Irrigation and related publications by Larry E. Williams

1. Grimes, D.W. and **L.E. Williams**. 1990. Irrigation effects on plant water relations and productivity of Thompson Seedless grapevines. Crop Science 30:255-260. *(ET_c estimated, Crop Water Stress Index (CWSI) and water-production function calculated)*

2. **Williams, L. E.** and M. A. Matthews. 1990. Grapevine, p. 1019-1055. In, Irrigation of Agricultural Crops, B.A. Stewart and D.R. Nielsen (Eds.), Agronomy Monograph No. 30. ASA-CSSA-SSA, Madison, WI. *(Estimated vineyard ET_c at several locations given)*

3. **Williams, L.E.**, R.J. Neja, J.L. Meyer, L.A. Yates and E.L. Walker. 1991. Postharvest irrigation influences budbreak of `Perlette' grapevines. HortScience 26:1081. *(Water savings resulted from early post-harvest cut-off date and an earlier budbreak the next year)*

4. Phene, C.J., G.J. Hoffman, T.A. Howell, D.A. Clark, R.M. Mead, R.S. Johnson and **L.E. Williams**. 1991. Automated lysimeters for irrigation and drainage control, p. 28-36. In, Proceedings for Lysimeters for Evapotranspiration and Environmental Measurements. ASCE, St. Joseph, MO, July 23-25, 1991. *(Summary of work conducted with the grape and peach weighing lysimeters at Kearney in calculating ET)*

5. **Williams, L.E.**, D.W. Grimes and C.J. Phene. 1993. Modeling grapevine water use, p. 29-33. In, Proceedings of the Eighth Australian Wine Technical Conference, C.S. Stockley, R.S. Johnstone, P.A. Leske and T.H. Lee (Eds.), Melbourne, Australia, October 25-29, 1992. *(Crop coefficients are given to calculate ET of grapevines in San Joaquin Valley)*

6. **Williams, L. E.**, N. K. Dokoozlian and R. Wample. 1994. Grape, Chapter 4, pp. 86-133. In, Handbook of Environmental Physiology of Fruit Crops, Volume I: Temperate Crops, B. Schaffer and P.C. Andersen (Eds.), CRC Press, Boca Raton, FL. *(Effects of applied water amounts on vine water status are given)*

7. Araujo, F., **L.E. Williams**, D.W. Grimes and M.A. Matthews. 1995. A comparative study of young `Thompson Seedless' grapevines under drip and furrow irrigation: I. Root and soil water distributions. Scientia Horticulturae 60:235-249. *(A comparison between drip and furrow irrigated grapevines for water required to meet vineyard ET was made)*

8. Araujo, F., **L.E. Williams** and M.A. Matthews. 1995. A comparative study of young `Thompson Seedless' grapevines under drip and furrow irrigation: II. Growth, water use efficiency, and nitrogen partitioning. Scientia Horticulturae 60:251-265. *(There was no difference in water use efficiency (ET_c or water used vs. yield) between the drip and furrow irrigated vines)*

9. **Williams, L. E.** Grape. 1996. In, Plants and Crops: Source-Sink Relationships. E. Zamski and A.A. Schaffer (Eds.), Marcel Dekker, Inc., New York. *(The effects of applied water amounts at various fractions of measured ET_c (determined with weighing lysimeter) on reproductive and vegetative biomass accumulation of vines is given)*

10. Ezzahouani, A. and **L. E. Williams**. 1997. Effect of rootstock on grapevine water status, productivity and grape quality of cultivar 'Italia.' Bulletin l'O.I.V. 799-800. *(Productivity of two table grape cultivars on 7 rootstocks under dry-farming conditions)*

11. **Williams, L. E.** 2000. Grapevine water relations. In, Raisin Production Manual, L. P. Christensen (Ed.), DANR Publications, University of California, Oakland, CA, p. 121-126. *(Diurnal and seasonal ET_c values of Thompson Seedless determined with lysimeter are given)*

12. Peacock, B., P. Christensen, and **L. Williams**. 2000. Water management and irrigation scheduling. In, Raisin Production Manual, L. P. Christensen (Ed.), DANR Publications, University of California, Oakland, CA, p. 127-133. *(Irrigation scheduling, based on historical data, is calculated along with seasonal crop coefficients and deficit irrigation factors)*

13. **Williams, L. E.**, W. A. Retzlaff, W. Yang, P. J. Biscay, and N. Ebisuda. 2000. Effect on leaf gas exchange, water status, and non-structural carbohydrates of field-grown *Vitis vinifera* L. (cv. Flame Seedless). American Journal of Enology and Viticulture 51:49-53. *(Leaf stomatal conductance is reduced when vines are girdled to increase berry size and recover when girdle heals)*

14. **Williams, L. E.** and F. J. Araujo. 2002. Correlations among predawn leaf, midday leaf and midday stem water potential and their correlations with other measures of plant water status in *Vitis Vinifera* L. Journal of the American Society of Horticultural Science 127:448-454. *(Predawn, midday leaf and stem water potentials are highly correlated with one another)*

15. Padgett-Johnson, M., **L. E. Williams**, and M. A. Walker. 2003. Vine water relations, gas exchange, and vegetative growth of seventeen *Vitis* species grown under irrigated and non-irrigated conditions in California. Journal of the American Horticultural Society 128:269-276. *(Response of Vitis species to lack of water and a ranking of drought tolerance)*

16. **Williams, L. E.**, C. J. Phene, D. W. Grimes, and T. J. Trout. 2003a. Water use of young Thompson Seedless grapevines in California. Irrigation Science 22:1-9. *(Vine ET_c (determined with lysimeter) and seasonal K_c values given for years 1 to 3 after planting)*

17. **Williams, L. E.**, C. J. Phene, D. W. Grimes, and T. J. Trout. 2003b. Water use of mature Thompson Seedless grapevines in California. Irrigation Science 22:11-18. *(Vine ET_c (determined with lysimeter) and seasonal K_c values given for years 4 to 7 after planting. The K_c values are given as a function of calendar days and degree-days after budbreak)*

18. **Williams, L. E.** and J. E. Ayars. 2005a. Water use of Thompson Seedless grapevines as affected by the application of gibberellic acid (GA_3) and trunk girdling – practices to increase berry size. Agricultural and Forest Meteorology 129-85-94. *(Grapevine ET_c and K_c are reduced when the vines are girdled at berry set to increase berry size, recovers when it has healed. The K_c remains high through the end of the irrigation season, November 1)*

19. Johnson, R. S., **L. E. Williams**, J. E. Ayars, and T. J. Trout. 2005. Weighing lysimeters aid study of water relations in tree and vine crops. California Agriculture 59:133-136. *(Summary of work done in both the peach and grape weighing lysimeters at Kearney)*

20. **Williams, L.E.** and J.E. Ayars. 2005b. Grapevine water use and the crop coefficient are linear functions of the shaded area measured beneath the canopy. Agricultural and Forest Meteorology. 132: 201-211. *(The seasonal crop coefficient is a linear function of the amount of shade (or fraction of cover) measured beneath the canopy at solar noon)*

21. **Williams, L.E.** and T.J. Trout. 2005. Water relations of field-grown *Vitis vinifera* L. in response to high frequency drip irrigation. American Journal of Enology and Viticulture. 56:357-366. *(Non-water stressed values of midday leaf and stem water potential are given. These values can be used to determine if one is irrigating at full ET_c)*

22. **Williams, L.E.** and P. Baeza. 2007. Relationships among ambient temperature and vapor pressure deficit and leaf and stem water potentials of fully irrigated, field-grown grapevines. American Journal of Enology and Viticulture. 58:173-181. *(Leaf and stem water potentials of grapevines are significantly affected by VPD and ambient temperature at the time of measurement, both decrease linearly as VPD and Temperature increase)*

23. Ezzahouani, A. and **L. E. Williams**. 2007. Effect of irrigation amount and preharvest irrigation cutoff date on vine water status and productivity of Danlas grapevines. American Journal of Enology and Viticulture. 58:333-340. *(Canopy temperature and leaf water potential were measured to determine water stress)*

24. **Williams, L. E**., D. W. Grimes and C. J. Phene. 2010a. Effects of applied water at various fractions of measured evapotranspiration on water relations and vegetative growth of Thompson Seedless grapevines. Irrigation Science. 28:221–232. *(Applied water amounts were based upon the measurement of ET_c with weighing lysimeter)*

25. **Williams, L. E**., D. W. Grimes and C. J. Phene. 2010b. Effects of applied water at various fractions of measured evapotranspiration on reproductive growth and water productivity of Thompson Seedless grapevines. Irrigation Science. 28:233–243. *(Applied water amounts were based upon the measurement of ET_c with weighing lysimeter)*

26. **Williams, L. E.** 2010. Interaction rootstock and applied water amounts at various fractions of estimated evapotranspiration (ET_c) on productivity of Cabernet Sauvignon. Australian Journal of Grape and Wine Research. 16:434-444. *(A crop coefficient developed in a VSP trained vineyard on 2.13 m row spacing was adapted for a row spacing of 3.05 m*)

27. **Williams, L. E**., P. Baeza, and P. Vaughn. 2011. Midday measurements of leaf water potential and stomatal conductance are highly correlated with daily water use of Thompson Seedless grapevines. Irrigation Science. 30:201-212. *(Midday leaf water potential (and conductance) decreased linearly as the ET_{Lys}/ET_o ratio decreased)*

28. **L. E. Williams.** 2012. Potential vineyard evapotranspiration (ET) due to global warming: Comparison of vineyard ET at three locations in California differing in mean seasonal temperatures. Acta Horticulturae. 931:221-226. *(Crop coefficients are calculated as a function of location in CA for a sprawl type canopy on a 3.35 m row spacing)*

29. **Williams, L.E**. 2012. Interaction of applied water amounts and leaf removal in the fruiting zone on grapevine water relations and productivity of Merlot. Irrigation Science. 30:363-375 *(The seasonal K_c values were derived by measuring the shaded area under the vines across 5 years)*

30. **Williams, L.E.** 2012. Leaf water potentials of sunlit and/or shaded grapevine leaves are sensitive alternatives to stem water potential. Journal International des Sciences de la Vigne et du Vin. 46:207-219. *(Study indicates that stem water potential measurements are no better than leaf water potential, if the latter is measured correctly)*

31. Shapland, T.M., R.L. Synder, D.R. Smart and **L.E. Williams.** 2012. Estimation of actual evapotranspiration in winegrape vineyards located on hillside terrain using surface renewal analysis. Irrigation Science. 30:471-484. *(ET_c estimated using the surface renewal technique)*

32. **Williams, L.E.** 2012. Effects of applied water amounts at various fractions of evapotranspiration (ET_c) on leaf gas exchange of Thompson Seedless grapevines. Australian Journal of Grape and Wine Research 18:100-108. *(Applied water amounts were based upon measured ET_c with a weighing lysimeter*)

33. Iandolino, A.B., R.W. Pearcy and **L.E. Williams**. 2013. Simulating three-dimensional grapevine canopies and modeling their light interception characteristics. Australian Journal of Grape and Wine Research. 19:388-400. *(The YPLANT model simulated the interception of light across the day as a function of row direction, N/S row intercepted the most, E/W row least)*

34. Zarco-Tejada, P.J., V. González-Dugo, **L.E. Williams**, L. Suárez, J.A.J. Berni, D. Goldhamer and E. Fereres. 2013 A PRI-based water stress index combining structural and chlorophyll effects: Assessment using diurnal narrow-band airborne imagery and the CWSI thermal index. Remote Sensing of Environment. 138:38-50. *(Photochemical Reflectance Index (PRI) was highly correlated with other measures of vine water stress to include leaf water potential and CWSI)*

35. **Williams, L.E.** 2014. Determination of evapotranspiration and crop coefficients for a Chardonnay vineyard located in a cool climate. American Journal of Enology and Viticulture. 65:159 – 169. *(Seasonal vineyard ET_c and the calculation of the K_c were determined using the water balance technique. The seasonal K_c values were similar to those predicted using the shaded area technique)*

36. **Williams, L.E.** 2014. Effect of applied water amounts at various fractions of evapotranspiration on productivity and water footprint of Chardonnay grapevines. American Journal of Enology and Viticulture. 65:215 – 221. *(Productivity measured with applied water amounts at various fractions of estimated ET_c and water footprint calculated)*

37. Iandolino, A.B and **L.E. Williams**. 2014. Recovery of ^{15}N labeled fertilizer by *Vitis vinifera* L. cv. Cabernet Sauvignon: Effects of N fertilizer rates and applied water amounts. American Journal of Enology and Viticulture. 65:189 – 196. *(Used K_c values developed for VSP trained*

vines on a 2.13 m row spacing and adapted for a 1.83 m row spacing and examined the effect of deficit irrigation on N fertilizer use efficiency)

38. Pearsall, K.R., **L.E. Williams**, S. Castorani, T.M. Bleby and A.J. McElrone. 2014. Evaluating the potential of a novel dual heat-pulse sensor to measure volumetric water use in grapevines under a range of flow conditions. Functional Plant Biology. 41:874-883. *(Calculation of vine water use with sap flow sensors was compared to water use of vines in lysimeter)*

39. Steenwerth, K.L., E.B. Strong, R.F. Greenhut, **L.E. Williams,** A. Kendall. 2015. Life cycle greenhouse gas, energy, and water assessment of wine grape production in California. Int. J. Life Cycle Assess. 20:1243-1253. *(Calculation of ET_c used K_c values from the Paso Robles study (publication 26) and the Carneros study (publication 35))*

40. **Williams, L.E.** and Fidelibus MW. 2016. Measured and estimated water use and crop coefficient of grapevines trained to overhead trellis systems in California's San Joaquin Valley. Irrig. Sci. 34:431-441. *(Vines in the lysimeter were farmed as overhead trellised, Dried on the Vine raisins for the first two years and an open gable type trellis for table grape production for the next two years. Measured values of the seasonal K_c for lysimeter vines were compared to shaded area K_c values from other vineyards)*

41. **Williams, L.E**. 2016. Irrigation scheduling: Use of reference ET (ET_o) and crop coefficients (K_c). In: Proceedings of Managing Water in California Vineyards Symposium, 67th ASEV national conference. Monterey, CA. 10 pp. *(This provided a summary of how to estimate ET_c using K_c values adapted to different trellis types and row spacings)*

42. **Williams, L.E.** 2017. Physiological tools to assess vine water status for use in vineyard irrigation management: Review and update. Acta Hortic 1157:151-166. *(This is a review of how to determine when to start irrigating and then how much to apply once that decision has been made)*

43. **Williams, LE and Heymann H**. 2017 Effects of applied water amounts and trellis/training system on grapevine water relations, berry characteristics, productivity and wine composition of Cabernet Sauvignon. Acta Hortic 1150:413-426. *(Used K_c values developed for VSP trained vines on a 2.13 m row spacing and adapted for a 1.82 m row spacing and developed the seasonal K_c for the Scott Henry trellis (vertically split canopy) using the shaded area technique)*

44. **Williams, L.E.** 2017. Deficit irrigation of wine grape vineyards. Progressive Crop Consultant, November/December. pp. 8-14. *(This provided a summary of how to estimate ET_c using K_c values adapted to different trellis types and row spacings and then how to deficit irrigate the vines)*