AG-RECON™

REMOTE SENSING DETECTION AND MAPPING OF PIERCE'S DISEASE

This is an update on the AG-RECON project to detect and map Pierce's Disease (PD). This project was done with the USDA-APHIS at the General Beale GWSS Study area near Arvin, California. Example images from this project are attached.

Our objectives with this project were to evaluate the usefulness of remote sensing as a tool to detect and map PD, determine the spectral and spatial distribution characteristics of PD positive plants, evaluate different resolutions of imagery for PD detection and to determine the best timing for image data acquisition.

In addition to the images, also attached are copies of our literature that explains the general characteristics of each of the image types we produce and an explanation of how we use our imagery to detect and map Phylloxera in grapes. There are obviously some differences in our strategies for Pierce's Disease vs. Phylloxera detection and mapping, but some of the principles explained in this literature are directly applicable.

IMAGE EXPLANATIONS
There are two sets of images from two different flights:

July 10, 2001 Images – These images are 1 meter resolution and show individual rows and vines. The block at the upper right hand corner of the image is of the "infamous" Red Globe grape vineyard and will be the focus of the image explanations.

The GROWTHMAP shows weak vine growth in light green and yellows. Vines with the typical PD leaf necrosis and margin burning show up as light brown on the image. Note that the pattern of distribution of the weak vines is consistent with the high mobility and random feeding of the GWSS. This pattern of distribution is dissimilar to almost any other grape production or disease problem.

The STRESSMAP shows crop canopy temperatures and correlates directly to plant transpiration rates. Typically this image shows plant stresses well in advance of the symptoms becoming visible. The alarming information on this image is the size of the area with an anomalous stress (circled on the image). Note that the epicenter of the stress anomaly is the same location as the visibly PD affected vines detected and confirmed from the GROWTHMAP image. Our hypothesis from this, which was later confirmed, was that this entire area was infected and would visibly collapse before the end of the season.

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August 2, 2001 Images – These images are 2 meter resolution. The Red Globe Vineyard is the only area processed in this image so that the full impact of the disease can be more effectively communicated to convince the grower to pull this block for the good of the growing community.

The GROWTHMAP image shows significant deterioration of the vineyard since the July 10th image. Almost the entire area identified as "anomalously stressed" in the July 10th image has now collapsed and is expressing readily visible symptoms. Approximately 60% of the vineyard is now showing symptoms.

The STRESSMAP image shows that an additional 20% of the vineyard is now showing these same anomalous stresses (and the stress is getting more severe).

PROJECT CONCLUSIONS

- PD can be successfully detected and mapped using a combination of the GROWTHMAP and STRESSMAP imagery
- STRESSMAP imagery can detect PD induced stress earlier than symptoms are visible
- PD can be detected starting as early as the beginning of July
- PD symptoms become more severe later in the season
- Imagery can be used as a tool to quantify economic impacts and to communicate with growers to develop and implement management plans

NEXT PHASE OPPORTUNITIES

- Use imagery as a targeted scouting and sampling tool to detect early stages of PD
- Early detection provides opportunity to "rogue out" infected vines to reduce infection rates
- Imagery can be acquired now as a baseline of stress conditions to be later compared to future imagery to detect stress changes (we have several growers who are doing this now)
- Use our "Zone Management Program" to convert our imagery into variable rate (or selective) application control of fertilizers that can be used as a "remedial fertility program" to support recovery of infected, replanted or heavily pruned back vines

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