

INTERNAL REPORT 118

EVAPORATION AND BIOMASS ACCUMULATION WITH A WEIGHING LYSIMETER

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A 28-m Douglas-fir tree was installed in a weighing lysimeter to obtain accurate short-period measurements of evaporation. The details of design and construction procedures of the lysimeter installation are presented by Fritschen et al., 1973. The salient features of the installation are: A 3.66-m dia. x 1.2-m deep soil container was constructed around the rootball of a 28-m Douglas-fir tree in a naturally regenerated stand at the Thompson Research Center on the lower Cedar River watershed. The container, soil, and tree weighed 28,900 kg. The weighing mechanism consists of 165.5 m of 6.35 cm butyl rubber tubing filled with water, connected to a standpipe and placed underneath the soil container.

Weight changes are detected by measuring the differential pressure between an active and dummy standpipe. The sensitivity of the system is 630 g which is equivalent to 0.06 mm of water.

During the reporting period, modifications to the lysimeter installation consisted of the addition of a pressure transducer and strip chart recorder to indicate the differential pressure. The differential pressure was sensed with a Variable Reluctance Differential Pressure Transducer Model DP-15, range ± 11 cm water (0.1 psid) Validyne Engineering Corporation, Northridge, California 91324. The output of the pressure transducer system was recorded on the magnetic tape data logging system.

Weight changes were recorded hourly. However, due to wind and electrical noise, hourly recordings provided an inadequate record for short-period evapotranspiration determinations. Therefore, the output was also recorded continuously on a strip chart recorder with the speed of 1/2-in. hour⁻¹.

The lysimeter tree was guyed to four towers which surrounded the tree to prevent the tree from falling over in wind storms. In the original guy wire system, the tree was guyed tightly to one of the four towers and loosely to the rest, thus, climbing any of the towers affected the output of the pressure transducer by moving the tree. This problem was eliminated by isolating the tower to which the tree was guyed tightly from the rest of the towers. This modification was made during the latter part of July 1972.

Some of the results from the lysimeter installation are presented in a manuscript entitled "Dew, an addition to the hydrologic balance of Douglas-fir." The summary of the manuscript states that the hydrologic balance of a 28-m Douglas-fir tree was determined for two clear days in May 1972, using a weighing lysimeter. The results suggest dew as an addition to the hydrologic balance of 6.4 l. (1.7 gal.) and 10.9 l.

(2.9 gal.) when the total evaporation was 42.5 l. (11.2 gal.) and 55.2 l. (14.6 gal.) respectively, Using the stand density of 1 tree per 17.5 m², the above figures of dew amount to 3.7 and 6.3 l. ha⁻¹ (393 and 670 gal. acre⁻¹) of dew and 24.3 and 31.6 l. ha⁻¹ (2,587 and 3,373 gal. acre⁻¹) of evaporation. Thus, 15% and 19% of the hydrologic balance was evaporation of dew on these two days.

Data from the lysimeter tree installation for 1972 are still being processed.

REFERENCES

- Fritschen, Leo J., Lloyd Cox, and Russell Kinerson. 1973. A 28-m Douglas-fir in a weighing lysimeter. (Submitted to Forest Science)