

Sap flow of willow varieties being used to develop an evapotranspiration cover for the Solvay wastebeds in Upstate New York

Jaconette Mirck and Timothy A. Volk

241, Illick Hall, Department of Forest and Natural Resources Management,
State University of New York, College of Environmental Science and Forestry,
Syracuse, NY. 13210

jmirck@syr.edu; tavolk@esf.edu

The production of soda ash over a 100 year period using the Solvay process resulted in the creation of about 600 ha of wastebeds near Syracuse, NY that are up to 21 m deep. About 250 ha of wastebeds remain uncovered. Chloride leaching from these wastebeds is impacting nearby water bodies. As part of a project to develop an evapotranspiration (ET) landfill cover using shrub willows, sap flow rates are being measured. The objectives of our study were to measure sap flow at different points in the growing season and to calculate the impact on the water budget of a willow ET cover. Sap flow was measured on established willow plantings on a gravelly silt loam soil using the heat balance method on three willow varieties (*Salix miyabeana* (SX64), *S. eriocephala* (S25) and *S. dasyclados* (SV1)) in the fall of 2004 and the whole year of 2005. In 2006 sap flow was measured on four willow varieties (*S. miyabeana* (SX64), *S. sachalinensis* (SX61), *S. sachalinensis x miyabeana* (9870-23) and *S. purpurea x purpurea* (9882-34)) that were established on the Solvay wastebeds in 2004. Maximum single-stem sap flow rates for willow stems ranging from 10-35 mm in diameter on gravelly silt loam soils were 0.8, 0.4 and 0.3 liter per day for SX64, SV1 and S25 respectively during the fall of 2004 as compared to 6.0 and 2.5 liter per day for SX64 and S25 during the middle of the summer of 2005. Sap flow rates during the summer of 2006 on the Solvay wastebeds for willow stems ranging from 10-25 mm in diameter changed over time and were different between willow varieties. Maximum sap flow rates for single stems were 4.1 liter per day for variety 9870-23 in June and 2.0 liter per day for variety 9882-34 in July. Diameter distributions were used to calculate stand level sap flow rates. The sap flow rates we observed during the end of the growing season suggest that willow short rotation coppice continue to have an impact on a site its overall water budget at least until the end of October.

Key words: transpiration, water-balance, *Salix*, Penman-Monteith, leaf area index.