Aerial Photography to Assess Wheat Winter Survival

Purpose:

Every spring growers must decide whether a surviving winter wheat stand will make a viable crop. This has been a very subjective process, often done as a windshield survey from the road. Due to human error, the amount of wheat winter kill is commonly overestimated, often by a factor of 200%. To date, the only objective way to assess wheat stands is by a thorough field walk pattern, marking areas on a map, or simply counting paces of good areas and winter killed areas. Unfortunately, this process is tedious and time consuming, and can give erroneous results, dependent upon the number and location of field transects investigated.

In order to provide growers with a better, faster, and more accurate method of assessing stand survival, aerial photography and computer driven digital image analysis were investigated as a possible alternative.

Methods:

Aerial photographs were taken of several wheat fields with significant winter kill and winter injury. These photographs were then digitized and analyzed using the powerful Arcview 3.2 Geographic Information Processing System.

Ground truthing of digital images was accomplished using a backpack satellite global positioning system (GPS). Winter killed areas were mapped and geo-referenced with this system, to verify the accuracy of the digital imaging process. The accuracy between the digital image analysis and actual ground mapping was excellent, proving that the digital analysis method holds tremendous promise in accurately assessing wheat stands.

Results:

Figure 1 shows the original photograph, taken April 19th. Figure 2 and 3 show one analysis process utilized with the Arcview system, comparing only healthy wheat areas to areas of winter kill. This analysis showed that 8% (3 acres) of the field had no winter wheat left growing on it.

Figure 1 - Field Under Study Early Season

Original Photo - Taken April 19, 2003

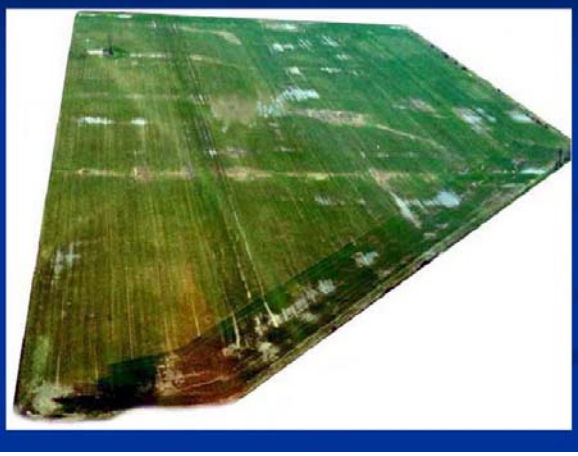


Figure 2 - Photo run through *Arcview 3.2* filter to show just one colour scheme

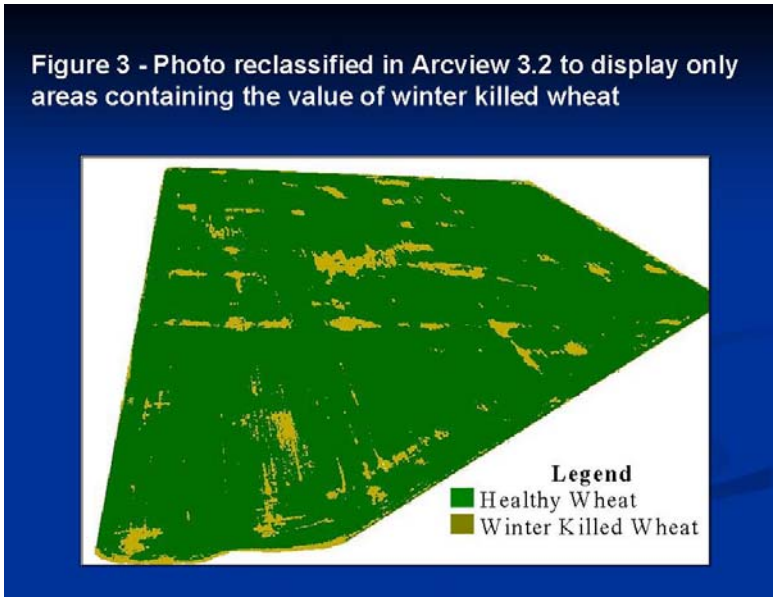


Figure 4 shows the excellent correlation of ground mapping compared with the digital analysis.

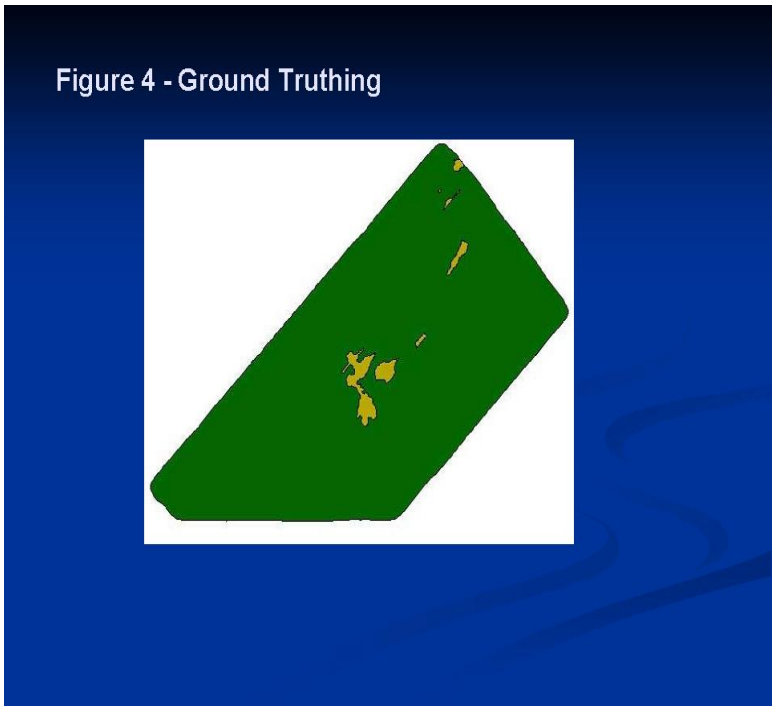
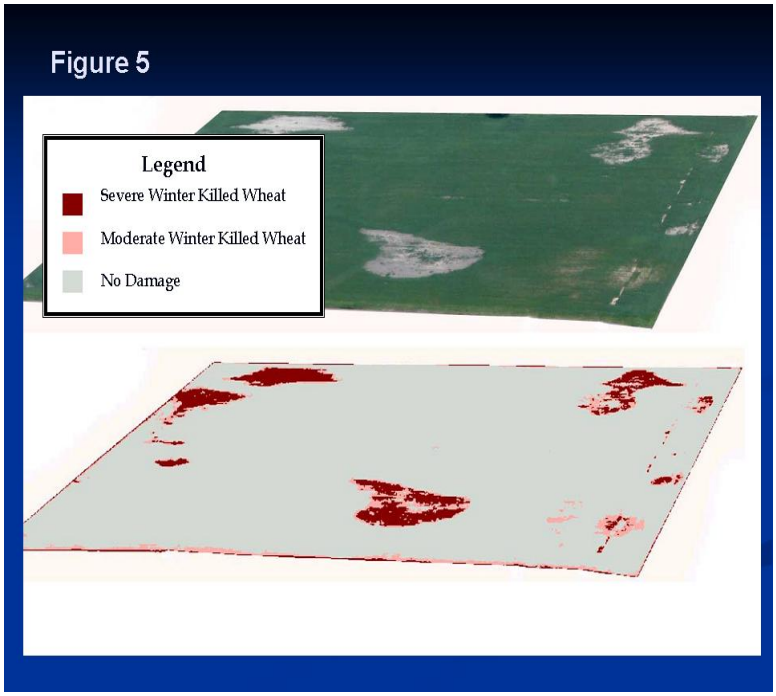
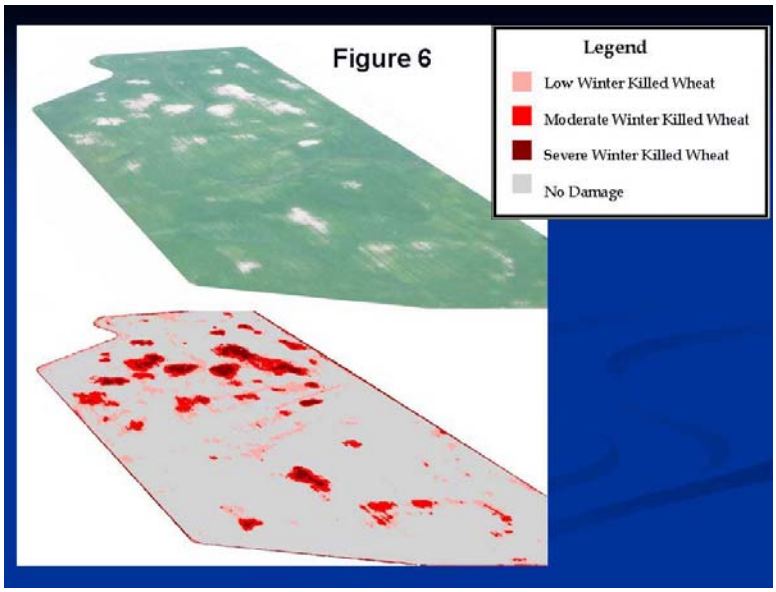


Figure 5 and Figure 6 show increasing levels of analysis within the Arcview program. Figure 5 delineates areas of damage into severe winter kill and moderate winter kill, resulting in 11.5% of this field being affected. Figure 6 delineates three levels of winter kill, low moderate and severe. A full 20.4% of this field is impacted by winter injury.





Summary:

Aerial photography is available across the province. High-end software packages such as Arcview through to free downloadable programs from the internet are available for image analysis of this nature. Growers should request digital photographs taken straight down over the field for best results from the analysis.

This approach holds great promise for assessing wheat stands, and making management decisions on the viability of winter damaged fields.

Next Steps:

Further field trials would help validate this initial study.

Acknowledgements:

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Project Contacts:

Please contact Peter Johnson at peter.johnson@ontario.ca for more information on this study or if you wish to be involved in similar trials in the future.