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Hydrologic and Engineering Study for Extreme Drawdown of Lake Griffin: Part 2 - Executive Summary

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HYDROLOGIC AND ENGINEERING STUDY FOR EXTREME DRAWDOWN OF LAKE GRIFFIN

EXECUTIVE SUMMARY

An evaluation of the hydrologic and engineering aspects of an extreme drawdown of Lake Griffin, located in Lake County, Florida, has been completed. The study was conducted after a proposal was made by the Florida Game and Fresh Water Fish Commission to drawdown the lake to improve the sportfish habitat. The economic and technical feasibility and impacts of such a project were investigated. The range of alternatives investigated which might accomplish the goal of increased sportfish populations was limited to water level fluctuation or drawdown.

The need for a drawdown results from the impacts which man's encroachment, pollution and control of the natural river and lake system have created. These impacts, commonly known as cultural and agricultural eutrophication, can be traced to the decline in bass and other sportfish populations through their impacts on vegetation and other environmental characteristics of a natural water system. The drawdown would be expected to produce benefits on Lake Griffin and its marginal areas similar to those which it and all natural lakes would experience periodically - a drought. Because of the controlled water level in Lake Griffin not even the extreme drought during 1980-81, with an estimated frequency of occurrence of approximately once in 100 years, produced any observed benefits which a natural lake subject to water level fluctuations normally receives from a drought.

Evaluation of Drawdown Plans

The lake levels during a drawdown are related to rainfall in the weeks before the start of the drawdown and during the drawdown, the storage

volume in the lake between the normal water level and the drawdown level, and the discharge capacity of the Moss Bluff structure and the approximately seven miles of leveed channel between the lake and the structure. The results of this study indicate that an extreme drawdown of Lake Griffin, implemented in any random year by simply opening the spillway gates at Moss Bluff Strucutre, could result in a wide range of lake levels and impacts.

Actions which would increase flooding potential in areas either upstream or downstream of Lake Griffin were avoided in formulating alternative drawdown plans during this study. Flooding risks are therefore not increased. It is impossible, however, to conduct an extreme drawdown of Lake Griffin without increasing flood damage risks and, at the same time, not increase risks of drought damage. The risk of abnormal drought damage must be weighed against the expected benefits of the drawdown. The results of the study indicate that expected project benefits are sufficiently large to result in an economically feasible project.

A number of technically feasible plans were formulated. Some of the plans included altering the normal regulation plan for the upstream Apopka-Beauclair and Burrell Dams. The current regulation schedules for the three control structures and the schedules for each alternative evaluated are given in Figures 1a.- 1c. The water level and probability data for each are given in the Table 1. Plan A has no impact on water levels upstream of Lake Griffin beyond normal conditions since no alteration of Burrell or Apopka-Beauclair schedules would result from this plan. Plan B is presented, but is not considered feasible because of the increased flood damage potential which would result during May through August for areas upstream of Lake Griffin. Plans C and G have acceptable regulation

schedules but the data given in the table for these two plans reflect a discharge at Moss Bluff up to hydraulic capacity of the structure which is not desirable for water quality reasons. Plan K regulation schedule for Lake Griffin begins drawdown on February 1 which would significantly impact the fish camps by cutting short their peak business season. Plan L, which has the same regulation schedule as Plan A, has an estimated construction cost of near $1 million as well as additional environmental concerns related to the dredging contained in this plan. Plan J is believed to be the best drawdown plan because it provides acceptable probability of project success while it includes no construction, limits discharges at Moss Bluff to what is believed would result in acceptable water quality and water levels downstream of the structure, would result in water levels upstream of Lake Griffin being less than 0.5 foot below normal, and would minimize the drawdown impacts on fish camps during their peak season.

For Plan J, if Lake Griffin is lowered to 58.0 feet by March 1, 1.5 feet below desired stage on that date, and a discharge at Moss Bluff of about 750 cubic feet per second is made after that date until the lake level is no longer high enough to maintain this flow, there is an estimated 50 percent chance that a lake level not higher than 53.6 feet can be maintained for three months. There is an 80 percent chance and a 20 percent chance that a lake level of less than 54.5 and 52.7 feet, respectively, can be maintained for a period of three months. There is a 80, 50 and 20 percent chance of attaining a lake stage higher than 56.8, 58.8 and 59.2 feet, respectively, by November 1.

The probabilities given in the table were estimated by hydrologic simulation using 21 years of historic lake stage and stream flow data. The results of simulation for Plan J for four selected years are seen in Figure

2. The spring months of 1968 were relatively wet with the chance of larger runoff volumes being approximately 10 percent while 1967 and 1977 were relatively dry springs with the probability of less runoff during the spring months being about 10 percent. The spring of 1963 was average one for runoff volume. The summer and fall of 1977 were also dry with a probability of less runoff during those months being less than 10 percent.

Impacts of Drawdown

A number of impacts can be expected to result from what would be considered a successful project in regard to water levels. Some are expected to be significant and some not significant.

Consolidation of Lake Sediments

This impact is the objective of the extreme drawdown. By lowering the lake level and exposing the lake sediments around the perimeter it is expected that the sediments will drain, dry and consolidate. The drying period, which is expected to require between 60 and 90 days, will leave a firm crust which is expected to remain indefinitely after refill. This is where the benefits of the project are expected to occur. In its present unconsolidated condition, the sediment will not support rooted vegetation needed for spawning and feeding by bass and other sportfish. Exposure, drying and consolidation are expected to germinate and support this type of vegetation leading to increased fish populations.

Lake Front and Lake Access Residences

During a drawdown, lake front and lake access dwellings will be adversely impacted. Most if not all private boat access channels will be dry or too shallow to navigate. Most homes situated around the lake have boat docks and/or boat houses.

These residences as well as some which may not be immediately adjacent to the lake or canal would also temporarily lose the aesthetic advantages of living near the lake. There may be some odor when the organic sediments in the lake are exposed by the drawdown.

If the summer is relatively dry some additional watering of lawn trees and shrubs may be necessary. This could result from a drop in the water table which will accompany a drawdown. The maximum drop would occur at the lakes edge and would be no more than the drop in lake stage. Impacts at a distance of about 1,000 feet from the lake would probably be insignificant.

Many property owners around the lake and on Haines Creek have constructed retaining walls of timber, steel or concrete. A fall in lake stage will increase the stresses on the walls due to the loss of water pressure on the wall. It is impossible to evaluate the risks involved due to the lack of information on the construction details of the walls and because of the large variation in age and condition.

It should be noted that a drawdown would provide an opportune time for owners to do maintenance on the walls, decks and boat access channels (subject to normal agency permit requirements).

Agriculture

Agriculture is the primary land use along the northern half of the lake. The eastern side is predominately muck farms while the western side is citrus. The citrus areas could be affected by the fall in water table level which would accompany a drawdown. Extensive study and surveys done

for the Lake Apopka Restoration Project[1] indicated that only trees within about 1,000 feet of Lake Apopka would be affected. The area around Lake Griffin is believed to be subject to a similar condition. Trees within this distance would probably need additional irrigation to offset the drop in water table level.

An additional potential impact on the citrus groves is the loss of freeze protection provided by Lake Griffin. It is believed that an insignificant reduction in freeze protection would exist for lake levels above about 56.0 feet. Water depth and surface area characteristics of Lake Griffin for lower stages, however, could result in loss of freeze protection. It is seen in the table that for Plan J there is an estimated 20 percent chance that Lake Griffin would be below 56.8 feet on November 1 and approximately a 15 percent chance of being below 56.0 feet. Because there is approximately a 50 percent chance of at least one damaging freeze event in each year the probability of damage occuring resulting from abnormally low lake levels is less than 10 percent.

Impacts on the muck farms is expected to be insignificant. Although there is potential for these farms to use Lake Griffin for irrigation, this practice is not common. They do, however, use lake water to flood the fields once each two or three years to kill nemotodes. Sufficient notice of a drawdown plan should minimize impacts on the muck farms.

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[1]Preliminary Engineering Report, Lake Apopka Restoration Project, Ross, Saarinen, Bolton and Wilder, Clearwater, Florida, October 1978.

Fish Camps

There are several fish camps on Lake Griffin. The peak season for these is the winter months and extending through March. These camps would probably lose lake access by late March if the drawdown began on March 1. Refill is expected to raise water levels sufficient for boat access by November 1. The fish camp use is expected to increase after the drawdown due to the improved fishery, offsetting losses in business during the summer drawdown. Experiences with lake drawdowns have resulted in improvements of fisheries lasting for six to seven years.

Retail Business

The retail business around Lake Griffin can be expected to be impacted similarly to the fish camps but not as directly. Many businesses profit from the sale of fishing equipment, food and lodging to users of Lake Griffin. Other retail businesses receive secondary benefits as the impacts pass through the economy of the area. As with the fish camps, increased profits in future years are expected to offset losses occurring during the drawdown.

Sediment Transport

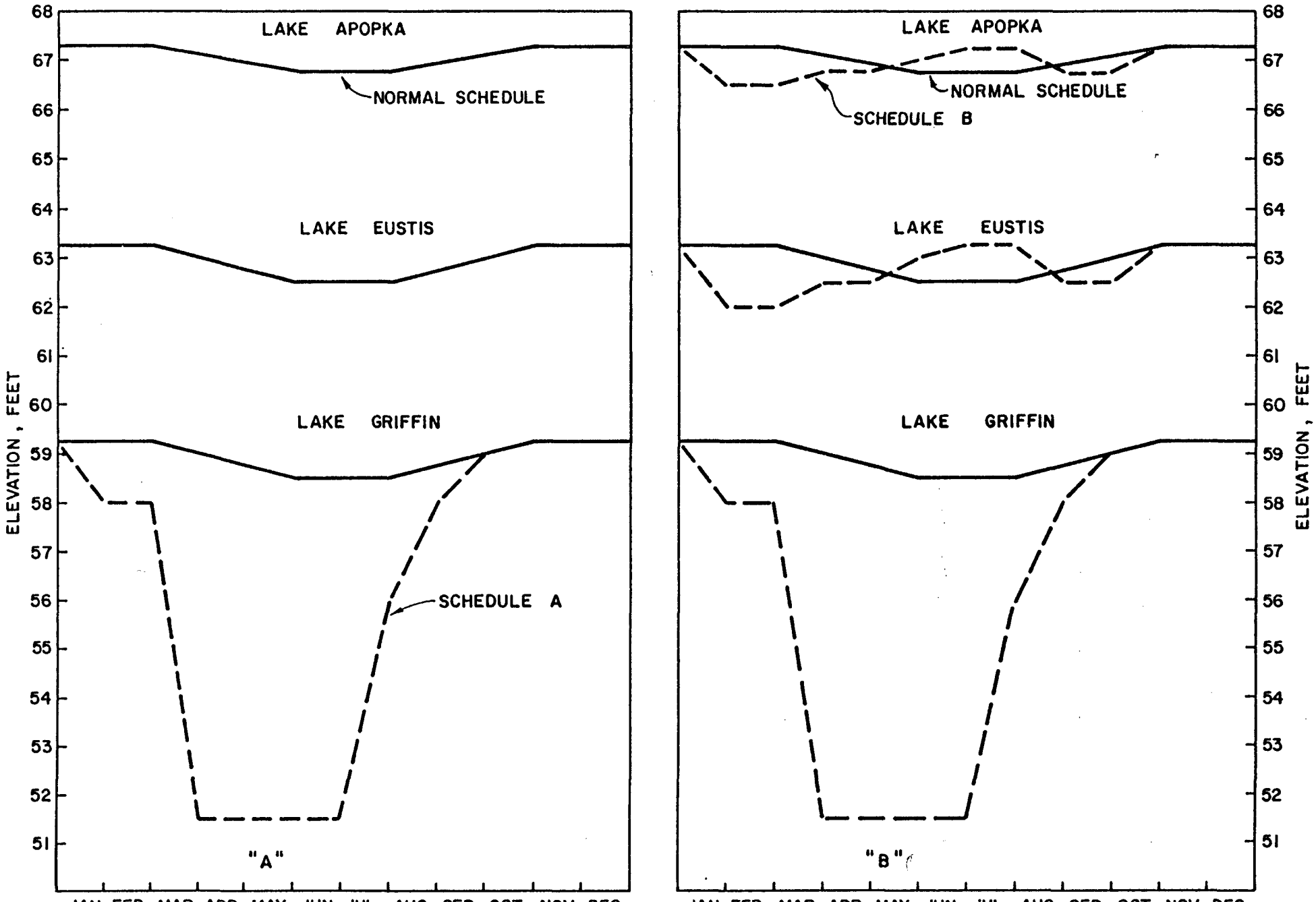
The changed hydraulic conditions in Haines Creek, Lake Griffin and the C-231 canal upstream of Moss Bluff will result in increased sediment transport potential. The impacts of this would be increased turbidity in waters discharged at Moss Bluff due to suspended sediment. This sediment being organic in nature could also exert a biochemical oxygen demand on the downstream waters. Problems with sediment transport are expected to be within acceptable limits if discharge is held below about 750 cfs while the lake is below 58.0 feet. Water quality monitoring would be necessary to

adjust releases according to conditions.

TABLE 1.

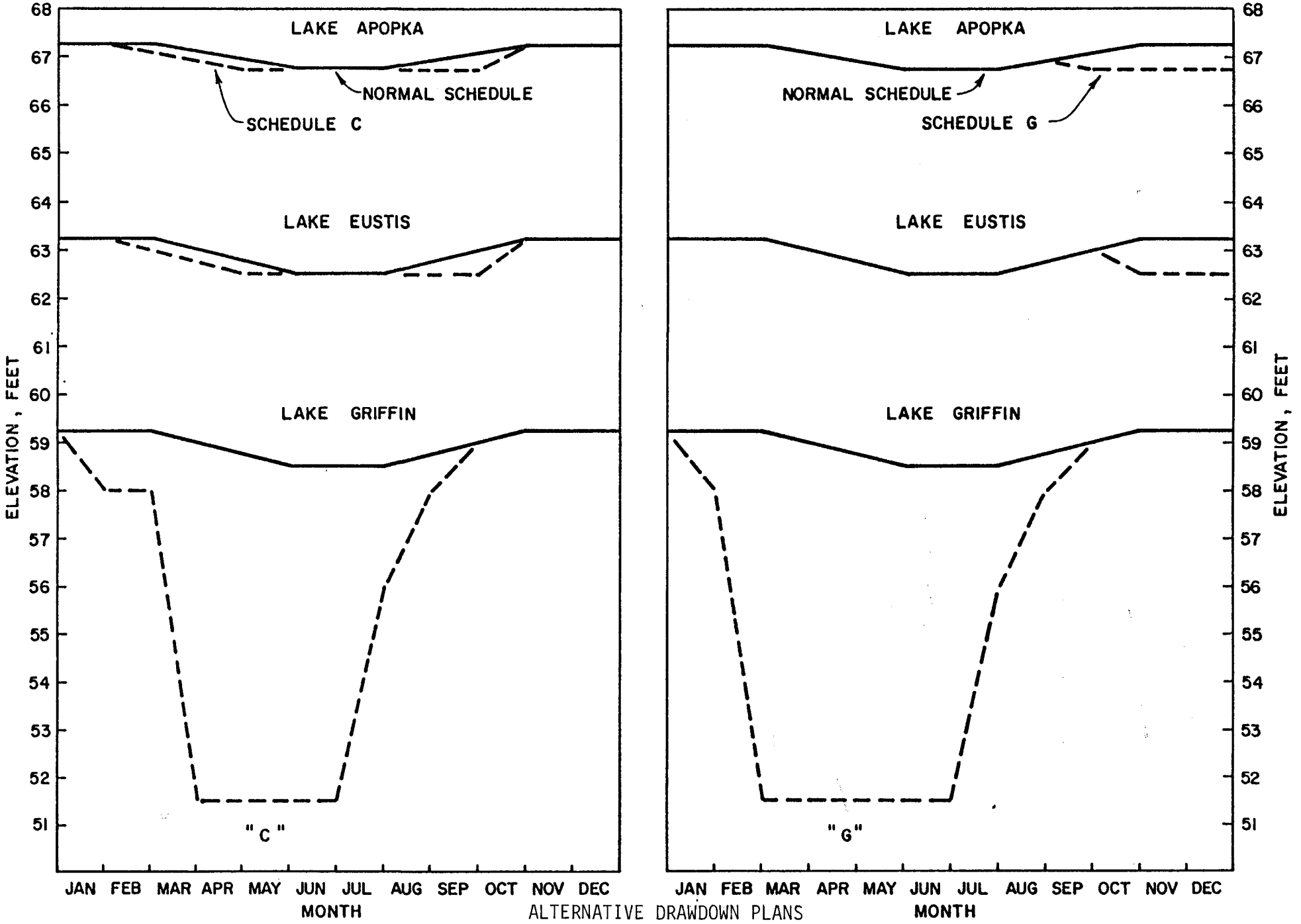
	PROB. OF EXCEED.	DATA FROM SIMULATED REGULATION PLANS A	B	C	G	J	K	L
LAKE GRIFFIN:								
3-MO LOW STAGE	10%	54.7	53.2	54.6	54.1	55.0	54.5	54.3
	20%	54.3	53.0	54.2	53.8	54.5	54.2	54.0
	50%	53.6	52.7	53.5	53.3	53.6	53.5	52.8
	80%	52.9	52.2	52.5	52.8	52.7	52.5	52.0
2-MO LOW STAGE	10%	53.6	52.9	53.6	53.6	53.4	53.2	53.2
	20%	53.4	52.4	53.0	53.2	53.0	52.9	52.2
	50%	53.0	52.2	52.5	52.8	52.6	52.5	51.9
	80%	52.4	52.0	52.0	52.2	52.2	52.2	51.6
NOV.1 STAGE	90%	53.0	52.8	53.7	53.6	53.7	53.7	53.0
	80%	55.4	54.8	56.8	57.0	56.8	56.8	56.2
	50%	58.4	58.4	58.9	59.2	58.8	58.8	58.8
	20%	59.1	59.2	59.2	59.3	59.2	59.2	59.2
JAN.1 STAGE	90%	54.2	53.4	54.7	55.2	54.2	54.2	53.6
	80%	56.5	55.4	57.4	58.1	56.8	56.8	56.4
	50%	58.6	58.4	59.0	59.2	58.8	58.8	58.8
	20%	59.3	59.3	59.3	59.3	59.3	59.3	59.3
LAKE APOPKA:								
MAY 1 STAGE	90%	66.5	65.7	66.4	66.5	66.2	66.2	66.2
	80%	66.6	65.9	66.5	66.6	66.3	66.3	66.3
	50%	66.8	66.3	66.6	66.8	66.4	66.4	66.4
	20%	66.9	66.5	66.8	66.9	66.6	66.6	66.6
NOV.1 STAGE	90%	66.4	66.1	66.2	66.3	66.2	66.2	66.2
	80%	66.7	66.3	66.4	66.4	66.4	66.4	66.4
	50%	67.0	66.6	66.6	66.6	66.6	66.6	66.6
	20%	67.2	67.0	67.0	66.8	67.0	67.0	67.0

"J" AND "K" LIMIT DISCHARGE TO 750 CFS
"L" IS WITH DREDGED CHANNEL AND LIMIT DISCHARGE TO 1000 CFS

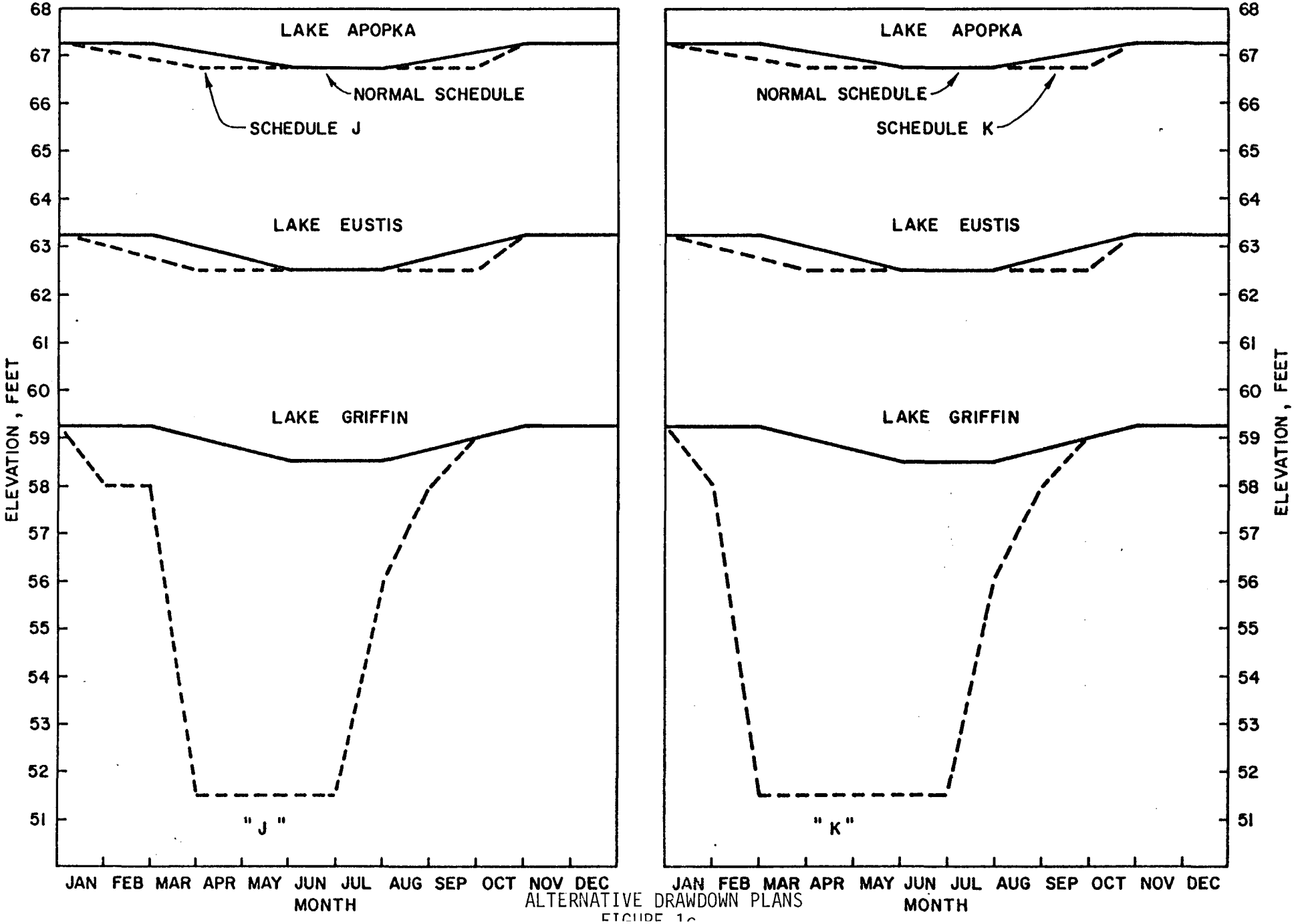


ALTERNATIVE DRAWDOWN PLANS

FIGURE 1a



ALTERNATIVE DRAWDOWN PLANS
FIGURE 1b.



ALTERNATIVE DRAWDOWN PLANS
FIGURE 1c

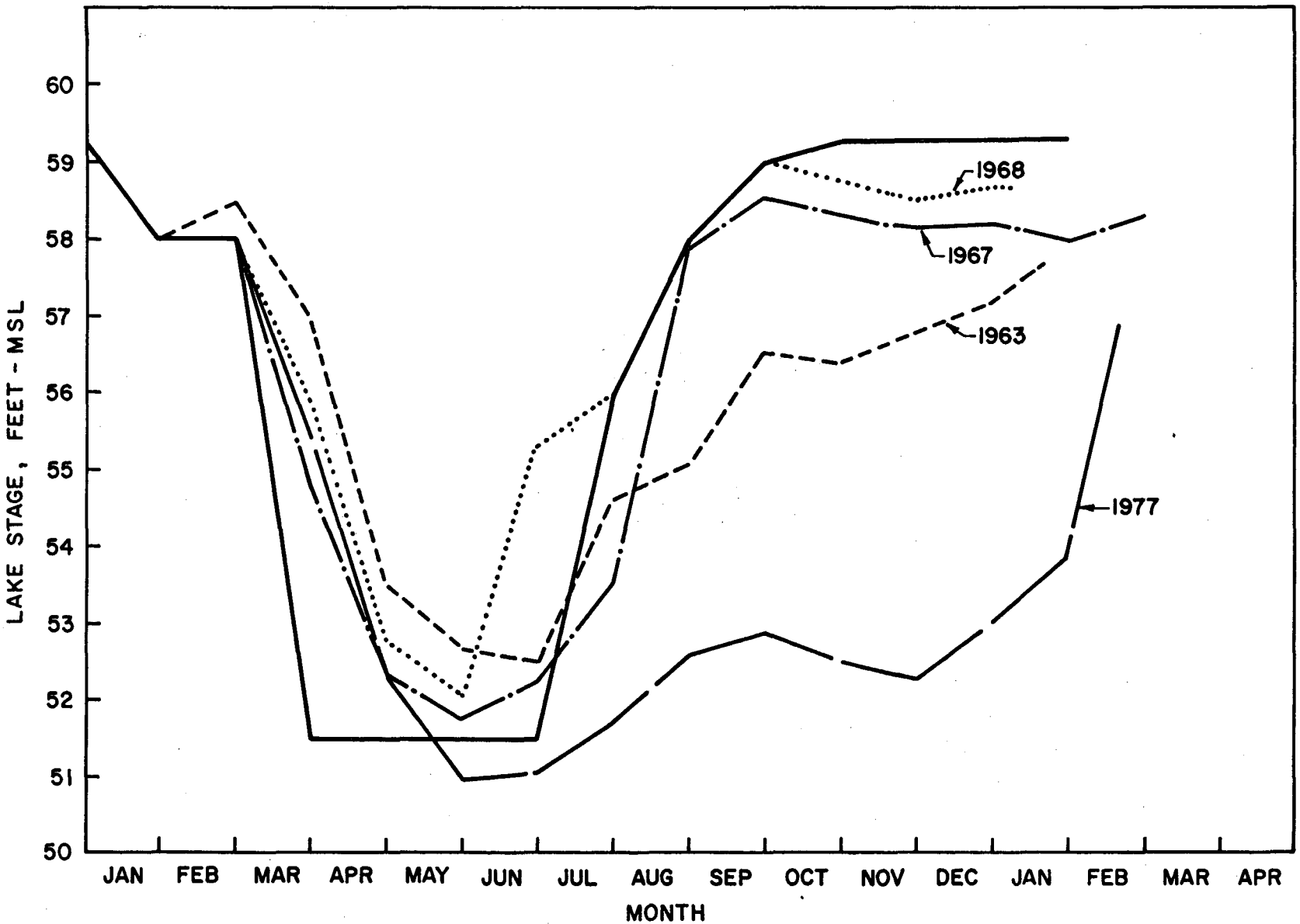


FIGURE 2. Simulated Drawdown Results for Selected Years of Record.