Research Note

SIDEWALK EFFECTS ON SOIL MOISTURE AND TEMPERATURE

by J. Alan Wagar and Albert L. Franklin

Soils under sidewalks, unless severely compacted or poorly aerated, may be better environments for tree roots than surrounding soils, being both moister and warmer. However, few data have been collected to measure the effects of sidewalks on moisture and temperature. During 1982, 13 arrays of gypsum blocks and 5 arrays of thermocouples were used to measure moisture and temperature in a clay loam soil under sidewalks and under sod near sidewalks. As part of a study testing procedures for reducing tree-root damage to sidewalks, the arrays were installed on the grounds of the Department of Environmental Horticulture, University of California at Davis. In each array sensors were placed at 3 depths (6, 12, and 18 inches) at each of 4 positions (under center of walk, at edge of walk, and under sod at 18 and 36 inches from edge of walk), giving 12 sensors per array. Sidewalks were 36 inches wide and 3 to 4 inches thick. The study area was sprinkler irrigated at rates sufficient to maintain the sod in good condition.

Table 1 summarizes moisture levels and temperatures, in both cases measured in clear weather 2 days after sprinkler irrigation. The moisture measurements shown were made the morning of August 26, 1982; the temperature measurements were made from 7:30 to 8:15 am, 11:30 am to 12:15 pm, and 6:30 to 7:10 pm on September 2, 1982. Analysis of variance showed soils significantly moister and warmer under sidewalks than under sod ($P < .001$). Soils under sod were significantly moister 18 inches from the sidewalk edge than 36 inches from the edge ($P < .001$). Temperature differences between soils 18 and 36 inches from the sidewalk edge were not significant

Table 1. Sidewalk effects on soil moisture and temperature beneath center and edge of sidewalks and under sod 18 and 36 inches from edge, Davis, California. Moisture data in percent (**bold**) are from August 26, 1982. Moisture values based on the full data set used in analyses are shown without parentheses. (Values in parentheses result from excluding erratic readings that may have resulted from compaction or other soil irregularities or from instrumentation problems and probably indicate the most usual moisture patterns.) Temperatures in °F (morning/midday/evening) are from September 2, 1982.

Depth	center	edge	18"	36"	Average
6"	**38.1 (43.2)**	**39.4**	**12.4**	**6.2**	**24.0 (25.3)**
	74.8/73.0/82.2	73.0/71.0/80.2	69.2/67.8/80.0	69.2/67.2/74.0	71.6/69.8/77.2
12"	**41.6 (46.1)**	**41.3**	**15.2**	**5.9**	**26.0 (27.1)**
	76.4/73.6/75.6	74.6/72.2/74.6	71.2/69.2/71.0	71.0/69.0/70.2	73.3/71.0/72.8
18"	**43.6 (46.6)**	**38.4 (40.7)**	**23.6**	**10.0**	**28.9 (30.3)**
	75.6/73.6/75.4	74.0/72.0/72.6	71.4/69.6/70.0	70.6/69.0/69.6	72.9/71.0/71.9
Average	**41.1 (45.3)**	**39.7 (40.5)**	**17.1**	**7.4**	**26.3 (27.6)**
	75.6/73.4/77.7	73.9/71.7/75.7	70.6/68.9/71.7	70.3/68.3/70.7	72.3/70.6/74.0

(at P = .05).

The temperature patterns are as would be expected. But the moisture patterns go against common expectations that soils under impervious pavements will be drier than surrounding soils. However, results are consistent with Harris (1992) who noted that much moisture moves through soils as vapor. Moisture from warm soil apparently moves as vapor, condensing and concentrating under the walks as they cool at night and becoming a source that then influences soils at some distance.

Literature Cited

1. Harris, R. W. 1992 (2nd ed.) Arboriculture: Integrated management of landscape trees, shrubs, and vines. Prentice Hall, Englewood Cliffs NJ. 674 pp.

Research Professor
Center for Urban Horticulture
University of Washington
Seattle, WA 98195
and
Botanist,
USDI Bureau of Land Management
Folsom, CA 95630

NEW ISA PUBLICATIONS

New Compendium: Social Aspects of Urban Forestry. The International Society of Arboriculture has just released Volume 6 of the Journal of Arboriculture Compendium series entitled *Social Aspects of Urban Forestry*. Compiled by Dr. Dan Neely, each volume of this series contains selected articles on a specific subject published earlier in the Journal of Arboriculture. This book contains articles that explore how the public perceives and deals with various aspects of the urban forest. The volume contains over 20 articles written by the top researchers and practitioners in the field of urban forestry. Major subject matter areas include: psychological values of the urban forest, perception of urban forest management programs, street tree management, parks/recreation and utility arboriculture.

The compendia can be purchased separately or as a complete set of all six volumes. The other volumes include: *Construction Damage to Trees, IPM in Arboriculture, Amenity Tree Fertilization, Wounds on Trees*, and *Tree Growth Retardation.*

Each compendium can be purchased for $35.00 retail/ $25.00 for ISA members or the complete set of six compendia for $180.00 retail/ $100.00 for members. Please add $5.00 shipping and handling in the U.S., $15.00 elsewhere. The books can be ordered prepaid from ISA, P.O. Box GG, Savoy, IL 61874, or FAX your Visa/MasterCard orders with card number and expiration date to (217) 355-9516.

New Consumer Information Brochure. The International Society of Arboriculture has added a new brochure to the very popular Consumer Information Series entitled *Why Hire an Arborist.* The brochure will be the tenth of the series and are used by garden centers, utility companies, volunteer groups, state agencies and commercial tree care firms to promote proper tree selection and care. The new brochure discusses the services an arborist can provide such as pruning, removal, planting, spraying and emergency tree care. Additional services could include plant health care, fertilization, cabling and bracing, aeration, and lightning protection system installation.

A substantial portion of the brochure is devoted to selecting the right arborist for the job. Tree work