

Monitoring of Intertidal Vegetation by Remote Sensing

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*SATELLITE
IMAGERY*

*AERIAL
IMAGERY*

*Tynemouth
and
Montrose*

*FIELD
WORK*

SEPA RS Research

Using RS in SEPA

- *Water Framework Directive*
 - *Opportunistic Macro algae in transitional waters.*
- *WFD Tool Parameters*
 - *% AIH affected by Macro algae*
 - *& cover within a patch*
 - *Biomass*
- *Traditionally achieved with Field work*
 - *Time consuming*
 - *Not all areas accessible*
- *Develop a routine, cost and time efficient method that is accurate, reliable and confident of classifying estuaries for WFD from RS imagery.*
- *Now investigating the use of this technique for salt marsh and sea grass.*



Principles of RS

Remote sensing is the science of measuring or inferring the physical properties of an object or medium, using a sensor that is at some distance from the object or medium.

The term is used to describe measurements of electromagnetic radiation scattered or emitted from the Earth's atmosphere or surface using instruments on aircraft or satellites.

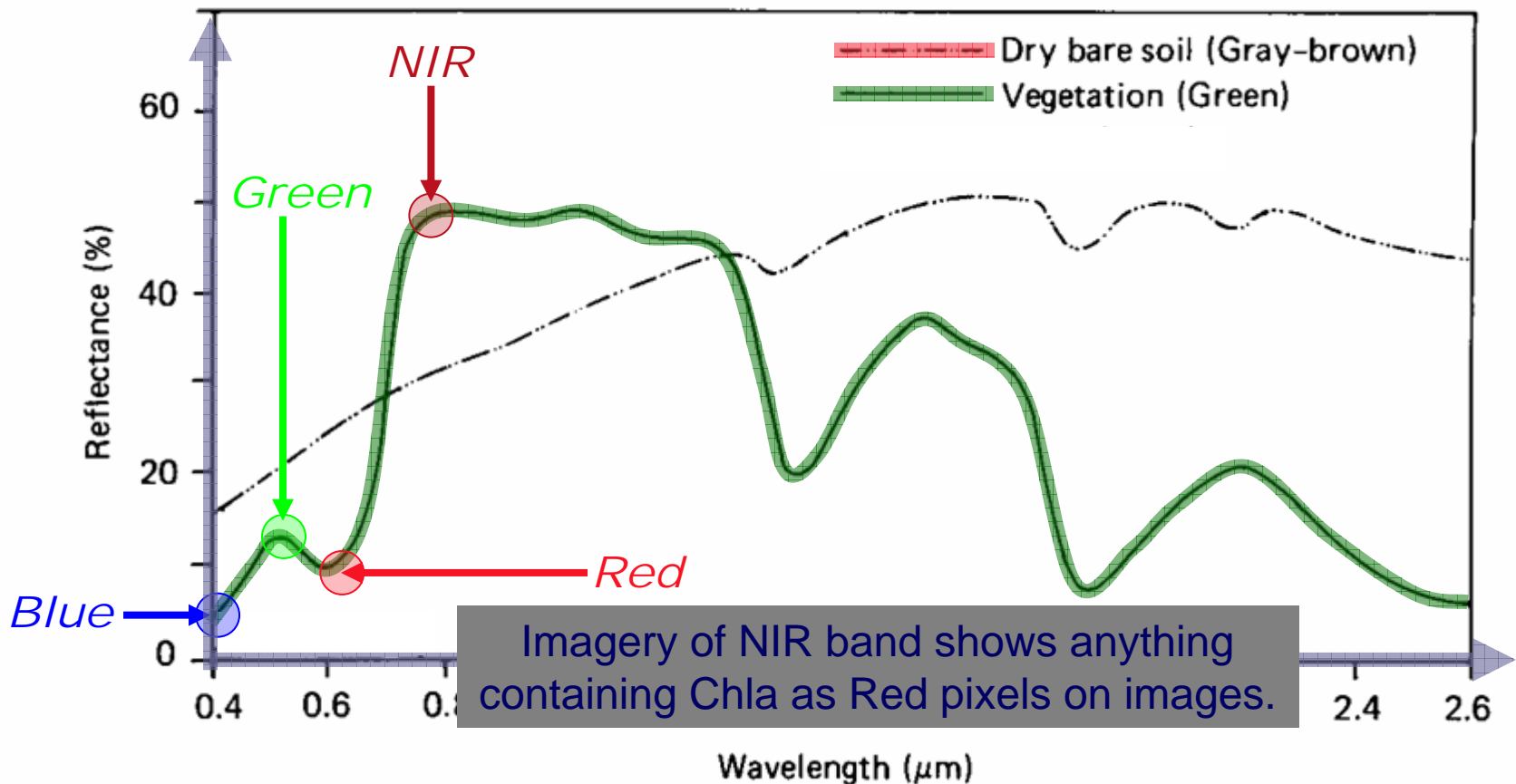


Image Analysis

- *RS data*
 - *Pixels.*
 - *Different substrates will have a different pixel value in each waveband.*
- *ERDAS Imagine*
 - *image classification.*
 - *unsupervised classification*
 - *supervised classification*
- *Field data*
 - *Can obtain % cover, biomass measurements and % of basin affected by macro algae.*
 - *Possibly Seagrass & Saltmarsh vegetation types.*



Image Requirements

Low tide

Daylight

Cloud
free

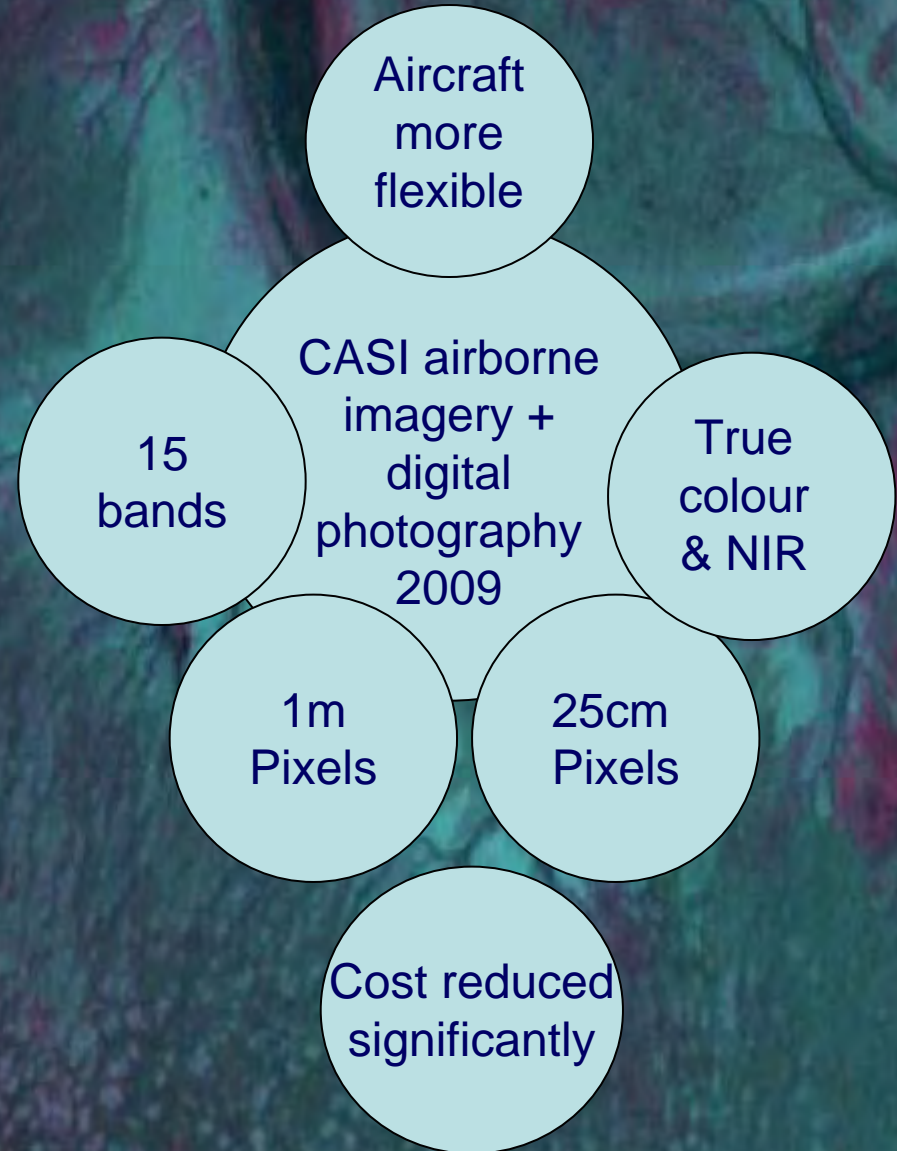
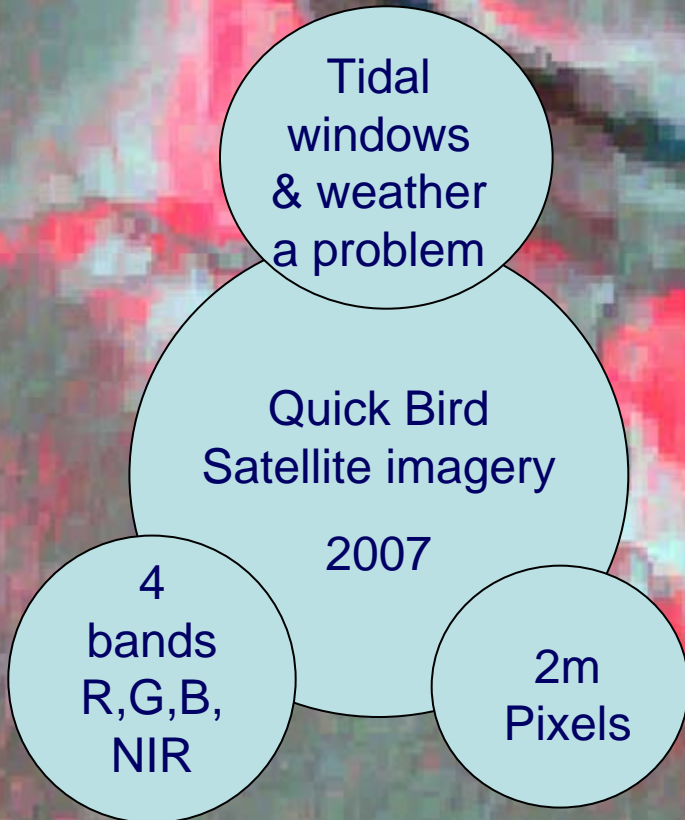
Spatial
Resolution

Spectral
resolution

Cost

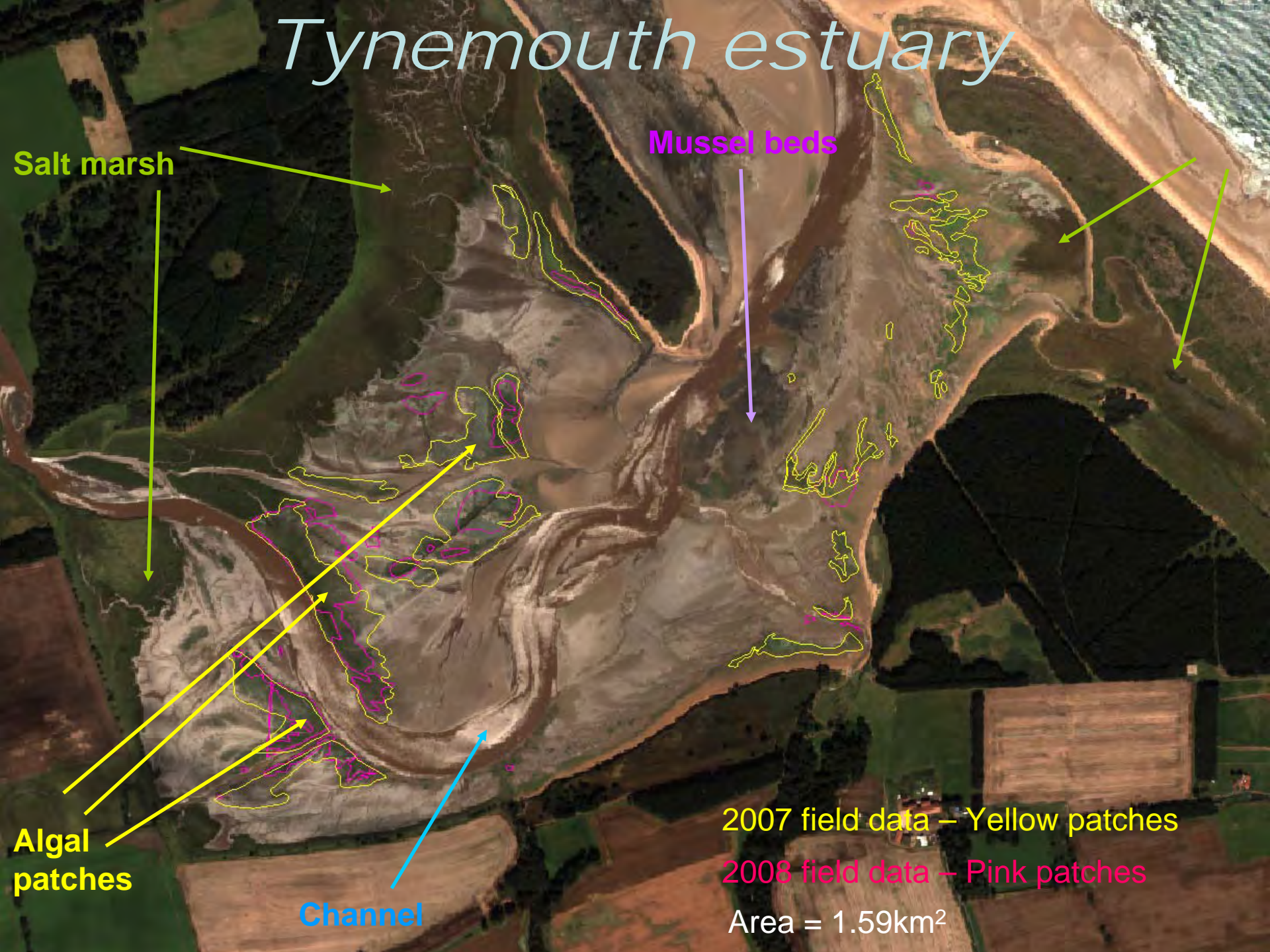
Processing
time/skills

Imagery





Tynemouth estuary



Mussel beds

Salt marsh

Algal patches

Channel

2007 field data – Yellow patches

2008 field data – Pink patches

Area = 1.59km²

Tynemouth Estuary NIR – August 2007

Salt marsh

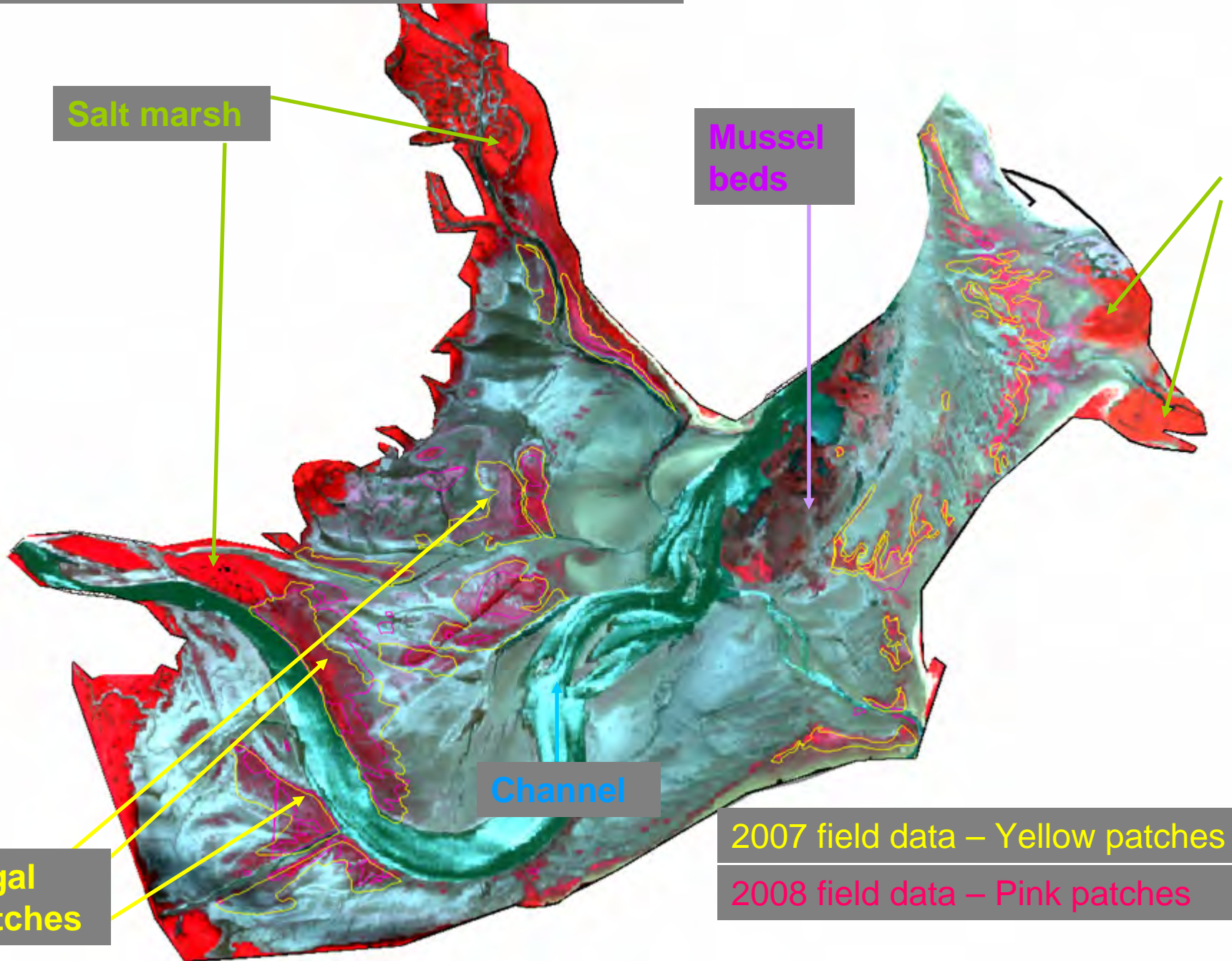
Mussel beds

Channel

Algal patches

2007 field data – Yellow patches

2008 field data – Pink patches



Airborne Imagery – Tynemouth Estuary

September 2009



No Green

Blue patches – Salicornia

Yellow patches - Algae

Satellite Imagery - Tynemouth estuary

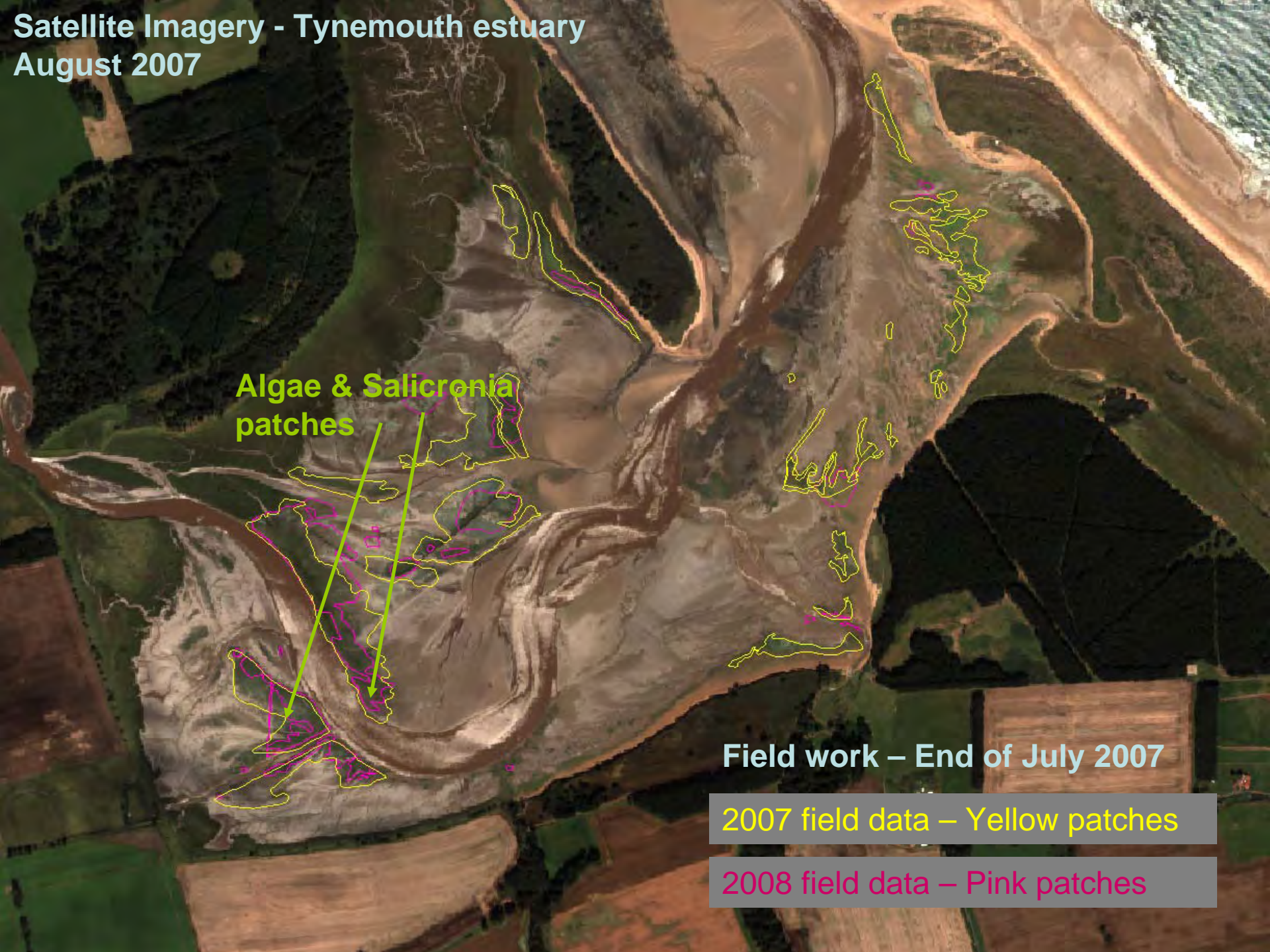
August 2007

**Algae & Salicornia
patches**

Field work – End of July 2007

2007 field data – Yellow patches

2008 field data – Pink patches



Salicornia Patch Tynemouth estuary - July 2009



Salicornia patch Tynemouth estuary -September 2009



September 2009

Another Patch
appeared

- *Timing*
- *Image Acquisition vs Field work*
- *Review timings of peak growth.*

Algae patches
appeared from
end July

Field Work July 2009

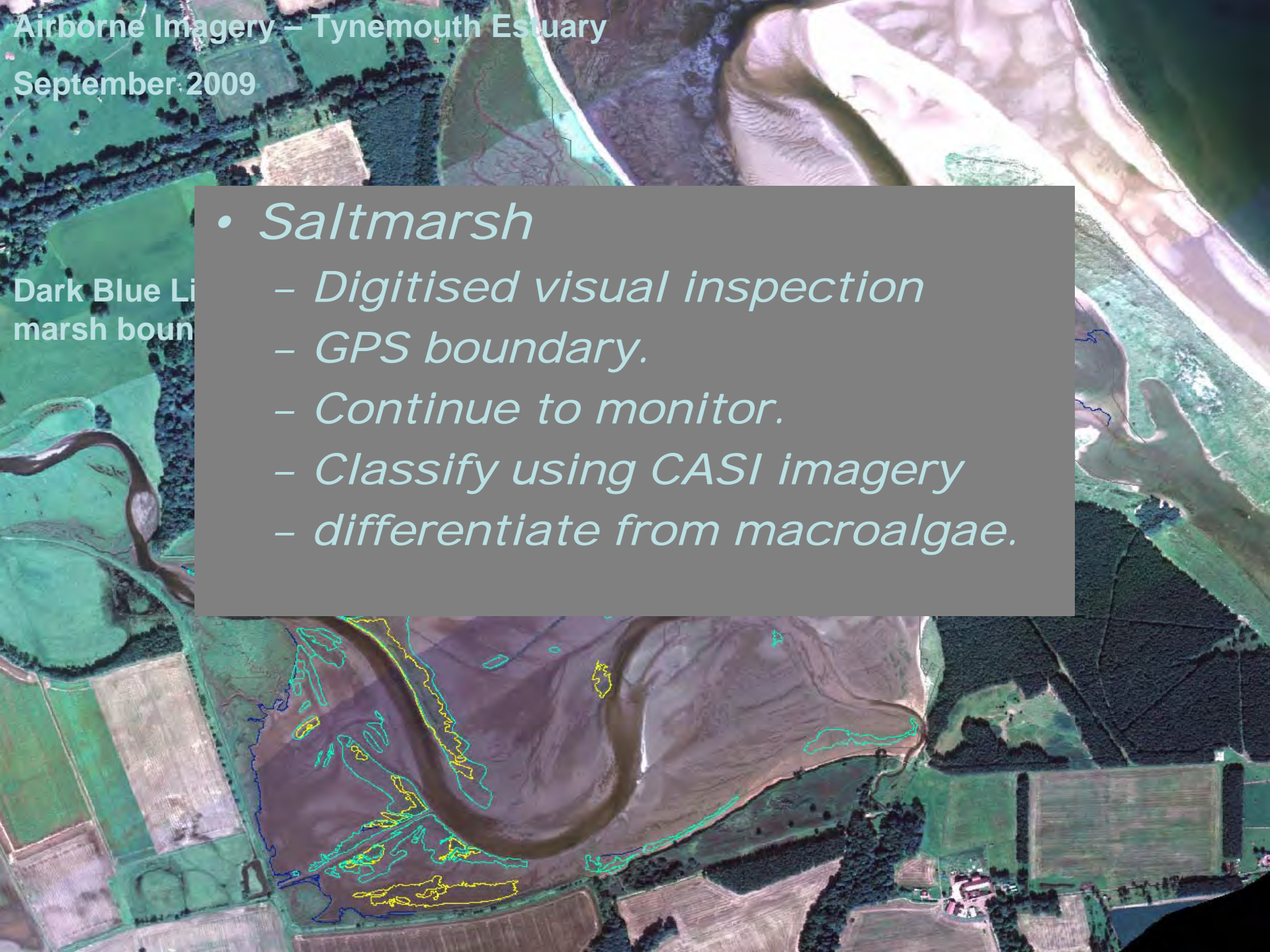
Blue patches – *Salicornia*

Yellow patches – Algae

- *Saltmarsh*

- *Digitised visual inspection*
- *GPS boundary.*
- *Continue to monitor.*
- *Classify using CASI imagery*
- *differentiate from macroalgae.*

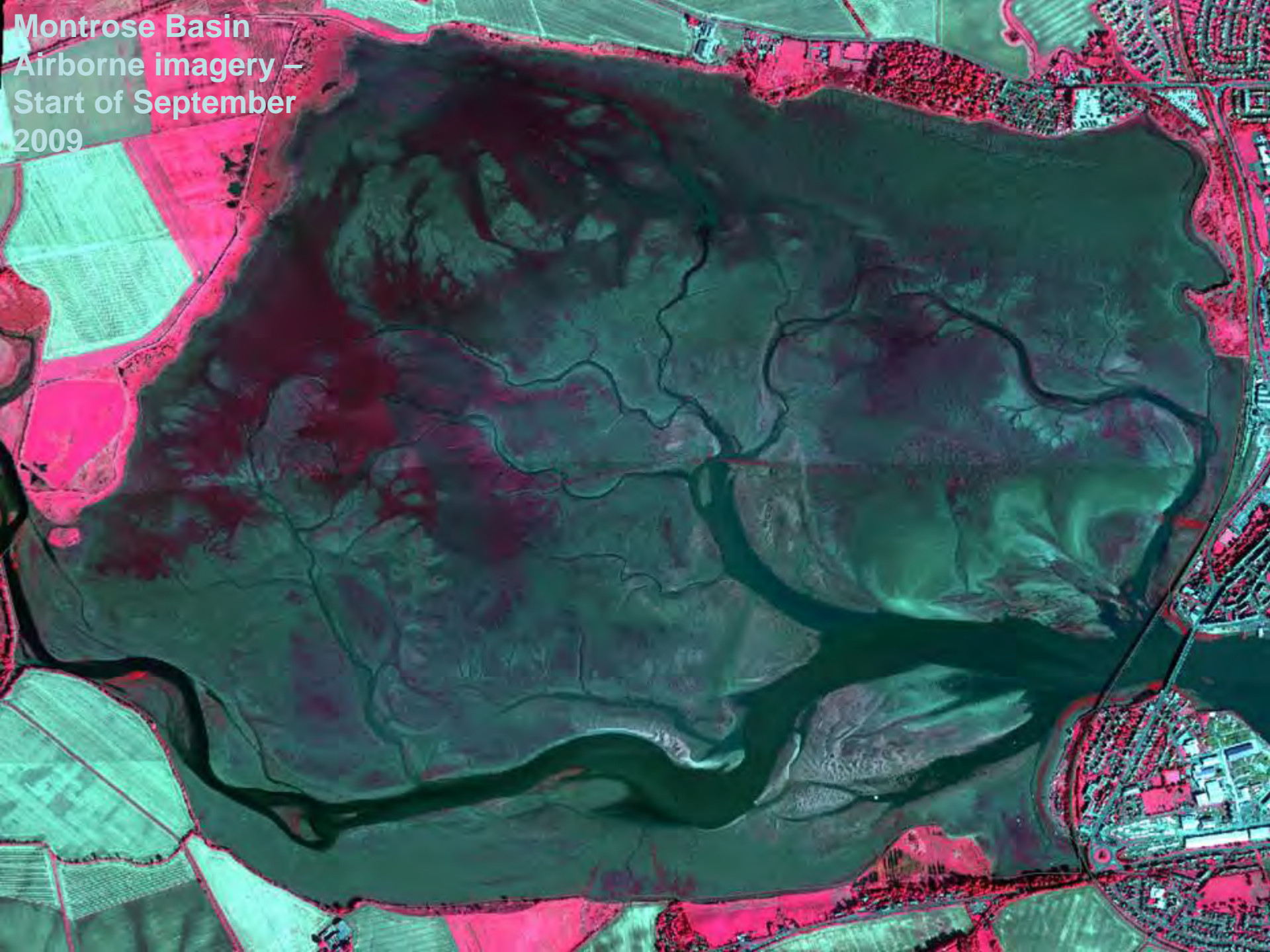
Dark Blue Line
marsh bound



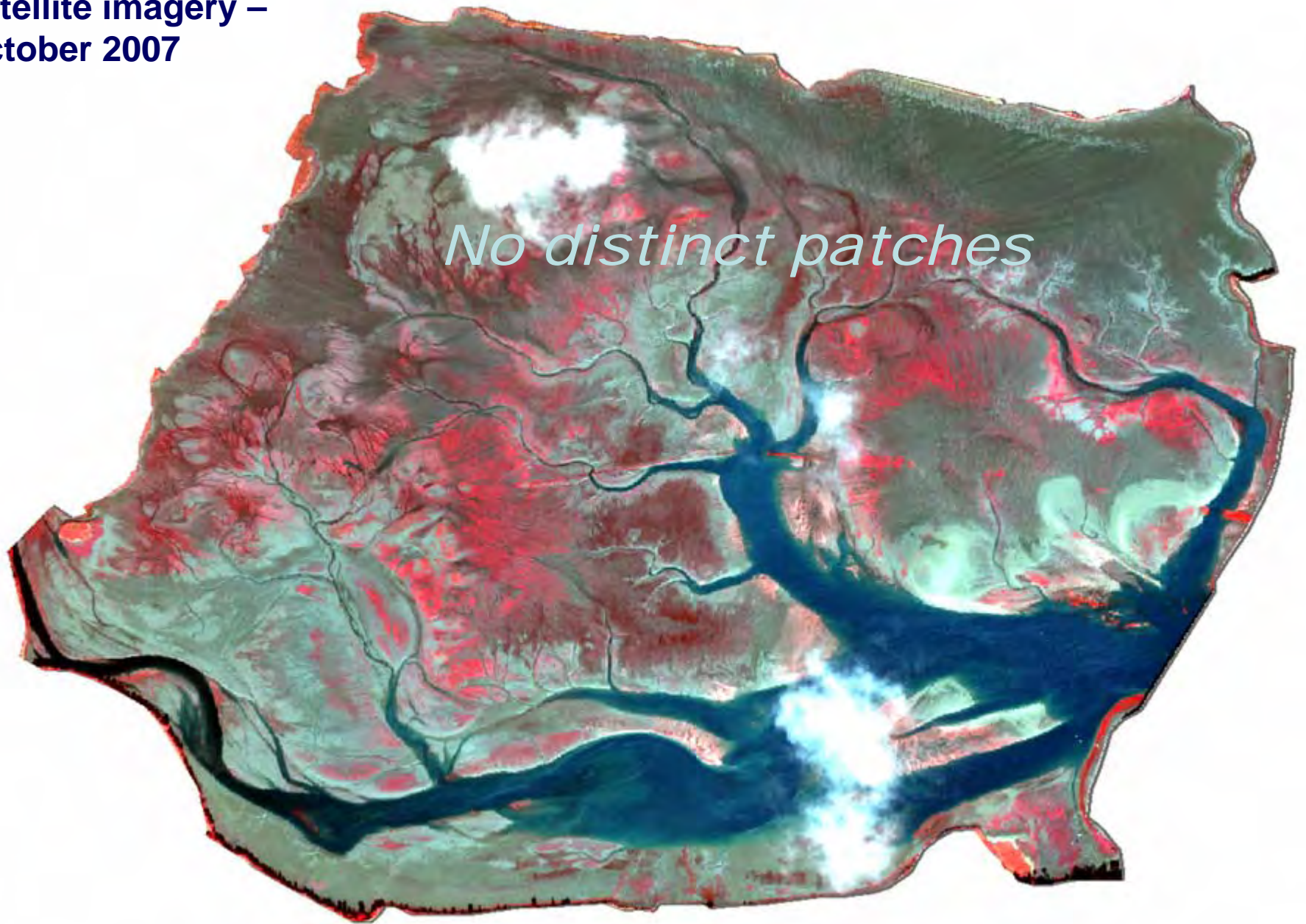
Montrose Basin



Montrose Basin
Airborne imagery –
Start of September
2009

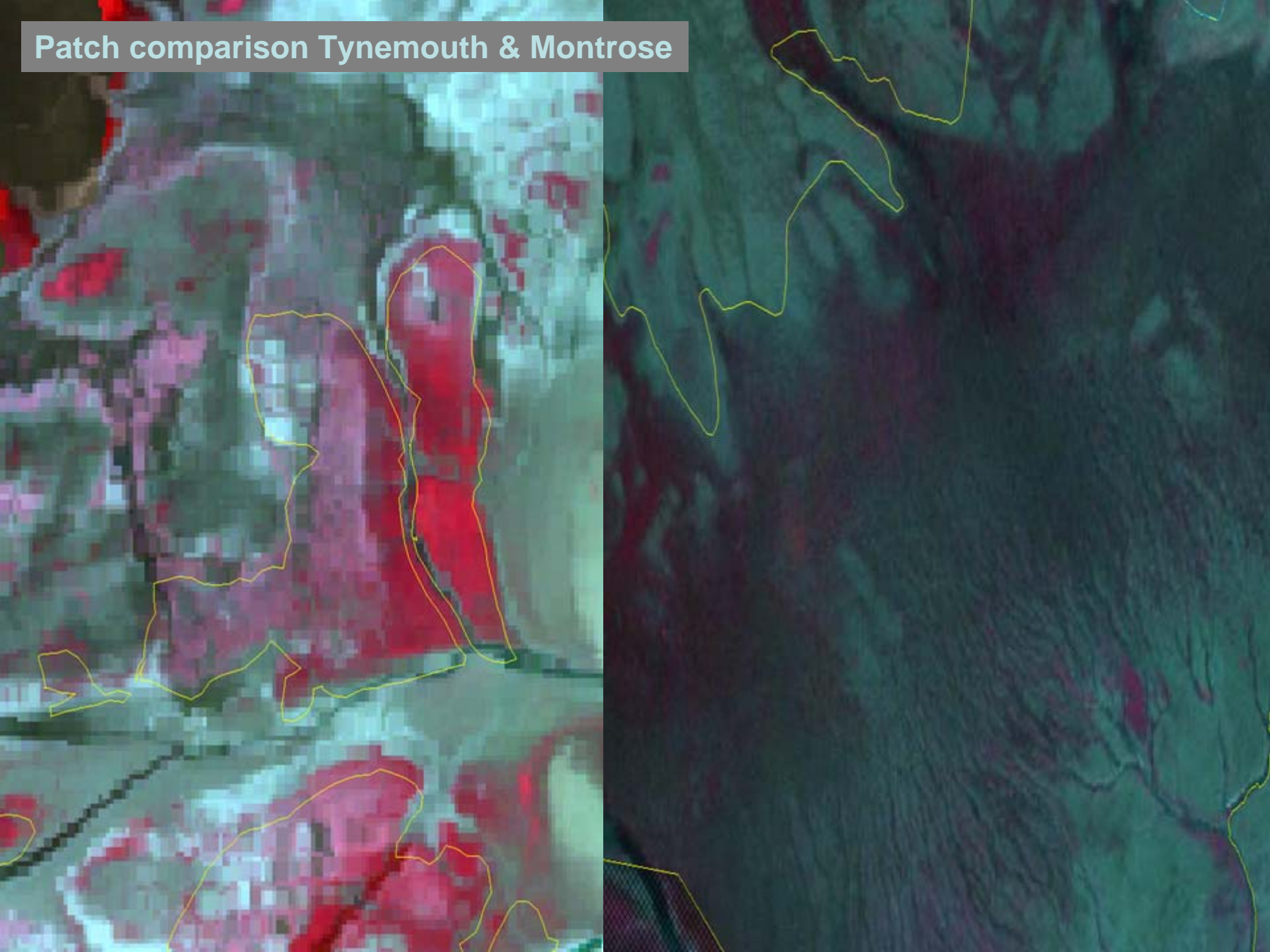


Montrose Basin
Satellite imagery –
October 2007



No distinct patches

Patch comparison Tynemouth & Montrose



- *Montrose*

- *Potential for Miss-classification*
- *Huge continuum in field.*
- *H&S excluded zones (hovercraft?).*
- *RS techniques are essential.*
- *Increase Field work here next year.*

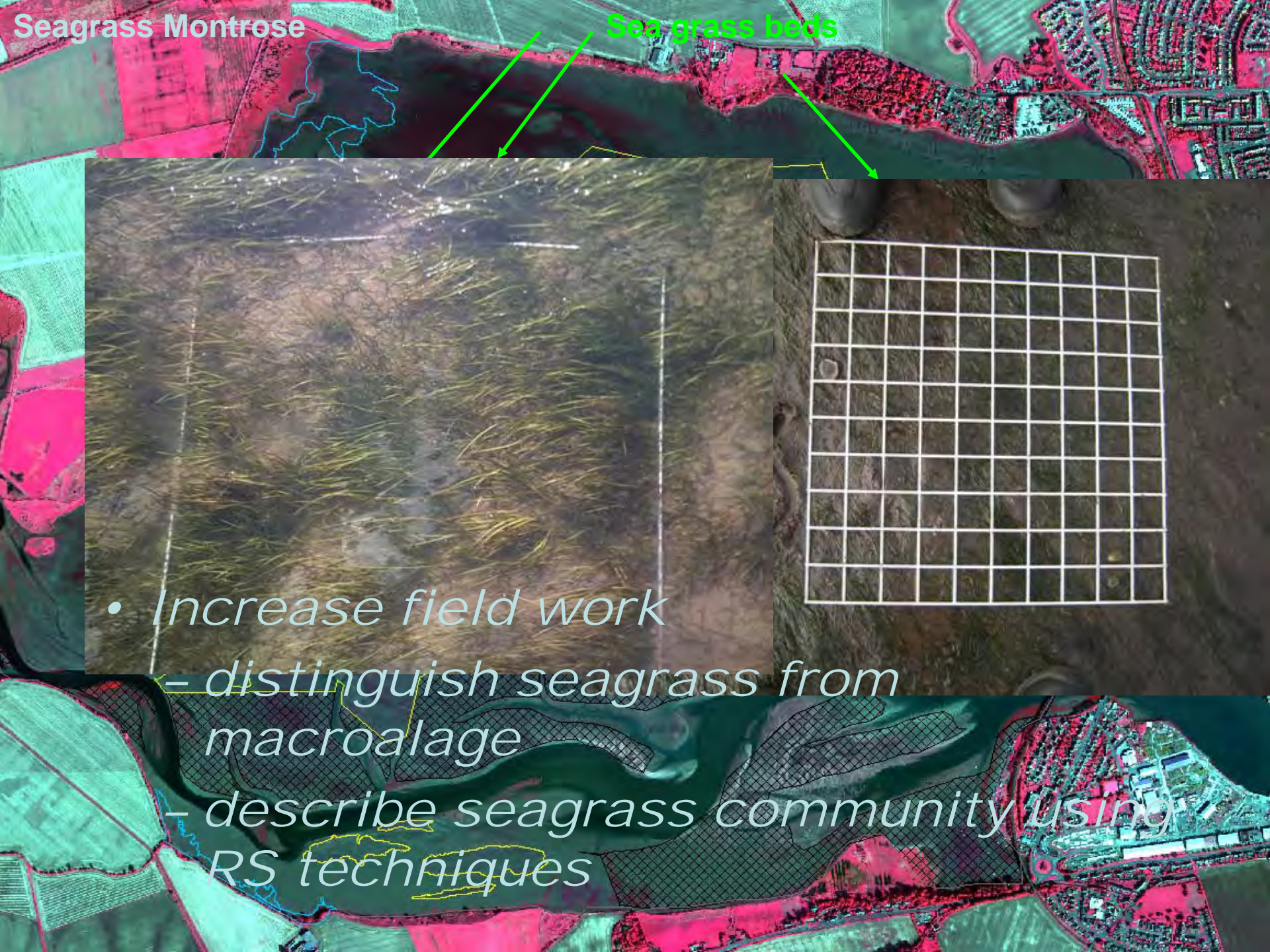
Field data end of August 2009

Yellow patches – Macroalgae

Area = 7.51km²

Seagrass Montrose

Sea grass beds



- Increase field work
 - distinguish seagrass from macroalage
 - describe seagrass community using RS techniques

Morphology Montrose



- *Differences in height*
- *submerged macroalgae*
- *Solutions*
 - *winter imagery*
 - *time of year, local weather conditions and timing of imagery, high tide etc.*
 - *Could use LIDAR data (height)*

Conclusions

- *Get together - SEPA RS Group*
- *Keep up to date*
- *Iterative process - its not an exact science!*
- *Concentrate on CASI image processing now as a viable continuing option.*
- *Concentrate work on Montrose basin.*
- *Salt marsh and sea grasses using CASI*
- *The Answer - this time next year!!!*

Acknowledgments

- *Thanks to SEPA MAB team*
- *EA Geomatics for CASI imagery & aerial photography.*
 - <http://www.geomatics-group.co.uk/GeoCMS/Products/CASI.aspx>
- *Eurimage & Digital Globe for Quick Bird satellite imagery.*
 - <http://www.eurimage.com/products/quickbird.html>
- *Processed using ArcGIS & ERDAS Imagine software.*
- *support from Infoterra Ltd.*
 - <http://www.infoterra.co.uk>
 - <http://www.infoterra-support.co.uk/home/index.php>

References

- *Lillesand T.M. & Kiefer R.(1994) Remote Sensing and Image Interpretation, 3rd Edition, John Wiley & Sons.*
- *Green E.P., Mumby P.J., Edwards A.J. & Clark C.D (2000) Remote Sensing Handbook for Tropical Coastal Management, UNESCO*
- *Scanlan C.M, Foden J., Wells E., Best M.A. (2007), The monitoring of opportunistic macroalgal blooms for the water framework directive. Marine Pollution Bulletin 55, 162-171.*
- *<http://www.rspsoc.org/information-zones/learning-zone/>*

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