CHAPTER XIV. PROFILE SOIL MOISTURE

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A. INTRODUCTION

The objective for this phase of the project was to monitor profile soil moisture during the period between June 10-18 at 18 field sites within the Little Washita Watershed. Measurements were taken at 14 rain gauge locations (in close proximity to aircraft flight lines) and 4 meteorological observation sites.

B. METHODS

Soil moisture measurements were obtained using a Resonant Frequency Capacitance (RFC) probe. The RFC probe is a recently developed instrument that monitors volumetric soil water content in both the saturated and unsaturated regions of the vadose zone. The technology is based upon the use of soil dielectric properties to measure soil moisture (Dean et al., 1987; Bell et al., 1987). The instrument primarily consists of a control unit and probe. The control unit stores probe calibrations (factory and field), measured data, and has computer downloading capability. The probe contains a sensor that measures the capacitance of the electrode system with dielectric comprising the in-situ moist soil surrounding the 2 inch diameter vertical PVC access tube.

Prior to and during the initial phases of the Washita '92 project, access tubes were installed at site locations either hydraulically or manually. Site location identification and dates on which profile soil moisture measurements were made during the experiment period are provided in Table XIV-1. Measurements were taken at 6 inch intervals to a depth of 45 inches beginning at 3 inches below the soil surface (Fig. XIV-1). In Figure XIV-2, soil moisture content at selected depths are plotted for the two week period. For the same site, rain gauge 136, time series of the data at selected depths are extended through August 92 (Fig. XIV-3).

In addition to RFC probe readings, soil cores wore collected and neutron probe readings taken at several sites after the initial data collection period for calibration and comparative purposes. The graph of profile soil moisture data shown in Figure XIV-1 indicate that field calibrated probe data, RFC and neutron, agree relatively well with gravimetric moisture data. Probe calibrations were determined using a combination of

the techniques described by van Bavel, 1961 and Bell et al., 1987.

C. PROFILE SOIL MOISTURE DATA BASE

As mentioned above, following the June data collection period, field calibrations were determined for the RFC and neutron probes at several watershed rain gauge sites. Calibrations consisted of gravimetric sampling and simultaneous probe readings (Van Bevel, 1961). Also, access tubes have been installed at all rain gauge sites that were not included during the June 1992 data collection period (44 total sites). Data has been continuously collected since that time on a weekly or bi-weekly basis.

The conversion of factory calibrated data to field calibrated data is in progress, in addition to further calibration work. To insure that field calibrations are representative and reliable, a broad range of moisture values are needed at different locations throughout the watershed. Further field sampling and data collection should provide the data necessary to satisfy this requirement. Once this has been accomplished a substantial data base will exist for profile soil moisture on the Little Washita Watershed. It is our intention to have this data base available for use by June 1993.

D. REFERENCES

Bell, J.P., Dean, T.J., and Hartnett, M.G. 1987. Soil moisture measurement by an improved capacitance technique, Part II. Field techniques, evaluation and calibration. J. Hydrol., 93:79-90.

Dean, T.J., Bell, J.P., and Baty, A.J. 1987. Soil moisture measurement by an improved capacitance technique, Part I. Sensor design and performance. J. Hydrol., 93:67-78.

van Bavel, C.H.M. 1961. Calibration and characteristics of two neutron moisture probes. Soil Sci. Soc. Amer. Proc., 25:329-334.

Table XIV-1. Rain gauge sites and days on which profile soil moisture data were collected during the period June 10-18, 1992.

Site	Julian Day 1992								
	162	163	164	165	166	167	168	169	170
RG 122	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 123	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 130		θ	θ		θ	θ	θ		θ
RG 132		θ	θ	θ	θ	θ	θ	θ	θ
RG 133	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 134	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 135	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 136	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 137	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 146	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 147		θ	θ	θ	θ	θ		θ	θ
RG 148	θ	θ	θ	θ	θ	θ	θ	θ	θ
RG 152		θ	θ	θ	θ	θ	θ	θ	θ
RG 154			θ		θ	θ	θ	θ	θ
MT1					θ	θ	θ	θ	θ
MT2	θ	θ	θ	θ	θ	θ	θ		
MT3	θ	θ	θ	θ	θ	θ	θ		
MT4	θ	θ	θ	θ	θ	θ	θ		

θ (theta) - soil moisture data obtained on this date.

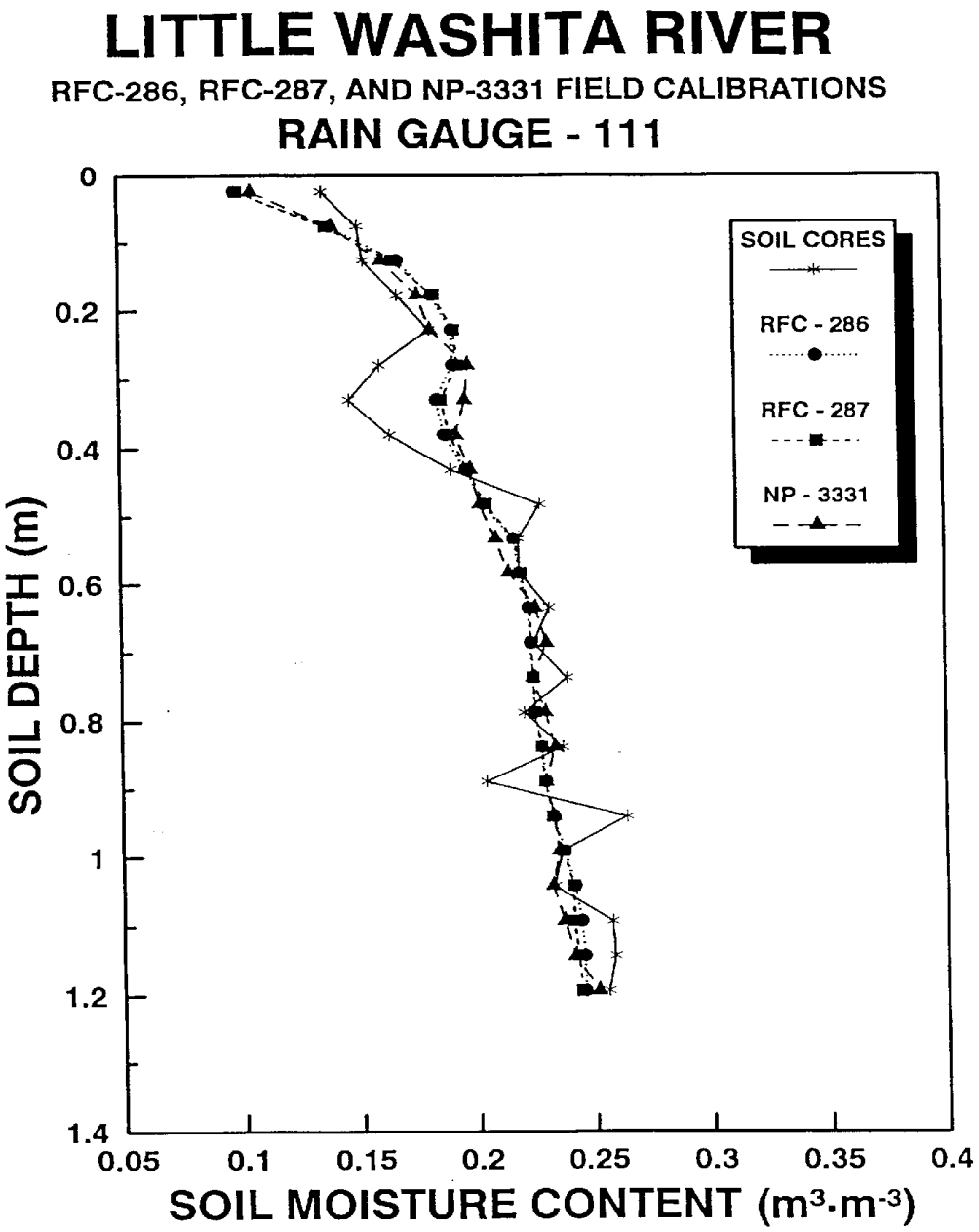

Figure XIV-1. Soil depth vs moisture content at site RG111.

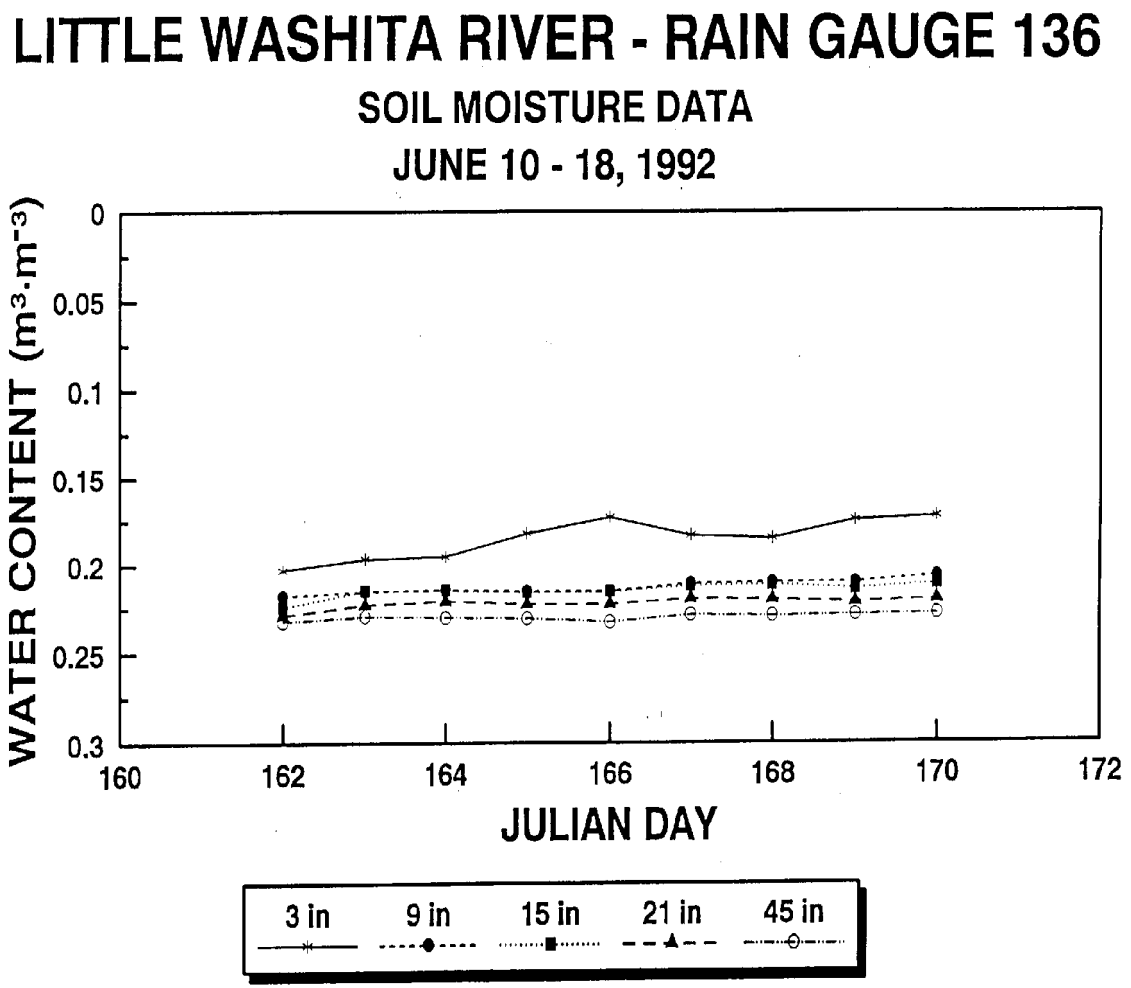

Figure XIV-2. Soil moisture data at selected depths for site RG136.

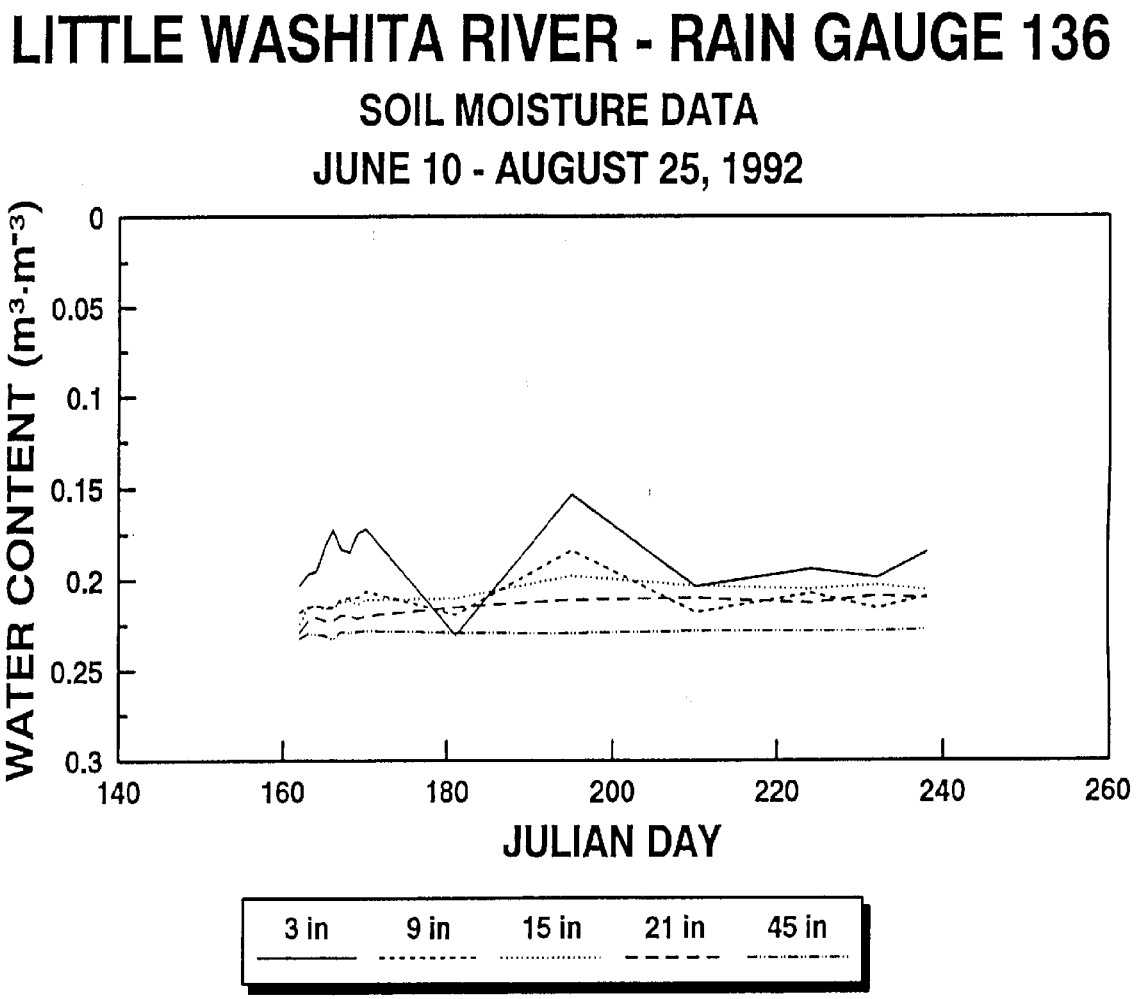

Figure XIV-3. Soil moisture data at selected depths for site RG136.