

Table 1. Monthly precipitation totals from the on-site rain gage and from the Dulles weather station and their differences.

Precipitation				
Month	On-Site Rain	Dulles Weather	Difference	Ratio
1996-97	Gage (cm)	Station (cm)	(cm)	
May 10-31	5.41	9.88	-4.47	0.5
June 1-18	16.26	12.40	3.86	1.3
July 4-31	14.94	14.66	0.28	1.0
August	12.19	4.14	8.05	2.9
September	20.04	19.61	0.43	1.0
October	14.58	10.08	4.50	1.4
Growing				
Season Total	83.41	70.76	12.65	1.2
November	8.03	9.53	-1.50	0.8
December	11.23	13.21	-1.98	0.9
January 1-15	1.14	1.47	-0.33	0.8
February 1-25	5.51	5.21	0.30	1.1
Total	109.32	99.54	9.78	1.1

Table 2. Stage and discharge data used to develop rating curves for inflow and outflow stream gages on Cockrell Branch.

Date	Stream Inflow		Stream Outflow	
	Stage (cm)	Discharge (L/s)	Stage (cm)	Discharge (L/s)
8-May-96	49.68	129.05	24.99	129.61
9-May-96	55.78	234.32	32.00	266.30
4-Jun-96	37.80	7.08	13.11	4.53
5-Jun-96	37.49	6.23	nd	nd
11-Jun-96	46.63	102.45	23.16	107.54
13-Jul-96	59.74	314.13	43.59	577.32
15-Jul-96	38.40	20.94	14.63	11.89
5-Aug-96	35.66	12.74	12.19	4.25
13-Aug-96	56.69	260.08	95.71	319.79
20-Aug-96	39.62	16.98	14.63	11.32
2-Oct-96	46.94	78.39	15.24	14.43
15-Oct-97	35.97	13.02	14.02	9.06
22-Nov-97	34.75	11.32	13.11	6.51
15-Jan-97	56.08	269.13	33.22	302.81

nd = no data

Table 3. Volume ($m^3 \times 1000$) of precipitation over Cockrell Branch and the corresponding watershed (W1). Stream inflow disaggregated into its surface runoff and baseflow components by the hydrograph separation technique.

Month (1996-97)	Precipitation	Stream Inflow	Estimated Runoff	Estimated Baseflow
May 10-31	235.97	159.00	97.52	61.48
June 1-18	458.64	nd	nd	nd
July 4-31	641.43	115.98	102.98	13.00
August	531.75	148.05	135.35	12.70
September	874.07	303.21	287.35	15.86
October	635.89	214.86	201.97	12.89
November	350.07	119.28	105.73	13.55
December	489.66	256.85	214.03	42.82
January 1-15	49.85	13.34	6.90	6.44
February 1-25	240.40	104.74	83.65	21.09

nd = no data

Table 4a. Percent differences between runoff estimated from stream gage data and by the SCS runoff method using fixed and variable antecedent moisture conditions.

Surface Runoff				
Precipitation	On-site	On-site	On-site	On-site
Month (1996-97)	Variable AMC	AMC III	AMC II	AMC I
May 10-31	100.00	75.58	99.57	100.00
July 4-31	80.26	-64.36	54.35	99.23
August	99.42	-18.28	71.83	99.44
September	37.37	-21.60	46.16	88.86
October	77.29	-48.85	27.81	81.61
November	91.30	-36.41	43.21	91.30
December	86.71	56.54	94.03	100.00
January 1-15	100.00	84.70	100.00	100.00
February 1-25	100.00	73.84	99.89	100.00
Total	72.90	2.87	64.92	94.66

Table 4b. Percent differences between the runoff estimated from stream gage data and by the SCS runoff method with AMC II using either the on-site or Dulles precipitation data.

SCS Runoff			
Precipitation	On-Site	Dulles	Difference
Month (1996-97)	AMC II (%)	AMC II (%)	in %
May 10-31	99.57	95.09	4.49
July 4-31	54.35	58.16	-3.81
August	71.83	92.61	-20.78
September	46.16	31.99	14.17
October	27.81	65.64	-37.83
November	43.21	35.52	7.69
December	94.03	85.01	9.02
January 1-15	100.00	100.00	0.00
February 1-25	99.89	97.01	2.88
Total	64.92	72.27	-7.35

Table 5a. On-site measured runoff and SCS runoff estimates using an AMC II group expressed as a depth of water over the wetland for the study period (1996-97).

Surface Runoff		
Month	On-Site Measured	SCS Runoff AMC II
1996-97	Runoff (cm)	(cm)
May 10-31	114.79	5.64
June 1-18	308.21	0.00
July 4-31	121.22	50.72
August	159.31	11.77
September	338.22	230.01
October	237.73	81.69
November	124.45	80.24
December	251.92	37.76
January 1-15	8.12	0.00
February 1-25	98.46	2.94
Total	1762.43	500.77

Table 5b. SCS runoff estimates using an AMC II group expressed as a depth of water over the wetland for a historical dry (1965) and wet (1979) rainfall period.

Surface Runoff		
Month	SCS Runoff AMC II	SCS Runoff AMC II
	1965 (cm)	1979 (cm)
January	5.93	46.93
February	31.15	60.24
March	25.97	47.68
April	4.09	18.71
May	0.26	27.60
June	0.06	34.75
July	13.39	0.14
August	32.43	22.39
September	13.78	329.05
October	32.30	276.37
November	18.71	0.72
December	18.71	18.71
Total	196.76	883

Table 6. Monthly evapotranspiration estimated by Thornthwaite's method and measured by the diurnal cycles in groundwater levels in the wetland and the differences and ratios between these values.

Evapotranspiration					
Month	Thornthwaite	Diurnal Cycles	Difference		
1996	cm / month	cm / month	n	cm	Ratio
May	7.88	12.16	1	4.28	1.5
June	13.78	10.73	10	-3.05	0.8
July	13.79	8.92	3	-4.87	0.6
August	12.35	12.77	10	0.42	1.0
September	9.41	11.69	3	2.27	1.2

n = number of days measured

Table 7. Well data collected at the Manassas wetland site (Rich Whittecar, Old Dominion University). All relative elevations and depths are in cm.

Well ID	Top of Casing Elevation	Ground Surface Elevation	Depth to Groundwater	Groundwater Elevation	Depth of Well (BLS)
VT106	0	-64	87	-87	161
AMRL01	-12	-71	143	-155	195
AMRL02	-13	-74	113	-126	94

Temporary benchmark established at well VT119 and assigned an elevation of 0 cm.

VT119	0	-35	64	-64	170
AMRL03	5	-36	71	-66	76
AMRL04	86	22	224	-138	192
AMRL05	93	35	95	-2	97

Temporary benchmark established at well VT106 and assigned an elevation of 0 cm.

BLS = Below Land Surface

Table 8a. Groundwater seepage (cm day^{-1}) calculated from measured hydraulic gradients using a hydraulic conductivity of $1 \times 10^{-6} \text{ cm s}^{-1}$.

Groundwater Flow		
hydraulic gradient	cm/d	cm/month
1.00	-0.086	-2.58
0.29	-0.025	-0.75
0.39	-0.034	-1.02
0.026	-0.002	-0.06
-0.035	0.003	0.09

Note: Negative value indicates loss.

Table 8b. Groundwater seepage calculated as the residual of the water budget for the Manassas wetland from on-site measurements during dry periods.

Groundwater Flow		
Month (1996)	cm/day	cm/month
July 4-7	-0.03302	-1.02362
August 1-5	0.00508	0.15748
Aug 29 - Sept 2	0.99568	29.8704
September 18-21	1.50622	45.1866
September 23-26	0.91186	27.3558

Table 9. Water budget components and potential storage for the Manassas wetland for May 1996 - February 1997.

Modified Pierce Water Budget Model - Depth (cm)					
Month (1996-97)	Precipitation	Runoff AMC II	Evapotranspiration	Groundwater	Potential Storage
May 10-31	9.88	5.64	-5.59	-1.89	8.04
June 1-18	3.61	0.00	-8.27	-1.55	-6.21
July 4-31	14.15	50.72	-12.46	-2.41	50.01
August	4.14	11.77	-12.34	-2.66	0.90
September	19.61	230.01	-9.42	-2.58	237.62
October	10.08	81.69	-4.93	-2.66	84.18
November	9.53	80.24	-0.94	-2.58	86.25
December	13.21	37.76	-0.94	-2.66	47.37
January 1-15	1.47	0.00	-0.01	-1.29	0.17
February 1-25	5.21	2.94	-1.02	-2.15	4.98

On-Site Measured Water Budget Model - Depth (cm)					
Month (1996-97)	Precipitation	Runoff	Evapotranspiration	Groundwater	Potential Storage
May 10-31	5.41	115.00	-8.63	-0.44	111.34
June 1-18	10.51	nd	-6.30	-0.36	---
July 4-31	4.71	121.00	-8.06	-0.56	117.09
August	12.19	159.00	-12.77	-0.62	157.80
September	20.04	338.00	-11.69	-0.62	345.73
October	14.58	238.00	-4.93	-0.62	247.03
November	8.03	124.00	-0.94	-0.62	130.47
December	11.23	252.00	-0.94	-0.62	261.67
January 1-15	1.14	8.00	-0.01	-0.30	8.83
February 1-25	5.51	98.00	-1.02	-0.50	101.99

nd = no data

Table 10. Modified Pierce water budget components for a historically wet (1979) and dry year (1965).

WET YEAR 1979						
Month	Precipitation (cm)	W1 Runoff (cm)	W2 Runoff (cm)	Evapotranspiration (cm)	Groundwater Outflow (cm)	Potential Storage (cm)
January	16.79	46.93	0.41	0.00	2.58	61.55
February	14.61	60.24	0.80	0.00	2.58	73.07
March	8.89	47.68	1.68	2.56	2.58	53.11
April	5.21	18.71	0.00	4.54	2.58	16.80
May	12.42	27.60	0.09	9.06	2.58	28.46
June	11.79	34.75	0.51	11.54	2.58	32.93
July	5.54	0.14	0.00	14.03	2.58	-10.94
August	15.37	22.39	0.07	13.21	2.58	22.04
September	19.25	329.05	24.79	9.13	2.58	361.39
October	21.97	276.37	21.58	4.48	2.58	312.87
November	6.73	0.72	0.00	2.85	2.58	2.02
December	2.24	18.71	0.00	0.91	2.58	17.46
Sum	140.79	883.31	49.92	72.30	30.96	970.76
DRY YEAR 1965						
Month	Precipitation (cm)	W1 Runoff (cm)	W2 Runoff (cm)	Evapotranspiration (cm)	Groundwater Outflow (cm)	Potential Storage (cm)
January	8.23	5.93	0.00	0.00	2.58	11.57
February	6.55	31.15	0.00	0.28	2.58	34.84
March	10.85	25.97	0.00	0.97	2.58	33.27
April	6.43	4.09	0.00	4.22	2.58	3.72
May	4.50	0.26	0.00	10.49	2.58	-8.32
June	4.45	0.06	0.00	12.34	2.58	-10.42
July	10.01	13.39	0.00	14.33	2.58	6.49
August	9.53	32.43	0.57	13.36	2.58	26.58
September	5.79	13.78	0.04	10.39	2.58	6.64
October	4.75	32.30	0.77	4.27	2.58	30.97
November	1.17	18.71	0.00	1.88	2.58	15.42
December	1.07	18.71	0.00	0.79	2.58	16.41
Sum	73.30	196.76	1.37	73.30	30.96	167.18

Table 11. On-site measured water budget expressed as depth of water over the wetland (cm) for the 10 month study period. Note: Surface water inflows consist of total stream inflow and additional runoff from surrounding watersheds (W2).

Water Budget - Depth (cm)							
Month	Precipitation	Surface Water Inflows	Evapo-transpiration	Groundwater Outflow	Change in Storage	Residual Surface Water Outflow	Gaged Surface Water Outflow
May 10-31	5.41	187.47	-8.63	-0.44	0.73	-184.53	-150.85
June 1-18	10.51	280.69	-6.30	-0.36	0.22	-284.77	-284.77
July 4-31	4.71	137.64	-8.06	-0.56	1.56	-135.28	-127.09
August	12.19	175.14	-12.77	-0.62	-2.33	-171.61	-391.91
September	20.04	360.39	-11.69	-0.62	0.31	-368.44	-1883.32
October	14.58	256.60	-4.93	-0.62	-0.13	-265.50	-1380.32
November	8.03	141.45	-0.93	-0.62	0.29	-148.21	-280.15
December	11.23	302.95	-0.94	-0.62	119.80	-432.41	-966.67
January 1-15	1.14	15.58	-0.02	-0.30	-120.06	103.66	-47.74
February 1-25	5.51	122.88	-1.18	-0.50	-48.29	-78.43	-87.78
Total	93	1,981	-55	-5	-48	-1,966	-5,601