

Incorporating the **Coastal Blue Band (CBB)** aboard
Satellites and Unmanned Aerial Surveillance (UAS):
A **Remote Sensing Toolkit** for
Mapping Intertidal **Mudflats** in South SF Bay



Mudflat Mapping Team



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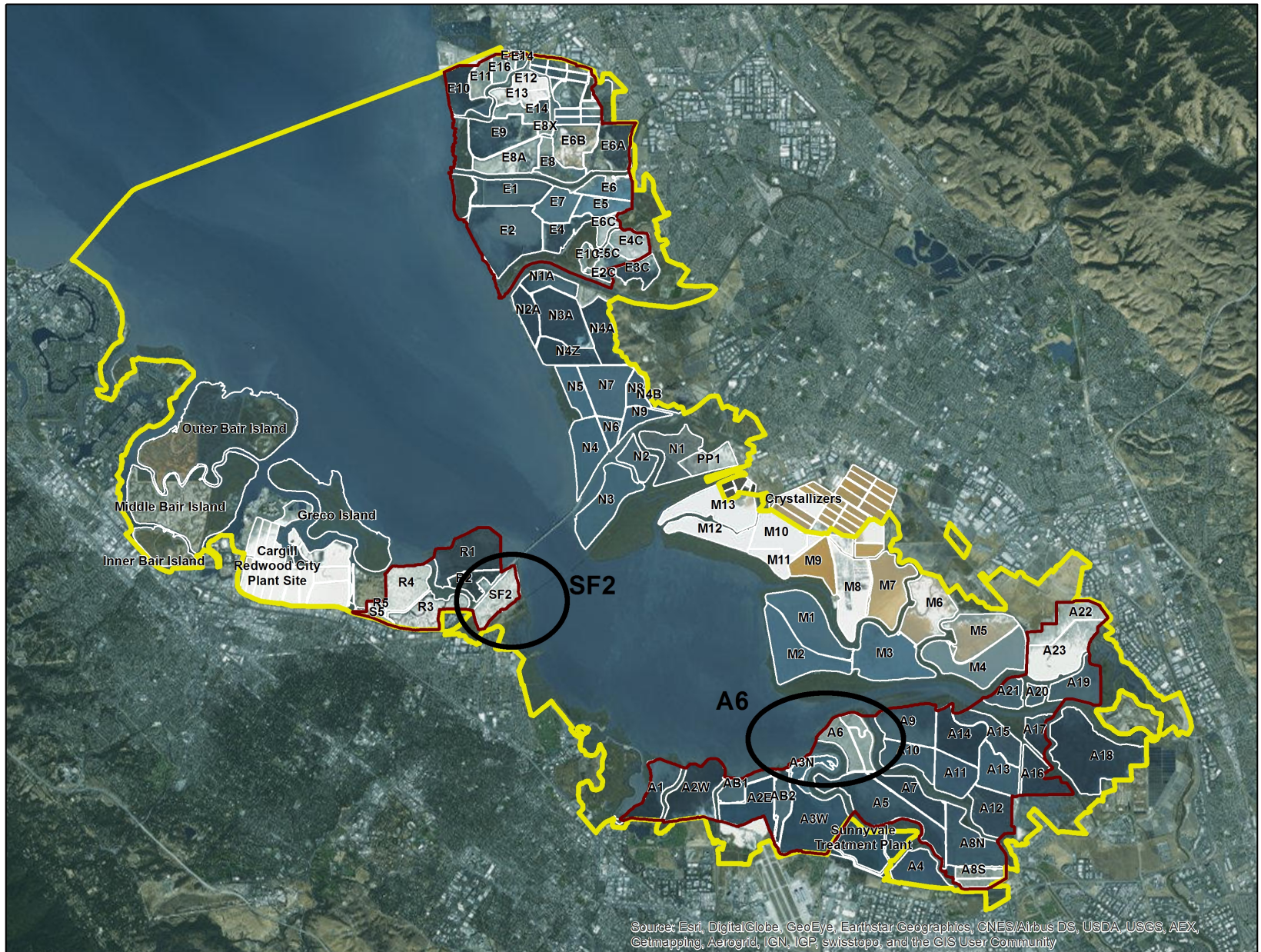
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Need, Issue(s) and Approach

- Track **full geographic extent of mud flat**
- Spatial Resolution: **50 square meters** (~7 meters)
- Tide at **Mean Lower Low Water** (MLLW) to allow for full exposure of mudflats
- **2D** is adequate to meet needs of management
- Track changes every 1 to 3+ years
- **Low Cost** Option

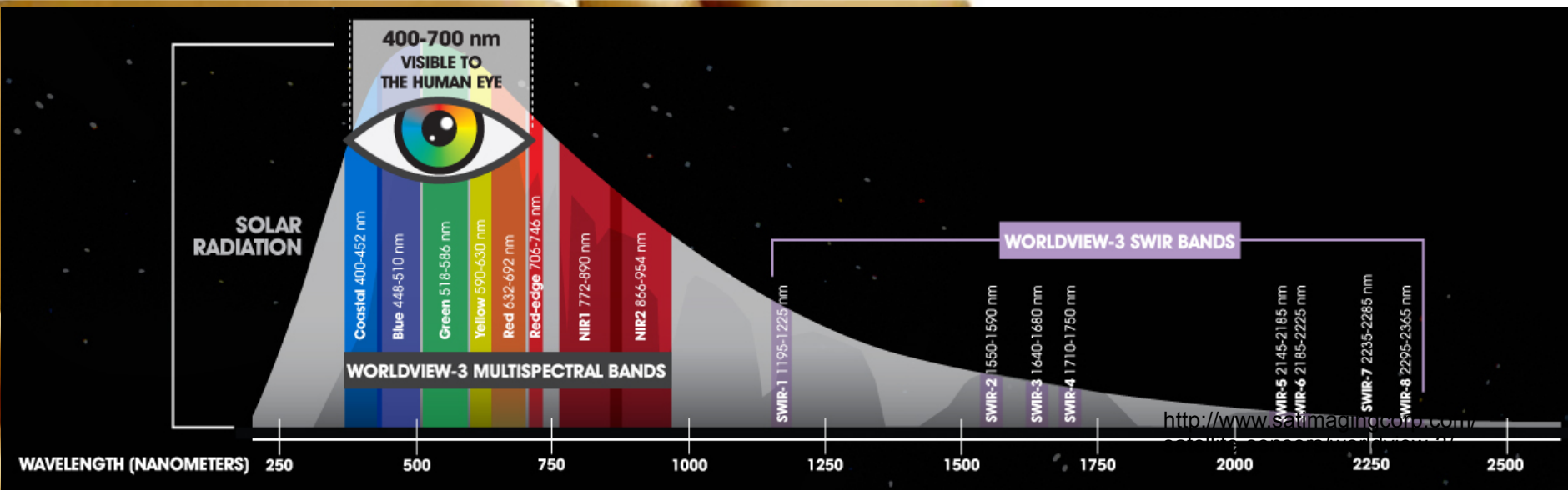
Goal: Map Mudflats with Coastal Blue Band (CBB) on



Step #1: Image Acquisition - completed

Digital Globe World View-3 Satellite Data

Free Via USGS CRSSP Imagery Derived Requirements (CIDR) Tool



- 1.3 meter resolution
- 8 multispectral bands, including coastal blue band (400-452 nm)
- Tasked satellite to correspond with <0 MLLW predicted low tides
- RPC orthorectification in ENVI w/ SF Bay topo/bathy DEM, RMSE~0.5m
- Atmospherically corrected with ENVI FLAASH

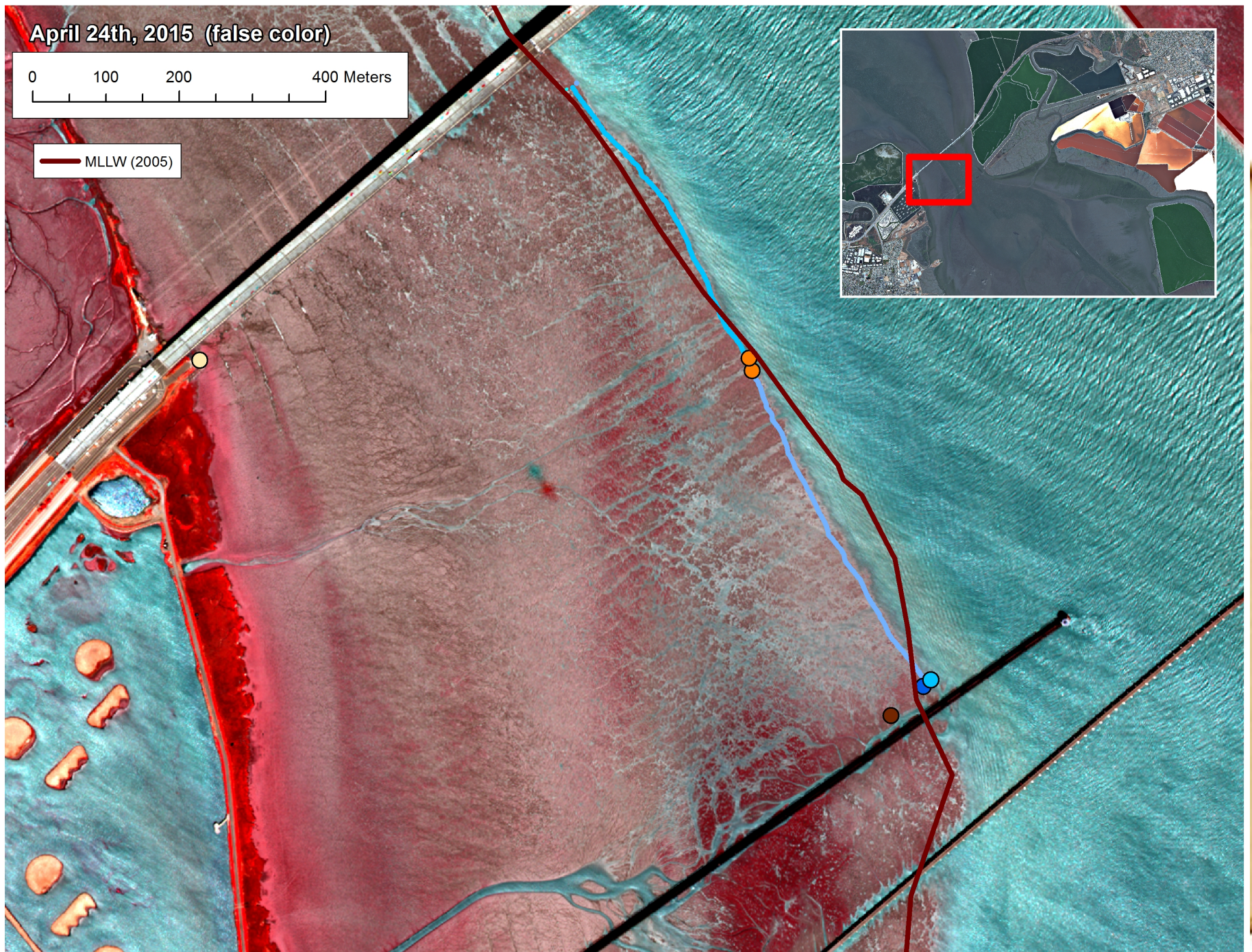
4/24: 12:05 pm collection;
Redwood City water level 0.561 ft.
Coyote Creek water level 0.919 ft.

6/7; 12:00 pm collection;
Redwood City water level 0.43 ft.
Coyote Creek water level 0.328 ft.

April 24th, 2015 (false color)

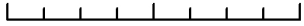
0 100 200 400 Meters

— MLLW (2005)



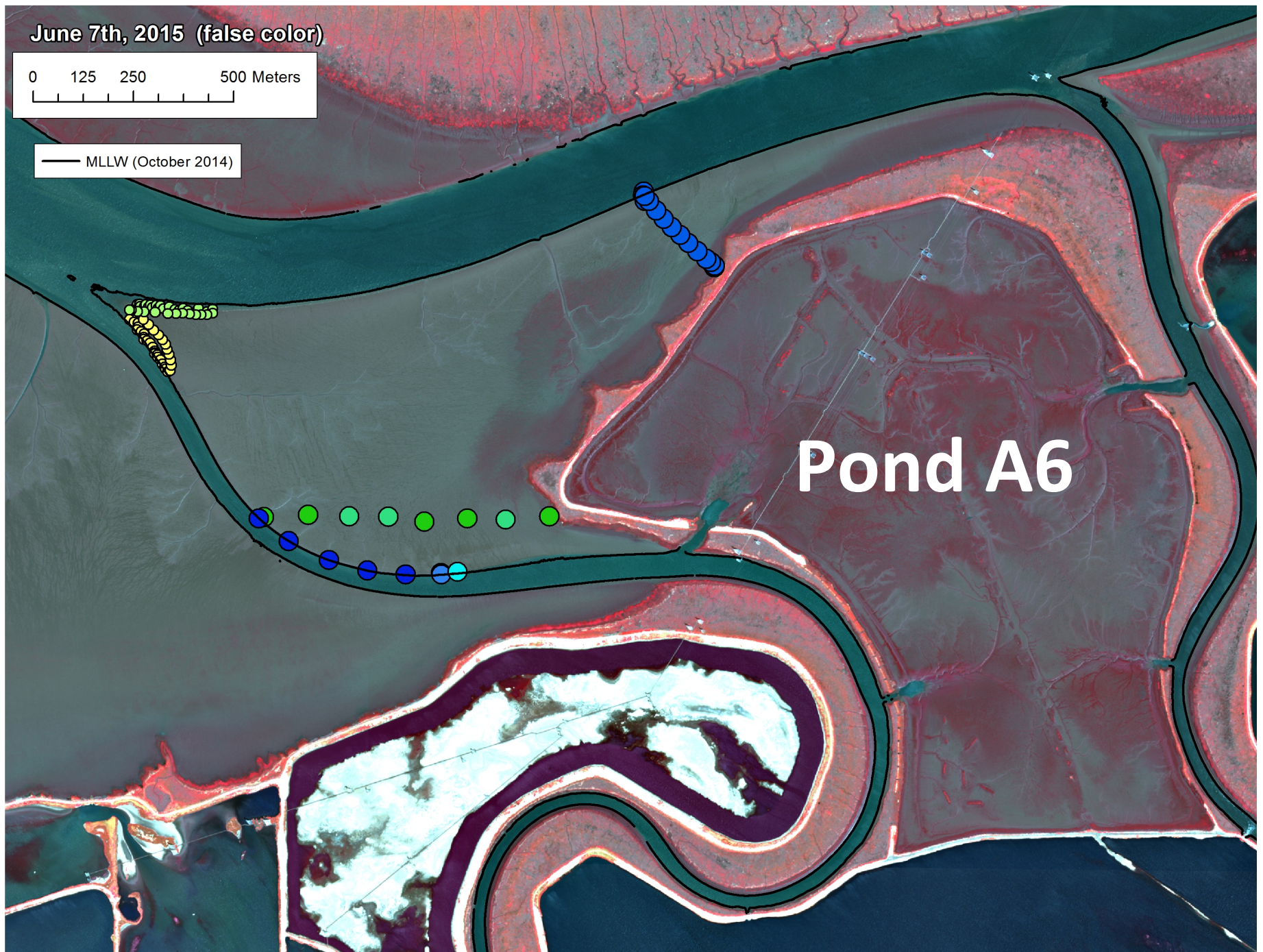
June 7th, 2015 (false color)

0 125 250 500 Meters



— MLLW (October 2014)

Pond A6



Step 2a: Map Mudflats with Multispectral Remote Sensing (WorldView3) – *in process*

Mudflats spatial and spectral variability:

(1) exposed mudflats

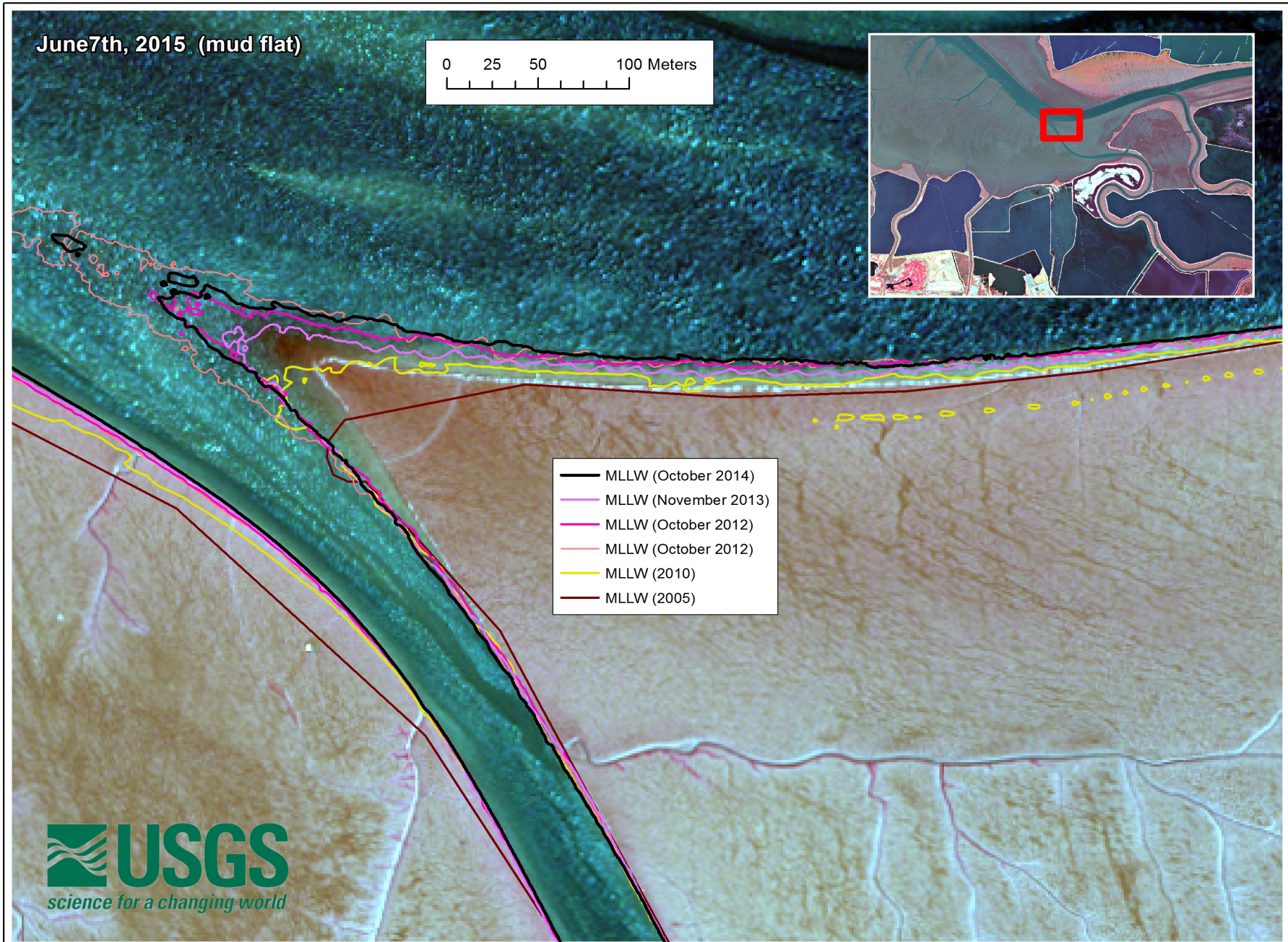
(2) mudflats with “ponding”

(3) mudflats under water (tidal issues) and mudflat “edge”

(4) mudflats with biofilm



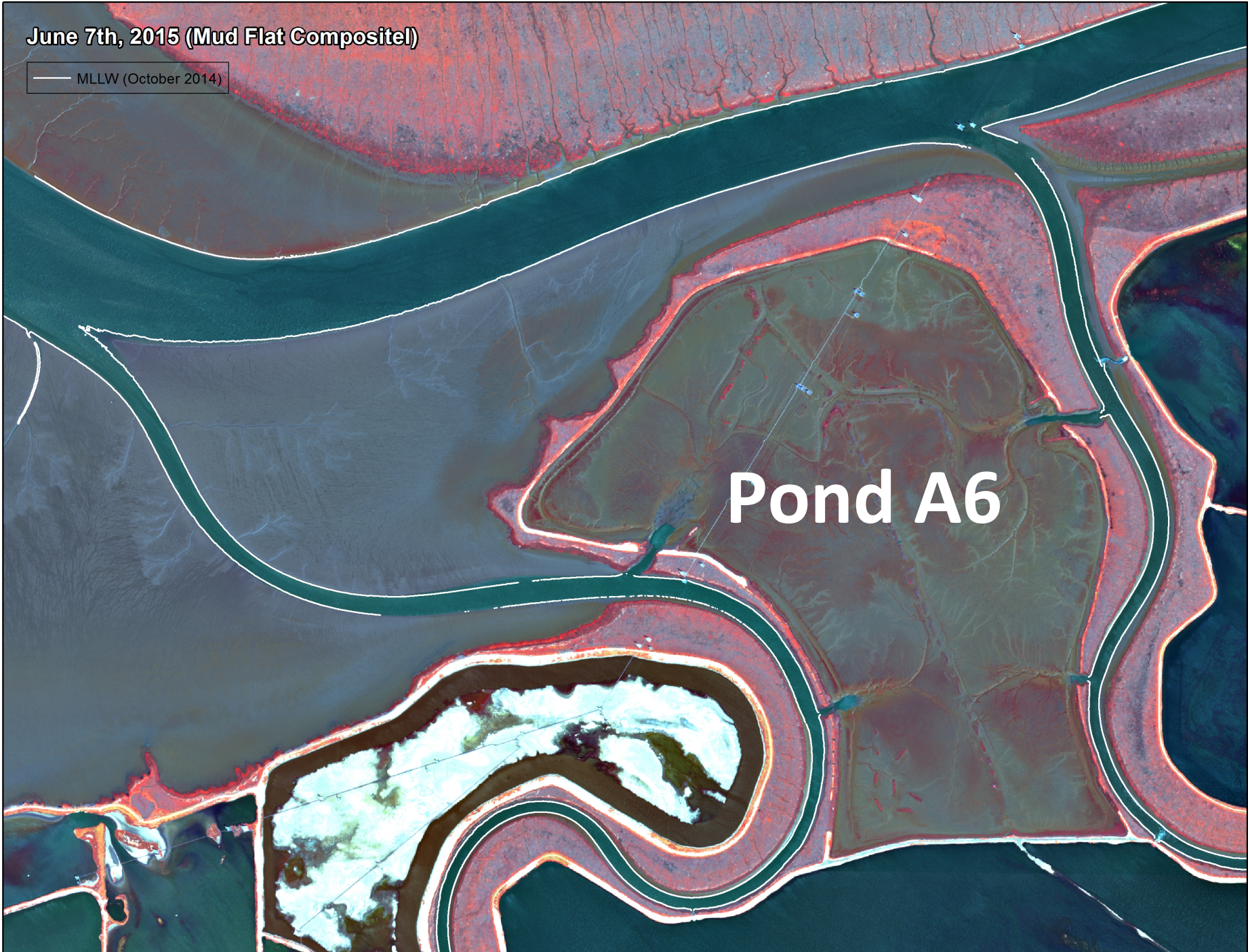
Step #2b: Use Lidar (MLLW) as baseline Mudflat "edge" - *in process*



June 7th, 2015 (Mud Flat Compositel)

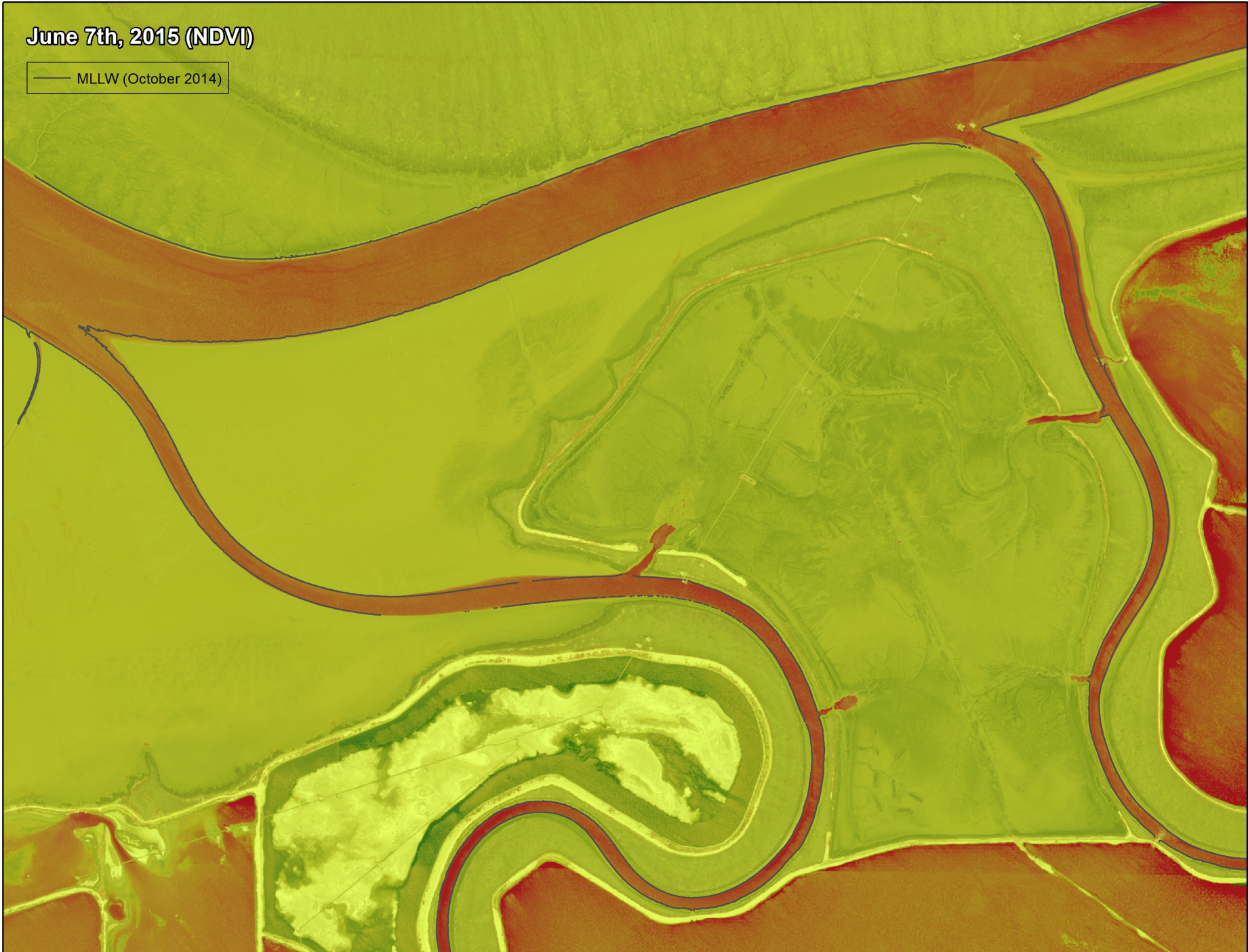
— MLLW (October 2014)

Pond A6

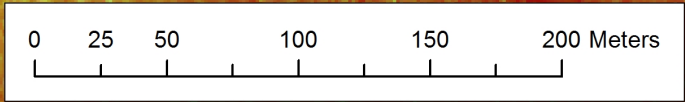


June 7th, 2015 (NDVI)

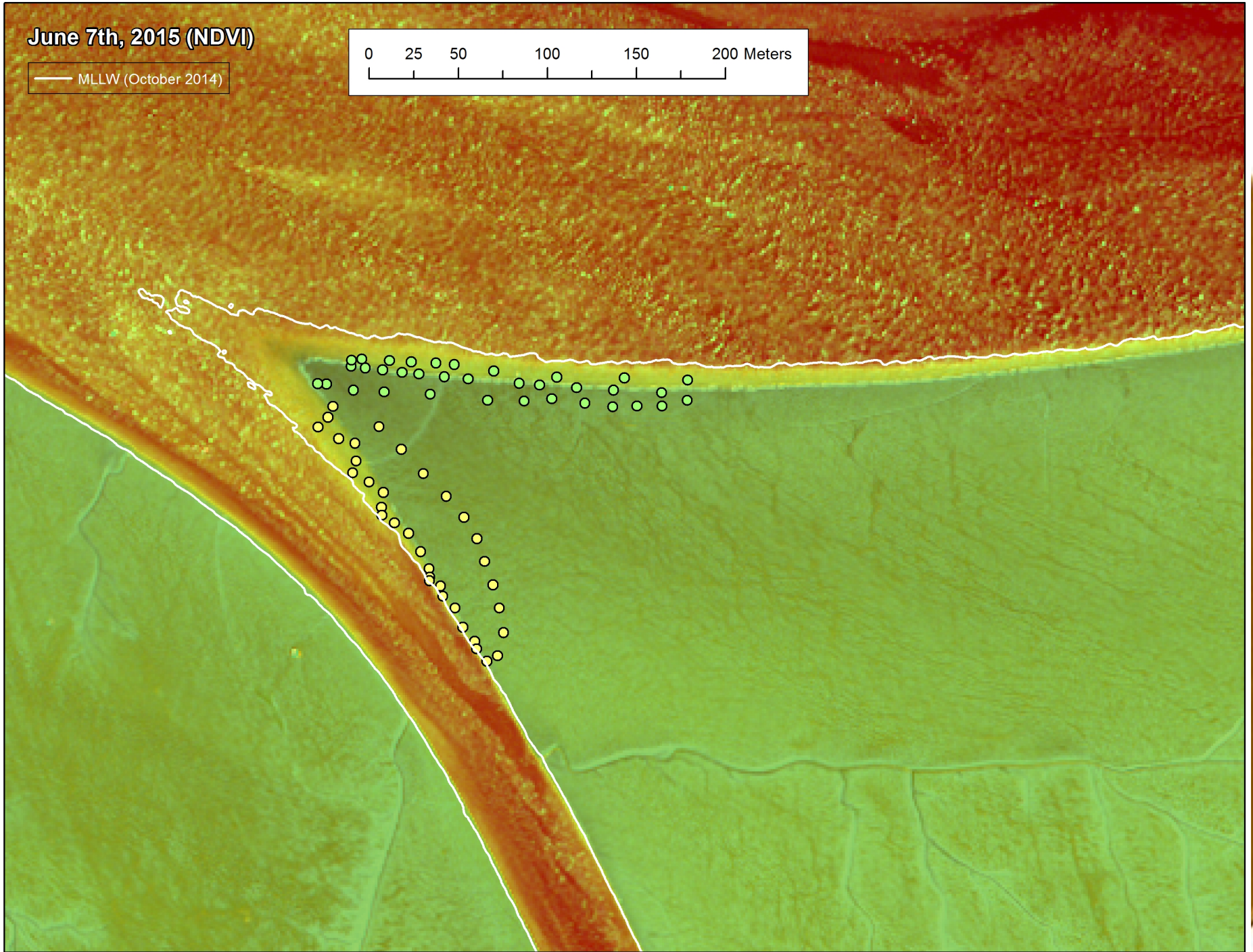
— MLLW (October 2014)



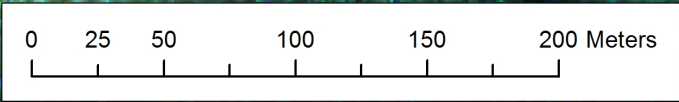
June 7th, 2015 (NDVI)



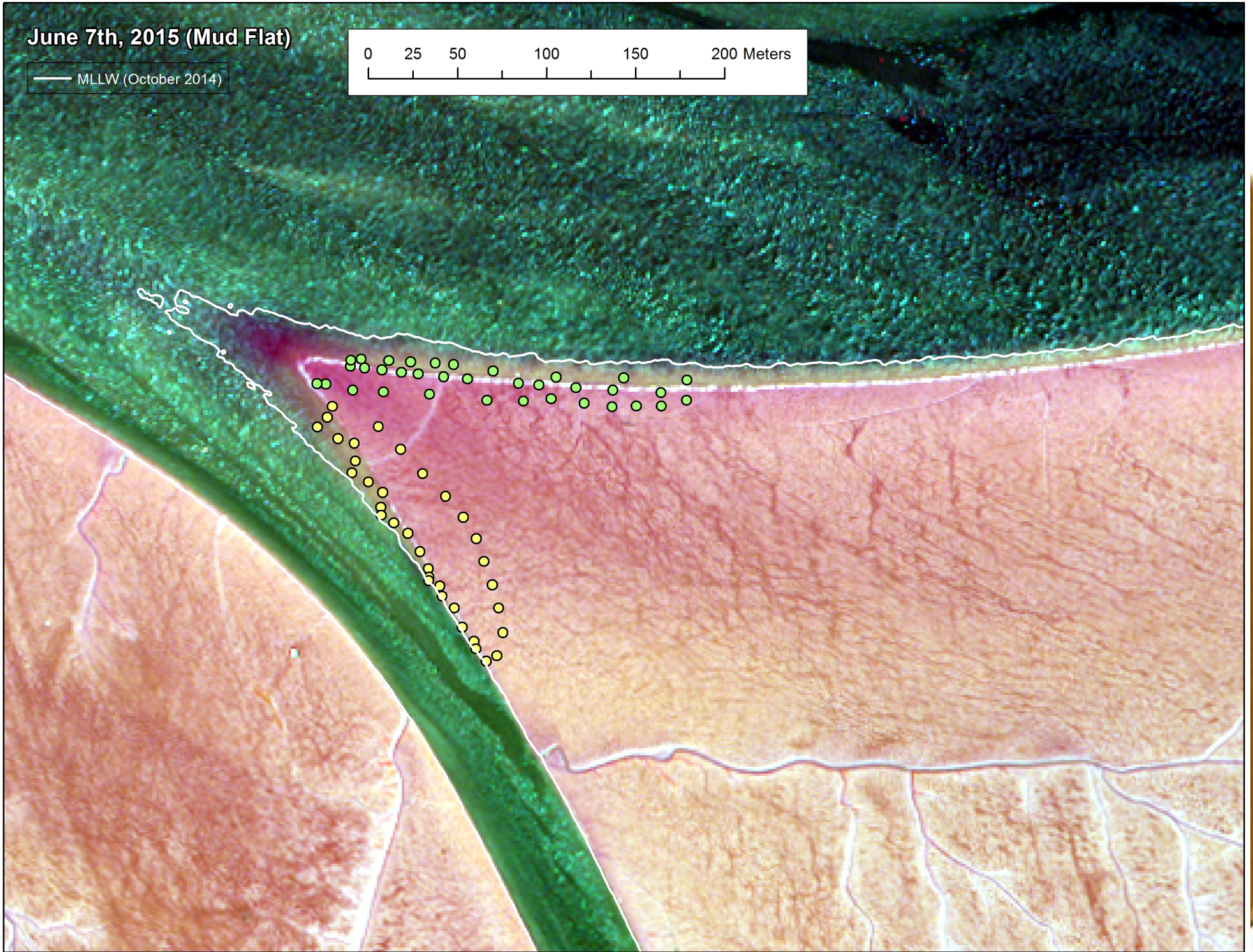
— MLLW (October 2014)



June 7th, 2015 (Mud Flat)

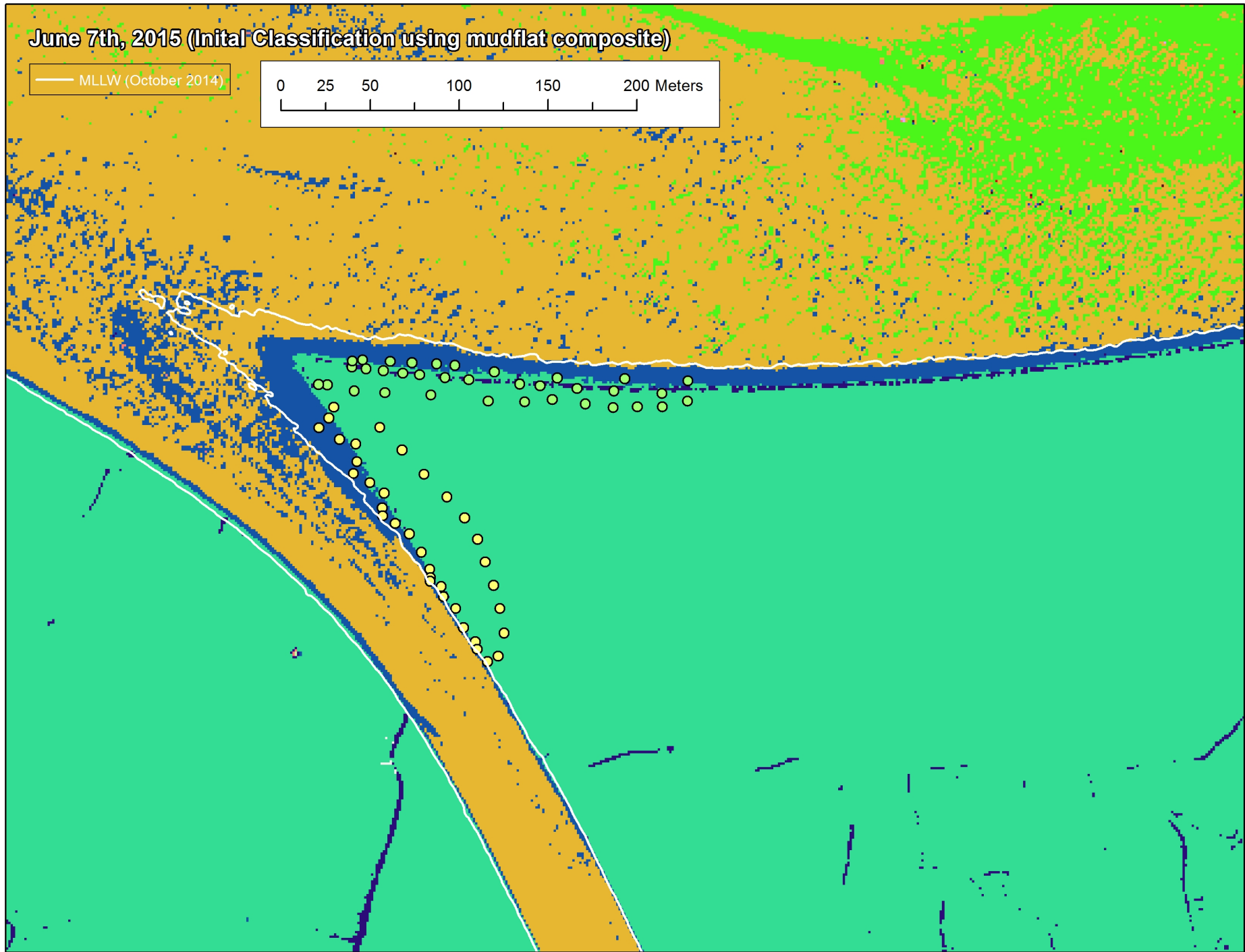
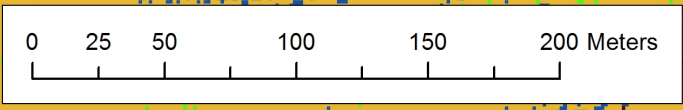


— MLLW (October 2014)

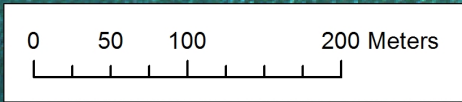


June 7th, 2015 (Initial Classification using mudflat composite)

— MLLW (October 2014)



June 7th, 2015 (mud flat)



April 24th - point

type

- all water
- mostly water
- edge
- mostly mud
- shoreline



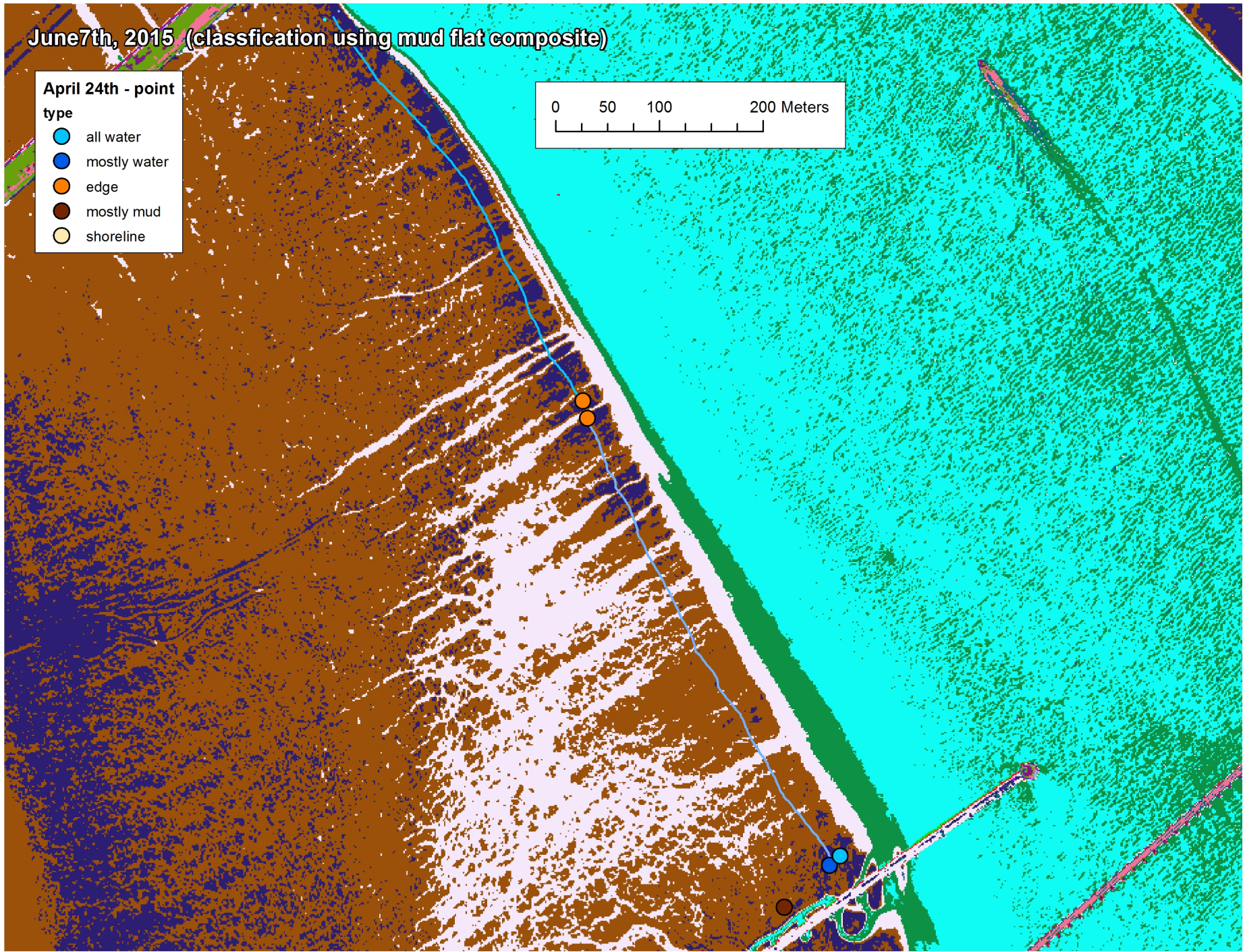
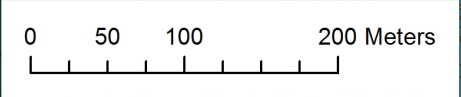
Pond
SF2

June 7th, 2015 (classification using mud flat composite)

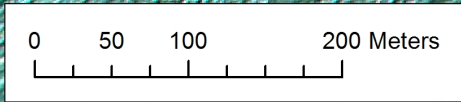
April 24th - point

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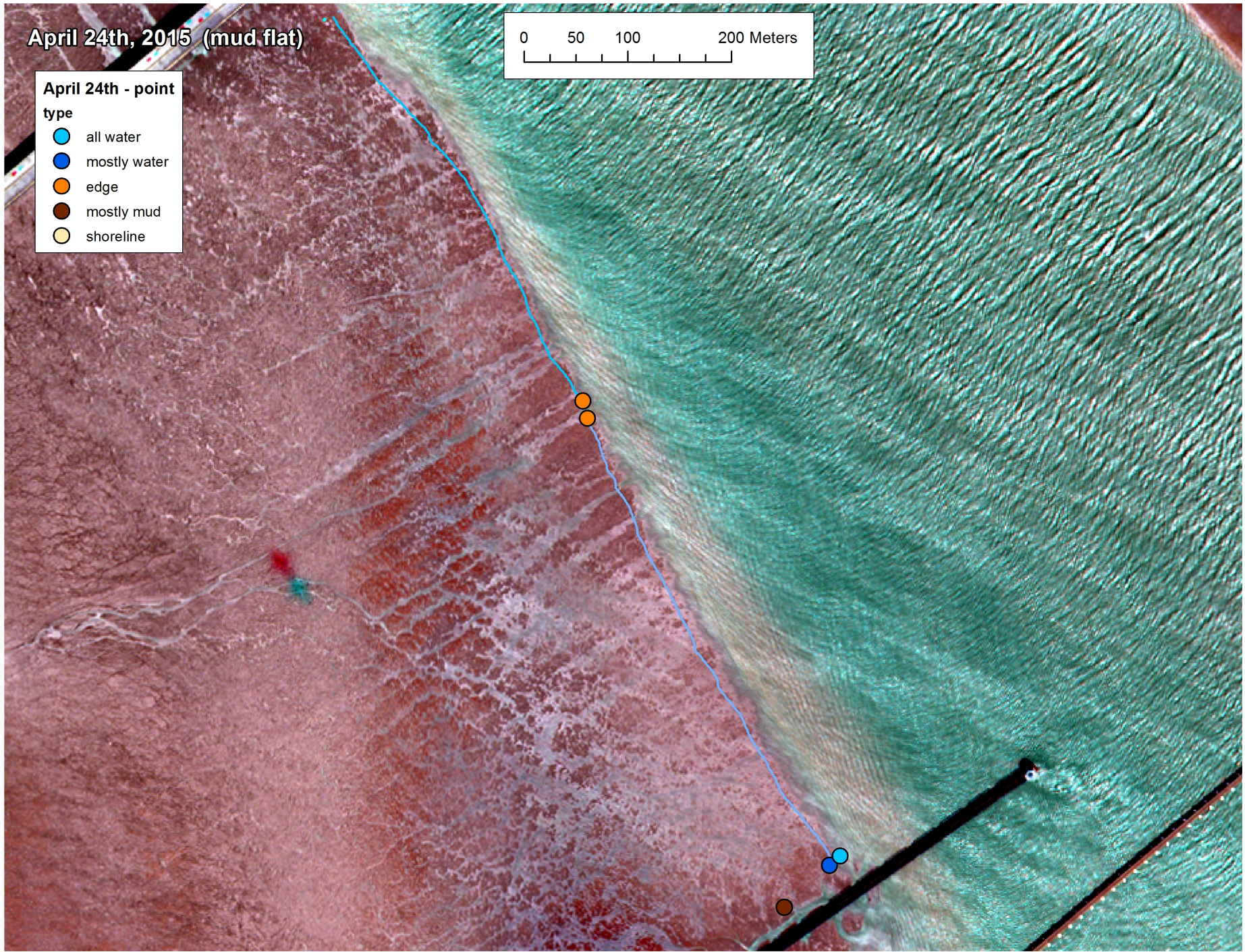
April 24th, 2015 (mud flat)



April 24th - point

type

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Step #3: Use Unmanned Aerial Surveillance (UAS) to map mudflats (currently unfunded)

Significant advantages over satellite imaging *for smaller areas*:

- (1) significant increase in time flexibility for image acquisition
- (2) potentially increase in spectral and spatial accuracy
 - in shallow water, turbid water, and mudflats w/ biofilm
 - lower elevation and higher time over site

Also:

- (3) cost effective for platform and sensor
- (4) serve as calibration for satellite mapping over entire SBSRP area

Step #3: Use Unmanned Aerial Surveillance (UAS) to map mudflats (currently unfunded)



The AggieAir is a multispectral remote sensing unmanned aerial vehicle (UAV) available by collaboration with Dr Chen at UC Merced

The MESA Lab Mechatronics, Embedded Systems and Automation



Commercial-off-the-shelf camera and image sensor. Camera could support Coastal Blue Band by replacing the visible light filter with a custom (400-450nm) narrow band filter

Acknowledgments



Mud Flat Mapping Project



Questions?

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