AggieAir - A LOW-COST AUTONOMOUS MULTISPECTRAL REMOTE SENSING PLATFORM

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Outline

1. Introduction
2. Platform Details
3. Products
4. Applications
5. Future Developments

Motivation

Save water by helping farmers irrigate more efficiently

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A new remote sensing platform is needed!

- Affordable
- Easy to use
- Imagery updated often
- Measure soil moisture

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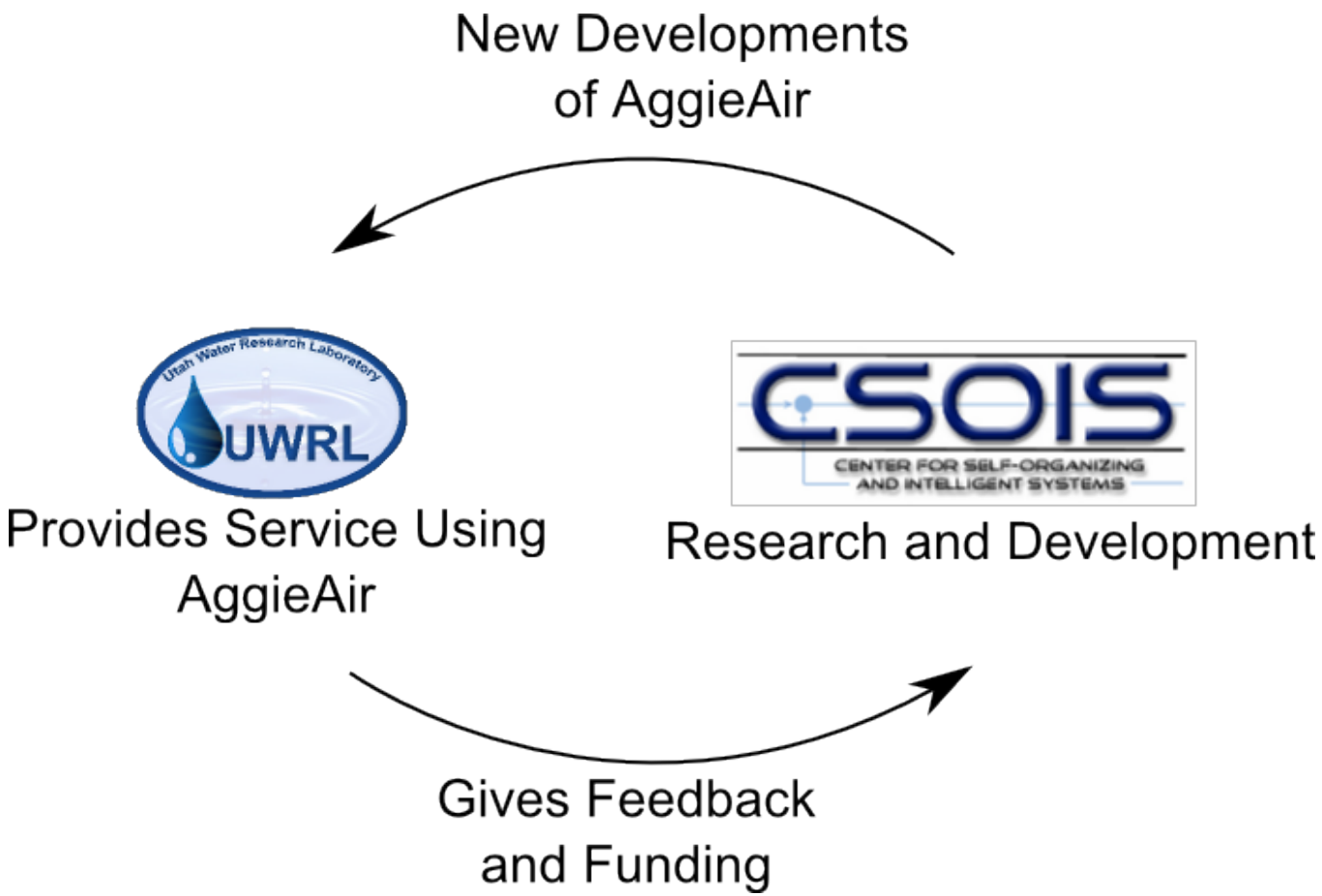
Other applications

- Riparian mapping
- Roads and Highways
- Fish Tracking

The Team


New Developments
of AggieAir
Utah Water Research Laboratory
UWRL
Provides Service Using
AggieAir
CSOIS
CENTER FOR SELF-ORGANIZING
AND INTELLIGENT SYSTEMS
Research and Development
Gives Feedback
and Funding

What is AggieAir?

Fixed Wing Remote Sensing Platform

- Low cost
- Small
- Fully autonomous
- Easy to use
- Independent of runway
- Coven capable
- High spatial resolution
- Multispectral
- Fast turnover

Bungee Launch

Skid Landing

UAV Operation

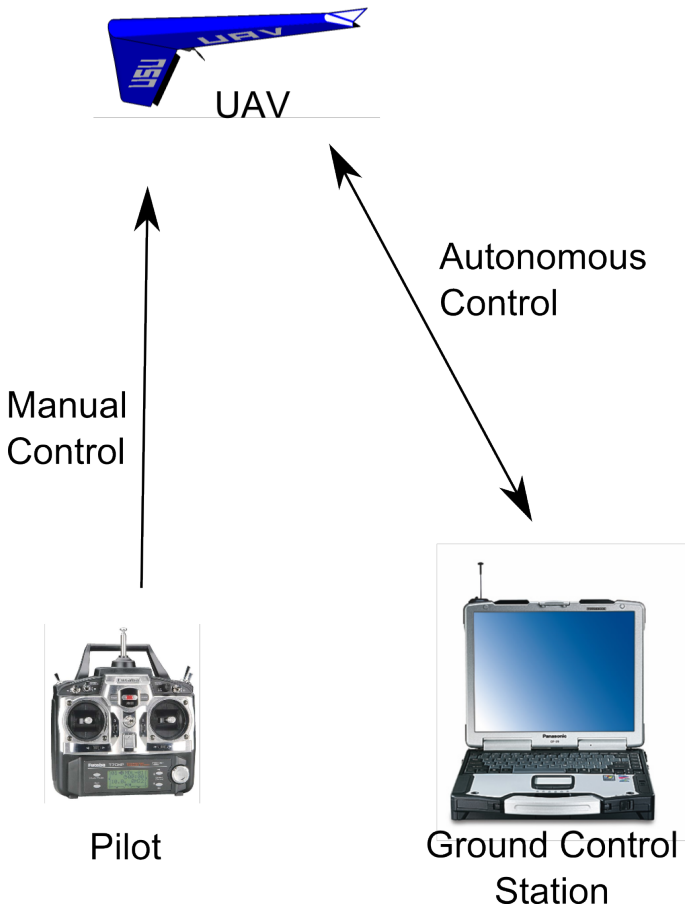
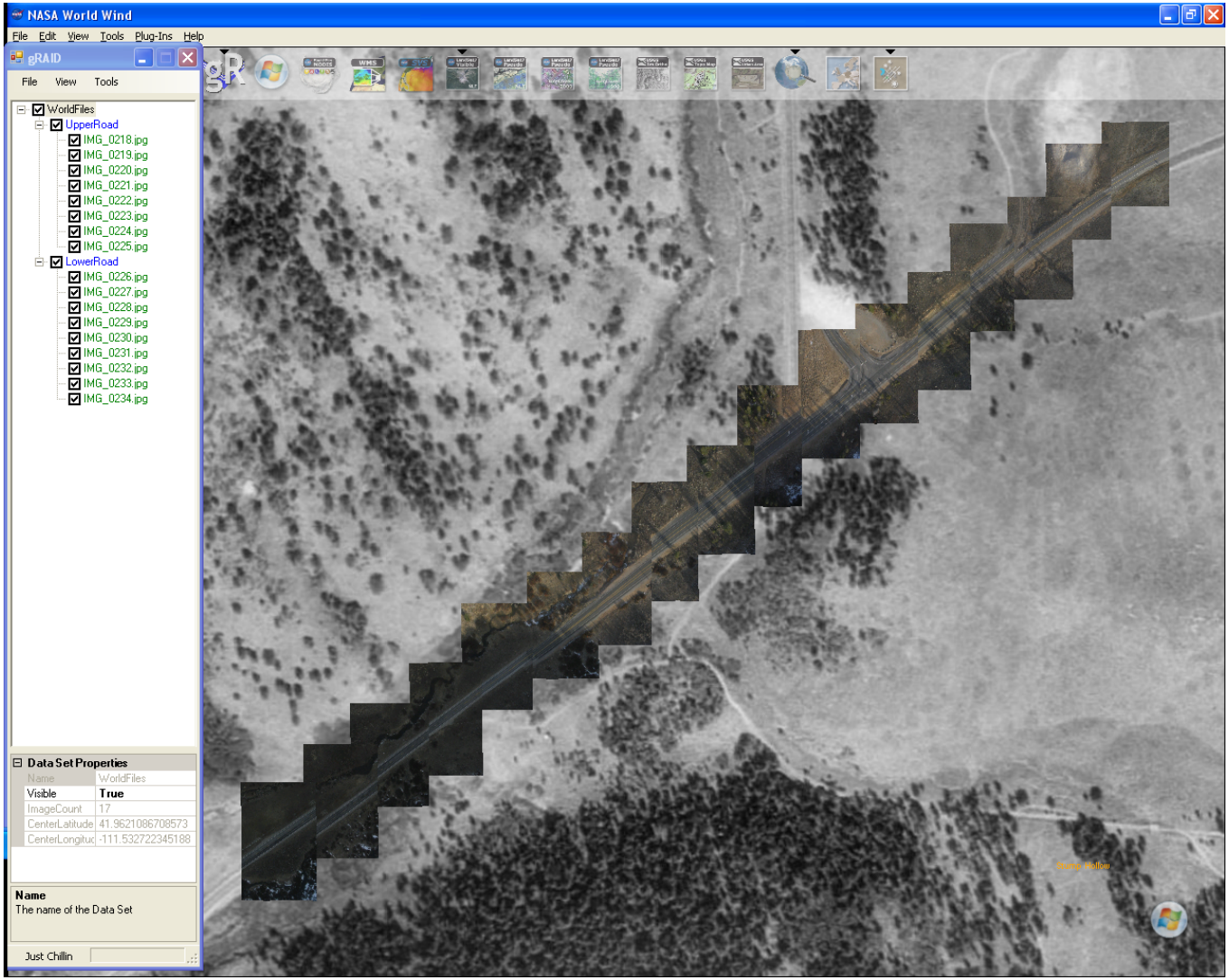


Image Processing



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72" Flying Wing

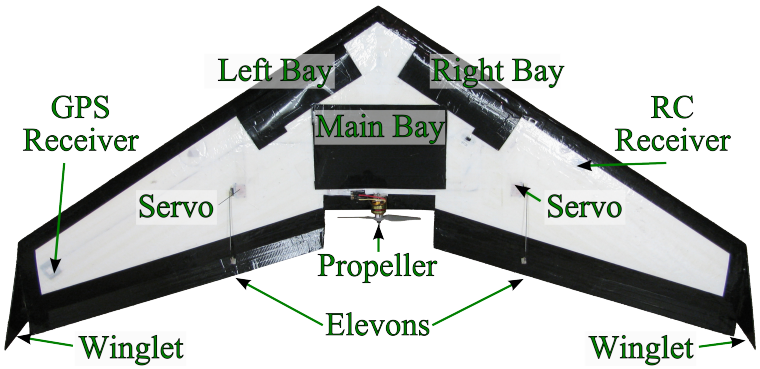


Figure: Aircraft Layout

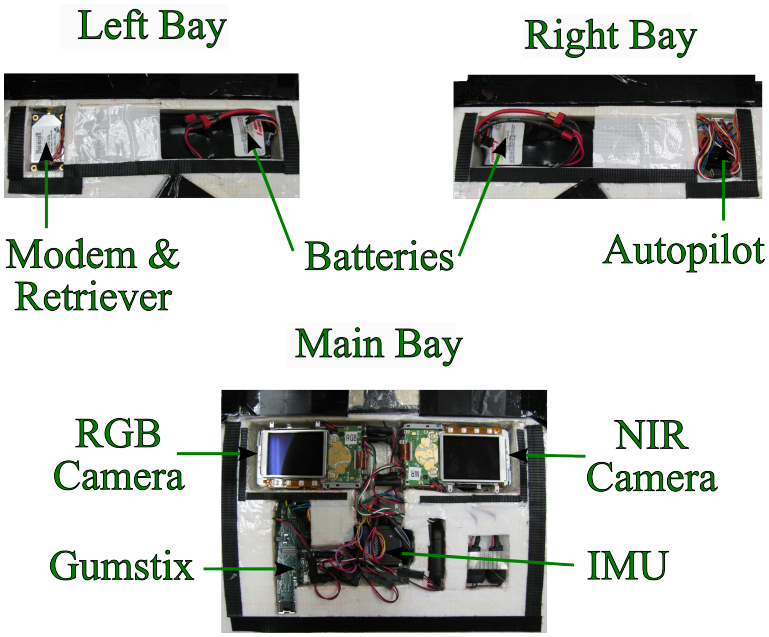


Figure: Bay Layout

72" Flying Wing

Table: AggieAir Aircraft Specifications

Wingspan	1.8 m (72 inch)
Weight	3.62 kg (8 lbs)
Nominal Air Speed	15 m/s (33 miles/hr)
Max flight duration	1-1.3 hours
Battery capacity	16,000 mAh
Payload capacity	1.36 kg (3 lbs)

Paparazzi

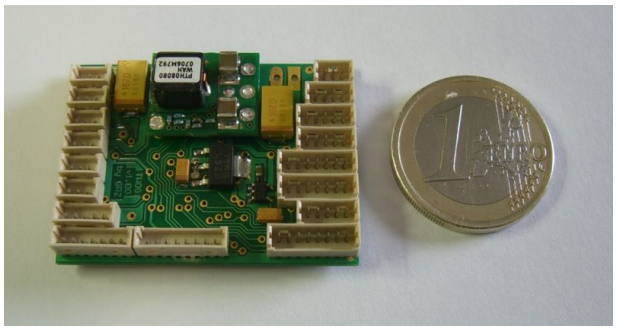
Description

An open source autopilot originally developed at ENAC university in France

Features

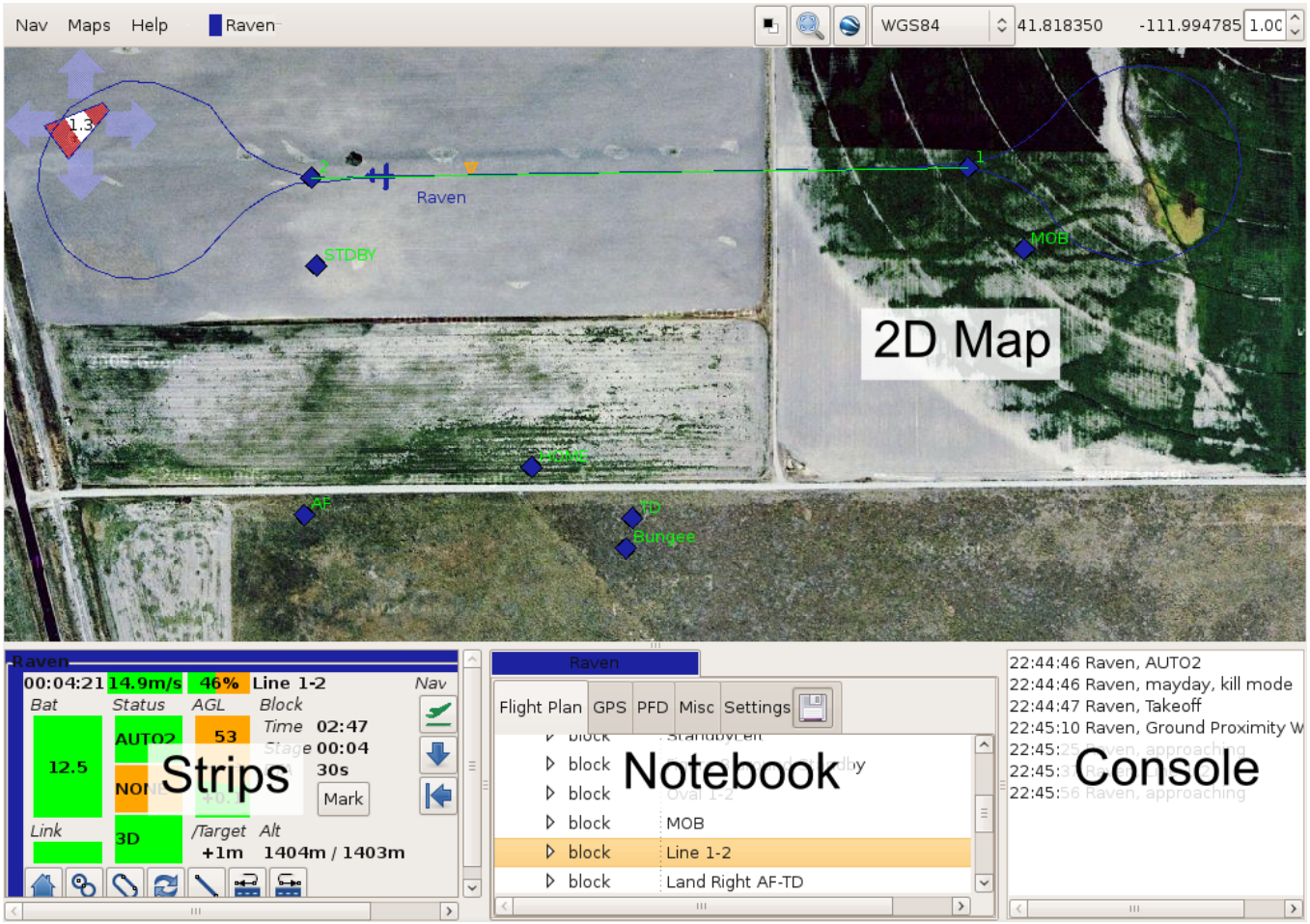
- Low cost
- Open source
- Very Flexible

(a) Logo



(b) TWOG Autopilot

Paparazzi Ground Control Station (GCS)



Ghost Foto (GFoto)

Features

- Software interface
- High resolution
- Accurate synchronization
- Uses onboard inertial sensors
- Real-time potential

Ghost Foto

Ghost Foto (GFoto)

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- Software interface
- High resolution
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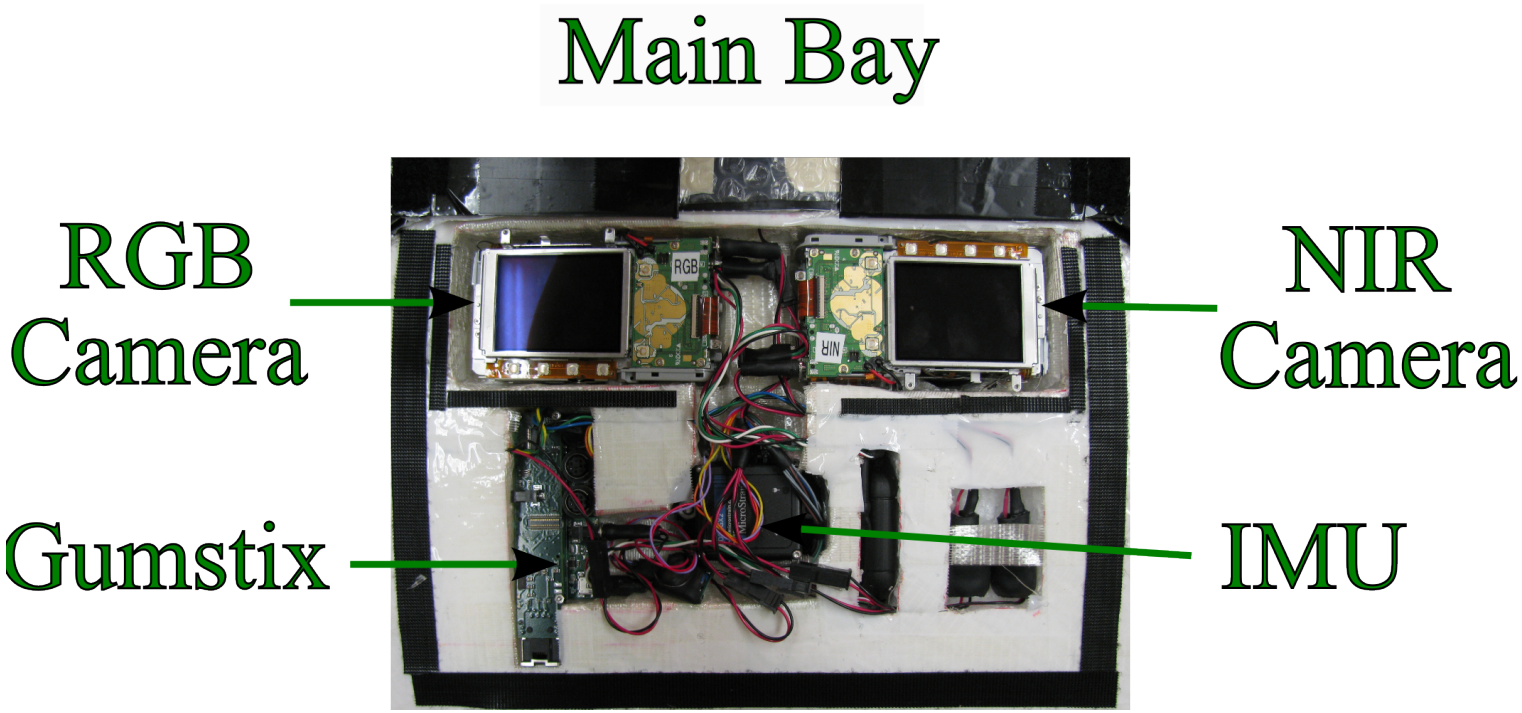
- Real-time potential

Resolution (pixels)	3264x2448
Focal Length (mm)	6
Field of View (deg)	50x39
Ground Resolution (m)	0.05
Swath Width (m)	190
Weight (g)	250
Frequency (FPS)	0.3

Ghost Foto Specifications (200m height)

Ghost Foto (GFoto)



Main Bay Layout

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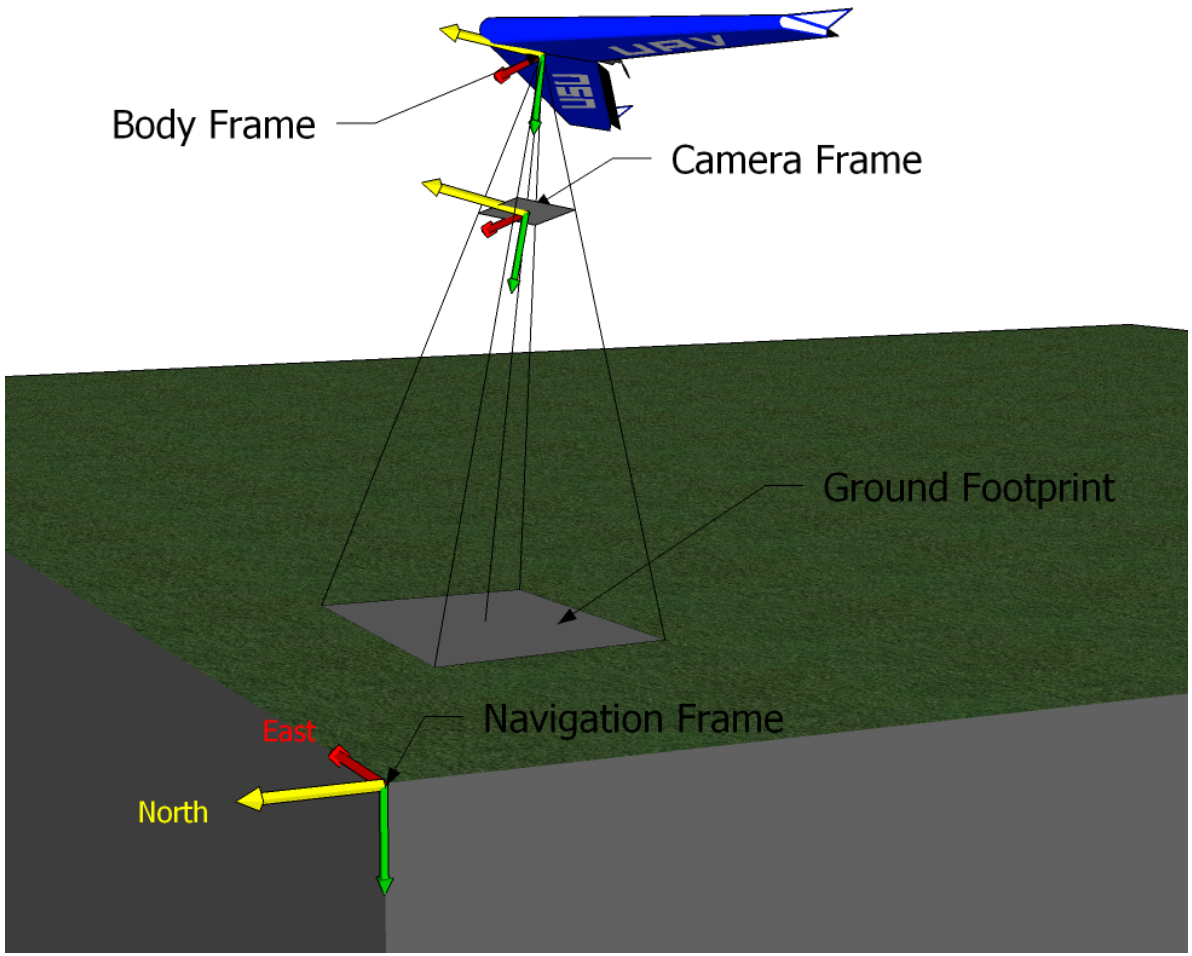
Raw Images

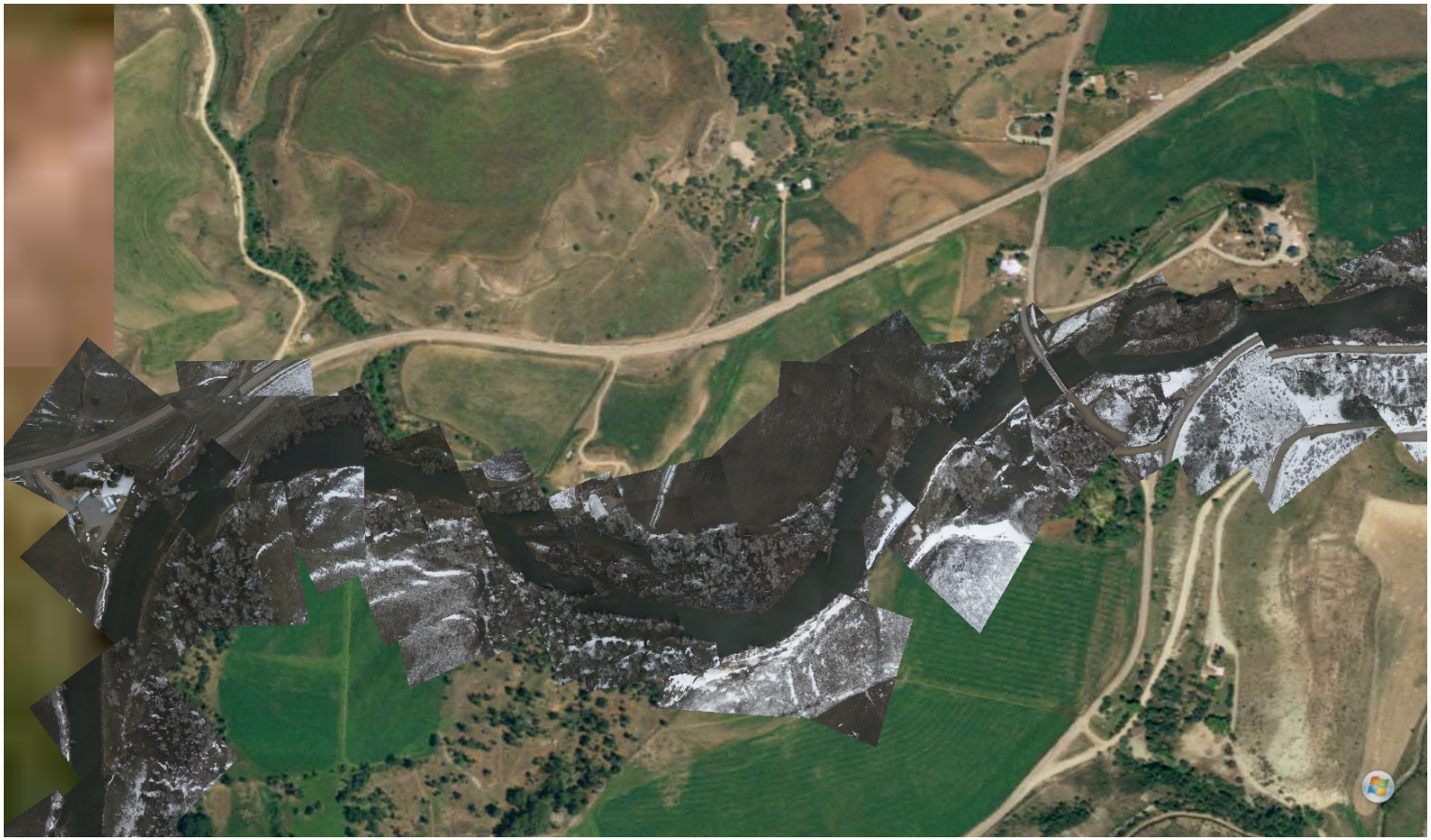
Manually Georeferencing

Direct Georeference



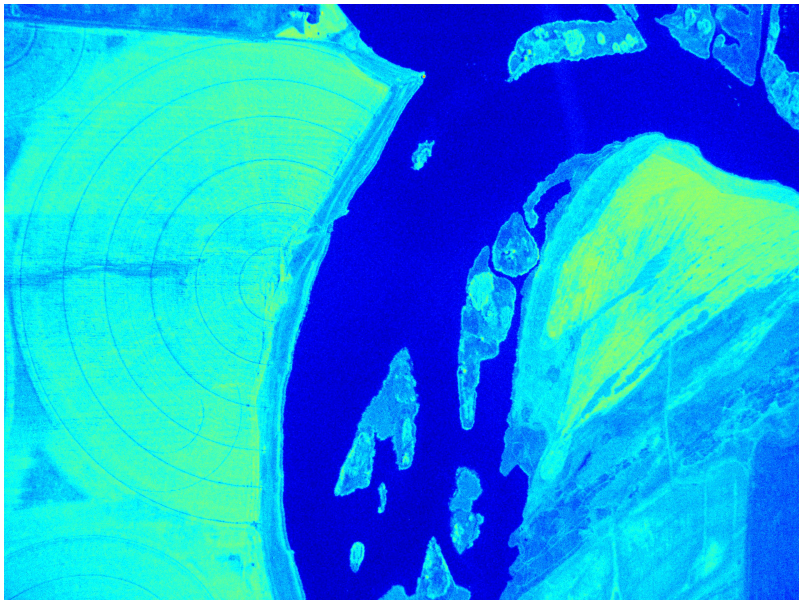
Direct Georeference

Direct Georeference



ENSOMosaic

RGB vs. NIR



An RGB and NIR image of the same area

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Agricultural Applications

RGB and NIR Mosaics of Agricultural Area

Soil moisture coming soon...

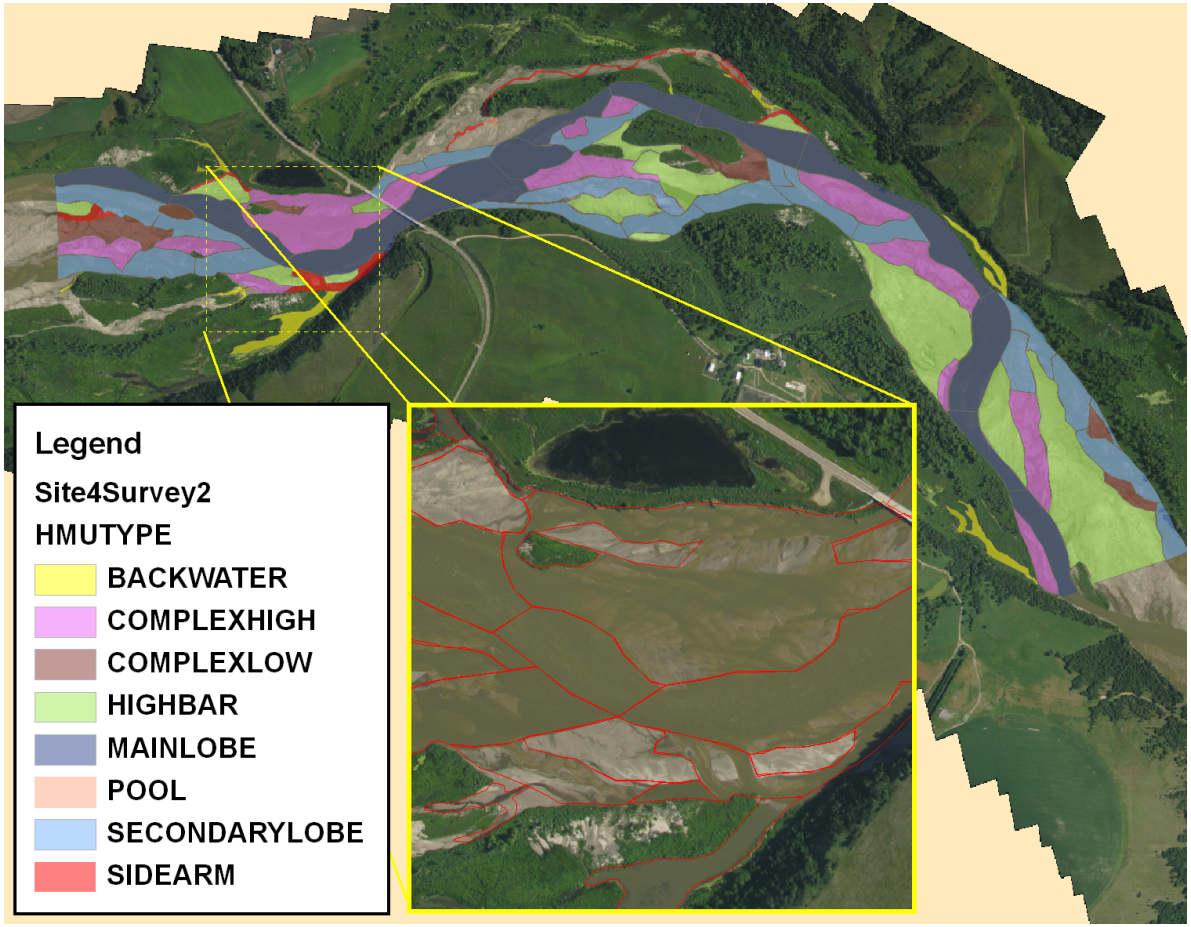
Riparian Applications

Up-To-Date imagery is important for riparian applications...

Mosaics of a River During High, Medium and Low Flows

Riparian Applications

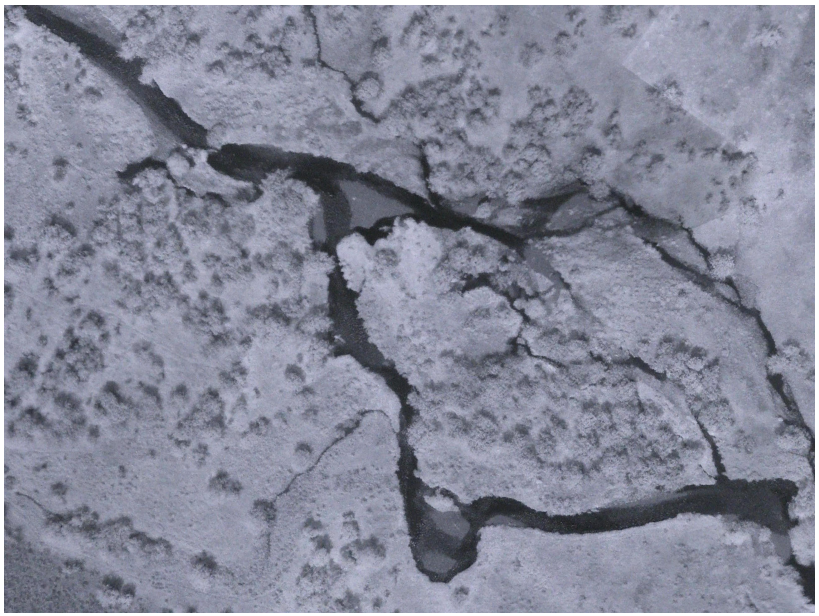
A fast turnaround time is important for riparian applications...



Annotated Mosaic 72hours After Flight

Riparian Applications

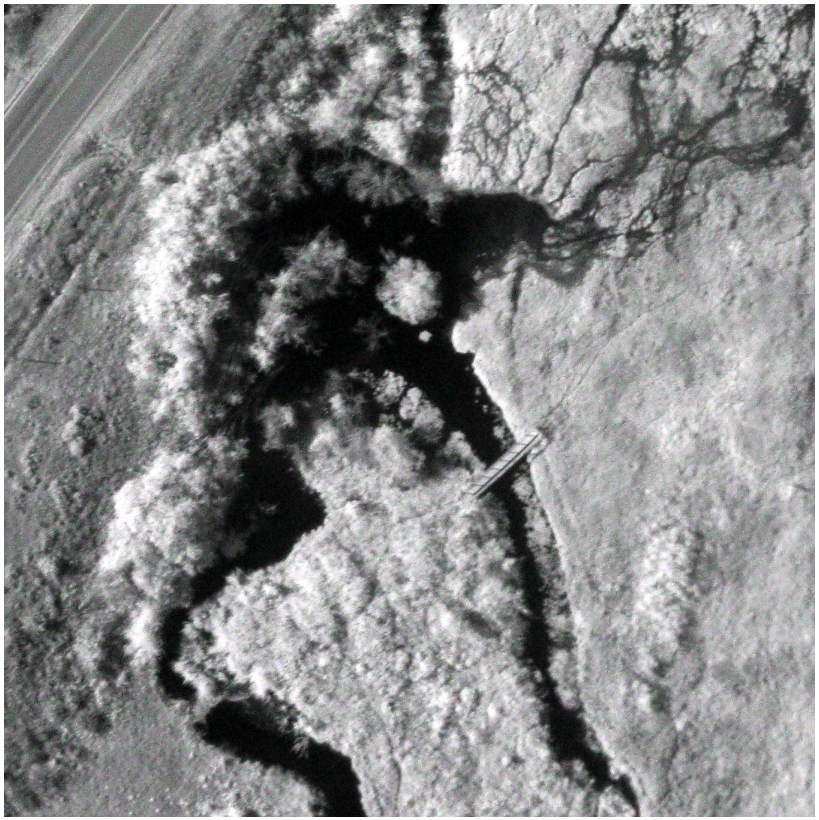
RGB and NIR imagery is important for riparian applications...



RGB and NIR Mosaics of Riparian Area

Riparian Applications

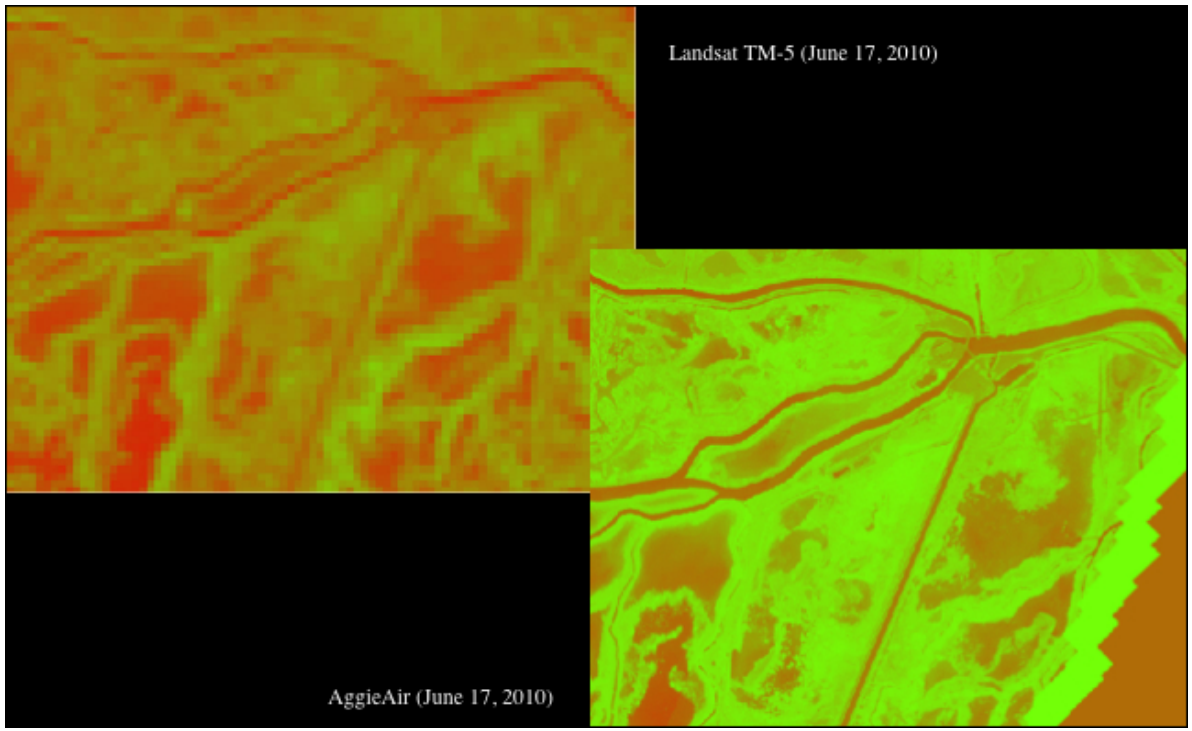
High resolution imagery is important for riparian applications...



RGB and NIR Mosaics of Riparian Area

Wetlands

High resolution imagery for image classification...

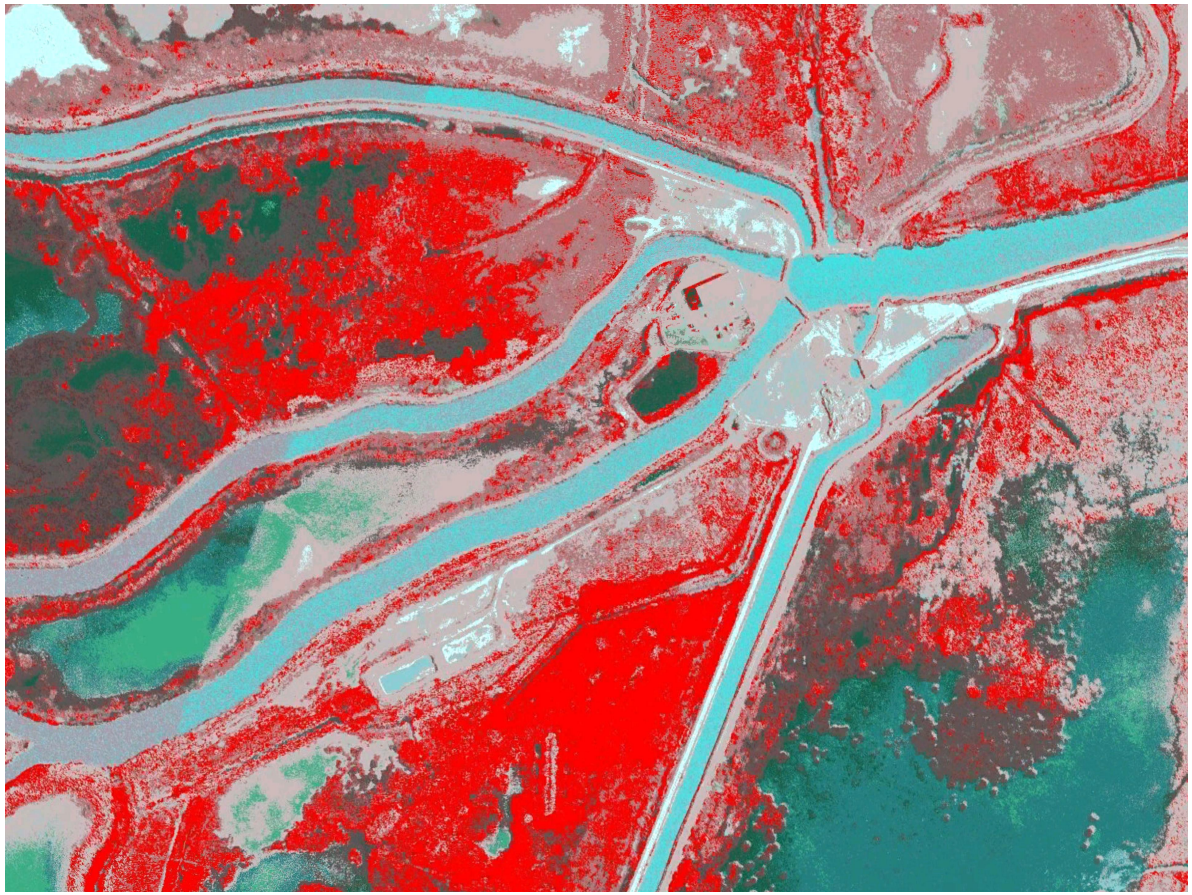


Comparison Between Landsat Imagery and AggieAir

Wetlands

RGB and NIR Mosaics of Wetland Area

Wetlands

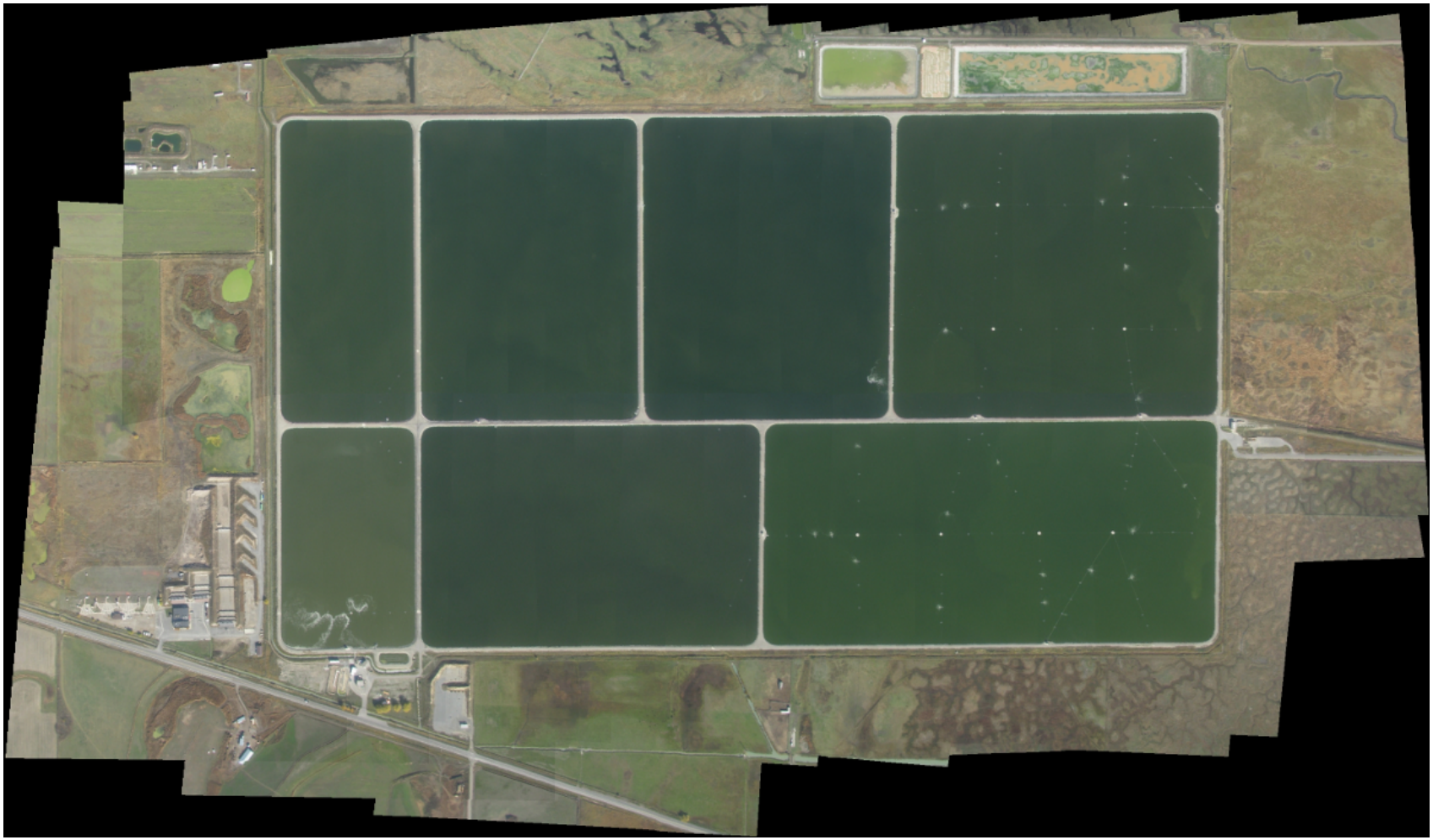


Mosaic of Non-Native Phragmites

General Surveying

Mosaics of a Highway Bridge During Construction

Biofuels



Others?....

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Fish Tracking

Thermal Camera

Low cost thermal imagery

- Thermal camera adds information
- Low cost solution needs to be calibrated

FLIR Thermal Camera

VTOL UAV

VTOL UAV

Thank you!

http://aggieair.usu.edu
http://www.engr.usu.edu/wiki/index.php/OSAM
http://paparazzi.enac.fr/wiki/Main_Page