SOUTH FLORIDA RESEARCH CENTER

Report T-612

Hydrologic Impacts of L-31(W) on Taylor Slough, Everglades National Park

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INTRODUCTION

Taylor Slough is the second largest natural drainage system in Everglades National Park (Figure 1). The slough arises in a poorly defined headwaters region outside the park boundary in the vicinity of Chekika State Recreation Area. It flows southward, establishing definitive boundaries near its entrance at Everglades National Park, approximately two miles north of park headquarters. Surface waters continue to flow southward until they merge with the estuarine areas and contribute directly into Florida Bay.

Taylor Slough, an important source of fresh water for the park, is largely dependent upon the contributions from rainfall and overland sheet flow for its hydrologic inputs. Data concerning rainfall, discharge, stage and water quality in Taylor Slough have been monitored continuously since October, 1960, as a cooperative effort between the National Park Service and the U.S. Geological Survey.

In September, 1968, the U.S. Army Corps of Engineers began construction of Levee/Canal 31(W) near the eastern edge of the slough and adjacent to the boundary of Everglades National Park. The purpose of this levee was "to prevent flooding from Everglades National Park into agricultural and industrial areas to the east," while the purpose of the canal was to: "Convey flow to replenish the freshwater supply in the Taylor Slough area of the park" (U.S. Army Corps of Engineers, 1967). This construction has severed Taylor Slough from a portion of its natural drainage area, impacted hydroperiods and rerouted surface runoff into the L-31(W) canal causing significant changes in the hydrological regime of Taylor Slough.

Early studies by the USGS (Earle and Hartwell, 1973) documented hydrologic conditions in Taylor Slough from October, 1960 through September, 1968, prior to canal construction. The study contained herein compares current hydrologic conditions to those of the past to determine the impacts of L-31(W) on Taylor Slough's hydrologic regime utilizing stage and discharge data, and provides a basis for comparison of future planned water management practices.

Rainfall

Precipitation inputs into the hydrologic regime serves as a significant factor in the generation of overland sheet flow in south Florida. Rainfall amounts have been monitored on a daily basis in Taylor Slough and vicinity at two long-term NOAA climatological weather stations. The Royal Palm station with a continuous rainfall record since May 1949 is located within Everglades National Park and Taylor Slough proper. The Homestead Experiment Station, operative since January 1940, is representative of rainfall totals north and east of the park boundary and Taylor Slough.

Precipitation trends at Royal Palm and the Homestead Experiment Station from 1960 through 1978 reflected similar patterns. Both stations deviated from their yearly means in accordance with general precipitation trends for the Taylor Slough locale (Figure 2). Relatively dry years were reported during 1961, 1965, 1970, 1971, and 1974. Conversely, wet years were experienced in 1960, 1968, 1969 and 1978.

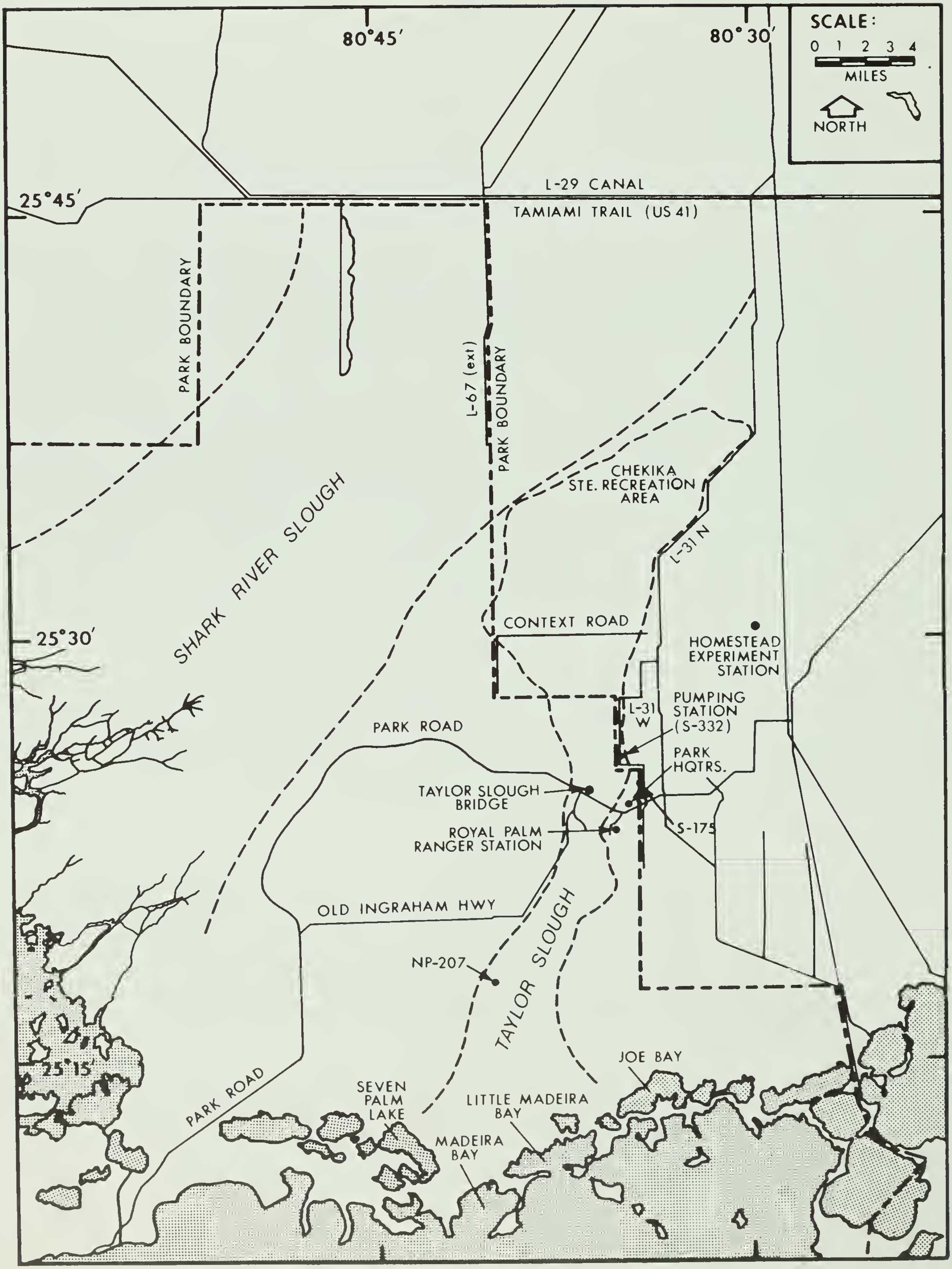


Figure 1. Map of Taylor Slough, Everglades National Park.

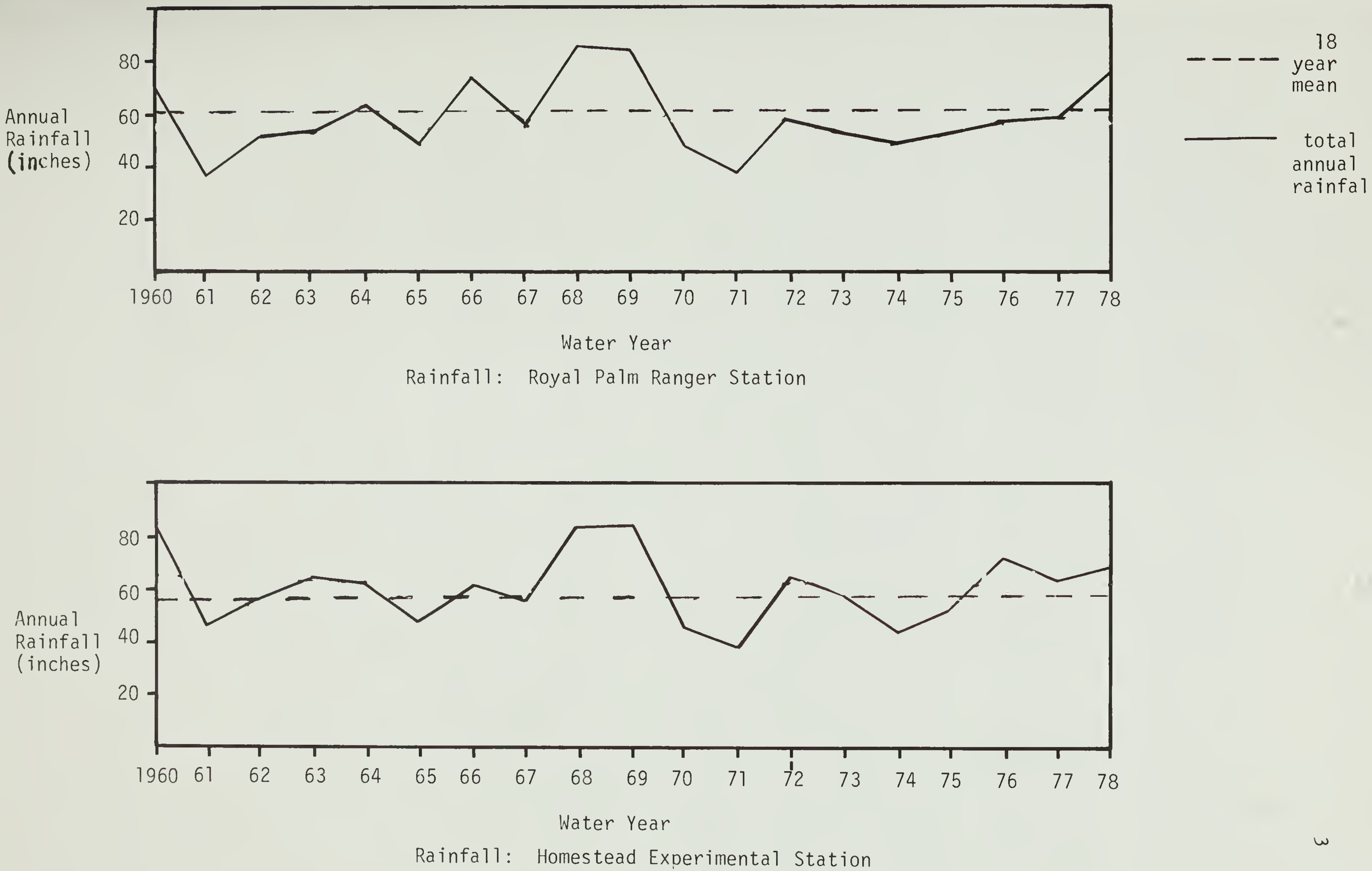


Figure 2: Annual rainfall at Royal Palm Ranger Station and the Homestead Experimental Station (Water Years 1960-1968)

The mean annual rainfall inputs monitored at Royal Palm for water years 1969 through 1978 and water years 1960 through 1968 indicate a relatively constant rainfall contribution to Taylor Slough throughout both periods of time (Appendix I). The annual mean rainfall for water years 1960 through 1968 totalled 59.06 inches (150 cm) compared to 56.96 inches (145 cm) during water years 1969 through 1978.

Likewise, the mean annual rainfall contributions monitored at the Homestead Experiment Station for water years 1969 through 1978 and water years 1960 through 1968 were similar (Appendix I). The mean annual total for water years 1960 through 1968 was 62.69 inches (159 cm) compared to 59.29 inches (151 cm) for water years 1969 through 1978. The differences in means deviate by 2.40 inches (6.1 cm) for the two time periods.

Double mass curves were generated for rainfall totals monitored at each climatological station. These curves show accumulated rainfall from 1960 through 1978 at Royal Palm versus associated accumulated rainfall totals from 1960 through 1978 for the Homestead Experiment Station (Figure 3). Linear regressions were employed to calculate the equation of best fit. The regression generated a high positive correlation coefficient ($r = 0.999$) which indicates little change in spatial relationships between rainfall contributions monitored at Royal Palm and the Homestead Experiment Station between the years 1960 through 1978.

Double mass curves were also developed for each monitoring station during the two time periods, 1960-1968 and 1969-1978. The rainfall monitored at Royal Palm and Homestead Experiment Station was accumulated for each time period at each station and the totals were related to corresponding time periods.

Linear regressions were generated to determine if there was a change in the relationship between the rainfall contributions 1960-1968 vs. 1969-1977 at each station (Figure 4). The double mass curves for both Royal Palm and Homestead Experiment Station indicate the rainfall contributions for the period of time 1960-1968 were similar to rainfall contributions from 1969-1978 at each station.

The regression analysis showed a high positive correlation coefficient for both Royal Palm and Homestead Experiment Station ($r = 0.998$ and $r = 0.999$ respectively) supporting previous observations that similar rainfall contributions occurred in Taylor Slough between the years 1960-1978.

Discharge

The flow of water through Taylor Slough has traditionally been quantified by calculating discharge through 23 outlets located along the main park road, which intersects Taylor Slough near the eastern boundary of Everglades National Park (Figure 5). Discharge measurements at these outlets were obtained as a cooperative effort with the U.S. Geological Survey. Discharge values have been compiled into a rating curve, so that the total flow through the outlets can be calculated from water level, recorded continuously at the Taylor Slough Bridge (USGS Station 02290800). The outlets along the main park road are numbered consecutively in a westward direction from the eastern boundary of Everglades National Park. They consist of 17 round pipe culverts 2 feet (0.61 m) in diameter (outlets 1-16 and

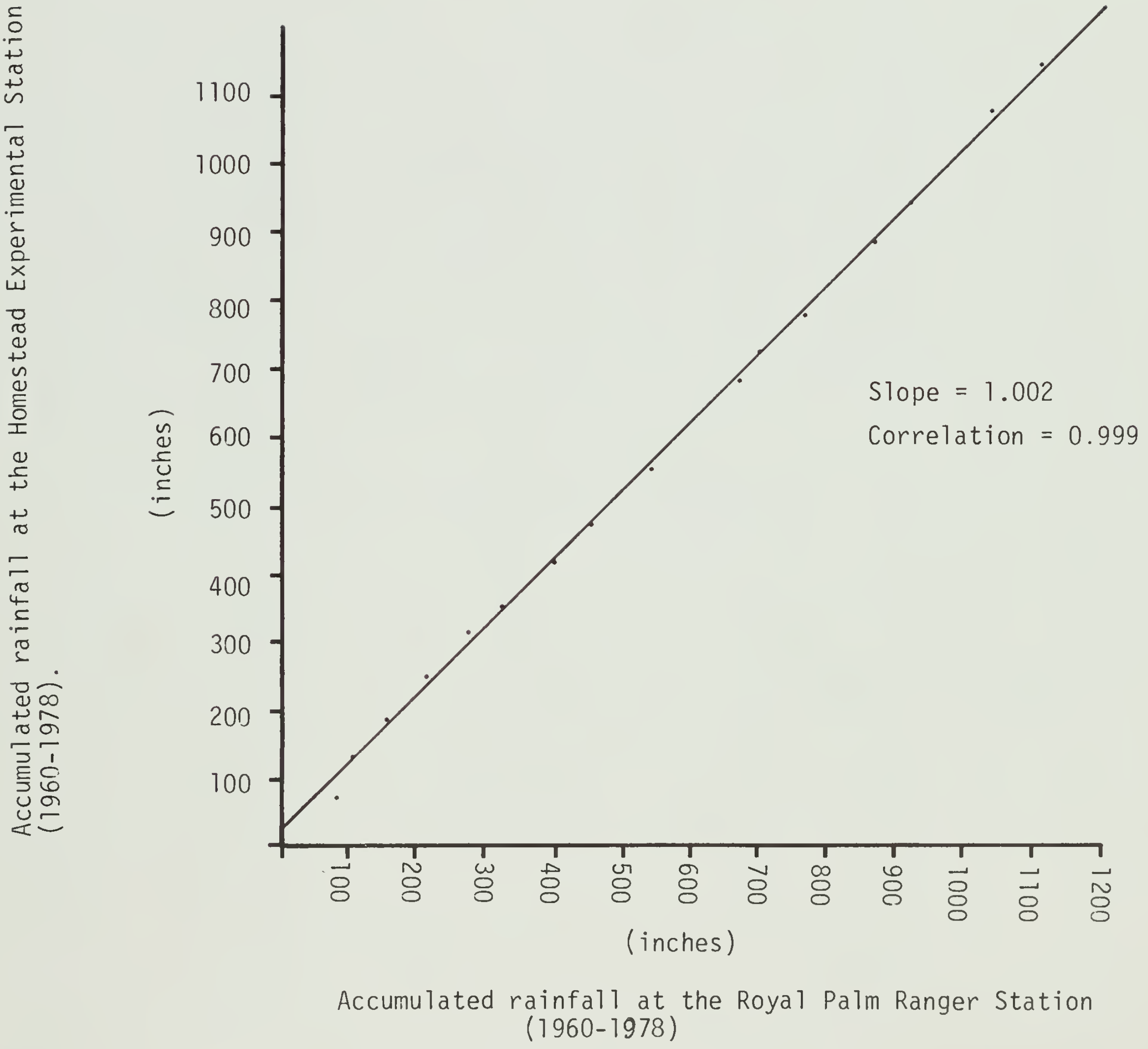


Figure 3: Relationship between total accumulated rainfall at the Royal Palm Ranger Station and Homestead Experimental Station, 1960-1978.

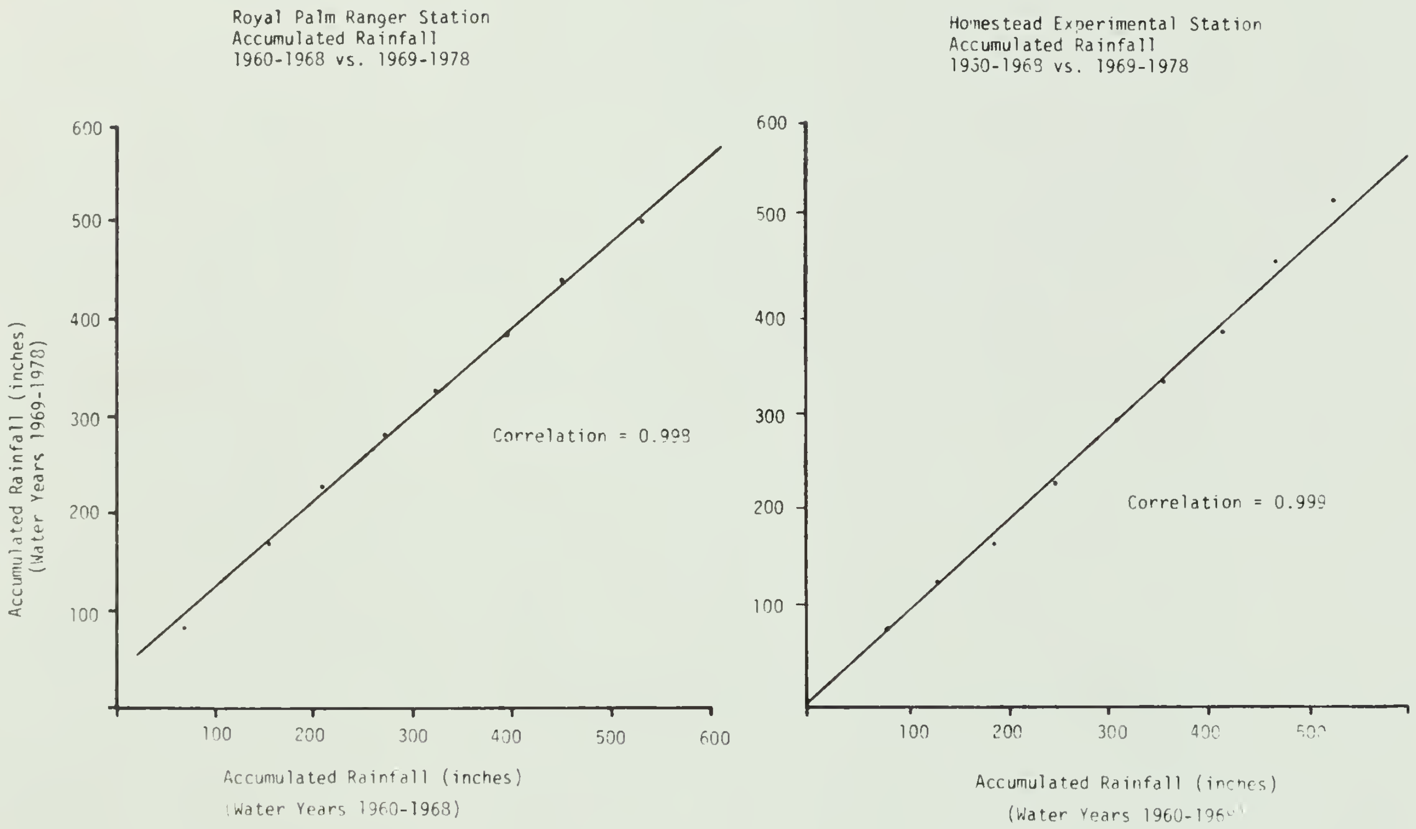


Figure 4: Accumulated rainfall 1960-1968 vs. 1969-1978 at Royal Palm Ranger Station and Homestead Experimental Station.

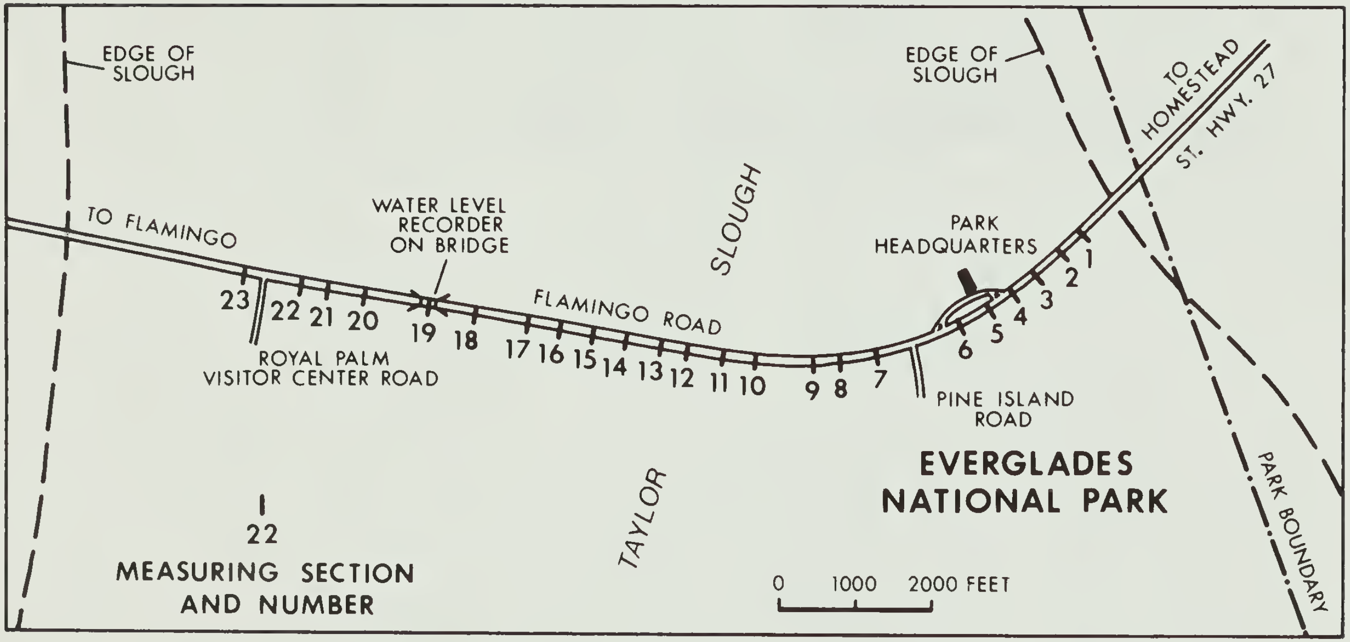


Figure 5. Map of the Taylor Slough flow section along the main park road, Everglades National Park.

outlet 23), 3 round pipe culverts with a diameter of 3 feet (0.91 m) (outlets 17, 21 and 22), 2 concrete box culverts measuring 8 feet by 4 feet (2.4 m by 1.2 m) (outlets 18 and 20) and a bridge with a length of 100 feet (30.5 m) (outlet 19).

Earle and Hartwell (1973) reported that flow through the outlets could be grouped into six different flow classes (Figure 6). In each class, the greatest flow occurred at the Taylor Slough Bridge. However, as total flow through the openings increased, the percentage of total flow occurring at the Taylor Slough Bridge decreased. When total flow through the culverts was less than 100 cfs (28.4 m^3/sec), outlets 17-22 accounted for 98.5 percent of the flow (Earle and Hartwell, 1973). When the total flow was in excess of 400 cfs (113.5 m^3/s), only 73 percent of the total flow occurred through these same outlets (Earle and Hartwell, 1973).

Changes in mean annual discharge have occurred in Taylor Slough since the construction of L-31(W) along the eastern boundary of the slough. Before construction (October 1960 through September 1968), the mean annual discharge across the main park road was 47.4 cfs (13.5 m^3/s) (Appendix II, Figure 7) (Hartwell, 1973). However, in the period after construction (October 1968 through September 1978), the mean annual discharge has decreased almost 40 percent to 28.5 cfs (8.1 m^3/s). This represents an annual discharge which is below the 18 year mean for 7 of the last 9 years (Figure 8).

An analysis of discharge duration curves as presented in Figure 9, also indicates that alterations in flow have occurred since construction commenced. From this curve it can be determined that during 5, 10, 20 and 30 percent of the time flow at Taylor Slough Bridge equalled or exceeded 250, 165, 80, 40 cfs, respectively, prior to construction, compared to only 150, 100, 40 and 20 cfs, respectively, after canal/levee installation.

The number of no flow days experienced each year can be used as an indicator of the severity of drawdown of the local water table. Since the construction of L-31(W), both the number of no flow days and their seasonal distribution has been affected (Figures 8 and 10). The number of no flow days during a given water year has been increased from a pre-construction annual mean of 167 days to a post-construction annual mean of 191 days. The 18 year mean for the number of no flow days was exceeded in only 3 of the 8 years prior to construction. However, the annual mean of no flow days was exceeded in 6 of the 10 years following construction. In addition, the number of no flow days has been affected seasonally. An increase in no flow days was recorded from November through March, and in June, during the post-construction period indicating that the presence of L-31(W) has decreased the hydroperiod in many areas of Taylor Slough.

Figure 11 demonstrates the correlation between discharge and rainfall in Taylor Slough. As noted earlier, the mean annual rainfall did not vary significantly between pre-construction and post-construction periods. However, a distinct change in slope of the accumulated discharge vs. accumulated rainfall curve is seen to occur after 1968. This indicates that since the construction of L-31(W), some of the water previously entering Taylor Slough has been diverted. Therefore, for the same rainfall inputs less surface flow was recorded after L-31 was constructed.

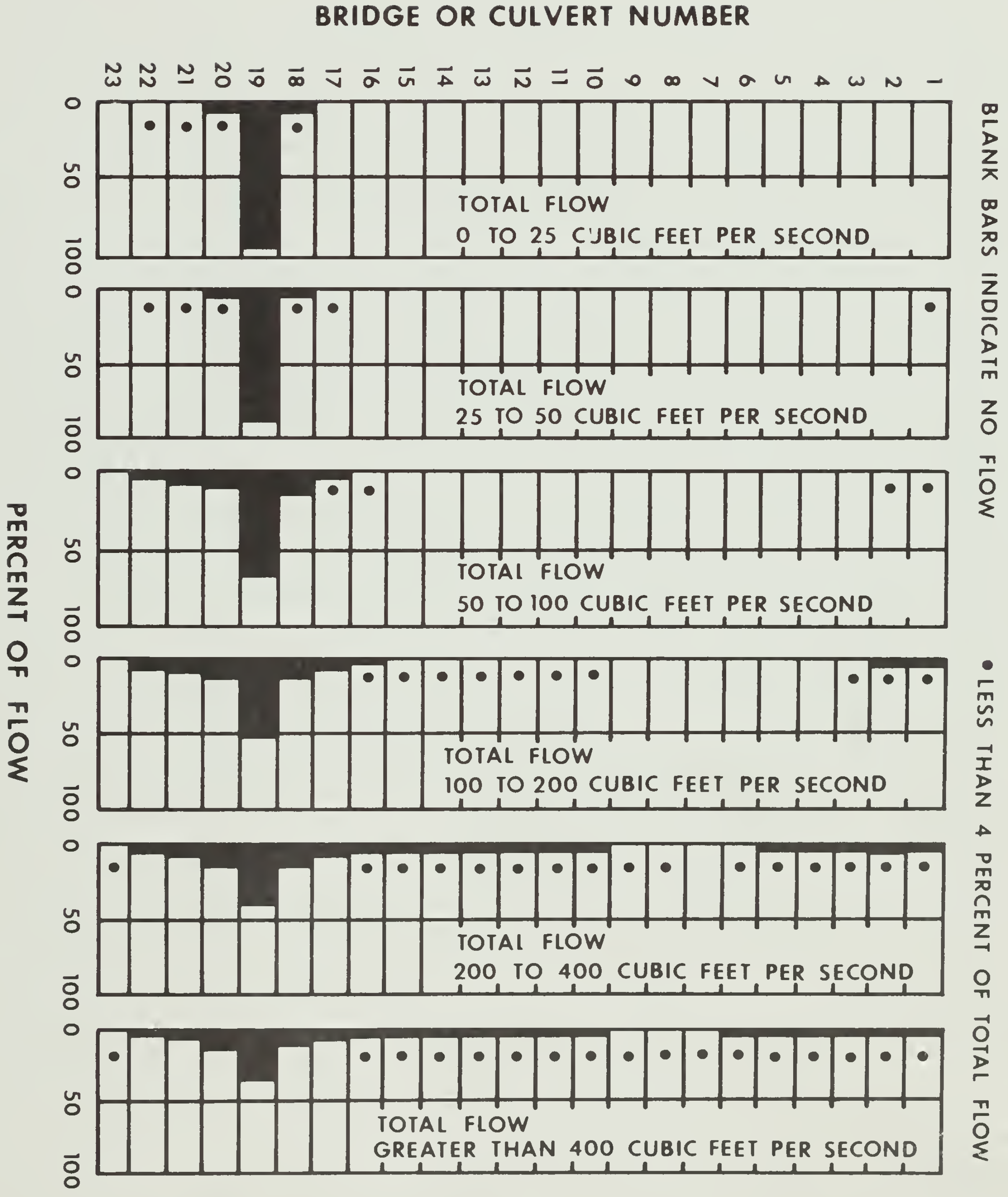


Figure 6. Graph showing percent of total flow through each opening for Taylor Slough (1960-1968) Hartwell, 1973.

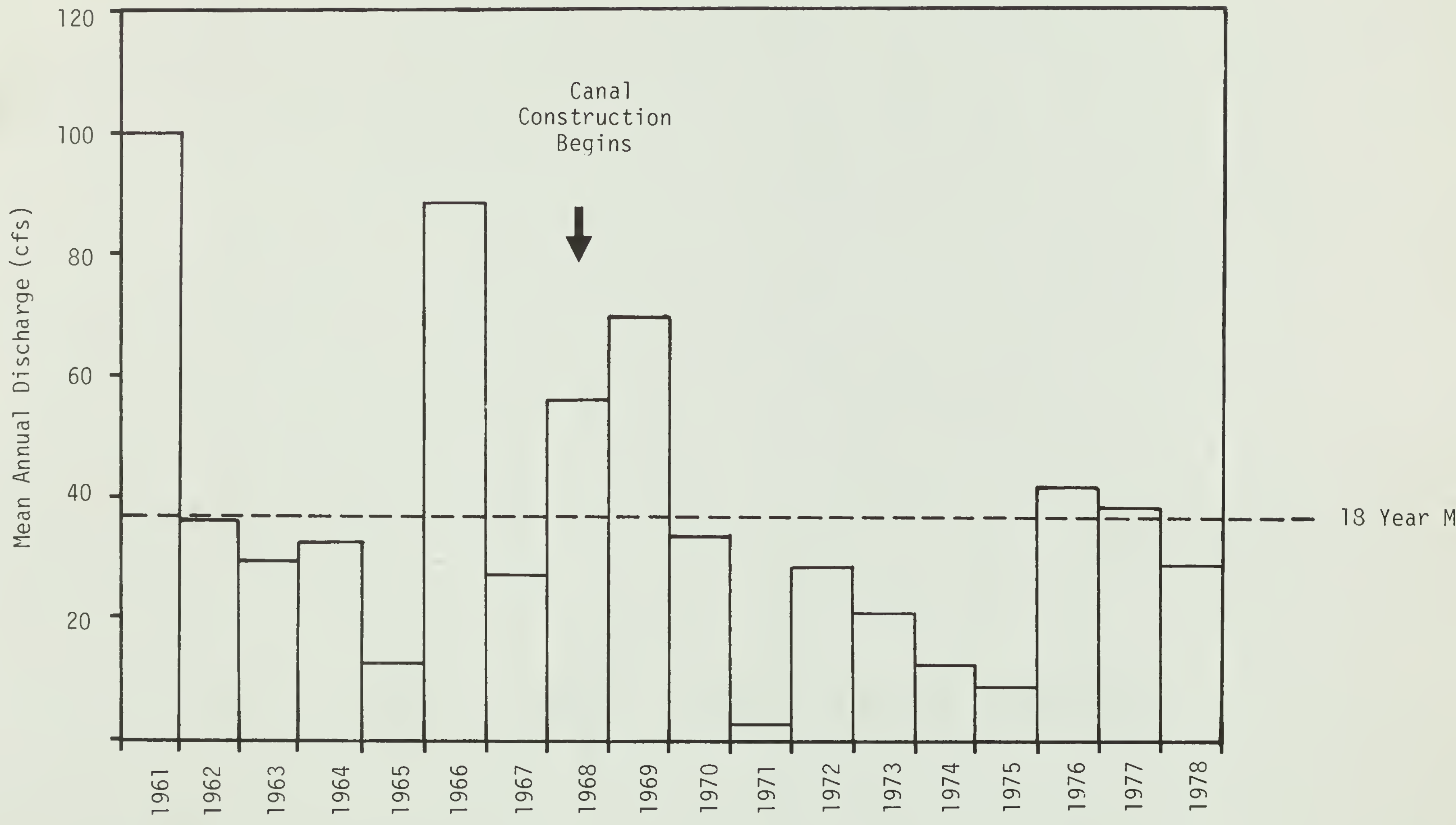


Figure 7: Mean annual discharge of Taylor Slough at the Main Park Road (Water Years 1961-1978).

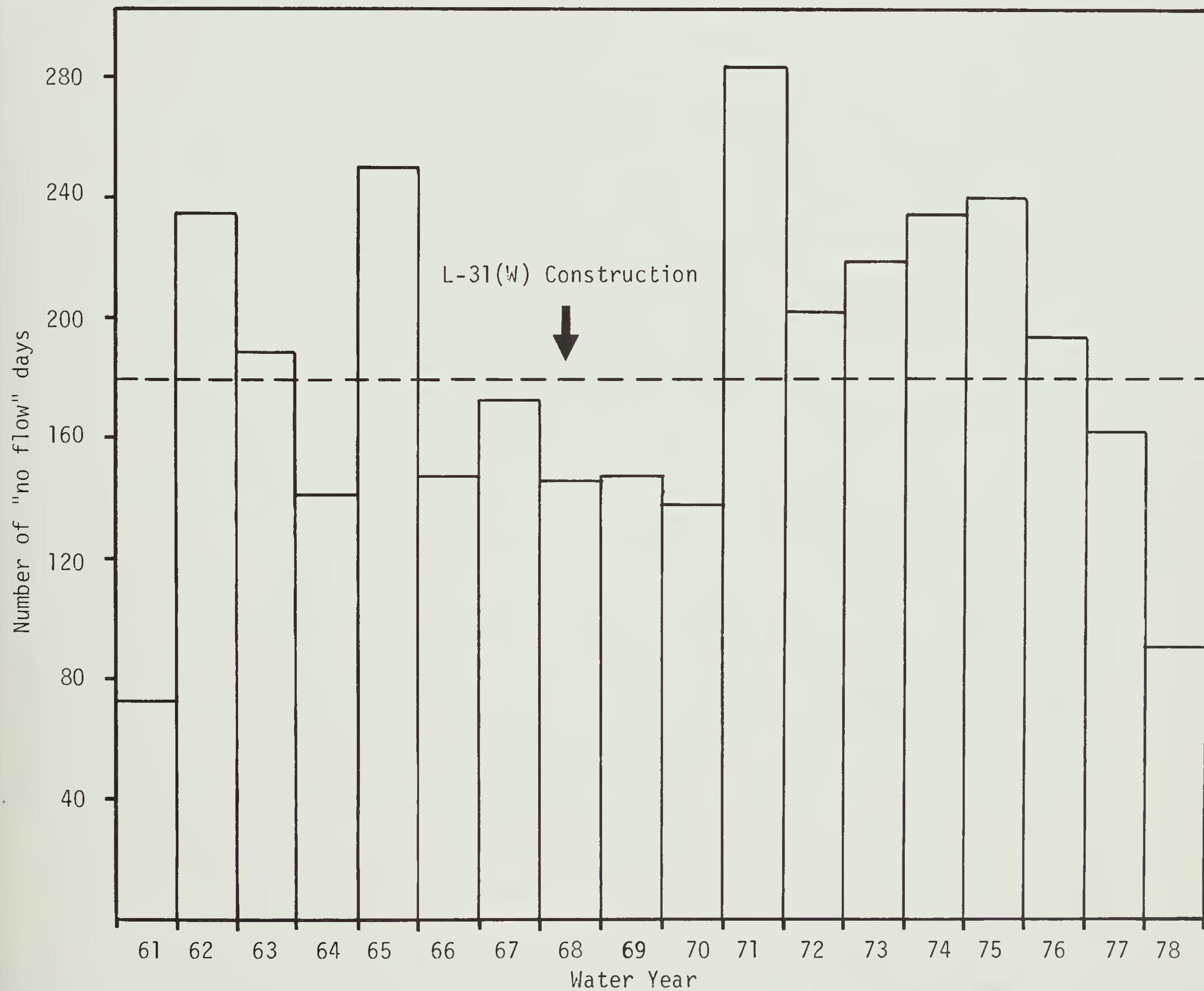


Figure 8: Annual number of "no flow" days for Taylor Slough at the bridge (Water Years 1961-1978)

— — — 18 year mean

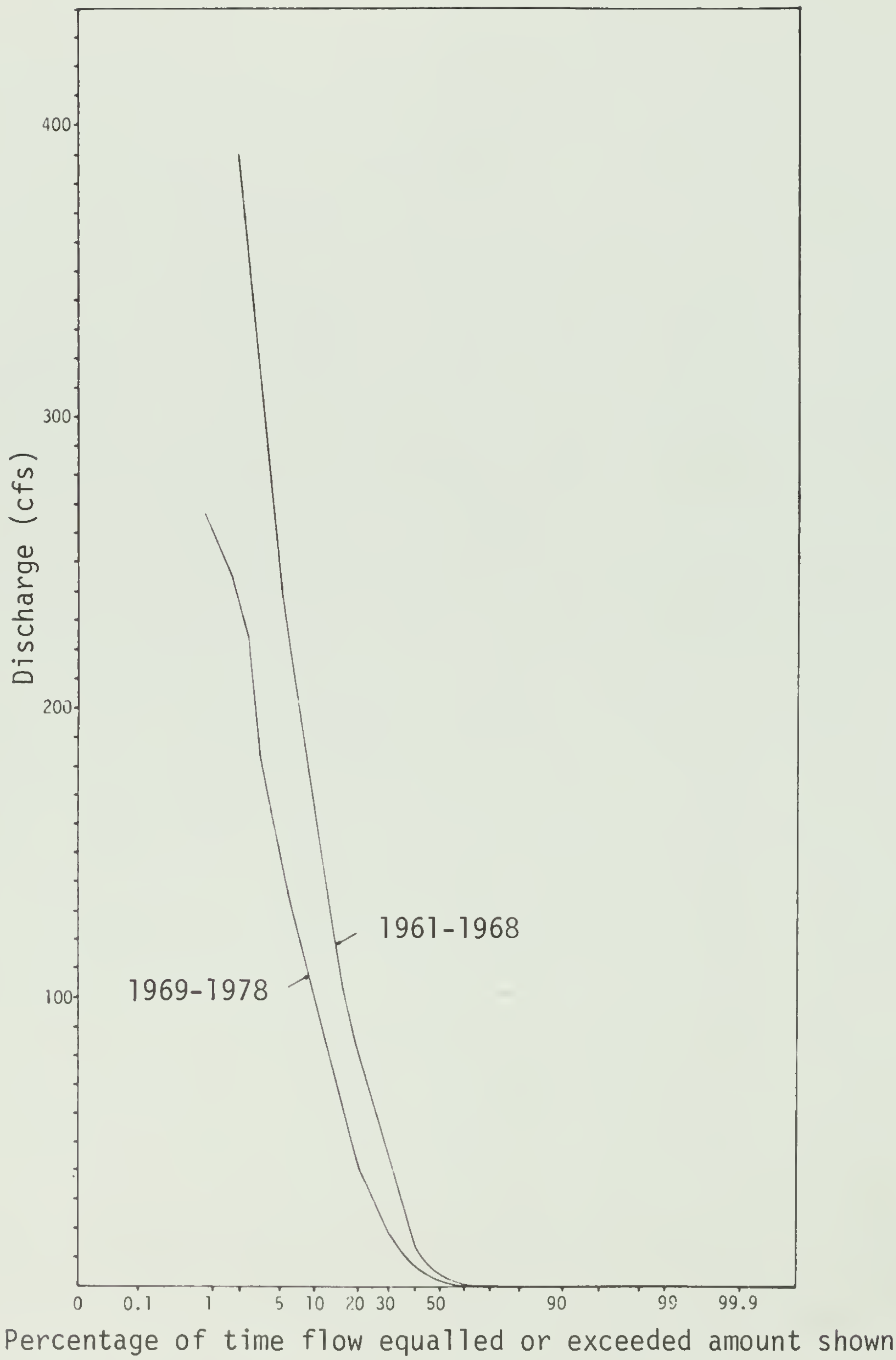
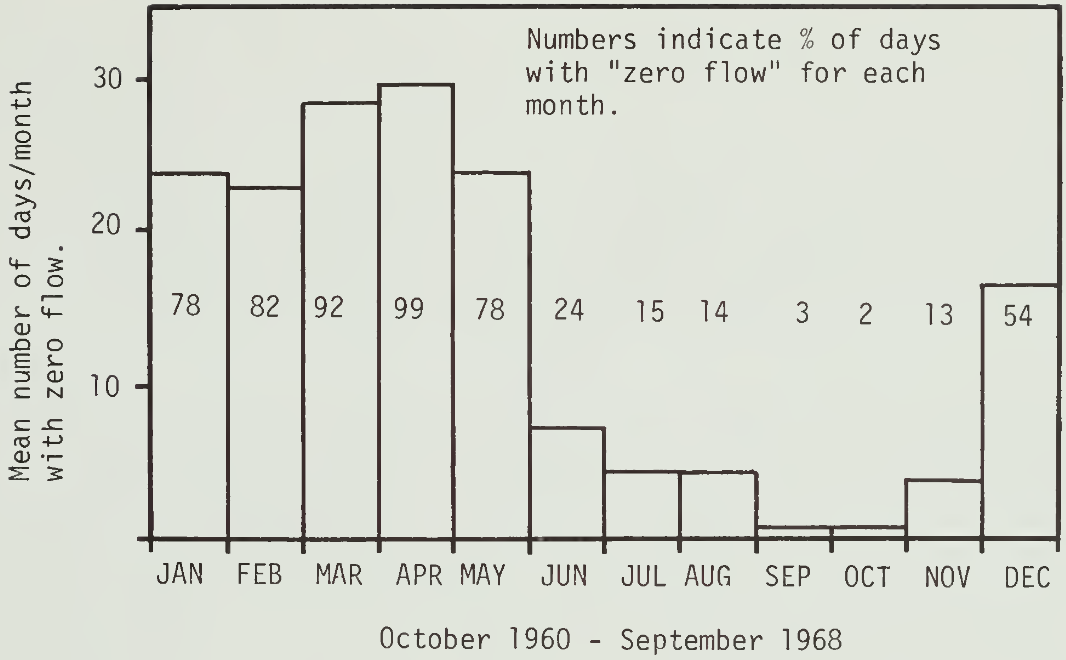


Figure 9: Duration curve for discharge at Taylor Slough Bridge 1960-1968 and 1969-1978.



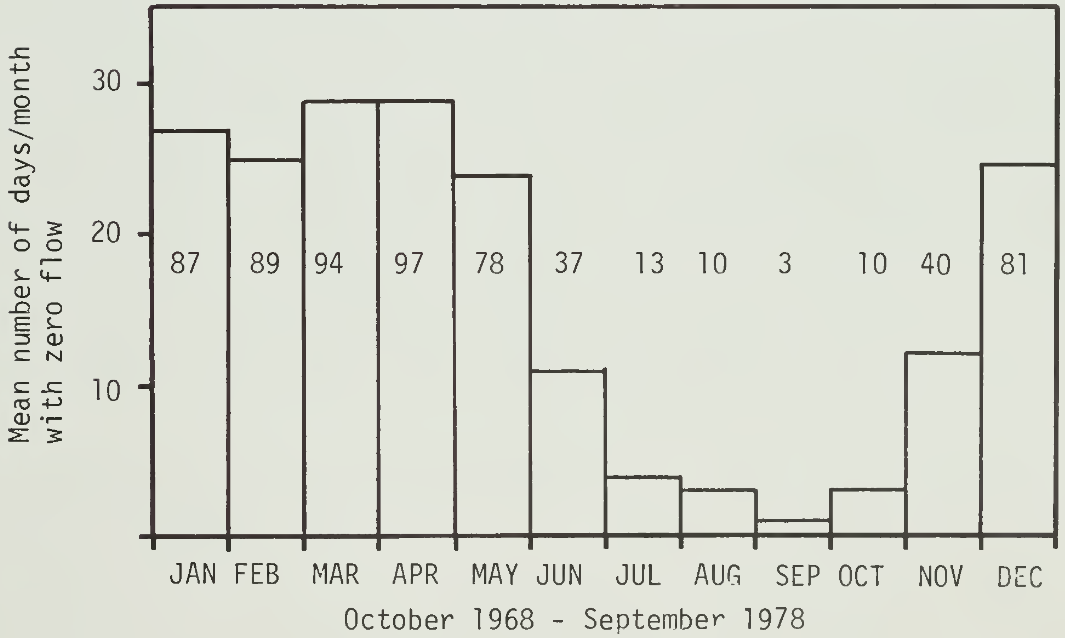


Figure 10: Mean number of days and monthly percent of days per month "no flow" days at the Taylor Slough Bridge.

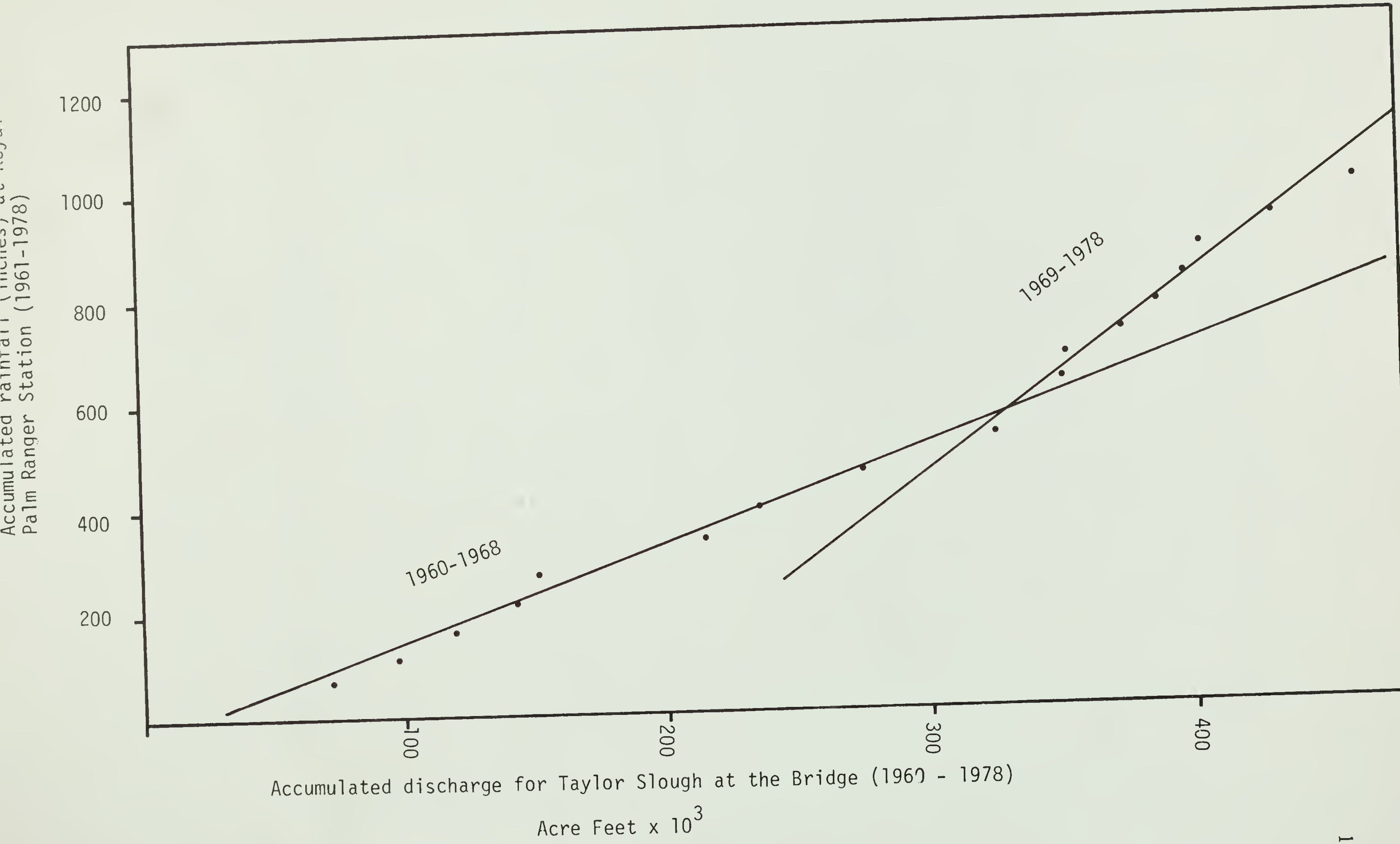


Figure 11: Relationship between total rainfall (Royal Palm Ranger Station) and total discharge for Taylor Slough at the Bridge (1960 - 1978).

In 1981 or 1982, Pumping Station 332, located at the intersection of L-31(W) and Taylor Slough, will become operational. This pumping station is designed to augment natural flow into the slough with water from L-31(W) at an annual pumping rate of 37,000 acre-feet as mandated by the U.S. Congress in accordance with Public Law 91-282. The monthly delivery schedule for Taylor Slough ranges from a maximum of 7,400 acre-feet per month during July to a minimum of 185 acre-feet per month during April (Table 1). The additional water to be delivered exceeds by 18,948 acre-feet per annum the historic (1960-1968) Taylor Slough discharge. This annual increase will cause a longer hydroperiod, higher discharge and stage height than previously recorded northern Taylor Slough.

Water Levels

Water levels in Taylor Slough have been monitored by continuous recording stations since 1960. The recorder located at the Taylor Slough Bridge is the longest term station for the slough and records have been maintained since August 1960. The water level data collected at this station have helped document the impact of L-31(W) on the hydrologic regime of Taylor Slough. Mean monthly water levels, as well as the mean of the maximum and minimum monthly water levels, are presented in Table 2 for data collected at Taylor Slough Bridge during pre- and post-levee construction periods. Data representing mean monthly water levels for these two periods are also plotted in Figure 12. Before L-31(W) construction the highest stage means were reported during October, typical of the end of the "wet" season in south Florida. However, after L-31(W) canal construction the highest water level period was observed one month earlier. During this period October reported a mean water level decrease of -0.58 feet (-.18 m) compared to the October mean found before canal construction. The change in mean water levels observed during November was even more pronounced, decreasing by -0.69 feet (-.21 m) compared to the pre-construction mean for November. This suggests that during the end of the "wet" season when water levels are relatively high, the traditional flow pattern has been disrupted by L-31(W). It appears that once surface waters are intercepted by the L-31(W) canal in Taylor Slough, the waters either circumvent the northern portion of the slough by flowing within the constraints of the canal system, to be discharged downstream of Taylor Slough Bridge or are lost by evaporation. This impact resulted in the lowering of water levels by 20 percent at the Taylor Slough Bridge by the end of the "wet" season (November means). The greatest overall monthly decrease, however, occurred during the month of June when mean surface water levels were decreased by -1.03 feet (-.31 m), from the monthly mean, a decline of 28.6 percent.

Mean monthly water levels increased during the end of the dry season (April and May) from those found prior to L-31(W) construction. Mean April water levels increased +0.09 feet (+0.03 m) while May registered a greater increase of +0.55 feet (+0.17 m) representing increases of 16 and 167 percent, respectively. A cursory examination of the increase represented a somewhat significant water level change brought about by L-31(W) for the "dry" season. The mean levels recorded for May at Taylor Slough Bridge after canal construction were 0.88 feet (0.27 m). This level is far below surface flow conditions which are 2.33 feet (0.71 m) at the Taylor Slough Bridge. The general porosity of the Miami oolitic limestone in the Biscayne Aquifer which stores Taylor Slough's ground waters is

Table 1. Monthly mean discharge and pumping schedule for Taylor Slough.

	Mean monthly discharge 1960-1968 (Acre-feet)	Mean monthly discharge 1969-1977 (Acre-feet)	Approved pumping schedule (Acre-feet)	1969-1977 Mean monghly discharge plus pumping (Acre-feet)	*Change in discharge between 1960-1968 and projected post-pumping schedule (Acre-feet)
January	652	43	740	784	+131
February	194	39	370	409	+215
March	6	31	185	216	+210
April	1	12	185	197	+196
May	301	240	370	610	+309
June	5,438	4,498	6,660	11,158	+5,720
July	7,071	2,890	7,400	10,290	+3,219
August	2,103	2,269	2,960	5,229	+3,126
September	9,044	5,706	5,920	11,626	+2,582
October	7,747	3,529	7,770	11,299	+3,552
November	4,879	1,250	3,700	4,950	+71
December	1,224	101	740	841	-383
Total	38,660	20,608	37,000	57,609	+18,948

*Does not include evaporative losses, amount going to ground water storage in northern Taylor Slough or recirculation back to L-31W.

Table 2. Stage means and extremes at Taylor Slough Bridge during pre- and post-levee L-31(W) construction periods.

	October-September 1960-1968			October-September 1968-1978			Water Level Change *		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
January	2.06	2.36	1.78	1.87	2.29	1.65	-0.19	-0.07	-0.14
February	1.85	2.15	1.48	1.65	2.10	1.44	-0.20	-0.15	-0.04
March	1.32	1.80	0.76	1.20	1.70	0.88	-0.12	-0.10	+0.12
April	0.55	1.23	-0.05	0.64	1.25	0.37	+0.09	+0.02	+0.42
May	0.33	1.86	-0.09	0.88	1.90	0.22	+0.55	+0.04	+0.31
June	3.60	3.83	1.68	2.57	3.63	1.66	-1.03	-0.20	-0.02
July	3.69	3.95	2.84	3.25	3.80	2.72	-0.44	-0.15	-0.12
August	3.12	3.52	3.12	3.17	3.69	2.53	+0.05	-0.17	-0.59
September	3.65	4.34	3.50	3.67	4.06	3.33	+0.02	-0.28	-0.17
October	3.91	4.33	3.33	3.33	3.91	3.12	-0.58	-0.42	-0.21
November	3.46	3.82	2.89	2.77	3.45	2.34	-0.69	-0.37	-0.55
December	2.48	2.90	2.11	2.22	2.65	1.88	-0.26	-0.25	-0.23

* (+) increased water amount to Taylor Slough

(-) decreased water amount to Taylor Slough roughly 20 percent. In order to increase water levels during the dry season by +0.55 feet (0.17 m), canal L-31(W) would have to contribute only .11 feet (11.3 inch) of water to the slough on a comparative basis with surface water contributions. During the months of August and September, slight increases of 2 and 1 percent were observed, essentially indicating no change during these 2 wet season months.

The overall impact on water levels in the northern reaches of Taylor Slough due to L-31(W) correspond to the change in stage duration for Taylor Slough at the bridge. During the pre-construction years (1960-1968) for 50 percent of the time, stage was equal to or exceeded 3.40 feet (1.04 m) (Figure 14). Following the construction of L-31(W), water levels were equal to or exceeded 3.40 feet (1.04 m) only 25 percent of the time (1969-1978). The stage-duration curve clearly indicates the reduced ability of the slough to achieve pre-construction water level conditions after completion of L-31(W). The stage has been reduced consistently 20 to 30 percent throughout much of the stage duration curve since 1968.

CONCLUSIONS

Alterations to Taylor Slough's hydrology due to the presence of the adjacent L-31 (W) canal/levee system have been determined. It was found that although the twc time periods 1960-1968, and 1969-1978 representing pre-and post canal periods experienced similar precipitation amounts. Stage and discharge amounts were significantly altered. Utilizing the double mass curve technique as presented in this report, it was found that after canal/levee construction a greater amount of rainfall was now required to provide surface water inflows that were equivalent to pre-canal period flow rates at Taylor Slough Bridge.

Specific hydrologic alternations as determined at Taylor Slough Bridge between pre-and post construction periods include:

-A 40 percent reduction of the mean annual discharge.

-The annual mean of the number of days having "no-flow" increased from-167 days to 191 days.

-The annual mean of "no-flow" days was exceeded in 6 of 10 years during the post-construction period compared with 3 of 8 years for the pre-construction period.

-During 20 percent of the time flow rates equalled or exceeded 80 cfs during pre-construction periods compared to only 40 cfs after construction.

-During 50 percent of the time water levels equalled or exceeded 3.5 feet compared to only 2.8 feet after construction indicating a stage reduction of 20 percent.

-Mean water levels were decreased by: 9, 11, 9, 29, 12, 15, 20, and 10 percent during the months of January, February, March, June, July, October, November and December, respectively, and increased by 16, 167, 2, and 1 percent during April, May, August and September respectively, while the largest decrease in mean water level was 1.03 feet occuring during June.

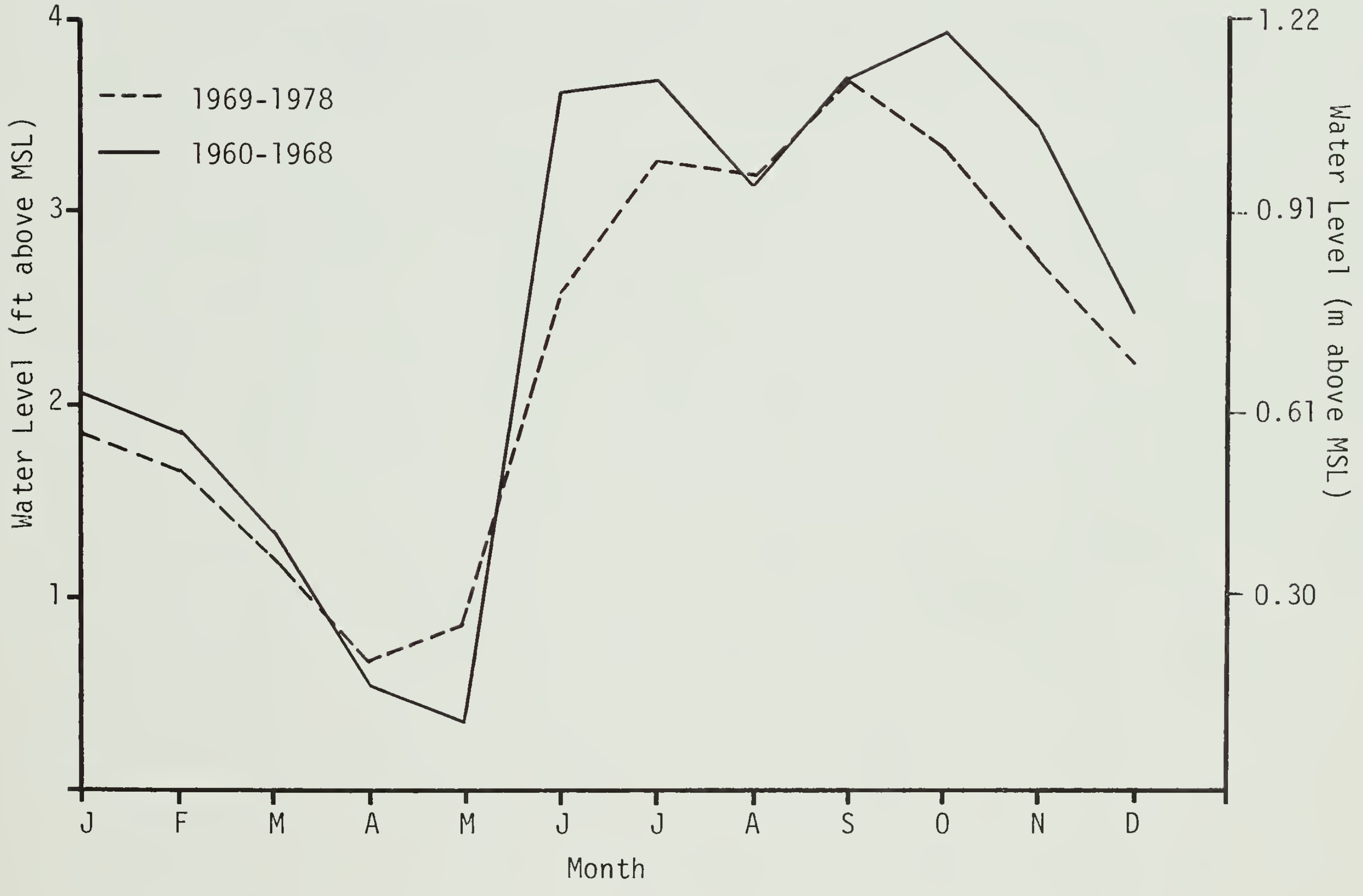


Figure 12: Mean monthly stage for Taylor Slough at the bridge (1960-1978).

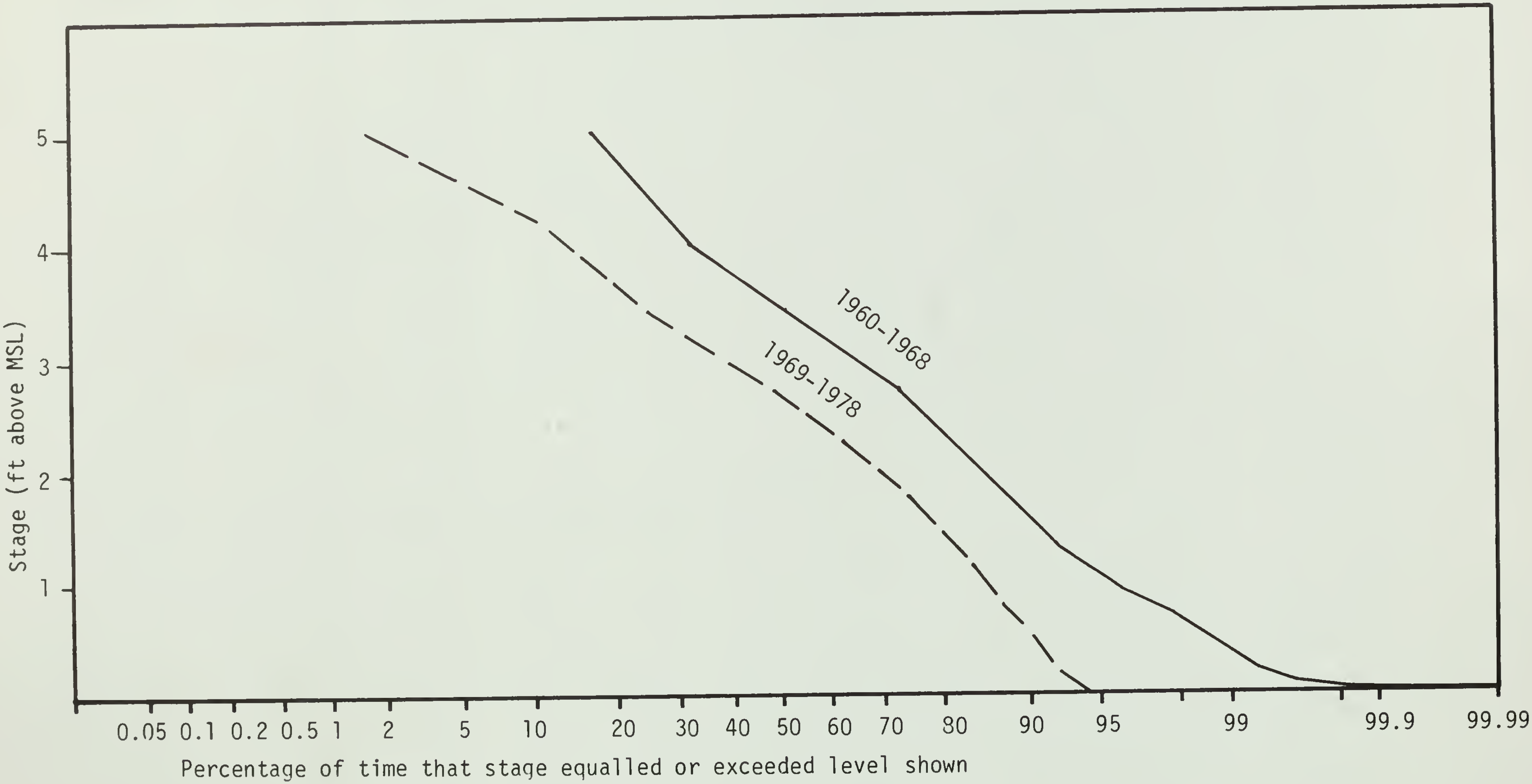


Figure 13: Time duration curve for stage at the Taylor Slough Bridge, 1960-1968 and 1969-1978.

Upon commencement of pumping at the newly installed station S-332 it is anticipated that both stages and flow rates will increase in Taylor Slough. The precise amount will be determined by continued field monitoring. In the event all scheduled pumping amounts actually reach Taylor Slough Bridge, mean annual discharges could be as much as 18,948 acre-feet greater due to pumping compared to the pre-construction period. It is anticipated, however, that actual effects will be considerably less due to much of the pumped waters going into ground water storage in northern Taylor Slough, recirculation of waters back to L-31 W and evaporative losses.

ACKNOWLEDGEMENTS

We would like to express our appreciation to Mr. Louis Zachos for his contributions to this report. In addition, our thanks are extended to the hydrology staff at Everglades National Park for assistance in collecting field data vital for this analysis.

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APPENDIX I: Royal Palm Ranger Station Rainfall 1961-1968 and 1969-1978.

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
WATER YEARS 1961 - 1968													
1961	6.14	2.99	0.42	2.32	1.14	2.22	0.06	8.86	6.78	3.34	6.80	3.20	44.27
1962	5.56	0.72	0.13	1.34	0.66	3.60	1.77	1.06	14.14	8.72	7.60	8.40	53.70
1963	3.48	2.38	0.20	05.9	2.96	0.30	0.34	8.04	9.32	3.12	8.14	16.49	55.36
1964	3.78	2.58	2.45	0.40	2.04	0.94	6.08	4.01	9.79	7.18	8.20	10.29	57.74
1965	9.08	2.04	1.88	1.24	1.78	1.50	0.14	1.60	6.54	3.58	4.54	12.34	46.26
1966	11.80	2.85	0.16	4.08	1.24	1.97	1.12	7.74	18.96	10.11	2.73	11.48	74.24
1967	4.76	0.60	0.71	2.39	1.26	1.89	0.24	2.52	17.71	4.34	5.08	8.76	50.26
1968	7.24	2.23	1.40	1.26	2.01	1.00	0.23	19.73	20.38	8.16	6.30	14.37	84.31
AVG	6.48	2.05	0.92	1.70	1.64	1.68	1.25	6.70	12.95	6.07	6.17	10.67	59.00
MAX	11.80	2.99	2.45	4.08	2.96	3.60	6.08	19.73	20.38	10.11	8.20	16.49	
MIN	3.48	0.60	0.13	0.40	0.66	0.30	0.06	1.06	6.54	3.12	2.73	3.20	
Rainfall, in inches, January 1950 to December 1968													
AVG	7.31	1.88	1.20	1.53	1.90	2.11	2.73	6.67	9.91	7.50	7.22	9.10	59.06
MAX	13.90	7.58	3.32	5.65	4.23	6.32	7.36	19.73	20.38	12.23	11.54	17.18	
MIN	3.48	0.60	0.13	0.17	0.58	0.02	0.06	1.06	1.72	3.12	2.73	3.20	
WATER YEARS 1969 - 1979													
1969	9.57	1.12	0.09	5.60	2.42	3.70	2.30	7.57	25.49	6.95	6.85	9.55	81.21
1970	10.65	1.28	1.39	3.61	2.35	2.49	0.08	6.46	8.11	6.19	4.30	4.98	51.89
1971	6.80	0.62	0.14	0.59	0.88	0.41	0.19	1.87	10.70	2.86	4.60	6.09	35.75
1972	4.52	1.29	3.28	1.16	2.72	1.40	7.09	4.75	8.70	10.05	7.63	5.15	57.74
1973	5.39	4.69	0.93	1.94	2.00	1.06	0.47	3.08	9.09	8.91	14.42	5.20	57.18
1974	3.87	0.41	2.68	0.31	0.06	0.13	5.33	2.29	9.29	10.76	6.34	5.40	46.87
1975	6.00	2.12	0.30	0.16	0.83	0.25	0.06	10.37	11.87	7.10	8.70	6.96	54.72
1976	5.31	1.03	0.51	0.93	2.11	0.20	3.85	8.14	8.13	3.94	13.95	8.82	56.92
1977	2.17	4.23	1.19	1.96	1.65	0.70	0.64	12.81	8.67	5.53	4.43	11.68	55.66
1978	3.53	2.89	3.58	3.32	4.60	2.77	6.31	5.07	8.71	6.25	11.41	13.67	72.11
AVG	6.12	1.91	1.49	1.95	1.82	1.22	3.26	6.14	10.39	10.76	7.91	7.91	56.96
MAX	10.65	4.69	3.58	5.60	4.60	3.70	9.56	12.81	25.49	10.76	14.42	13.67	
MIN	3.53	0.41	0.14	0.16	0.06	0.20	0.06	1.87	5.56	2.86	4.30	4.98	

APPENDIX I (continued)

Homestead Experiment Station Monthly Rainfall

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
WATER YEARS 1960 - 1968													
1960	13.04	9.72	1.23	0.20	1.84	0.64	7.44	7.04	13.52	13.90	9.49	19.04	97.10
1961	6.79	1.69	0.53	2.54	0.99	3.66	0.04	9.23	10.47	3.08	6.01	2.71	47.74
1962	6.02	0.90	0.10	1.42	0.68	4.02	1.37	1.10	14.39	8.43	9.08	9.01	56.52
1963	3.56	2.33	0.17	0.50	3.04	0.52	0.57	9.09	10.82	3.51	6.58	20.26	60.95
1964	3.56	1.55	2.65	0.55	2.46	1.83	6.16	2.22	9.21	7.09	7.81	8.17	53.26
1965	12.11	1.93	1.55	1.96	1.55	1.98	0.19	0.19	5.86	4.14	4.34	12.98	48.78
1966	10.85	2.14	0.12	4.58	1.07	3.25	2.24	7.62	17.69	6.35	3.67	7.32	66.91
1967	4.78	0.46	0.96	2.66	1.09	3.05	0.27	2.94	16.17	5.63	4.74	7.79	50.54
1968	6.03	2.41	1.37	1.22	2.01	0.56	0.40	15.62	23.98	8.60	6.83	13.18	82.21
$\bar{x}$	7.42	2.57	0.96	1.74	1.64	2.17	2.08	6.12	13.57	6.75	6.51	11.16	62.69
MAX	13.04	9.72	2.65	4.58	3.04	4.02	7.44	15.62	23.98	13.90	9.49	20.26	
MIN	3.56	0.46	0.10	0.20	0.68	0.52	0.04	0.19	5.86	3.08	3.67	2.71	
WATER YEARS 1969 - 1978													
1969	10.40	0.73	0.14	4.72	1.76	2.88	3.40	4.14	20.67	5.78	12.30	11.01	77.93
1970	15.52	0.82	0.72	3.29	2.70	1.26	0.10	6.49	10.03	5.15	3.57	6.10	55.75
1971	6.87	0.09	0.24	0.56	1.07	0.07	0.07	3.05	6.11	4.94	4.27	6.95	34.29
1972	5.38	2.47	2.26	0.69	2.32	3.49	4.55	12.39	11.45	7.29	7.87	5.52	65.68
1973	3.64	3.31	1.53	1.60	2.49	1.61	1.15	3.38	6.86	10.04	14.95	8.22	58.78
1974	3.63	0.78	3.20	0.79	0.00	0.09	3.20	3.84	6.05	9.37	9.72	4.86	45.53
1975	1.66	3.18	0.67	0.25	1.20	0.15	0.12	10.33	9.48	8.87	8.79	4.93	49.63
1976	4.57	1.11	1.59	0.18	5.67	0.62	3.43	12.73	9.54	3.03	13.28	12.46	68.21
1977	6.72	2.78	1.28	1.38	1.59	0.74	1.02	16.17	6.84	6.71	11.95	10.70	67.88
1978	6.58	2.98	1.66	2.19	5.12	3.11	2.96	7.06	10.24	9.18	8.96	8.98	69.02
$\bar{x}$	6.50	1.83	1.33	1.57	2.39	1.40	2.00	7.96	9.73	7.04	9.57	7.97	59.29
MAX	15.52	3.31	3.20	4.72	5.67	3.49	4.55	16.17	20.67	10.04	13.28	11.01	
MIN	1.66	0.09	0.14	0.18	0.00	0.07	0.07	3.05	6.05	3.03	4.27	4.86	

Note: Rainfall is mean of rainfall at Homestead Experiment Station and at Royal Palm Visitor Center.

APPENDIX II: Monthly mean and average annual discharge (cfs) at Taylor Slough Bridge, October 1960-September 1978.

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	$\bar{x}$
1961	390	433	151	84.0	27.5	1.1	0	0.3	57.6	35.5	3.8	2.8	99.2
1962	4.2	0	0	0	0	0	0	0	58.5	164	96.7	108	36.2
1963	59.3	8.4	0.1	0	0	0	0	0.5	35.8	3.5	14.4	232	29.3
1964	227	16.1	0.1	0.5	0	0	0.1	1.7	31.6	46.6	15.1	46.9	32.4
1965	22.6	68.2	4.9	0	0	0	0	0	0	0	0	54.9	12.5
1966	105	68.1	2.3	0.3	0.1	0	0	0.3	260	366	125	131	88.6
1967	131	21.1	0.3	0	0.1	0	0	0	105	60.9	4.1	7.5	27.6
1968	64.7	40.8	0.7	0	0	0	0	36.6	183	240	14.9	90.7	56.0
1969	267	51.6	0.1	3.6	0.7	0	0	1.2	244	80.6	63.7	121	69.7
1970	122	117	6.9	0.8	0.8	0	0	.07	52.7	84.9	2.4	10.9	33.4
1971	16.7	5.1	0	0	0	0	0	0	0.4	0.2	0	7.4	2.5
1972	1.9	1.5	0	0	0	0	0	13.3	130	119	27.4	49.2	28.5
1973	22.3	7.6	0	0	0	0	0	0	0	20.2	81.2	120	21.0
1974	37	0.6	.03	0	0	0	0	0	0	23.8	39.9	43.1	12.2
1975	7.9	0	.03	0	0	0	0	0	4.7	51.9	15.8	30.3	9.3
1976	15.9	3.5	0	0	0	0	0	3.3	179	51	76	170	41.4
1977	38.8	15.5	0	0	0	0	0	16.1	130	10.7	27.7	224	28.3
1978	45.2	7.9	11	2.9	6.2	5.1	1.7	5.2	15.6	28.3	34.6	183	28.9
1961-1968 $\bar{x}$	126	82	19.9	10.6	3.5	0.1	.01	4.9	91.4	115	34.2	152	47.4
1969-1978 $\bar{x}$	57.4	21	1.8	0.7	0.7	0.5	0.2	3.9	75.6	47.0	36.9	95.9	28.5
1961-1978 $\bar{x}$	87.8	48.1	9.8	2.0	1.9	0.3	0.1	4.3	82.6	77.2	35.7	120.8	36.9