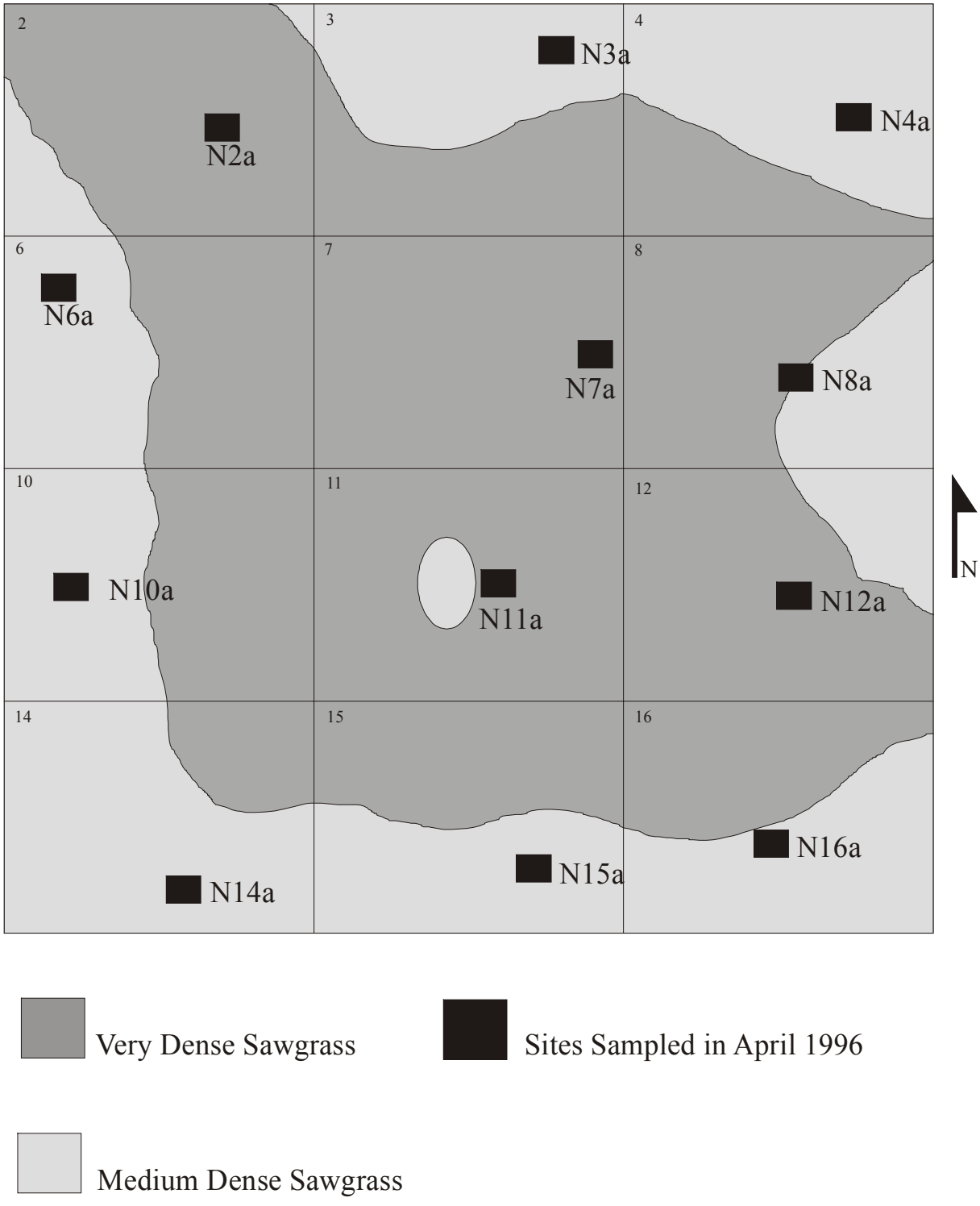


Figure 2. Site diagram of NESRS3 showing locations of vegetation sampling quadrats for April, 1996. (In the quadrat names the numbers correspond to the sample number, and the lower case 'a' denotes an April sample.)

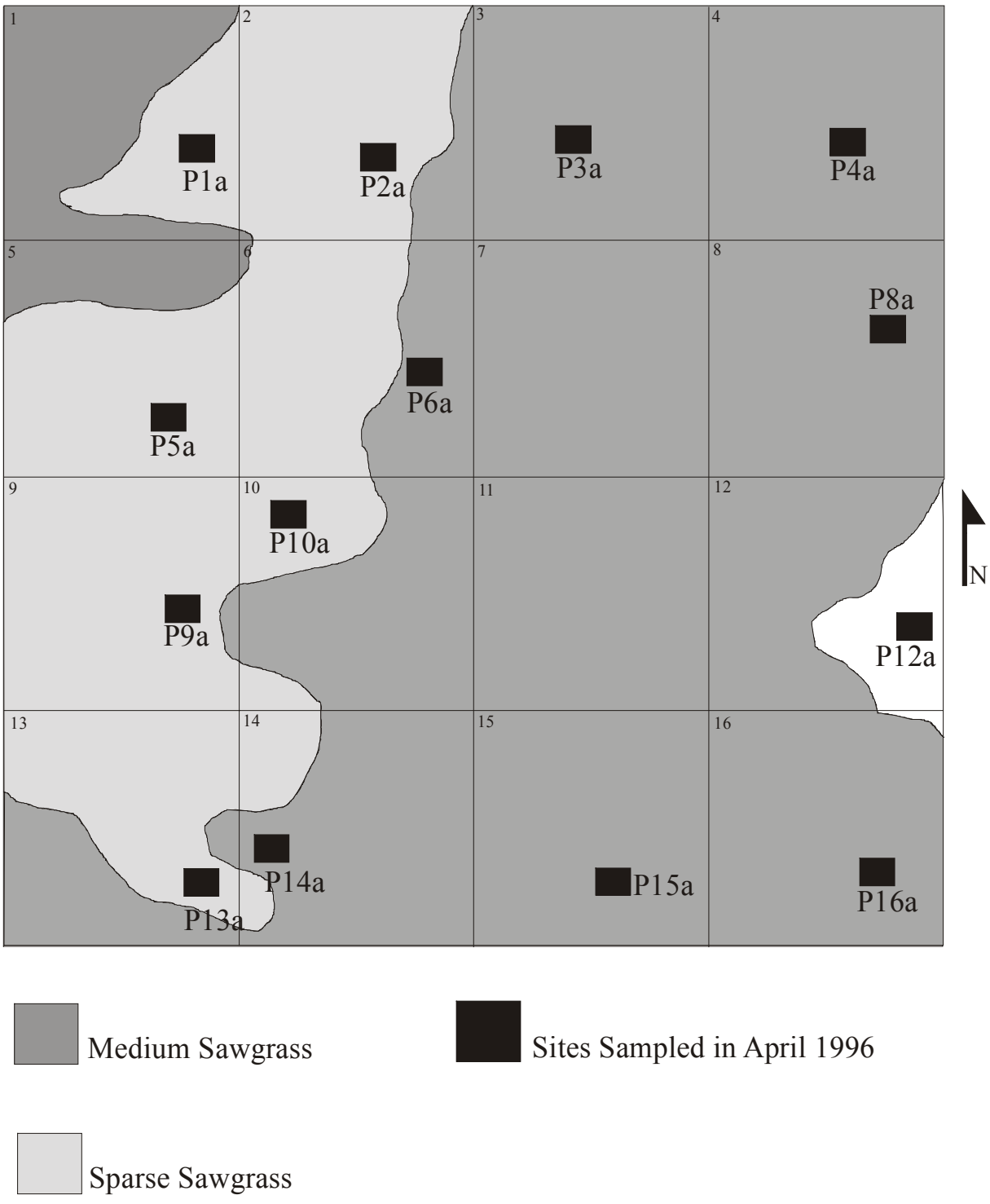


Figure 3. Site diagram of P33 showing location of vegetation sampling quadrats for April, 1996. (In the quadrat names the numbers correspond to the sample number, and the lower case ‘a’ denotes an April sample.)

RESULTS AND SAMPLE ANALYSES

The results of the analyses of vegetation samples from two sites in Shark River Slough are summarized in the tables and illustrations below. Table 2 gives the biomass and plant community based class, total biomass minus periphyton biomass, periphyton biomass, and live biomass of the NESRS3 and P33 quadrats from April, 1996. Table 3 summarizes the mean biomass of the eight classes found in the April quadrats. Appendix A contains the individual layer-by layer biomass for each April quadrat and accompanying illustration. Appendix B contains the individual layer-by-layer vegetative characteristics of each quadrat and the accompanying illustration. Appendix C contains the layer-by-layer LAIs and the corrected LAIs.

REFERENCES CITED

Lee, J.W. and Carter, Virginia, 1996, Vegetation affects water movement in the Florida Everglades: U.S. Geological Survey Fact Sheet FS-147-96.

_____, 1997, Vegetative resistance to flow in the Florida Everglades: U.S. Geological Survey Open-File Report 97-385, p. 49-50.

Table 1. Description of vegetation in sampling quadrats in Shark River Slough, Everglades National Park, April, 1996
(cm = centimeters)

Quadrat	Description of Vegetation	Plant height (m)	Litter layer (cm)	Water depth (cm)
P1	Sparse rush	0.6		37
P2	Sparse rush with lily	0.5		35
P3	Dense sawgrass with small trees	2.0		18
P4	Medium sawgrass (6 plants)	1.8		23
P5	Sparse sawgrass	1.7		25
P6	Sparse sawgrass	1.5		25
P8	Medium sawgrass (8 plants) with sparse periphyton	1.6	10	18
P9	Sparse sawgrass (4 plants)	1.6		18
P10	Sparse sawgrass (4 plants)	1.7		20
P12	Sparse sawgrass (1 plant) and rush with periphyton	1.0	15	25
P13	Sparse rush with periphyton (some sawgrass)	0.45		22
P14	Sparse sawgrass with lily	1.8		22
P15	Sparse sawgrass (3 plants)			25
P16	Sparse sawgrass (5 plants) with rush. Periphyton thickness 1.5 to 2.5 cm	1.7		20
N2	Very dense sawgrass (12 plants)	2.2		35
N3	Dense sawgrass (9 plants)	2.0		40
N4	Sparse to medium sawgrass (2 plants). Periphyton sweaters 2.5 cm in diameter. Utricularia, Bacopa	1.53		35
N6	Medium sawgrass with periphyton. Bacopa and grass.	2.0		40
N7	Very dense sawgrass (8 plants)	2.7		35
N8	Dense sawgrass (10 plants) w little periphyton and Utricularia	2.0		40
N10	Medium sawgrass	1.7		40
N11	Very dense sawgrass (5 plants). No periphyton	2.7		30
N12	Dense sawgrass with periphyton	2.35		
N14	Medium to dense sawgrass with periphyton	2.0	10	40
N15	Dense sawgrass with periphyton and Sagittaria	2.1		40
N16	Dense sawgrass (7 plants)	2.3		

Table 2. Vegetative composition-based and biomass-based classification of quadrats sampled April, 1996, at sites P33 and NESRS3 in Shark River Slough, Everglades National Park (Biomass in grams dry weight per m^2 (gdw/m^2); sawgrass classes based on total biomass excluding periphyton: sparse = 0-500 gdw/m^2, medium = 500-1000 gdw/ m^2, dense = 1000-2000 gdw/ m^2 and very dense = >2000 gdw/ m^2 ; P1, etc. = quadrat number; Sg is sawgrass; R is rush)

Class	Quadrat number	Total biomass minus periphyton	Periphyton biomass	Live biomass
Sparse sawgrass	P5	304	95.9	84.9
Sparse sawgrass	P9	356.2	473.2	133.8
Sparse sawgrass	N10	355.2	114.8	150.2
Medium sawgrass	P4	779	95.3	209.2
Medium sawgrass	P14	753	89.9	235.3
Medium sawgrass	N6	823.9	269.6	377.7
Dense sawgrass	P3	1222.2	0	552.8
Dense sawgrass	P8	1236.0	52.8	344.0
Dense sawgrass	N3	1140.0	0	575.6
Dense sawgrass	N8	1576.4	3.0	547.5
Dense sawgrass	N14	1070.5	234.8	402.0
Dense sawgrass	N15	1250.1	260.1	322.5
Dense sawgrass	N16	1323.4	338.9	488.3
Very dense sawgrass	N2	2529.0	0	754.0
Very dense sawgrass	N7	2284.9	4.9	1078.8
Very dense sawgrass	N11	4697.7	0	1251.5
Very dense sawgrass	N12	3282.0	0	1427.4
Sparse Mixed SgR	P2	166.2	22.6	105.4
Sparse Mixed Sg/R	P10	487.1	13.4	86.2
Sparse Mixed Sg/R	P12	468.1	113.2	83.4
Sparse Mixed Sg/R	P13	306.0	175.3	22.1
Medium Mixed Sg/R	P6	893.4	0	197.6
Medium Mixed Sg/R	P16	776.0	354.1	164.6
Medium Mixed Sg/R	N4	506.8	264.8	178.8
Dense Mixed Sg/R	P15	1369.8	39.6	194.1
Sparse Rush	P1	61.5	57.4	2.4

Table 3. Mean biomass in NESRS3 and P33 quadrats sampled April, 1996, in Shark River Slough, Everglades National Park
(biomass in grams dry weight per square meter (gdw/m^2±1 standard deviation); sawgrass classes based on total biomass excluding periphyton: sparse = 0-500 gdw/ m^2, medium = 500-1000 gdw/ m^2, dense = 1000-2000 gdw/ m^2, very dense = >2000 gdw/ m^2; n=number of samples; Sg = sawgrass; R = rush)

Class	Total biomass minus periphyton	Total periphyton biomass	Total live biomass	Total dead biomass
Sparse sawgrass (n=3)	338.5±29.83	109.24±11.58	123.0±33.95	215.5±9.21
Medium sawgrass (n=3)	785.1±36.11	151.6±102.20	274.1±90.72	511.1±62.00
Dense sawgrass (n=7)	1259.8±161.54	127.1±145.69	461.81±104.97	798.0±167.42
Very dense sawgrass (n=4)	3198.4±1085.89	1.2±2.44	1152.94± 323.81	2045.5± 970.27
Sparse rush (n=1)	61.5	57.4	2.4	59.08
Sparse Mixed Sg/R (n=4)	356.9±150.86	81.1±77.29	74.3±36.11	282.6±156.7
Medium Mixed Sg/R (n=3)	741.8±400.00	206.3±184.17	180.3±16.55	561.5±165.14
Dense Mixed Sg/R (n=1)	1369.8	9.9	194.1	1175.68

Appendix A. Biomass by Individual Quadrat Sampled at Sites P33 and NESRS3 in Shark River Slough, Everglades National Park

Table A-1. Summary of biomass in quadrat P1, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = sparse rush; water surface = 37 cm; plant height = 0.6 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100					
80-100					
60-80					
40-60		1.64		1.64	1.64
30-40	0.56	14.36		14.92	14.92
20-30	0.48	3.56		4.04	4.04
10-20	1.00	8.24	57.40	66.64	9.24
0-10	0.40	31.28		31.68	31.68
Total	2.44	59.08	57.40	118.92	61.52

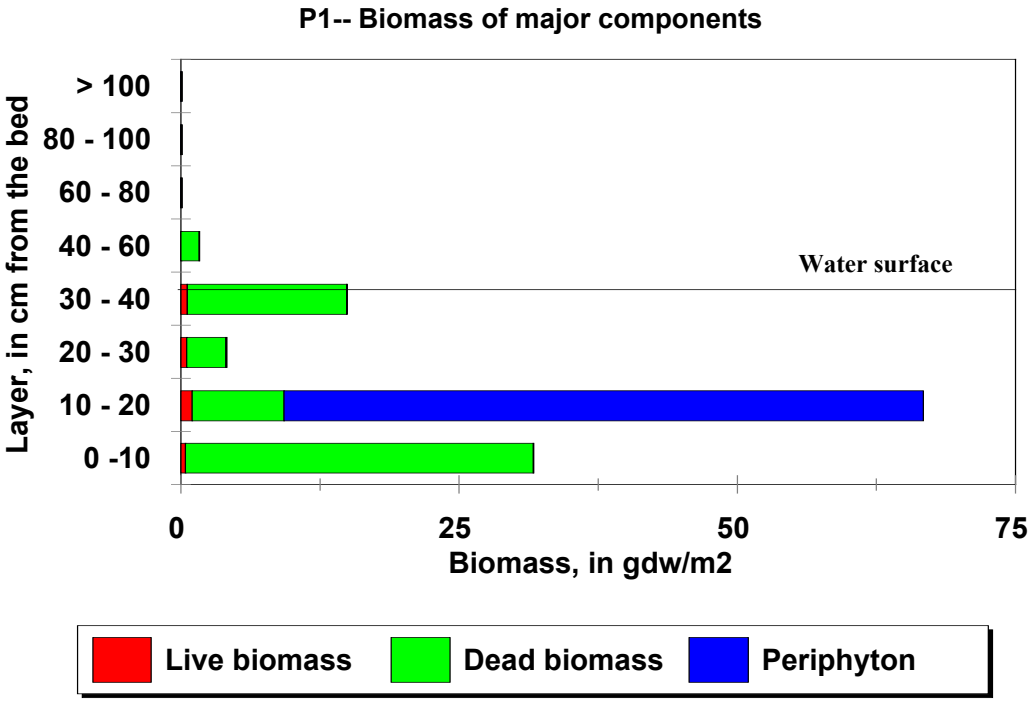


Table A-2. Summary of biomass in quadrat P2, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = sparse mixed sawgrass/rush; water surface = 35 cm; plant height = 0.5 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100					
80-100					
60-80					
40-60	0.44			0.44	0.44
30-40	103.68	2.84		106.52	106.52
20-30	0.60	18.40		19.00	19.00
10-20	0.64	14.36	7.32	22.32	15.00
0-10		25.20	15.24	40.44	25.20
Total	105.36	60.80	22.56	188.72	166.16

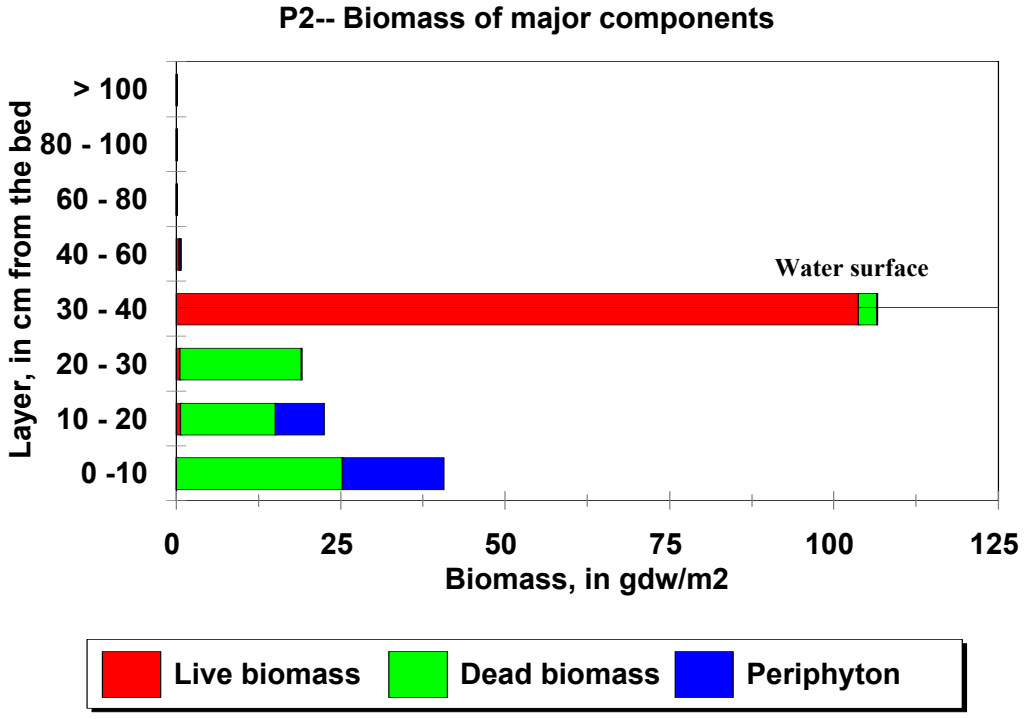


Table A-3. Summary of biomass in quadrat P3, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = dense sawgrass; water surface = 18 cm; plant height = 2.0 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	46.92	9.32		56.24	56.24
80-100	1.92	42.08		44.00	44.00
60-80	40.44	47.52		87.96	87.96
40-60	69.04	56.96		126.00	126.00
30-40	29.88	59.40		89.28	89.28
20-30	24.92	84.08		109.00	109.00
10-20	58.04	174.68		232.72	232.72
0-10	281.60	195.36		476.96	476.96
Total	552.76	669.40		1222.16	1222.16

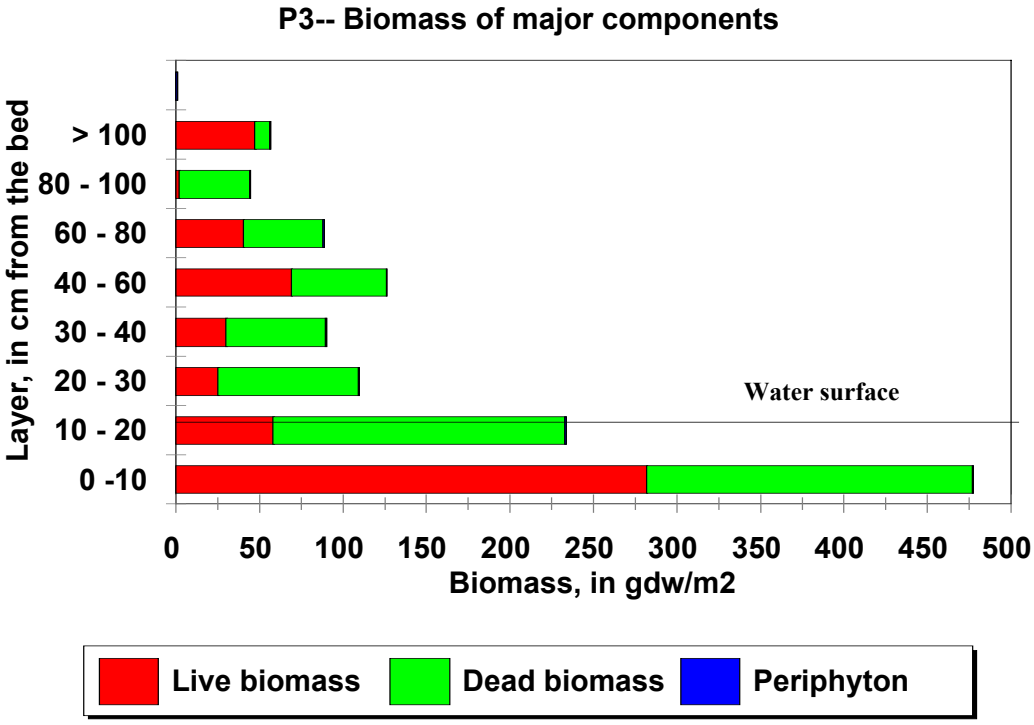


Table A-4. Summary of biomass in quadrat P4, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = medium sawgrass; water surface = 23 cm; plant height = 1.8 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	27.40	4.08		31.48	31.48
80-100	24.64	13.68		38.32	38.32
60-80	39.00	42.44		81.44	81.44
40-60	39.00	56.24		95.24	95.24
30-40	18.92	69.68		88.60	88.60
20-30	23.00	110.60		133.60	133.60
10-20	24.20	124.60	95.32	244.12	148.80
0-10	13.00	148.40		161.40	161.40
Total	209.16	569.72	95.32	874.20	778.88

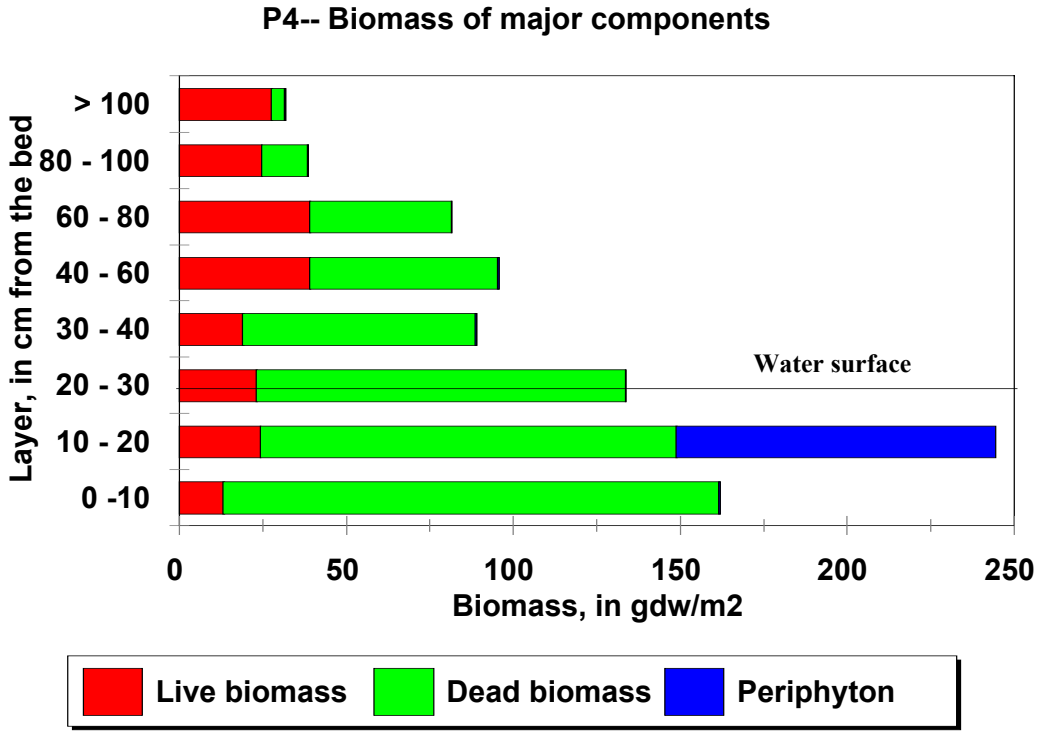


Table A-5. Summary of biomass in quadrat P5, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = sparse sawgrass; water surface = 25 cm; plant height = 1.6 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
> 100	6.84			6.84	6.84
80-100	6.16			6.16	6.16
60-80	6.00	10.84		16.84	16.84
40-60	14.32	34.04		48.36	48.36
30-40	14.28	29.96		44.24	44.24
20-30	8.40	41.92		50.32	50.32
10-20	11.28	40.76	95.92	147.96	52.04
0-10	17.64	61.60		79.24	79.24
Total	84.92	219.12	95.92	399.96	304.04

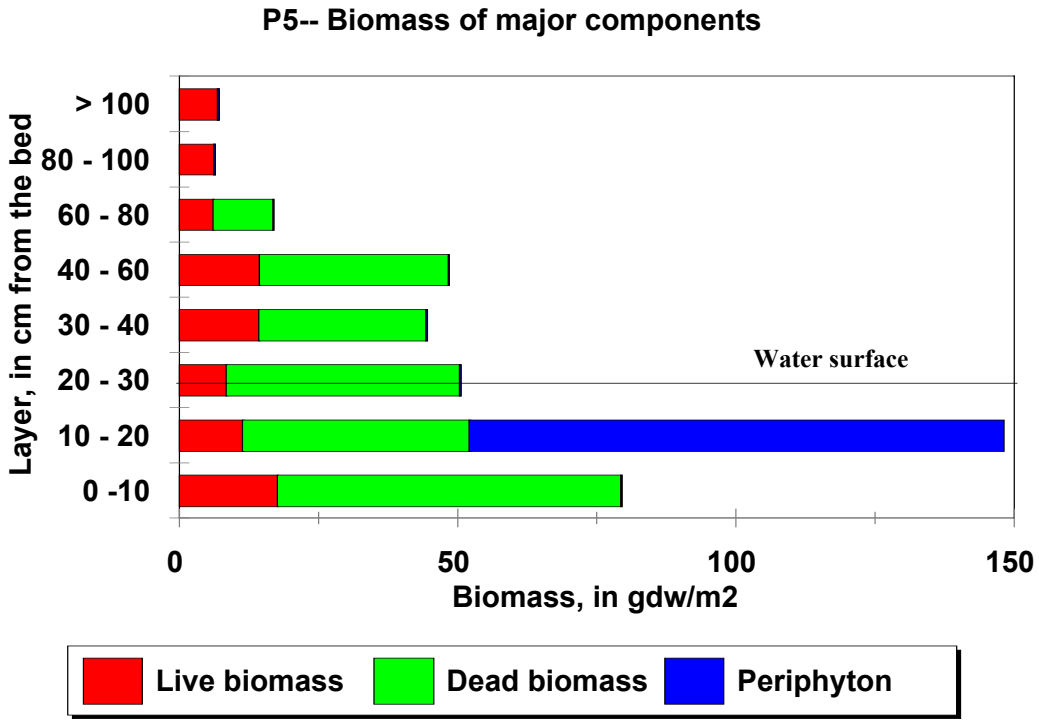


Table A-6. Summary of biomass in quadrat P6, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = medium mixed sawgrass/rush; water surface = 25 cm; plant height = 1.4 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	12.00	2.20		14.20	14.20
80-100	5.20	20.12		25.32	25.32
60-80	23.60	25.12		48.72	48.72
40-60	45.96	80.44		126.40	126.40
30-40	18.44	113.92		132.36	132.36
20-30	16.40	164.72		181.12	181.12
10-20	35.28	131.96		167.24	167.24
0-10	40.68	157.40		198.08	198.08
Total	197.56	695.88		893.44	893.44

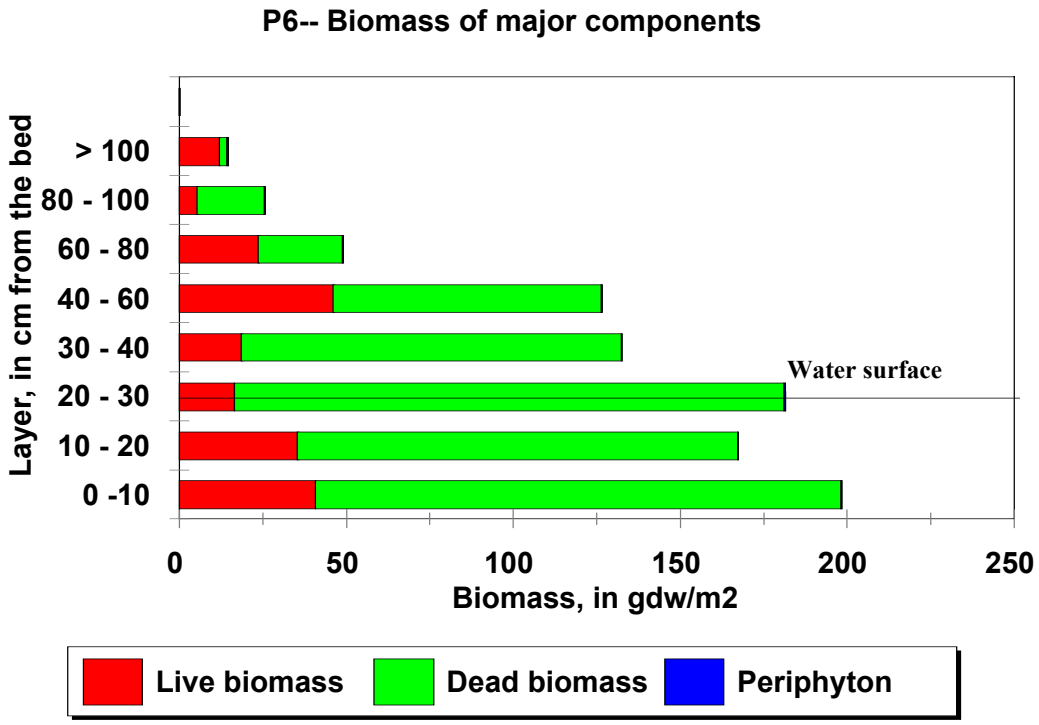


Table A-7. Summary of biomass in quadrat P8, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = dense sawgrass; water surface = 18 cm; plant height = 1.6 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	19.56	7.28		26.84	26.84
80-100	28.04	9.16		37.20	37.20
60-80	47.64	45.36		93.00	93.00
40-60	70.32	146.20		216.52	216.52
30-40	45.48	83.00		128.48	128.48
20-30	29.44	104.72		134.16	134.16
10-20	58.12	219.84		277.96	277.96
0-10	45.44	276.36	52.84	374.64	321.80
Total	344.04	891.92	52.84	1288.80	1235.96

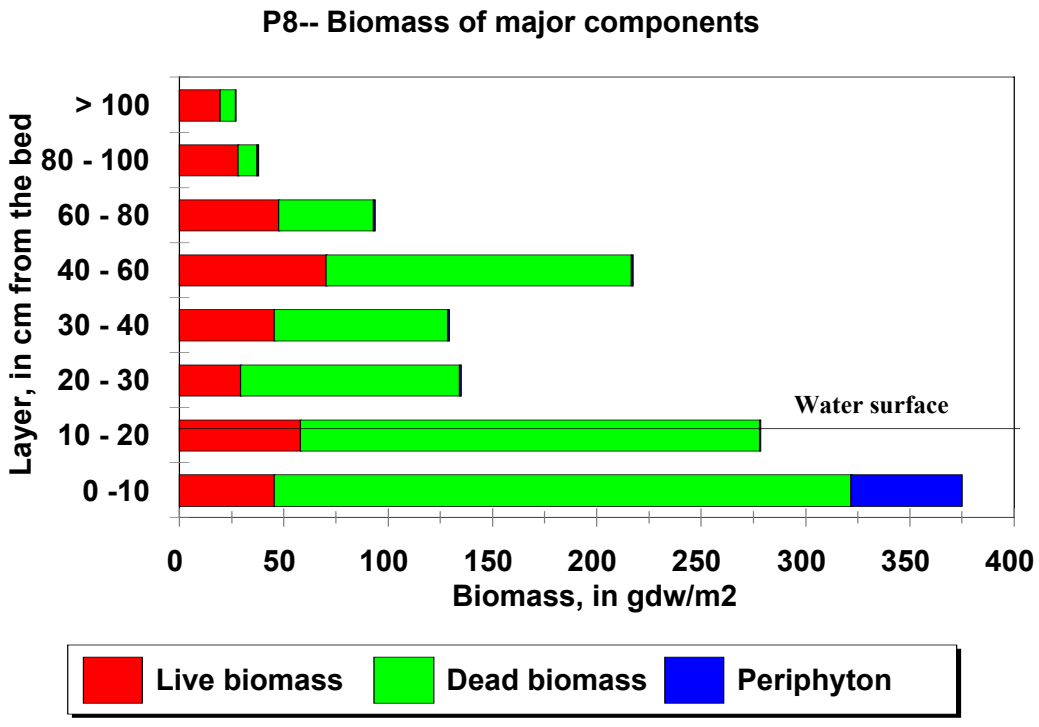


Table A-8. Summary of biomass in quadrat P9, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = sparse sawgrass; water surface = 18 cm; plant height = 1.6 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	10.48	0		10.48	10.48
80-100	13.32	8.64		21.96	21.96
60-80	20.72	15.32		36.04	36.04
40-60	23.16	28.24		51.40	51.40
30-40	13.28	35.08		48.36	48.36
20-30	6.04	24.6		30.64	30.64
10-20	17.36	41.28	54.68	113.32	58.64
0-10	29.48	69.20	62.28	160.96	98.68
Total	133.84	222.36	116.96	473.16	356.2

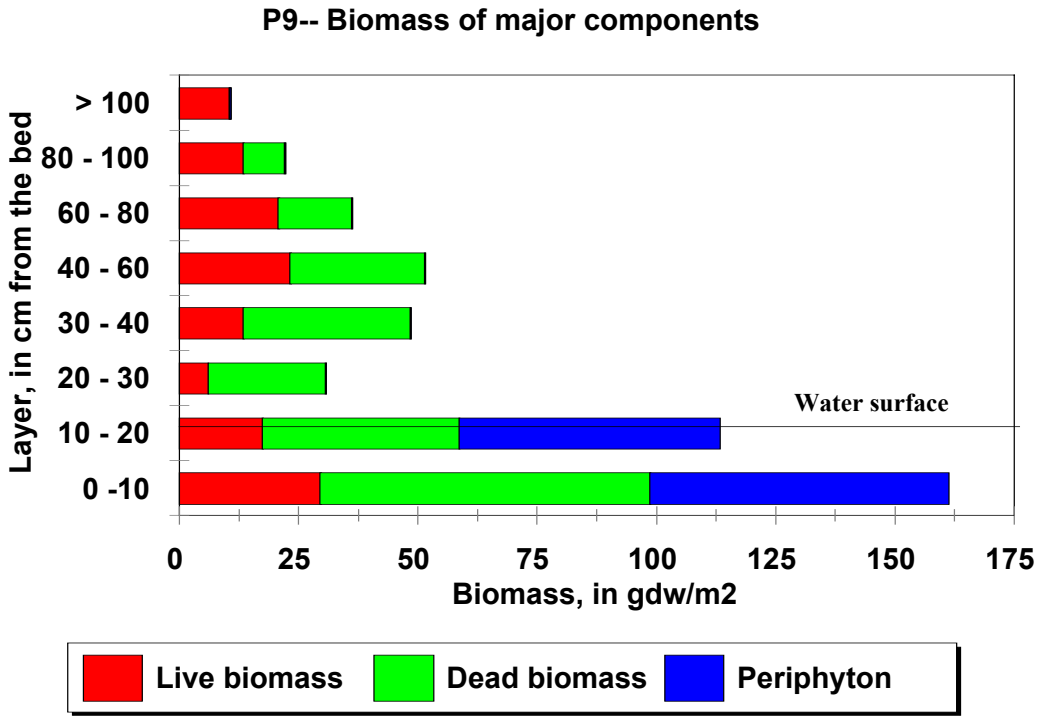


Table A-9. Summary of biomass in quadrat P10, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = sparse mixed sawgrass/rush; water surface = 20 cm; plant height = 1.7 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	2.92	9.68		12.60	12.60
80-100	5.08			5.08	5.08
60-80	8.16	6.92		15.08	15.08
40-60	17.52	21.16		38.68	38.68
30-40	14.44	23.24		37.68	37.68
20-30	5.52	48.24		53.76	53.76
10-20	8.64	166.60	13.36	188.60	175.24
0-10	23.88	125.12		149.00	149.00
Total	86.16	400.96	13.36	500.48	487.12

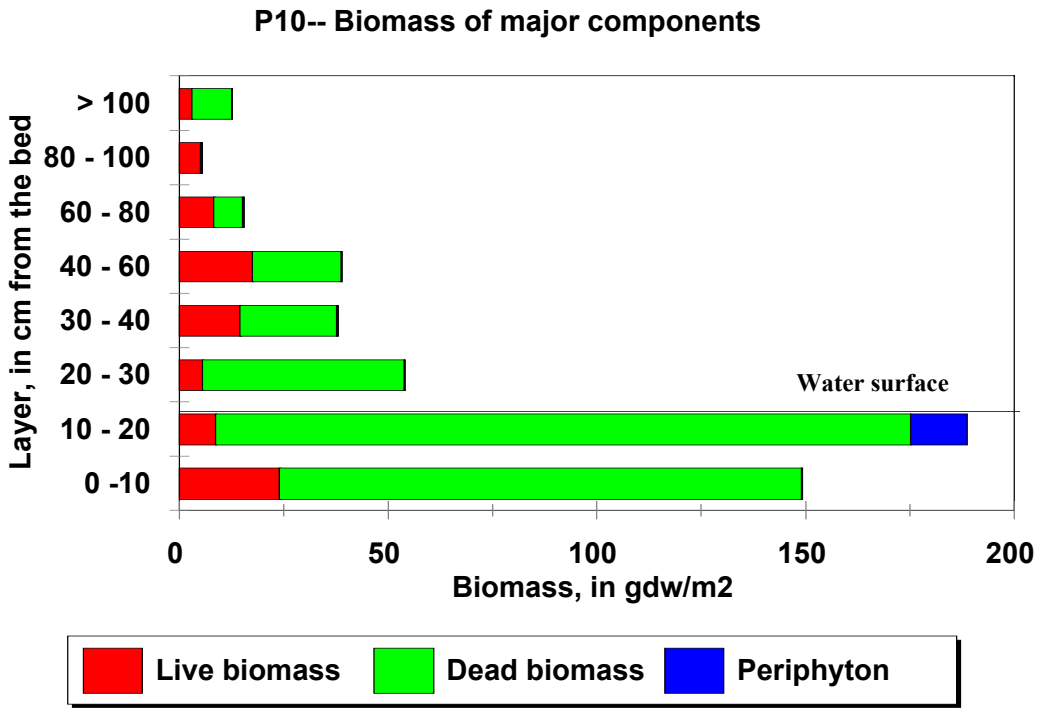


Table A-10. Summary of biomass in quadrat P12, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = sparse mixed sawgrass/rush; water surface = 25 cm; plant height = 1.0 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	9.04	3.36		12.40	12.40
80-100	8.48	1.52		10.00	10.00
60-80	7.12	0.48		7.6	7.60
40-60	12.64	36.64		49.28	49.28
30-40	12.40	20.68		33.08	33.08
20-30	9.64	67.52		77.16	77.16
10-20	10.16	84.60		94.76	94.76
0-10	13.92	169.92	113.20	297.04	183.84
Total	83.40	384.72	113.20	581.32	468.12

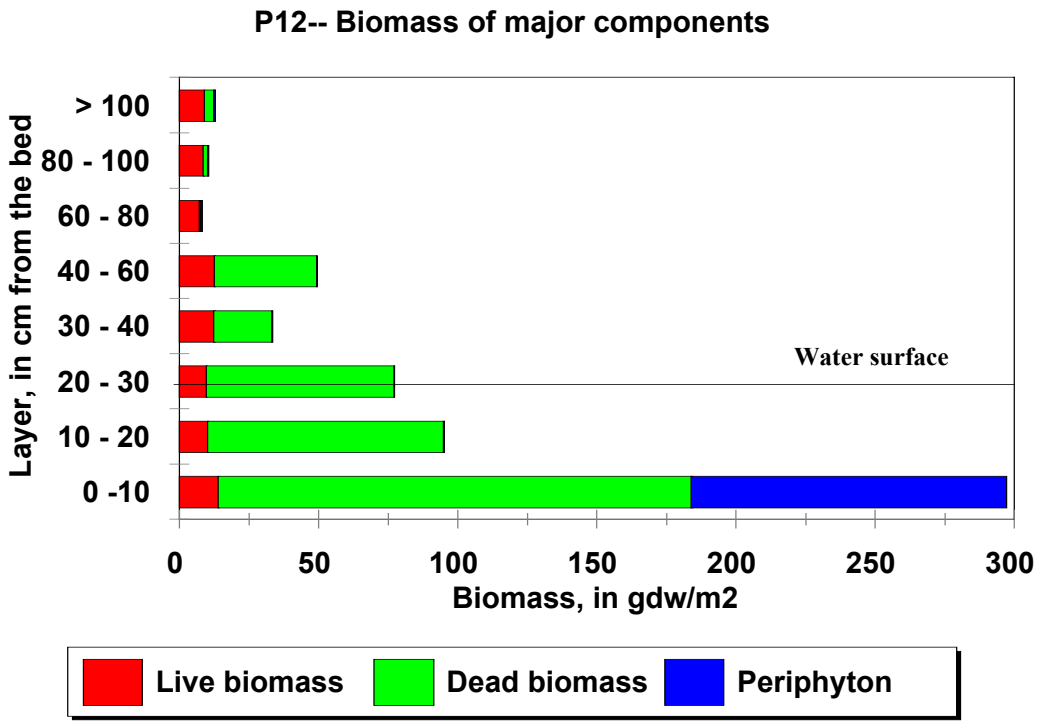


Table A-11. Summary of biomass in quadrat P13, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = sparse mixed sawgrass/rush; water surface = 22 cm; plant height = 0.45 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100					
80-100					
60-80					
40-60	3.36	5.08		8.44	8.44
30-40	0.60	8.80		9.40	9.40
20-30	0.04	14.80		14.84	14.84
10-20	1.04	137.12	175.32	313.48	138.16
0-10	17.08	118.04		135.12	135.12
Total	22.12	283.84	175.32	481.28	305.96

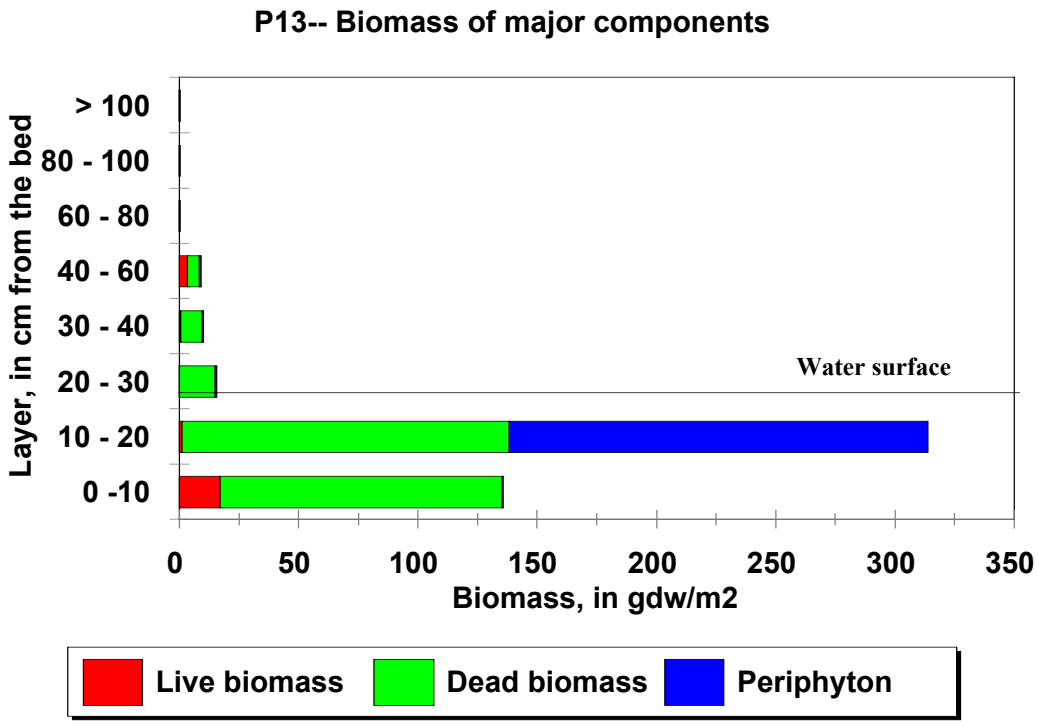


Table A-12. Summary of biomass in quadrat P14, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = medium sawgrass; water surface = 22 cm; plant height = 1.75 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	9.68			9.68	9.68
80-100	21.52			21.52	21.52
60-80	7.08	35.48		42.56	42.56
40-60	15.68	56.40		72.08	72.08
30-40	8.28	63.64		71.92	71.92
20-30	23.40	64.04		87.44	87.44
10-20	54.12	97.92	89.88	241.92	152.04
0-10	95.52	199.76		295.28	295.28
Total	235.28	517.24	89.88	842.40	752.52

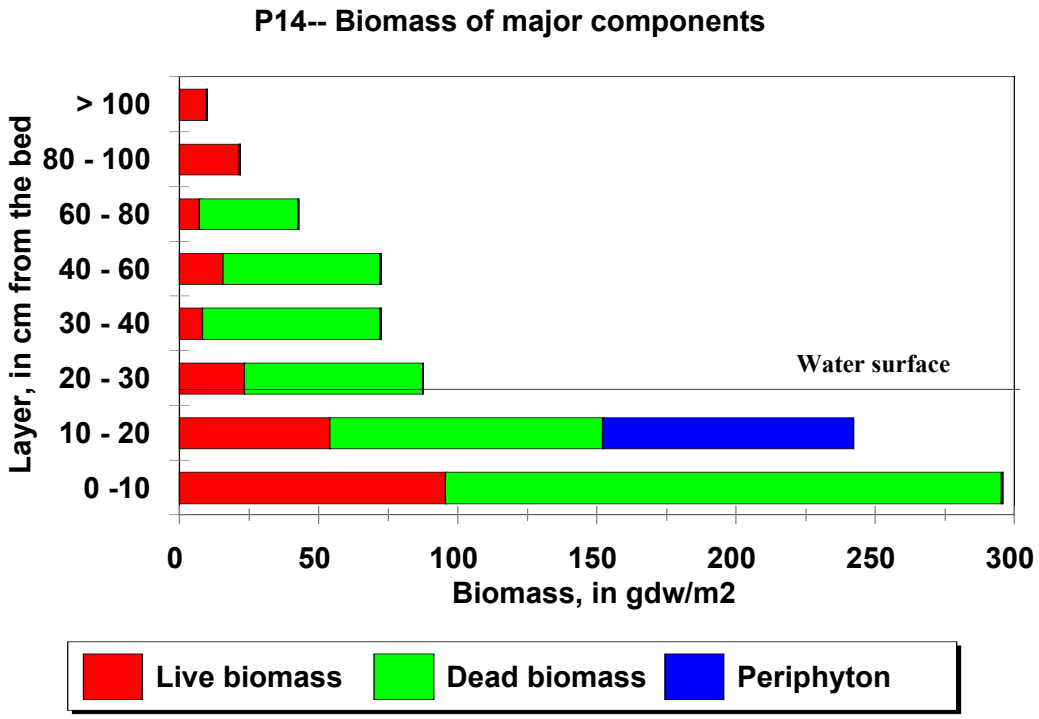


Table A-13. Summary of biomass in quadrat P15, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = dense mixed sawgrass/rush; water surface = 25 cm; plant height = no data

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	20.04			20.04	20.04
80-100	33.96			33.96	33.96
60-80	12.80	15.84		28.64	28.64
40-60	18.52	32.60		51.12	51.12
30-40	18.08	50.32		68.40	68.40
20-30	41.84	541.28		583.12	583.12
10-20	19.52	269.60	39.56	328.68	289.12
0-10	29.32	266.04		295.36	295.36
Total	194.08	1175.68	39.56	1409.32	1369.76

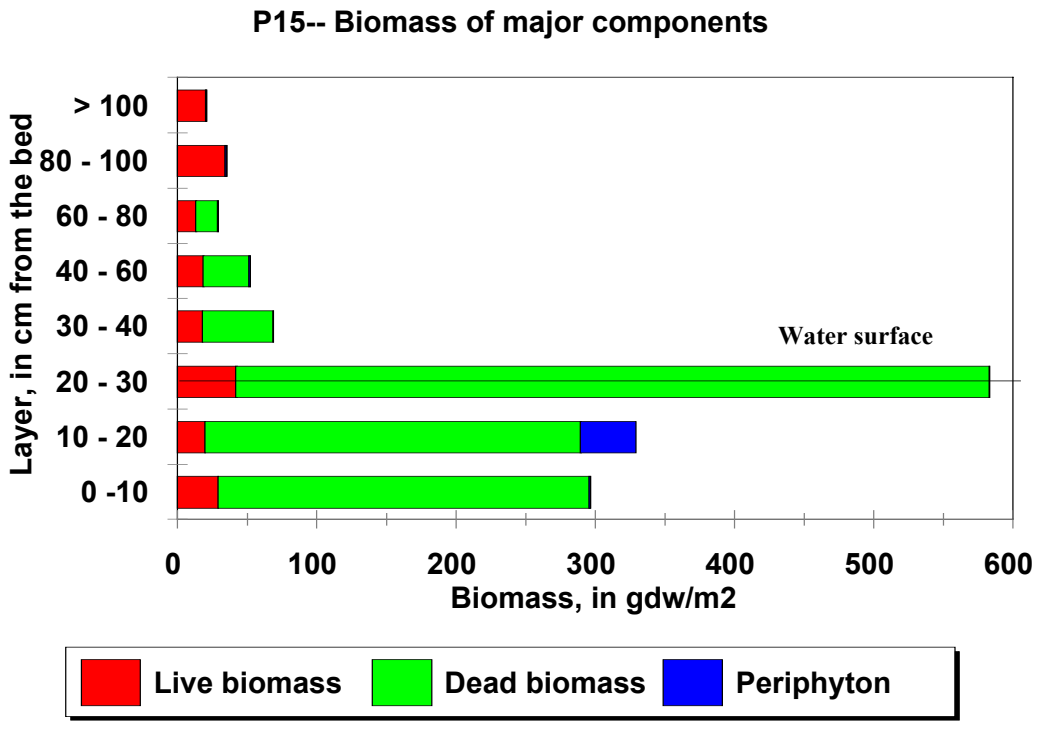


Table A-14. Summary of biomass in quadrat P16, P33 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = medium mixed sawgrass/rush; water surface = 20 cm; plant height = 1.7 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	11.20	11.44		22.64	22.64
80-100	16.40	13.12		29.52	29.52
60-80	18.04	14.28		32.32	32.32
40-60	22.68	41.44		64.12	64.12
30-40	26.24	84.84		111.08	111.08
20-30	26.92	82.52		109.44	109.44
10-20	23.44	119.64	263.88	406.96	143.08
0-10	19.64	244.12	90.24	354.00	263.76
Total	164.56	611.40	354.12	1130.08	775.96

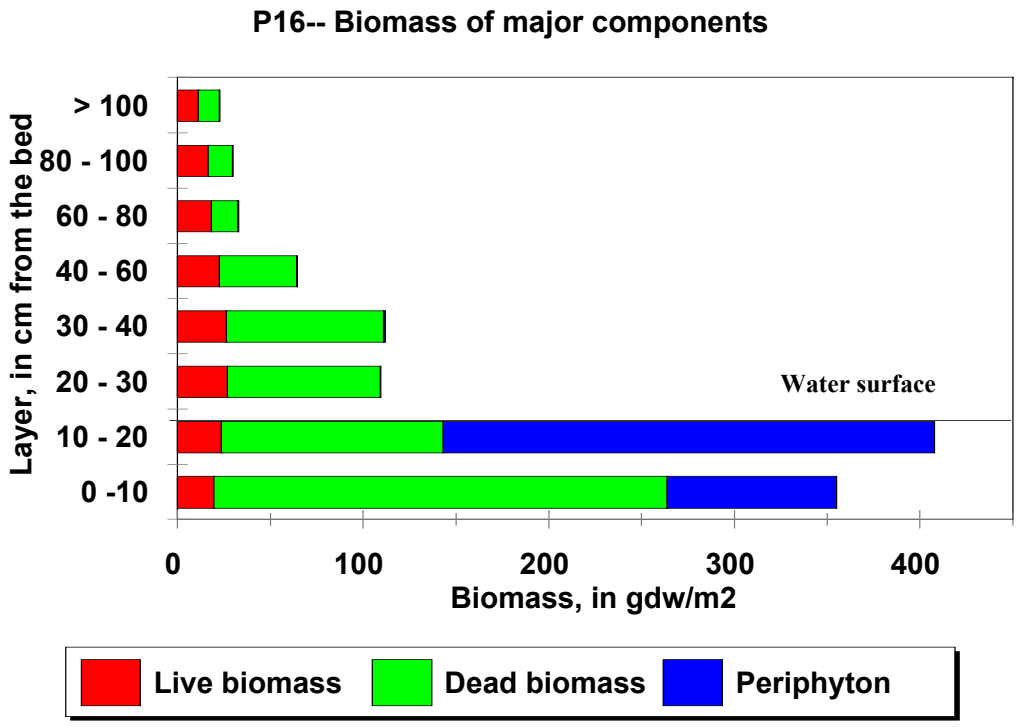


Table A-15. Summary of biomass in quadrat N2, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = very dense sawgrass; water surface = 35 cm; plant height = 2.2 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	132.24	107.76		240.00	240.00
80-100	30.00	195.04		225.04	225.04
60-80	85.96	256.92		342.88	342.88
40-60	74.68	303.00		377.68	377.68
30-40	24.36	252.60		276.96	276.96
20-30	31.96	128.08		160.04	160.04
10-20	78.72	290.12		368.84	368.84
0-10	296.12	241.48		537.60	537.60
Total	754.04	1775.00		2529.04	2529.04

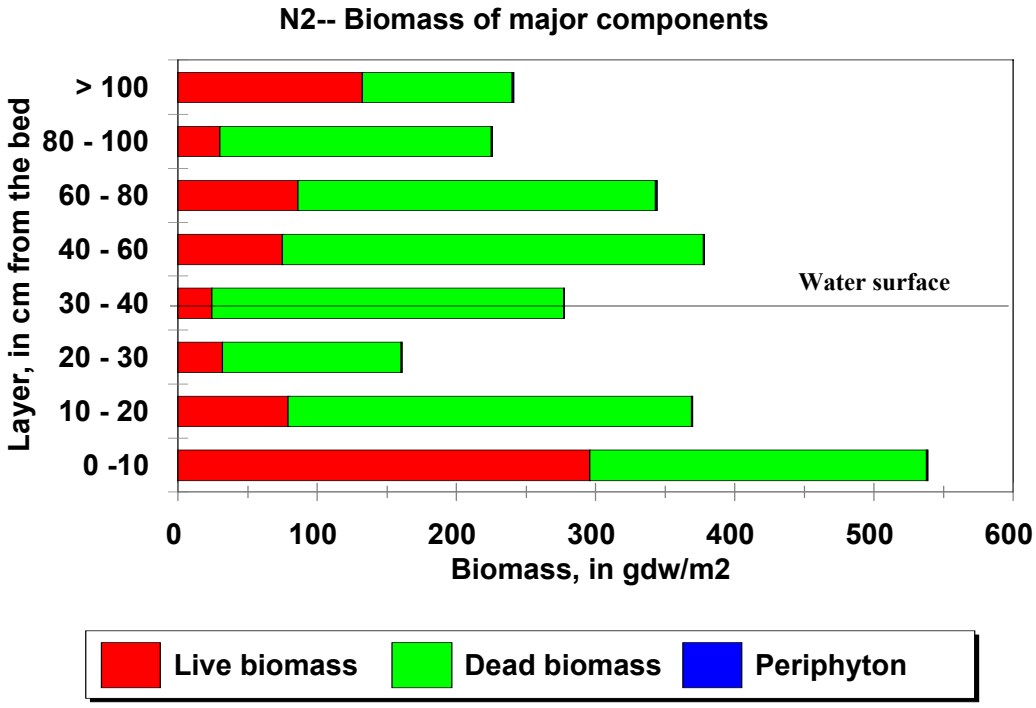


Table A-16. Summary of biomass in quadrat N3, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = dense sawgrass;water surface = 40 cm; plant height = 2.0 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	68.56	17.48		86.04	86.04
80-100	51.56	24.68		76.24	76.24
60-80	79.24	98.84		178.08	178.08
40-60	81.48	95.56		177.04	177.04
30-40	75.08	98.44		173.52	173.52
20-30	46.36	83.52		129.88	129.88
10-20	68.36	84.40		152.76	152.76
0-10	104.92	61.56		166.48	166.48
Total	575.56	564.48		1140.04	1140.04

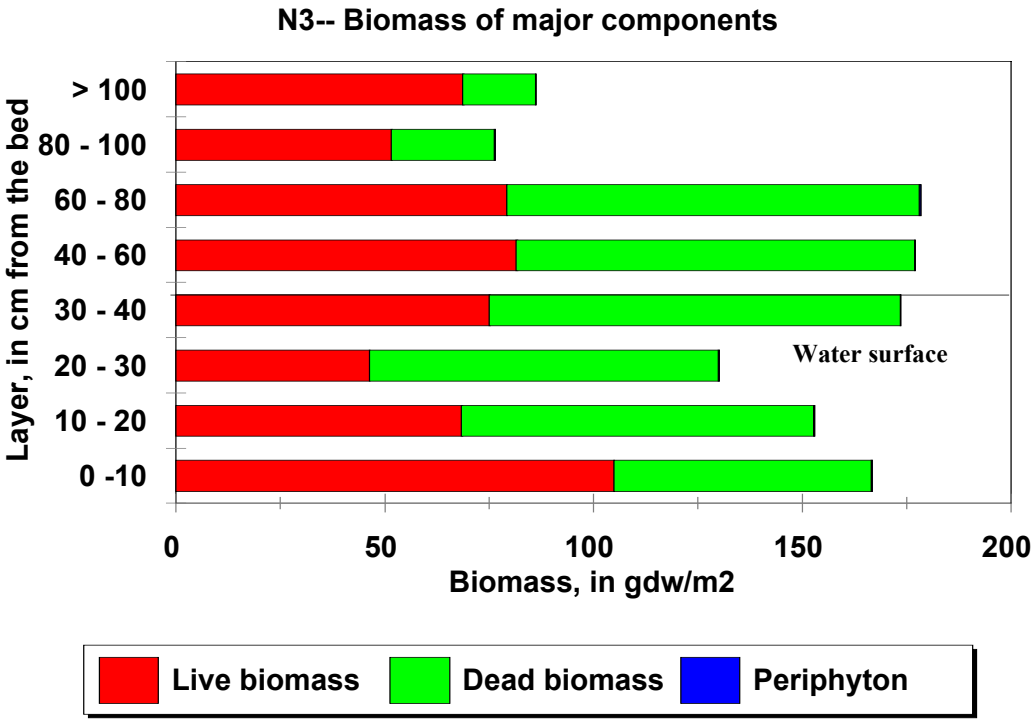


Table A-17. Summary of biomass in quadrat N4, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = medium mixed sawgrass/rush; water surface = 35 cm; plant height = 1.53 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	6.96			6.96	6.96
80-100	8.64	2.64		11.28	11.28
60-80	17.16	28.40		45.56	45.56
40-60	26.00	99.96		125.96	125.96
30-40	38.96	81.92	103.24	224.12	120.88
20-30	31.12	55.20	44.92	131.24	86.32
10-20	19.72	44.36	59.52	123.60	64.08
0-10	30.28	64.64	57.16	152.08	94.92
Total	178.84	377.12	264.84	820.8	506.84

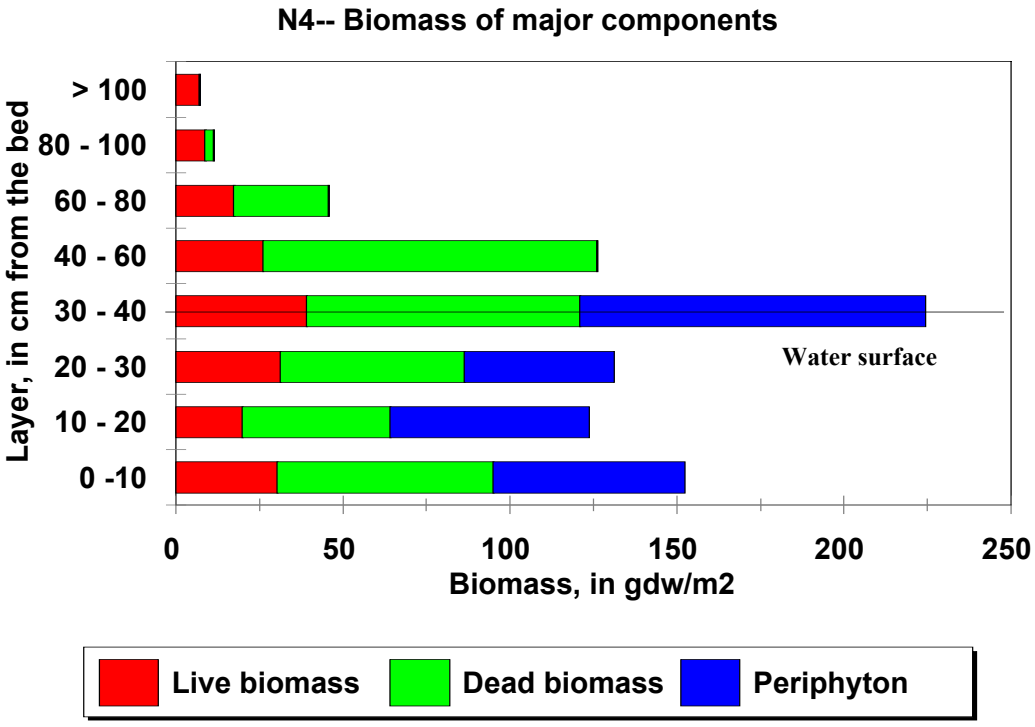


Table A-18. Summary of biomass in quadrat N6, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = medium sawgrass; water surface = 40 cm; plant height = 2.0 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	63.6			63.60	63.60
80-100	52.04			52.04	52.04
60-80	14.12	78.72		92.84	92.84
40-60	57.68	79.32		137.00	137.00
30-40	40.20	94.68	188.56	323.44	134.88
20-30	43.32	57.60	12.68	113.60	100.92
10-20	57.56	74.08	17.96	149.60	131.64
0-10	49.20	61.80	50.36	161.36	111.00
Total	377.72	446.20	269.56	1093.48	823.92

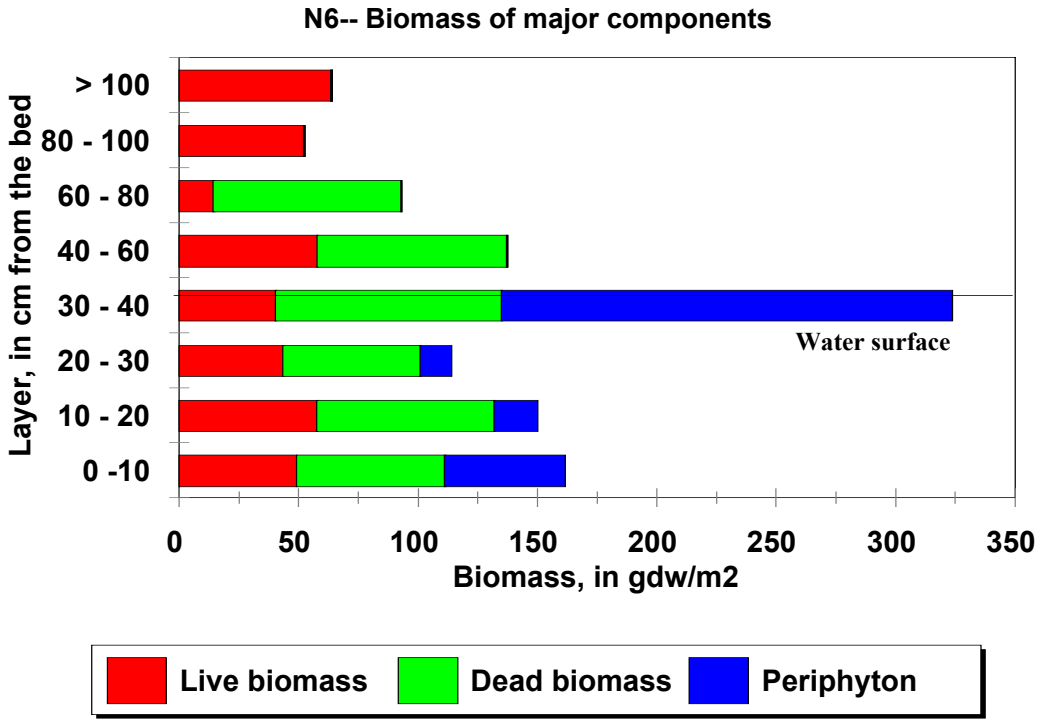


Table A-19. Summary of biomass in quadrat N7, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = very dense sawgrass; water surface = 35 cm; plant height = 2.7 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	245.28	81.12		326.40	326.40
80-100	89.12	134.28		223.40	223.40
60-80	123.84	206.92		330.76	330.76
40-60	126.28	260.28		386.56	386.56
30-40	20.76	198.08	4.88	223.72	218.84
20-30	64.40	117.28		181.68	181.68
10-20	77.80	106.40		184.20	184.20
0-10	331.32	101.72		433.04	433.04
Total	1078.80	1206.08	4.88	2289.76	2284.88

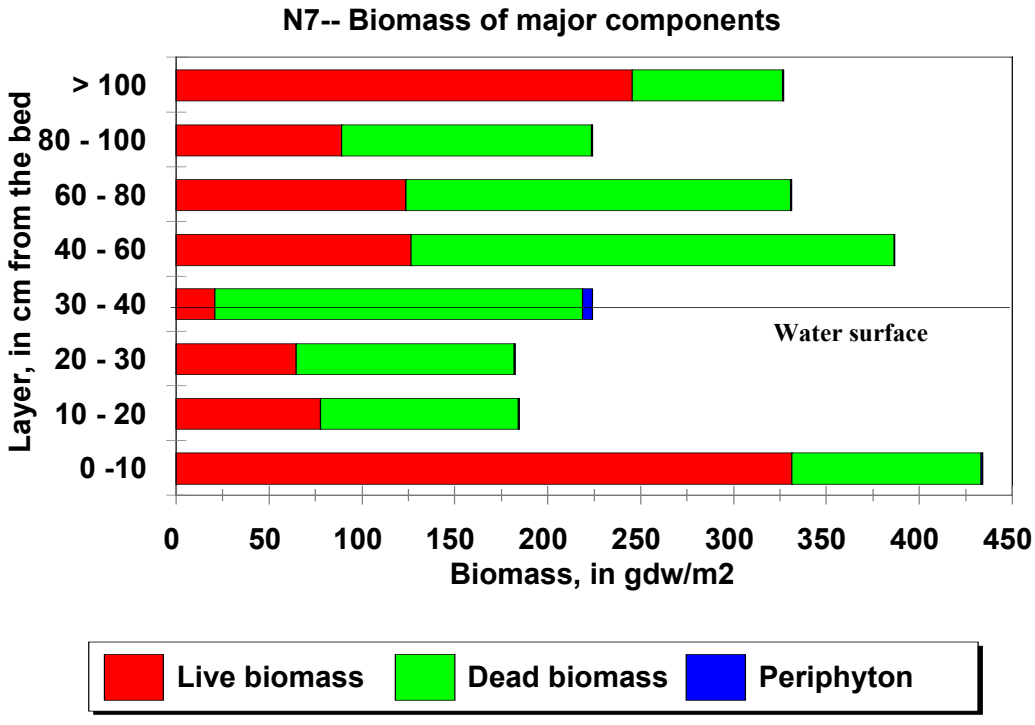


Table A-20. Summary of biomass in quadrat N8, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = dense sawgrass; water surface = 40 cm; plant height = 2.0 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	80.04	67.16		147.20	147.20
80-100	16.48	108.12		124.60	124.60
60-80	76.12	94.88		171.00	171.00
40-60	109.84	165.40		275.24	275.24
30-40	59.16	159.20	3.04	221.4	218.36
20-30	11.56	116.52		128.08	128.08
10-20	84.48	175.56		260.04	260.04
0-10	109.80	142.12		251.92	251.92
Total	547.48	1028.96	3.04	1579.48	1576.44

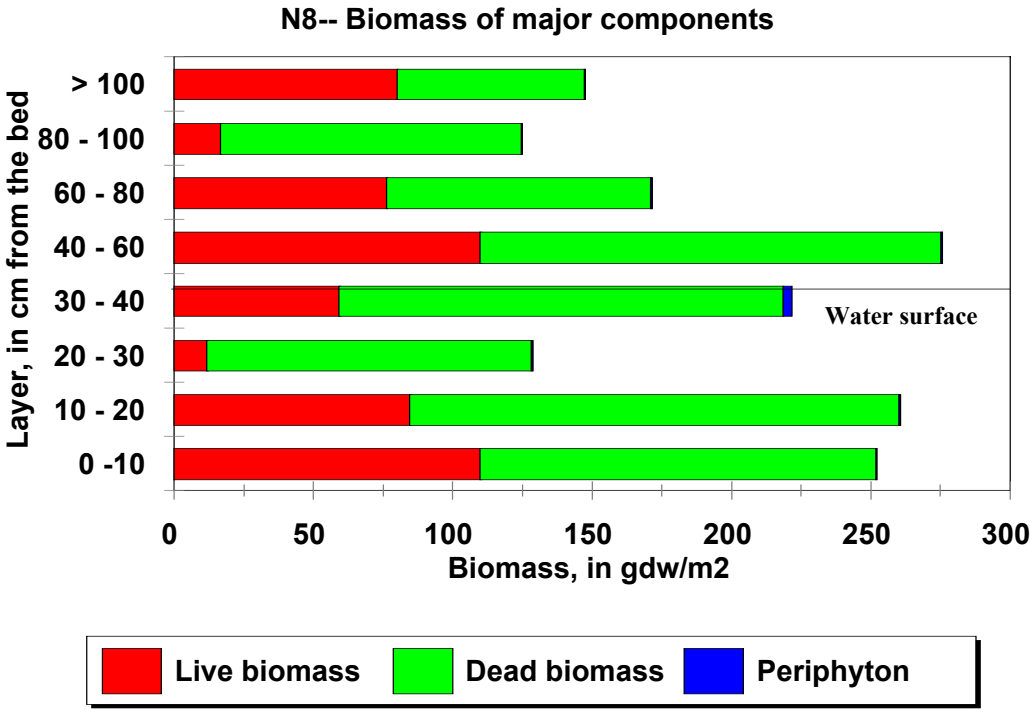


Table A-21. Summary of biomass in quadrat N10, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = sparse sawgrass; water surface = 40 cm; plant height = 1.7 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	20.28	3.24		23.52	23.52
80-100	12.52	12.44		24.96	24.96
60-80	28.04	21.68		49.72	49.72
40-60	15.76	52.80		68.56	68.56
30-40	24.28	24.68	36.76	85.72	48.96
20-30	18.68	34.12		52.80	52.8
10-20	15.92	9.76	62.12	87.80	25.68
0-10	14.68	46.32	15.96	76.96	61.00
Total	150.16	205.04	114.84	470.04	355.20

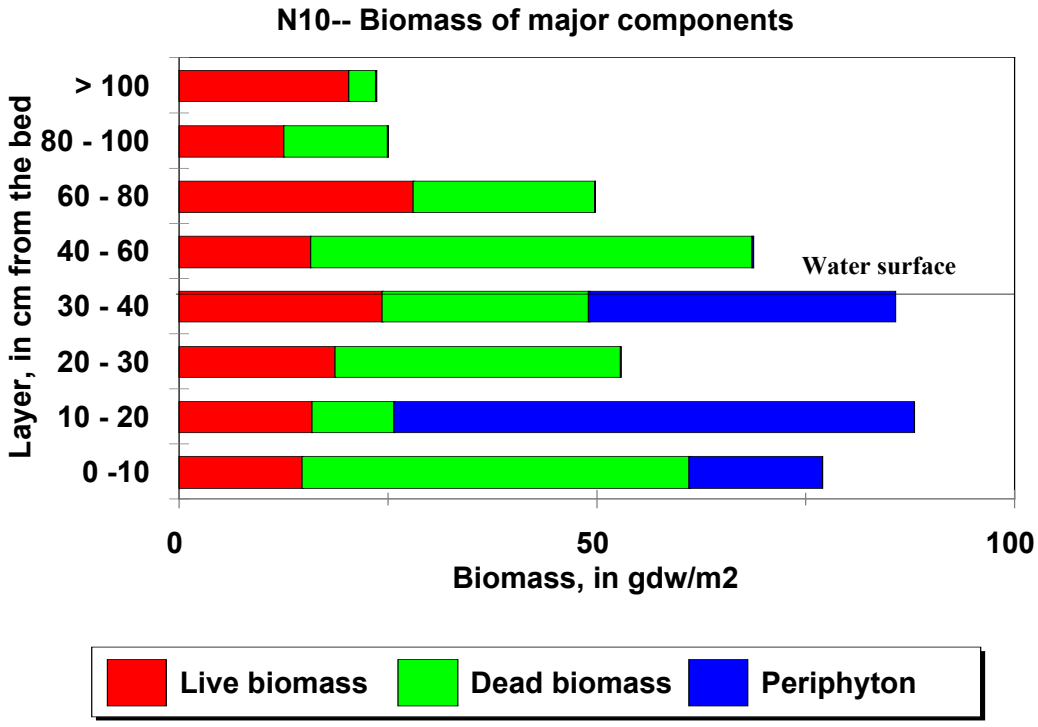


Table A-22. Summary of biomass in quadrat N11, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = very dense sawgrass; water surface = 30 cm; plant height = 2.7 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	207.92	258.16		466.08	466.08
80-100	104.60	207.72		312.32	312.32
60-80	114.56	341.44		456.00	456.00
40-60	150.84	593.84		744.68	744.68
30-40	76.04	649.16		725.20	725.20
20-30	102.24	750.08		852.32	852.32
10-20	231.28	326.68		557.96	557.96
0-10	264.04	319.08		583.12	583.12
Total	1251.52	3446.16		4697.68	4697.68

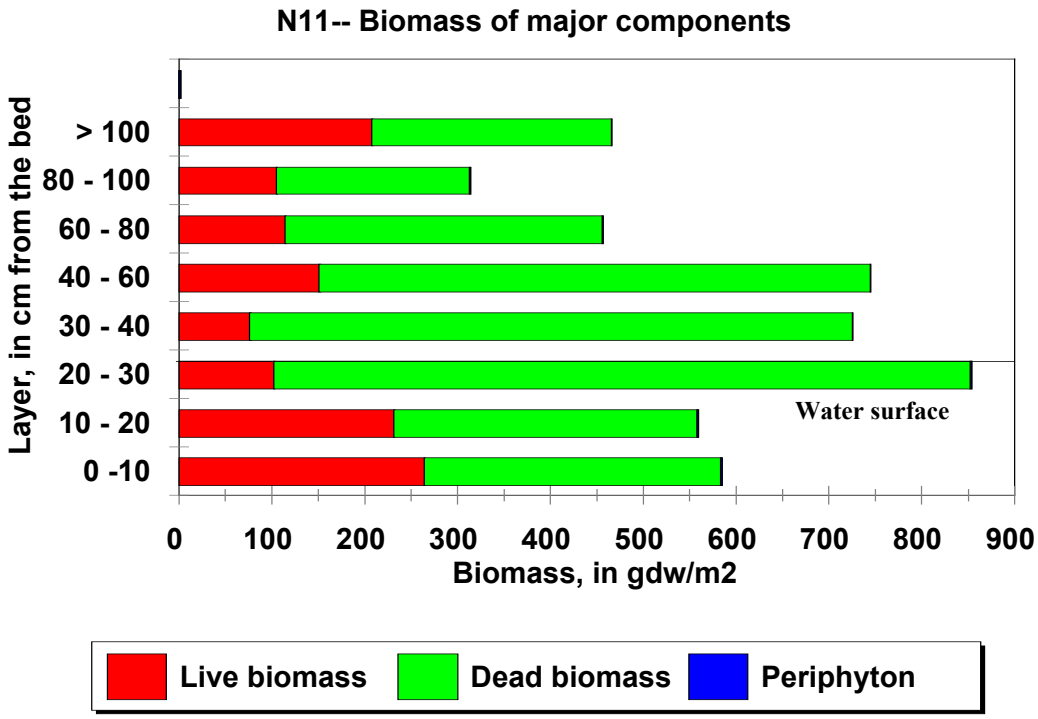


Table A-23. Summary of biomass in quadrat N12, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = very dense sawgrass; water surface = no data; plant height = 2.35 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	328.64	179.56		508.20	508.20
80-100	153.00	144.40		297.40	297.40
60-80	149.80	185.80		335.60	335.60
40-60	191.96	369.48		561.44	561.44
30-40	78.08	284.68		362.76	362.76
20-30	100.88	228.60		329.48	329.48
10-20	127.76	226.56		354.32	354.32
0-10	397.28	135.48		532.76	532.76
Total	1527.40	1754.56		3281.96	3281.96

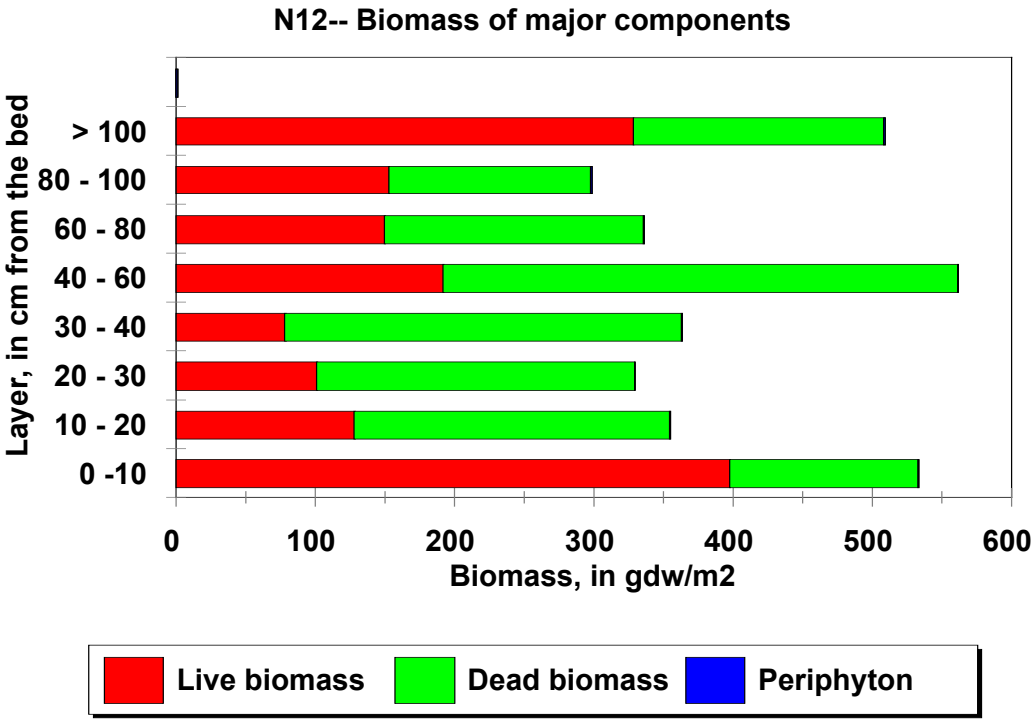


Table A-24. Summary of biomass in quadrat N14, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = dense sawgrass; water surface = 40 cm; plant height = 2.0 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	86.40			86.40	86.40
80-100	29.84	51.44		81.28	81.28
60-80	43.84	80.12		123.96	123.96
40-60	73.80	202.76		276.56	276.56
30-40	31.96	127.72		159.68	159.68
20-30	48.28	81.00	98.00	227.28	129.28
10-20	42.08	94.08	81.08	217.24	136.16
0-10	45.80	31.36	55.68	132.84	77.16
Total	402.00	668.48	234.76	1305.24	1070.48

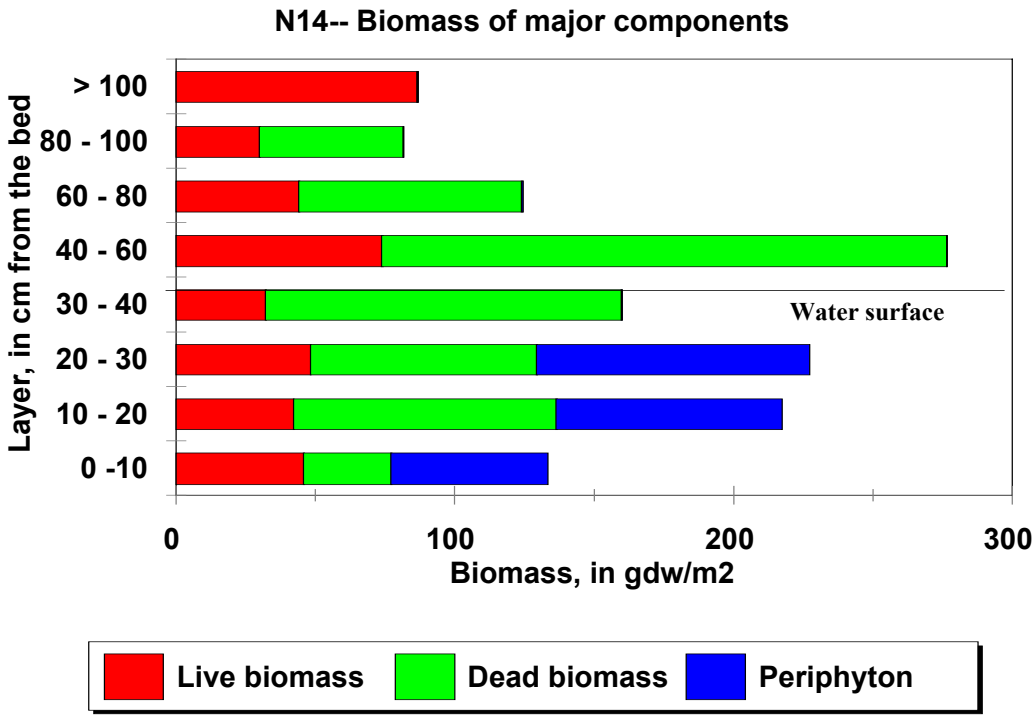


Table A-25. Summary of biomass in quadrat N15, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = dense sawgrass; water surface = 40 cm; plant height = 2.1 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	58.08	15.96		74.04	74.04
80-100	51.92	59.36		111.28	111.28
60-80	36.96	100.40		137.36	137.36
40-60	52.80	174.36		227.16	227.16
30-40	21.72	166.24	156.04	344.00	187.96
20-30	14.68	75.64	12.28	102.6	90.32
10-20	40.16	125.44	23.80	189.40	165.60
0-10	46.20	210.20	68.00	324.40	256.40
Total	322.52	927.60	260.12	1510.24	1250.12

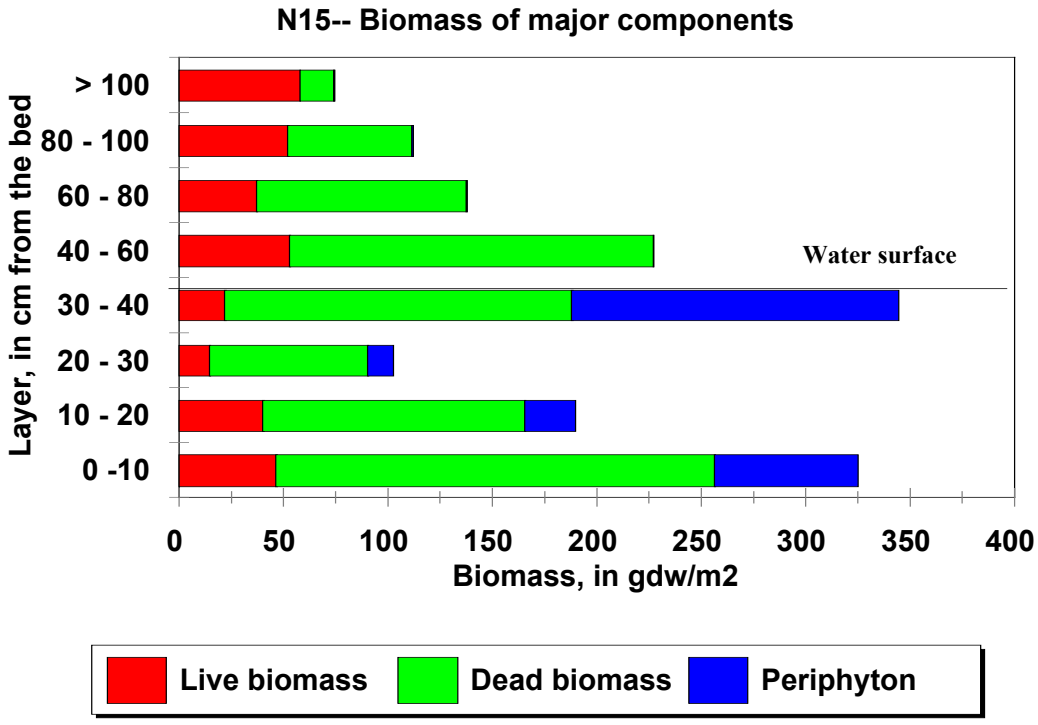
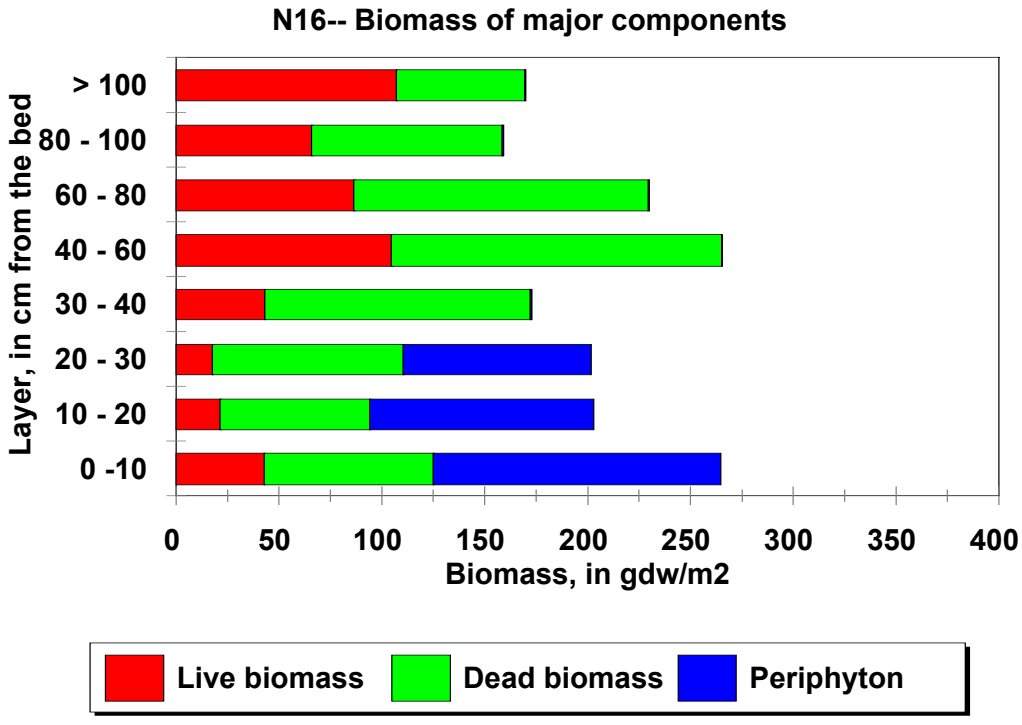


Table A-26. Summary of biomass in quadrat N16, NESRS3 site, South Florida, April, 1996 (Biomass in grams dry weight per square meter (gdw/m^2); dead includes all dead material)

Class = dense sawgrass; water surface = no data; plant height = 2.3 m

Layer	Live biomass	Dead biomass	Periphyton	Total biomass	Total biomass minus periphyton
>100	107.08	62.28		169.36	169.36
80-100	65.64	92.56		158.20	158.20
60-80	86.28	143.12		229.40	229.40
40-60	104.60	160.64		265.24	265.24
30-40	43.16	128.80		171.96	171.96
20-30	17.72	92.40	91.12	201.24	110.12
10-20	21.16	72.92	108.08	202.16	94.08
0-10	42.68	82.32	139.68	264.68	125.00
Total	488.32	835.04	338.88	1662.24	1323.36



Appendix B. Vegetation Characteristics by Individual Quadrat Sampled at Sites P33 and NESRS3 in Shark River Slough, Everglades National Park

Table B-1. Summary of vegetation in quadrat P1, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; Lvs = leaves; Lrg = large; Clm = clums; LL = large leaves; ML = medium leaves; SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = sparse rush; water surface = 37 cm; plant height = 0.6 m

Layer	Rsh/gr	Avg Rsh/gr width
>100		
80-100		
60-80		
40-60		
30-40	16	2.0
20-30	12	2.0
10-20	16	2.0
0-10	8	2.0

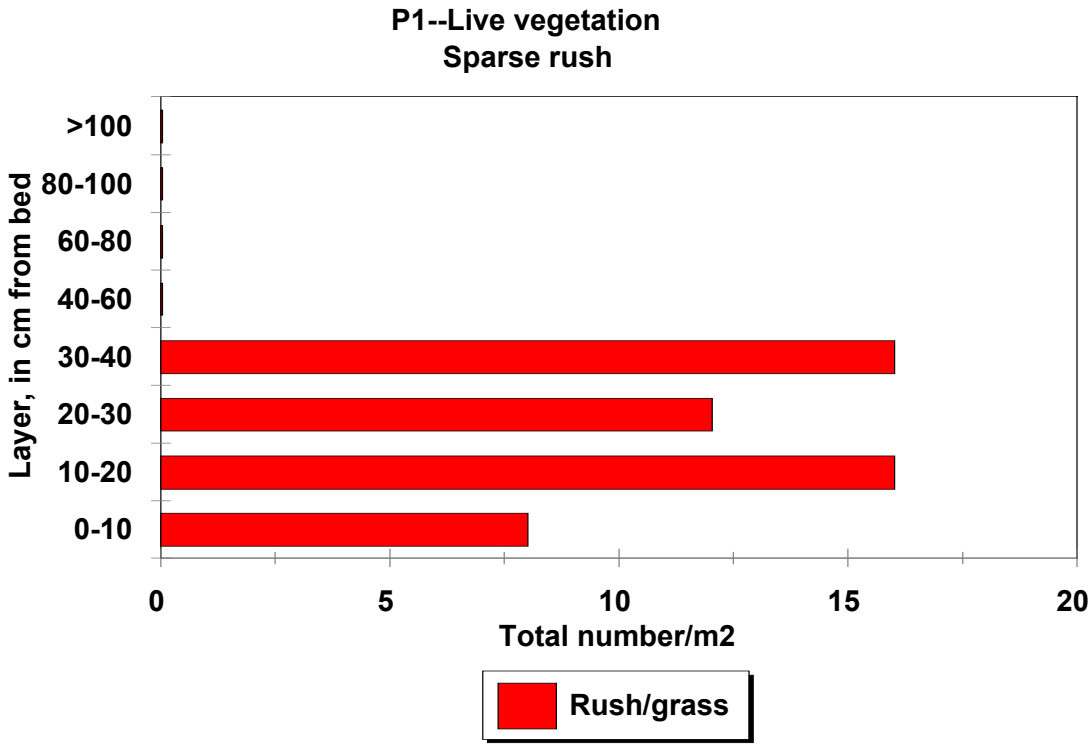


Table B-2. Summary of vegetation in quadrat P2, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = sparse mixed sawgrass/rush; water surface = 35 cm; plant height = 0.5 m

Layer	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width	Lily
>100									
80-100									
60-80									
40-60							32	2.0	
30-40							28	2.0	12
20-30	4	1.0					16	2.0	
10-20	24	3.2	16	17.8	24	6.7	20	2.0	
0-10									

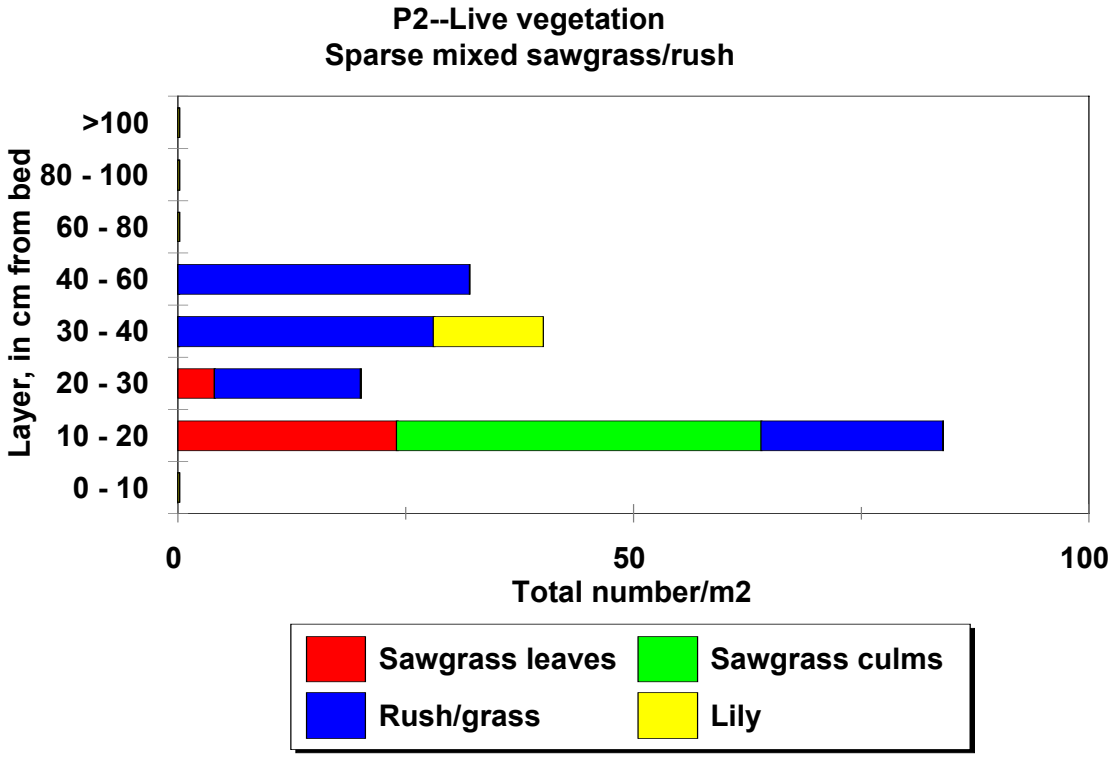


Table B-3. Summary of vegetation in quadrat P3, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = dense sawgrass; water surface = 18 cm; plant = 2.0 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width
>100			20	7.0	32	5.0				
80-100			4	8.0						
60-80	24	7.8	24	6.0	56	2.7				
40-60	64	12.2	20	4.8	36	2.2				
30-40	20	14.2	20	5.6	76	2.0				
20-30					16	4.5	8	18.5	12	4.3
10-20					20	2.2	4	42.0	16	9.5
0-10							32	38.5	12	8.7

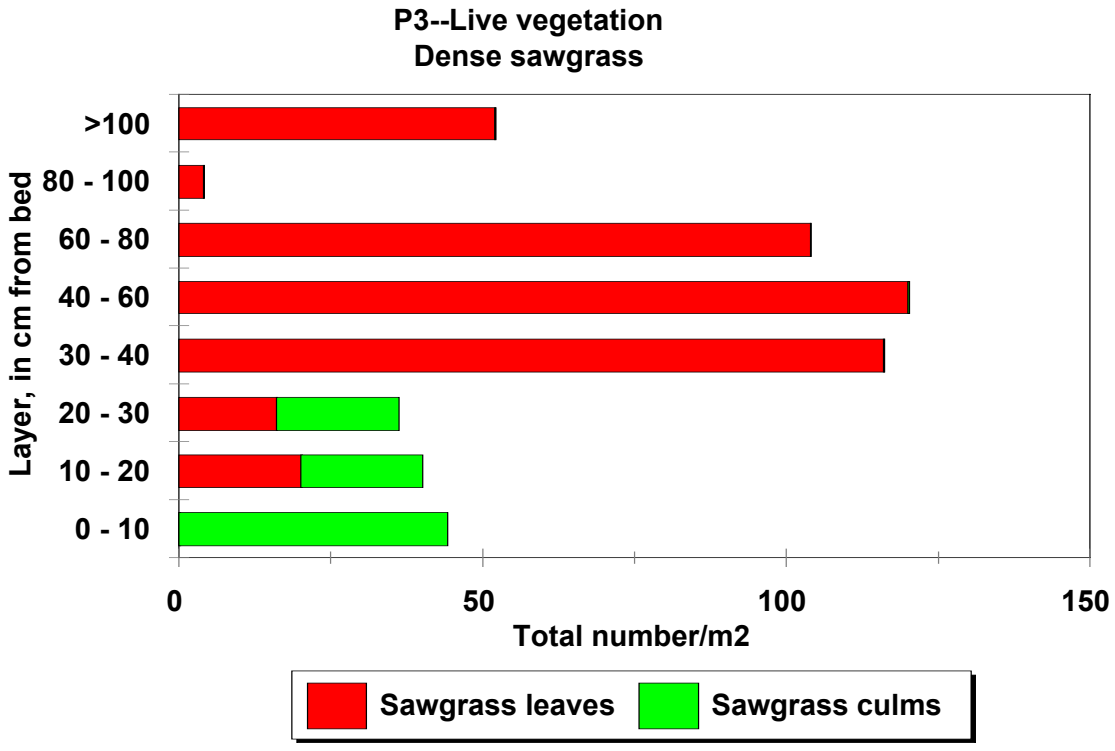


Table B-4. Summary of vegetation in quadrat P4, P33 site, South Florida, April, 1996

Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = medium sawgrass;water surface = 23 cm; plant height = 1.8 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Bacopa
>100					92	2.5					
80-100					92	3.7					
60-80			20	5.6	84	3.0					
40-60			36	5.7	72	2.7					
30-40			36	6.2	68	2.2					
20-30	12	7.3			40	3.0	16	7.3	4	3.0	4
10-20					8	2.0	16	9.8	12	4.3	4
0-10							16	8.0			

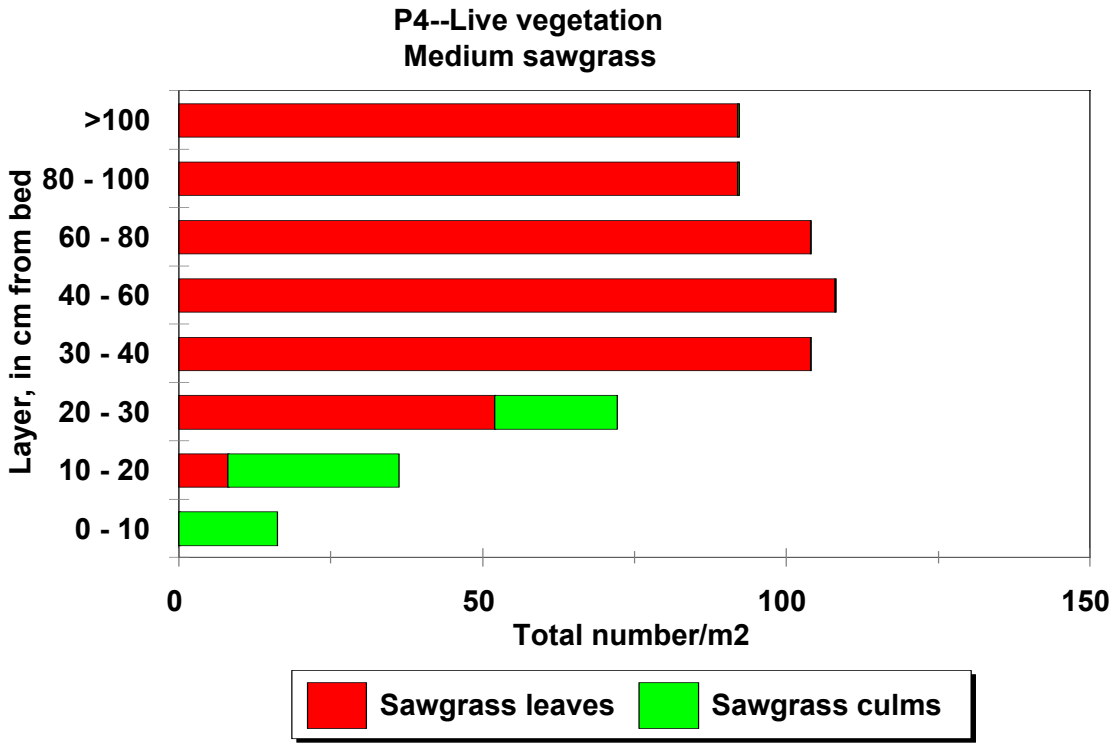


Table B-5. Summary of vegetation in quadrat P5, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC= small culms; Rsh/gr = rush grass)

Class = sparse sawgrass; water surface = 25 cm; plant height = 1.6 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC Width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width
>100			24	2.5						
80-100	12	3.3	20	1.6						
60-80	12	5.3	12	2.0						
40-60	20	5.8	20	2.2						
30-40	28	7.0	12	3.7					52	2.0
20-30	8	7.0					12	4.0	40	2.0
10-20							12	8.3	16	2.0
0-10					8	11.5	8	6.0	4	2.0

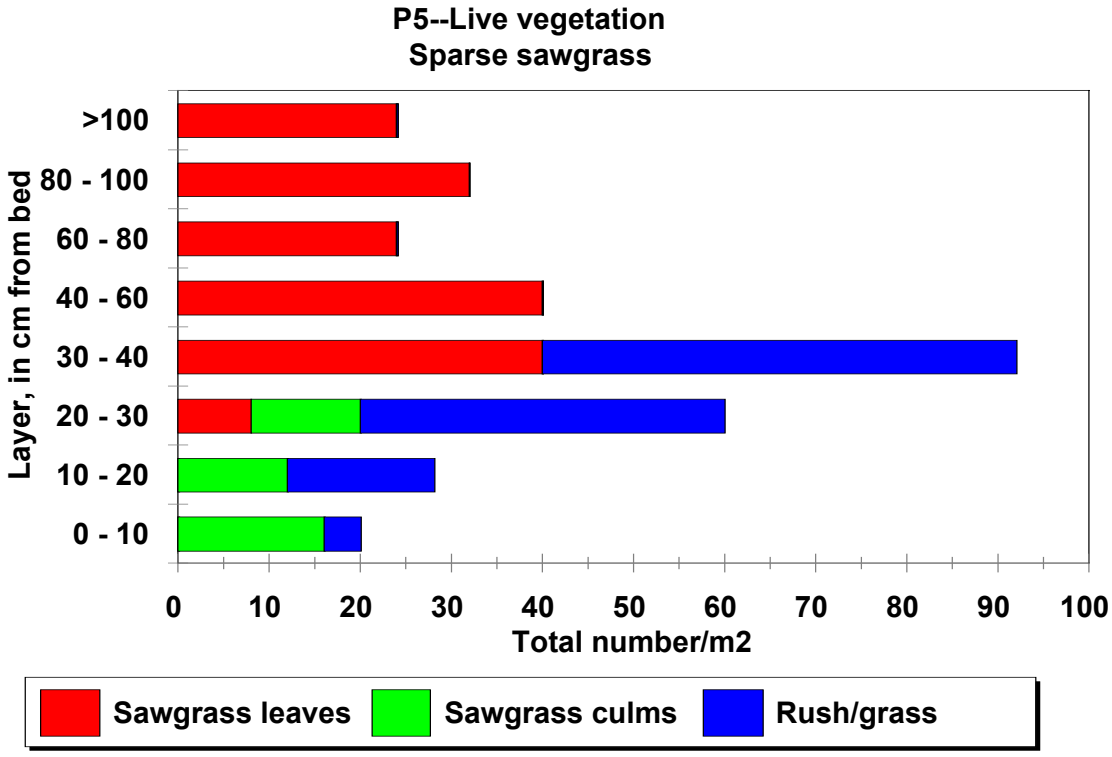


Table B-6. Summary of vegetation in quadrat P6, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = medium mixed sawgrass/rush; water surface = 25 cm; plant height = 1.4 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width	Bacopa
>100			44	2.0							
80-100			32	2.8							
60-80			92	2.7							
40-60			176	2.3					144	2.0	
30-40	24	5.3	96	2.5			4	6.0	148	2.0	
20-30			16	3.0			20	5.2	152	2.0	
10-20			0				44	7.2	40	2.0	12
0-10			0		8	14.0	48	6.3	44	2.0	

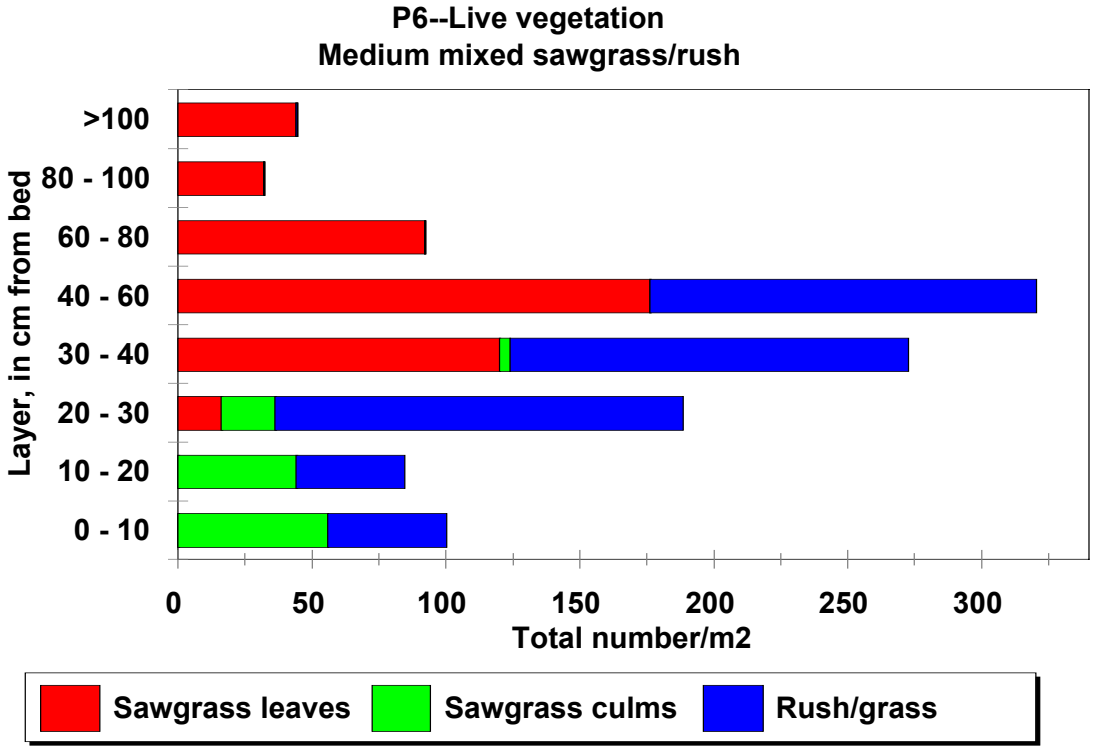


Table B-7. Summary of vegetation in quadrat P8, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = dense sawgrass; water surface = 18 cm; plant height = 1.6 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/ gr	Avg Rsh/gr width
>100					64	2.3						
80-100			12	5.7	96	2.8						
60-80			40	5.2	116	2.2						
40-60	20	6.8	56	5.2	128	2.8					52	2
30-40	20	8.0	48	5.3	160	2.5	4	9.0	4	5.0	96	2
20-30	16	8.5	32	5.7	132	2.5	8	7.5	4	4.0	52	2
10-20					108	3.5	28	11.2	24	4.5	80	2
0-10			4	5.0			4	55.0			48	2

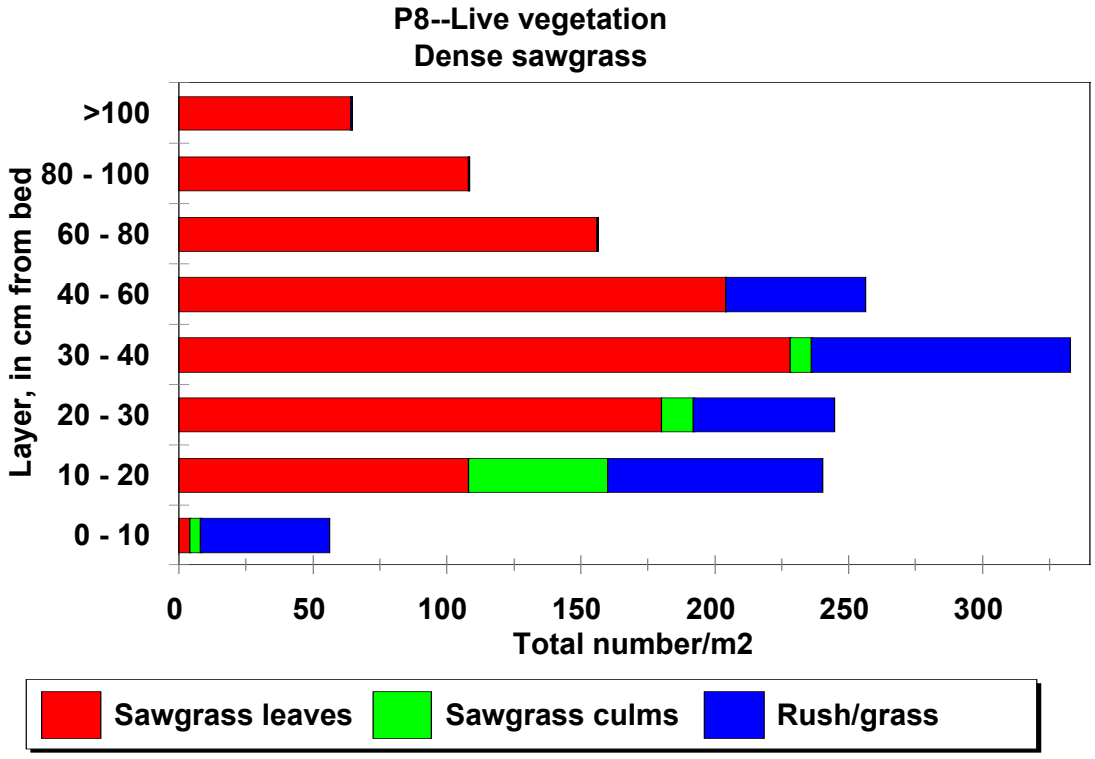


Table B-8. Summary of vegetation in quadrat P9, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC= small culms; Rsh/gr = rush grass)

Class = sparse sawgrass; water surface = 18 cm; plant height = 1.6 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width
>100			36	2.2				
80-100			52	2.5				
60-80	16	5.5	60	2.7				
40-60	20	6.2	80	3.2				
30-40	20	6.6	60	2.5			8	3.5
20-30							12	9.0
10-20							24	8.2
0-10					20	12.4	24	5.3

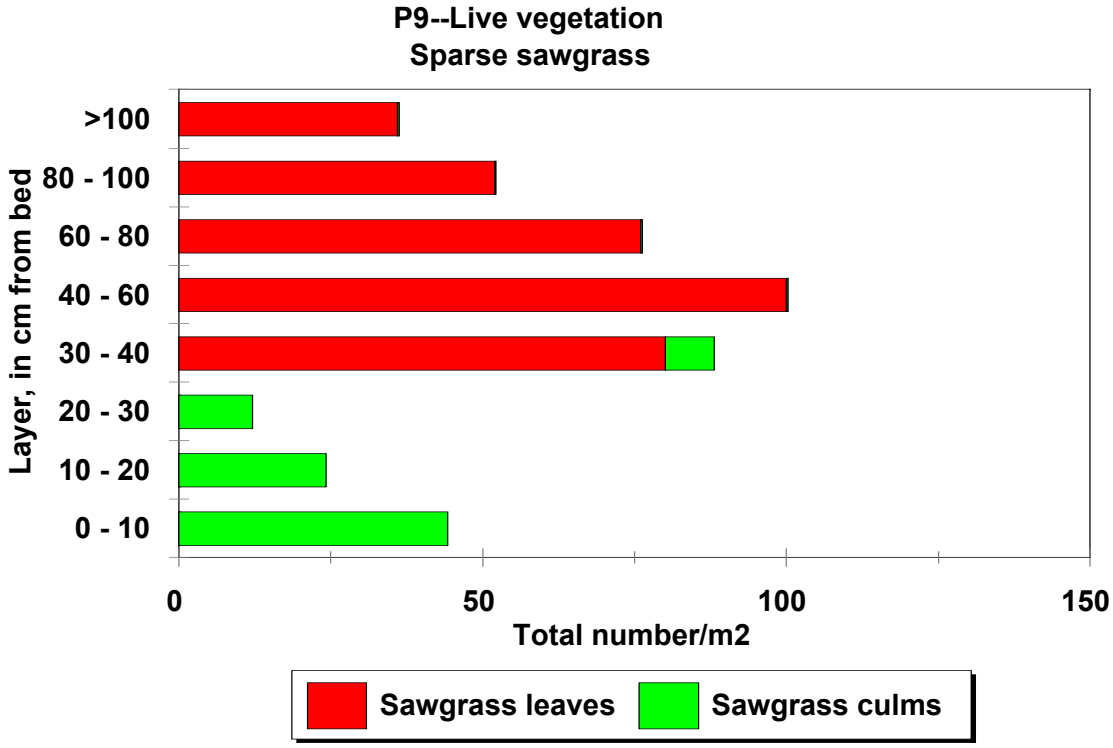


Table B-9. Summary of vegetation in quadrat P10, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = sparse sawgrass; water surface = 18 cm; plant height = 1.6 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width
>100			16	2.0					0	
80-100			28	1.8					0	
60-80			40	2.5					0	
40-60	12	5.3	44	2.3					28	2.0
30-40	20	5.6	36	2.8					80	2.0
20-30							8	7.5	24	2.0
10-20			8	1.5			4	9.0	56	2.0
0-10					4	16.0	24	7.0	8	2.0

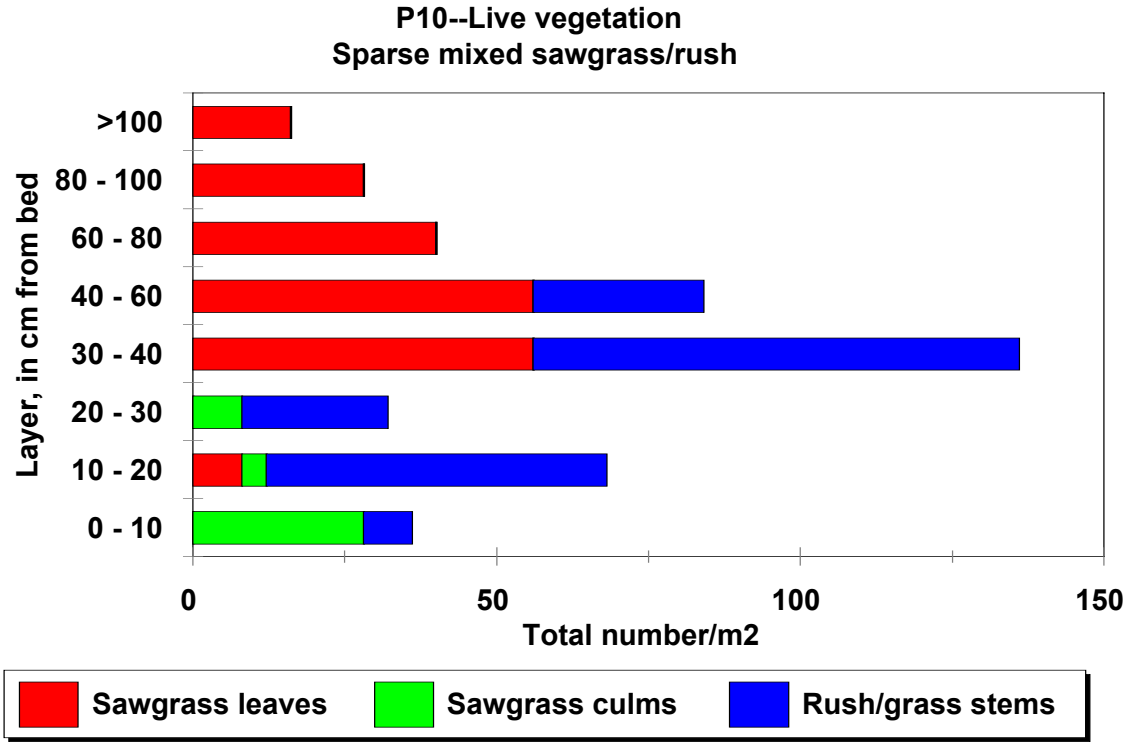


Table B-10. Summary of vegetation in quadrat P12, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = sparse mixed sawgrass/rush; water surface = 25 cm; plant height = 1.0 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width
>100					28	2.7						
80-100	16	2.0	12	4.0								
60-80			16	4.8	12						8	2.0
40-60			12	6.3	16	2.5					104	2.0
30-40			8	7.0	12	2.3					160	2.0
20-30			4	7.0					4	7.0	132	2.0
10-20							4	9.0			124	2.0
0-10							4	16.0			84	2.0

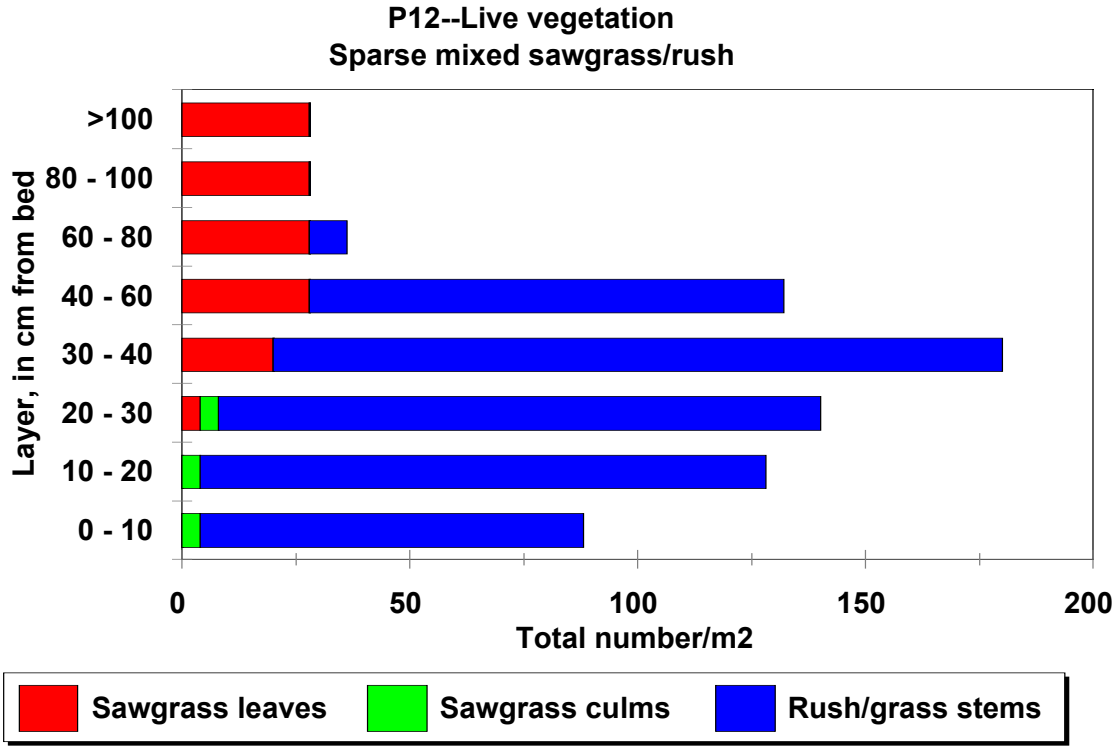


Table B-11. Summary of vegetation in quadrat P13, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = sparse mixed sawgrass/rush; water surface = 22 cm; plant height = 0.45 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width
>100								
80-100								
60-80								
40-60			16	2.3			56	2.0
30-40	4	5.0					16	2.0
20-30							20	2.0
10-20					4	4.0	12	2.0
0-10					24	7.2	8	2.0

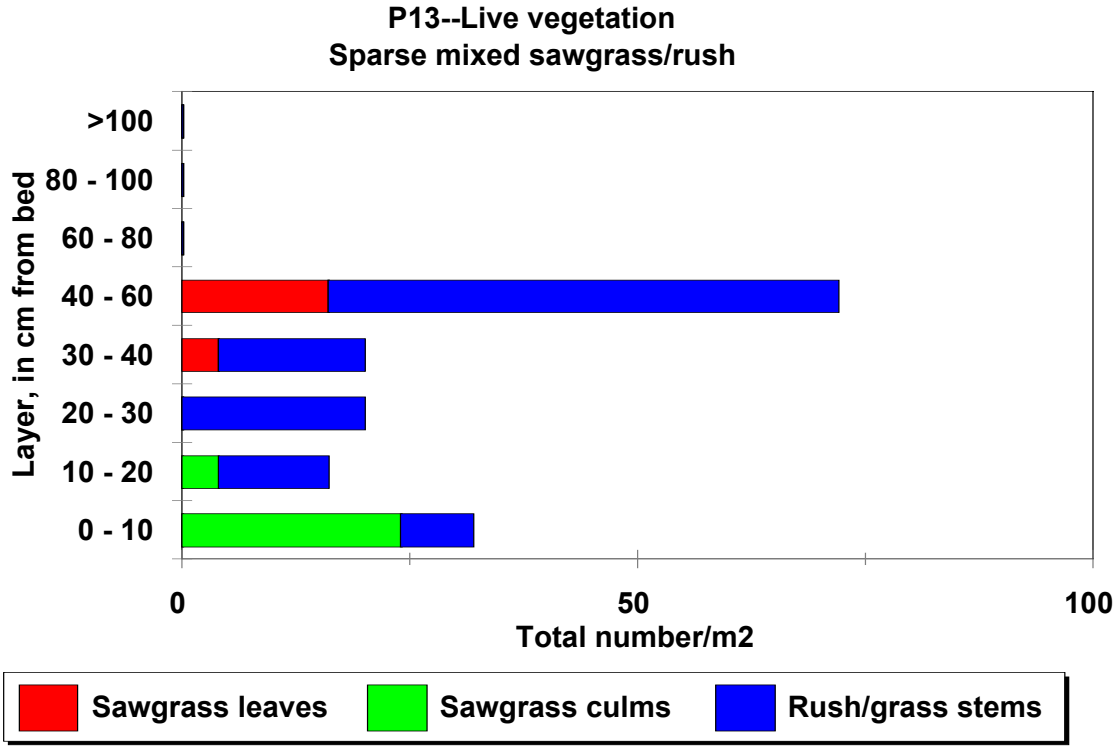


Table B-12. Summary of vegetation in quadrat P14, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = medium sawgrass; water surface = 22 cm; plant height = 1.75 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Lily	Sagittaria
>100			36	3.0						
80-100			68	2.7						
60-80			28	3.0						
40-60	20	5.2	52	3.2						
30-40	16	5.8	24	2.3			4	7.0	4	
20-30	4	5.0			4	12.0	24	6.0	32	
10-20					20	11.4	20	5.6		12
0-10					24	16.2	8	8.0		16

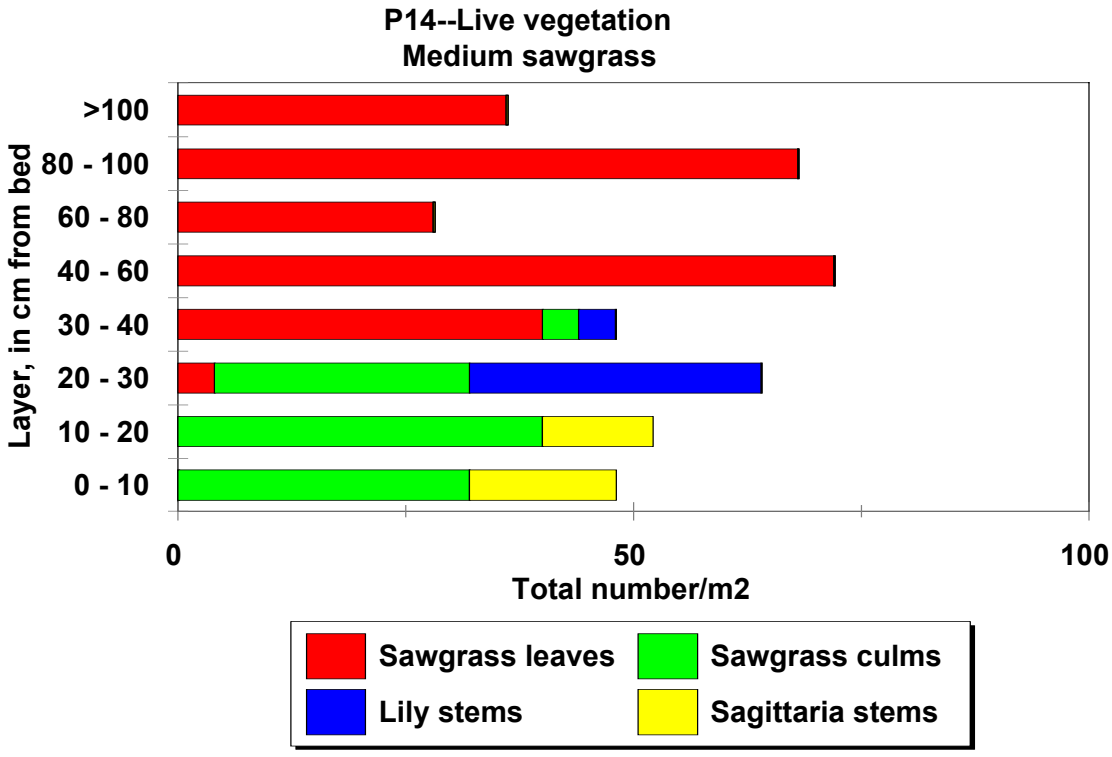


Table B-13. Summary of vegetation in quadrat P15, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = dense mixed sawgrass/rush; water surface = 25 cm; plant height = no data

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width
>100	0		32	3.0						
80-100	16	5.3	24	2.8						
60-80	16	4.5	28	2.0						
40-60	12	6.3	32	3.0					128	2.0
30-40	4	6.0	28	3.3					152	2.0
20-30	8	7.0					8	7.0	284	2.0
10-20	4	7.0			4	14.0	8	5.0	192	2.0
0-10	4	5.0			8	12.5	4	6.0	200	2.0

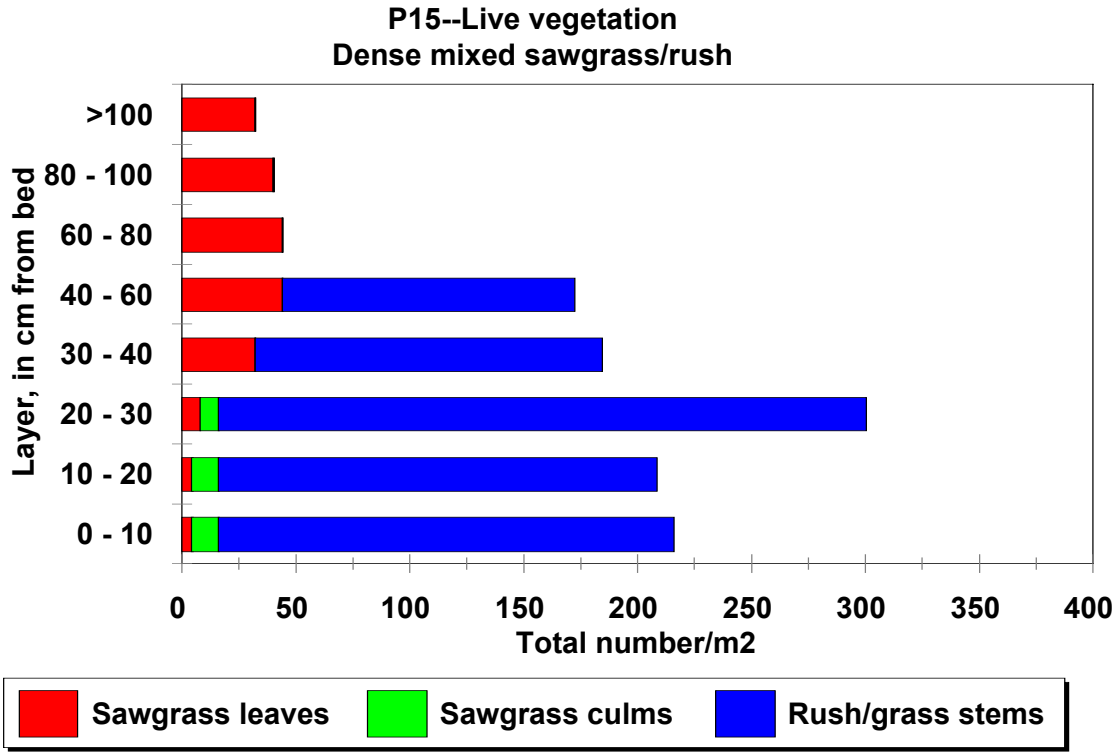


Table B-14. Summary of vegetation in quadrat P16, P33 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC= small culms; Rsh/gr = rush grass)

Class = medium mixed sawgrass/rush; water surface = 20 cm; plant height = 1.7 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width	Lily
>100			32	3.0							
80-100			80	2.7							
60-80	20	4.4	68	2.0							
40-60	28	5.5	68	2.5					36	2.0	
30-40	36	6.0	76	2.8					112	2.0	
20-30	28	6.0	60	3.2			16	4.0	168	2.0	
10-20	16	7.3	16	1.8			24	5.2	180	2.0	4
0-10					4	12.0	16	5.0	124	2.0	

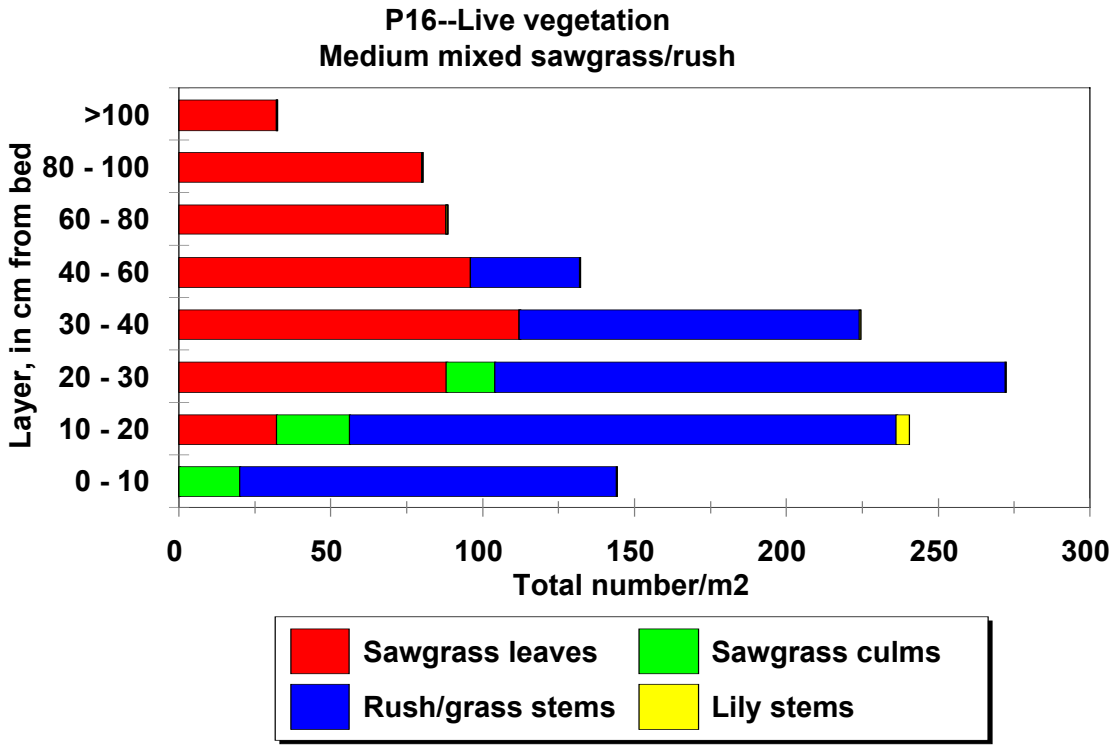


Table B-15. Summary of vegetation in quadrat N2, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = very dense sawgrass; water surface = 35 cm; plant height = 2.2 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width
>100			108	4.2	56	2.3						
80-100					104	3.0					4	2.0
60-80			164	6.0	108	2.5					16	2.0
40-60	28	8.7	72	5.3	52	2.0			28	5.5		2.0
30-40	8	9.5	8	5.5	4	1.0	20	10.2	12	5.7	8	2.0
20-30			12	7.3	28	2.2	12	14.0	20	7.2		2.0
10-20							20	15.4	32	10.0		2.0
0-10							24	47.8	28	11.5	12	2.0

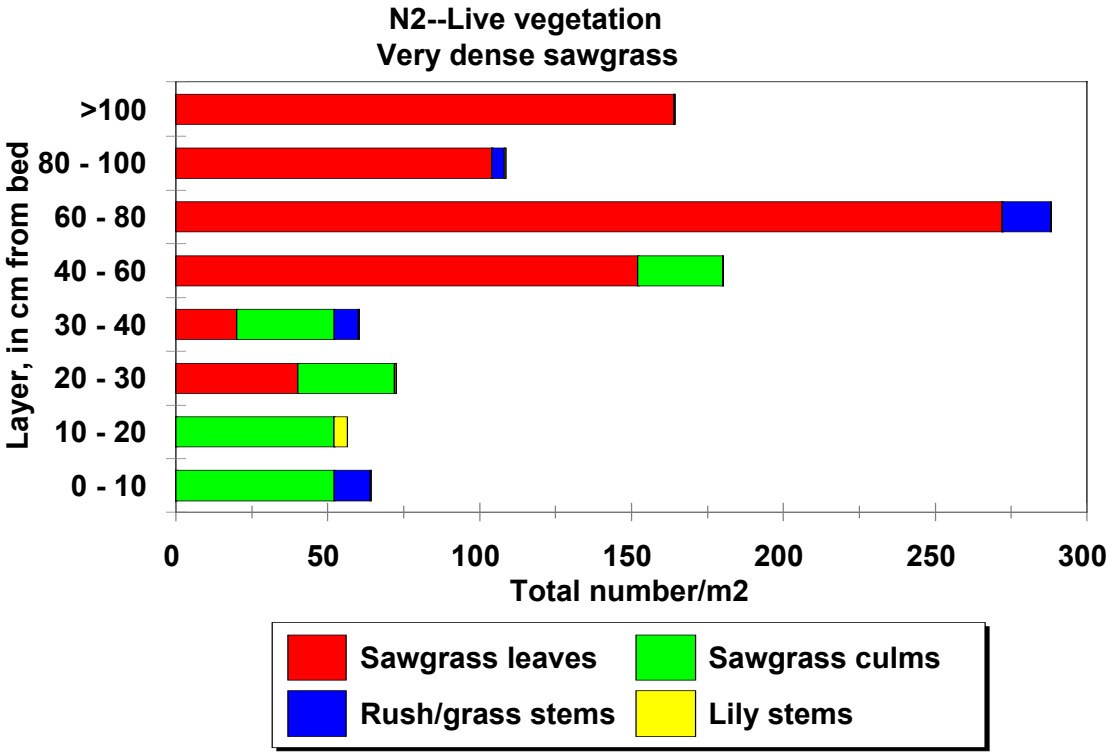


Table B-16. Summary of vegetation in quadrat N3, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC= small culms; Rsh/gr = rush grass)

Class = dense sawgrass; water surface = 40 cm; plant height = 2.0 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL lvs	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width
>100			32	5.8	72	3.2						
80-100			64	6.7	104	2.8						
60-80			100	6.7	136	2.8						
40-60	48	10.3	88	6.2	148	3.0						
30-40	32	12.2	36	5.8	56	2.8	12	11.0	44	5.0	8	2.0
20-30	4	15.0	28	5.5			12	16.3	32	6.3	12	2.0
10-20							24	15.8	32	8.3	4	2.0
0-10							8	60.0	28	10.3		

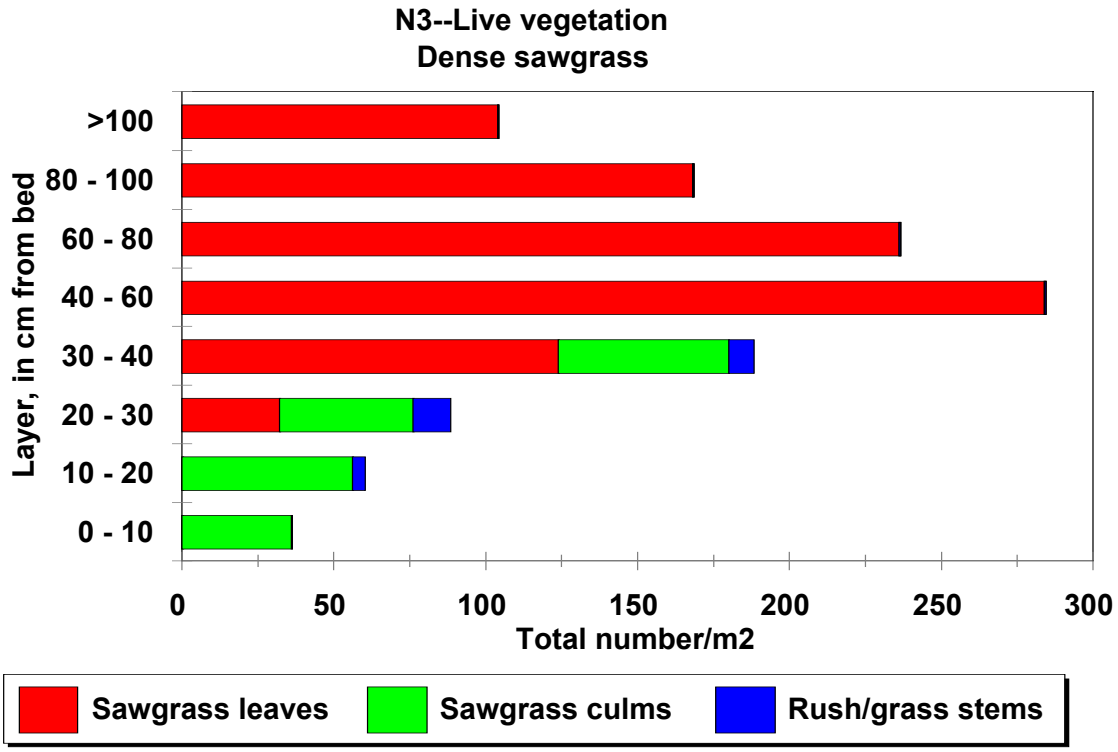


Table B-17. Summary of vegetation in quadrat N4, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = medium mixed sawgrass/rush; water surface = 40 cm; plant height = 2.0 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width	Bacopa
>100			32	2.2							
80-100	32	4.2	8	1.5							
60-80	56	4.5									
40-60	64	5.3							16	2.0	
30-40			96	2.7			20	4.4	40	2.0	48
20-30			44	3.5			16	7.0	20	2.0	92
10-20	4	6.0	20	2.4			24	6.8	12	2.0	32
0-10					8	17.0	12	8.0	48	2.0	28

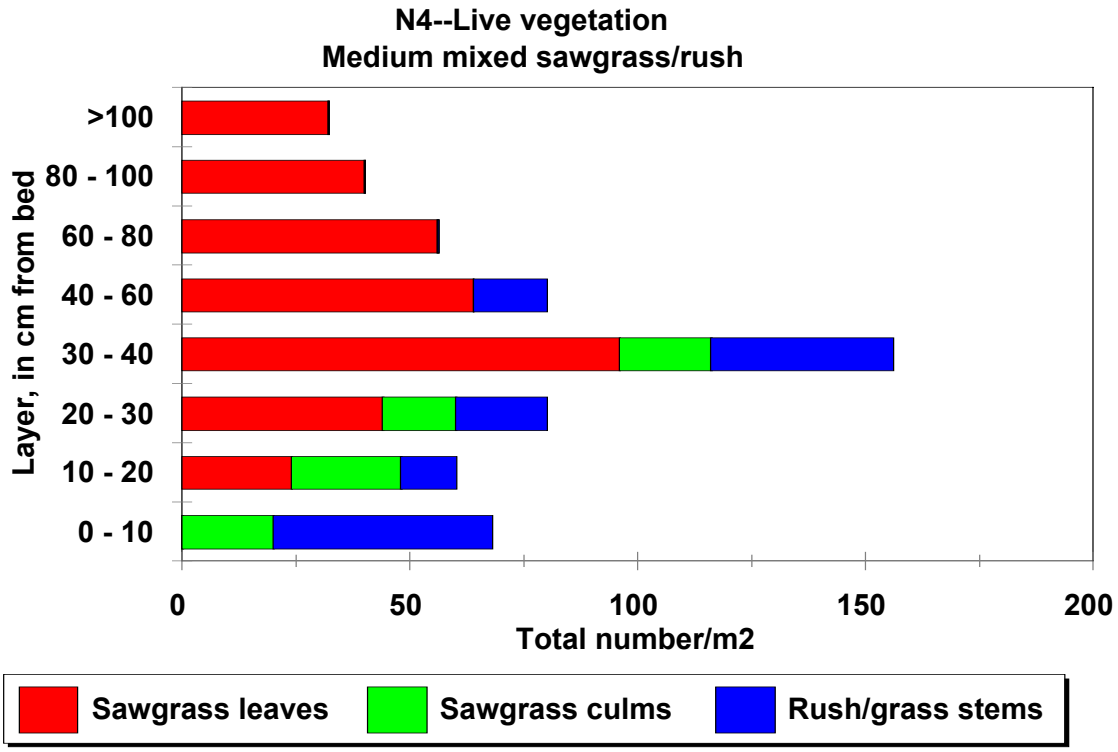


Table B-18. Summary of vegetation in quadrat N6, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = medium sawgrass; water surface = 35 cm; plant height = 1.53 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width	Bacopa
>100			44	4.3	76	2.2							
80-100			44	6.2	68	3.0							
60-80			16	5.3	16	3.0			4	6.0			
40-60	28	9.7	52	5.2	28	2.8							
30-40			28	8.0	68	2.0			40	6.2			
20-30			12	6.0	32	3.2	20	10.4	28	4.7	4	2.0	44
10-20			12	6.7									20
0-10			4	9.0	12	2.0	20	21.4	16	6.3			24

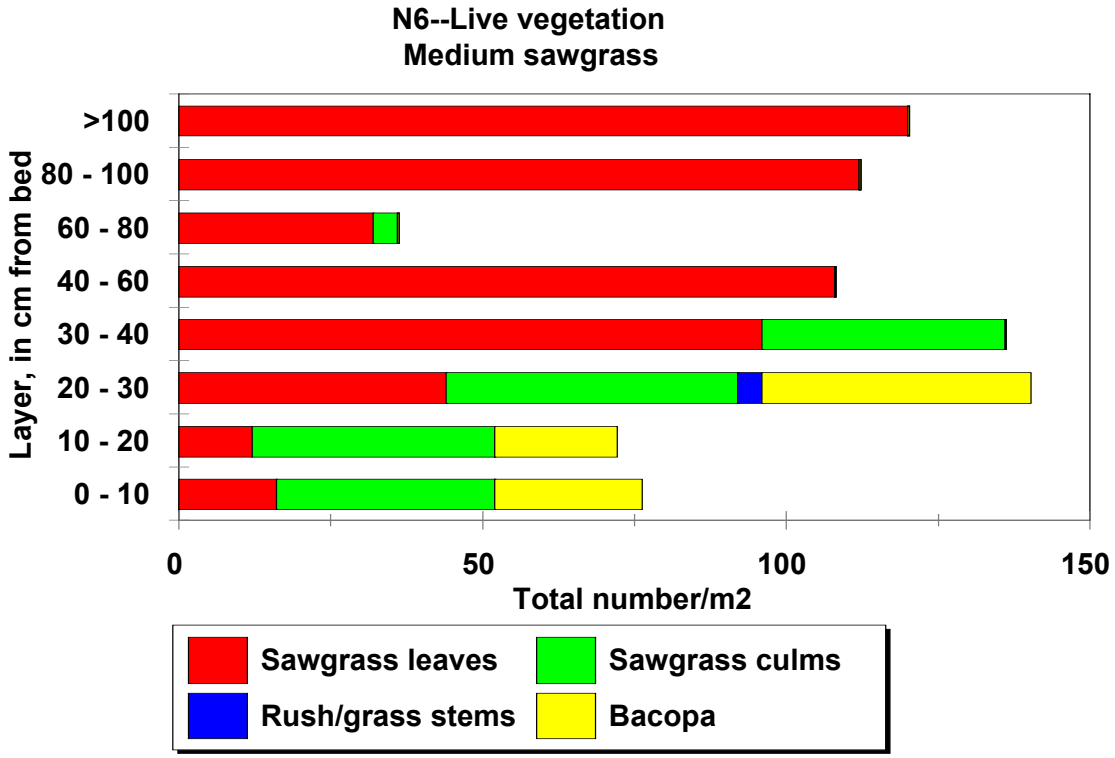


Table B-19. Summary of vegetation in quadrat N7, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC= small culms; Rsh/gr = rush grass)

Class = very dense sawgrass; water surface = 35 cm; plant height = 2.7 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Malaluca
>100			116	7.0	56	2.7					
80-100	88	9.5	48	4.5	44	2.2					
60-80	76	10.0	40	6.8	20	2.6			20	6.0	8
40-60	52	12.2	32	8.0	36	3.0	12	12.3	12	6.7	4
30-40			12	7.3	48	2.3	4	22.0	8	4.0	
20-30							16	20.8	16	8.5	
10-20							16	26.5	12	8.3	
0-10							28	38.7	4	11.0	

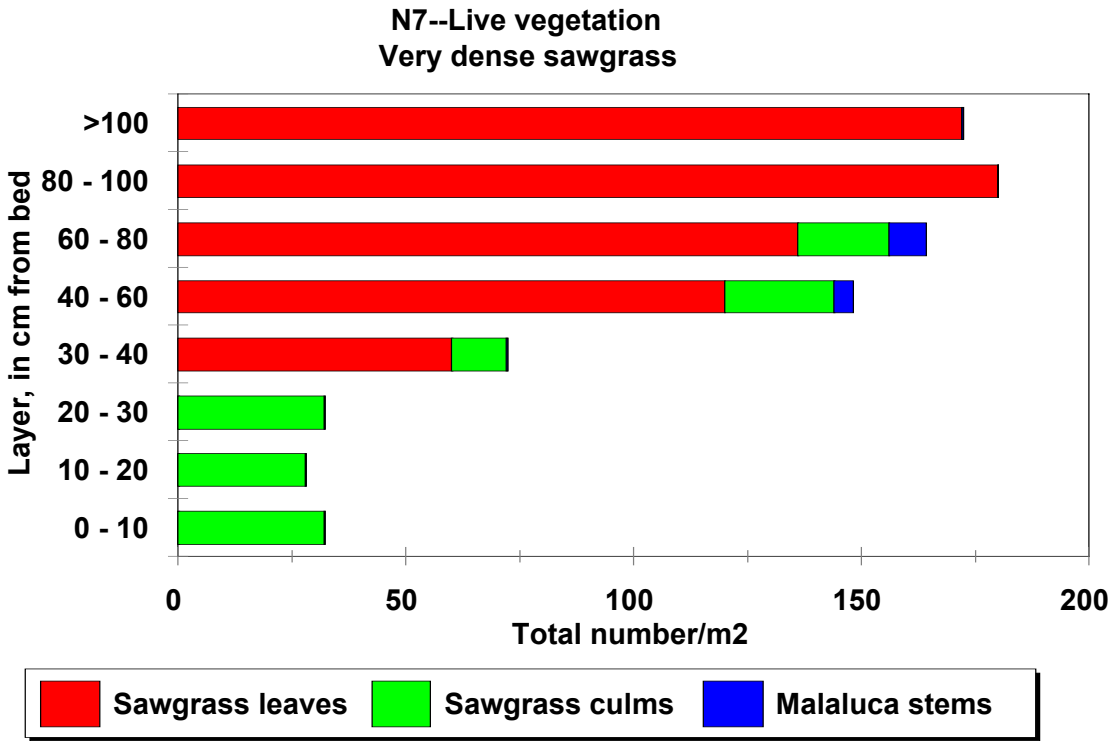


Table B-20. Summary of vegetation in quadrat N8, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = dense sawgrass; water surface = 40 cm; plant height = 2.0 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width
>100			72	5.2	40	2.0				
80-100			20	5.0	56	2.7				
60-80	68	9.0	60	5.5	56	2.3				
40-60	56	11.0	72	6.7	64	2.8	16	6.8		
30-40	36	11.7	36	7.3	52	2.5	16	11.5	12	5.3
20-30									20	7.6
10-20	12	12.7	4	7.0	4	4.0	24	16.0	16	4.5
0-10							20	31.2		

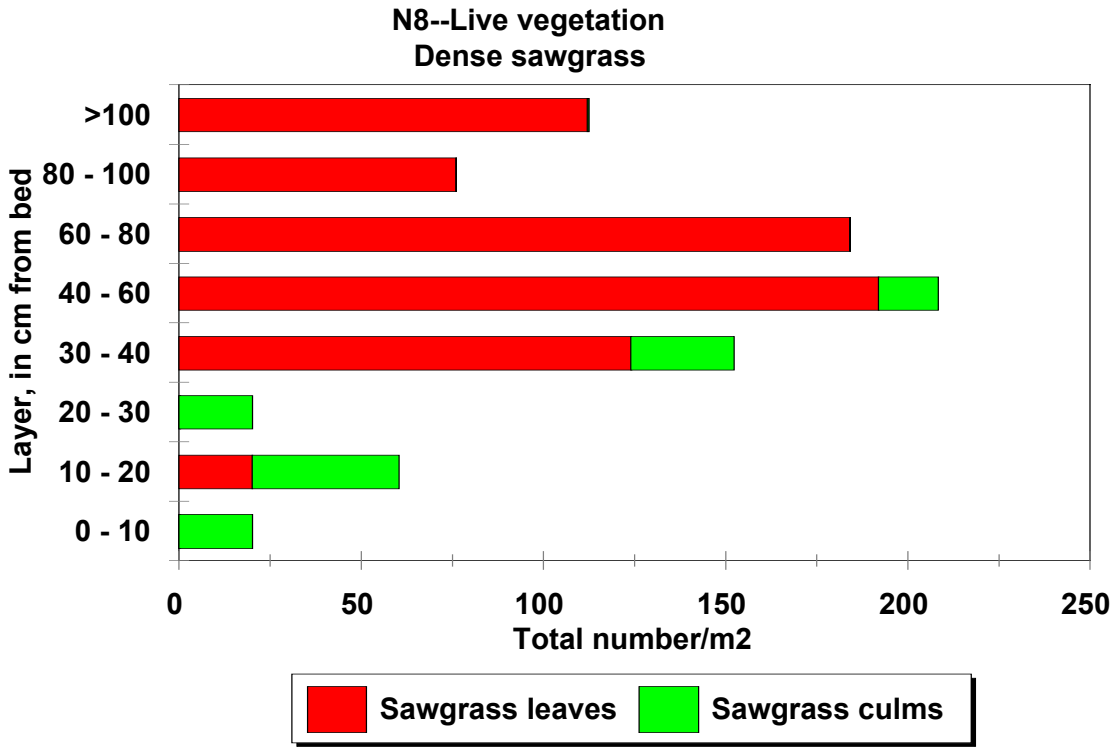


Table B-21. Summary of vegetation in quadrat N10, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = sparse sawgrass; water surface = 40 cm; plant height = 1.7 m

Layer	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width
>100	28	4.2	20	2.4				
80-100	28	5.2						
60-80	44	6.2	44	3.2				
40-60	24	5.5	20	2.0			8	
30-40	40	5.3	20	2.4			32	4.3
20-30	16	5.8	28	2.3			24	6.2
10-20	4	7.0					28	6.8
0-10					20	12.2		

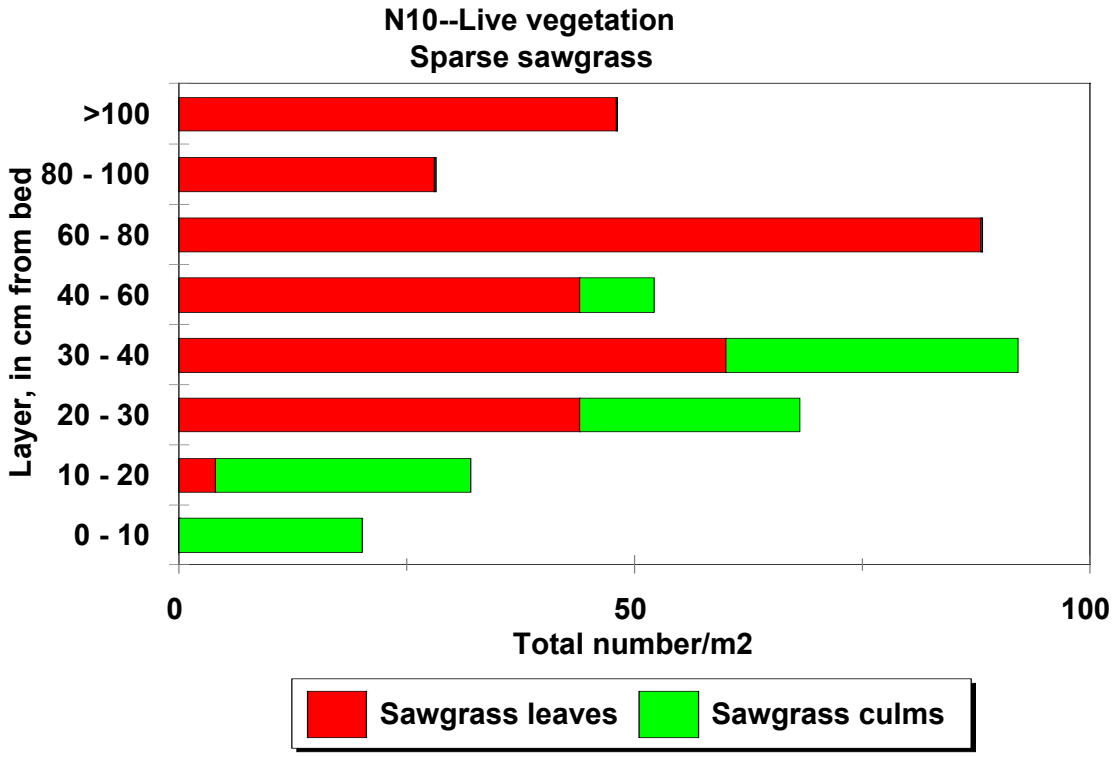


Table B-22. Summary of vegetation in quadrat N11, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = very dense sawgrass; water surface = 30 cm; plant height = 2.7 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width
>100	40	10.0	8	5.5	12	2.0	4	12.0		
80-100	52	12.2			12	4.7	4	16.0		
60-80	60	14.2			4	4.0	8	13.5		
40-60	40	17.5			4	3.0	20	16.6	4	3.0
30-40	4	10.0					20	24.6	4	6.0
20-30							32	24.2		
10-20							28	35.8		
0-10							28	35.5	16	12.8

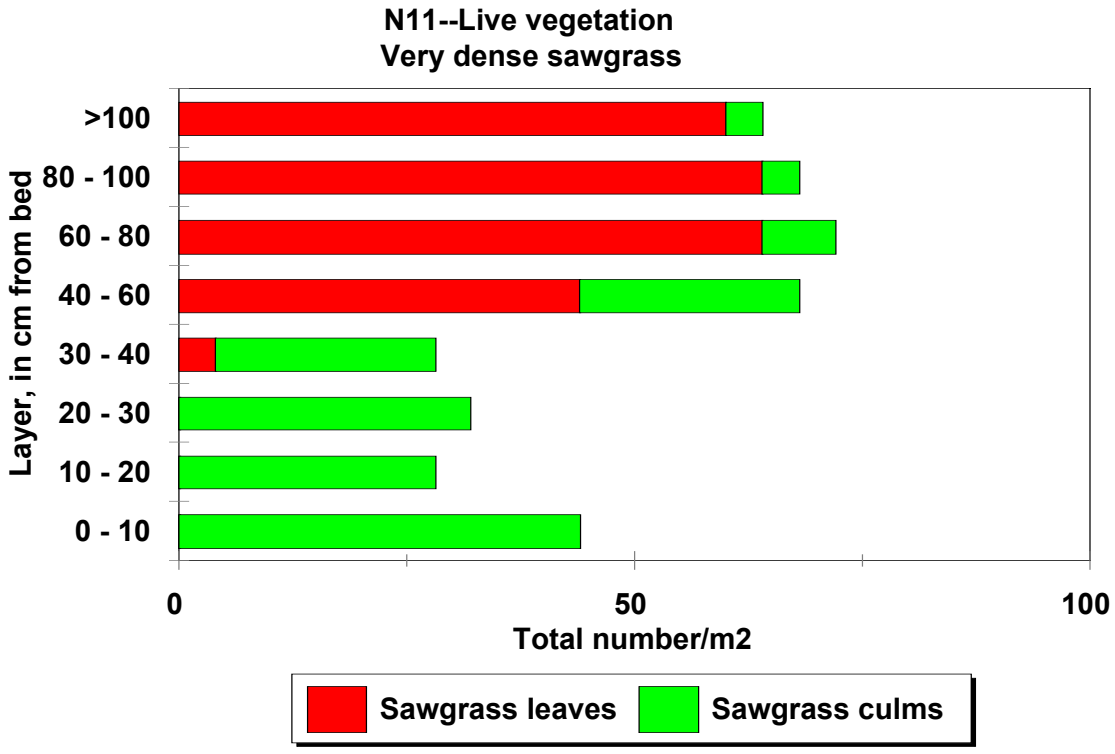


Table B-23. Summary of vegetation in quadrat N12, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = very dense sawgrass; water surface = no data; plant height = 2.35 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width
>100			188	6.5	96	3.0				
80-100			240	6.8	88	2.0				
60-80	164	9.8	72	5.7	64	2.2			16	3.8
40-60	36	12.5	152	7.7	12	3.7	16	7.8	44	5.0
30-40	24	15.0	32	8.5	68	2.7	20	14.4	20	8.4
20-30			16	5.0	40	2.8	16	14.8	28	5.3
10-20							36	25.0	12	11.3
0-10							24	43.5	16	16.5

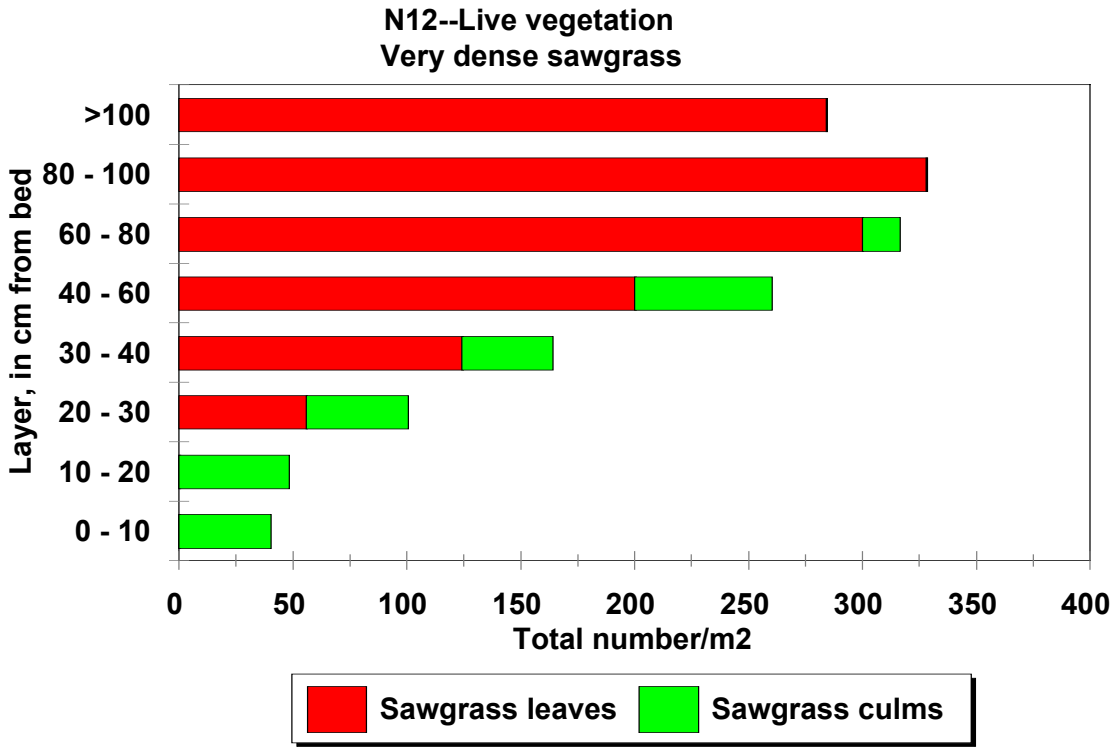


Table B-24. Summary of vegetation in quadrat N14, NESRS3 site, South Florida, April, 1996
Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species.
(Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = dense sawgrass; water surface = 40 cm; plant height = 2.0 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width
>100					60	3.3				
80-100			28	5.5	24	3.7				
60-80			56	5.7	48	3.2				
40-60	56	8.3	40	4.7	112	2.2				
30-40			20	7.0	84	3.0	16	9.8	32	4.2
20-30							44	21.0		
10-20			4	6.0	48	3.0	12	16.3	20	6.8
0-10							12	20.0	24	6.2

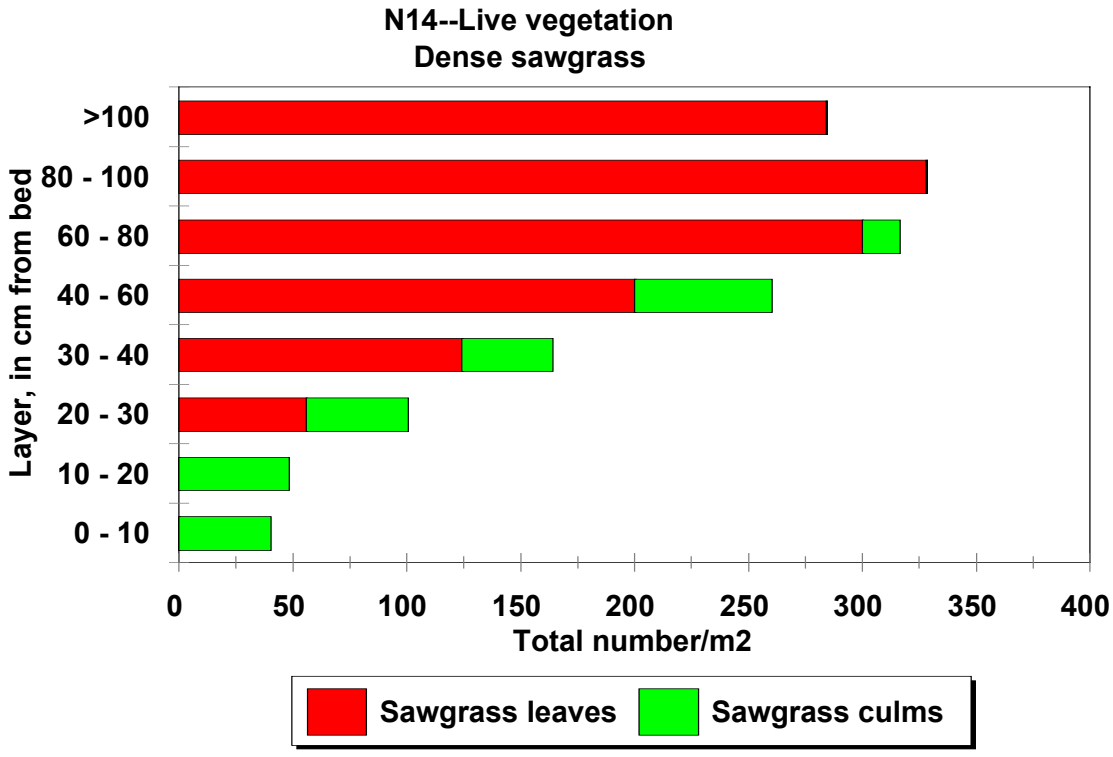


Table B-25. Summary of vegetation in quadrat N15, NESRS3 site, South Florida, April, 1996 Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species. (Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = dense sawgrass; water surface = 40 cm; plant height = 2.1 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Lily
>100					80	3.8					
80-100			108	4.5							
60-80			80	5.5	20	2.2					
40-60	36	9.2	48	5.8	24	1.7			8	7.0	
30-40	4	10.0	24	6.5	80	2.2			12	6.0	
20-30					8	3.5	8	10.5	20	5.2	12
10-20							24	13.3	8	5.0	4
0-10							24	18.2	12	5.7	4

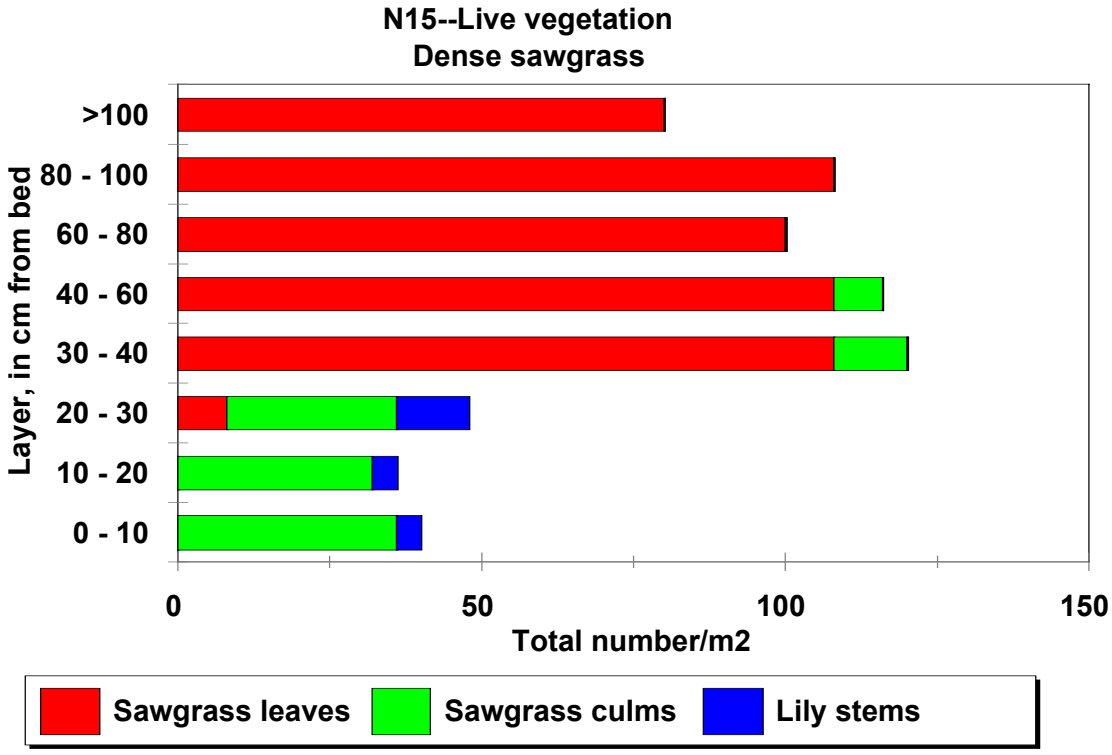
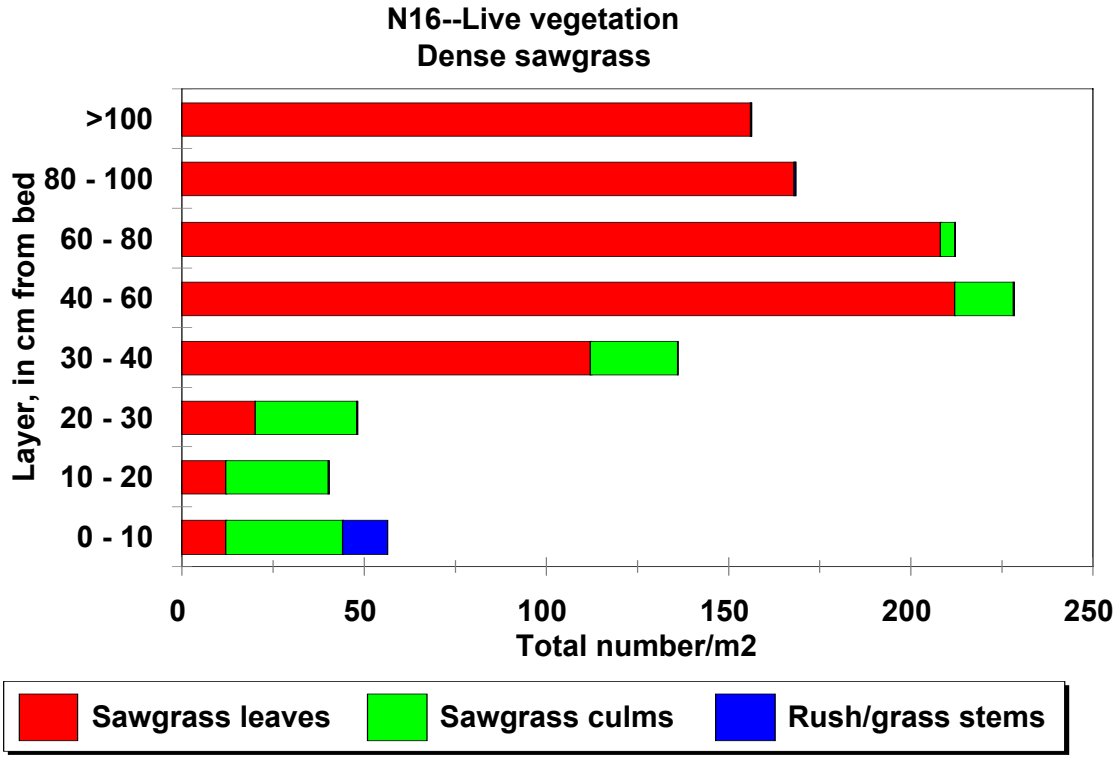


Table B-26. Summary of vegetation in quadrat N16, NESRS3 site, South Florida, April, 1996 Summary includes number of live sawgrass leaves and culms, rush stems, and stems of other species. (Width in mm; Sg = sawgrass; Avg = average; LL = large leaves; ML = medium leaves: SL = small leaves; LC = large culms; SC = small culms; Rsh/gr = rush grass)

Class = dense sawgrass; water surface = no data; plant height = 2.3 m

Layer	Sg LL	Avg LL width	Sg ML	Avg ML width	Sg SL	Avg SL width	Sg LC	Avg LC width	Sg SC	Avg SC width	Rsh/gr	Avg Rsh/gr width
>100			56	5.0	100	2.3			0			
80-100	40	8.3	44	5.3	84	2.7			0			
60-80			84	6.2	124	2.3			4	5.0		
40-60	40	9.7	72	6.0	100	3.0			16	7.0		
30-40	40	9.8	32	5.3	40	3.0	12	9.3	12	4.7		
20-30			8	6.0	12	3.3			28	6.2		
10-20			4	5.0	8	2.5	8	14.0	20	7.6		
0-10			0		12	3.0	28	16.0	4	9.0	12	2.0



Appendix C. LAI for Individual Quadrats Sampled at Sites P33 and NESRS 33 in Shark River Slough, Everglades National Park

Table C-1. Leaf area index (LAI) by layer for P1, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100		
60-80		
40-60		
30-40	0.0003	0.0085
20-30	0.0002	0.0020
10-20	0.0003	0.0030
0-10	0.0002	0.0127
total	0.0010	0.0262

Table C-2. Leaf area index (LAI) by layer for P2, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100		
60-80		
40-60	0.0013	0.0013
30-40	0.0006	0.0006
20-30	0.0004	0.0114
10-20	0.0056	0.1313
0-10	0.0000	0.1432
total	0.0078	0.1445

Table C-3. Leaf area index (LAI) by layer for P3, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0006	0.0147
60-80	0.0096	0.0209
40-60	0.0191	0.0348
30-40	0.0055	0.0164
20-30	0.0027	0.0119
10-20	0.0036	0.0146
0-10	0.0134	0.0226
total	0.0545	0.1359

Table C-4. Leaf area index (LAI) by layer for P4, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0067	0.0105
60-80	0.0073	0.0152
40-60	0.0079	0.0193
30-40	0.0037	0.0173
20-30	0.0034	0.0195
10-20	0.0022	0.0138
0-10	0.0013	0.0159
total	0.0325	0.1115

Table C-5. Leaf area index (LAI) by layer for P5, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0014	0.0014
60-80	0.0018	0.0049
40-60	0.0032	0.0108
30-40	0.0034	0.0107
20-30	0.0018	0.0110
10-20	0.0013	0.0061
0-10	0.0015	0.0066
total	0.0145	0.0516

Table C-6. Leaf area index (LAI) by layer for P6, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0018	0.0088
60-80	0.0049	0.0101
40-60	0.0140	0.0384
30-40	0.0069	0.0494
20-30	0.0046	0.0504
10-20	0.0040	0.0187
0-10	0.0050	0.0245
total	0.0411	0.2004

Table C-7. Leaf area index (LAI) by layer for P8, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0068	0.0090
60-80	0.0092	0.0179
40-60	0.0178	0.0549
30-40	0.0106	0.0301
20-30	0.0083	0.0377
10-20	0.0096	0.0458
0-10	0.0034	0.0238
total	0.0657	0.2192

Table C-8. Leaf area index (LAI) by layer for P9, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0026	0.0043
60-80	0.0050	0.0086
40-60	0.0075	0.0167
30-40	0.0031	0.0113
20-30	0.0011	0.0055
10-20	0.0020	0.0066
0-10	0.0038	0.0126
total	0.0250	0.0656

Table C-9. Leaf area index (LAI) by layer for P10, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0010	0.0010
60-80	0.0020	0.0037
40-60	0.0045	0.0098
30-40	0.0037	0.0098
20-30	0.0011	0.0105
10-20	0.0016	0.0325
0-10	0.0025	0.0155
total	0.0164	0.0827

Table C-10. Leaf area index (LAI) by layer for P12, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0016	0.0019
60-80	0.0018	0.0020
40-60	0.0065	0.0253
30-40	0.0040	0.0108
20-30	0.0032	0.0256
10-20	0.0028	0.0265
0-10	0.0023	0.0306
total	0.0223	0.1226

Table C-11. Leaf area index (LAI) by layer for P13, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100		
60-80		
40-60	0.0030	0.0074
30-40	0.0005	0.0081
20-30	0.0004	0.1484
10-20	0.0004	0.0531
0-10	0.0019	0.0149
total	0.0062	0.2320

Table C-12. Leaf area index (LAI) by layer for P14, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0002	0.0002
60-80	0.0002	0.0013
40-60	0.0005	0.0022
30-40	0.0004	0.0034
20-30	0.0010	0.0039
10-20	0.0013	0.0035
0-10	0.0037	0.0115
total	0.0073	0.0260

Table C-13. Leaf area index (LAI) by layer for P15, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0030	0.0030
60-80	0.0026	0.0057
40-60	0.0086	0.0236
30-40	0.0042	0.0159
20-30	0.0068	0.0948
10-20	0.0051	0.0752
0-10	0.0054	0.0548
total	0.0357	0.2731

Table C-14. Leaf area index (LAI) by layer for P16, P33 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0043	0.0077
60-80	0.0045	0.0080
40-60	0.0079	0.0224
30-40	0.0066	0.0277
20-30	0.0076	0.0308
10-20	0.0063	0.0383
0-10	0.0038	0.0505
total	0.0408	0.1855

Table C-15. Leaf area index (LAI) by layer for N2, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0064	0.0480
60-80	0.0257	0.1026
40-60	0.0177	0.0895
30-40	0.0041	0.0468
20-30	0.0046	0.0231
10-20	0.0063	0.0294
0-10	0.0149	0.0271
total	0.0798	0.3665

Table C-16. Leaf area index (LAI) by layer for N3, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0144	0.1082
60-80	0.0210	0.0839
40-60	0.0297	0.1500
30-40	0.0113	0.1280
20-30	0.0064	0.0319
10-20	0.0066	0.0307
0-10	0.0077	0.0140
total	0.0970	0.5467

Table C-17. Leaf area index (LAI) by layer for N4, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0029	0.0043
60-80	0.0050	0.0113
40-60	0.0075	0.0162
30-40	0.0042	0.0098
20-30	0.0031	0.0086
10-20	0.0026	0.0058
0-10	0.0033	0.0052
total	0.0286	0.0612

Table C-18. Leaf area index (LAI) by layer for N6, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0095	0.0124
60-80	0.0031	0.0083
40-60	0.0124	0.0599
30-40	0.0061	0.0188
20-30	0.0052	0.0144
10-20	0.0051	0.0165
0-10	0.0059	0.0184
total	0.0472	0.1488

Table C-19. Leaf area index (LAI) by layer for N7, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0229	0.0229
60-80	0.0241	0.1585
40-60	0.0245	0.0582
30-40	0.0032	0.0107
20-30	0.0047	0.0109
10-20	0.0052	0.0120
0-10	0.0113	0.0254
total	0.0959	0.2986

Table C-20. Leaf area index (LAI) by layer for N8, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0050	0.0125
60-80	0.0215	0.0573
40-60	0.0277	0.0848
30-40	0.0106	0.1119
20-30	0.0015	0.0043
10-20	0.00652	0.0154
0-10	0.0062	0.0082
total	0.0790	0.2944

Table C-21. Leaf area index (LAI) by layer for N10, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0029	0.0219
60-80	0.0082	0.0185
40-60	0.0034	0.0086
30-40	0.0040	0.0148
20-30	0.0031	0.0338
10-20	0.00219	0.0068
0-10	0.0024	0.0056
total	0.0262	0.1099

Table C-22. Leaf area index (LAI) by layer for N11, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0151	0.0300
60-80	0.0195	0.0345
40-60	0.0211	0.0919
30-40	0.0056	0.0112
20-30	0.0077	0.0219
10-20	0.01003	0.0162
0-10	0.0120	0.0498
total	0.0910	0.2555

Table C-23. Leaf area index (LAI) by layer for N12, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0363	0.1084
60-80	0.0444	0.1767
40-60	0.0401	0.1978
30-40	0.0127	0.1211
20-30	0.0058	0.0481
10-20	0.01036	0.0250
0-10	0.0131	0.0289
total	0.1627	0.7060

Table C-24. Leaf area index (LAI) by layer for N14, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0048	0.0094
60-80	0.0094	0.0210
40-60	0.0179	0.0524
30-40	0.0068	0.0317
20-30	0.0092	0.0302
10-20	0.00500	0.0139
0-10	0.0039	0.0052
total	0.0571	0.1638

Table C-25. Leaf area index (LAI) by layer for N15, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0097	0.0265
60-80	0.0097	0.0274
40-60	0.0141	0.0529
30-40	0.0044	0.0221
20-30	0.0022	0.0058
10-20	0.00360	0.0116
0-10	0.0050	0.0085
total	0.0487	0.1547

Table C-26. Leaf area index (LAI) by layer for N16, NESRS3 site, April, 1996 (See text for formulas)

Layer	LAI	Corrected LAI
80-100	0.0158	0.0339
60-80	0.0165	0.0615
40-60	0.0246	0.1059
30-40	0.0085	0.0737
20-30	0.0026	0.0160
10-20	0.00304	0.0125
0-10	0.0054	0.0302
total	0.0766	0.3338