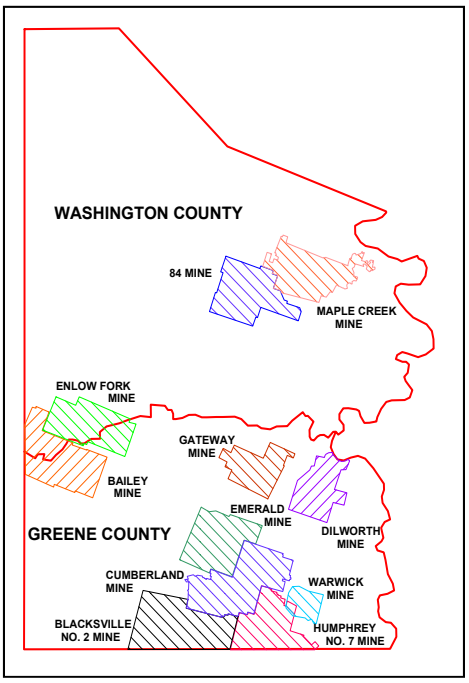
PROJECT PROFILE

REMOTE SENSING OF FORESTLAND ABOVE LONGWALL MINING AREAS

D'Appolonia was engaged by the Pennsylvania DEP Bureau of Mines and Reclamation to conduct remote sensing of forestland above longwall mining areas in Washington and Greene Counties, Pennsylvania. The work included the following tasks:

- Sites Selection
- Subsidence Analysis
- Remote Sensing
- Imaging Analysis
- Ground Truthing



Location of longwall mines in study.

Airborne multispectral scanning data obtained for the study sites included natural color, color infrared, normalized difference vegetation index (NDVI), and day and night thermal imagery. The image data were collected for 9 study sites (3 at each of 3 mines). Additional data were obtained in the form of satellite color infrared imagery (IKONOS I) and digitized aerial color photography.

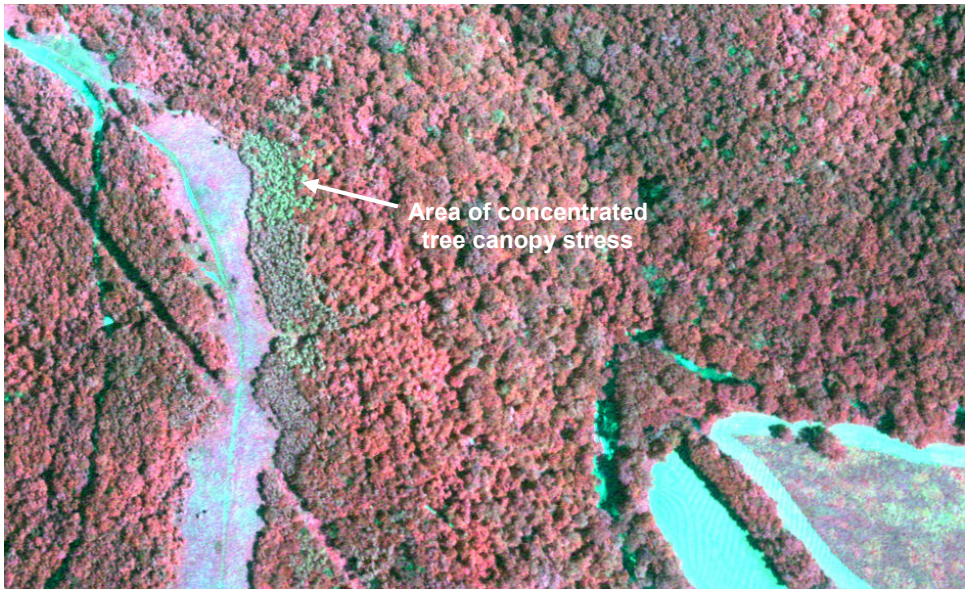
Remote sensing images were analyzed using the IMAGINE software developed by ERDAS. Multiple images from the multispectral scanning were enlarged and systematically examined using the software. Areas of potentially stressed tree canopy were identified by changes in color on the images. For the 9 study sites, 48 anomalous areas were identified from the imagery.

For the undermined study sites at the three mines selected for study, subsidence analyses were performed using the SDPS software developed at Virginia Tech. The results facilitated the location of high tensile strain areas associated with longwall panels and the ground truthing effort and remote sensing analysis.

Pool created by mine subsidence where field survey was conducted.

Areas of potentially stressed tree canopy identified from the imaging analysis were targeted for ground truthing to verify that they were actually stressed and to determine the cause of the stress. Additional areas associated with subsidence pools along a stream and longwall panel boundaries where high tensile strains were predicted were also surveyed.

Scarps, slides and trees with moderate to severe root damage were observed at several locations along longwall mine panel boundaries. Although some subsidence effects were identified, the tree canopies were found to be generally healthy. No linear zones of stressed tree canopy were identified that could be correlated with mine panel boundaries. Areas of stressed tree canopy were found in all types of predicted strain zones. The primary cause of the stressed canopy at field sites was determined to be insect infestation with the black locusts (locust leaf miner) and elms (elm leaf beetle) exhibiting the most severe damage. It was concluded that remote sensing imagery was effective for identification of tree crown stress, but that the effect of subsidence on tree crowns was generally minor.



Color infrared image of a study site showing areas of stressed tree canopy.