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CENTER PIVOT IRRIGATION DISTRIBUTION UNIFORMITY AUDIT

AG-RECON's GROWTHMAP and STRESSMAP images of a center pivot irrigation system exhibit several significant problems.

Two distinct patterns are apparent in the GROWTHMAP image, a circular or "bull's eye" pattern and a "wheel spoke" pattern. Both patterns are, to a lesser degree, also visible on the STRESSMAP image.

The "bull's eye" pattern demonstrates the effect on the crop of the sprinklers on the arm of the pivot having disproportionate water delivery. The circular patterns of less dense growth and warmer temperatures correspond to sprinklers delivering less water per unit area and the more dense growth and cooler temperature rings to sprinklers delivering more water. These sprinklers or nozzles can be isolated for testing and/or replacement by measuring from either the pivot edge or the pivot center to a ring and measuring the same distance down the arm of the pivot.

The spoke pattern is caused by two problems. As fertilizers are applied through the irrigation system, the check valve that meters application rates is erratic and releases bursts of fertilizer at intermittent intervals. This problem causes uneven fertilizer application rates and uneven plant growth responses as demonstrated by the GROWTHMAP variability and patterns. The second cause of the spoke pattern is uneven speed of the pivot arm as it passes around the field. This can be caused by arm angle control systems or from ruts in the wheel tracks. Uneven pivot arm speed affects fertilizer and water application rates and, to some extent, causes the problem with the fertilizer metering check valve so these two problems can potentially have a compounded effect.

The STRESSMAP image shows two areas of irrigation water run-off from this field. Over-irrigation of these areas is undoubtedly to compensate for the distribution uniformity problems and under-application on other areas of the field.

Note on the GROWTHMAP that the least dense crop growth occurs when a light ring and a light spoke intersect. When the problems are fixed on this center pivot, over 50% of the acreage on the field should make significant improvements.

Improving water distribution uniformity on this center pivot will increase crop yield and maturity uniformity; decrease water, power, and fertilizer consumption; and reduce the leaching of fertilizers and nutrients into ground water.