Using multi-temporal ALOS PALSAR to investigate flood dynamics in semi-arid wetlands: Murray Darling Basin, Australia.

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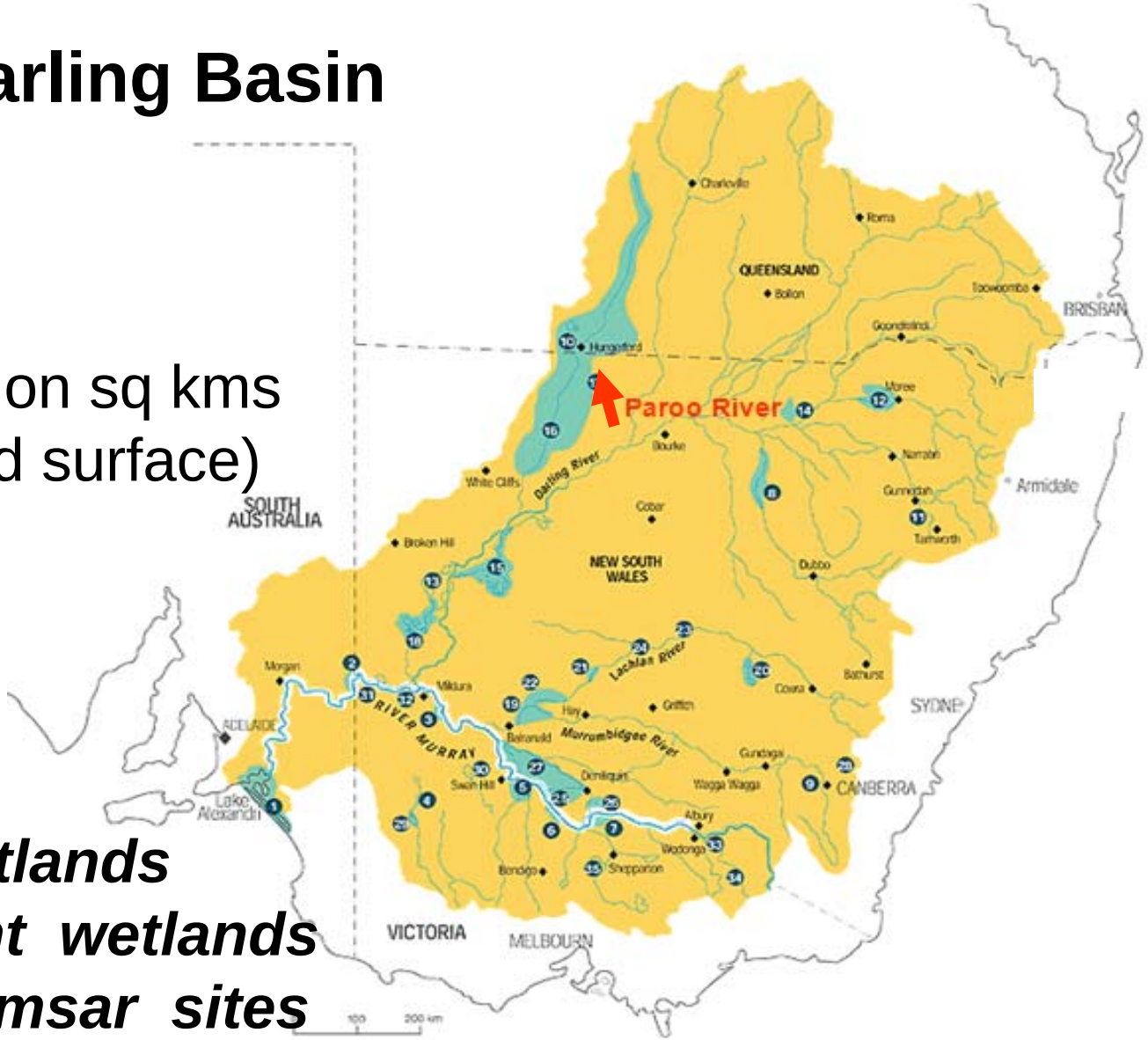
Corni Waterhole on the Paroo River in Currawinya National Park, outback Queensland

Murray-Darling Basin

Area 1.1 million sq kms
(1/7 Aust land surface)

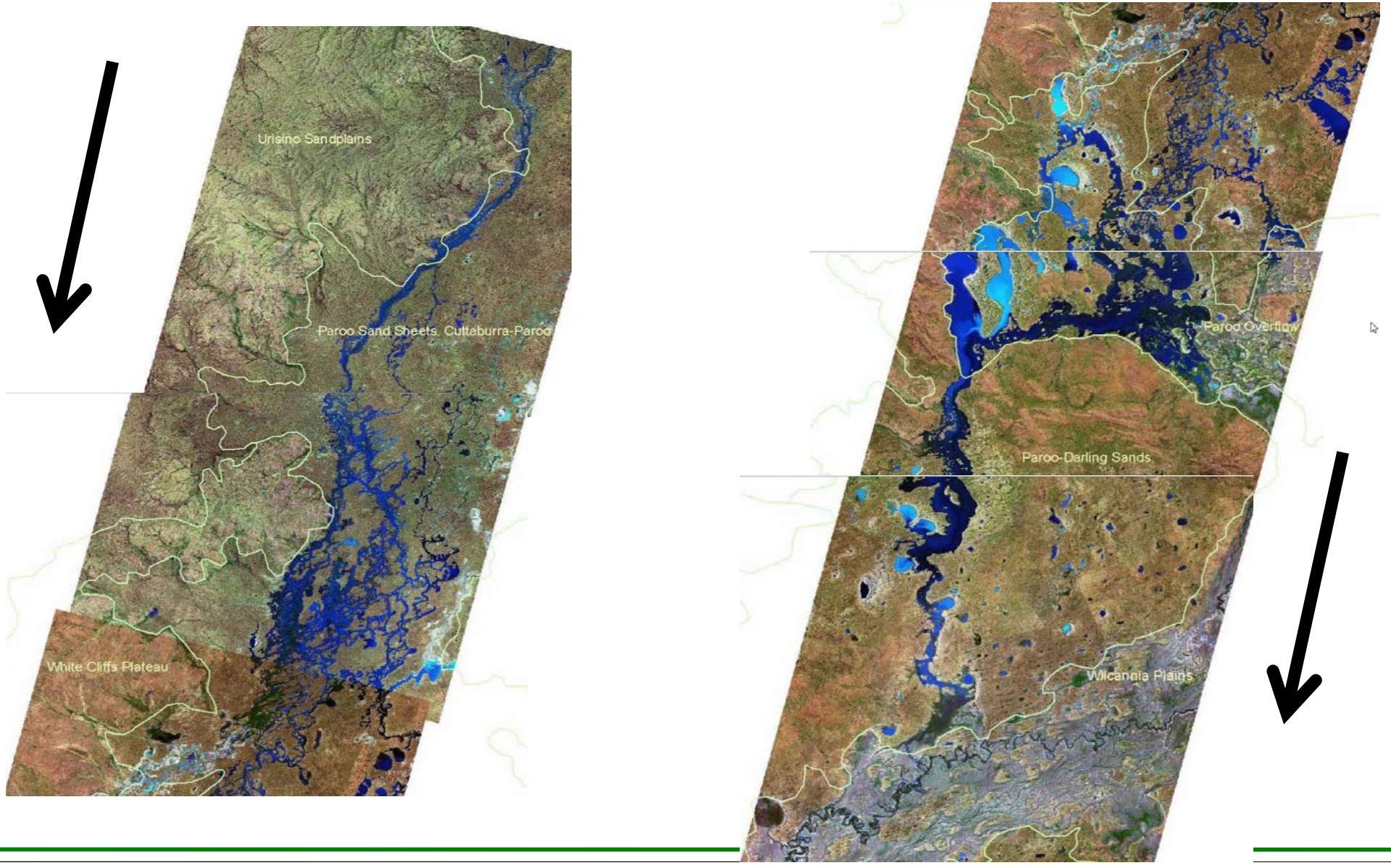


Over 200 wetlands
35 significant wetlands
10 listed Ramsar sites

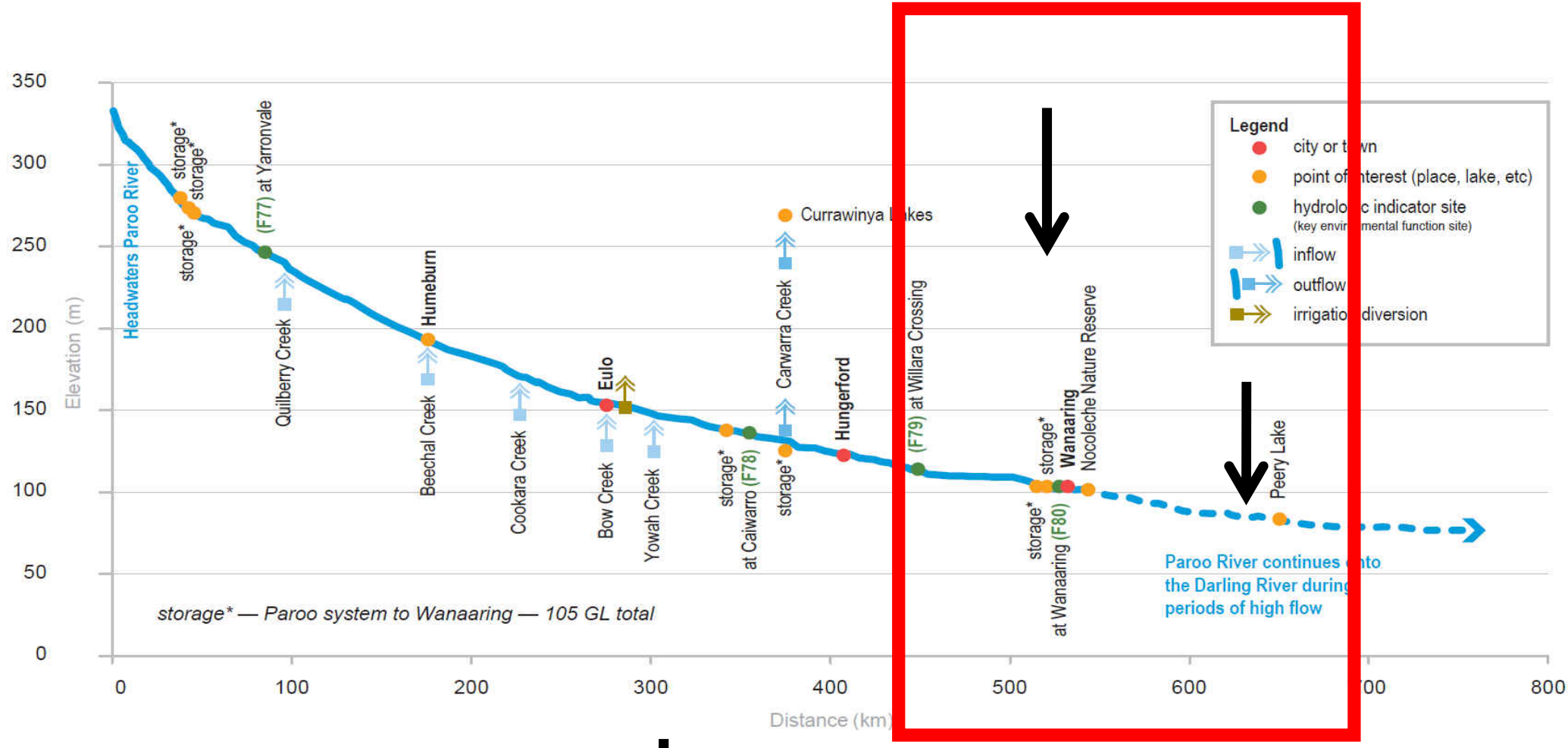
Paroo River Wetlands

- **The Paroo catchment cover 7,400,224 hectares. The river is over 600 km long.**
- **Channel type comprise braided channels, waterholes, swamps, claypans, mound springs, shallow freshwater lakes and salt lakes.**
- **There are two internationally recognised RAMSAR sites along the Paroo River and numerous sites in the catchments designated in the *Directory of Important Wetlands in Australia*.**

Paroo River Wetlands – in flood Dec 2010



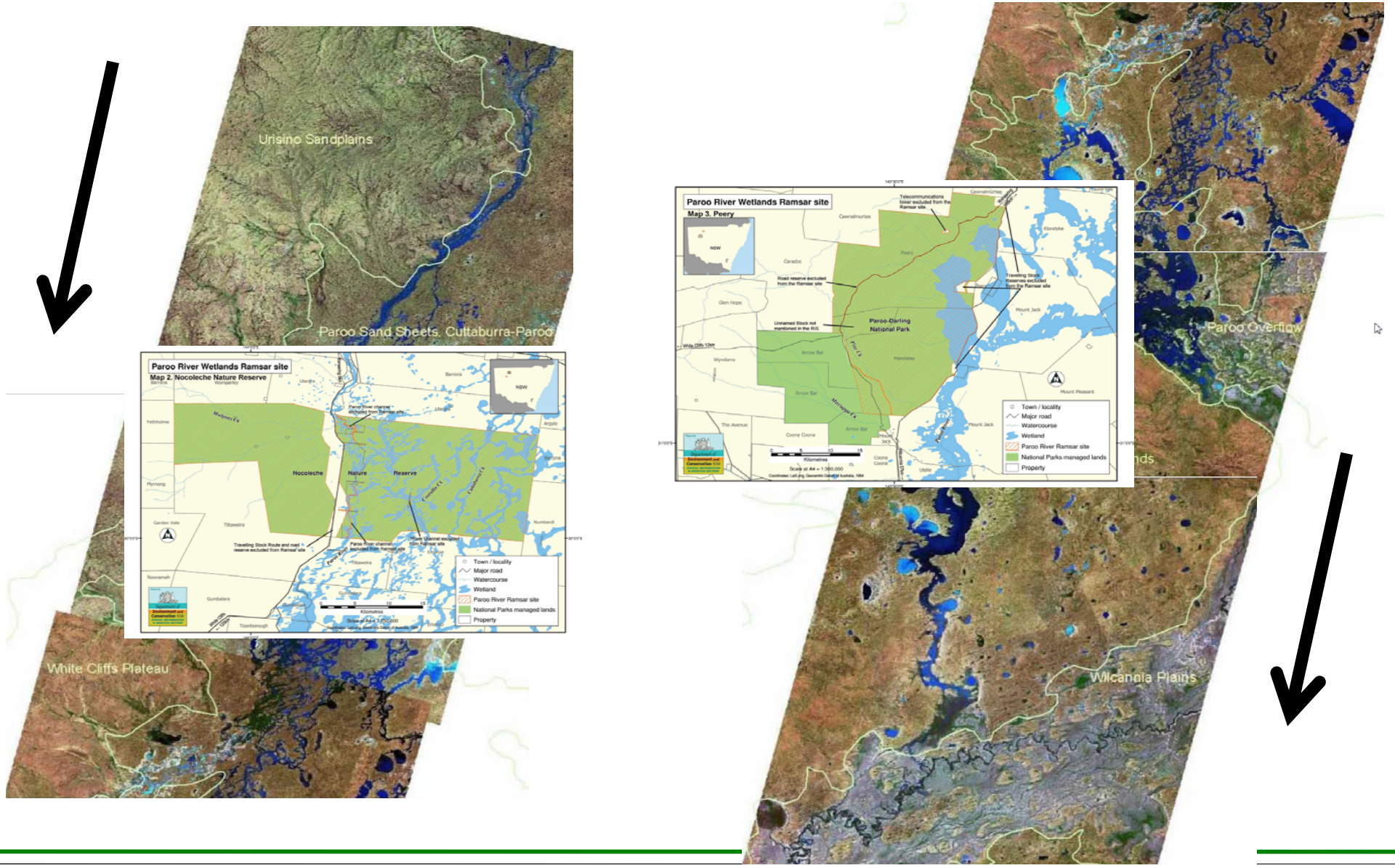
Paroo River Profile



Zone of Study

Ramsar Sites

Paroo River Wetlands – Ramsar Sites

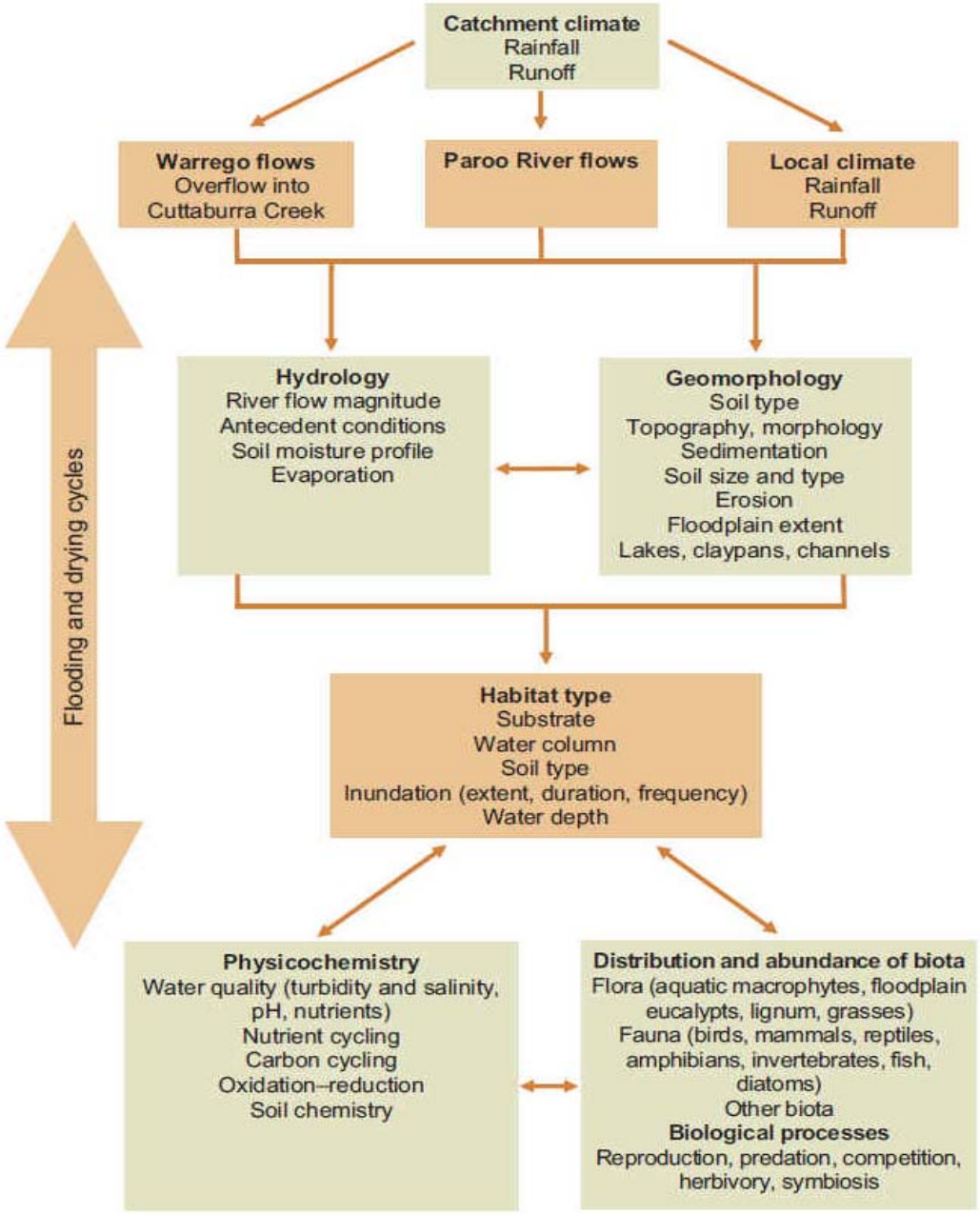


MDBA Program Objectives

- The establishment of baseline data for rivers and wetlands in the MDB to identify priorities for conservation action and rehabilitation under the International RAMSAR Convention
- To improve estimates of habitat availability for wetland dependent species and to identify species or habitats that require conservation.
- To evaluate the carrying capacity of the land for agriculture and potential carbon storage
- To perform flood risk mapping for flood mitigation and Government emergency response

Major KCCC Project Objectives

- **Use PALSAR for mapping and monitoring wetland distribution in the MDB arid zone**
- **Analyse pattern of flood flows, duration and recession of surface water**
- **Assess vegetation, soil and animal response to periodic flooding**
- **Investigate the effect of environmental flows in semi-arid landscapes**



Ecological Outcomes of Flow Regimes in the Murray-Darling Basin Overton, I.C., Colloff, M.J., Doody, T.M., Henderson, B. and Cuddy, S.M. (editors) 2009.

Morpho-ecological Mapping semi-arid wetland typologies

Class Types

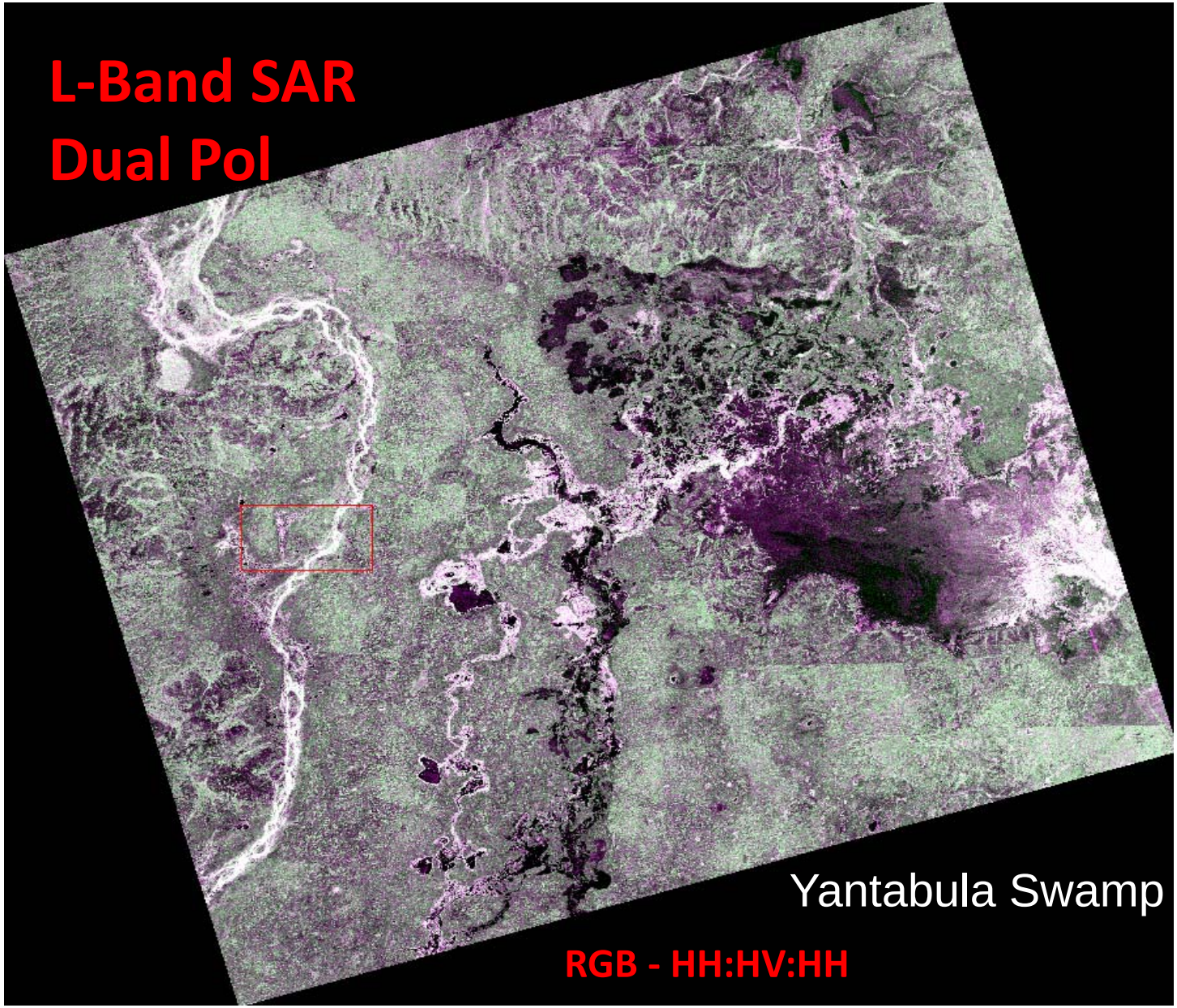
- Commonly wet freshwater lakes
- Periodically-inundated floodplain freshwater lakes
- Periodically-inundated non-floodplain (depressional) freshwater lakes
- Floodplain freshwater swamps
- Non-floodplain (depressional) freshwater swamps
- Saline lakes
- Saline swamps

Deliverables

- Change detection mapping of inundation patterns between July 2009 and May 2010.
- Identification of high conservation value areas for the protection of critical aquatic habitat in terms of refuges(perennially flooded areas).
- Operational methods for monitoring the flow pattern and recession of floodwaters using ALOS PALSAR
- Inundation maps of flood extent across the Paroo and Warrego Rivers for 2009-2011 with extensive field data for accuracy assessment; a prototype for emergency response applications.

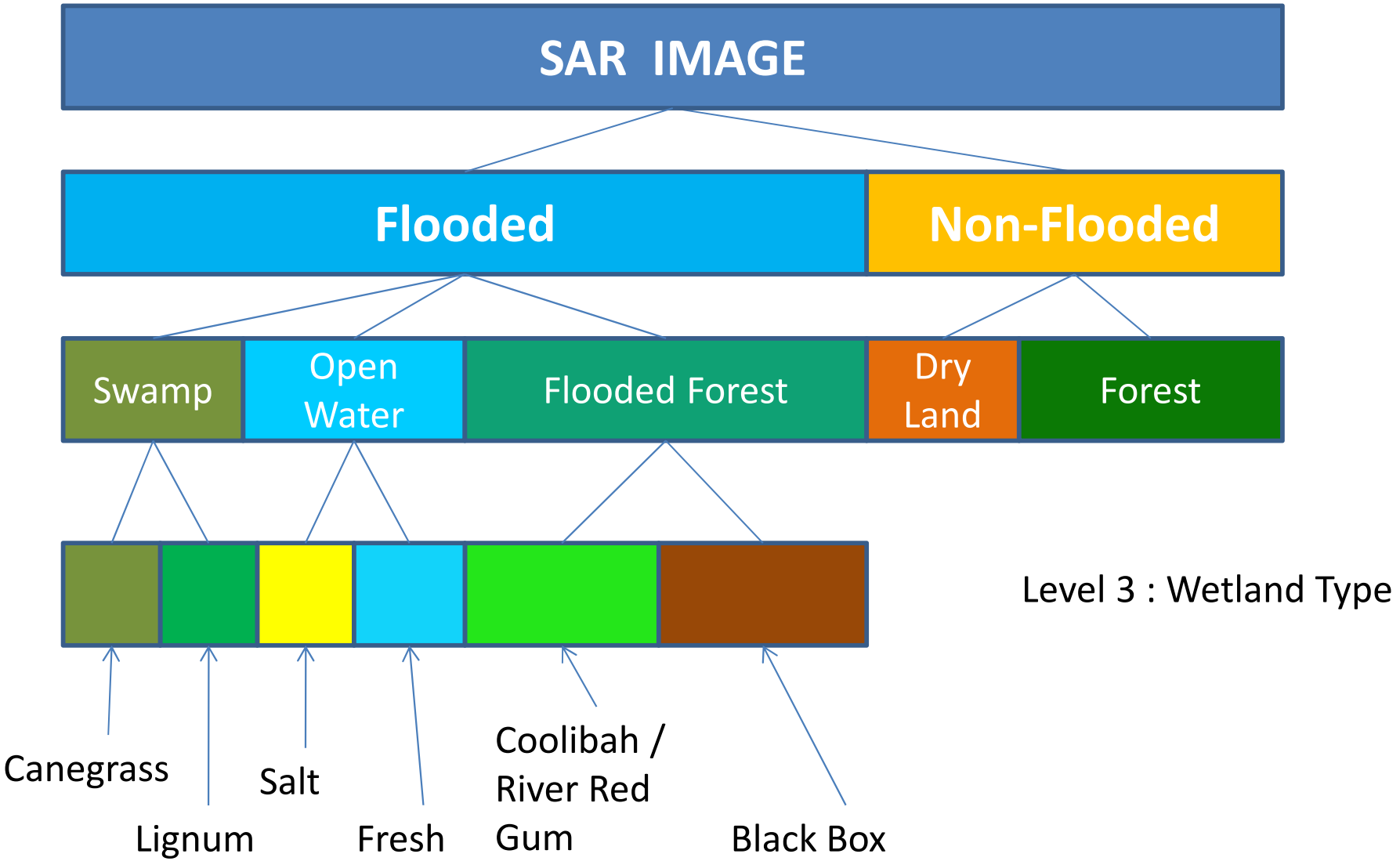
Deliverables contd., (MDBA)

- Identification of key vegetation indicators to measure during field surveys, for classification of community type and structure, using SAR imagery.
- Vegetation maps to community level for RAMSAR sites along the rivers showing the utility of ALOS PALSAR for characterization.
- Identification of ecologically significant wetland sites, in terms of the flood regime (timing, duration, extent of flooding) and vegetation characteristics, identified for their conservation value.

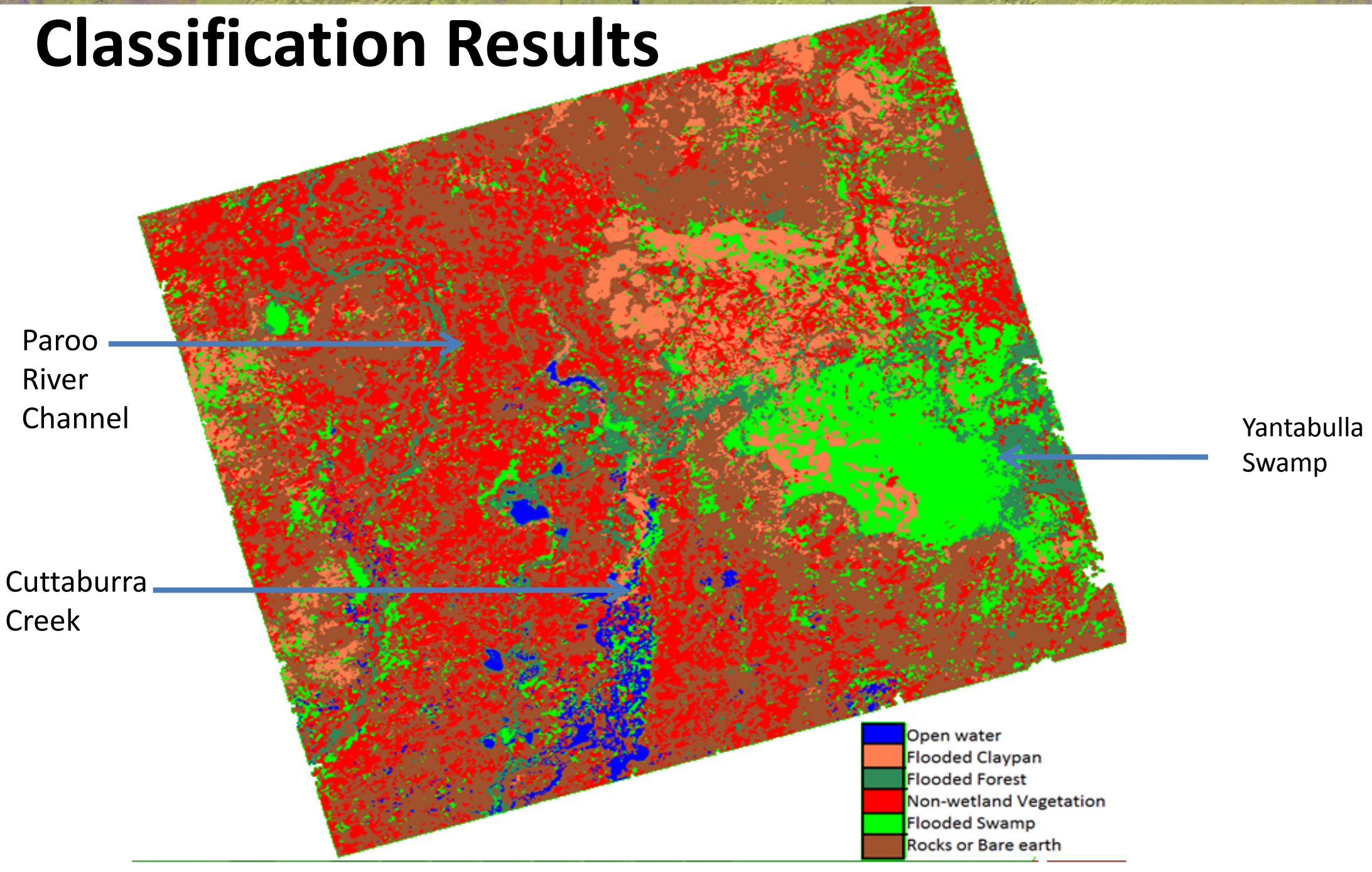

L-Band SAR
Dual Pol
Yantabula Swamp
RGB - HH:HV:HH

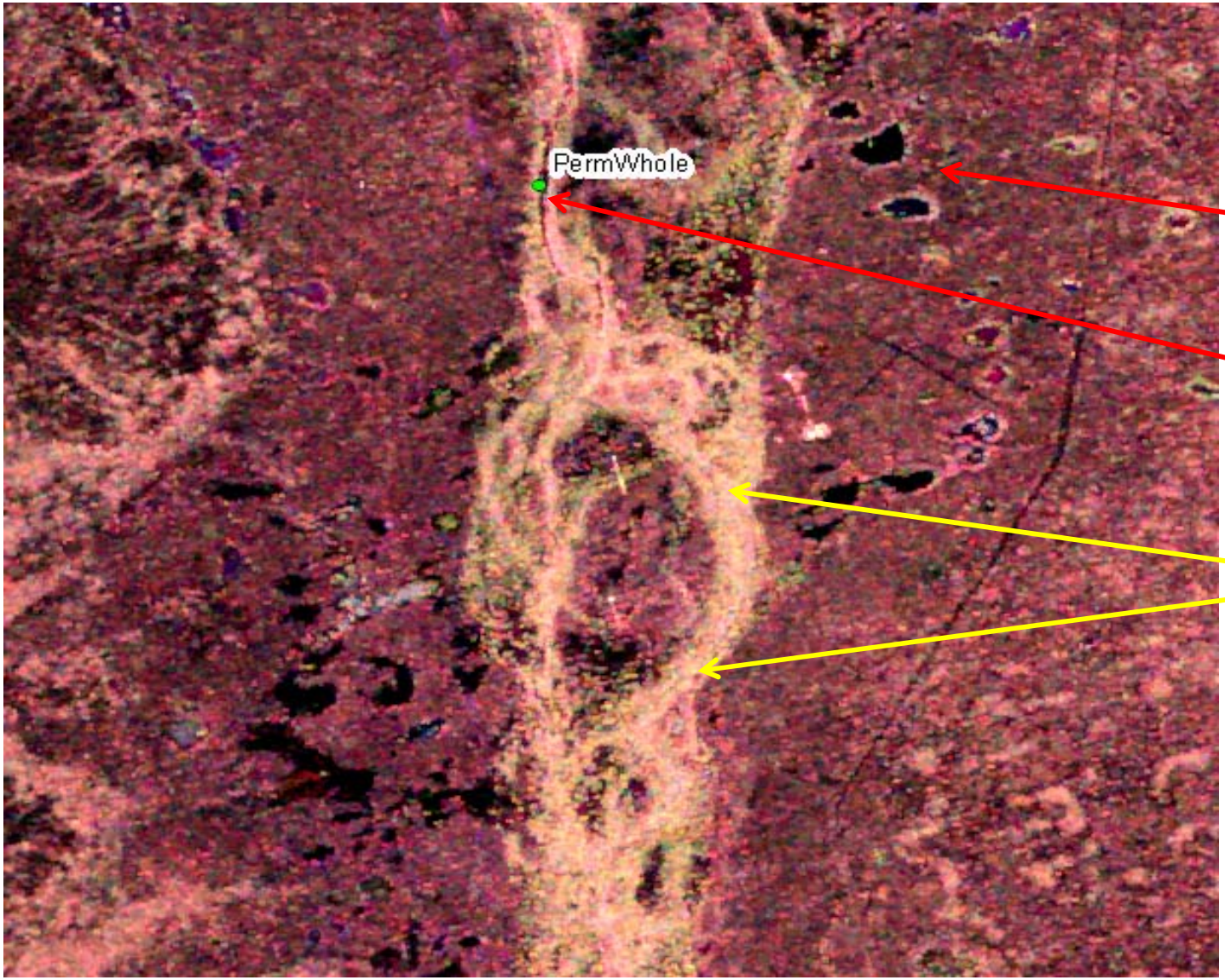
Segmentation

- Partition image into homogenous groups.
- Hierarchical ‘multiresolution’ approach
- Objects identified at different scales



Classification Results

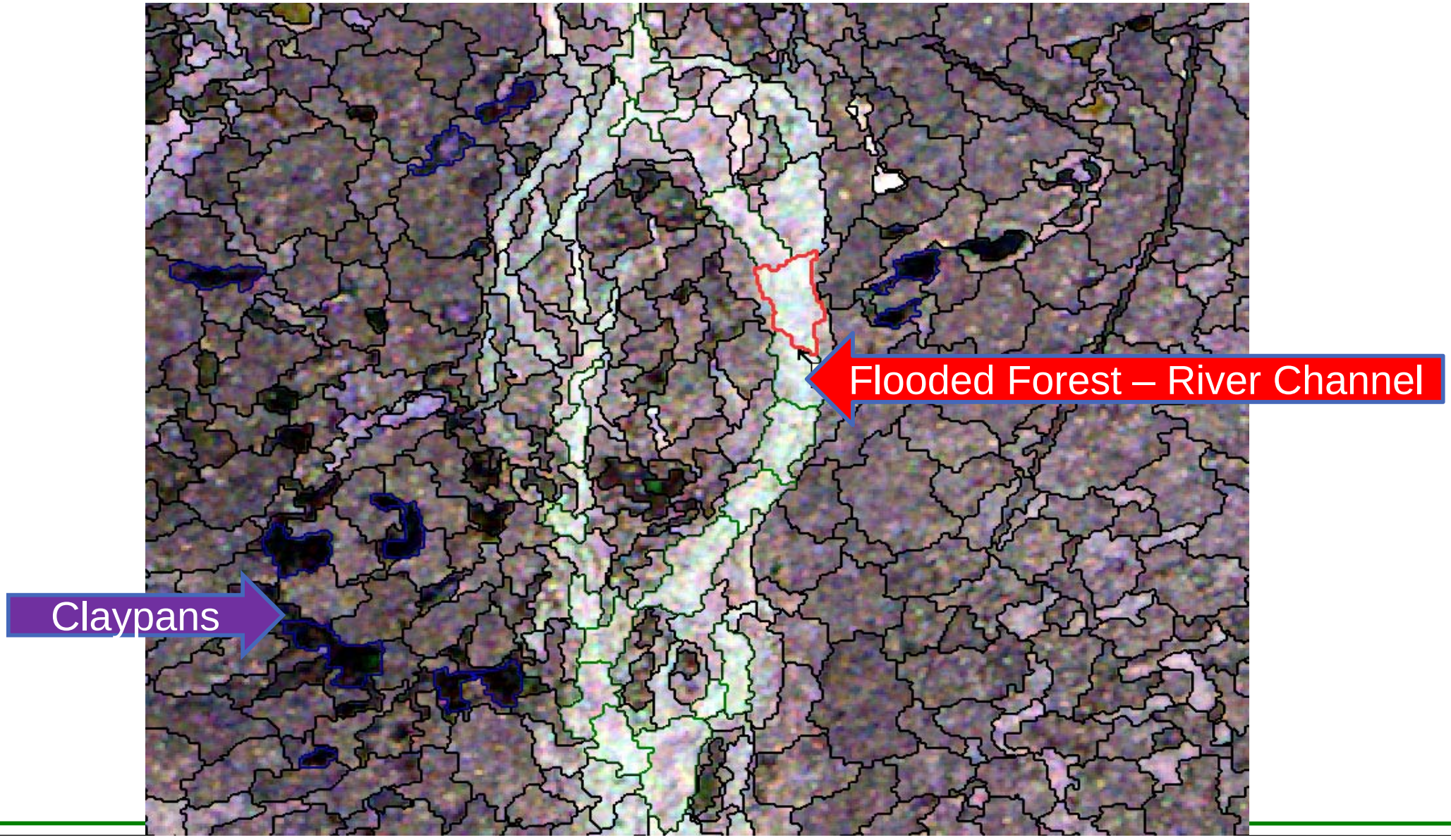




Open water is dark:
- Claypans
- Lakes
- Billabongs

Flooded channels covered in vegetation are bright

Segmented Floodplain



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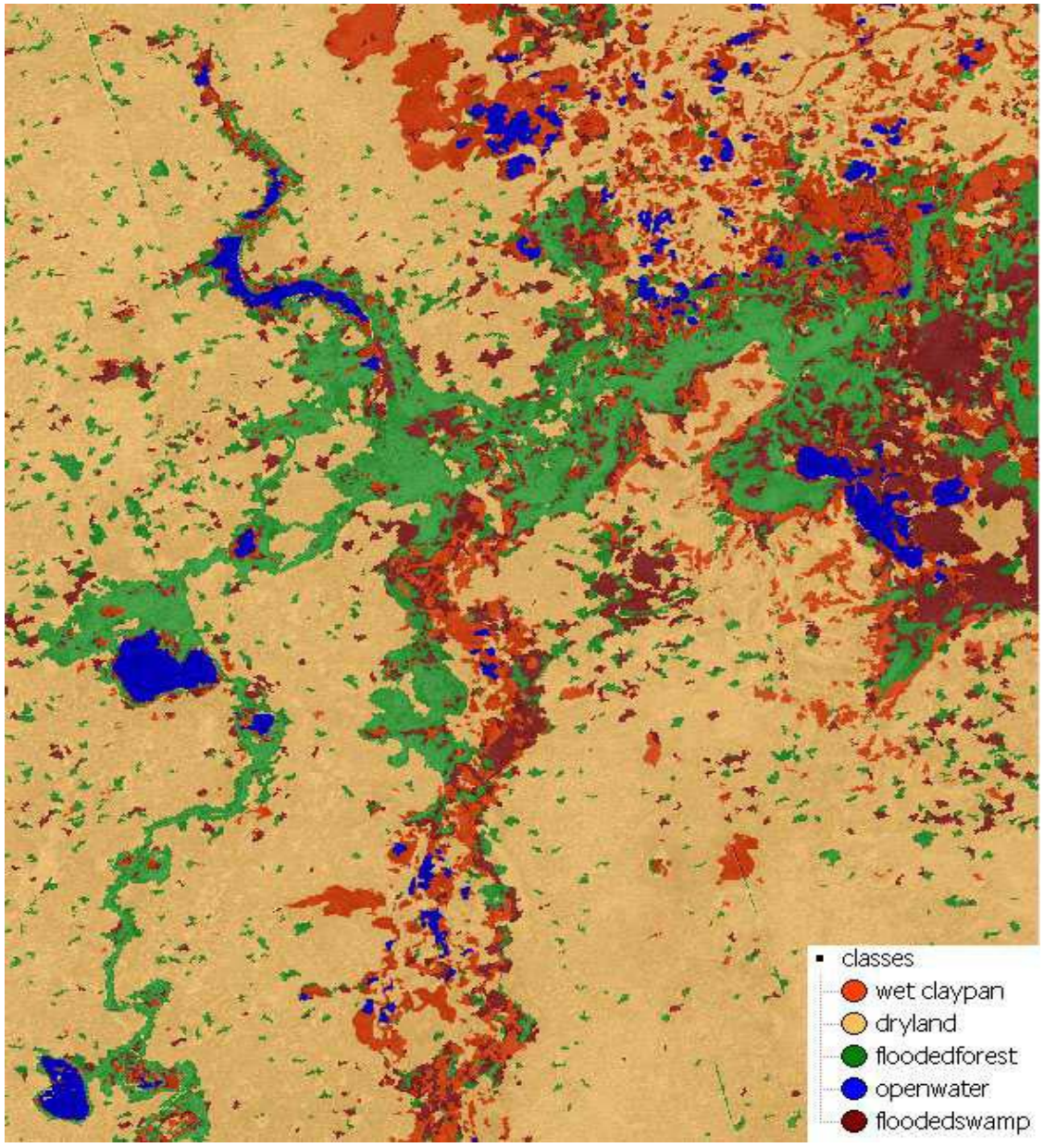
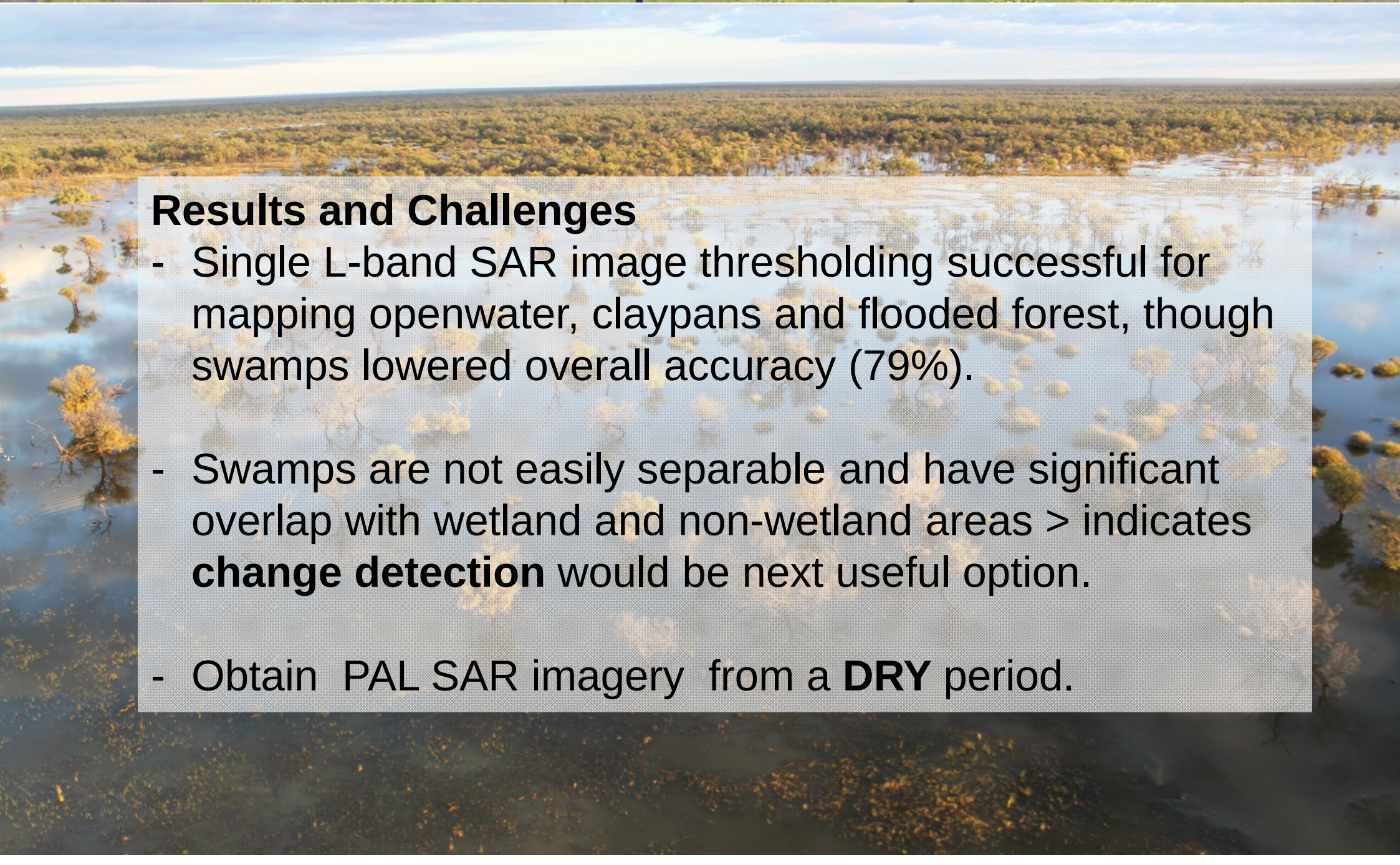




Results and Challenges

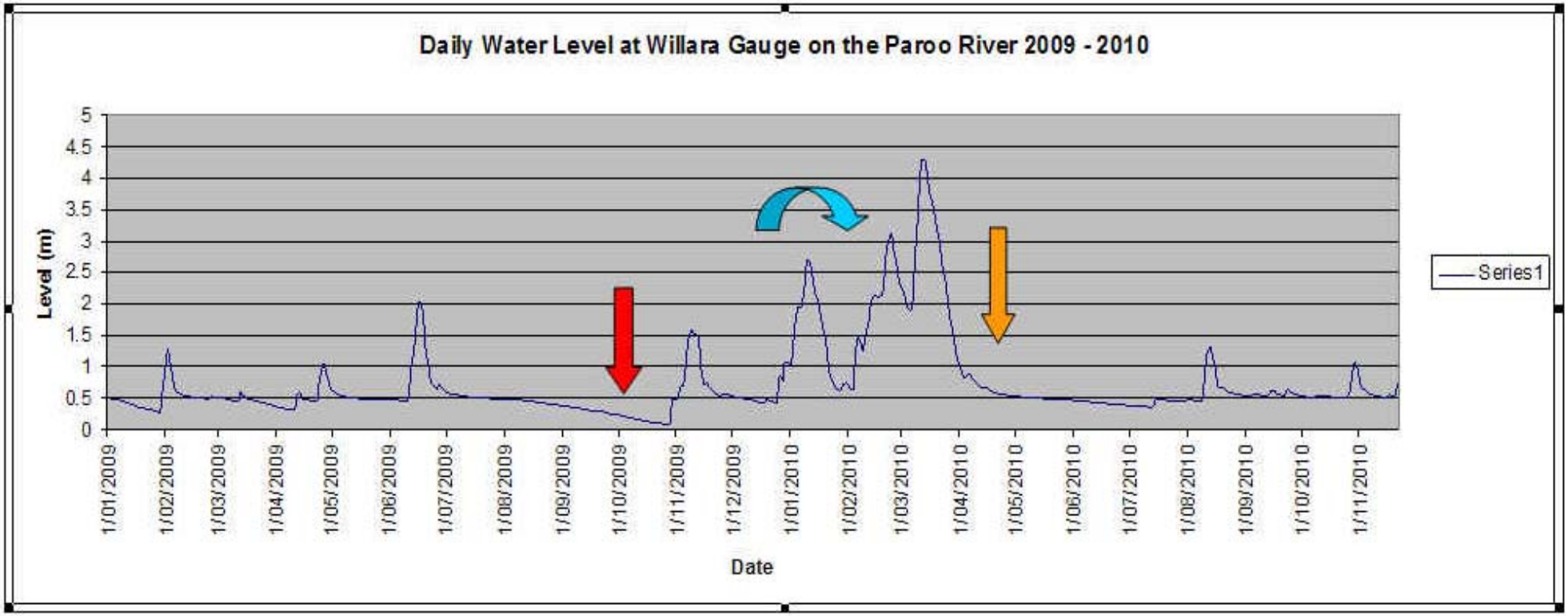
- Single L-band SAR image thresholding successful for mapping openwater, claypans and flooded forest, though swamps lowered overall accuracy (79%).

- Swamps are not easily separable and have significant overlap with wetland and non-wetland areas > indicates **change detection** would be next useful option.

- Obtain PAL SAR imagery from a **DRY** period.

River Levels in the PAROO

1. Willara Crossing on the Paroo River north of Hungerford NSW



Data required: see arrows on each graph
End of long dry period (before flood)
During wet period
During recession period as floodwaters recede and dry out

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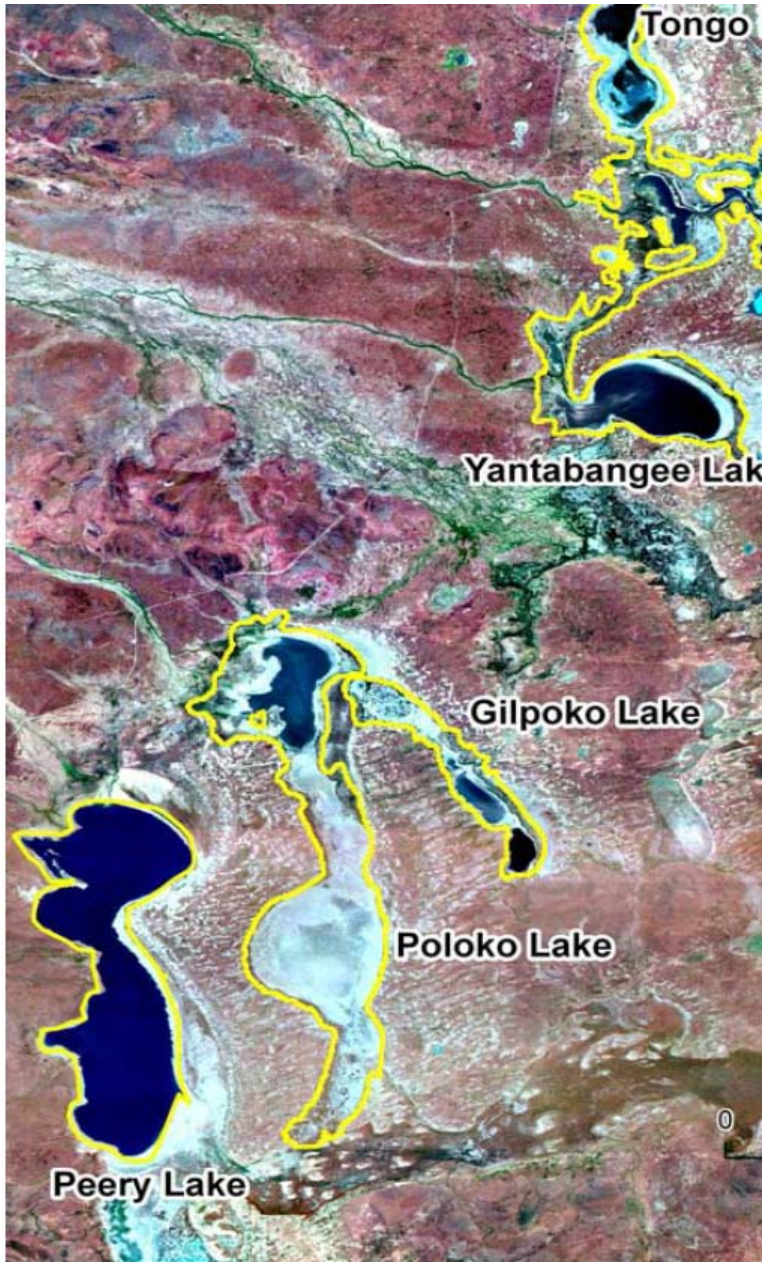
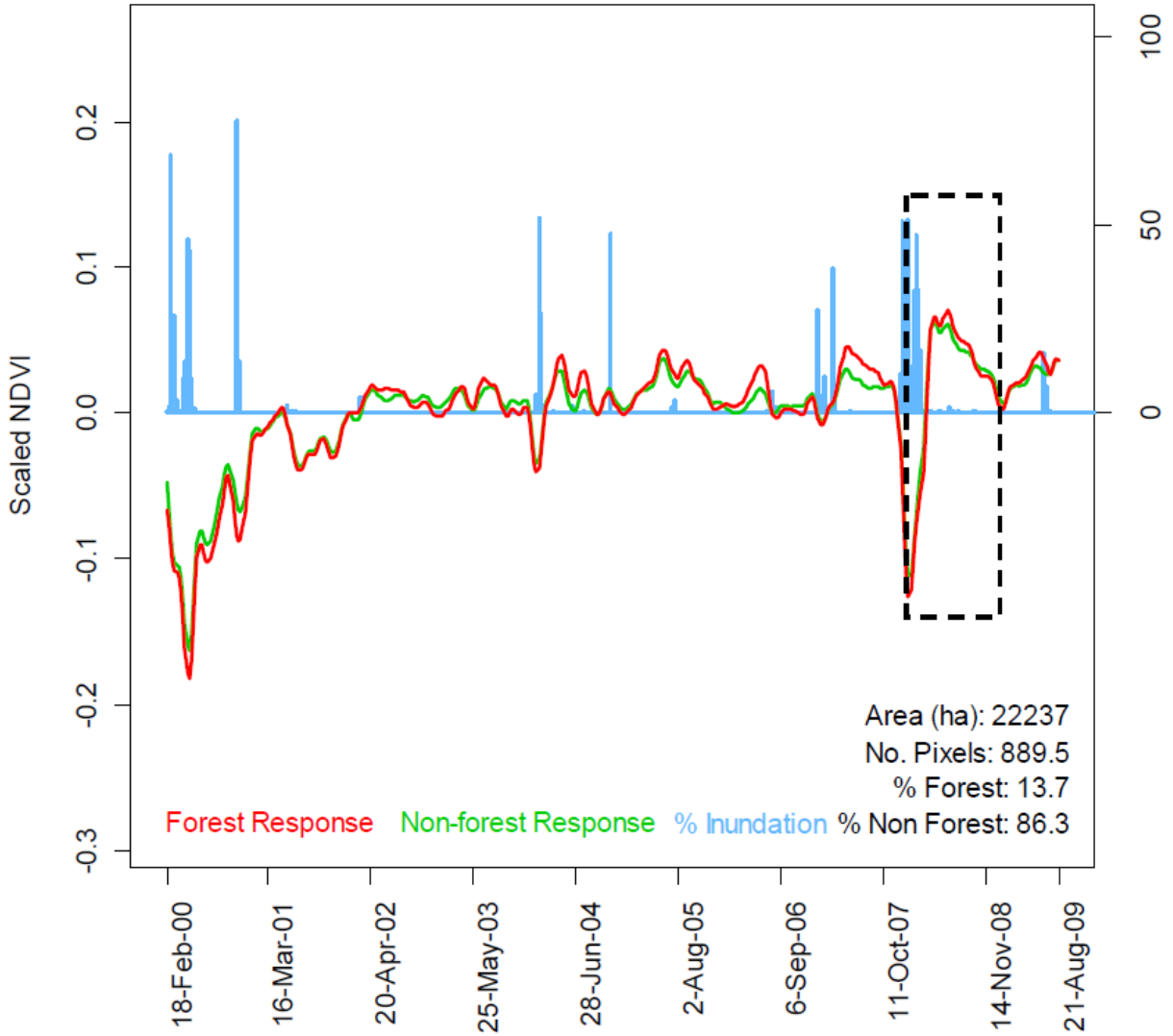


Peery Lake

2006

2010

Response curves for the Forest (red) and Non-forest (green) components of the Paroo River Wetlands, showing the proportion inundated as shown in the Open Water Likelihood data (blue).



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Continuing Work 2013-14

- Continue change detection analysis of inundation between July 2009 and May 2010
- Prepare inundation maps of flood extent across the Paroo River for 2009-2011.
- Develop operational methods for monitoring the recession of floodwaters using ALOS PALSAR
- Collect extensive field data for accuracy assessment.
- Identify ecologically significant wetland sites, in terms of the flood regime (timing, duration, extent of flooding) and vegetation characteristics in relation to their conservation value.
- Map vegetation to community level for the two RAMSAR sites showing the utility of ALOS PALSAR for characterization.
- Identification of high conservation value areas for the protection of critical aquatic habitat in terms of refuges especially in perennially flooded areas

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Thank You

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