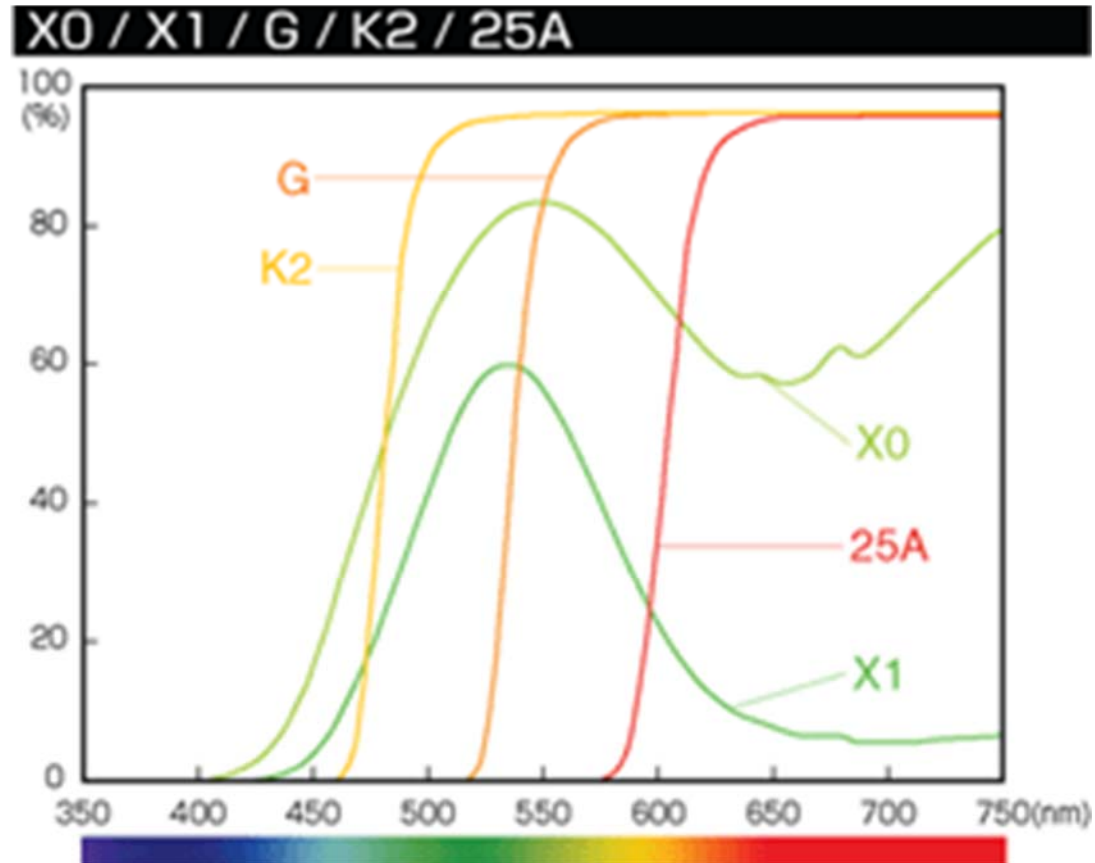


Camera Alterations and Filters

We have two altered Canon S95 cameras, the +IR and the NGB. The +IR simply has the IR blocking filter removed and has a filter mount installed for various Hoya filters, while the NGB has a notch filter that just removes the red installed where the IR blocking filter was removed.

The +IR Camera and Hoya Filters



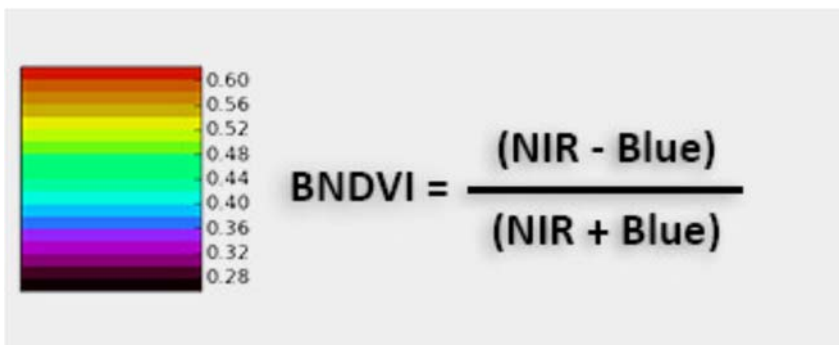
NGB

From Event38: Custom NGB Filter Glass for DIY Camera Conversion. This filter is installed inside the camera after the IR blocking filter is removed. It removes all of the red, but allows NIR through, so the red "band" just picks up infrared. We don't have a spectral diagram like we have for Hoya filters, but below is what Event38 says about the product. The Blue Normalized Difference Vegetation Index (BNDVI) can thus be derived, since the NIR as red can be ratioed with Blue light. While unable to distinguish between soils and healthy vegetation, the photos are easily interpreted and do show moisture stress well.



Product Description

Our custom vegetation-sensing filter glass filters out all red light and instead allows the normally blocked near infrared band to be collected. This allows an off-the-shelf camera to be used to collect NIR, Green and Blue light (NGB). With this data, the vegetation index BNDVI can be calculated.



White Balance

White balance is a setting that can be made with a digital camera before taking pictures. If you set white balance to a white piece of paper under the same lighting source as the subject being photographed, you can do a better job of getting a good balance in the exposure, and this is especially important for altered camera, where the camera may not be able to reliably set white balance automatically. Alternatively, if raw images are collected, white balance can be set after collection since raw values are stored. See Pete Christian's thesis that discusses this starting at about p.20 in <http://geog.sfsu.edu/thesis/using-low-cost-uas-and-consumer-grade-cameras-environmental-science-research> . This thesis also recommends a field protocol (around p. 48) that specifies to set white balance to a white piece of paper and to capture RAW files.

Folder Organization

For example images using the above cameras and filters, see the 'Cameras_Sensors_Equipment' folder (in LowAltRS) on Box. This document is stored there as well. The key folders are:

- NGB : photos from the NGB camera from campus, Pacifica, and elsewhere
- G filter tests : photos from the +IR camera with the G filter attached, similar locations. Some TIFFs created from RAW images and ArcMap documents used to create a type of false color by choosing "bands."
- NIR imagery : from Pete, using the +IR camera mostly with the Hoya 25A red filter, mostly from Dry Creek and Knuthson