

Imagery Tools for Small-Plot Research

DEVERON UAS



Executive Summary

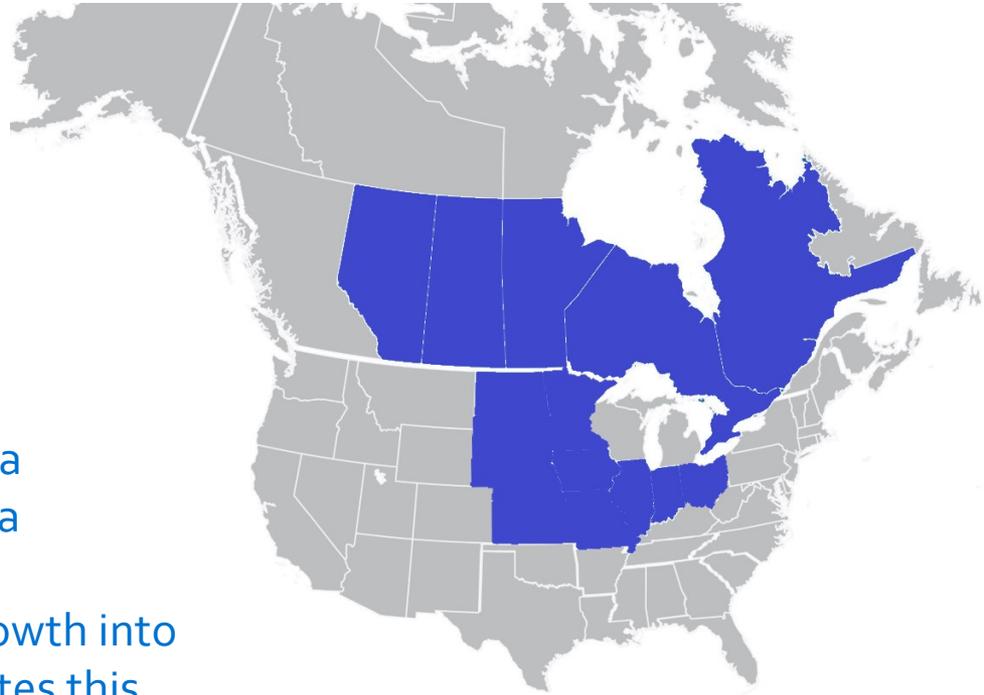
Crop researchers face increasing pressure to move genetics, products, and management practices through the selection process. Drone data is a solution to the labour and time constraints that limit the number of data points that can be collected in a single season. Using the rapid and simultaneous collection of plot observations by drones, researchers can improve the power of studies by redeploying resources to conducting trials in more environments and with greater depth.

Deveron's research offerings treat imagery like any other plot record so that it integrates with typical statistical analyses. Our products include plant counting, vegetative fraction, crop height, canola flowering, and multispectral analysis. Our expertise in remote sensing and crop science can be relied upon to further extract insight from imagery according to the specific needs of the researcher.

Who is Deveron?

Deveron is a full-service drone imagery provider operating a network of pilots across Canada and the US. In 2018, we were active in the following regions:

- Ohio
- Indiana
- Illinois
- Iowa
- Missouri
- Kansas
- Nebraska
- South Dakota
- North Dakota
- Minnesota
- Expected growth into southern states this winter

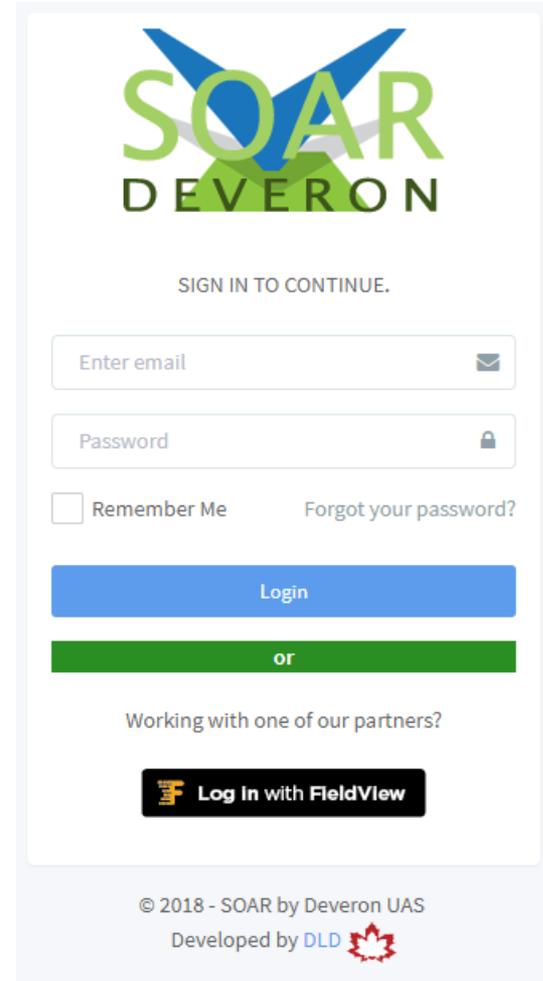


- Alberta
- Saskatchewan
- Manitoba
- Ontario
- Quebec

Deveron's Drone Data Service Platform

Order and download products using our SOAR platform

- Receive email updates when **flights are logged and completed**
- **Upload trial boundaries** via shapefile draw directly in geospatial app



The screenshot shows the login interface for the SOAR Deveron platform. At the top is the SOAR Deveron logo, which features a stylized blue and green bird-like shape above the text 'SOAR' in green and 'DEVERON' in blue. Below the logo, the text 'SIGN IN TO CONTINUE.' is centered. There are two input fields: 'Enter email' with an envelope icon and 'Password' with a lock icon. Below these fields are two links: 'Remember Me' with a checkbox and 'Forgot your password?'. A blue 'Login' button is positioned below the links. A green bar with the word 'or' in white is centered below the button. Underneath, the text 'Working with one of our partners?' is displayed above a black button with the FieldView logo and the text 'Log In with FieldView'. At the bottom of the page, the copyright notice '© 2018 - SOAR by Deveron UAS' and 'Developed by DLD' with a red maple leaf logo are visible.

Why drones for research?

Research is a numbers-limited endeavour. The power of a study is limited by:

- Treatment count
- Environmental replication
- Available labour



There is always a trade-off when designing experiments

More trials, extensive study

OR

Fewer trials, intensive study

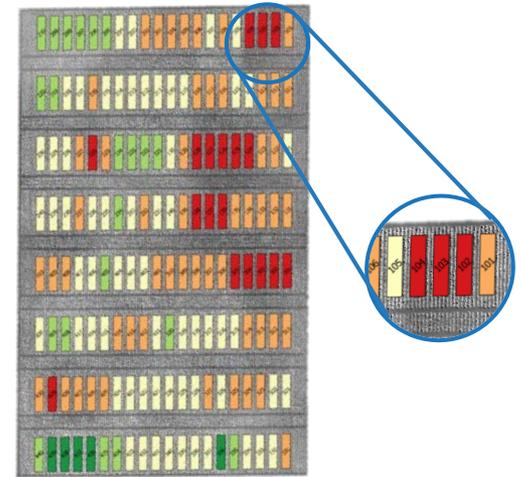
A Picture Says a Thousand Numbers

To be useful in statistical analyses, imagery must be transformed from visual observation into quantified information.

Each of Deveron's services include the identification and extraction of plot-level data into spreadsheets to be used in treatment analyses.

We also include a geospatial shapefile of plots to include with field records, and for reanalyzing trials according to new insights gained over time.

Observation



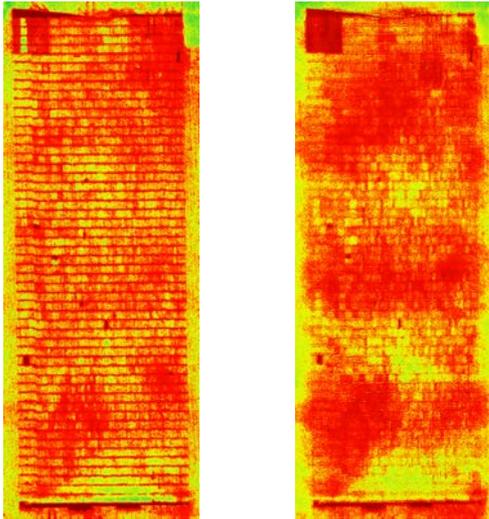
Information

	A	B	C	D	E	F
1	Trial	Plot	Rep	SubPlot	NDVI _{max}	NDVI _{mean}
2	UoGuelph	101	1	1	0.211	-0.002
3	UoGuelph	102	1	2	0.190	-0.014
4	UoGuelph	103	1	3	0.212	-0.025
5	UoGuelph	104	1	4	0.193	-0.011
6	UoGuelph	105	1	5	0.330	0.019
7	UoGuelph	106	1	6	0.288	0.007
8	UoGuelph	107	1	7	0.327	0.012
9	UoGuelph	108	1	8	0.241	0.004

Drone Data Services for Researchers

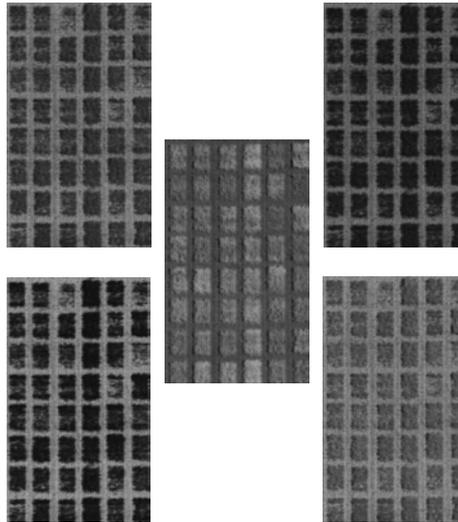


Data Services



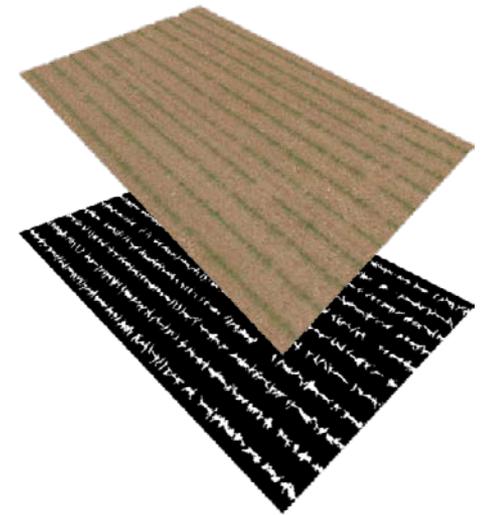
Basic NDVI/NDRE

- General indicator of plant stress
- Plot greenness for early- to mid-season (NDVI) and late-season (NDRE)
- Index maps compatible with GIS and imagery softwares



5-band Reflectance

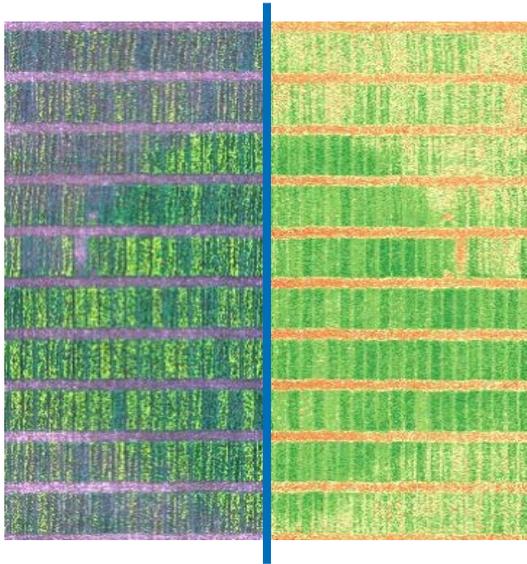
- Full RGB + NIR + red edge coverage
- Plot means for calculating any index in spreadsheet
- Reflectance Maps compatible with GIS and imagery softwares



Vegetative fraction (% green pixels)

- Estimate canopy extent using green pixels
- Plant-only mask enhances

Data Services



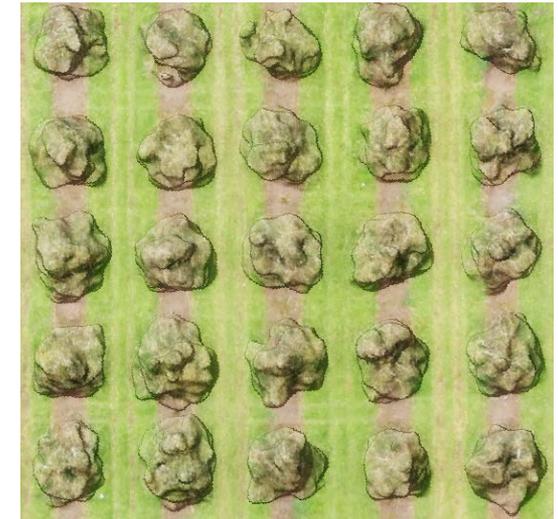
Canola Flowering

- Estimate flowering extent from yellowness index



Plant Count

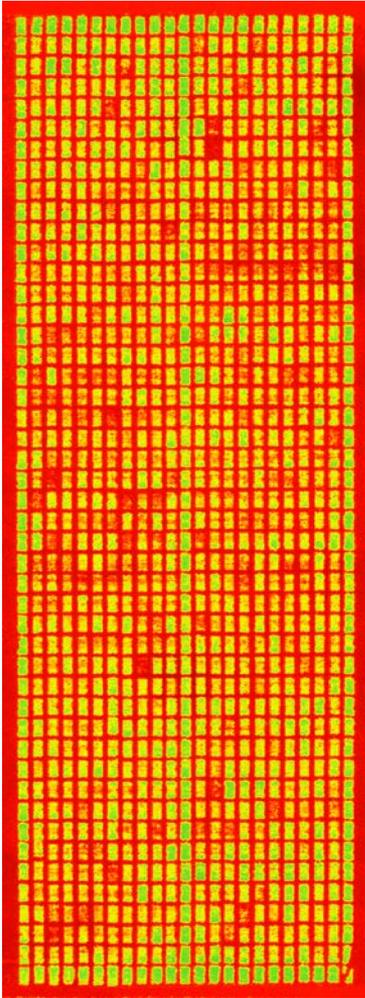
- 5mm resolution RGB
- Identify individual corn plants up to V4 (leaf-tip)
- Other crops with large plant-to-plant separation



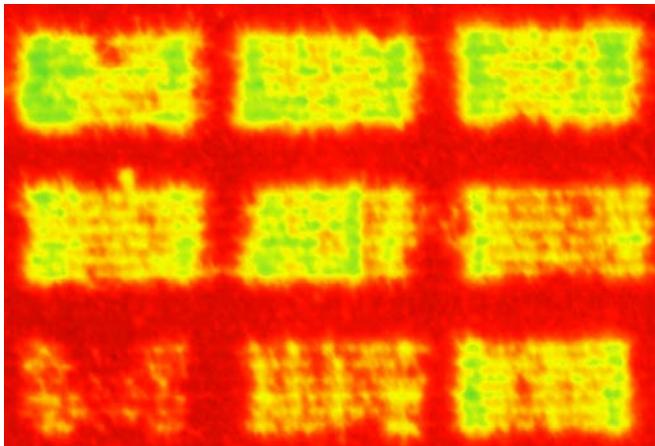
Plant Height

- 3D model of plot
- Estimate height using bareground map
- Combine with vegetative fraction and multispectral for crop modelling

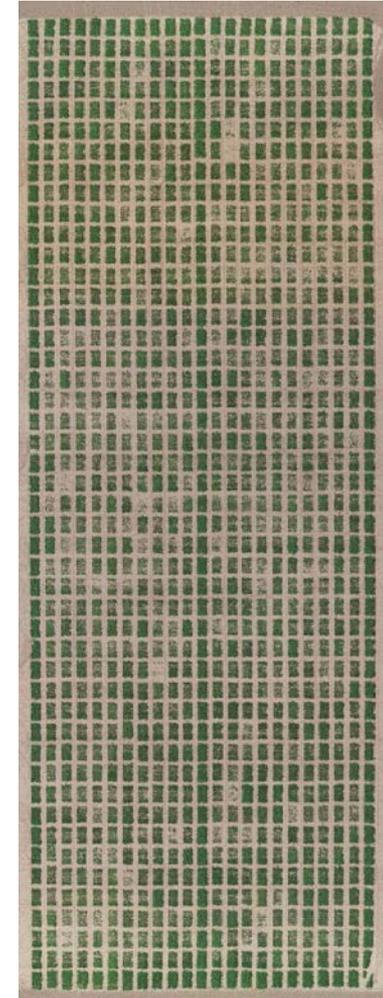
Imagery Example: Winter Wheat Variety Trial



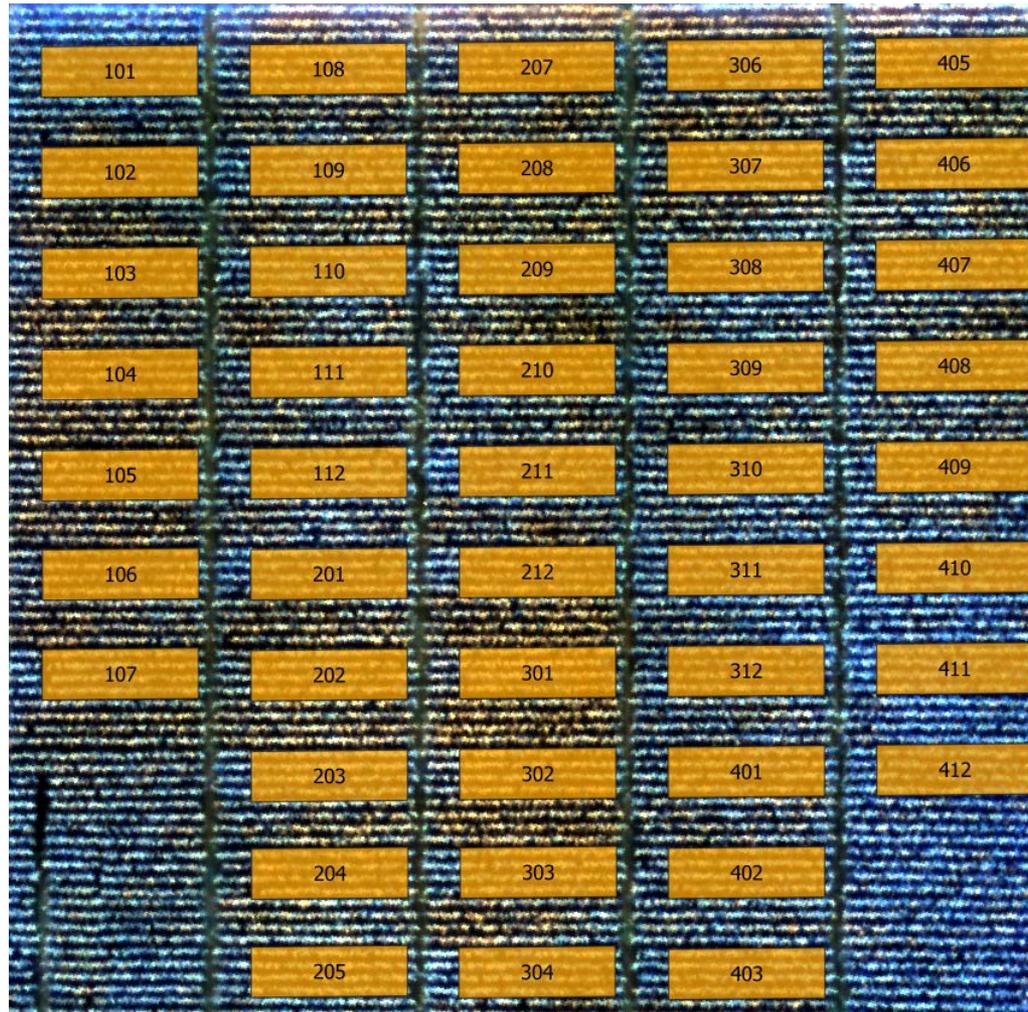
Winter wheat NDVI



Winter wheat RGB

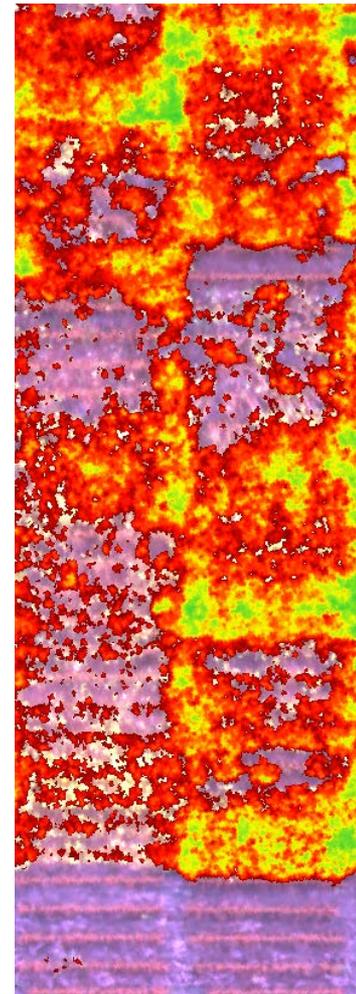
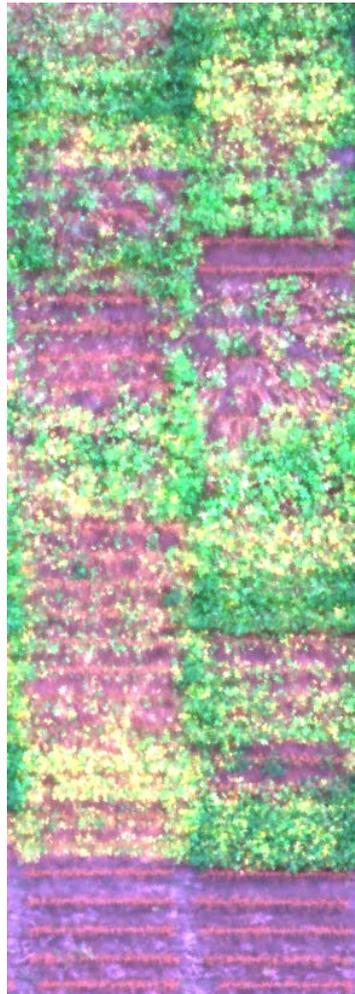


Plot Data Example: Factorial Corn Trial



Grain corn with 4x replicated experimental design

Vegetative Fraction Example: Soybean Senescence



Soybean yield trial. Pre-canopy (left), pre-harvest interval (centre), and extent of pre-harvest leaf drop (right).



For additional information please contact

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DEVERON UAS

The logo for Deveron UAS features the word "DEVERON" in a blue, sans-serif font. The letter "V" is stylized with a green and white graphic element resembling a field or a stylized letter. To the right of "DEVERON" is the text "UAS" in a smaller, grey, sans-serif font.