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**CONTINUOUS SIMULATION MODEL  
A RECENT CASE STUDY  
FOR A LAND- LOCKED SYSTEM**

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LAKE SHERWOOD  
ORANGE COUNTY, FLORIDA

funded by Orange County

project manager: Krishna Krishnamurthy, Ph.D., P.E.

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# LAKE SHERWOOD

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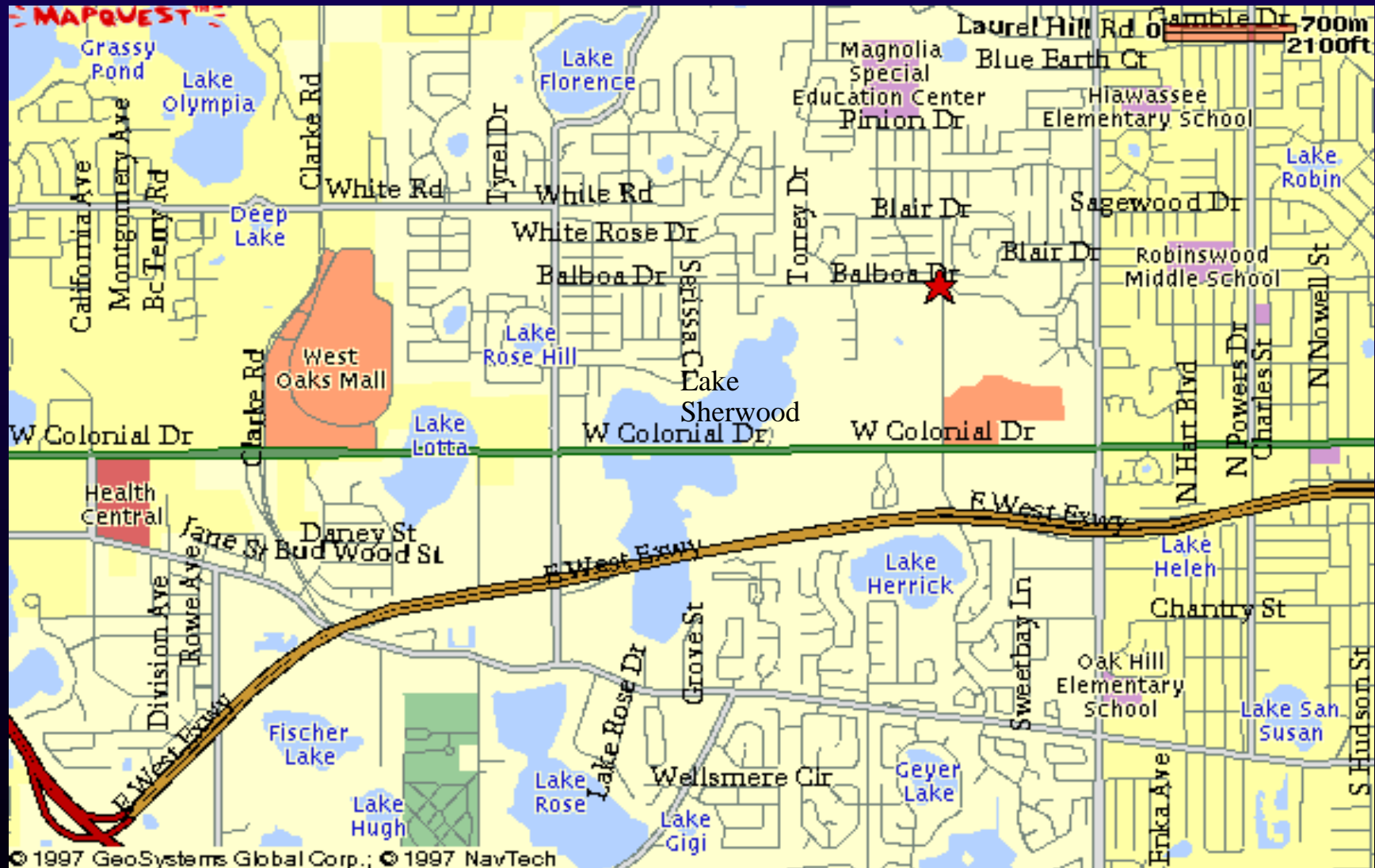
## BACKGROUND DATA

Lake Sherwood is a land-locked lake in western Orange County (Fl). It has the largest range of water level fluctuation recorded for lakes in Orange County. The maximum recorded lake stage was  $\approx +88$  ft in October 1960 following Hurricane Donna; the minimum was  $\approx +55$  ft NGVD in December 1981 following a period of drought.

During the high water period in 1960, numerous homes on the north side of the lake were flooded for almost a year.

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# SITE LOCATION



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# LAKE SHERWOOD

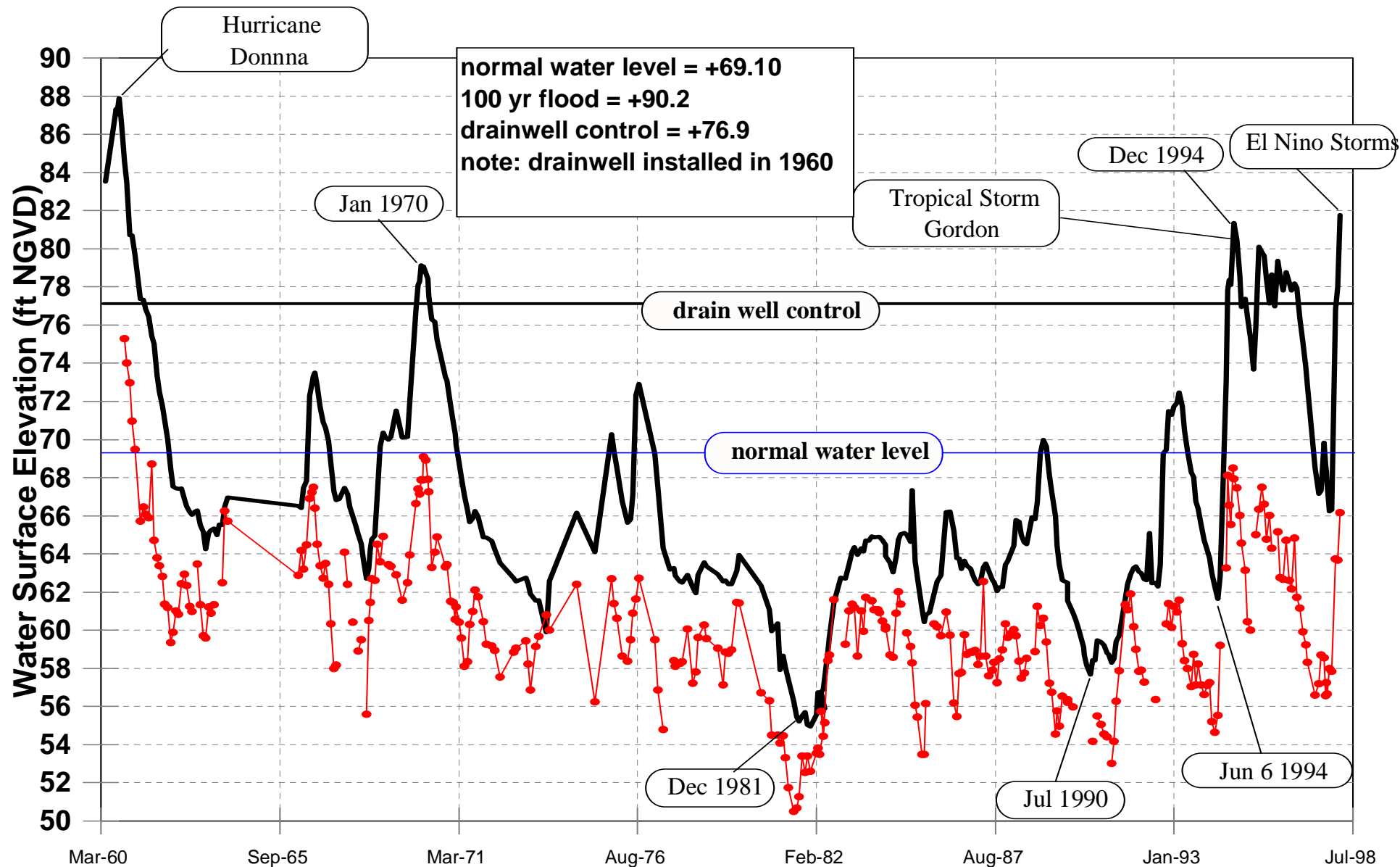
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## BACKGROUND DATA (Continued)

Following the high water in 1960, a 24-inch diameter drainage well was installed to discharge water from Lake Sherwood to the underlying Floridan aquifer. Water flows from the lake into the drainwell when the lake stage exceeds +76.9 ft.

At the present time, there are no other outfalls from this “closed” lake other than the drainwell.

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— Lake Sherwood

—•— Potentiometric Surface - Well OR 47

# LAKESHERWOOD

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## SOME RECENT OBSERVATIONS

- ❑ Between June 1994 and September 1994, the water level in Lake Sherwood rose over 16 ft (from +61.64 → +77.86 ft) and the drainage well started flowing.
  - ❑ Between November 1996 to July 1997, the water level dropped over 10 feet (+77.95 → +67.17 ft)
  - ❑ With the El-Nino driven rainfall in December 1997, the lake level rose over 10 ft in one month (+66.34 ft on Dec 5, 1997 → +76.85 ft on Jan 12, 1998).
  - ❑ With more El-Nino driven rainfall in February 1998, the lake level rose to +81.77 ft on March 3, 1998, or over 15 feet above its level 3 months before (Dec 5, 1997). Note that the +81.77 ft level was the highest recorded following the installation of the drain well.
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# LAKE SHERWOOD

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## BACKGROUND DATA (Continued)

Lake Sherwood is the terminus of a chain of interconnected lakes which include Lake Lotta, Lake Rose, and Steer Lake. These lakes have a combined watershed area of over 4,500 acres.

Development is progressing rapidly within the 4,500+ acre watershed and citrus groves are being developed, thus increasing the impervious area and surface water runoff. Given the existing/ future development and the sheer size of the contributing watershed (>4,500 acres), the Lake Sherwood drainage well is perhaps the most critical drainage well in unincorporated Orange County.

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some of the more recent problems (March 6, 1998)





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# LAKE SHERWOOD

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## STUDY PURPOSE

Orange County and the St. Johns River Water Management District (SJRWMD) are exploring the possibility of modifying the Lake Sherwood drainwell as part of a pilot study on stormwater drainwells.

It is proposed to lower the discharge elevation of the Lake Sherwood drainwell to enhance recharge to the Floridan aquifer and provide more effective flood management of the lake.



# LAKESHERWOOD

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## SPECIFIC OBJECTIVES

Calibrate a model to existing conditions. Use the calibrated model to make predictive simulations for scenarios where the discharge elevation of the Lake Sherwood drainwell is lowered by:

- ❶ 1 ft to +75.86 ft NGVD,
- ❷ 2 ft to +74.86 ft NGVD,
- ❸ 3 ft to +73.86 ft NGVD, and
- ❹ 4 ft to +72.86 ft NGVD.

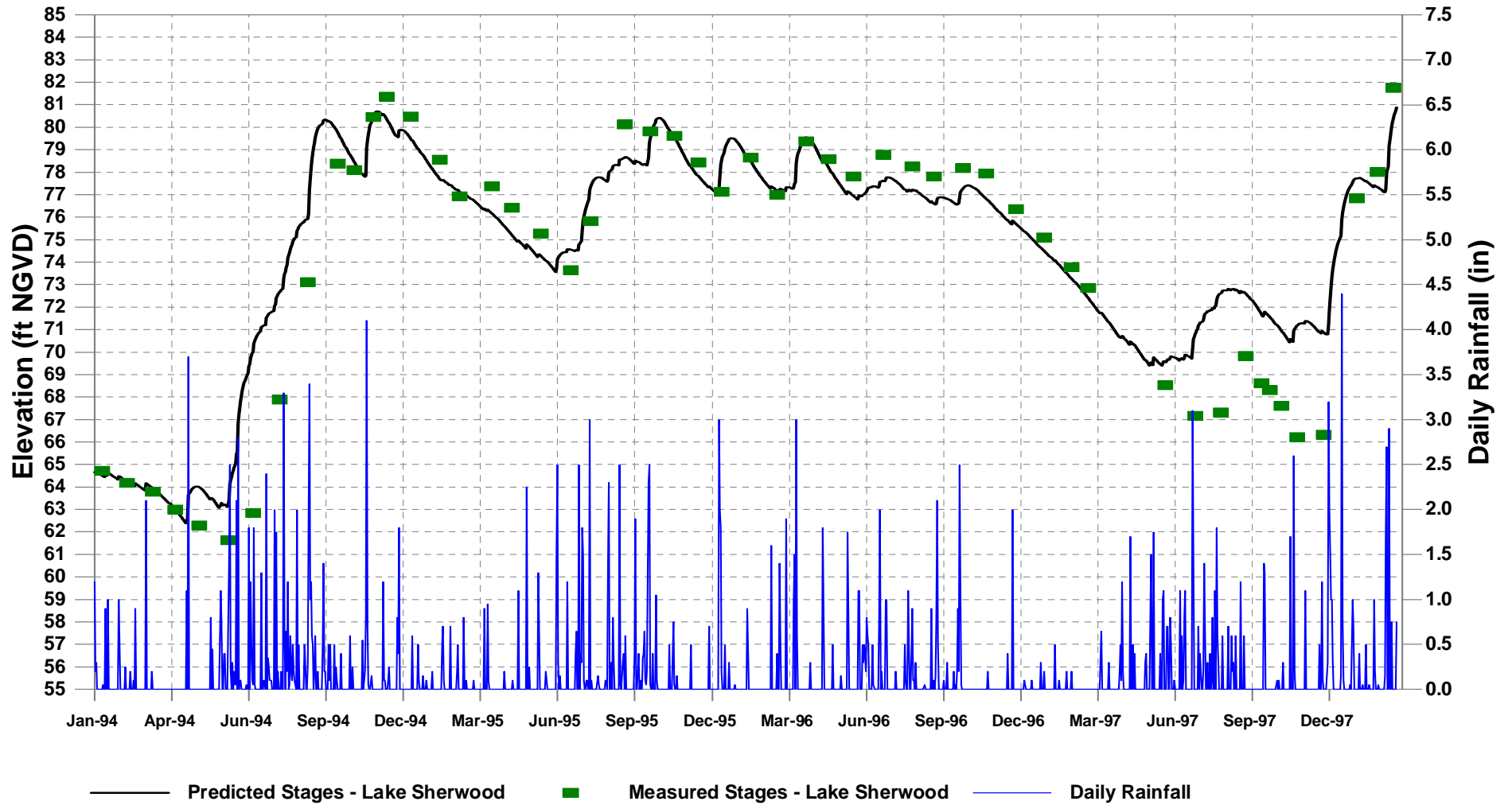
# LAKE SHERWOOD STUDY

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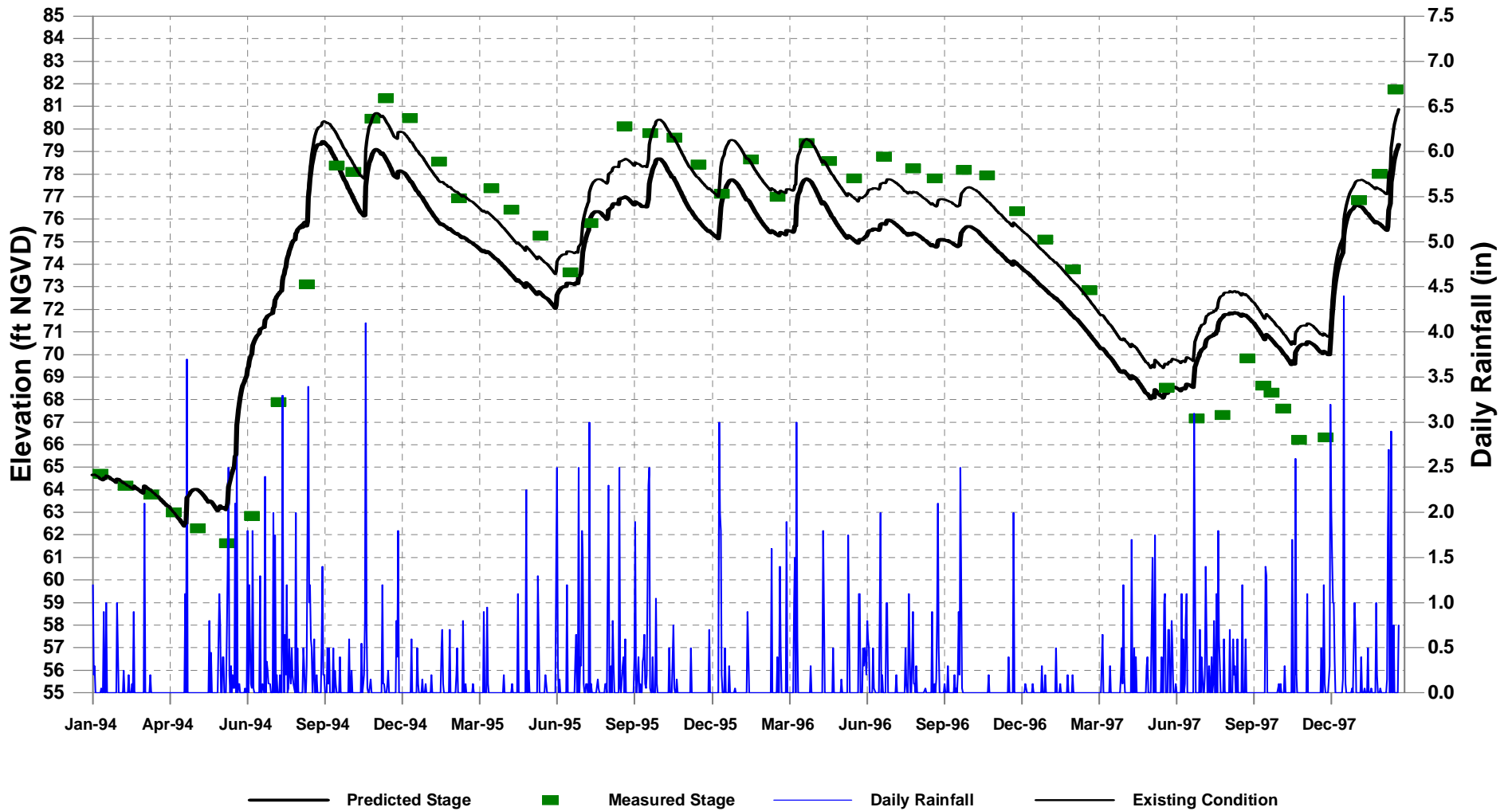
## SIMULATION PERIOD

Continuous simulation hydrographs were routed through the interconnected lakes at a time increment of 24 hours (or 1 day) for the 1,520 day period starting on January 1, 1994 and ending February 28, 1998. This simulation period includes Tropical Storm Gordon on November 15-16, 1994 and the El-Nino driven record rainfall experienced in December 1997 and February 1998. Rainfall over this 4.2 year period was  $\approx 33\%$  above normal.

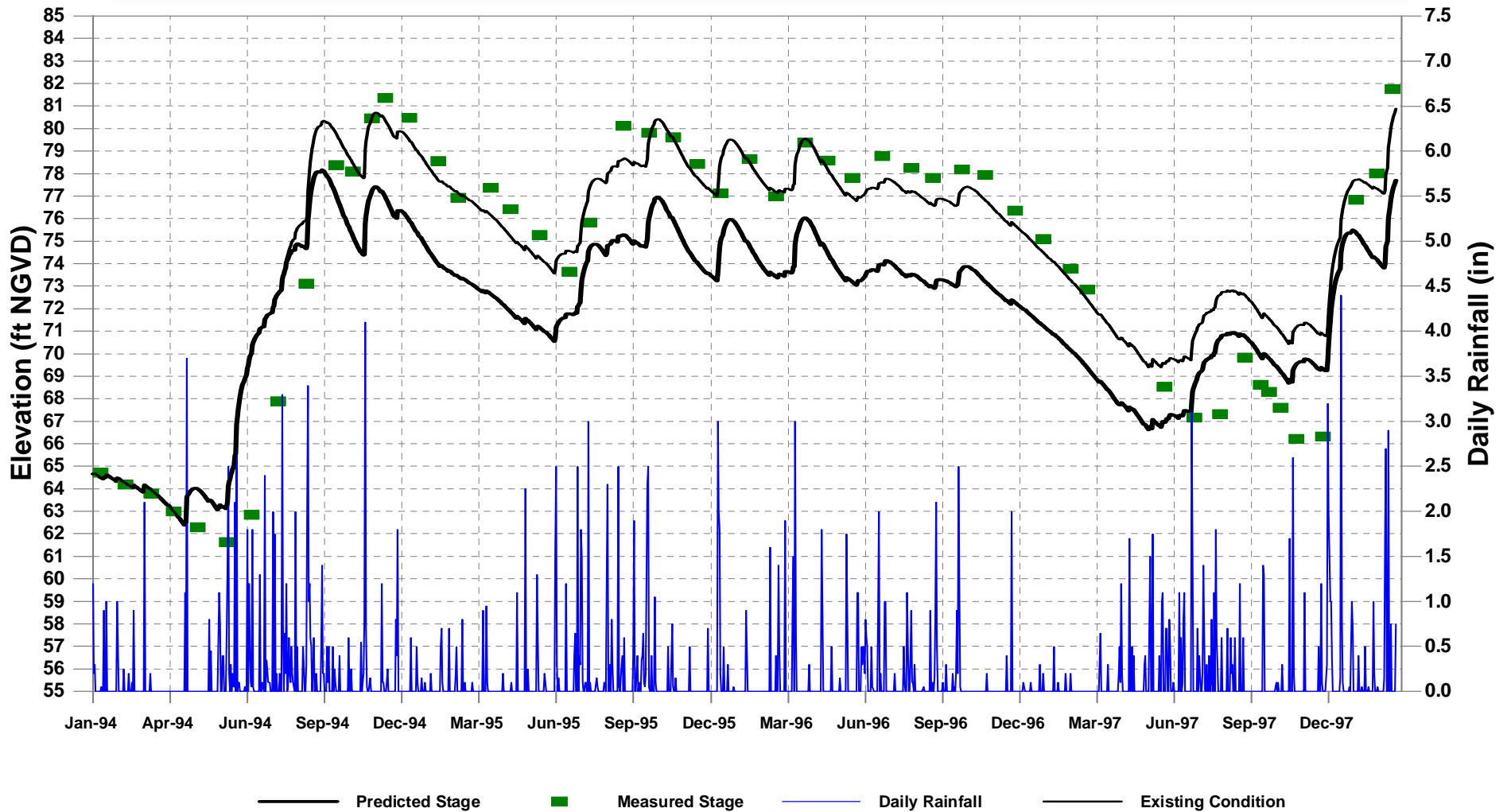
**Figure 5.04: Predicted & Measured Stages in Lake Sherwood (Existing Conditions)  
for Period Jan 1, 1994 to Feb 28, 1998**



**Figure 5.06: Predicted Stages in LakeSherwood if Drainwell is Lowered 2 ft  
for period: Jan 1, 1994 to Feb 28, 1998**



**Figure 5.08: Predicted Stages in LakeSherwood if Drainwell is Lowered 4 ft  
for period: Jan 1, 1994 to Feb 28, 1998**





<b>DRAIN WELL SCENARIO FOR LAKE SHERWOOD</b>	<b>SIMULATION PERIOD: JAN 1, 1994 TO FEB 28, 1998</b>			
	Predicted Peak Stage (ft NGVD)	Discharge Volumes (acre-ft) From Lake Sherwood to Floridan aquifer		
		Overflow Through Drainwell	Vertical Leakage <sup>1</sup>	Total
Existing conditions	80.74	4,802	5,762	10,564
Drain well invert lowered 1 ft	79.98	5,405	5,380	10,785
Drain well invert lowered 2 ft	79.46	6,018	4,991	11,009
Drain well invert lowered 3 ft	78.85	6,636	4,596	11,232
Drain well invert lowered 4 ft	78.18	7,257	4,197	11,454

- Notes:
- vertical leakage is the vertical ground water flow component to the underlying Floridan aquifer within the body of the lake (a.k.a. deep recharge).
  - Total = overflow through drainwell + vertical leakage