THE 1990 LAKE GEORGE LAY MONITORING PROGRAM

by

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INTRODUCTION

October brought the eleventh year of the Lake George Lay Monitoring Program to a close. Even though there were a few slight changes in the sites sampled, the quanity of data collected by the lay monitors was still staggering. They ascertained over 300 discrete Secchi depth and surface water temperature readings. This efficiently achieved the goal of the program which was to collect a large amount of physical lake data through the voluntary efforts of Lake George basin residents. A beneficial side-effect of the Lay Monitoring Program was the opportunity to educate basin residents with hands-on experience about lake water quality and techniques used to study freshwater ecology.

The basic water quality parameters measured by all lay monitors included water temperature and transparency (Secchi depth). Usually, chlorophyll was sampled as well, but this year, unfortunately, chlorophyll collections were not cost-effective. The lay monitors provided a great service by sampling the entire lake weekly, and by supplying information that would not otherwise be collected by the Rensselaer Fresh Water Institute.

SAMPLING SITES AND COLLECTION METHODS

There were a few changes in site locations this year, but once settled, the Lake George Lay Monitoring Program picked up a net gain of two sampling sites. Thirty-nine seperate areas were observed. More importantly, the monitored sites were spread throughout the lake covering nearly every mile between the Paulist Fathers (1.75 miles from Lake George Village) and

Hearts Bay (29.2 miles from the village). Figure 1 shows a map of these locations and Table 1 is a list of lay monitors with their respective sites.

All monitors were equipped with a calibrated thermometer, Secchi disk, and data sheets. They were asked to record each week their observations and measurements of weather conditions (e.g., wind, lighting, air temperature), surface water temperature and Secchi depth during the months of June through September. Secchi depth is a measurement of water clarity determined by lowering an eight inch diameter, black and white Secchi disk into the water until the viewer can no longer see it. Data were to be collected between 10 A.M. and 2 P.M. when the sun was as nearly directly overhead as possible. When convenient, measurements were to be limited to days with calm, clear weather in order to reduce the influence of waves and wind on the Secchi depth readings. In actuality, however, not all data were recorded under ideal conditions.

RESULTS

A total of 327 Secchi depths and corresponding surface water temperatures were reported starting May 2nd and ending October 20th. Weekly samplings were not necessarily continuous between these dates.

Surface water temperatures ranged from 11°C (51.8°F) on May 2nd to a high of 27°C (80.6°F) on July 30th. A late autumn low of 15°C (59.0°F) was reported on October 20th, the final sampling date. These data, plotted by week, are shown in Figure 2. Please note that points are only connected when the weeks are consecutive. The average surface water temperature for Lake George during the sampling season of 1990 was 21.9°C (71.4°F), scarcely different from the summer of 1989.

Water clarity in 1990 decreased one-half meter from 1989's low, but gained one-half meter on last year's high. Lake George water transparency spanned from 4.5 meters (14.76 ft) (Dunhams Bay, 07/09/90 and 08/20/90) to 13.5 meters (44.3 ft) (Scotch Bonnet, 08/04/90). The whole-lake average of water clarity increased to 9.0 meters from 8.5 meters last year, a difference of 19.8 inches. Accurate statistical analyses on the lay monitors' data is difficult due to the amount of variability in sampling conditions, eye sight, and differing number of volunteers and sites sampled each year. Therefore, it is hard to determine whether differences in average Secchi depths between years are significant. The only real information we can draw from the data are trends. For example, from 1980 to 1983 there was a steady drop in average water clarity to a low of only 7.8m (25.6 ft). Since 1984, water transparency has improved but in recent years has leveled off near 9 meters (29 ft). Figure 3 shows the relationship of yearly Secchi depth averages.

Average Secchi depths per site are plotted against distance from Lake George Village in Figure 4. From the graph, a general trend is apparent; water transparency is greater in the north basin than in the south. In fact, 2m (6.6 ft) is the difference in average clarity between the two basins (southern, 8.1m, 26.6 ft; northern, 10.1m, 33.1 ft). The trend of increasing transparency along a transect running from the southern end of Lake George north has been well documented in previous Rensselaer Fresh Water Institute Lay Monitoring Program reports.

An interesting note is the change in average Secchi depth; the change in the southern basin matched the change in the northern basin. Basically, this suggests that a uniform shift occurred throughout the lake.

Figure 5 is a plot of average Secchi depths by week comparing the two basins. Determining a seasonal trend in transparency is difficult due to day to day variability including wind and wave action and relative cloud cover. However, the graph is still informative. Please notice the dip in the curve during the first three weeks in August. Using the NOAA Climatological Data for the Glens Falls Airport (1990,1991), a plot was generated showing the year's precipitation compared to normal precipitation (Figure 6). The graph clearly indicates a wet August and a dry July and September. August weather, according to NOAA, dumped an additional 4.93 inches of rain on the area. This may easily explain the three week slump of Secchi disk readings in the beginning of August for both the northern and southern basins. Another interesting point from Figure 5 is that both basins reflect their highest Secchi readings in the week preceding and the week following that slump.

CONCLUSIONS

The results of the 1990 Lake George Lay Monitoring Program suggest a number of trends present in the Secchi transparency of the various sites sampled. These trends include:

- Greater Secchi transparency in the North basin than the South basin.

- Plateau effect in the improvement of water clarity.

- Uniform change in Secchi depth between basins.

- Relationship between heavy rain and decreased water clarity.

These trends support conclusions reached in the 1990 Lake

George Chemical Monitoring Program (FWI, 1990) in that greater concentrations of nutrients (nitrogen and phosphorus) and greater overall productivity were found in the south basin when compared to the north basin. Higher concentrations of nutrients generally result in more phytoplankton and thus reduced transparency.

The source of the elevated levels of nutrients in the south basin has been the subject of a number of studies (Gibble, 1974; Ferris and Clesceri, 1975; Aulenbach, 1979; Wood and Fuhs, 1979; Sutherland et al., 1983; and Dillon, 1983). Although estimates differ on the precise amounts of nutrient loading from various sources, all investigators agree that atmospheric deposition (rain, snow, and dryfall), erosion, and urban runoff are the major sources of nitrogen and phosphorus to the lake. In addition to these plant nutrients, erosion and urban runoff are the leading causes of sedimentation in Lake George. Urban runoff includes rainwater that washes tons of road salt and sand into the lake. This is particularly evident at the deltas of English, Finkle, East, West and Hague Brooks. Erosion, both natural and instigated, occurs all around the basin where bare soil is left open to the elements. Wind, rain and snowmelt all contribute to increased suspended solids, and therefore, decreased water transparency in Lake George. August rains and Secchi measurements lend themselves as a demonstration of this.

Erosion and urban runoff may be mediated in a variety of ways including sediment traps, management of vegetation in shoreline and riparian zones, replacement of impermeable with permeable surfaces, reduction in amount of road sanding, and a host of other methods dependent on the type and quantity of surface runoff. It should be the responsibility of all persons interested in the water quality of Lake George to press for more effective runoff controls.

ACKNOWLEDGMENTS

The staff of the Rensselaer Fresh Water Institute would like to thank all of this year's Lay Monitors for a job well done. The Lake George Lay Monitoring Program continues to provide an enormous amount of valuable data in a very cost effective manner. Results of this program support conclusions generated through this and other RFWI research activities whose overall goal is protection of the water quality of Lake George. You should be justifiably proud of your efforts.

Special thanks go to Mr. C.A. Kennedy who has collected Lay Monitoring data for eight years and to George and Helene Olsen who did the same for two years. Happy retirement to you all.

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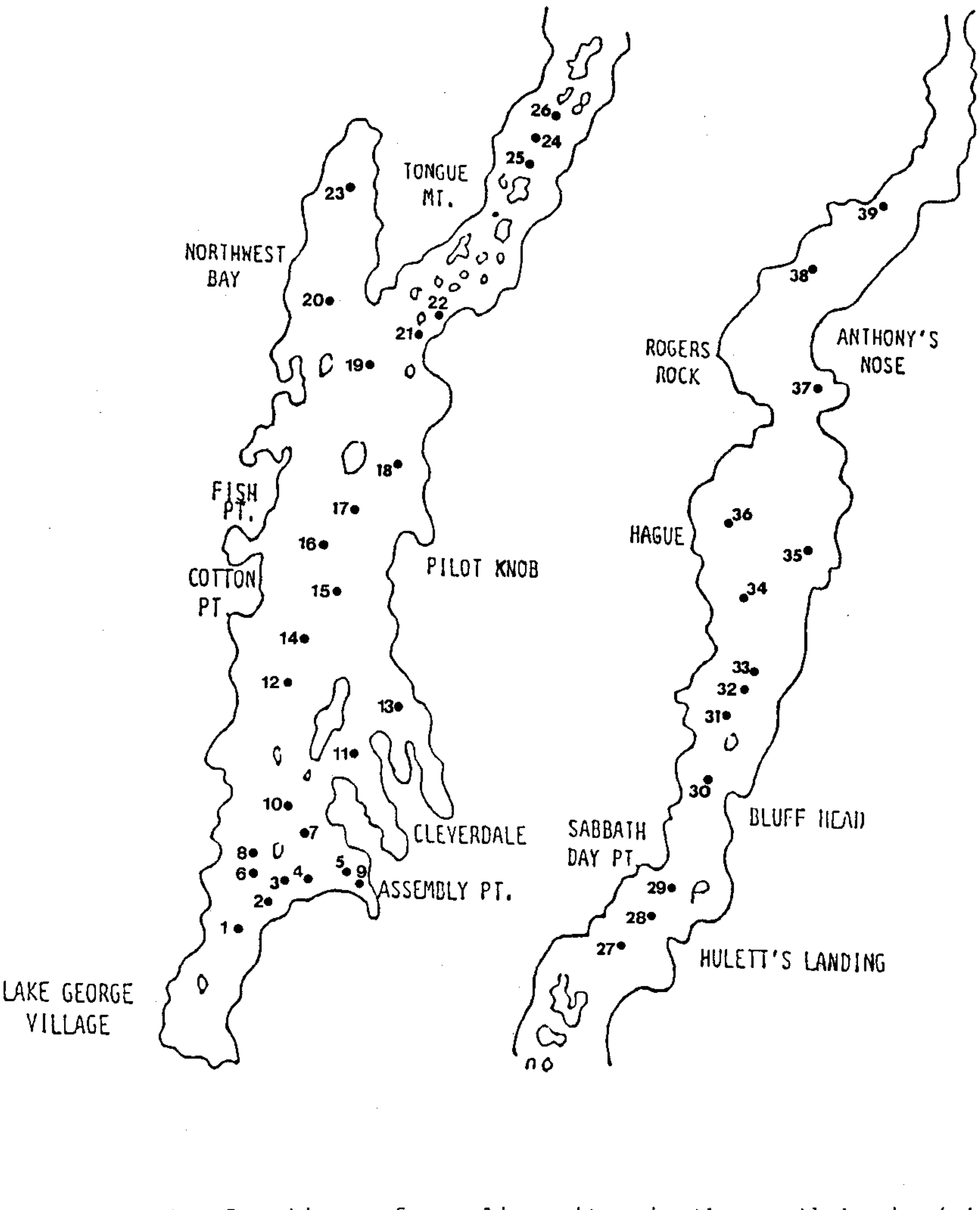

Figure 1. Locations of sampling sites in the north basin (right) and south basin (left) of Lake George.

Table 1. Volunteer Lay Monitors and the sites where they obtained Secchi depth and surface temperature measurements.

Monitor	Site No.	Site	Mile
SOUTH BASIN			
Blake	1	Paulist Fathers	1.75
	2	Plum Point midlake	2.25
	3	Woods Point	2.50
	4	Dark Bay	2.60
	5	Mouth of Dunhams Bay	3.20
Harrison	6	Diamond Is. (half mi. SW)	2.55
	7	Diamond Is. (half mi. NE)	3.70
Boehm	8	Cramer Point:Diamond Is.	3.00
	9	Dunhams Bay	3.30
	10	Diamond Is.:Canoe Is.	3.90
Wrigley	11	Assembly Pt.:Ripley Pt.	4.90
	12	Middleworth Bay midlake	5.80
Sebold	13	Kattskill Bay	5.75
	14	Long Is.:Cotton Point	6.25
Johnson	15	Cotton Pt.:Barber Bay	7.10
	16	Fish Pt.	7.75
	17	Three Bros. Is.:Phelps Is.	8.60
Summerhayes	18	Dome Is.: Watch Pt.	9.30
	19	Crown Is.: Shelving Rock	10.70
	20	Northwest Bay mouth	11.30
Whalen	21	Fourteen Mile Island	11.20
	22	Shelving Rock:Knapps Bay	11.25
Brown	23	Walker Pt. NWB	13.10

Table 1 cont.

Monitor	Site No.	Site	Mile
NORTH BASIN			
Brown	24	French Pt. midlake	13.50
Vilmar	25	Hazel Is. midlake	13.00
	26	Dollar Is.:Black Mt. Pt.	14.00
Olsen	27	Vicars Is.:Burgess Is.	17.60
	28	Vicars Is.:Agnes Is.	18.50
	29	Agnes Island midlake	19.00
Buck	30	Bluff Head:Werners marina	20.00
	31	Slim Pt.:Odell Is.	20.90
	32	Skipper Is.:Lamb Shanty	22.20
Bryant	33	Scotch Bonnet:Mallory Is.	22.70
	34	Jenkins Pt.	23.90
	35	Gull Is.:Skerry Pt.	24.00
	36	Hague Brook	24.50
Martin	37	Blairs Bay - Glenburnie	26.40
	38	Rogers Rock	28.50
	39	Hearts Bay	29.20

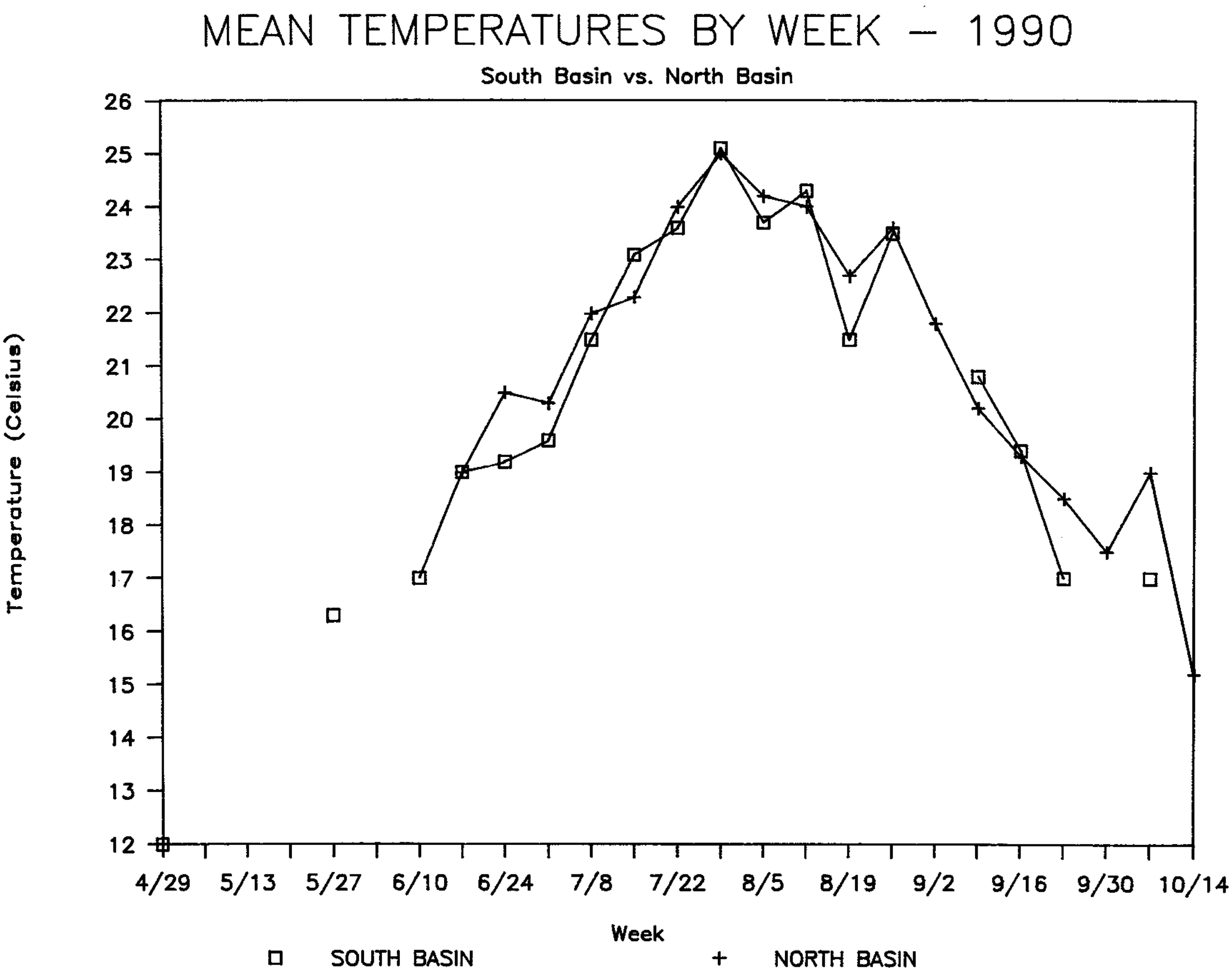

Figure 2. Surface water temperature by week in North and South basins of Lake George for the summer of 1990.

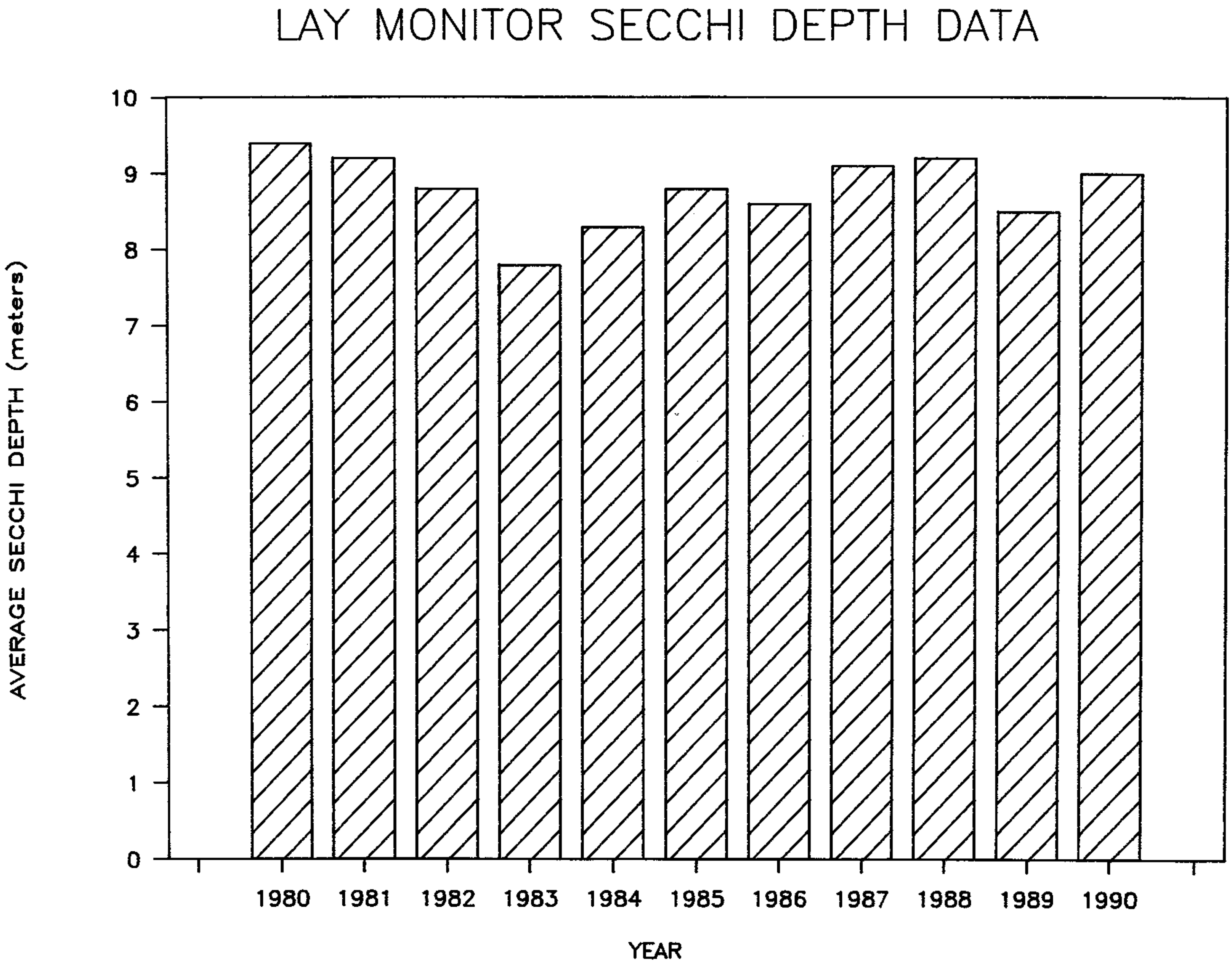

Figure 3. Average whole lake Secchi depths by year.

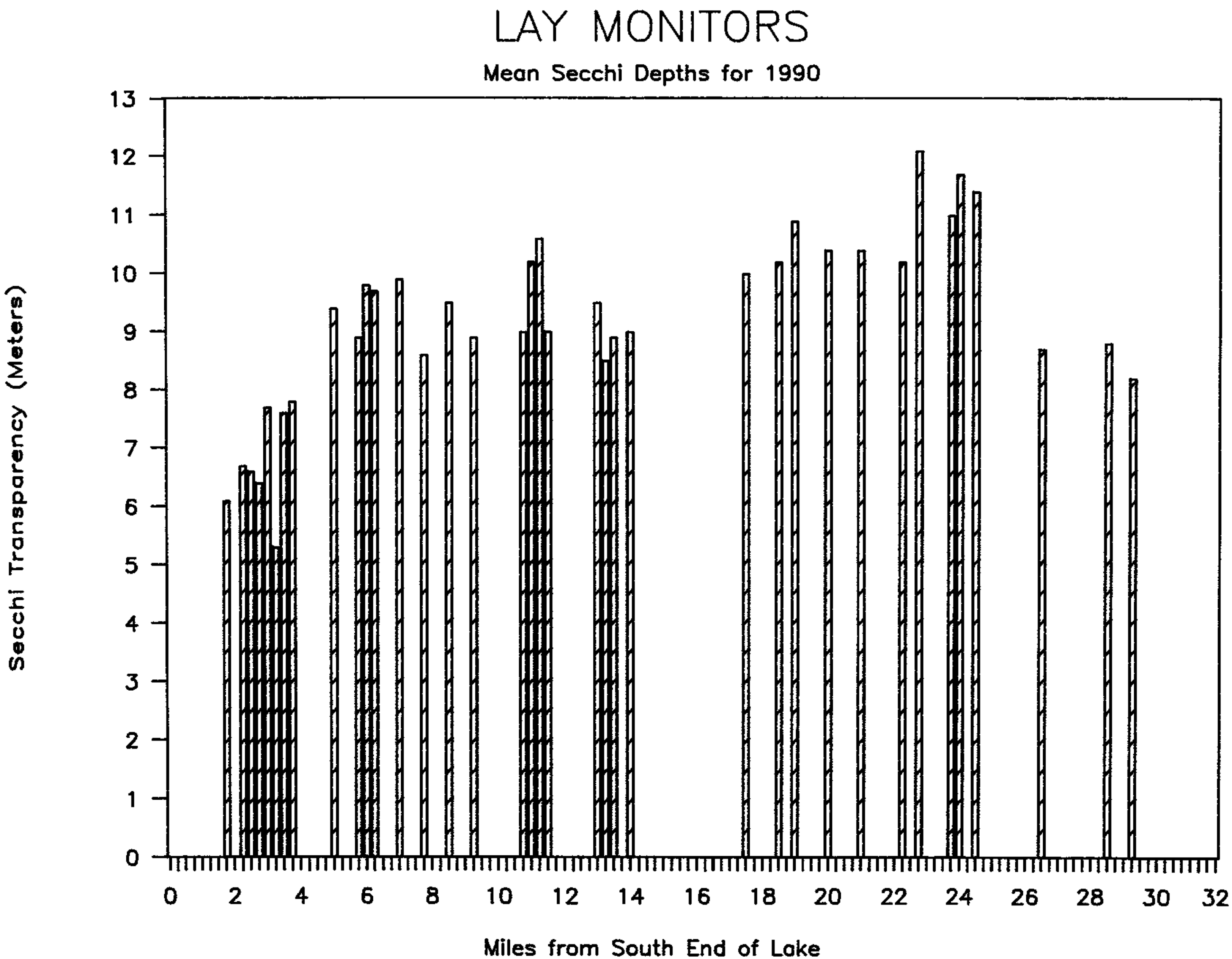

Figure 4. Average water transparencies by site vs. distance from south end of Lake George.

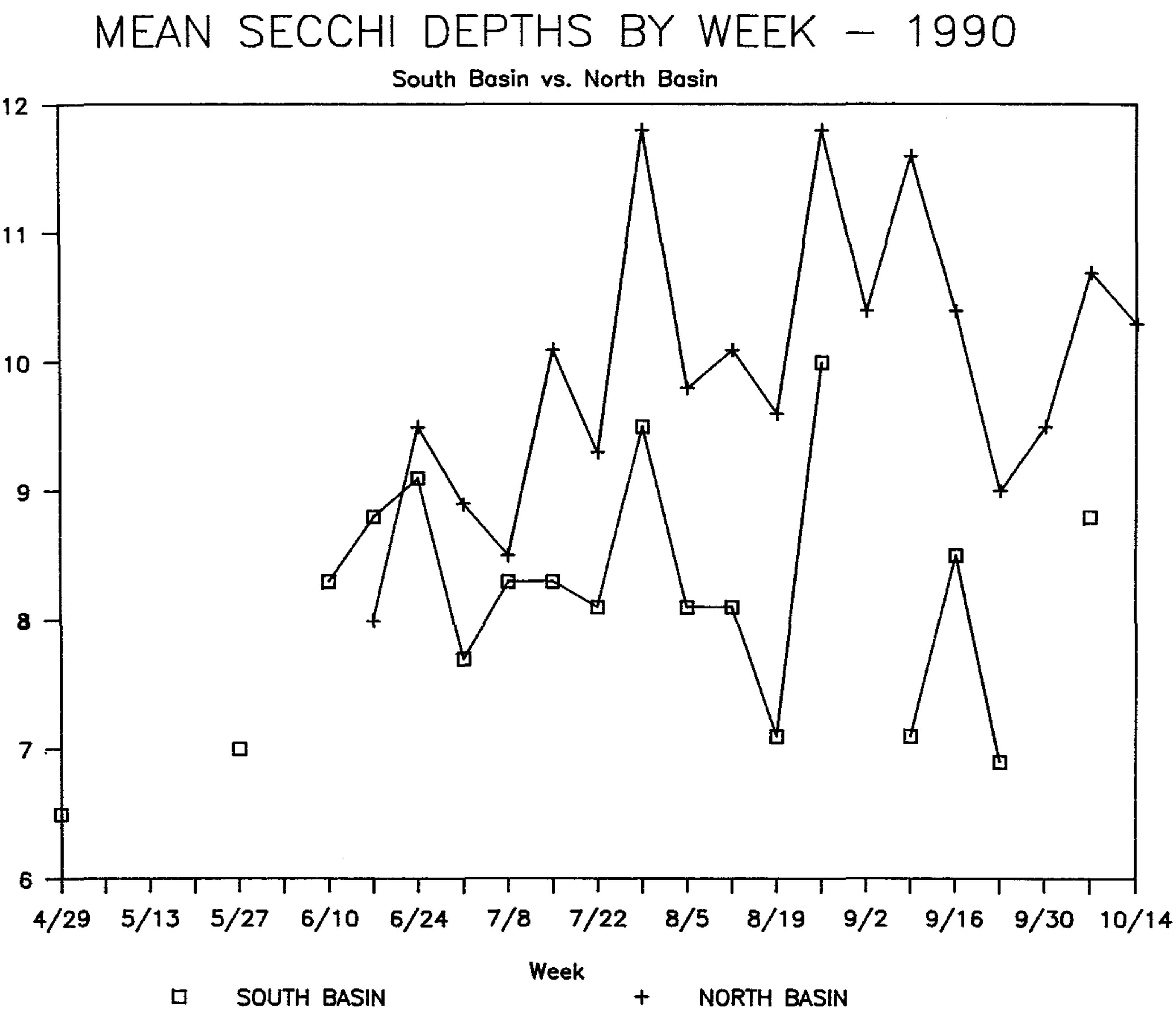

Figure 5. Surface water temperatures by week in North and South basins of Lake George for the summer of 1990.

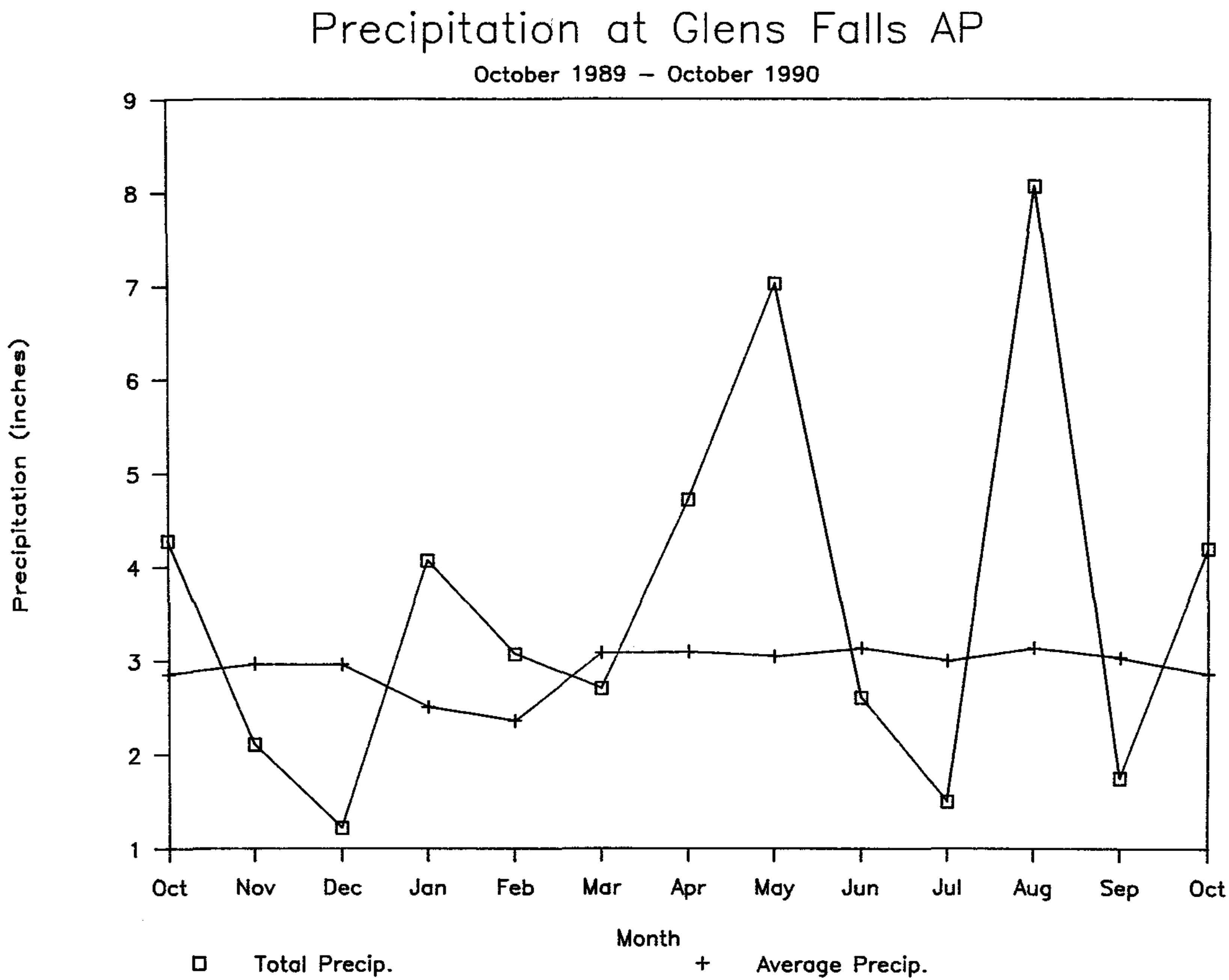

Figure 6. Average precipitation at the Glens Falls Airport from October 1989 through October 1990.