

## NOTES AND COMMENTS

### PRECIPITATION RETENTION BY CLADONIA MATS<sup>1</sup>

In the *Populus grandidentata* fire association of sandy, glacial soils in the northern portion of the southern peninsula of Michigan, the fruticose lichen, *Cladonia rangiferina*, quite frequently forms matted cushions in open, sunny places on the ground cover. During periods of moderate dryness these mats are gray, stiff, brittle, and transversed with shrinkage cracks; but after a rain the cracks disappear, and the mats become large and hummocky, green, elastic, and soft, due to the large amount of water absorbed. Allen ('29) showed that despite this large absorption of water, a ground cover of *Cladonia* is not favorable for the development of seedlings, because the mat prevents the roots of seedlings from coming in contact with the soil; swells on becoming wet, heaving the seeds and seedlings away from the soil; and "cracks" on exposure to the sun, the seedlings in the developing cracks drying up. Porter and Woollett ('29) proved by experiment that soil under the mat contains more moisture during dry periods than soil in the open; that soil under the mat does not receive as much moisture from rain and dew as soil in the open; and that the mat may absorb as much as 4.5 times its weight in water before allowing moisture to pass to the soil beneath.

It was to find an exact figure on the amount of precipitation retained by *Cladonia* mats before allowing moisture to pass to the soil beneath that this work was undertaken.

### METHODS AND RESULTS

The experimental apparatus consisted of five 8-inch U. S. Weather Bureau type funnels, each with a sieve soldered below the rim. On four a *Cladonia* mat of natural density was placed, the fifth being a control without such a mat. Each funnel drained into a separate container.

Artificial rains were produced with an ordinary garden hose.

Meteorologically, the summer of 1934 was normal, without drought, and with about an average rainfall, of both extremely light and more than moderate rains. During the period of experimentation (June 25 to August 15) there were 16 days of precipitation totaling 4.19 inches. In addition, 10 artificial rains produced a total of 3.73 inches of artificial precipitation.

As shown in the accompanying table, a *Cladonia* mat retains, on the average, 0.12 inches (extremes: 0.10-0.15) of precipitation, the differences being due, in part, to the intensity of the rains and the dryness of the mat just before a rain. Unless there is more than that amount of precipitation in any one rain, the soil beneath the mat does not receive any moisture, as was the case with one-third of the natural rains during the period of observation.

With artificial rains, however, the figure is somewhat greater, the mat retaining, on the average, 0.15 inches (extremes: 0.09-0.20) of precipitation.

<sup>1</sup> A contribution from the Biological Station of the University of Michigan, where the work was done under the direction of Professor Frank C. Gates, during the summer of 1934.

TABLE I. *Experimental data of precipitation and water retention by Cladonia mats. Measurements in inches*

Date	In control	Under mat	Retained by mat
Natural precipitation			
June 25	.01	—	—
“ 26	.55	.45	.10
“ 28	.02	—	—
“ 30	.30	.17	.13
July 6	.51	.38	.13
“ 6	.15	.05	.10
“ 10	.19	.05	.14
“ 13	.03	—	—
“ 13	.13	.02	.11
“ 19	.08	—	—
“ 21	.09	—	—
“ 27	.14	.02	.12
“ 29	.53	.38	.15
August 2	.58	.44	.14
“ 8	.60	.47	.13
“ 15	.30	.18	.12
Average <sup>1</sup>	.36	.24	.12
Artificial precipitation			
July 4	.41	.27	.14
“ 9	.72	.53	.19
“ 12	.44	.27	.17
“ 23	.29	.09	.20
“ 24	.60	.45	.15
“ 27	.19	.08	.11
“ 31	.24	.13	.11
August 1	.36	.19	.17
“ 3	.19	.10	.09
“ 7	.28	.15	.13
Average	.37	.22	.15

<sup>1</sup> Includes only those rains in which water went through the mat.

#### SUMMARY

By experimentation in northern lower Michigan during the summer of 1934 it was ascertained that all rains averaging less than 0.12 inches were retained by a normal *Cladonia rangiferina* mat.

Unless there was more than 0.12 inches of precipitation in any one rain, the soil beneath the mat did not receive any moisture, as was the case with one-third of the rains during that summer (a normal one).

#### LITERATURE CITED

- Allen, Anne E.** 1929. Influence of cladonia ground cover on the establishment of seedlings. *Ecology* 10: 354-355.
- Porter, Cedric L., and Marjorie L. Woollett.** 1929. The relation of Cladonia mats to soil moisture. *Torreya* 29: 69-71.

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