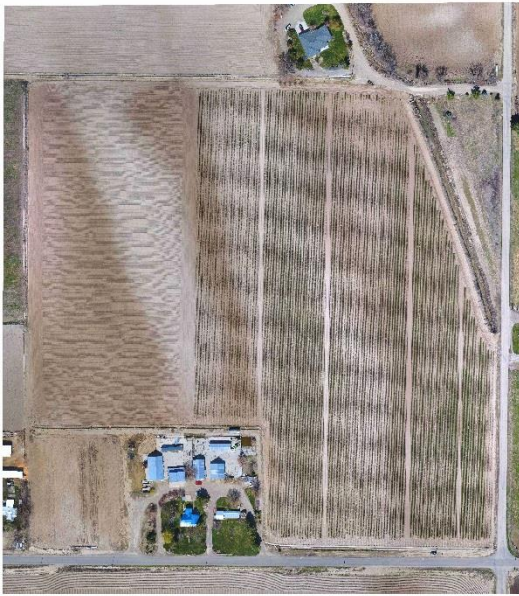


## Drone Based Agricultural Services

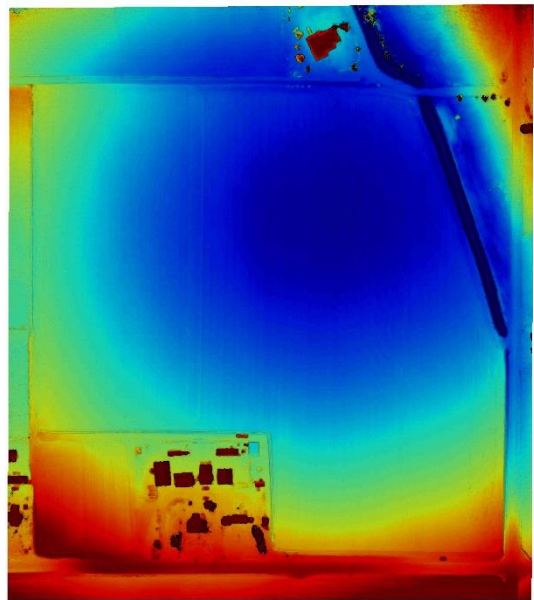
TCI Drone Services is Licensed, Insured, Equipped and Experienced in the production of useful aerial imagery products in support of agricultural businesses – especially those who want to utilize Precision Agriculture.

### Conventional Visible Light (RGB) – [click to view full image](#)

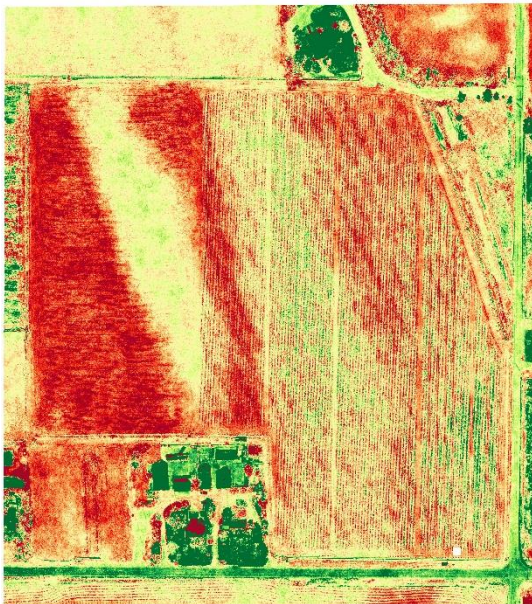
RGB Orthophoto (1.5" Pixels)



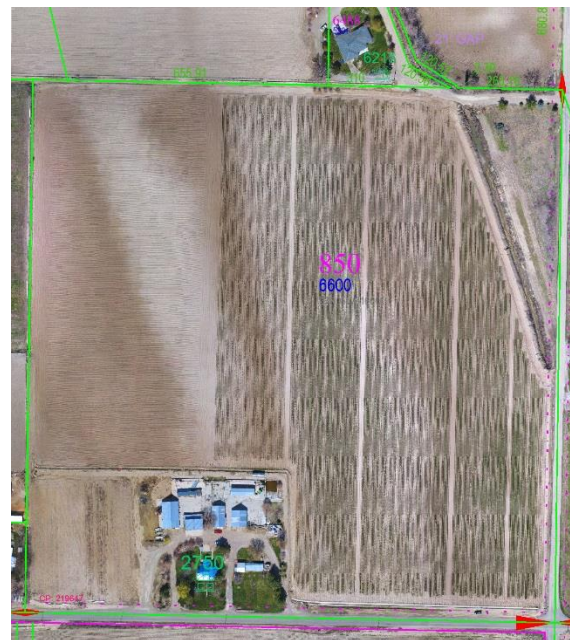
Elevation Model



Greenness (VARI)

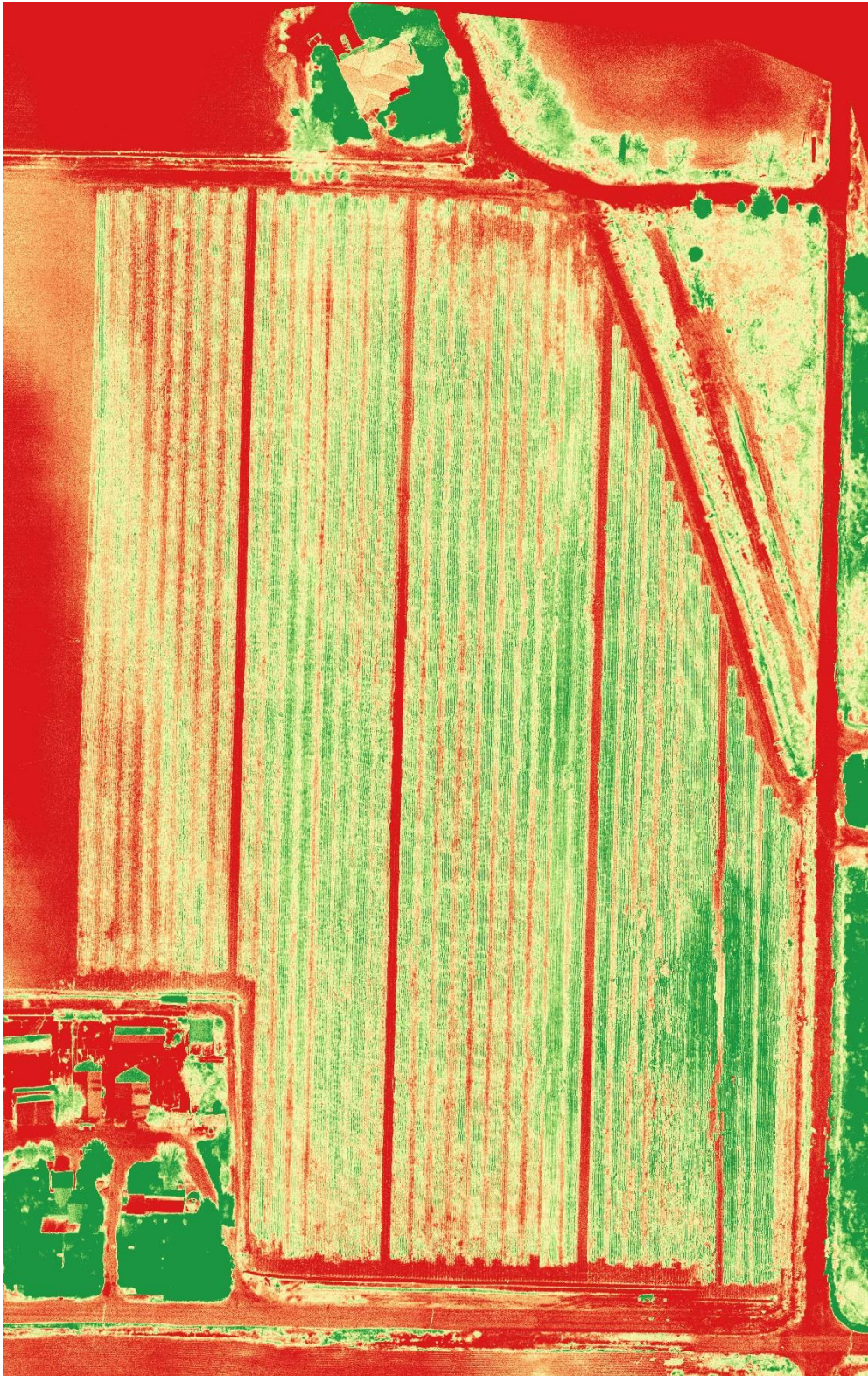


Ground Control option Parcel overlay





## Indexed Near Infrared Orthophotos (NDVI)



The NDVI index map is generated from photos taken by our NDVI Camera (records Red & NIR).

The index map uses "stop sign colors".

**Green** = Healthy

**Yellow** = Moderately Stressed

**Orange** = More Stressed

**Red** = Very Stressed / Non-vegetation.

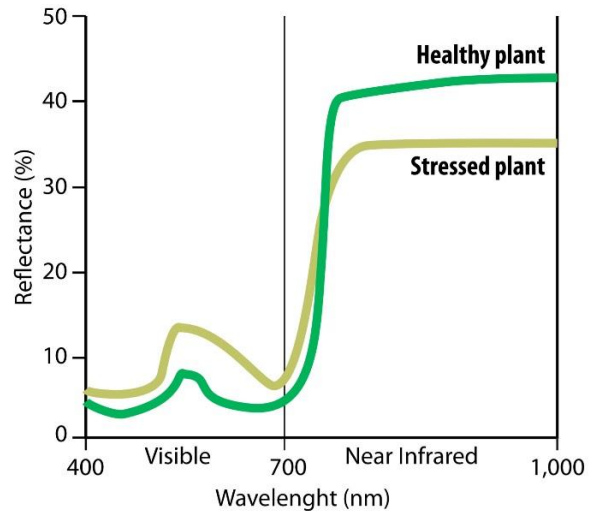
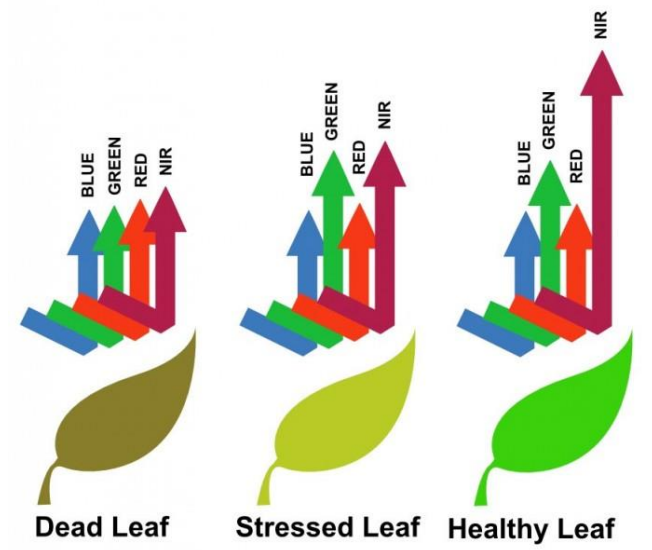
### VRA Maps

The NDVI map can also be used to produce a Variable Rate Application (VRA) map – compatible with chosen VRA equipment.

## NDVI Explained

The presence of *Chlorophyll* and *Photosynthesis* causes light absorption in the *Red* region of the spectrum while *internal structure or biomass of vegetation* can be indicated in the *Near Infrared* region.

In general healthy and/or dense vegetation reflects a lot of Near Infrared light but very little Red because it is absorbed instead. Conversely when vegetation is sparse or not so healthy we see a decrease in the Near Infrared reflectance but an increase in the Red reflectance as there is less Chlorophyll to absorb the Red light.



**Figure 1. Typical reflectance spectrum of a healthy and a stressed plant.**

NDVI is calculated from the Visible and Near Infrared light (NIR) reflected by vegetation using the formula:

$$NDVI = \frac{NIR - RED}{NIR + RED}$$

This imagery of a crop or field allows a farmer or agronomist to go directly to a section that is a problem. Quite often these are not easily seen from the ground and as the NDVI image can detect plant stress that humans just cannot see - preventative treatment can be applied, saving dollars and increasing yield.

Plant stress may be caused from a variety of issues; lack of moisture or nutrition, weeds, bug infestation, heat stress, and many others - but they all will show up as simply a plant under stress in an NDVI map.

- Ground proof to establish WHAT the problem is
- NDVI mapping will show you WHERE the problem is

The NDVI image will also show exactly where healthy plants are, that do not need expensive crop treatments or chemicals. More savings.



NDVI information can be used for:

- Determination of Chlorophyll level
- Plant health and stress level
- Optimal fertilizer use
- Nitrogen Management
- Identify insects and pests in crop
- Analyze plant disease
- Plant or weed identification
- Farm plan development
- Cultivation planning
- Harvest planning according to vigor

## **About Us**

TCI Drone Services is a DBA of TCI Corp., an Oregon corporation established in 1992. Our Mapping Services business (TCI Mapping Services) has been active for over 25 years and has completed thousands of mapping projects for Cities, Counties, Public Utilities and private business clients.

We have been in the Drone Service Business since 2015. Our Equipment is registered with the FAA: FA34KCLR7. Our principle Tom Inloes holds a Remote Pilot Certificate with a small UAS rating, by the FAA under the Small UAS Rule (Part 107) – Certificate Number: 3906034. We are Insured by Berkley Aviation with Liability, Bodily Injury & Property Damage coverage of \$1 Million per occurrence (details upon request).

Our service area is Eastern Oregon and SW Idaho (other areas upon request).

## **Our Equipment**

**Drones:** We fly a DJI Phantom 3 Pro and two Phantom 4's.

**Drone Cameras:** All three DJI drones are equipped with a 12MP visible light camera. These cameras capture all of our drone photography, videography and panoramic photos.

**NDVI** – We fly a MAPIR brand Near Infrared camera. It has a 16MP camera and sees both Near Infrared 850nm and Red 660nm light. We use this camera mounted to the bottom of one of our Phantom 4 drones to collect both Visible Light and NDVI photography.

**360° Panoramic Video** – We fly a Samsung Gear 360 camera and can produce 360° Panoramic videos viewable with computers, smartphones, tablets and VR systems.

## **Ground Control**

We own and use a Trimble Pathfinder Pro XRS system to collect GPS coordinates for ground control targets. We can achieve 1 decimeter (less than 4 inches) accuracy.

**To find out how our drone based agriculture services can help you,  
Give us a call or text at 503-705-0637 or email us at: tom@tcicorp.com**