

## Using Remote Sensing to Repair the Water System in Two Buttes, Montana

### Background:

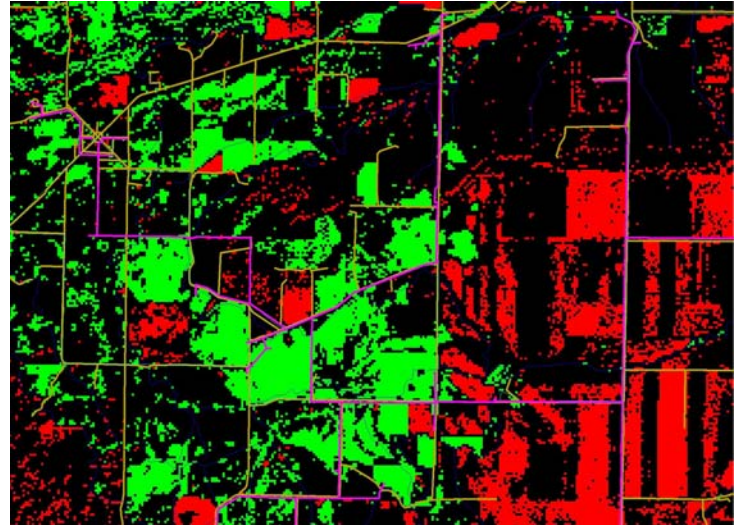
The residents of Two Buttes, Montana rely on a pump and network of pipes for the water system in their town. The town people found that they were pumping water far more than they were actually using. They were actually losing hundreds of thousands of gallons of water per day through leaks in the system of pipes. Chuck Merja, a nearby rancher, and Frank Dougher, a researcher from Montana State University, worked together to try and help the people of Two Buttes find a solution to their water problem. Chuck, a UMAC collaborator, was familiar with the use and acquisition of Landsat 5 satellite images and supposed that if the large amounts of water were soaking into the ground that it would be noticeable in the reflectance values of the images and these would be the most likely places to locate leaks.

### Use of Data:

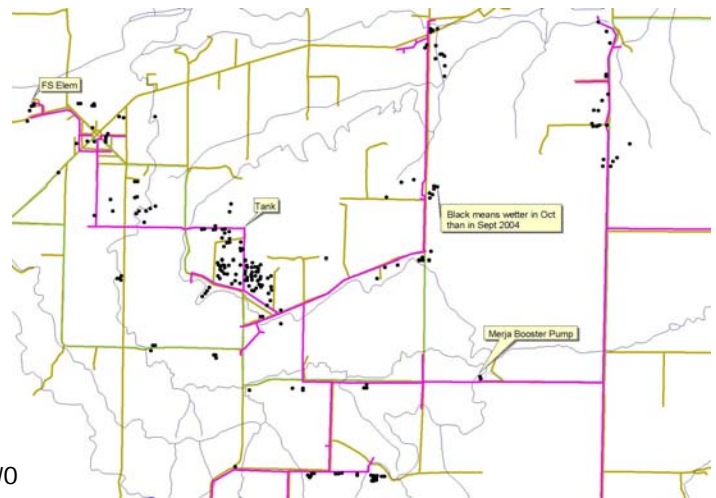
Chuck and Frank used two Landsat 5 scenes acquired September 11 and October 13, 2004. Using a specific portion of information collected by the satellite, the reflectance in the red portion of the light spectrum (band 3), they measured changes in the moisture of the ground near the pipes of the water system. They used remote sensing software to compare the data from the two images through a process called "change detection." This process does exactly as its name implies, it locates areas on the image where the data has changed. Change detection then produces a visual representation of the differences in the data and assigns colors for increases or decreases in the amount of light being reflected from the ground (See Figure 1). In this case red areas show increases in moisture content and green areas show decreases in moisture content. Chuck then used this change detection image and overlaid the water system, roads, and local streams and rivers to find point locations for the city should check for leaks (Figure 2).

### Economic and Environmental Benefits:

After locating and repairing leaks in the system, the city of Two Buttes will save thousands of dollars by pumping water more efficiently. They will be able to pump less and get the amount of water they need. The city will spend less money on energy and reduce the water wasted as it is traveling through the system. This will be a winning situation for the town, which will save money on energy and conserve water, by simply repairing leaky pipes



**Figure 1.** This change detection image of Two Buttes, MT was produced using two Landsat 5 images from September and October 2004. Any sites that showed increased wetness between the dates are shown in red. The green color indicates that wetness decreased, while black colors show no significant change in water content of the soil. Pink lines show the system water lines and gold lines indicate local roads.



**Figure 2.** This map showing points to check for leakage was produced from the change detection analysis (Fig 1). The figure also indicates roads (gold), the system water line (pink) and local rivers and streams (gray).