A HYDROLOGIC STUDY OF LAKE GEORGE AND THE UPPER KINNICKINNIC RIVER WATERSHED

by

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Chapter 1

INTRODUCTION AND STATEMENT OF THE PROBLEM

The Kinnickinnic River is a small to medium sized perennial stream approximately 25 miles long that drains a 67,981 acre watershed in parts of Saint Croix and Pierce County, and flows into the Saint Croix River about half way between Hudson and Prescott. (Figure 1. Location of the upper Kinnickinnic River watershed). It is a peaceful river valley that winds its way through hundreds of acres of very productive agricultural land from the beginning to the city of River Falls. From River Falls to the Saint Croix River the Kinnickinnic has cut several feet through limestone and sandstone to form a deep narrow valley with rough and wooded terrain. Being located within one hours commuting distance of Saint Paul - Minneapolis, this area has been under extreme pressure for residential and recreational development. This area is presently being studied under a Federal Tile I Project for the purpose of proper land use planning. Federal, State and local agencies and groups have suggested that this nearly pristine river valley is ideally suited for outdoor recreation, nature study and park development. Therefore, it is extremely important that proper land use planning be implemented to control residential and private recreational development and to encourage public agencies to control, develop and preserve this area for all public use for years to come.

The primary pressure upon the upper part of the river is from agriculture. Several farmsteads are located very close to the river and with expanding cattle numbers several problems with animal wastes getting into the river have been identified. Many fields cultivated for crop production lie adjacent to the river and any soil erosion from

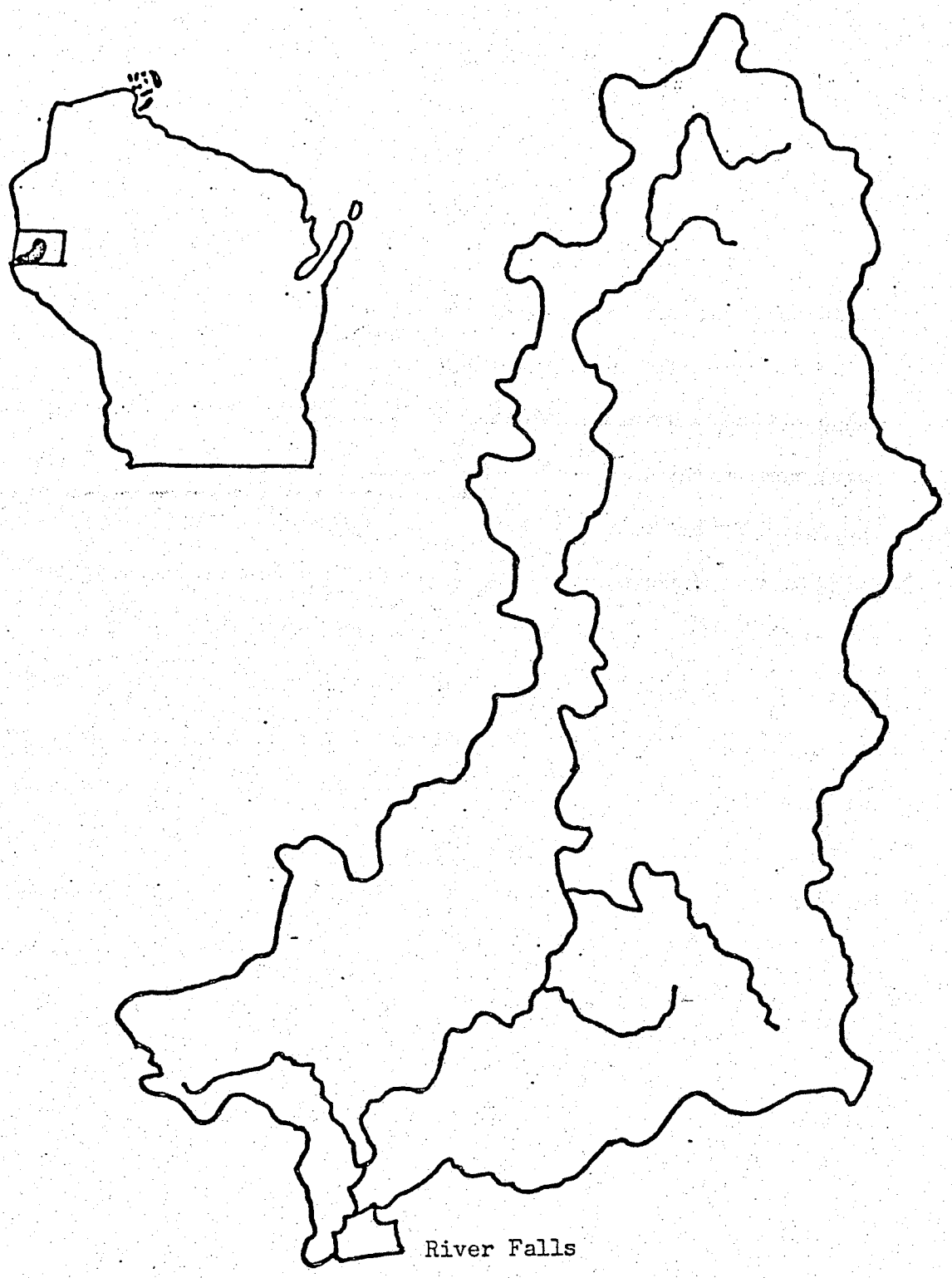

Figure 1: The Upper Kinnickinnic River watershed in St Croix Co. Wisconsin

these fields results in sediment load in the river. Cattle grazing and watering along stream banks destroy the vegetation and accelerate the stream bank erosion process. A number of town, county, state and federal highways run adjacent or cross the river. Erosion from road cuts during or after construction lead to sediment in the river. Fertilizers, herbicides and insecticides spread on adjoining fields can be sources of nutrients and organic materials getting into the river. The Kinnickinnic is also an excellent trout stream and was written up in Field & Stream as one of the best trout streams in the state of Wisconsin. To help protect trout fishing in the upper part of this river the Department of Natural Resources in 1950 established a stream habitat program in cooperation with land owners along the river. In this program 25 feet of easement back from the waters edge is obtained from the landowner and fenced to keep cattle off these river banks. In return a tax free status is obtained for the landowners on this river bank land. Through cooperative programs such as this a desirable stream bank environment is maintained for public use and individual land ownership is maintained.

The Kinnickinnic River flows into Lake George within the city limits of River Falls. The lake is a reservoir formed by a dam across the river originally built in 1867. This first dam was washed out by the flood of 1894 but was replaced in 1904 by the dam that still remains at that site. Lake George located where it is could provide excellent recreational facilities for the city if its characteristics could be improved and maintained. Since the dam was built much of the lake has silted in, greatly limiting the potential use of the lake. Evaluations of these sediments and flow characteristics of the Kinnickinnic River will help determine alternate management plans.

To protect the present environmental quality of the upper Kinnickinnic River Valley and Lake George into which the river flows, it is very important to understand all hydrologic characteristics of the watershed and the lake. Complete evaluation of all hydrologic characteristics will also be necessary if changes are to be made to enhance the recreational use, agricultural use, and urban development of the area.

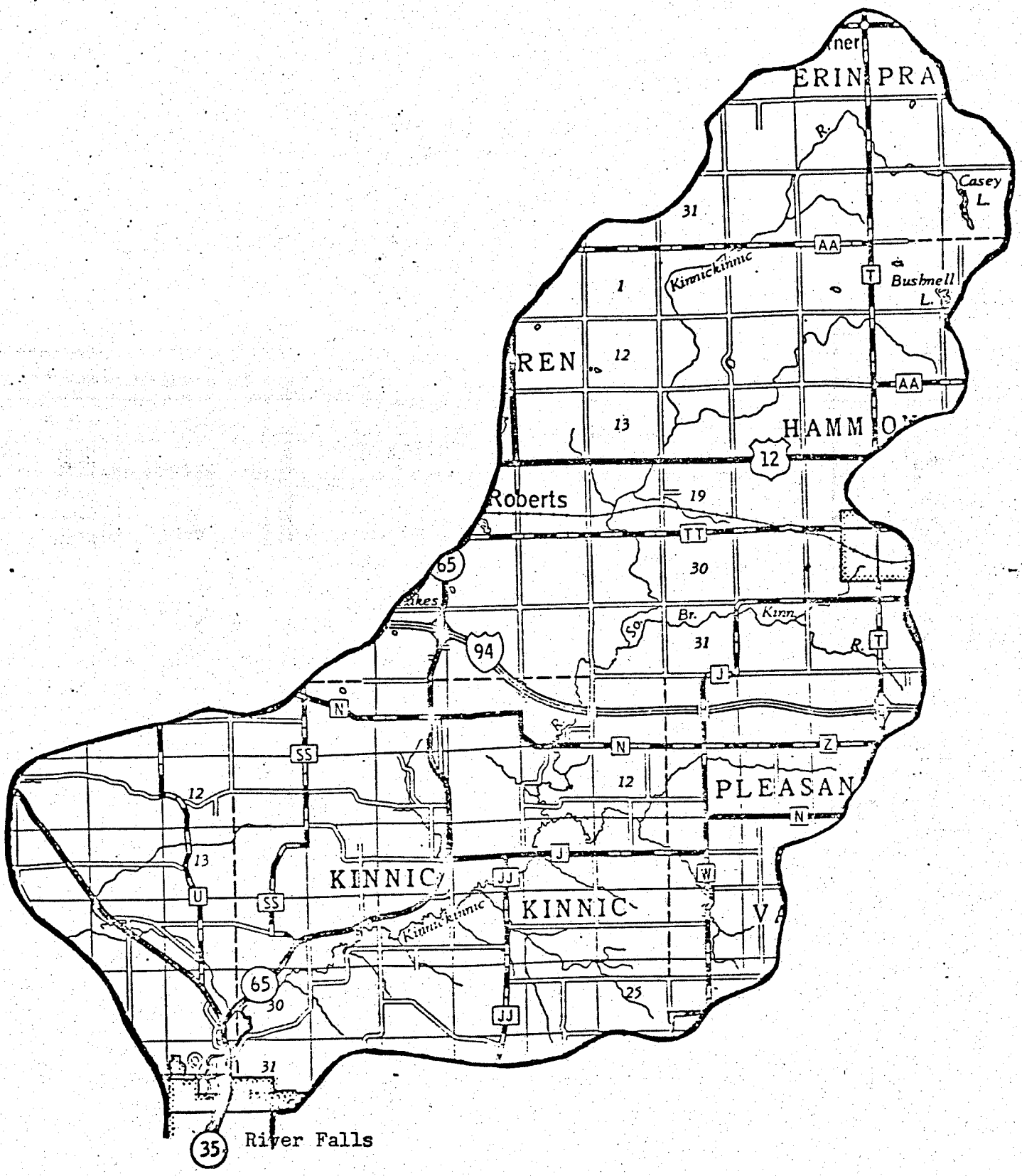

Figure 2: The Upper Kinnic River watershed

Chapter 2

CLIMATE

The climate of the watershed is of the continental type. Winters are long and snowy, and many of them are extremely cold. The summers are warm and they usually include several short periods in which the weather is excessively hot and humid.

Changes in the weather can be expected every few days from late in fall through spring. All of the climatic features in this watershed area tend toward the extremes, as the area is influenced greatly by the succession of high and low pressure systems that move from west to east across the country.

Temperatures:

Figure 3 on the following page shows the average temperature, plotted along with the average maximum and average minimum temperatures, for each month.

Lowest average air temperatures, on the watershed, occur during the month of January (10 - 15 F), and the highest average air temperatures (68 - 72 F) are reached in July. The temperatures vary about twice as much in winter than they do in the summer. From mid March to late October the temperatures average above freezing. The average growing season is about 120 days, the ground is generally frozen from late November through early April, and maximum depth of frost of 26 inches occurs in early March.

In spring and fall, which are often short, the temperatures and precipitation are composites of the temperatures and precipitation of both summer and winter.

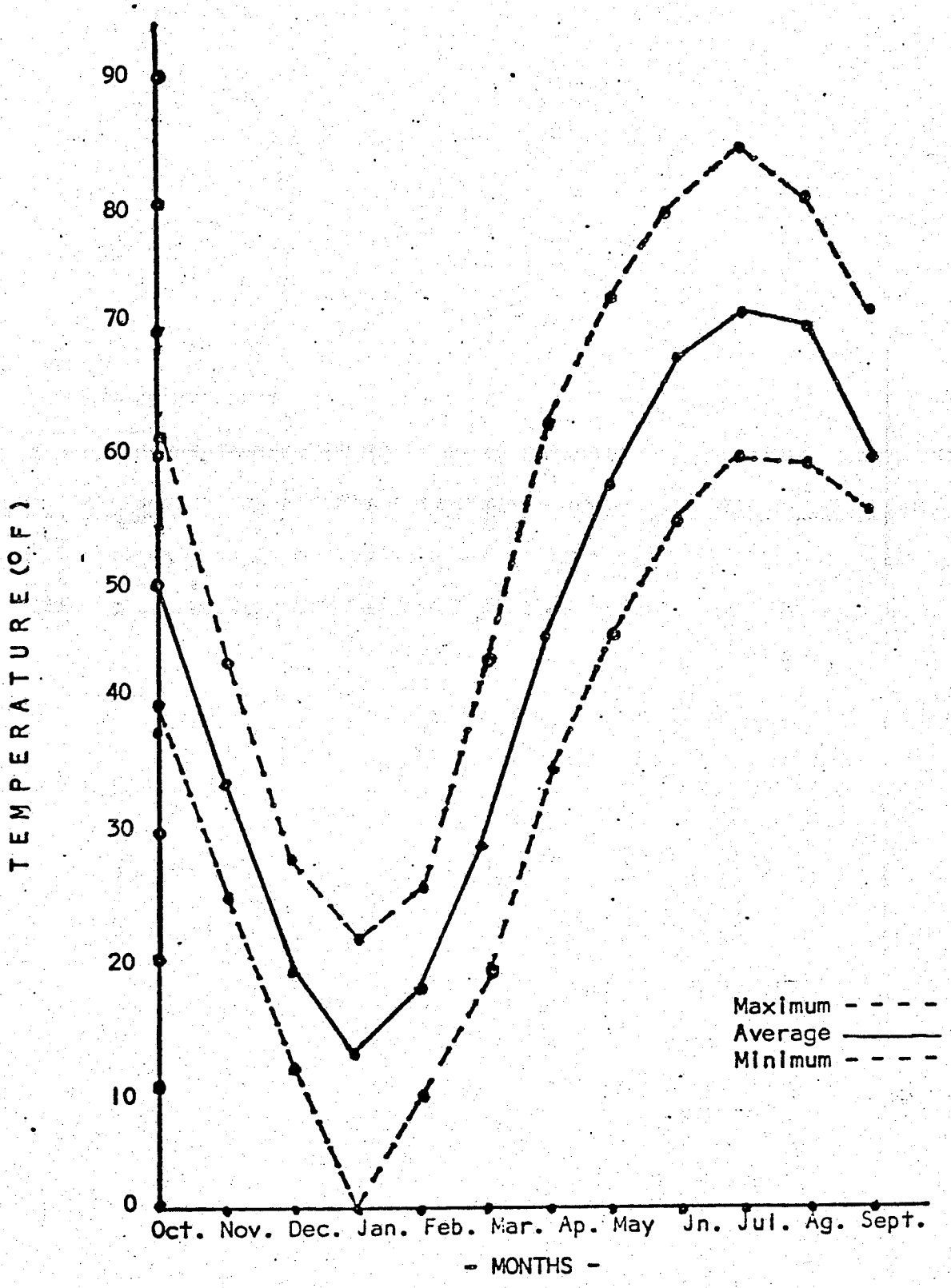

Figure 3-Mean monthly temperature and observed maximum and minimum temperature for the period of record 1918-1973.

Precipitation:

Figure 4 illustrates the average precipitation along with the potential evaporation (PE). The average annual precipitation for River Falls is 29.8 inches with June being the month of greatest precipitation of 4.9 inches and February the least with .8 inches. The extremes in precipitation for River Falls have been from a high of 43.8 inches in 1942 to a low of 17.8 in 1936. About 2/3 of the annual precipitation falls during the growing season. Snowfall comprises about 15% of the annual precipitation. The potential evaporation is highest in July and almost nonexistent from November through March. About once every two years, intensive rainfall occurs on the watershed with rates of 1.4 inches in one hour, 2.1 inches in 6 hours and 2.8 inches in 24 hours. The greatest amount of rainfall measured in 24 hours was 7.25 inches, which fell in River Falls on Memorial Day of 1965.

Potential Evapotranspiration:

Potential evapotranspiration, as computed by the Thornthwaite method, is largely based upon the mean monthly temperature. PE is an index of heat energy available to vaporize water and is an estimate of the amount of evapotranspiration that would occur if plant and soil water were not limiting factors.

The relation of soil moisture to evapotranspiration and precipitation varies throughout the year, as shown in Figure 5. Estimates of monthly "actual" and "potential" evapotranspiration, determined by an empirical method (Thornthwaite and Mather, 1957), illustrate the monthly water balance for River Falls. Winter snow accumulation and spring rainfall maintain a soil-moisture surplus through spring. The monthly surplus decreases as evapotranspiration increases during the spring,

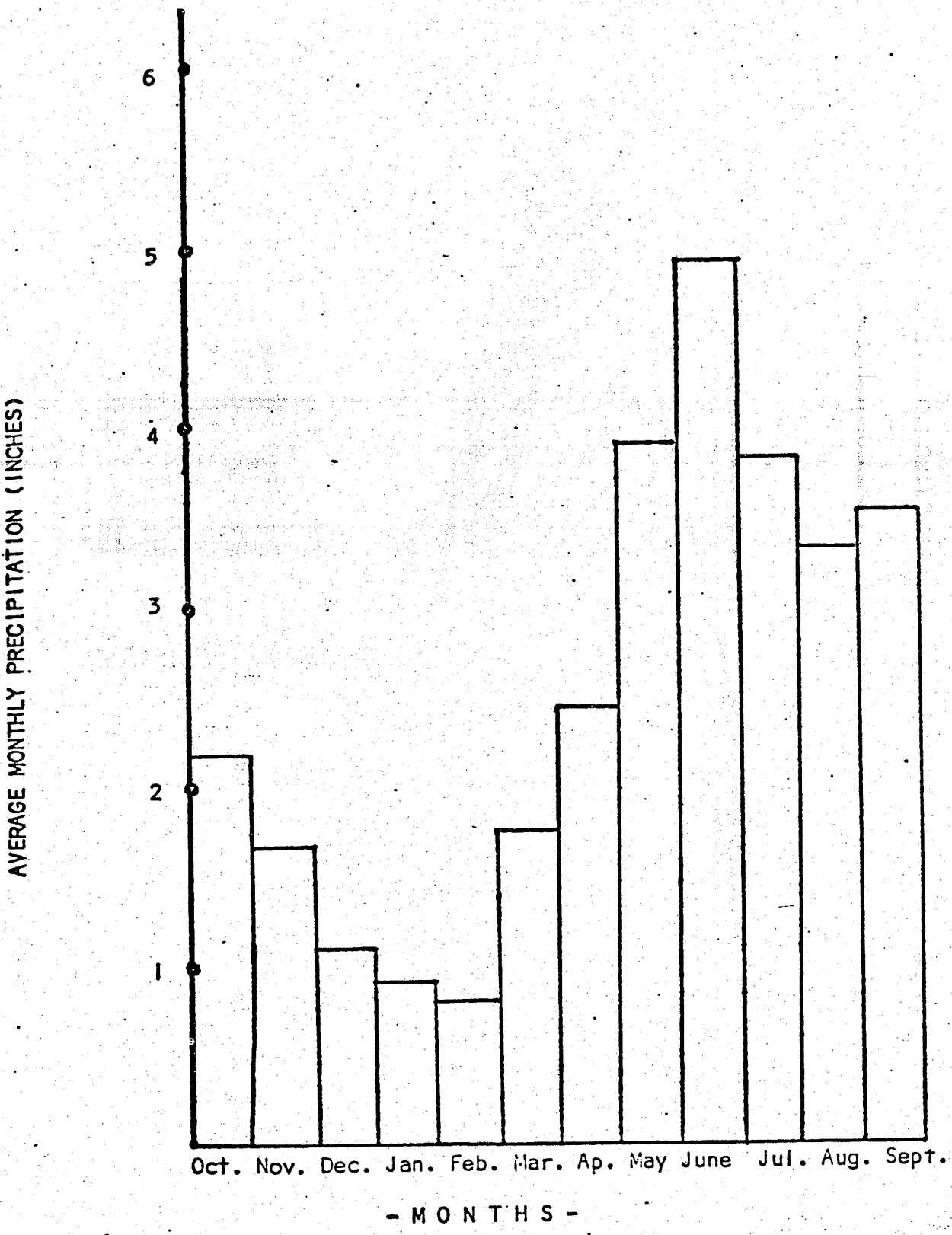

Figure 4: Average monthly precipitation for the period of record 1918-1973