WHEAT SCOUT: DECISION AID FOR INTEGRATED MANAGEMENT OF GRASS WEEDS IN SPRING WHEAT. David Archer, Frank Forcella, Beverly Durgan, and James Eklund, Agricultural Economist, Research Agronomist, Professor, and Engineering Science Technician, USDA-ARS, Morris, MN 56267, and University of Minnesota, St. Paul, MN 55108.

The concept of "weed thresholds" has been useful as it encouraged critical examination of weed management assumptions. However, thresholds, as represented by a single value of weed abundance, should be envisioned only as a reflection of a reality with a single dimension. In multidimensional reality, thresholds should move along a scale of weed abundance. The direction and extent of movement along this scale depends upon a multitude of factors that may alter economic returns due to weed management. Although the effects of one or two of these factors (e.g., herbicide cost, commodity price) on threshold values have been studied, the aggregate effects of multiple factors, and sometimes opposing factors, are much more difficult to judge. Such judgments are especially troubling for practitioners who have little spare time during the early growing season to weigh and integrate the individual effects of several variables on the worth of weed thresholds and control tactics. Consequently, we developed WheatScout software to aid decisions in managing spring wheat regarding the timing and type of control for the two most troublesome grass weeds in the northern Great Plains of the USA and Canada: green foxtail and wild oat (*Setaria viridis* and *Avena fatua*). This tool is an easily used model whose simplicity belies detailed calculations, hidden from users, regarding biology of weeds and wheat, economics, and management. Biological information generated by WheatScout includes (a) micrometeorologically-based simulations of weed and wheat emergence timing and leaf-stage development; (b) weed/crop interference, including effects of differential weed/crop development rates; and (c) weed seed production as functions of weed density and herbicide rate. Management information involves: (a) herbicides appropriate for specific plant growth stages, (b) herbicide dose-responses for each labeled graminicide for control of green foxtail and wild oat, and (c) effects of delayed herbicide application on herbicide efficacy. Economic information entails net returns for each potential herbicide, including those for a range of reduced application rates, at the current scouting date as well as at future evaluation dates.

WheatScout simulates weed and wheat emergence and development after crop sowing. At some point after initial crop and weed emergence, crop scouts, the presumed users, are expected to supply basic information on crop and weed developmental stage (average leaf numbers per plant) and an estimate of weed density. WheatScout recalibrates weed and crop development based upon these inputs. The scout also selects a future evaluation date, such as 7 or 14 days hence. WheatScout then simulates net returns for all appropriate herbicides and rates as if applications were made on the current date or the specified future date. Weed seed production also is simulated. Thus, users can make immediate judgments on the same days that fields are scouted, as well as user-selected future dates. Calculations are based upon actual, forecasted, and/or contrived weather data, as well as recalibration from ground-truthing during scouting activities. Forecasted net returns and weed seed production help scouts and their clients make better and more informed decisions regarding both immediate potential profitability as well as long-term impacts of their weed management choices.