VALIDATION OF WEEDSOFT CROP-YIELD LOSS PREDICTIONS FOR COHORTS OF MIXED-SPECIES WEED COMMUNITIES. Mark R. Jeschke and David E. Stoltenberg, Graduate Research Assistant and Professor, Department of Agronomy, University of Wisconsin, Madison, WI 53706; J. Anita Dille, Assistant Professor, Department of Agronomy, Kansas State University, Manhattan, KS 66506; Gregg A. Johnson, Associate Professor, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108; George O. Kegode, Assistant Professor, Department of Plant Sciences, North Dakota State University, Fargo, ND 58105; Stevan Z. Knezevic and Shawn M. Hock, Associate Professor and Graduate Research Assistant, Department of Agronomy and Horticulture, University of Nebraska, Lincoln, NE 68583; and Christy L. Sprague, Assistant Professor, Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824.

WeedSOFT is a decision support system that brings together a wealth of information on weed biology and management efficacy to improve weed management decision-making. An essential part of maintaining WeedSOFT as a state-of-the-art weed management tool is validation and improvement of the crop-yield loss model. Research was conducted in corn and soybean at several sites in the north central region in 2004 and 2005 to determine crop-yield loss associated with four cohorts of multi-species weed communities for validation of WeedSOFT. Crop-yield loss observed in these experiments was compared to yield loss predicted by WeedSOFT to determine the accuracy of predictions across a wide range of weed emergence times relative to the crop.

Separate experiments were conducted for corn and soybean. The experimental design was a randomized complete block with four or more replications of four weed cohorts and a weed-free treatment. Weed cohorts were established relative to crop growth stage: weeds that emerged at the same time as the crop (cohort 1) and at the V2 (cohort 2), V4 (cohort 3), and V6 (cohort 4) growth stages in corn, and at the VC (cohort 2), V1 (cohort 3), and V3 (cohort 4) stages in soybean. Glyphosate was applied to maintain a weed-free environment before targeted weed emergence times. Each experiment included a season-long weed-free treatment. Common lambsquarters, giant ragweed, velvetleaf, redroot pigweed, tall waterhemp, woolly cupgrass, giant foxtail, barnyardgrass, yellow foxtail, and large crabgrass were selected as target species at the outset of the experiment, and research sites were chosen based on the presence of at least two of these species. Corn was planted at 79,000 seeds ha^{-1} in rows spaced 76-cm apart and soybean was planted at 494,000 seeds ha^{-1} in rows spaced 19-cm apart. Plot size was 3.0 m by 9.1 m. Weed community data were collected from two 25 cm by 76 cm quadrats in each plot. Crop-yield loss predicted by WeedSOFT was based on weed density 2 wk following cohort establishment. Crop yield in the weed-free treatment was used as the weed-free yield for WeedSOFT predictions.

Weed communities across research sites consisted largely of grass species and moderately competitive broadleaf species. Crop-yield loss due to weed interference occurred only for cohorts 1 and 2, with yield loss up to 85% and 100% in soybean and corn, respectively. Crop-yield loss occurred in four of six soybean site-years, and in all corn site-years for cohort 1, and in one soybean and one corn site-year for cohort 2. WeedSOFT typically over-predicted yield loss in both corn and soybean, with substantial yield loss predicted in many cases where no yield loss occurred. Yield loss was greatly over-estimated for cohort 2, with an average over-prediction of 31% in corn and 35% in soybean. The greatest over-predictions of yield loss were associated with weed communities composed largely of grasses, indicating that WeedSOFT over-estimated the competitiveness of these species at later emergence times. Substantial under-prediction of crop-yield loss occurred only when observed corn-yield loss exceeded the upper limit for corn-yield loss (60%) in the WeedSOFT model.

2005 North Central Weed Science Society Proceedings 60:66.