

U.S. Department of the Interior
U.S. Geological Survey

**Biomass and Vegetative Characteristics of
Sawgrass Grown in a Tilting Flume as Part of a
Study of Vegetative Resistance to Flow**

Open-File Report 99-230



Biomass and Vegetative Characteristics of Sawgrass Grown in a Tilting Flume as Part of a Study of Vegetative Resistance to Flow

**By Nancy B. Rybicki, Justin Reel, Henry A. Ruhl, Patricia T. Gammon,
Virginia Carter, and Jonathan K. Lee**

U. S. GEOLOGICAL SURVEY

Open-File Report 99-230

Reston, Virginia

1999

Revised September 2003

U. S. DEPARTMENT OF THE INTERIOR
BRUCE BABBITT, *Secretary*

U. S. GEOLOGICAL SURVEY
Charles G. Groat, *Director*

For additional information, write to:

Chief, Vegetation and Hydrogeomorphic
Relations
U. S. Geological Survey
MS 430 - National Center
Reston, Virginia 20192

Copies of this report can be purchased from:

U. S. Geological Survey
Branch of Information Services
Box 25286, Federal Center
Denver, Colorado 80225-0286

CONTENTS

	Page
Abstract	1
Introduction	1
Study methods	
Quadrat biomass	2
Plant descriptions	2
Results of data collection	3
References cited	3

TABLES

Table 1. Procedures used at each vegetation sampling date and treatment between and during sampling dates	5
Table 2. Selected results of flume vegetation sampling for six plant ages chosen to illustrate change in plant structure over time	6
Table 3. Summary of uncorrected Leaf Area Indices (LAI) for six plant ages	7
Tables 4a-4e. September, 1995	
4a. Sawgrass biomass in the flume	7
4b. Summary of sawgrass biomass in the flume	7
4c. Descriptive information on flume vegetation	8
4d. Summary of leaves and culms in the flume	8
4e. Leaf area index by layer for the flume	8
Tables 5a-5e. January, 1996	
5a. Sawgrass biomass in the flume	9
5b. Summary of sawgrass biomass in the flume	9
5c. Descriptive information on flume vegetation	10
5d. Summary of leaves and culms in the flume	10
5e. Leaf area index by layer for the flume	10
Tables 6a-6e. May, 1996	
6a. Sawgrass biomass in the flume	11
6b. Summary of sawgrass biomass in the flume	11
6c. Descriptive information on flume vegetation	12
6d. Summary of leaves and culms in the flume	12
6e. Leaf area index by layer for the flume	12
Tables 7a-7g. October, 1996	
7a. Sawgrass biomass in the flume	13
7b. Summary of sawgrass biomass in the flume	13
7c. Sawgrass biomass (leaves, culms, dead) in the flume	14
7d. Summary of biomass (leaves and culms) in the flume	14
7e. Descriptive information on flume vegetation	15
7f. Summary of leaves and culms in the flume	15
7g. Leaf area index by layer for the flume	15
Tables 8a-8g. March, 1997	

8a. Sawgrass biomass in the flume	16
8b. Summary of sawgrass biomass in the flume	16
8c. Sawgrass biomass (live and dead culms and leaves and dead litter) in the flume	17
8d. Summary of biomass (live and dead culms and leaves and dead litter) in the flume	18
8e. Descriptive information on flume vegetation	18
8f. Summary of leaves and culms in the flume	19
8g. Leaf area index by layer for the flume	19
Tables 9a-9h. June, 1997	
9a. Sawgrass biomass in the flume, layers 0-20 through 60-90 cm	20
9b. Summary of sawgrass biomass in the flume, layers 0-20 through 60-90 cm	21
9c. Sawgrass biomass (and live leaves and culms) in the flume, layers 0-20 through 60-90	21
9d. Sawgrass biomass (dead and live leaves and culms) in the flume, layers 0-20 through 60-90	22
9e. Summary of biomass (live and dead leaves and culms and dead litter) in the flume	22
9f. Descriptive information on flume vegetation, layers 0-20 through 60-90 cm	22
9g. Summary of leaves and culms in the flume	23
9h. Leaf area index by layer for the flume	23

ILLUSTRATIONS

Figures 1-5. Flume averages and totals, 1995-97	
1. Average live biomass	25
2. Average dead biomass	26
3. Average total biomass	27
4. Number of live leaves	28
5. Number of live culms	29

BIOMASS AND VEGETATIVE CHARACTERISTICS OF SAWGRASS GROWN IN A TILTING FLUME AS PART OF A STUDY OF VEGETATIVE RESISTANCE TO FLOW

by

Nancy B. Rybicki, Justin Reel, Henry A. Ruhl, Patricia T. Gammon, Virginia Carter, and Jonathan K. Lee

ABSTRACT

The U.S. Geological Survey is studying vegetative resistance to flow in the south Florida Everglades as part of a multidisciplinary effort to restore the South Florida Ecosystem. In order to test the flow resistance of sawgrass, one of the dominant species in the Everglades, uniform, dense stands of sawgrass were grown in the tilting flume at Stennis Space Center, Mississippi. Depth of water in the flume was controlled by adding or removing metal plates at the downstream end of the flume. A series of experiments were conducted at various flow depths, and the velocity, flow depth, and water-surface slope were measured. During each set of experiments, the sawgrass was sampled in layers from the sediment water interface for vegetative characteristics, biomass, and leaf area index. The results of the vegetation sampling are summarized in a series of tables.

INTRODUCTION

As part of the South Florida Ecosystem Study, "Determination of Vegetative Resistance to Flow," uniform, dense stands of sawgrass were grown in pans that were fit tightly into a tilting flume at Stennis Space Center, Mississippi, to form a 61 m long, 1.8 m wide artificial sawgrass ecosystem (Lee and Carter, 1996). The depth of water in the flume is controlled by adding or removing metal plates at the downstream end. Several series of experiments were conducted at various flow depths between 0 and 90 cm, and vegetative resistance was calculated from velocity, flow depth, and surface-water slope.

During each experimental series, the vegetation in the flume was sampled to determine, as a function of distance from the bed or the sediment/water interface, the biomass per unit area, the number of live stems and leaves per unit area, leaf and stem width, and leaf area index. The general methods for measuring biomass and plant characteristics are outlined below. Measurements were made starting in September, 1995, when the plants were nine months old, and continued at intervals as each individual series of experiments were concluded.

This publication is the first of two planned Open-File reports summarizing the vegetation information by date and plant age. Following the series of experiments described here, part of the flume was converted to a wind tunnel, and several series of experiments were

conducted at different flow velocities, depths, and wind speeds. The results of the later set of experiments will be described in the second report.

STUDY METHODS

Quadrat Biomass

Measurement dates, type of measurement, and treatment of plants between measurements are summarized in Table 1. Biomass was measured in 37x55 cm quadrats; the number of quadrats varied by date. Leaves, culms, and dead material were cut and removed at 90, 60, 40, 20, and 0 cm from the sediment/water interface, starting at the top of the plants. The plant material from each layer was sorted (see plant description below) and dried at 105 °C for about 12 hours, weighed, and the weight expressed as grams dry weight per square meter (gdw/m²). This method, with variations in the number and positions of the quadrats, was used throughout the duration of the sawgrass experiments. For the first three sampling periods, all live leaves and culms were separated from dead standing leaves and culms and the remaining litter; thus, live biomass includes both leaves and culms, and dead biomass includes all dead material. In October, 1996, we began to separate live leaves from live culms and measure their biomass separately. The dead standing leaves and culms were still combined with the dead litter. By March, 1997, dead upright leaves and culms were present when we did the sampling, and the biomass measurements were further refined to include them. In March and June of 1997, we separated all components, live leaves, live culms, dead standing leaves, dead standing culms, and dead litter, and measured their biomass separately. Biomass data for individual quadrats were averaged to give biomass data for the flume for each date.

It was necessary to trim the tops of the sawgrass back to 1 meter total height frequently to permit the measuring cart to move across the top of the flume. For this reason, the >90 cm layer was not measured after September, 1995, until June 1997, when the tops of the plants were allowed to grow for wind simulation experiments. Visually, the plants were generally healthy and green with strongly stiff and upright leaves (the tips having been cut off). Some mortality occurred as time went on, and new plants also sprouted. During some periods between sampling, plants were thinned out or transplanted to fill gaps. The amount of litter in the bottom increased naturally, but was far less than we observed in the field. For this reason, we added to the bottom litter by throwing the cut-off tops of the plants into the flume in order to more closely simulate natural field conditions.

Plant Descriptions

All leaves and culms in each layer were counted and dried. Leaves were separated into small, medium, and large classes, and six widths were measured for each size class, when possible. Likewise, culms were divided into small and large classes and six diameters were measured for each class. In October, 1996, March, 1997, and June, 1997, additional descriptive information was collected, including number of live culms, number of dead

standing culms, number of live leaves, number of dead standing leaves, and, in June, 1997, composition of the vegetation above 90 cm. Descriptive data were summarized for each date. Leaf Area Index (LAI) in m^2m^{-2} (square meters of leaf opposing flow per square meter of sediment surface) was calculated for each layer using the equation:

$$LAI = (LL \times AW_{LL} + ML \times AW_{ML} + SL \times AW_{SL} + LC \times AW_{LC} + SC \times AW_{SC}) \times DL$$

where AW = average width in meters of leaves or culms, LL = number of large live leaves only or live plus dead leaves per m^2 , ML = number of medium live leaves only or live plus dead leaves per m^2 , SL = number of small live leaves only or live plus dead leaves per m^2 , LC = number of large live culms or live culms plus dead culms per m^2 , SC = number of small live culms or live plus dead culms per m^2 , and DL = depth of the layer in meters. Use of live versus live plus dead depended on date of sampling. In September, 1995, January, 1996, May, 1996, and October, 1996, the number of leaves and culms used to calculate LAI included only live leaves and culms. In March, 1997, and June, 1997, the number of leaves and culms used to calculate LAI included both live and dead standing leaves and culms. In order to account for the resistance of the remaining dead material, we determined the ratio of dead material/standing biomass for each layer and then multiplied the LAI by the ratio to calculate a litter LAI. This litter LAI was added to the standing LAI to form a corrected LAI for each layer.

RESULTS OF DATA COLLECTION

Selected results of the flume sampling are summarized Table 2. In general, the plants became larger and more robust as time went on; the culms extended into higher layers, the leaves became larger, and the number of leaves decreased. Table 3 summarizes the leaf area indices (LAI) for the six dates. Biomass and descriptive information for each date are summarized in Tables 4 through 9. Tables are numbered by date; thus Tables 4a through 4d are for September, 1995, and so forth. Figures 1 through 3 summarize the average live, dead, and total biomass in the flume respectively for the six sampling dates. Figure 4 shows the number of leaves, and Figure 5 shows the number of culms in the flume for the six sampling dates.

REFERENCES CITED

Lee, J. K., and Carter, Virginia, 1996, Vegetation affects water movement in the Florida Everglades: U.S. Geological Survey Fact Sheet FS-147-96, 2 p.

Table 1. Procedures used at each vegetation sampling date and treatment between and during sampling dates

Dates/age of plants	Plant characteristics	Sampling design	Treatment between sampling dates/comments
September 1995 (9 months)	Biomass: live, dead, total Description Leaf distribution Transects Leaf area index	8 quadrats 8 quadrats 8 blocks 4 all layers	Samples taken at upstream and downstream end of flume
January 1996 (13 months)	Biomass: live, dead, total Description Transects Leaf area index	16 quadrats 16 quadrats 4 all layers	Top of plants in quadrats trimmed and thrown into flume Quadrats in 4 strips across flume
May 1996 (17 months)	Biomass: live, dead, total Description Transects Leaf area index	12 quadrats 12 quadrats 4 all layers	Plants thinned between this date and previous date. Plants transplanted to gaps Old plant material from trimming tops and thinning thrown into flume
October 1996 (21 months)	Biomass: live leaves, live culms, dead, total Description Transects Leaf area index	12 quadrats 12 quadrats 4 all layers	Plants transplanted to gaps Plants thinned between this date and previous date
March 1997 (27 months)	Biomass: live leaves and culms, dead standing leaves and culms, dead litter, total Description Transects Leaf area index	12 quadrats 12 quadrats 4 all layers	Sponges added before this date Plants transplanted to gaps
June 1997 (30 months)	Biomass: live leaves and culms, dead standing leaves and culms, dead litter, total Description Transects Leaf area index	8 quadrats 8 quadrats 4 all layers	Wind tunnel installed Front and back sections cleared Tops of plants not cut since March runs

Table 2. Selected results of flume vegetation sampling for six plant ages

[Sg = sawgrass; mos = months; Av = average; standing includes both live and dead leaves or culms; biomass in gdw/m²]

	9 mos	13 mos	17 mos	21 mos	27 mos	30 mos
Av total biomass	588	795	727	532	731	813
Class	Medium Sg	Medium Sg	Medium Sg	Medium Sg	Medium Sg	Medium Sg
Total number of leaves at 40-60 cm	1183 (live only)	562 (live only)	325 (live only)	228 (live only)	344 (standing live and dead) 185 (live only)	331 (standing live and dead) 179 (live only)
Total number of leaves at 20-40 cm	1086 (live only)	330 (live only)	75 (live only)	110 (live only)	267 (standing live and dead) 103 (live only)	213 (standing live and dead) 38 (live only)
Total number of culms at 0-20 cm	225 (live only)	115 (live only)	75 (live only)	48 (live only)	54 (standing live and dead) 38 (live only)	64 (standing live and dead) 50 (live only)
Total number of culms at 20-40 cm	97 (live only)	97 (live only)	68 (live only)	41 (live only)	46 (standing live and dead) 37 (live only)	47 (standing live and dead) 42 (live only)
Total dead biomass	65	305	300	246	259	323

Table 3. Summary of uncorrected Leaf Area Indices (LAI) for six plant ages
[cm = centimeter; mos = months; LAI in m²; see text for formulas.]

Age of plant ---- Layer	9 mos	13 mos	17 mos	21 mos	27 mos	30 mos
60-90 cm	1.258	1.195	0.775	0.488	0.771	0.862
40-60 cm	0.941	0.694	0.456	0.333	0.560	0.653
20-40 cm	0.929	0.545	0.261	0.237	0.577	0.545
0-20 cm	0.593	0.460	0.222	0.191	0.577	0.336
Total	3.721	2.894	1.713	1.248	2.485	2.396

Table 4a. Sawgrass biomass in the flume, September, 1995

[Plants are nine months old; layer in centimeters above the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); dead includes all dead material.]

Sample designation ---- Layer	Sample biomass (gdw/m ²)											
	U22			U23			U16			U15		
	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
>90	44.13		44.13	47.43		47.43	49.01		49.01	63.36		63.36
60-90	100.68		100.68	103.76		103.76	68.53		68.53	95.66	3.37	99.03
40-60	93.93	5.24	99.17	113.24	13.20	126.44	85.54	4.16	89.70	104.91	5.24	110.15
20-40	123.21	3.95	127.16	111.73	18.16	129.89	126.94	3.30	130.24	110.08	11.48	121.56
0-20	159.31	43.77	203.08	152.06	42.84	194.90	123.00	35.09	158.09	146.82	22.75	169.57
total	521.26	52.96	574.22	528.23	74.20	602.43	453.02	42.55	495.57	520.83	42.84	563.67

Sample designation ---- Layer	Sample biomass (gdw/m ²)											
	D17			D5			D10			D8		
	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
>90	26.91	1.15	28.06	51.31	1.87	53.17	32.94	5.67	38.61	50.88	4.23	55.11
60-90	69.54	3.44	72.98	140.94	3.37	144.31	80.37	2.37	82.74	93.00	8.47	101.47
40-60	100.39	9.19	109.58	132.11	7.68	139.79	81.95	12.49	94.44	93.29	5.53	98.81
20-40	138.86	28.63	167.49	158.02	17.65	175.67	109.22	29.13	138.35	131.82	12.99	144.81
0-20	159.67	51.45	211.12	217.94	47.15	265.08	122.49	30.14	152.63	170.57	25.47	196.05
total	495.36	93.86	589.22	700.31	77.72	778.02	426.97	79.80	506.77	539.56	56.69	596.25

Table 4b. Summary of sawgrass biomass in the flume, September, 1995

[Plants are nine months old; layer in centimeters above the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); SD = standard deviation; N = number of samples; dead includes all dead material.]

Layer	Average live biomass	SD	N	Average dead biomass	SD	Average total biomass	SD
>90	45.75	11.36	8	1.61	26.88	47.36	10.77
60-90	94.06	23.64	8	2.63	55.79	96.69	23.64
40-60	100.67	17.06	8	7.84	55.03	108.51	17.06
20-40	126.23	19.74	8	15.66	75.03	141.90	19.74
0-20	156.48	35.92	8	37.33	88.30	193.81	35.92
total	523.19	86.44	8	65.08	295.14	588.27	86.44

Table 4c. Descriptive information on flume vegetation, September, 1995

[Plants are nine months old; layer in centimeters above the sediment/water interface; average width in millimeters.]

Layer	Large leaves		Medium leaves		Small leaves		Large culms		Small culms	
	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # culms/m ²	Average width	Average # culms/m ²	Average width
>90	36.8	7.5	262.8	4.7	197.3	2.3				
60-90	32.3	7.2	600.1	5.2	356.1	2.3				
40-60	9.9	7.1	781.3	4.7	392.0	2.4				
20-40	9.0	7.6	630.6	4.8	446.7	2.4	38.6	7.3	58.3	4.3
0-20	19.7	9.4	164.2	5.5	83.4	3.2	121.1	9.7	104.1	4.2

Table 4d. Summary of leaves and culms in the flume, September, 1995

[Plants are nine months old; layer in centimeters above the sediment/water interface: SD = standard deviation; N = number of samples.]

Layer	Total # leaves/m ²	SD	N	Total # culms/m ²	SD
> 90	496.9	144.33	8		
60-90	988.5	273.45	8		
40-60	1183.1	273.45	8		
20-40	1086.3	225.66	8	96.9	32.32
0-20	267.3	82.78	8	225.2	44.56

Table 4e. Leaf area index by layer for the flume, September, 1995

[Leaf area index is calculated for live leaves and culms only; layer in centimeters above the sediment-water interface; see text for formulas.]

Layer	Leaf Area Index	Corrected Leaf Area Index
60-90	1.258	1.293
40-60	0.941	1.014
20-40	0.929	1.044
0-20	0.593	0.735
Total	3.721	4.086

Table 5a. Sawgrass biomass in the flume, January, 1996

[Plants are 13 months old; layer in centimeters above the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); dead includes all dead material.]

Sample biomass (gdw/m ²)												
Sample designation ----	10E1			10E2			10E3			10E4		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	157.58	19.02	176.60	110.94	28.85	139.79	162.18	32.51	194.68	130.10	14.57	144.67
40-60	145.31	54.54	199.85	96.01	34.66	130.67	162.75	69.32	232.07	123.14	55.97	179.11
20-40	162.03	52.82	214.85	101.47	67.17	168.64	146.53	59.63	206.17	104.98	47.15	152.13
0-20	167.92	144.60	312.51	97.95	192.60	290.56	135.91	146.82	282.73	136.56	152.63	289.19
total	632.85	270.97	903.82	406.38	323.28	729.66	607.38	308.28	915.66	494.79	270.32	765.11
Sample designation ----	20E1			20E2			20E3			20E4		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	91.42	13.99	105.42	218.15	34.37	252.52	109.51	21.46	130.96	150.48	60.42	210.90
40-60	78.72	42.84	121.56	194.18	55.90	250.08	91.42	58.63	150.05	109.08	89.77	198.85
20-40	98.74	64.30	163.04	152.20	61.00	213.20	111.44	90.85	202.29	131.39	81.88	213.27
0-20	100.46	115.68	216.14	228.48	127.16	355.64	145.96	162.18	308.14	108.14	122.14	230.28
total	369.35	236.81	606.16	793.02	278.43	1,071.45	458.33	333.11	791.44	499.09	354.21	853.30
Sample designation ----	30E1			30E2			30E3			30E4		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	187.80	41.69	229.49	111.59	20.31	131.89	63.29	13.85	77.14	109.79	47.36	157.15
40-60	179.40	103.62	283.02	99.39	38.61	137.99	52.53	21.38	73.91	79.94	43.99	123.93
20-40	130.82	58.99	189.81	102.40	45.64	148.04	62.00	52.96	114.96	94.44	77.07	171.51
0-20	215.06	196.91	411.97	148.76	144.02	292.78	71.98	161.96	233.94	135.48	211.19	346.67
total	713.08	401.21	1,114.29	462.13	248.58	710.71	249.80	250.16	499.95	419.65	379.61	799.26
Sample designation ----	40E1			40E2			40E3			40E4		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	120.20	27.84	148.04	122.35	62.93	185.28	65.95	29.42	95.37	133.11	18.44	151.56
40-60	118.26	46.72	164.98	112.66	75.92	188.59	60.13	37.03	97.16	124.14	29.71	153.85
20-40	95.80	63.01	158.80	117.83	97.59	215.42	57.84	60.92	118.76	136.99	47.07	184.06
0-20	109.36	202.36	311.73	153.28	157.80	311.08	50.09	158.95	209.04	151.70	112.38	264.08
total	443.62	339.93	783.55	506.12	394.25	900.37	234.01	286.32	520.33	545.95	207.60	753.55

Table 5b. Summary of sawgrass biomass in the flume, January, 1996

[Plants are 13 months old; layer in centimeters above the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); SD = standard deviation, N = number of samples; dead includes all dead material.]

Layer	Average live biomass	SD	N	Average dead biomass	SD	Average total biomass	SD
60-90	127.78	40.81	16	30.44	15.61	158.22	48.01
40-60	114.19	40.35	16	53.66	22.08	167.86	56.20
20-40	112.93	29.57	16	64.25	15.42	177.18	33.23
0-20	134.82	46.39	16	156.84	30.72	291.66	53.89
total	489.72	148.98	16	305.19	58.49	794.91	169.62

Table 5c. Descriptive information on flume vegetation, January, 1996

[Plants are 13 months old; layer in centimeters above the sediment/water interface; average width in millimeters.]

Layer	Large leaves		Medium leaves		Small leaves		Large culms		Small culms	
	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # culms/m ²	Average width	Average # culms/m ²	Average width
60-90	87.0	8.5	343.1	6.3	293.8	3.5			8.5	4.2
40-60	61.4	9.0	285.7	6.0	214.8	3.8	13.5	10.2	50.7	5.1
20-40	52.0	9.2	131.0	6.4	147.1	4.0	36.3	11.9	61.0	6.4
0-20	49.3	10.6	59.7	7.0	34.5	3.5	55.2	14.0	59.7	7.8

Table 5d. Summary of leaves and culms in the flume, January, 1996

[Plants are 13 months old; layer in centimeters above the sediment/water interface; SD = standard deviation; N = number of samples.]

Layer	Total leaves/m ²	SD	N	Total culms/m ²	SD
60-90	723.9	214.96	16	8.5	11.18
40-60	562.0	181.93	16	64.1	27.2
20-40	330.1	129.04	16	97.3	28.34
0-20	143.5	83.15	16	114.8	32.52

Table 5e. Leaf area index by layer for the flume, January, 1996

[Leaf area index is calculated for live leaves and culms only; layer in centimeters above the sediment-water interface; see text for formulas.]

Layer	Leaf Area Index	Corrected Leaf Area Index
60-90	1.195	1.480
40-60	0.694	1.020
20-40	0.545	0.856
0-20	0.460	0.994
Total	2.894	4.349

Table 6a. Sawgrass biomass in the flume, May, 1996

[Plants are 17 months old; layer in centimeters from sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); dead includes all dead material.]

Sample biomass (gdw/m ²)									
Sample designation ----	1A			1B			1C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	99.75	12.77	112.52	43.70	31.43	75.13	68.17	16.72	84.89
40-60	74.70	38.68	113.38	27.34	26.34	53.68	55.33	41.12	96.45
20-40	111.16	61.14	172.30	33.44	25.69	59.13	56.19	67.38	123.57
0-20	111.16	63.65	174.81	68.10	127.88	195.98	82.95	170.29	253.24
Total	396.76	176.24	573.00	172.58	211.33	383.92	262.64	295.51	558.15
Sample designation ----	2A			2B			2C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	125.44	6.60	132.04	164.98	23.97	188.94	189.16	33.30	222.46
40-60	107.50	20.88	128.38	116.83	69.75	186.58	125.01	67.74	192.75
20-40	113.88	56.33	170.21	116.25	81.81	198.06	148.76	70.76	219.51
0-20	123.07	153.78	276.85	170.79	204.30	375.09	161.32	227.98	389.30
Total	469.88	237.60	707.48	568.84	379.83	948.67	624.24	399.77	1024.02
Sample designation ----	3A			3B			3C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	42.12	12.99	55.11	163.47	28.13	191.60	103.48	16.00	119.48
40-60	40.76	34.80	75.56	117.97	57.05	175.02	53.82	51.60	105.42
20-40	41.26	39.54	80.80	135.05	58.48	193.54	83.60	52.10	135.70
0-20	88.26	189.37	277.64	153.71	187.08	340.79	87.40	165.98	253.38
Total	212.41	276.71	489.12	570.20	330.74	900.95	328.30	285.68	613.98
Sample designation ----	4A			4B			4C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	200.28	29.78	230.06	189.09	122.78	311.87	51.52	7.75	59.27
40-60	129.60	59.20	188.80	146.75	41.48	188.23	41.41	26.41	67.81
20-40	139.36	51.45	190.81	165.48	40.40	205.88	59.20	162.90	222.10
0-20	150.77	156.37	307.13	179.11	148.04	327.15	60.28	159.52	219.80
Total	620.01	296.80	916.81	680.43	352.70	1033.13	212.41	356.58	568.99

Table 6b. Summary of sawgrass biomass in the flume, May, 1996

[Plants are 17 months old; layer in centimeters from the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); SD = standard deviation; N = number of samples; dead includes all dead material.]

Layer	Average live biomass	SD	N	Average dead biomass	SD	Average total biomass	SD
60-90	120.10	60.22	12	28.52	31.09	148.61	80.24
40-60	86.42	41.70	12	44.59	16.42	131.00	52.80
20-40	100.30	44.47	12	64.00	34.61	164.30	53.45
0-20	119.74	42.27	12	162.85	41.27	282.60	67.92
Total	465.15	243.40	12	299.96	68.16	726.52	226.03

Table 6c. Descriptive information on flume vegetation, May, 1996

[Plants are 17 months old; layer in centimeters above the sediment/water interface; average width in millimeters.]

Layer	Large leaves		Medium leaves		Small leaves		Large culms		Small culms	
	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # culms/m ²	Average width	Average # culms/m ²	Average width
60 - 90	27.5	8.9	253.6	6.7	125.0	3.9			32.3	4.6
40 - 60	32.9	10.1	185.4	6.6	106.4	4.0	4.8	11.7	49.0	4.9
20 - 40	22.7	12.3	41.3	7.2	11.4	4.1	28.1	13.4	40.1	7.5
0 - 20	5.4	14.8	5.4	7.6	0.6	4.0	52.0	14.8	23.3	9.2

Table 6d. Summary of leaves and culms in the flume, May, 1996

[Plants are 17 months old; layer in centimeters above the sediment/water interface; SD = standard deviation; N = number of samples.]

Layer	Total leaves/m ²	SD	N	Total culms/m ²	SD
60 - 90	406.0	145.19	12	32.3	24.95
40 - 60	324.7	130.90	12	53.8	19.95
20 - 40	75.4	43.43	12	68.2	20.18
0 - 20	11.4	13.84	12	75.4	17.97

Table 6e. Leaf area index by layer for the flume, May, 1996

[Leaf area index is calculated for live leaves and culms only; layer in centimeters above the sediment-water interface; see text for formulas.]

Layer	Leaf Area Index	Corrected Leaf Area Index
60-90	0.775	0.959
40-60	0.456	0.692
20-40	0.261	0.427
0-20	0.222	0.523
Total	1.713	2.601

Table 7a. Sawgrass biomass in the flume, October, 1996

[Plants are 21 months old; layer in centimeters above the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); dead includes all dead material.]

Sample biomass (gdw/m ²)									
Sample designation ----	1A			1B			1C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	103.41	19.73	123.14	143.30	36.10	179.40	105.85	25.04	130.89
40-60	63.65	25.26	88.91	133.26	59.35	192.60	100.75	63.36	164.12
20-40	87.76	87.83	175.60	115.68	104.77	220.45	77.43	84.82	162.25
0-20	143.88	242.91	386.79	128.16	177.96	306.13	123.86	128.24	252.09
Totals	398.70	375.74	774.43	520.40	378.18	898.58	407.88	301.46	709.35
Sample designation ----	2A			2B			2C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	43.34	5.09	48.44	93.22	43.85	137.06	24.18	8.68	32.87
40-60	40.19	7.61	47.79	93.50	72.33	165.84	25.40	22.96	48.37
20-40	31.07	30.57	61.64	79.37	78.58	157.94	16.50	42.19	58.70
0-20	29.85	44.63	74.49	97.74	72.41	170.14	17.94	137.56	155.50
Totals	144.45	87.91	232.36	363.82	267.16	630.99	84.03	211.40	295.44
Sample designation ----	3A			3B			3C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	75.92	34.88	110.80	28.92	5.74	34.66	161.60	34.44	196.05
40-60	67.88	34.37	102.26	29.78	9.47	39.25	113.02	53.25	166.27
20-40	57.84	44.71	102.55	25.12	65.37	90.49	99.75	76.71	176.46
0-20	69.32	139.21	208.53	44.13	181.55	225.69	108.93	177.89	286.82
Totals	270.97	253.17	524.14	127.95	262.14	390.09	483.30	342.30	825.60
Sample designation ----	4A			4B			4C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	96.59	23.18	119.77	46.14	17.72	63.87	28.56	9.04	37.60
40-60	88.19	30.79	118.98	39.83	22.32	62.14	22.03	7.10	29.13
20-40	68.60	39.04	107.64	54.82	41.91	96.73	27.13	40.33	67.45
0-20	73.77	126.01	199.78	56.91	70.76	127.66	26.12	49.01	75.13
Totals	327.15	219.01	546.17	197.70	152.71	350.40	103.84	105.49	209.32

Table 7b. Summary of sawgrass biomass in the flume, October, 1996

[Plants are 21 months old; layer in centimeters above sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); SD = standard deviation; N = number of samples; dead includes all dead material.]

Layer	Average live biomass	SD	N	Average dead biomass	SD	Average total biomass	SD
60-90	79.25	45.93	12	21.96	13.23	101.21	56.82
40-60	68.12	37.41	12	34.01	22.79	102.14	58.30
20-40	61.76	31.94	12	61.40	24.49	123.16	53.31
0-20	76.72	46.57	12	129.01	60.92	205.73	93.51
Totals	285.85	152.61	12	246.39	96.66	532.24	238.15

Table 7c. Sawgrass biomass (leaves, culms, dead) in the flume, October, 1996

[Plants are 21 months old; layer in centimeters above sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); dead includes all dead material.]

Sample biomass (gdw/m ²)									
Sample designation ----	1A			1B			1C		
Layer	Leaves	Culms	Dead	Leaves	Culms	Dead	Leaves	Culms	Dead
60-90	86.47	16.94	19.73	121.13	22.17	36.10	94.51	11.34	25.04
40-60	48.44	15.21	25.26	99.03	34.23	59.35	81.23	19.52	63.36
20-40	39.61	48.15	87.83	42.91	72.76	104.77	40.97	36.45	84.82
0-20		143.88	242.91	4.45	123.71	177.96	14.57	109.29	128.24
total	24.32	224.18	375.74	267.52	24.32	378.18	231.28	176.60	301.46
Sample designation ----	2A			2B			2C		
Layer	Leaves	Culms	Dead	Leaves	Culms	Dead	Leaves	Culms	Dead
60-90	34.23	9.11	5.09	78.36	14.85	43.85	19.45	4.74	8.68
40-60	26.19	13.99	7.61	65.45	28.06	72.33	17.94	7.46	22.96
20-40	17.65	13.42	30.57	21.38	57.98	78.58	6.60	9.90	42.19
0-20	6.17	23.68	44.63	3.88	93.86	72.41	1.29	16.65	137.56
total	84.25	60.21	87.91	169.07	194.76	267.16	45.28	38.75	211.40
Sample designation ----	3A			3B			3C		
Layer	Leaves	Culms	Dead	Leaves	Culms	Dead	Leaves	Culms	Dead
60-90	69.32	6.60	34.88	27.05	1.87	5.74	141.80	19.81	34.44
40-60	49.66	18.23	34.37	27.13	2.66	9.47	80.08	32.94	53.25
20-40	16.15	41.69	44.71	16.36	8.75	65.37	43.06	56.69	76.71
0-20	4.45	64.87	139.21	6.53	37.60	181.55	18.37	90.56	177.89
total	139.57	131.39	253.17	77.07	50.88	262.14	283.31	200.00	342.30
Sample designation ----	4A			4B			4C		
Layer	Leaves	Culms	Dead	Leaves	Culms	Dead	Leaves	Culms	Dead
60-90	77.43	19.16	23.18	37.24	8.90	17.72	25.83	2.73	9.04
40-60	64.94	23.25	30.79	21.74	18.08	22.32	16.36	5.67	7.10
20-40	26.26	42.34	39.04	12.70	42.12	41.91	4.88	22.25	40.33
0-20	11.63	62.14	126.01	3.30	53.60	70.76		26.12	49.01
total	180.26	146.89	219.01	74.99	122.71	152.71	47.07	56.76	105.49

Table 7d. Summary of biomass (leaves, culms) in flume in October, 1996

[Plants are 21 months old; layer in centimeters above sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²).]

Layer	Average leaves	SD	N	Average culms	SD
60-90	67.74	39.78	12	11.52	6.97
40-60	49.85	28.28	12	18.27	10.18
20-40	24.05	14.21	12	37.71	20.47
0-20	6.22	5.79	12	70.50	41.78
total	135.33	90.26	12	118.95	70.71

Table 7e. Descriptive information on flume vegetation, October, 1996

[Plants are 21 months old; layer in centimeters above the sediment/water interface; average width in millimeters.]

Layer	Large leaves		Medium leaves		Small leaves		Large culms		Small culms	
	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # culms/m ²	Average width	Average # culms/m ²	Average width
60-90	6.0	9.7	180.0	6.3	70.6	3.9			35.9	4.7
40-60	5.4	10.8	166.8	6.9	56.2	4.0	3.6	10.9	33.5	5.9
20-40	7.2	11.6	83.7	7.4	19.1	4.1	19.1	11.5	22.1	8.0
0-20	13.8	9.9	13.8	8.3	0.6	3.0	40.7	15.2	7.2	8.8

Table 7f. Summary of leaves and culms in the flume, October, 1996

[Plants are 21 months old; layer in centimeters above the sediment/water interface; SD = standard deviation; N = number of samples.]

Layer	Total leaves/m ²	SD	N	Total culms/m ²	SD
60-90	256.5	125.16	12	35.9	19.11
40-60	228.4	113.33	12	37.1	17.26
20-40	110.0	60.92	12	41.3	18.64
0-20	28.1	20.17	12	47.8	24.35

Table 7g. Leaf area index by layer for the flume, October, 1996

[Leaf area index is calculated for live leaves and culms only; layer in centimeters above the sediment-water interface; see text for formulas.]

Layer	Leaf Area Index	Corrected Leaf Area Index
60-90	0.488	0.624
40-60	0.333	0.499
20-40	0.237	0.472
0-20	0.191	0.511
Total	1.248	2.106

Table 8a. Sawgrass biomass in the flume, March, 1997

[Plants are 27 months old; layer in centimeters above the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); dead includes all dead material.]

Sample biomass (gdw/m ²)									
Sample designation ----	1A			1B			1C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	145.24	31.86	177.10	69.75	10.69	80.44	158.80	26.34	185.14
40-60	131.25	59.92	191.17	78.79	14.57	93.36	132.83	27.99	160.81
20-40	156.37	118.12	274.48	76.28	27.84	104.12	175.17	38.68	213.84
0-20	187.94	138.50	326.44	91.57	59.49	151.05	196.19	141.15	337.34
Totals	620.80	348.39	969.19	316.39	112.59	428.98	662.99	234.15	897.14
Sample designation ----	2A			2B			2C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	81.30	70.40	151.70	190.74	64.58	255.32	67.24	29.92	97.16
40-60	53.25	55.11	108.36	108.21	38.18	146.39	54.82	20.88	75.71
20-40	61.93	98.60	160.53	108.14	64.01	172.15	63.36	53.96	117.33
0-20	84.75	257.62	342.37	147.04	120.92	267.95	62.93	68.03	130.96
Totals	281.23	481.72	762.95	554.13	287.69	841.82	248.36	172.80	421.16
Sample designation ----	3A			3B			3C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	52.60	4.59	57.19	133.33	35.38	168.71	153.06	40.40	193.46
40-60	46.07	13.28	59.35	96.30	43.06	139.36	118.12	47.51	165.62
20-40	43.06	41.19	84.25	109.29	57.84	167.13	108.43	70.61	179.04
0-20	51.60	135.34	186.93	149.83	140.29	290.13	137.28	183.49	320.77
Totals	193.32	194.40	387.72	488.76	276.56	765.32	516.89	342.01	858.90
Sample designation ----	4A			4B			4C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	159.45	39.97	199.42	53.68	16.29	69.97	185.07	67.02	252.09
40-60	131.82	43.70	175.52	50.73	5.45	56.19	142.87	58.05	200.93
20-40	146.18	65.59	211.76	46.14	9.11	55.26	199.92	75.92	275.85
0-20	343.08	110.94	454.03	82.81	59.78	142.59	235.01	111.73	346.74
Totals	780.53	260.20	1040.74	233.36	90.63	324.00	762.88	312.73	1075.61

Table 8b. Summary of sawgrass biomass in the flume, March, 1997

[Plants are 27 months old; layer in centimeters above sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²); SD = standard deviation; N = number of samples; dead includes all dead material.]

Layer	Average live biomass	SD	N	Average dead biomass	SD	Average total biomass	SD
60-90	120.86	52.18	12	36.45	21.66	157.31	67.54
40-60	95.42	37.02	12	35.64	18.76	131.06	50.99
20-40	107.86	52.16	12	60.12	29.78	167.98	69.78
0-20	147.50	84.01	12	127.27	55.52	274.78	100.92
Totals	471.64	211.64	12	259.49	108.92	731.13	269.78

Table 8c. Sawgrass biomass (live and dead culms and leaves and dead litter) in the flume, March, 1997
 [Plants are 27 months old; sample biomass in grams dry weight per square meter (gdw/m²); dead refers to dead standing leaves and culms; dead litter is tabulated separately.]

Sample biomass (gdw/m ²)										
Sample designation ----										
Layer	Dead culms	Live culms	1A			Dead culms	Live culms	1B		
			Dead leaves	Live leaves	Dead litter			Dead leaves	Live leaves	Dead litter
60-90		33.37	29.92	111.87	1.94		46.86	10.69	22.89	
40-60		67.67	44.85	63.58	15.07		25.40	14.57	53.39	
20-40	15.43	107.78	33.51	48.58	69.18		53.53	18.80	22.75	9.04
0-20	25.62	179.33	42.70	8.61	70.18		87.26	8.68	4.31	50.81
total	41.05	388.15	150.98	232.65	156.37		213.06	52.74	103.33	59.85
Sample designation ----										
Layer	Dead culms	Live culms	1C			Dead culms	Live culms	2A		
			Dead leaves	Live leaves	Dead litter			Dead leaves	Live leaves	Dead litter
60-90		44.56	26.34	114.24		17.15	70.40	64.15		
40-60		43.13	27.99	89.70		25.04	50.81	28.20		4.31
20-40	8.25	94.22	16.07	80.95	14.35	14.42	48.37	21.17	13.56	63.01
0-20	33.37	156.15	18.94	40.04	88.84	45.42	76.21	74.70	8.54	137.49
total	41.62	338.06	89.34	324.93	103.19	59.85	166.77	217.07	114.46	204.80
Sample designation ----										
Layer	Dead culms	Live culms	2B			Dead culms	Live culms	2C		
			Dead leaves	Live leaves	Dead litter			Dead leaves	Live leaves	Dead litter
60-90		42.19	64.58	148.54		17.51	29.92	49.73		
40-60		41.05	38.18	67.17		21.60	20.88	33.22		
20-40		90.70	64.01	17.44		4.02	45.14	25.47	18.23	24.47
0-20		147.04	60.57	0.00	60.35	11.19	57.12	18.30	5.81	38.54
total		320.99	227.34	233.15	60.35	15.21	141.37	94.58	106.99	63.01
Sample designation ----										
Layer	Dead culms	Live culms	3A			Dead culms	Live culms	3B		
			Dead leaves	Live leaves	Dead litter			Dead leaves	Live leaves	Dead litter
60-90		6.31	4.59	46.29		21.89	35.38	111.44		
40-60		8.68	13.28	37.39		28.27	43.06	68.03		
20-40		22.82	27.91	20.24	13.28	5.60	69.75	41.05	39.54	11.19
0-20	10.12	42.05	34.37	9.54	90.85	22.32	147.11	59.99	2.73	57.98
total	10.12	79.87	80.16	113.45	104.12	27.91	267.02	179.47	221.74	69.18
Sample designation ----										
Layer	Dead culms	Live culms	3C			Dead culms	Live culms	4A		
			Dead leaves	Live leaves	Dead litter			Dead leaves	Live leaves	Dead litter
60-90		22.96	40.40	130.10		48.08	39.97	111.37		
40-60		27.99	47.51	90.13		54.75	43.70	77.07		
20-40	13.42	69.75	35.02	38.68	22.17	4.45	87.62	52.46	58.56	8.68
0-20	53.75	115.32	58.34	21.96	71.40		320.12	27.63	22.96	83.31
total	67.17	236.02	181.27	280.87	93.58	4.45	510.57	163.76	269.96	92.00

Table 8c. Sawgrass biomass (live and dead culms and leaves and dead litter) in the flume, March, 1997, continued

[Plants are 27 months old; sample biomass in grams dry weight per square meter (gdw/m²); dead refers to dead standing leaves and culms; dead litter is tabulated separately.]

Sample designation ----	Sample biomass (gdw/m ²)										
	Layer	Dead culms	4B			Dead litter	Dead culms	4C			Dead litter
			Live culms	Dead leaves	Live leaves			Live culms	Dead leaves	Live leaves	
60-90		6.96	16.29	46.72			55.97	67.02	129.10		
40-60		12.41	5.45	38.32			59.13	52.46	83.74	5.60	
20-40		19.66	9.11	26.48			145.96	55.26	53.96	20.67	
0-20		79.37	17.01	3.44	42.77	28.13	223.17	18.23	11.84	65.37	
total		118.40	47.86	114.96	42.77	28.13	484.24	192.96	278.64	91.64	

Table 8d. Summary of biomass (live and dead culms and leaves and dead litter) in the flume, March 1997

[Plants are 27 months old; biomass in grams dry weight per square meter (gdw/m²); SD = standard deviation, N = number of samples.]

Layer	Mean dead culms	SD	Mean live culms	SD	Mean dead leaves	SD	Mean live leaves	SD	Mean dead litter	SD	N
60-90			30.32	17.02	36.29	21.70	90.54	41.69	0.16	0.56	12
40-60			34.59	18.61	33.56	16.36	60.83	22.40	2.08	4.52	12
20-40	5.47	6.05	71.28	36.46	33.32	17.01	36.58	20.68	21.34	22.31	12
0-20	19.16	18.67	135.85	79.01	36.62	21.98	11.65	11.42	71.49	26.72	12
total	24.63	23.66	272.04	140.02	139.79	63.70	199.59	83.06	95.07	45.58	12

Table 8e. Descriptive information on flume vegetation, March, 1997

[Plants are 27 months old; dead leaves and culms were erect and standing; dead litter was not counted; layer in centimeters above the sediment/water interface; average width in millimeters.]

LIVE	Large leaves		Medium leaves		Small leaves		Large culms		Small culms	
	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # culms/m ²	Average width	Average # culms/m ²	Average width
60-90	28.7	11.4	139.3	7.3	58.0	4.2	7.8	12.7	19.1	6.5
40-60	39.5	12.4	100.5	7.8	45.5	4.0	16.7	13.7	11.4	7.4
20-40	36.5	13.2	57.4	8.1	9.6	4.0	26.9	17.4	10.2	6.5
0-20	26.9	14.9	2.4	8.2	2.4	4.8	32.3	24.7	5.4	6.4
DEAD	Large leaves		Medium leaves		Small leaves		Large culms		Small culms	
	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # leaves/m ²	Average width	Average # culms/m ²	Average width	Average # culms/m ²	Average width
60-90	2.4	11.3	73.0	7.1	49.0	4.1				
40-60	3.0	11.3	101.7	6.9	53.8	4.3				
20-40	23.3	12.5	104.1	7.4	35.9	4.2	1.8	12.0	7.2	6.9
0-20	38.3	14.5	81.9	7.3	22.7	4.2	9.0	15.5	7.8	8.1

Table 8f. Summary of leaves and culms in the flume, March, 1997

[Plants are 27 months old; dead leaves and culms were erect and standing; dead litter was not counted; layer in centimeters above the sediment/water interface; SD = standard deviation; N = number of samples.]

LIVE Layer	Total leaves/m ²	SD	N	Total culms/m ²	SD
60-90	226.0	89.86	12	26.9	10.65
40-60	185.4	71.49	12	28.1	12.41
20-40	103.5	50.69	12	37.1	19.07
0-20	31.7	26.58	12	37.7	17.34
DEAD Layer	Total leaves/m ²	SD	N	Total culms/m ²	SD
60-90	124.4	70.60	12		
40-60	158.5	114.02	12		
20-40	163.3	72.35	12	9.0	9.24
0-20	142.9	83.93	12	16.7	15.70

Table 8g. Leaf area index by layer for the flume, March, 1997

[Leaf area index is calculated for live leaves and culms plus dead standing leaves and culms; layer in centimeters above the sediment-water interface; see text for formulas.]

Layer	Leaf Area Index	Corrected Leaf Area Index
60-90	0.771	0.772
40-60	0.560	0.572
20-40	0.577	0.691
0-20	0.577	0.857
Total	2.485	2.892

Table 9a. Sawgrass biomass in the flume, layers 0-20 through 60-90 centimeters, June, 1997
 [Plants are 30 months old; layer in centimeters above the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²).]

Sample biomass (gdw/m ²)									
Sample designation ----	1A			1B			1C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	117.11	20.88	137.99	37.39	4.95	42.34	80.16	77.43	157.58
40-60	77.07	55.69	132.76	30.71	7.25	37.96	60.42	65.30	125.72
20-40	91.21	84.10	175.31	19.09	23.47	42.55	64.37	88.91	153.28
0-20	108.21	168.85	277.07	35.38	90.92	126.30	88.55	216.36	304.91
Total	393.60	329.52	723.13	122.57	126.58	249.15	293.50	448.00	741.50
Sample designation ----	2A			2B			2C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	105.06	24.83	129.89	72.33	8.32	80.66	264.08	63.44	327.51
40-60	77.93	56.83	134.77	46.86	56.62	103.48	199.42	125.22	324.64
20-40	98.96	107.78	206.74	35.38	106.20	141.58	176.53	110.94	287.47
0-20	177.61	169.35	346.96	76.21	160.02	236.23	382.55	155.65	538.20
Total	459.55	358.80	818.35	230.78	331.17	561.95	1022.58	455.25	1477.83
Sample designation ----	3A			3B			3C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	140.15	13.56	153.71	75.42	4.09	79.51	42.19	0.00	42.19
40-60	94.87	35.23	130.10	44.20	12.06	56.26	69.32	10.26	79.58
20-40	89.63	50.38	140.00	52.82	15.79	68.60	34.01	22.39	56.40
0-20	133.76	151.20	284.96	53.03	106.92	159.95	40.47	120.13	160.60
Total	458.40	250.37	708.77	225.47	138.86	364.33	186.00	152.78	338.78
Sample designation ----	4A			4B			4C		
Layer	Live	Dead	Total	Live	Dead	Total	Live	Dead	Total
60-90	405.52	102.40	507.92	102.69	6.67	109.36	279.65	49.01	328.66
40-60	219.80	136.49	356.29	119.27	27.27	146.53	191.89	93.43	285.32
20-40	204.87	138.28	343.16	93.93	60.28	154.21	183.63	108.93	292.57
0-20	283.67	260.78	544.44	118.62	134.05	252.67	278.86	170.21	449.07
Total	1113.86	637.95	1751.81	434.51	228.27	662.78	934.03	421.59	1355.62

Table 9b. Summary of sawgrass biomass in the flume, layers 0-20 through 60-90 centimeters, June, 1997
 [Plants are 30 months old; layer in centimeters above the sediment/water interface; sample biomass in grams dry weight per square meter (gdw/m²).]

Layer	Average live biomass	SD	N	Average dead biomass	SD	Average total biomass	SD
60-90	143.48	113.14	12	31.30	33.77	174.78	141.24
40-60	102.65	65.54	12	56.80	43.07	159.45	104.57
20-40	95.37	62.08	12	76.45	41.01	171.82	96.20
0-20	148.08	111.20	12	158.70	46.25	306.78	140.35
Total	489.57	342.12	12	323.26	153.48	812.83	474.01

Table 9c. Sawgrass biomass (dead and live leaves and culms) in the flume, layers 0-20 through 60-90 centimeters, June, 1997

[Plants are 30 months old; sample biomass in grams dry weight per square meter (gdw/m²); dead refers to dead standing leaves and culms; dead litter is tabulated separately.]

Sample designation ----		Sample biomass (gdw/m ²)								
Layer	Live leaves	Dead leaves	1A			Dead	1B			Dead
			Live culms	Dead culms	Dead		Live leaves	Dead leaves	Live culms	
60-90	94.51	20.88	22.60			33.44	3.95	3.95		1.00
40-60	39.11	28.49	37.96		27.20	23.25	7.25	7.46		
20-40	16.07	33.01	75.13	4.45	46.64	0.00	11.19	19.09		12.27
0-20	3.80	11.63	104.41	29.42	127.80	2.08	8.61	33.30	36.17	46.14
Total	153.49	94.01	240.11	33.87	201.65	58.77	31.00	63.79	36.17	59.42
Sample designation ----		Sample biomass (gdw/m ²)								
Layer	Live leaves	Dead leaves	1C			Dead	2A			Dead
			Live culms	Dead culms	Dead		Live leaves	Dead leaves	Live culms	
60-90	71.83	34.88	8.32		42.55	95.23	5.67	9.83		19.16
40-60	45.28	52.89	15.14		12.41	55.54	20.38	22.39		36.45
20-40	4.81	66.02	59.56	6.75	16.15	21.10	38.25	77.86	3.23	66.31
0-20		25.47	88.55	13.28	177.61		9.83	177.61	19.16	140.36
Total	121.92	179.26	171.58	20.02	248.72	171.87	74.13	287.69	22.39	262.28
Sample designation ----		Sample biomass (gdw/m ²)								
Layer	Live leaves	Dead leaves	2B			Dead	2C			Dead
			Live culms	Dead culms	Dead		Live leaves	Dead leaves	Live culms	
60-90	68.89	8.32	3.44			216.28	55.97	47.79		7.46
40-60	33.22	55.04	13.63		1.58	119.48	60.06	79.94		65.16
20-40	5.53	48.58	29.85		57.62	19.16	61.07	157.37	4.95	44.92
0-20		33.51	76.21	22.82	103.69	0.00	24.61	382.55	16.00	115.03
Total	107.64	145.46	123.14	22.82	162.90	354.92	201.72	667.66	20.95	232.57
Sample designation ----		Sample biomass (gdw/m ²)								
Layer	Live leaves	Dead leaves	3A			Dead	3B			Dead
			Live culms	Dead culms	Dead		Live leaves	Dead leaves	Live culms	
60-90	123.00	13.56	17.15			67.96	4.09	7.46		
40-60	69.39	32.22	25.47		3.01	37.32	10.26	6.89		1.79
20-40	4.81	45.35	84.82		5.02	10.05	15.14	42.77		0.65
0-20	1.00	16.58	132.76	1.22	133.40		22.75	53.03	3.01	81.16
Total	198.20	107.71	260.20	1.22	141.44	115.32	52.24	110.15	3.01	83.60
Sample designation ----		Sample biomass (gdw/m ²)								
Layer	Live leaves	Dead leaves	3C			Dead	4A			Dead
			Live culms	Dead culms	Dead		Live leaves	Dead leaves	Live culms	
60-90	39.32		2.87			339.28	93.07	66.23		9.33
40-60	62.07	10.26	7.25			128.31	119.34	91.49		17.15
20-40	10.98	15.36	23.03		7.03	6.31	123.79	198.56	2.51	11.98
0-20		8.47	40.47	12.92	98.74		34.80	283.67	3.88	222.10
Total	112.38	34.09	73.63	12.92	105.77	473.90	371.00	639.96	6.39	260.56

Table 9d. Sawgrass biomass (dead and live leaves and culms) in the flume, layers 0-20 through 60-90 centimeters, June, 1997, continued

[Plants are 30 months old; sample biomass in grams dry weight per square meter (gdw/m²); dead refers to dead standing leaves and culms; dead litter is tabulated separately.]

Sample designation ----	Sample biomass (gdw/m ²)										
	Layer	Live leaves	Dead leaves	4B		Dead culms	Live leaves	Dead leaves	4C		Dead culms
				Live culms	Dead culms				Live culms	Dead culms	
60-90	93.72	4.02	8.97	0.00	2.66	223.75	49.01	55.90	0.00	0.00	
40-60	76.64	16.65	42.63	0.00	10.62	111.01	91.64	80.87	0.00	1.79	
20-40	13.63	36.17	80.30	4.81	19.30	26.12	77.50	157.51	4.23	27.20	
0-20	0.00	9.83	118.62	3.59	120.63	0.00	13.63	278.86	4.31	152.27	
Total	183.99	66.67	250.51	8.40	153.21	360.88	231.78	573.15	8.54	181.27	

Table 9e. Summary of biomass (live and dead leaves and culms and dead litter) in the flume, June, 1997

[Plants are 30 months old; biomass in grams dry weight per square meter (gdw/m²); SD = standard deviation; N = number of samples.]

Layer	Average live leaves	SD	Average dead leaves	SD	Average live culms	SD	Average dead culms	SD	Average dead litter	SD	N
60-90	122.27	91.28	24.45	28.62	21.21	22.44			6.85	12.67	12
40-60	66.72	35.53	42.04	35.25	35.93	31.32			14.76	19.72	12
20-40	11.55	7.84	47.62	31.73	83.82	58.15	2.58	2.48	26.26	22.11	12
0-20	0.57	1.20	18.31	9.62	147.50	111.53	13.81	11.39	126.58	45.35	12
Total	201.11	127.04	132.42	100.07	288.46	217.92	16.39	11.50	174.45	69.21	12

Table 9f. Descriptive information on flume vegetation, layers 0-20 through 60-90 centimeters, June, 1997

[Plants are 30 months old; dead leaves and culms were erect and standing; dead litter was not counted; layer in centimeters above sediment/water interface; average width in millimeters.]

LIVE Layer	Avg # of Lg. leaves/m ²	Average width	Avg # of Med. leaves/m ²	Average width	Avg # of Sm. leaves/m ²	Average width	Avg # of Lg. culms/m ²	Average width	Avg # of Sm. culms/m ²	Average width
60-90	26.9	11.3	218.3	7.2	38.3	3.3	1.2	13.5	32.9	5.3
40-60	31.1	13.8	125.0	7.5	35.3	4.0	11.4	13.2	29.9	5.8
20-40	19.5	13.8	10.2	7.3	9.0	2.9	30.5	14.5	15.0	7.4
0-20	0.6	11.0	0.6	6.0	0.6	5.0	40.7	20.7	9.0	6.4
DEAD Layer	Avg # of Lg. leaves/m ²	Average width	Avg # of Med. leaves/m ²	Average width	Avg # of Sm. leaves/m ²	Average width	Avg # of Lg. culms/m ²	Average width	Avg # of Sm. culms/m ²	Average width
60-90	1.2	12.0	65.8	6.5	17.3	3.8			0.00	
40-60	21.5	14.8	107.0	6.8	22.7	4.3			0.00	
20-40	61.0	16.1	102.3	7.7	12.0	4.3	0.6	15.0	4.78	7.67
0-20	37.7	14.9	20.9	6.9	7.8	3.7	7.2	15.0	6.58	8.54

Table 9g. Summary of leaves and culms in the flume, June, 1997

[Plants are 30 months old; dead leaves and culms were erect and standing; dead litter was not counted; layer in centimeters above the sediment/water interface; SD = standard deviation; N = number of samples.]

LIVE Layer	Total leaves/m ²	SD	N	Total culms/m ²	SD
60-90	283.5	154.77	12	34.1	21.45
40-60	191.4	75.59	12	41.3	24.12
20-40	38.7	22.4	12	45.4	23.77
0-20	1.8	3.25	12	49.6	28.45
DEAD Layer	Total leaves/m ²	SD	N	Total culms/m ²	SD
60-90	77.1	89.48	12		
40-60	139.3	130.02	12		
20-40	165.0	117.14	12	4.8	6.21
0-20	66.4	35.83	12	13.8	9.41

Table 9h. Leaf area index by layer for the flume, June, 1997

[Leaf area index is calculated for live leaves and culms plus dead standing leaves and culms; layer in centimeters above the sediment-water interface; see text for formulas.]

Layer	Leaf Area Index	Corrected Leaf Area Index
60-90	0.862	0.897
40-60	0.653	0.719
20-40	0.545	0.643
0-20	0.336	0.572
Total	2.395	2.831

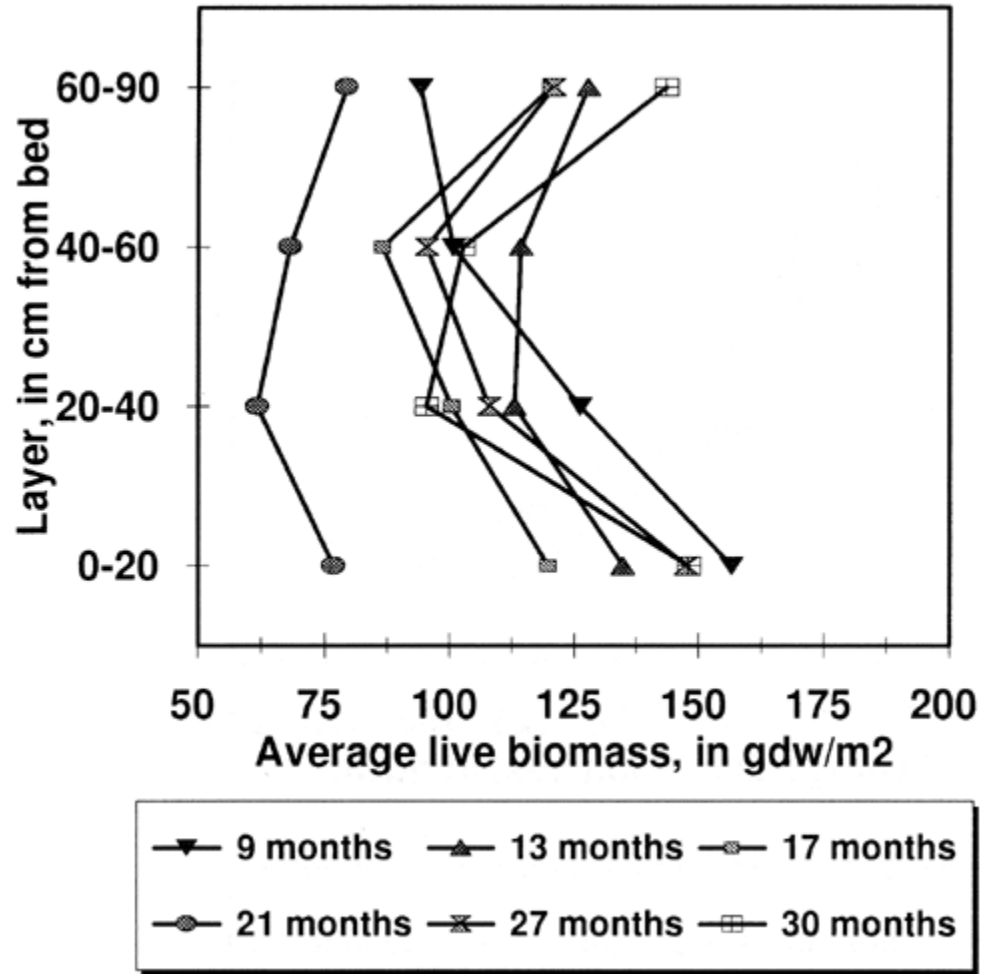


Figure 1. Average live biomass in the flume, 1995 - 97.

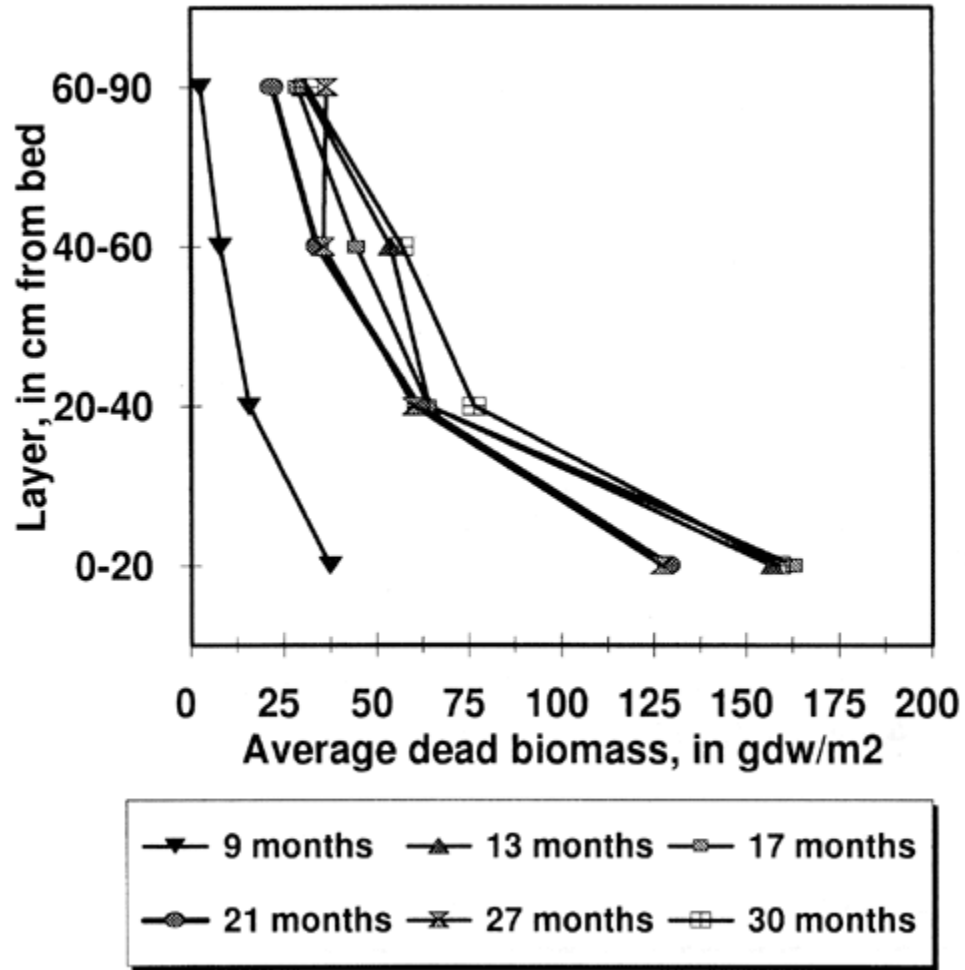


Figure 2. Average dead biomass in the flume, 1995 - 97.

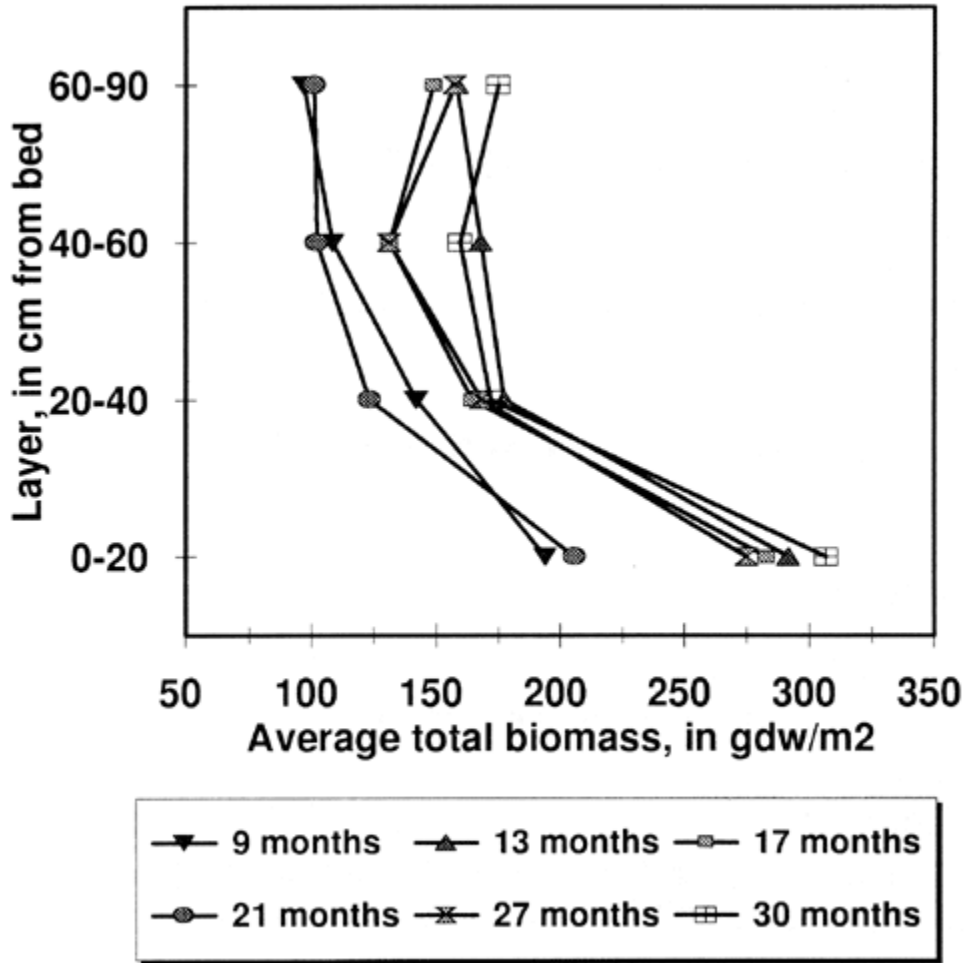


Figure 3. Average total biomass in the flume, 1995 - 97.

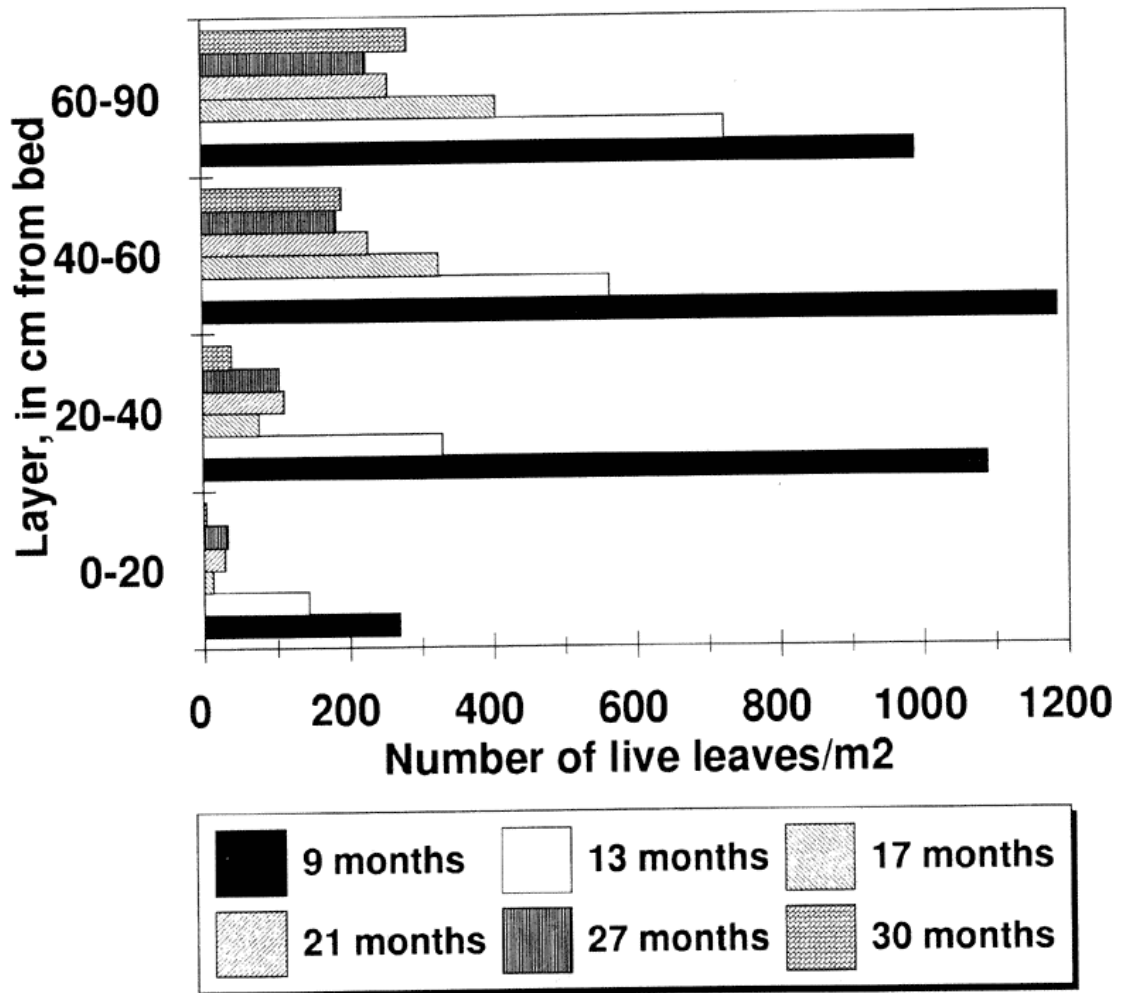


Figure 4. Number of live leaves in the flume, 1995 - 97.

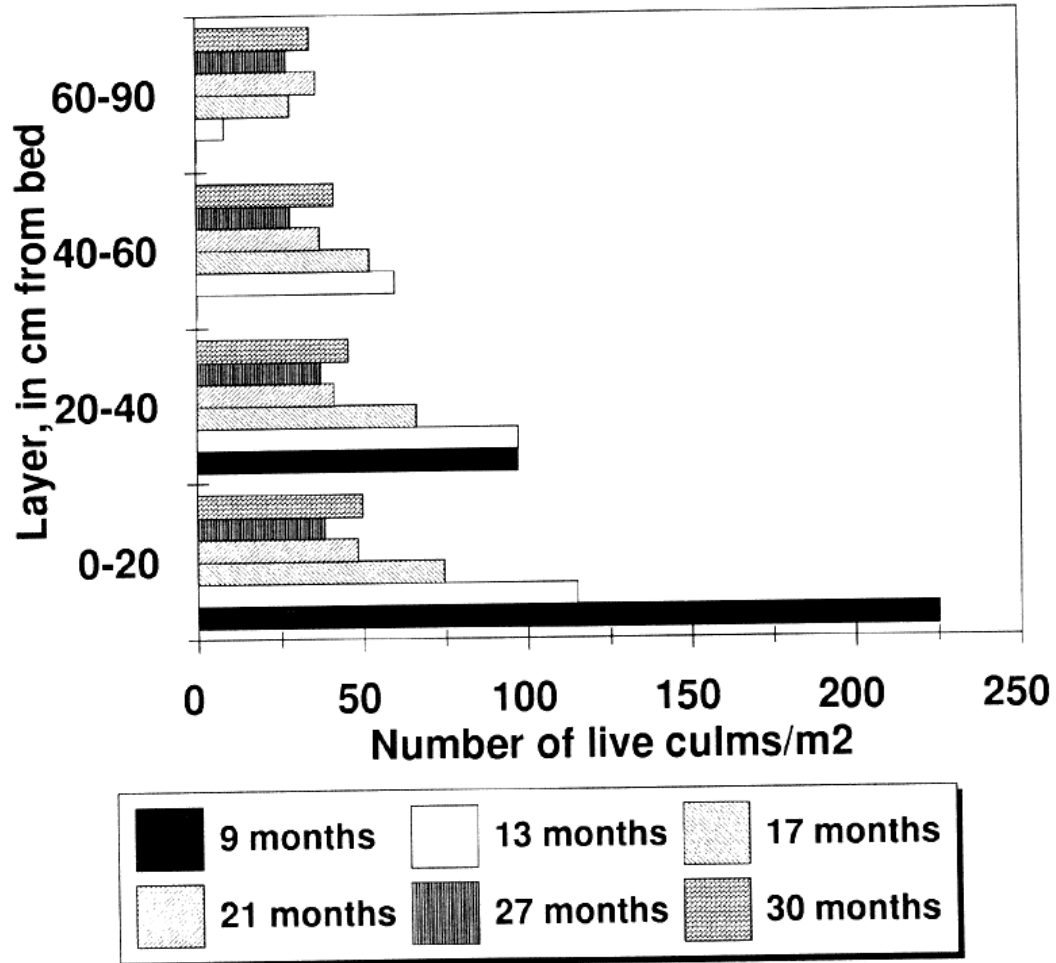


Figure 5. Number of live culms in the flume, 1995 - 97.