Powder River Aquatic Task Group Aerial and Satellite Imagery

In-stream habitat classification categories were created in Dec.
SamplePoint analysis commenced in January.

Classes:
Outside of stream – beyond the scope of this classification
Dry Channel – along the bank, was wet in June
Variable-Depth Flow – Anything wet that is not waveform or shallow
Waveform – Substrate generally visible without detail
Shallow – Detailed substrate visible underwater
Emergent dry feature – sandbar in the current
Puddle – Ephemeral, shallow pool of water near the bank
Backwater – area of still water largley, but not completely, separate from main channel
Island – Dry in-channel feature with permanent vegetation
Debris – logs, sticks, grass, etc. in main channel
Isolated Pool – Area of deep water isolated from the main channel. Not ephemeral.

Current issues:

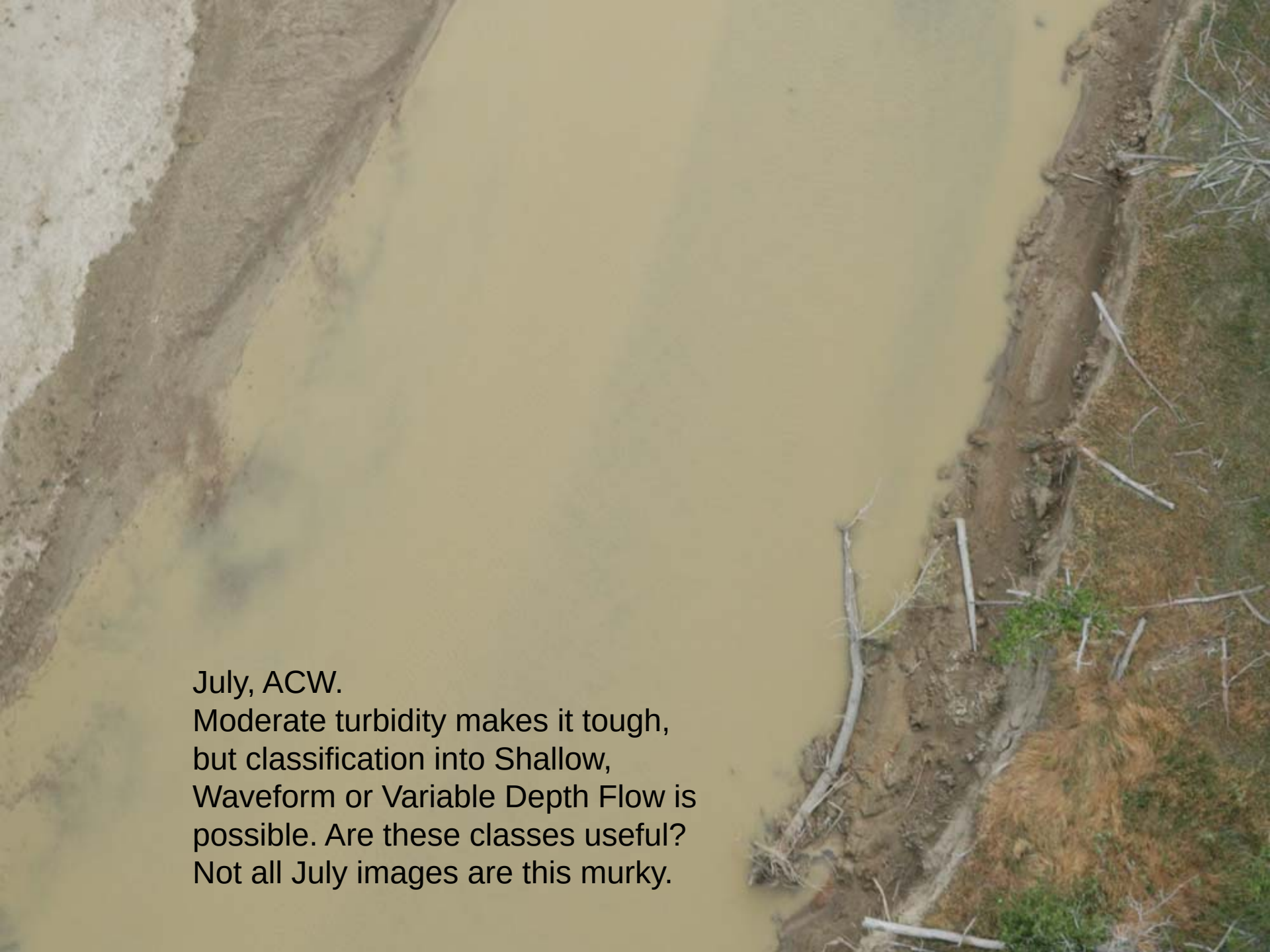
1) June and August images taken during high turbidity, so everything wet is variable flow (no shallow or waveform). Hard to see value in calling everything wet the same thing.

2) Is it useful for the ATG to know variable flow, shallow or waveform? Are these classifications useful?

3) Some July images are very clear. Can we classify riffles, pools, runs in these images?

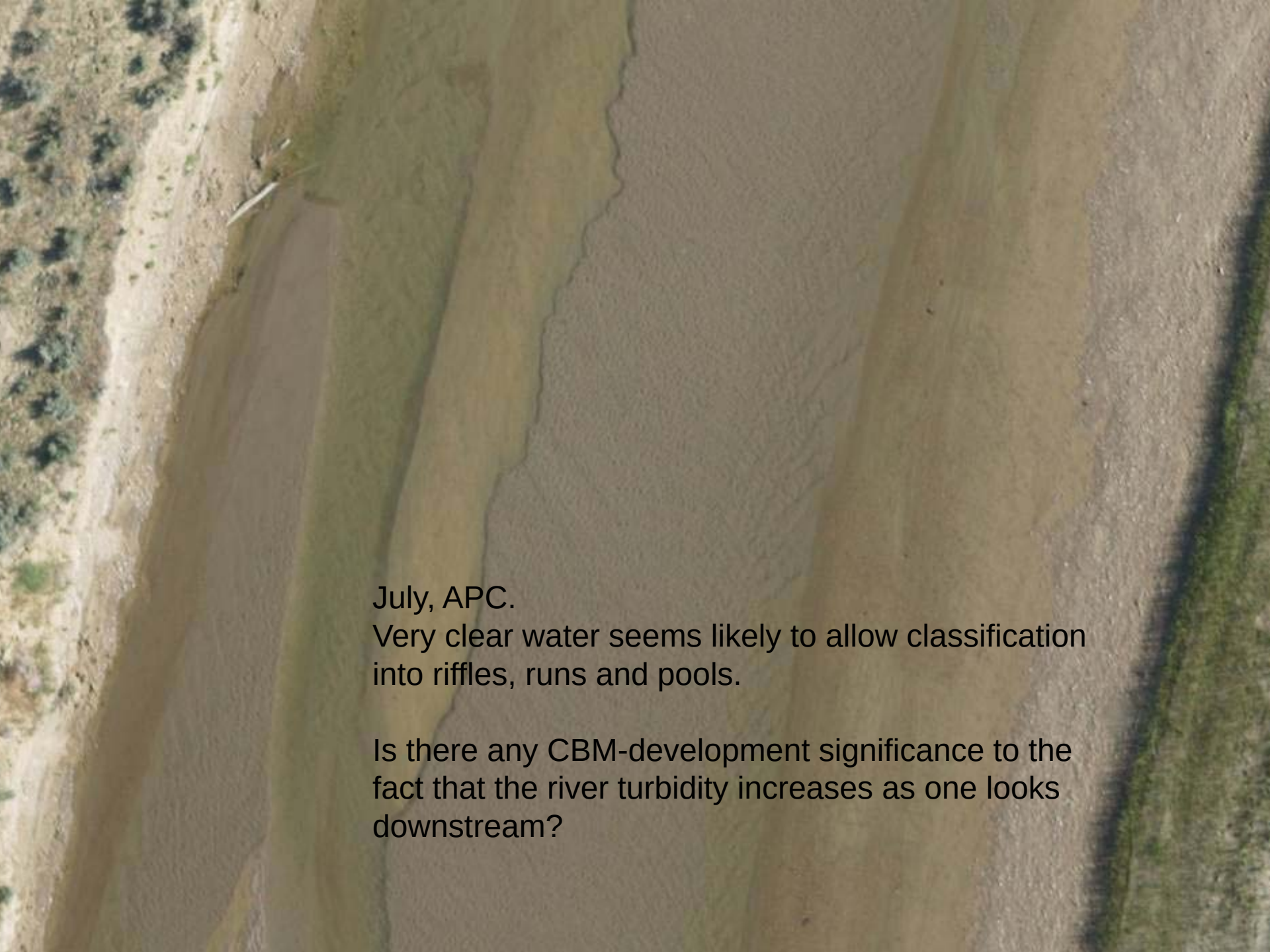
Example of image with moderate turbidity that allows shallow, waveform and variable depth flow classification

Example of August image with high turbidity. Nothing below water surface is visible. Everything wet is classified as Variable Depth Flow. All August images look this way.



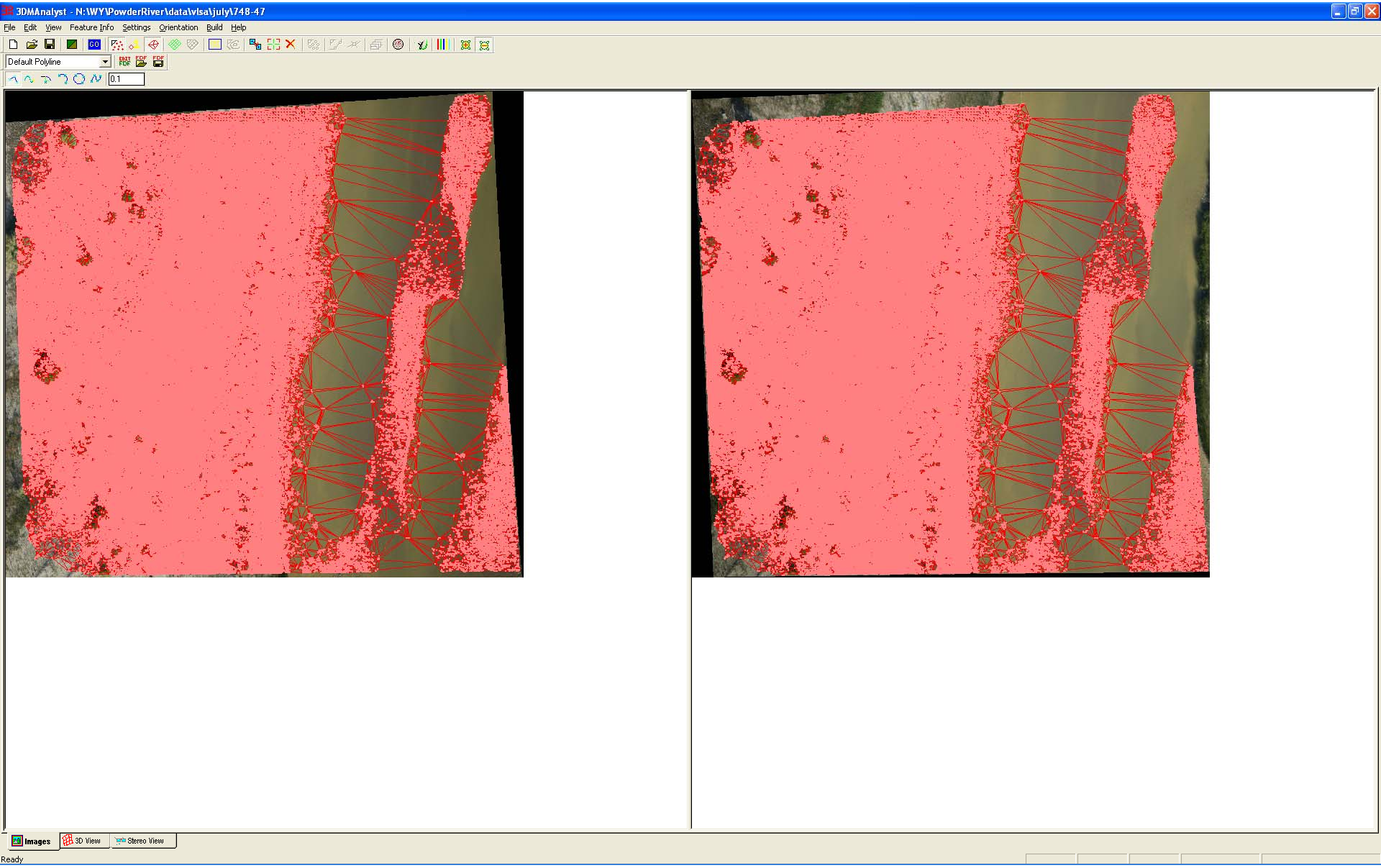
July, ACW.
Moderate turbidity makes it tough, but classification into Shallow, Waveform or Variable Depth Flow is possible. Are these classes useful? Not all July images are this murky.

July, BBD
Much clearer water.
Could riffles, runs and pools be classified in this stretch of the river?

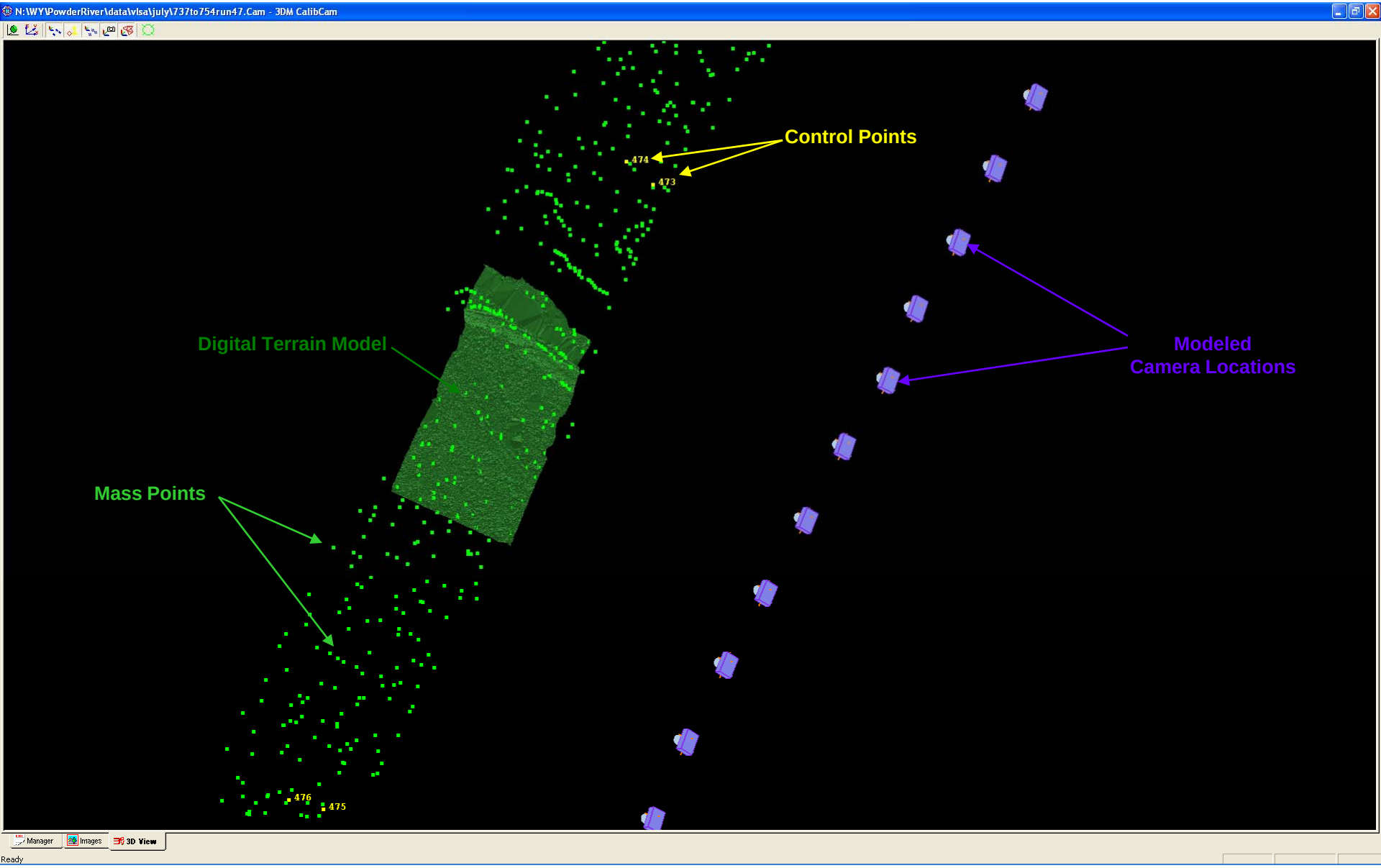


July, APC.
Very clear water seems likely to allow classification into riffles, runs and pools.

Is there any CBM-development significance to the fact that the river turbidity increases as one looks downstream?



Digital Terrain Model using TIN



Currently, ground control points are needed to orient photos in real-world coordinates. With accurate *location* (GPS) and *orientation* (IMU) data for the camera ground control would not be needed.

Potential Derived Data

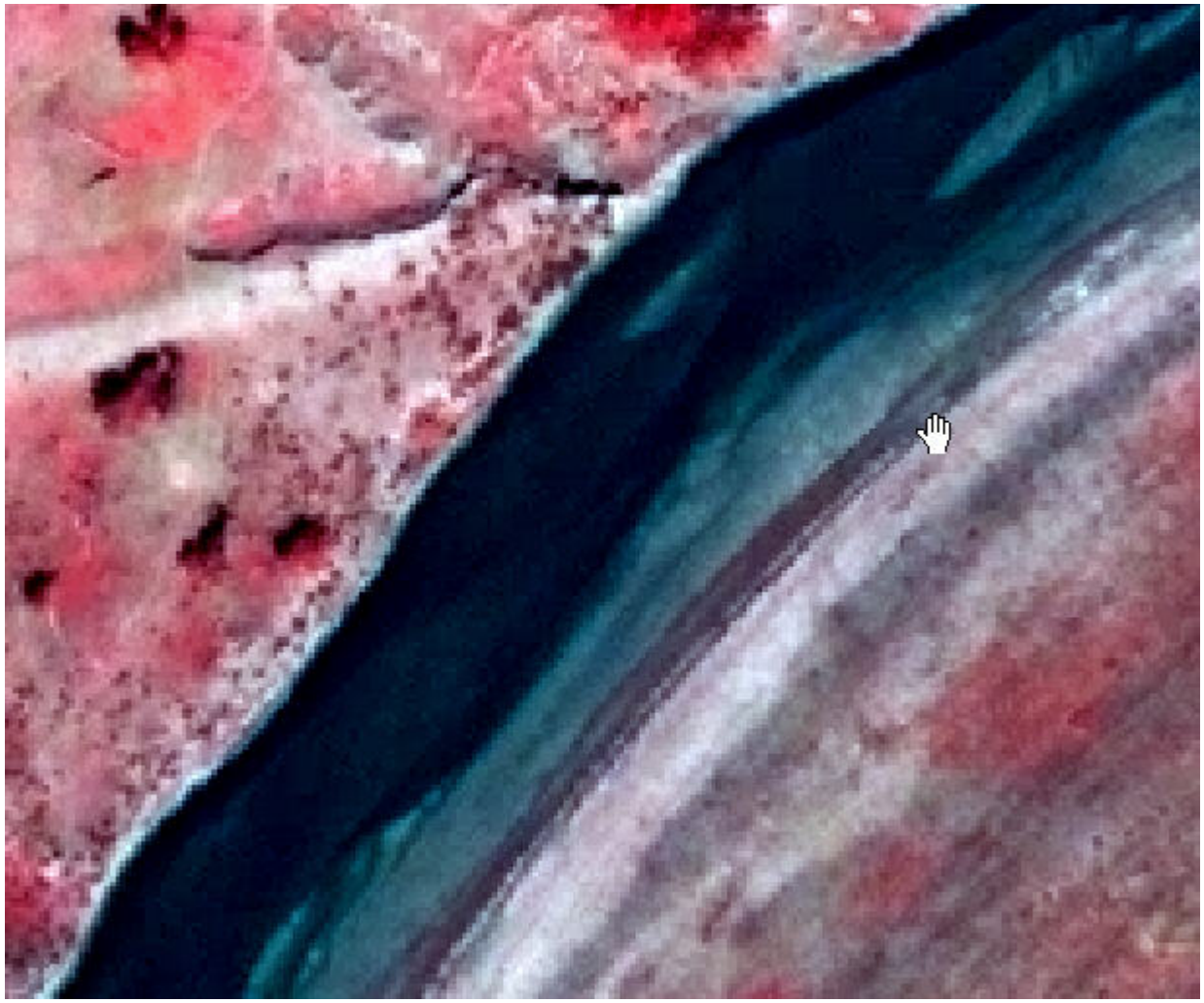
1. Vegetation Heights
2. Bank Erosion, Slope
3. Water Depth (need baseline of empty stream channel elevation)
4. Vegetative cover/Bare Ground

Uses

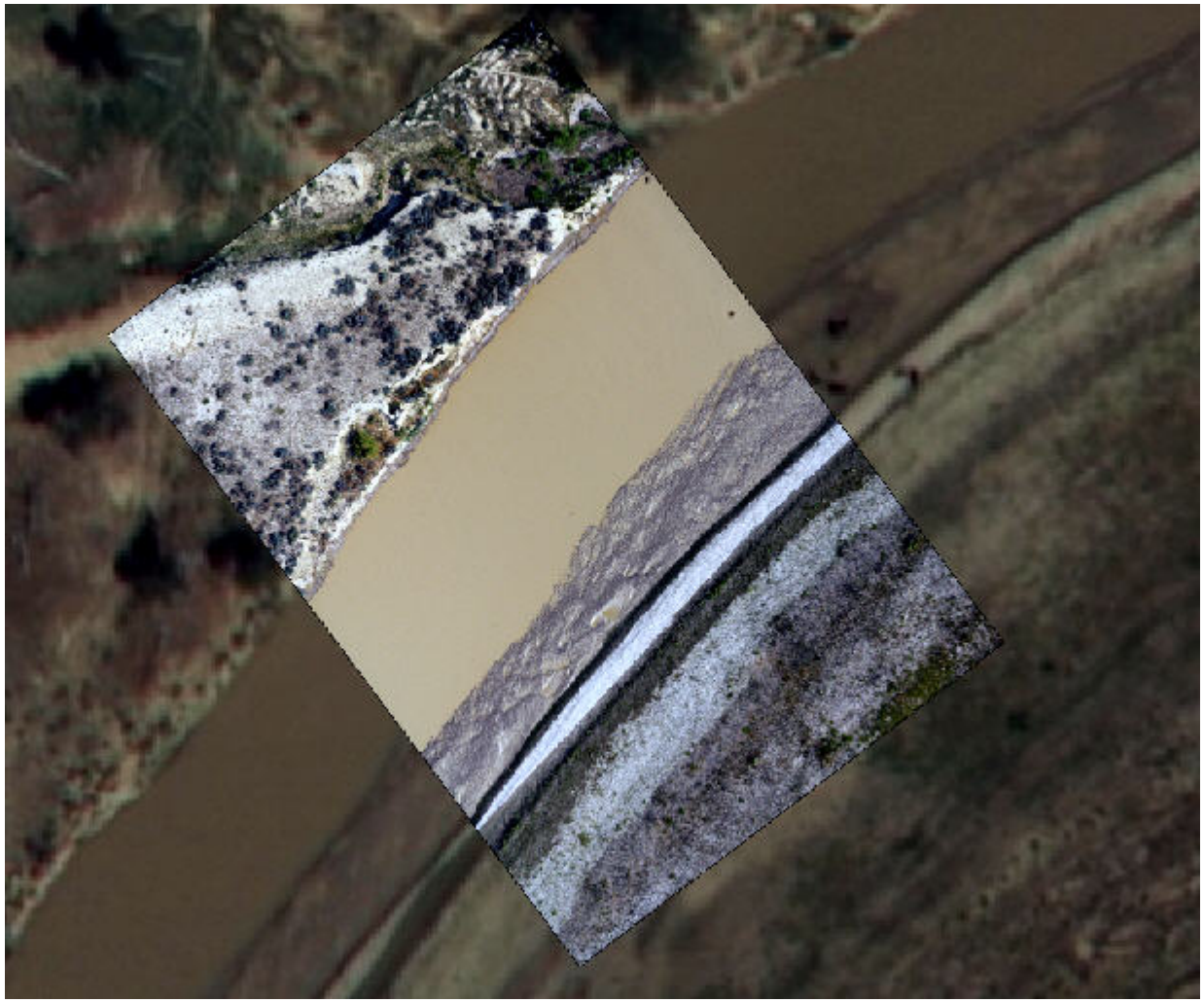
1. Training coarser resolution imagery
2. Monitoring invasive species
3. Change detection
4. Guide sampling
5. Visualization tool

Need

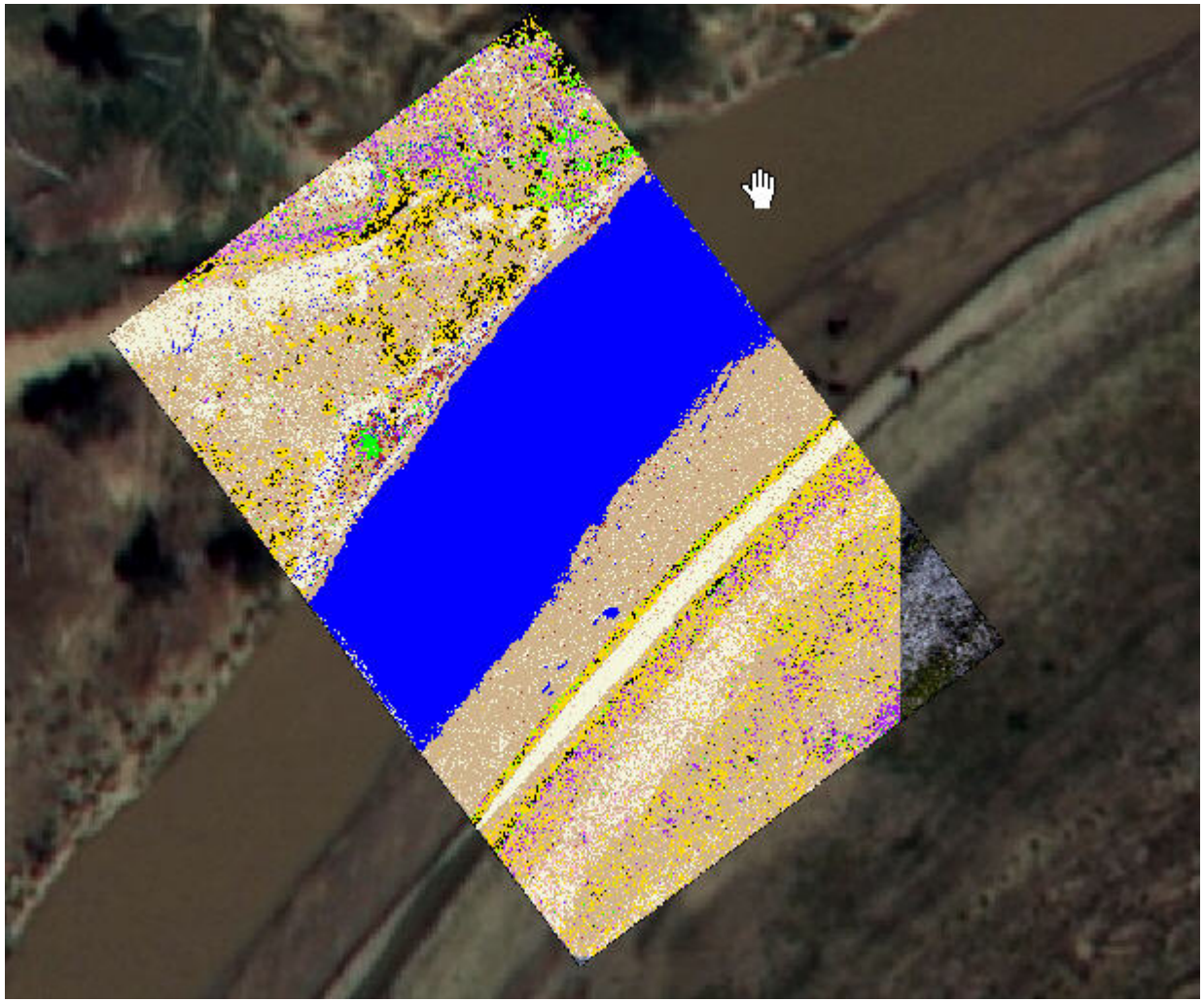
Accurate, Low-cost, multi-temporal, co-registered imagery



QuickBird; 0.60 meter resolution



VLSA, referenced using AEROCam Mosaic



Supervised Classification of VLSA

Recommendations for Further Aerial and Satellite Imagery Analysis

- Continue with a multi-resolution approach using VLSA and Quickbird.
- Use available 2005 Quickbird imagery for change-detection analysis.
- Possible purchase of IMU/GPS for ultra-light aircraft.
- VLSA can provide repeatable annual imagery.
- Vegetation height could be determined from VLSA stereo model.
- High resolution DEM can be generated from stereo imagery.
- Fieldwork would help with calibration of aerial and satellite imagery.

Micro IMU/GPS System for VLSA Photography

- Advances in micro-electronics are enabling the miniaturization of Global Positioning Systems (GPS) and Inertial Mapping Units (IMU).
- These new devices have the *potential* (testing needed) to eliminate the need for ground control, thus significantly reducing imagery acquisition and georeferencing costs while speeding up data processing times for generation of orthos and digital terrain models and increasing accuracy of products.
- Such a device would greatly assist with multi-temporal analyses by ensuring greater overlap of photography on successive flights due to increased navigation precision. The three VLSA flights in 2007 produced less than 20% overlap between dates for selected transects.
- A cost estimate for outfitting ARS' current VLSA system with a new integrated GPS/IMU is still being generated.