

## Wheat Virus Survey Using Satellite Imagery

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### BACKGROUND

Wheat diseases caused by viral pathogens are a major threat in the Texas Panhandle every year. Much of the wheat in this area is at high risk because it is planted for forage as well as grain. Forage wheat is planted early to maximize grazing through the winter. Common vectors of viral diseases move from summer hosts to winter wheat, which enables these viruliferous pests to survive throughout the year. Wheat virus surveys conducted for several years in the Panhandle have shown *Wheat streak mosaic* and, to a lesser degree, *Barley yellow dwarf* are commonly found every year. *Wheat streak mosaic* is likely the most economically damaging wheat virus in the region. However, it is unclear how much disease damage there is because of the scale of the area affected. Viral diseases often cause chlorosis and stunted growth. Satellite imagery technology is being investigated as a way to detect symptoms over a large area.



Landsat 5 TM images acquired throughout the growing season are used to classify the vegetative status of wheat. Normalized difference vegetative index is calculated during dormancy to identify wheat fields. A supervised classification is applied to wheat fields using the maximum likelihood algorithm, with five initial classes. The classification is based on ground truth data ranging from lush vegetation to severe chlorosis. Classification error is measured with a confusion matrix and the area of each class is measured using geographic information system software. The total area infected and the locations of infected fields can now be obtained. With more ground control points and classification training, accurate detection will increase and classification error will decrease.

### OBJECTIVES

- Accurately estimate total area of damage caused by viral pathogens in wheat.
- Develop a cross platform method to detect specific crop stresses over large areas.

### RESULTS/BENEFITS

- In the 2004 growing season, the western portion of the Panhandle included 3.2 million hectares (ha), of which 281,218 ha were classified as wheat. The area severely infected in February, March and May was 21,103 ha; 33,959 ha; and 39,541 ha, respectively. The overall accuracy for each date is 73, 70 and 40 percent, respectively. This suggests Landsat TM imagery can be used to detect disease, however more training is needed as the season progresses to identify factors which may affect vegetation late in the season, such as cattle grazing.
- Wheat disease surveys have shown *Wheat streak mosaic* occurs abundantly in the Texas Panhandle every year and causes severe loss to both forage and grain production. Little has been done to estimate the total impact of this disease in the region and as a result, it continues to cause unnecessary damage from year to year. By estimating the damage caused by this disease, producer education on control measures will follow as well as more emphasis on breeding resistant varieties.