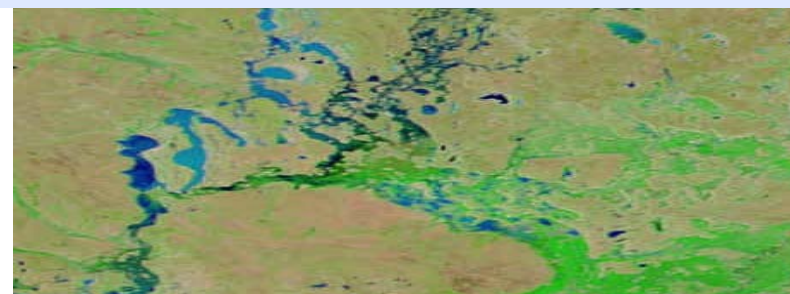
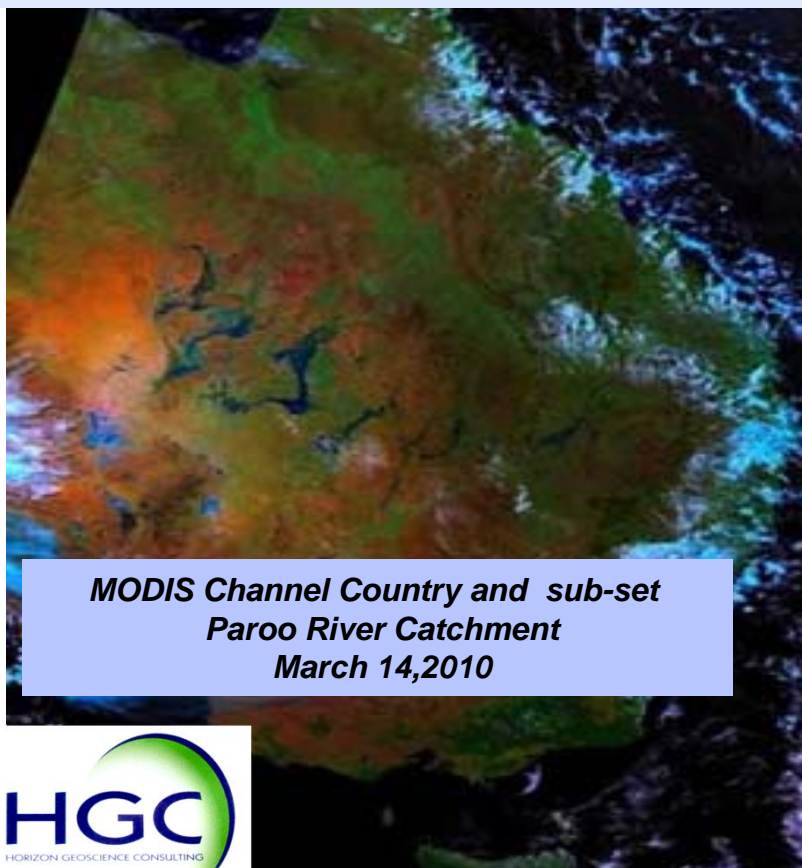


***Using multi-temporal ALOS PALSAR to investigate  
flood dynamics in semi-arid wetlands:  
Murray Darling Basin, Australia.***

**Tony Milne, Rachel Melrose**



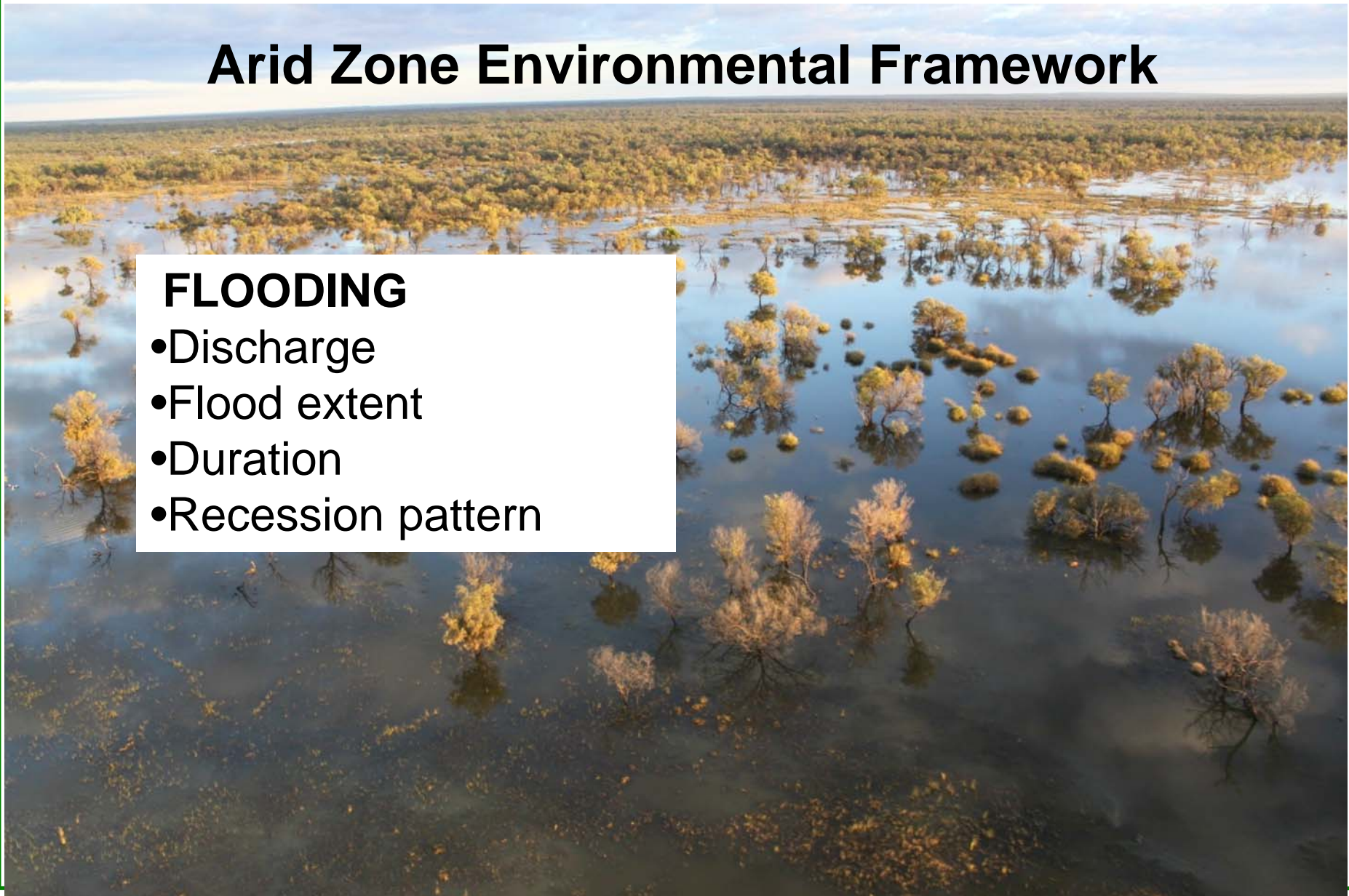
Science Team meeting #19  
JAXA TKSC/RESTEC HQ, Tokyo, 8-12<sup>th</sup> April, 2013



## Arid Zone Environmental Framework

### **FLOODING**

- Discharge
- Flood extent
- Duration
- Recession pattern





## Arid Zone Environmental Framework

### FLOODING

- Discharge
- Flood extent
- Duration
- Recession pattern

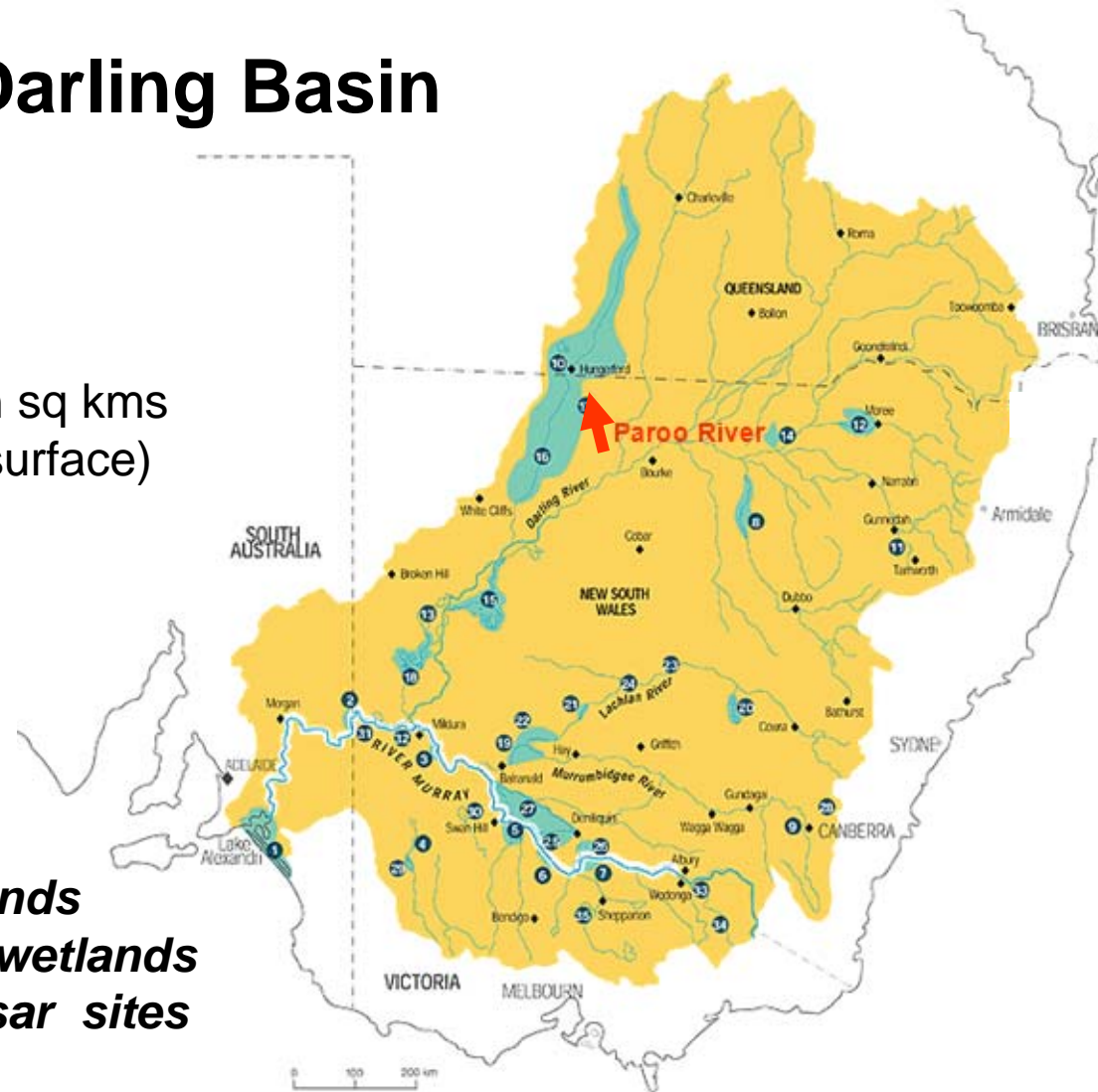
### VEGETATION

- Xerophytic
- Riparian
- Woody shrubs
- Grasslands

## 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*.

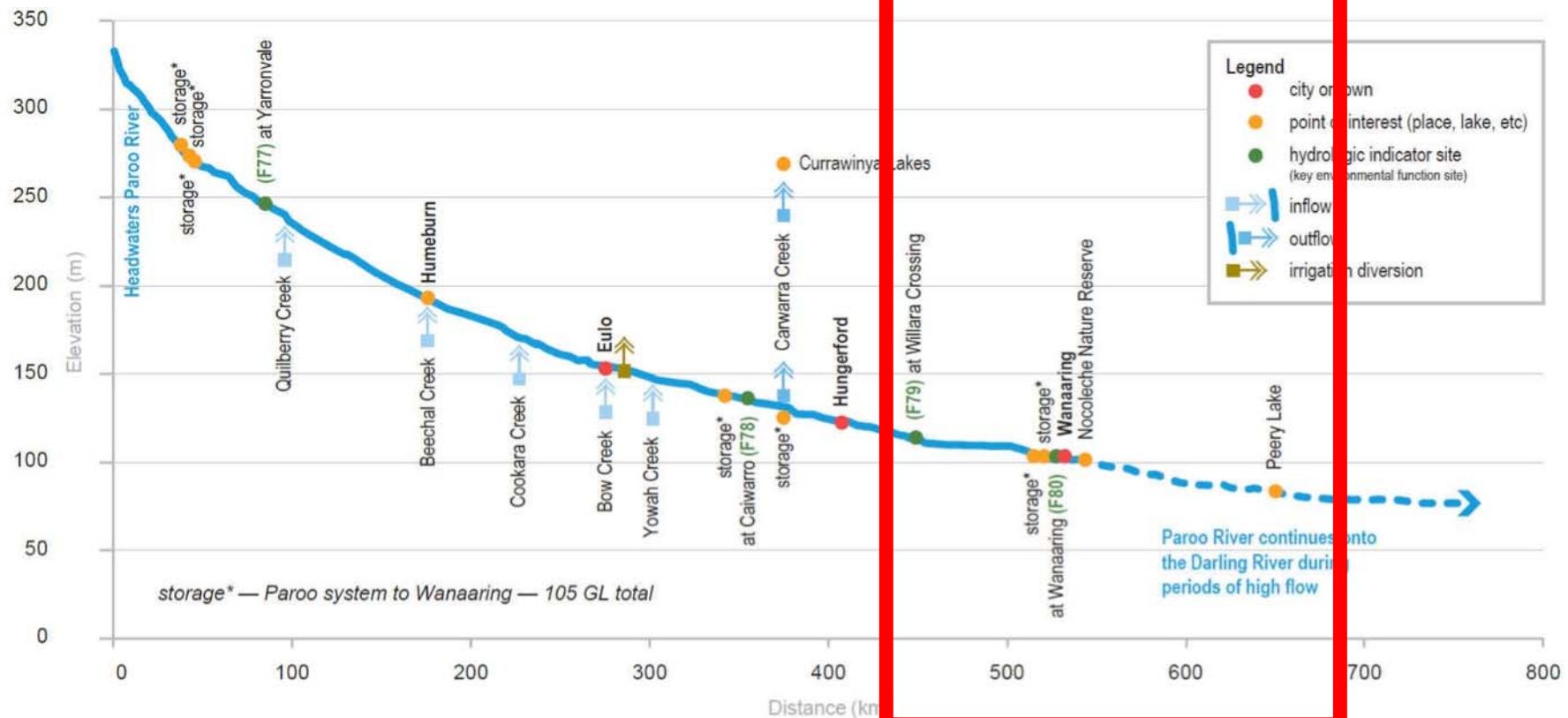
## **MDBA Program Objectives**

- **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**

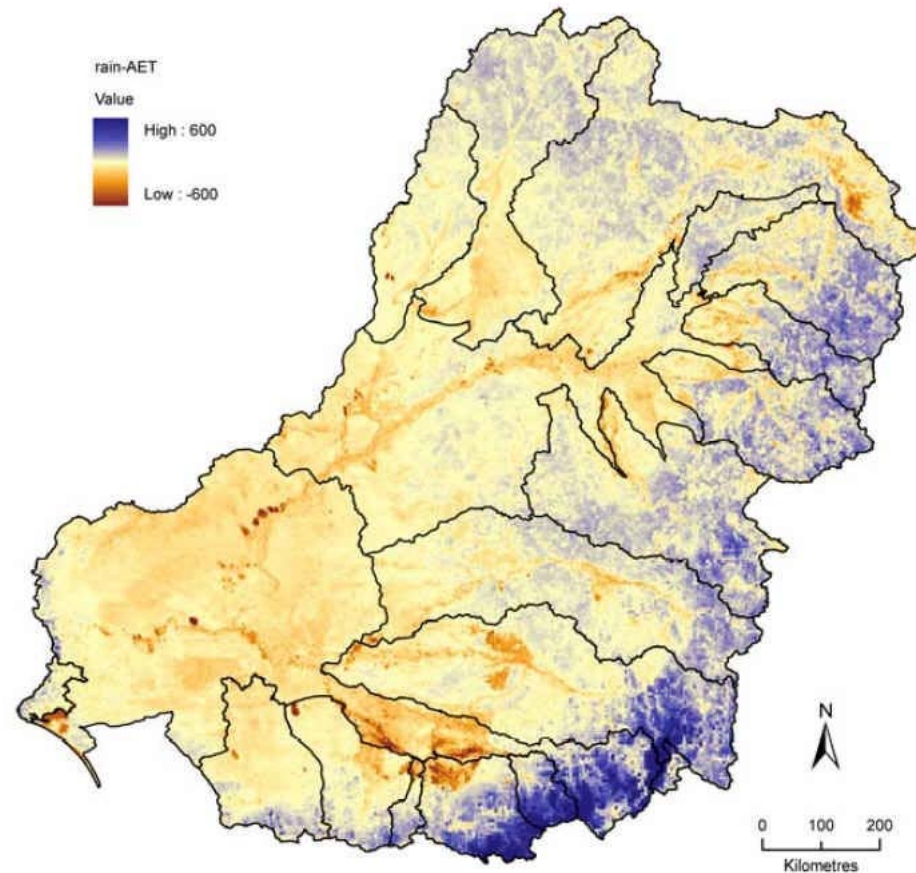
## Paroo River Profile



Zone of Study



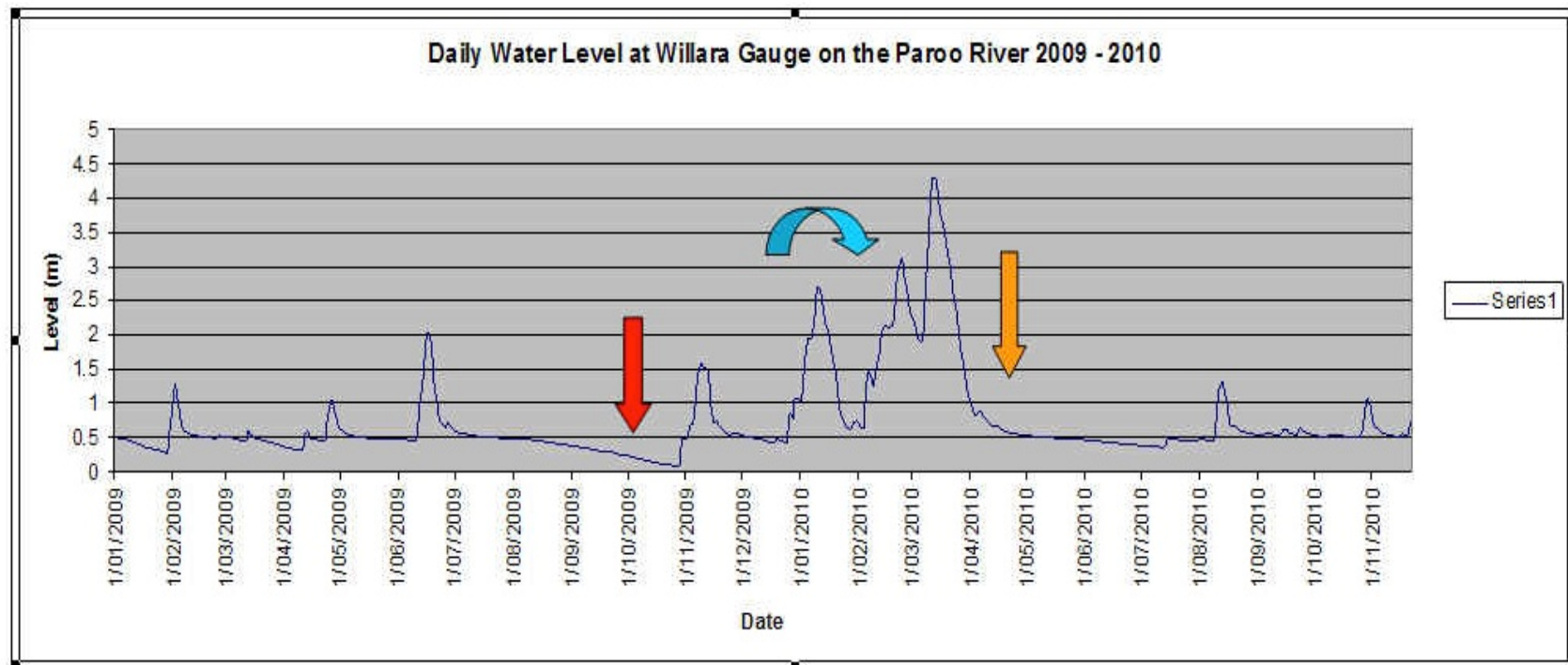
## Estimated net water balance - rainfall minus actual evapotranspiration.



Blue indicates regions where runoff is generated, yellow no runoff, red/brown indicates standing water (Kirby et.al.,2008)

# River Levels in the PAROO

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



Data required: see arrows on each graph

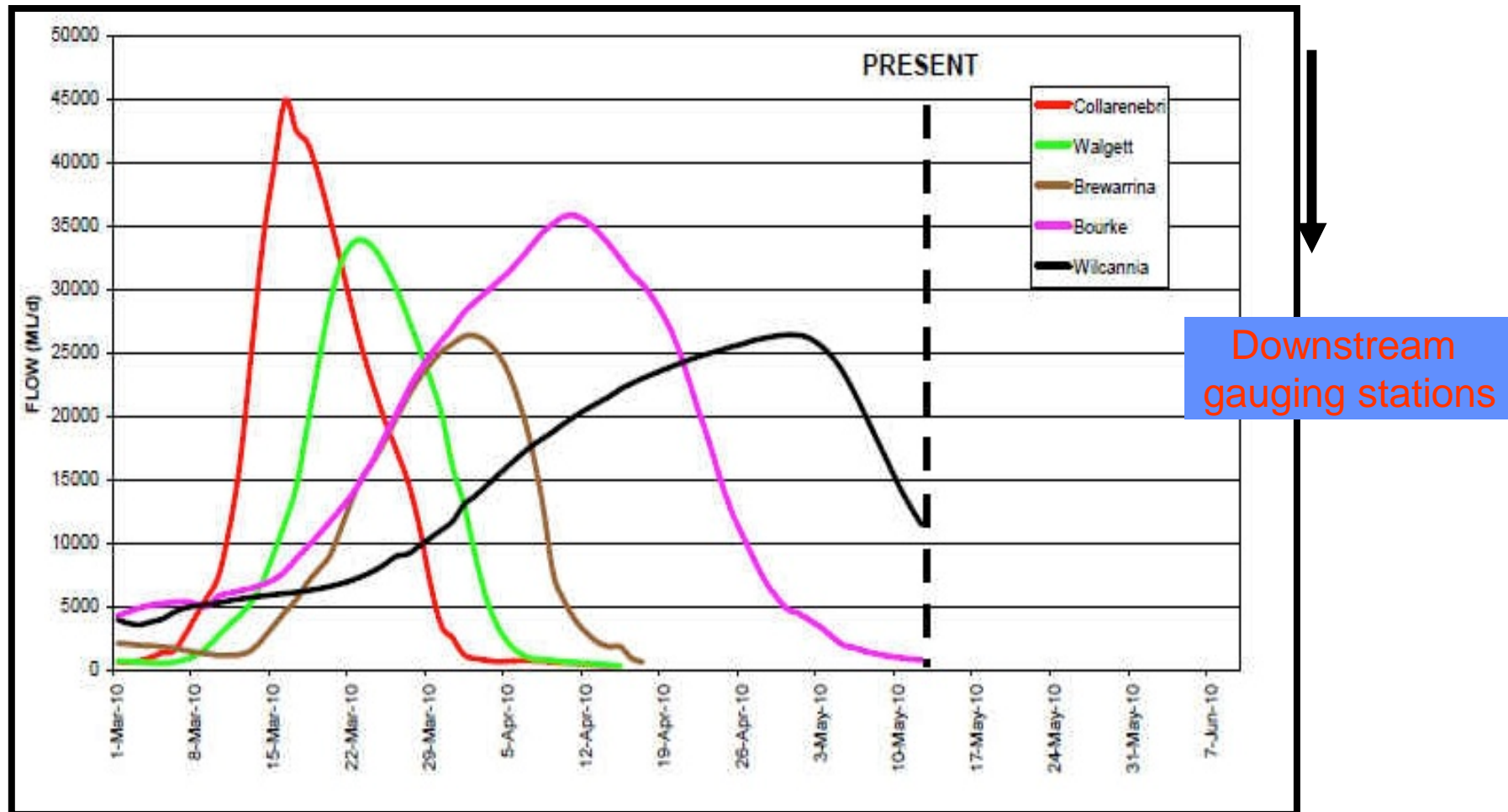
End of long dry period (before flood)

During wet period

During recession period as floodwaters recede and dry out

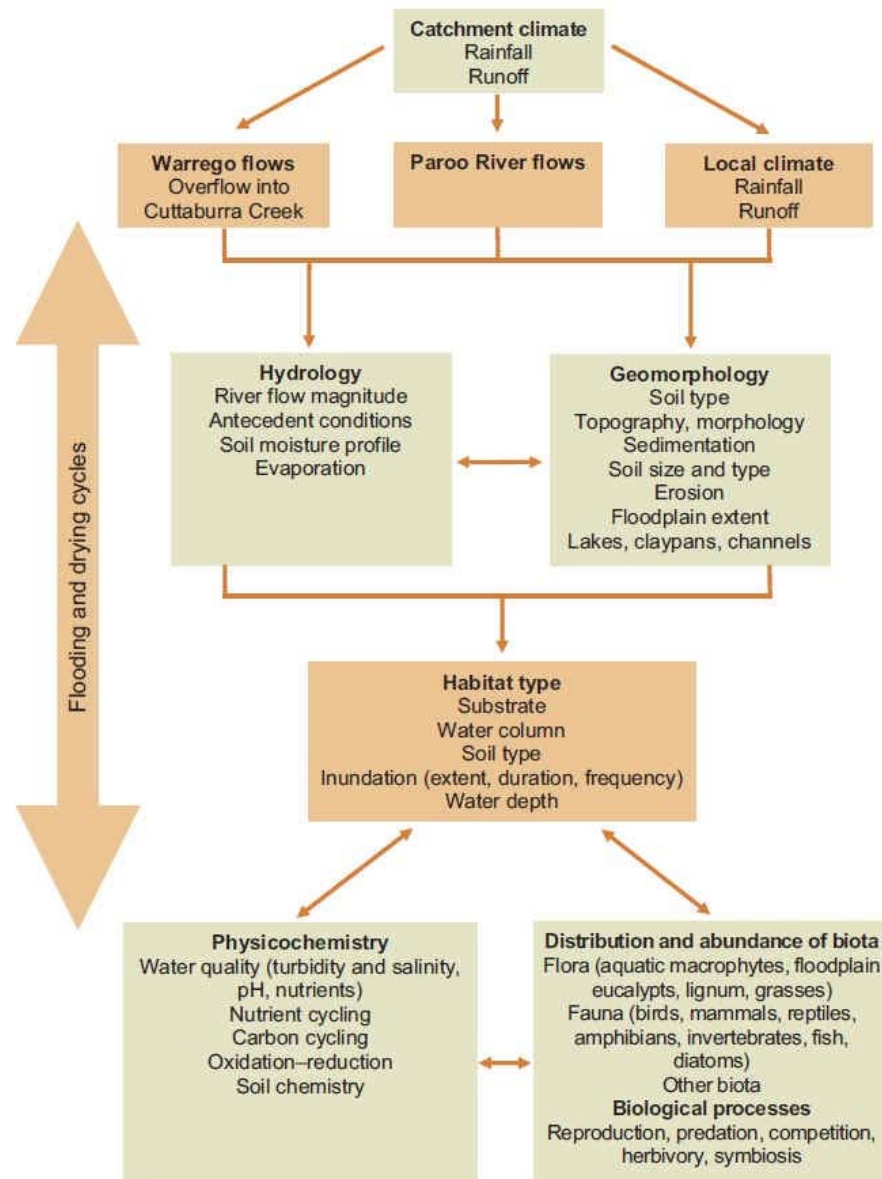


## Following the Flood



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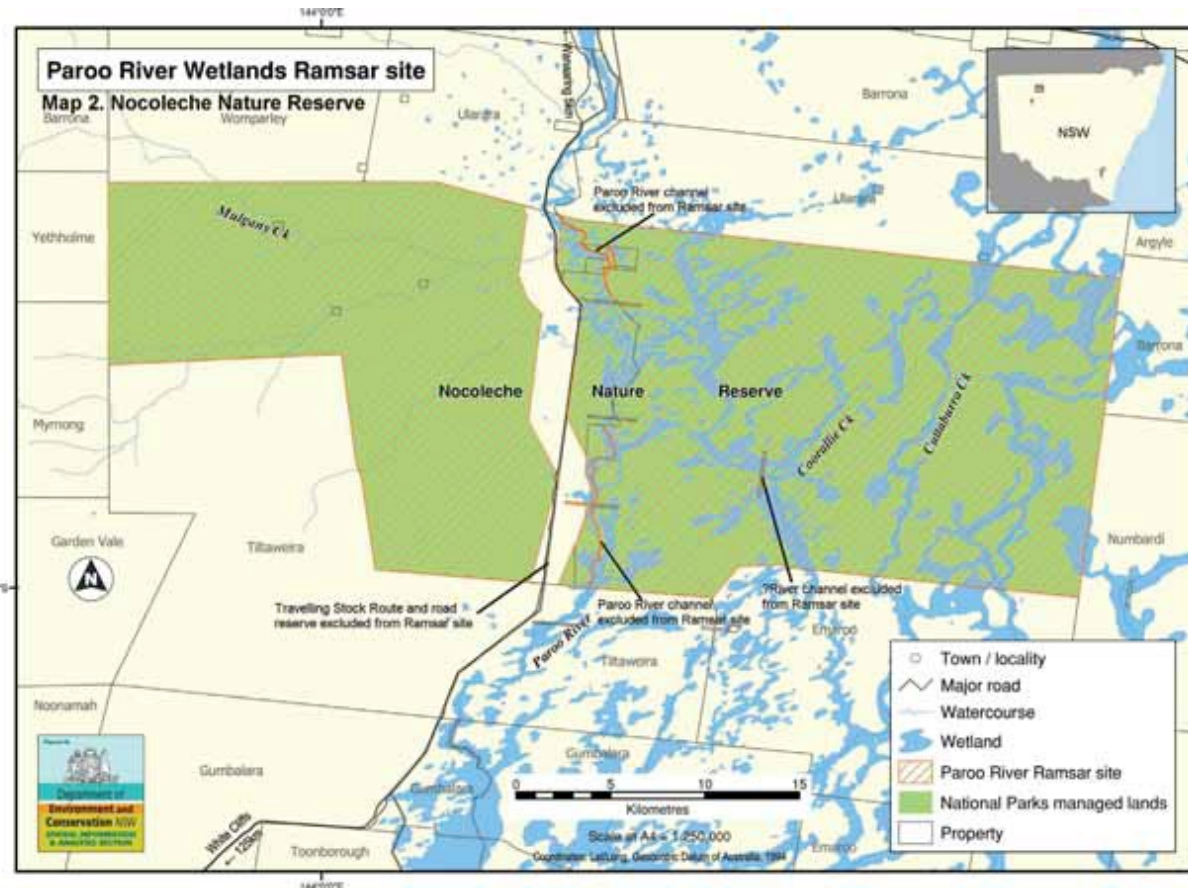


Ecological Outcomes of Flow Regimes in the  
Murray-Darling Basin Overton, I.C., Colloff, M.J., Doody, T.M.,  
Henderson, B. and Cuddy, S.M. (editors) 2009.



# ALOS

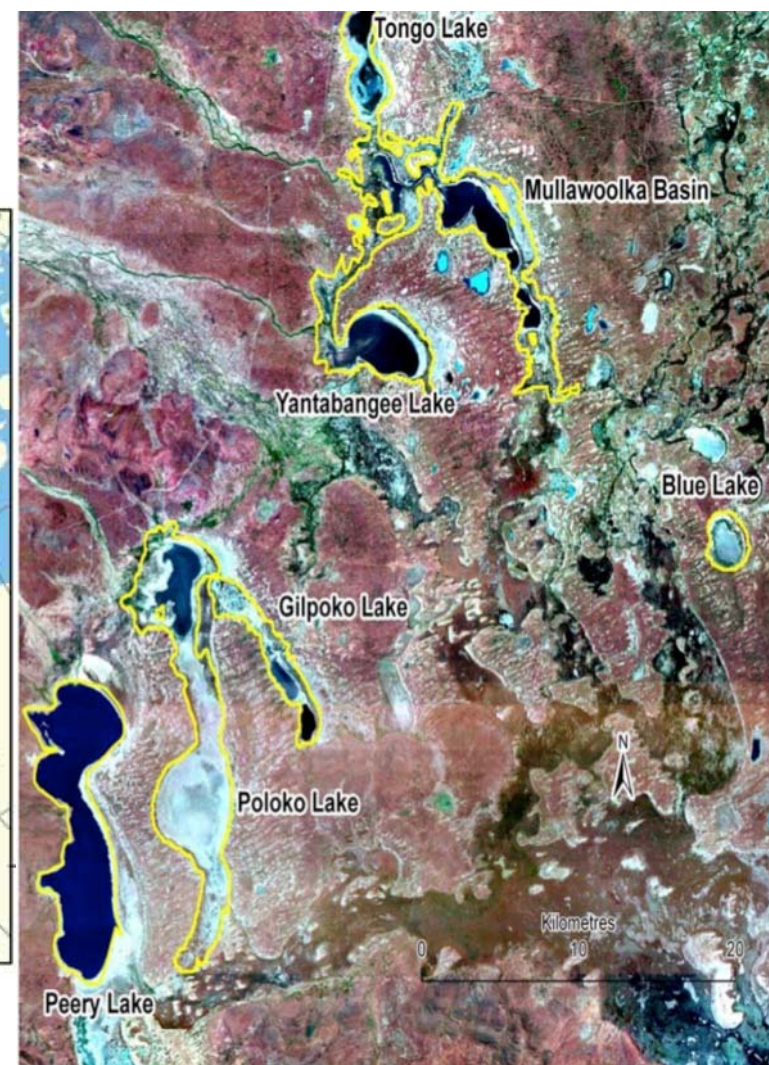
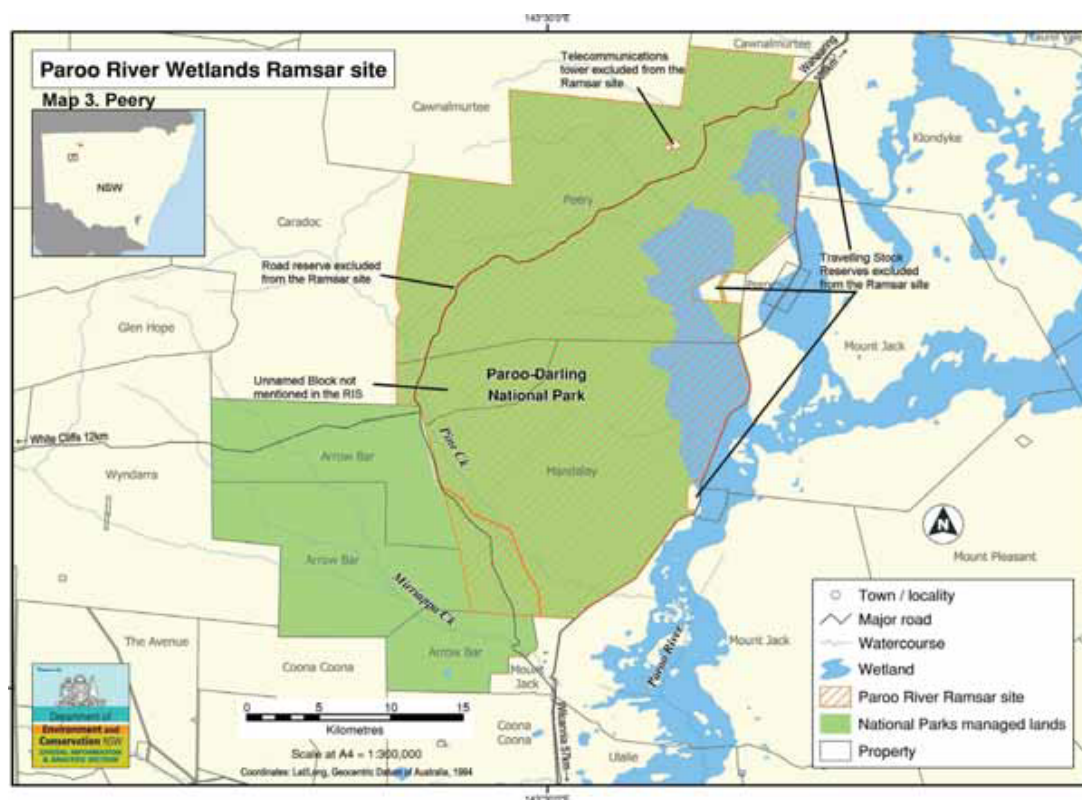
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# ALOS

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An international science collaboration led by JAXA

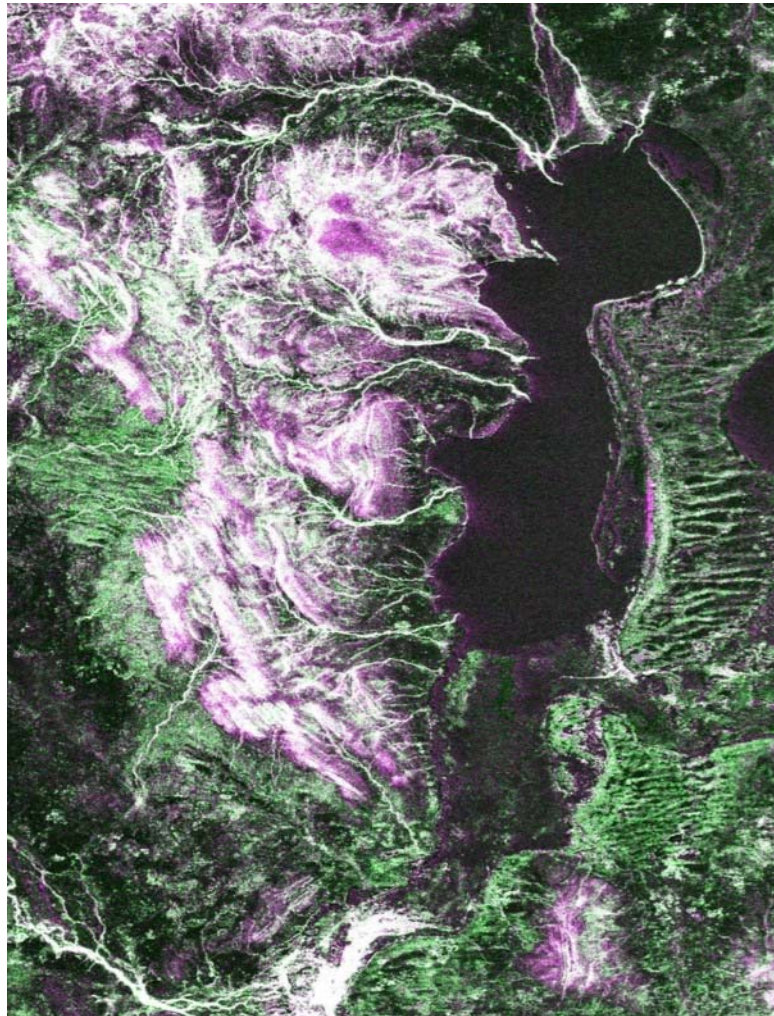




# ALOS

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*An international science collaboration led by JAXA*

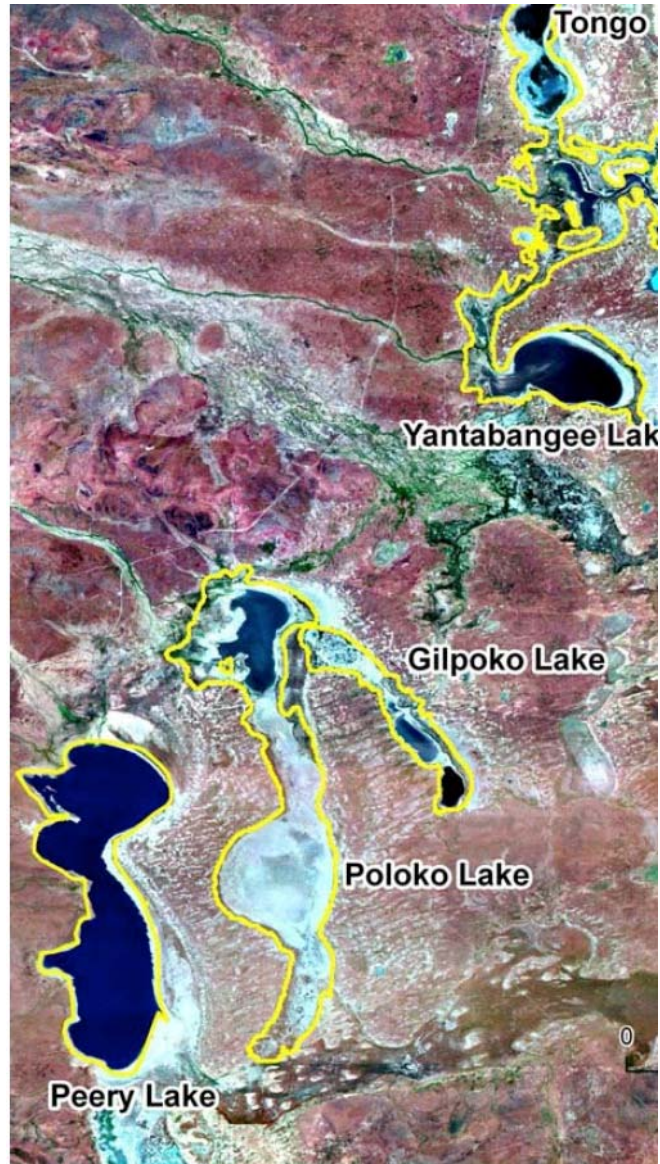
**L-Band ALOS PALSAR FBD (HH;HV;HH in RGB) sub-area (left) and Landsat insert (right) of Lake Peery which is the largest overflow lake on the Paroo River. It is approximately 15km long and covers over 5,026 hectares when in flood. The lake is bordered by sedimentary ranges on the west and sand dunes and sand plains on the east and is a RAMSAR listed site. The Lake is fed by floodwaters passing down the Paroo River**





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## Peery Lake



2006

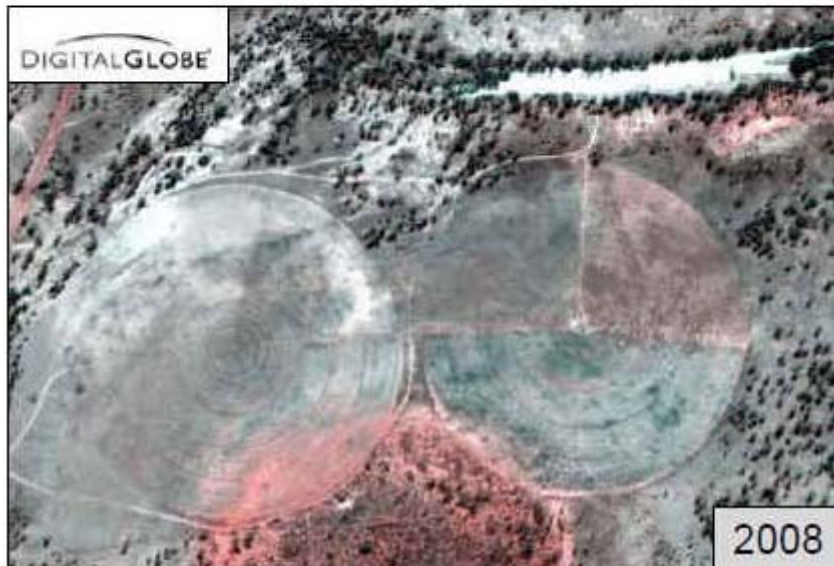


2010

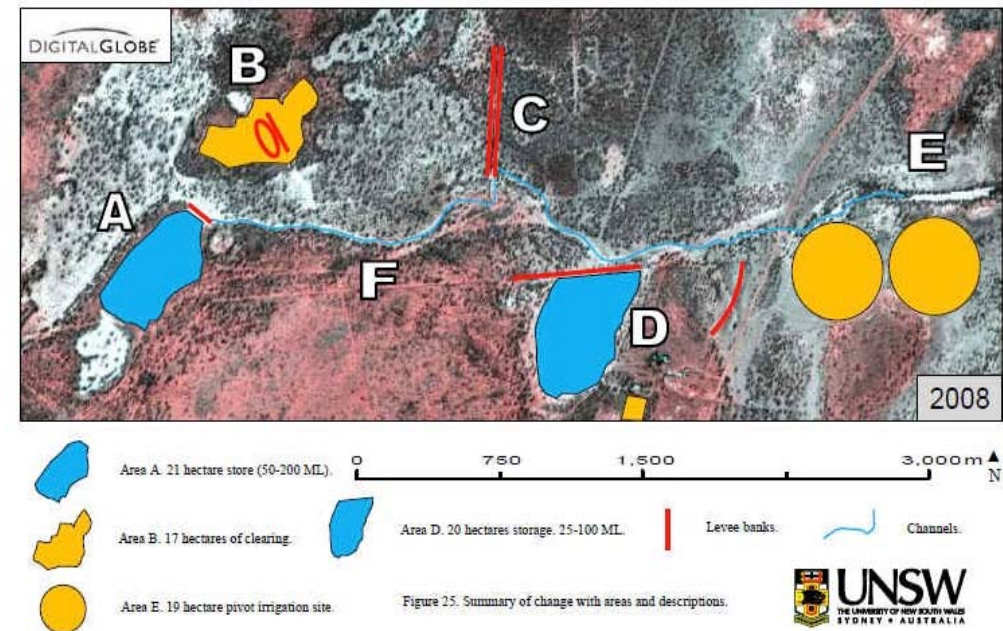


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## Transforming Wetlands- Paroo River near Eulo



***Pivot irrigation each 19hct in area***

Source Kingsford, 2007

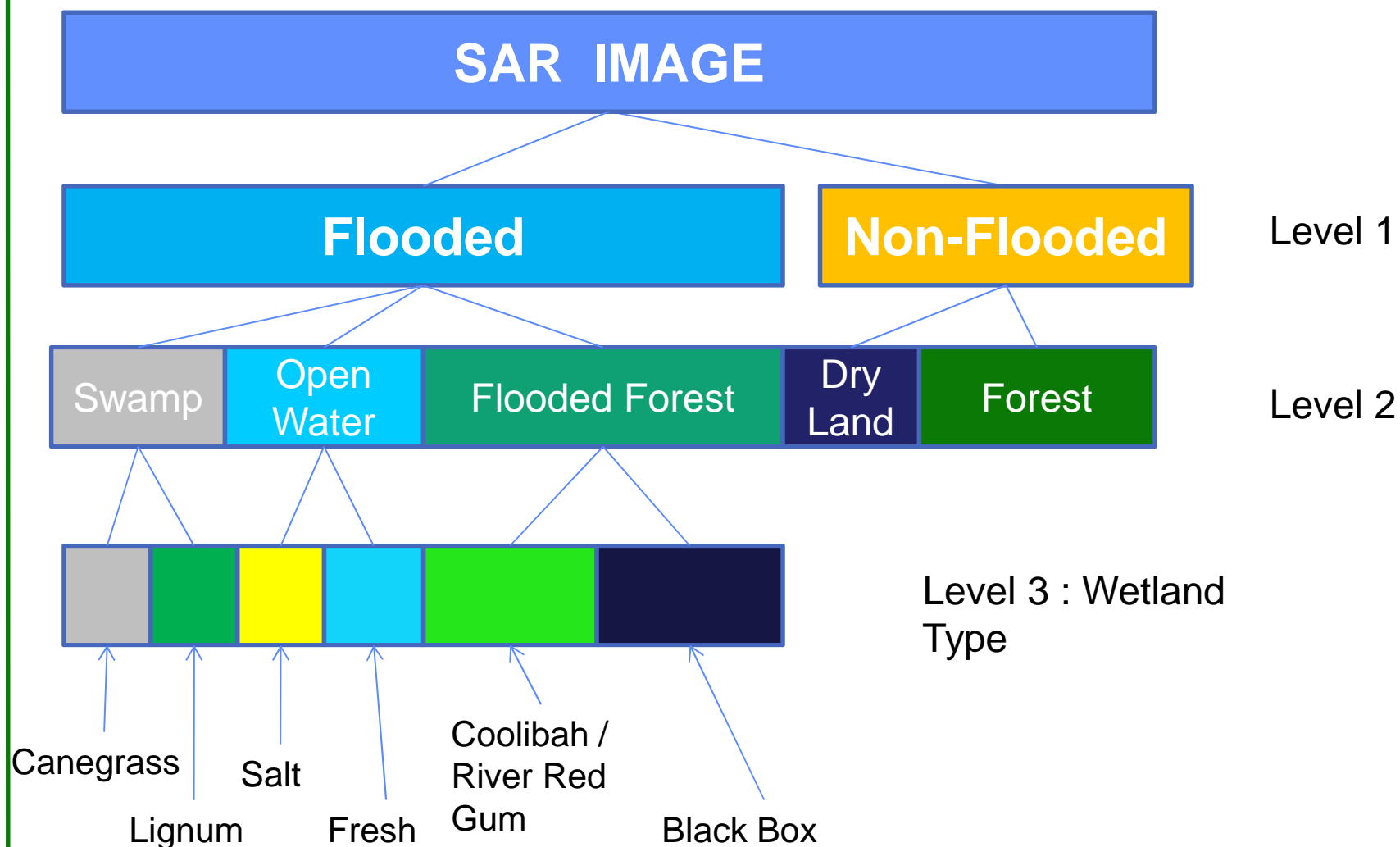
# **Morpho-ecological Mapping semi-arid wetland typologies**

## **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**



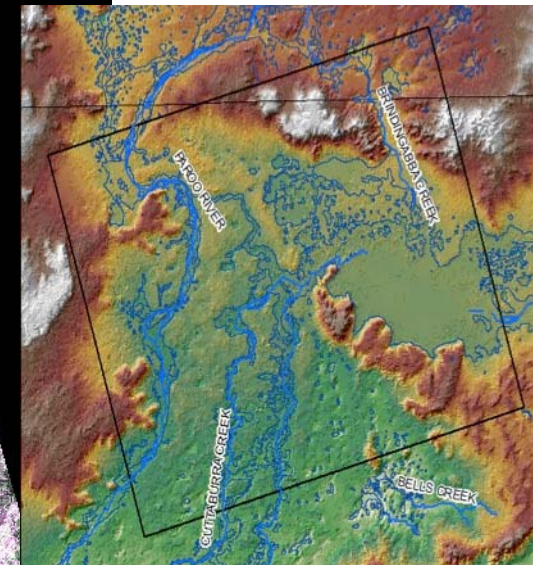
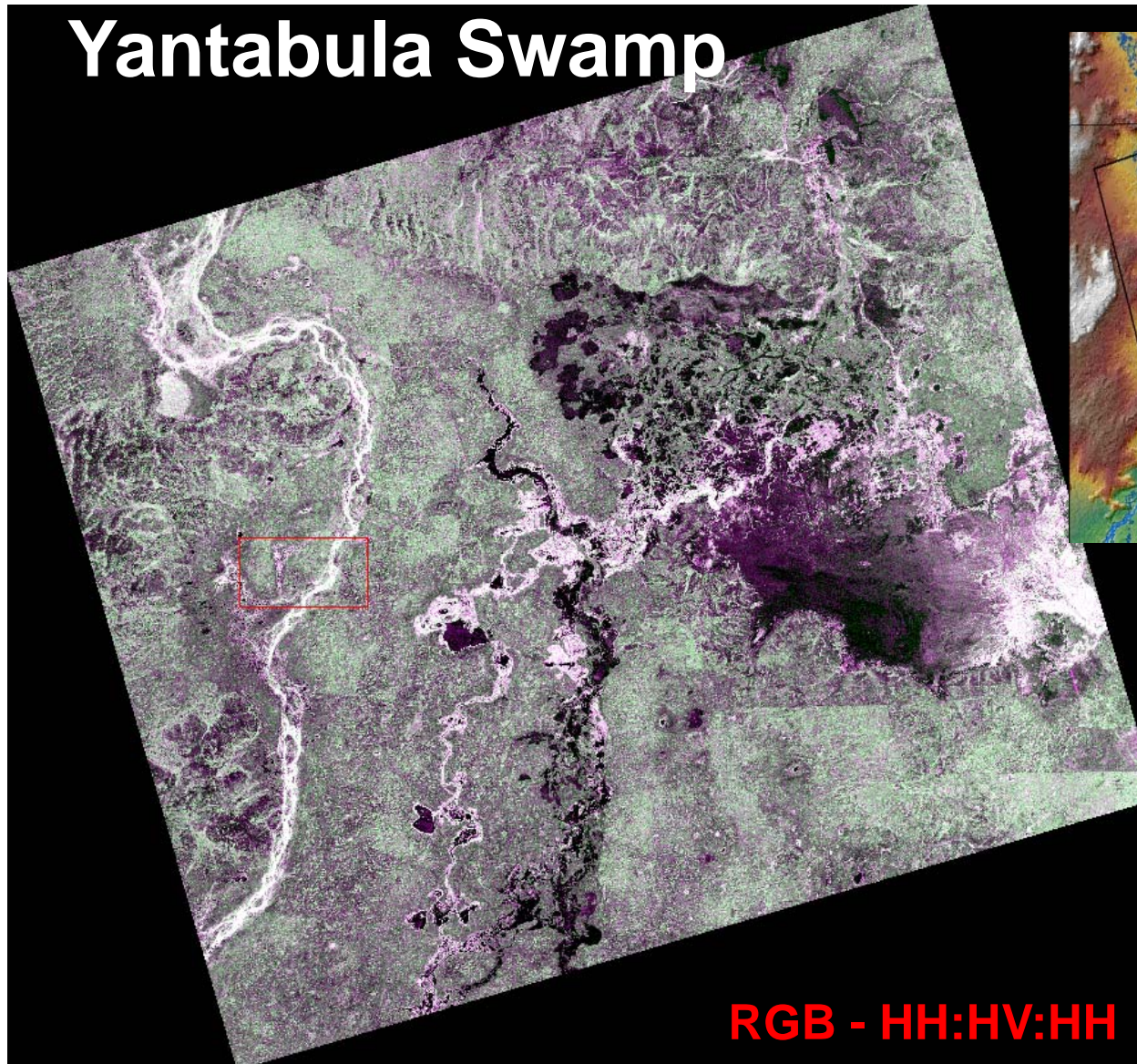
## Segmentation



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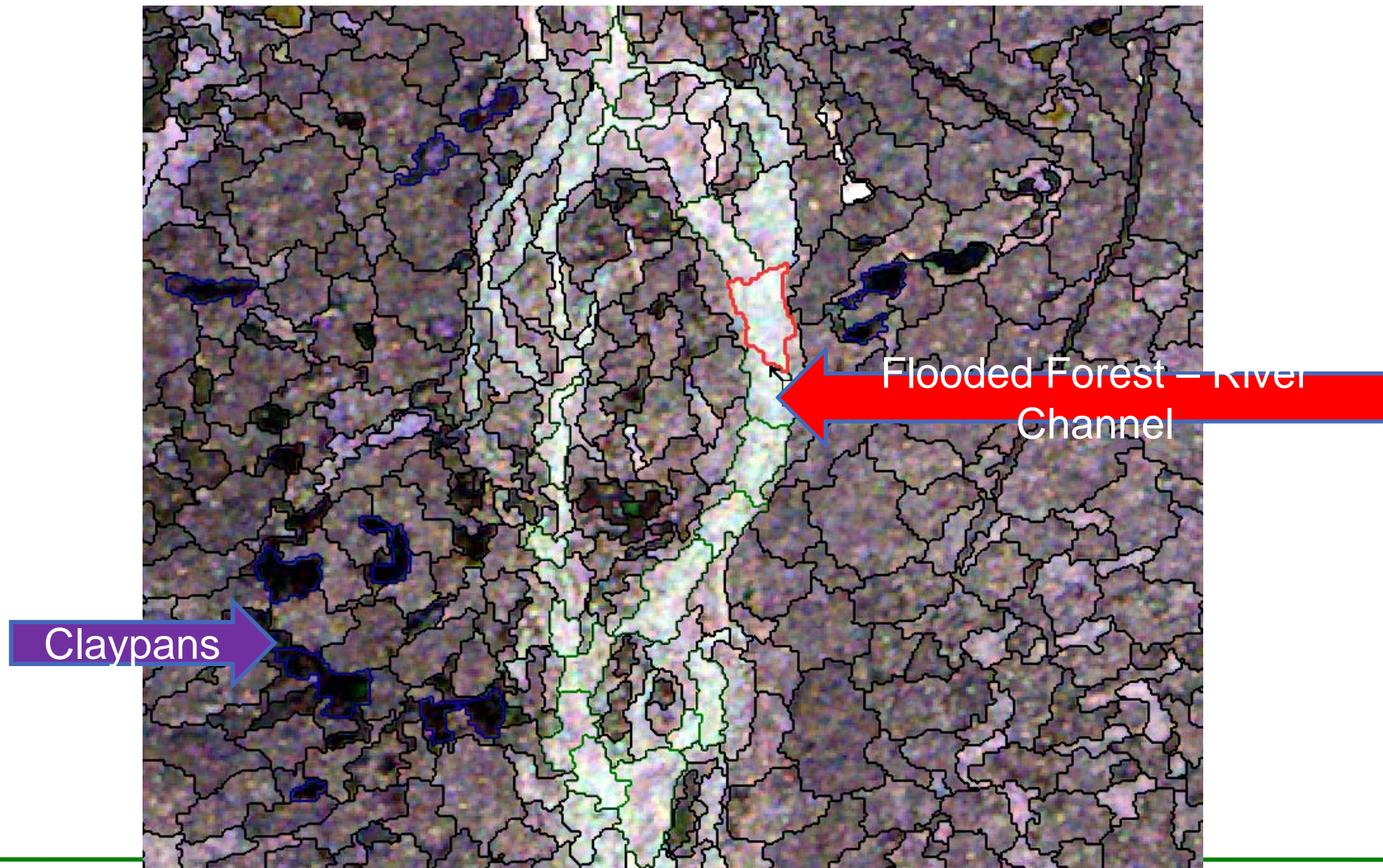
# Yantabula Swamp



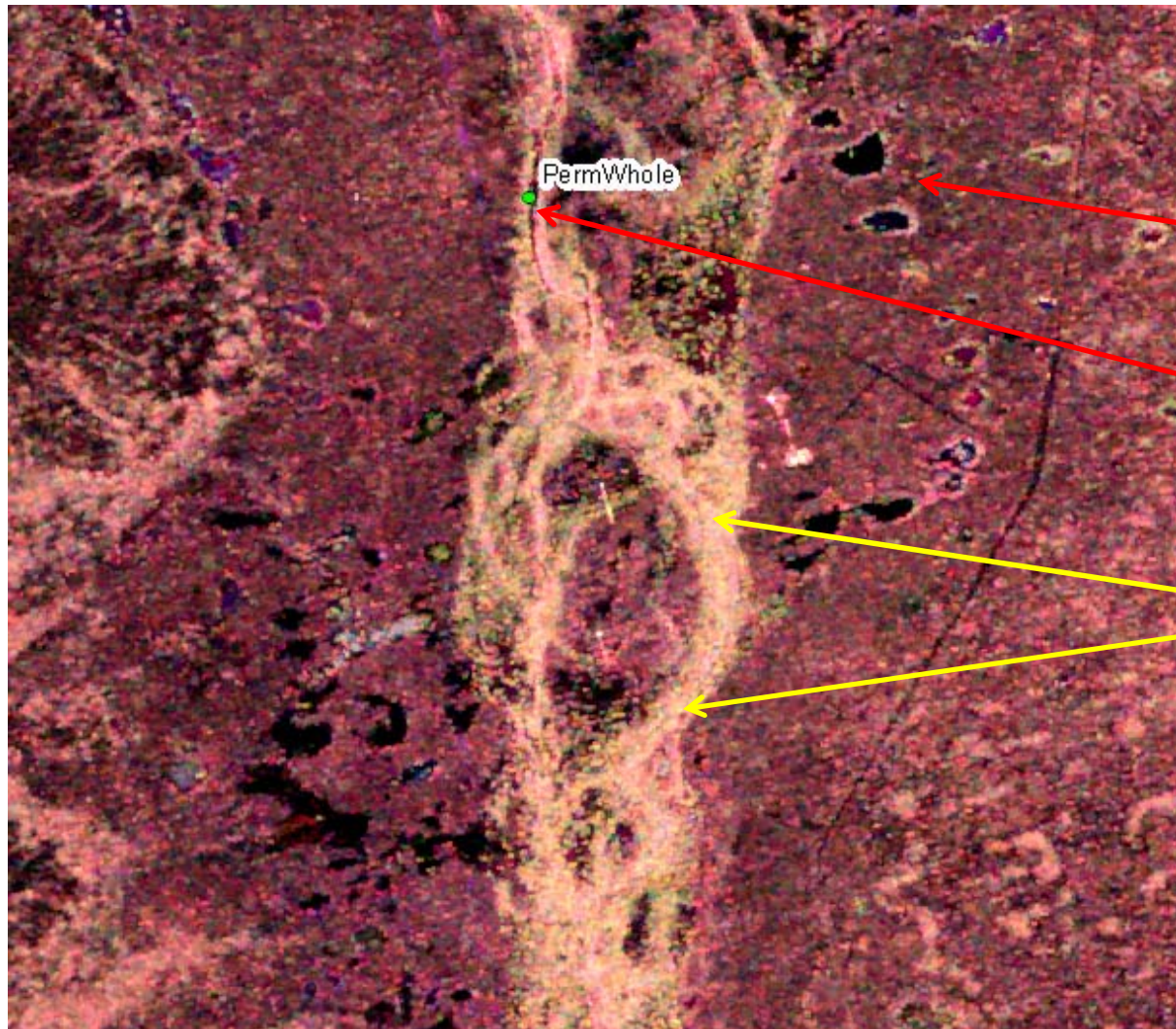
RGB - HH:HV:HH



# Segmented Floodplain







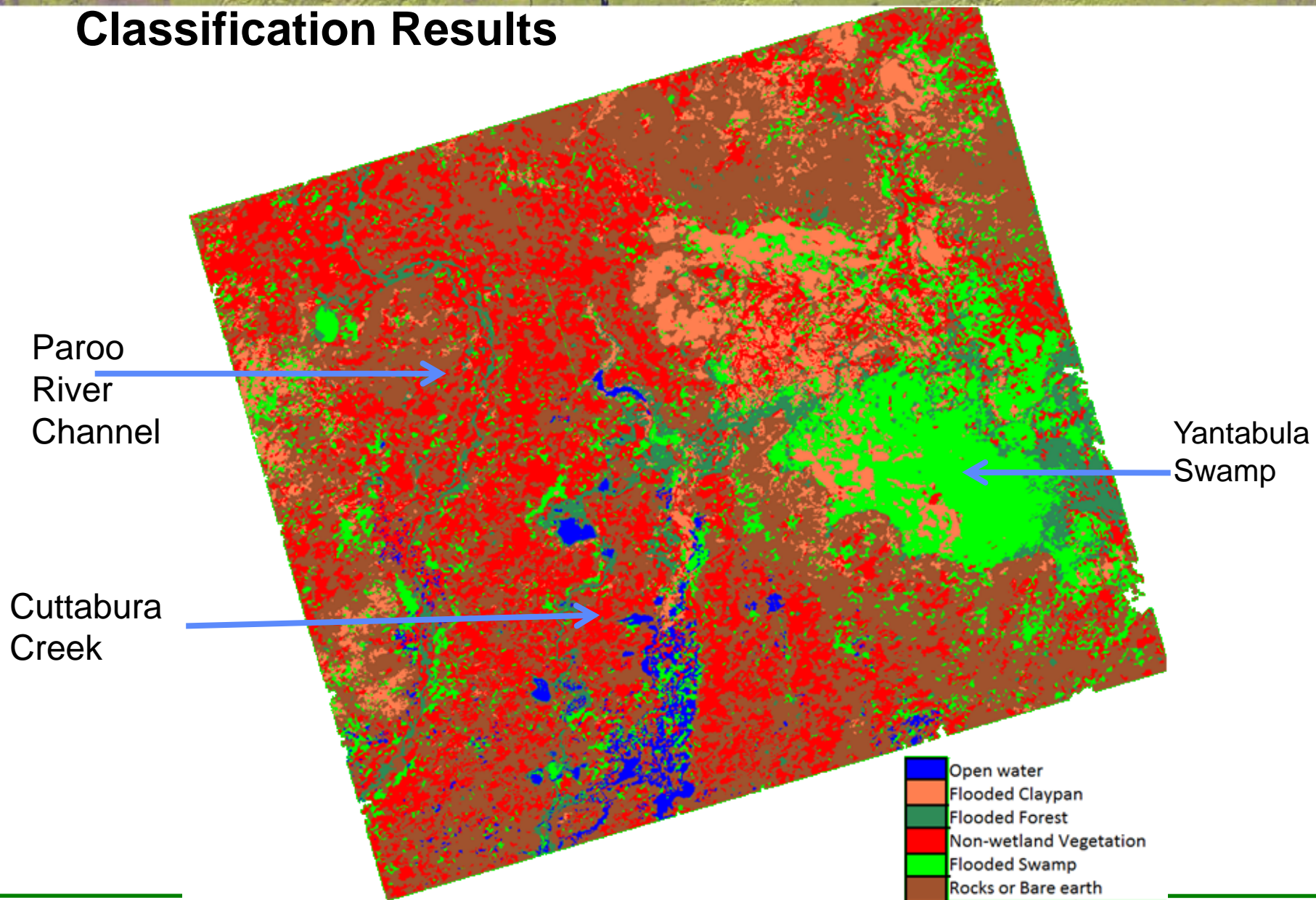
**Open water  
is dark:**

- Claypans
- Lakes
- Billabongs

**Flooded  
channels  
covered in  
vegetation  
are bright**



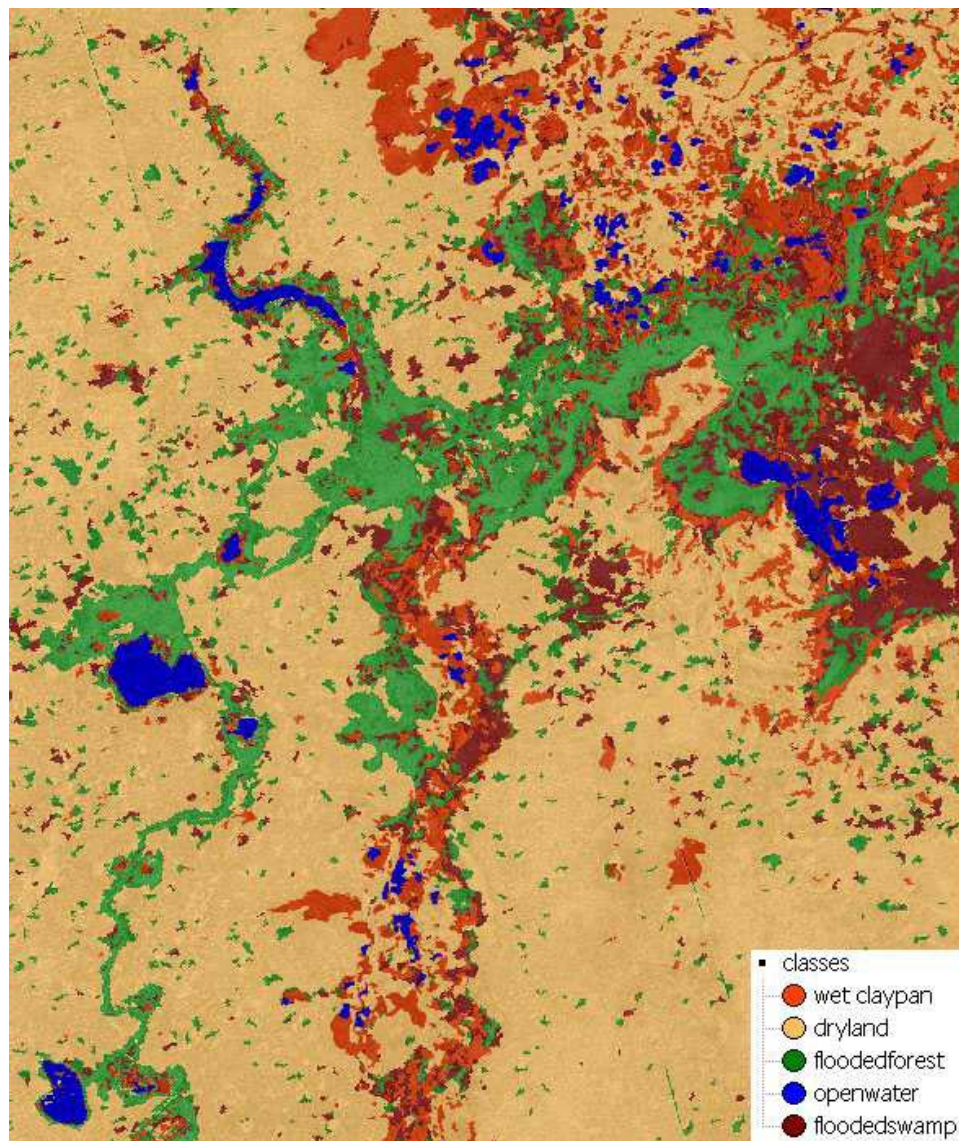
## Classification Results





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**Riverine Forest**



**Shrubland Swamp**

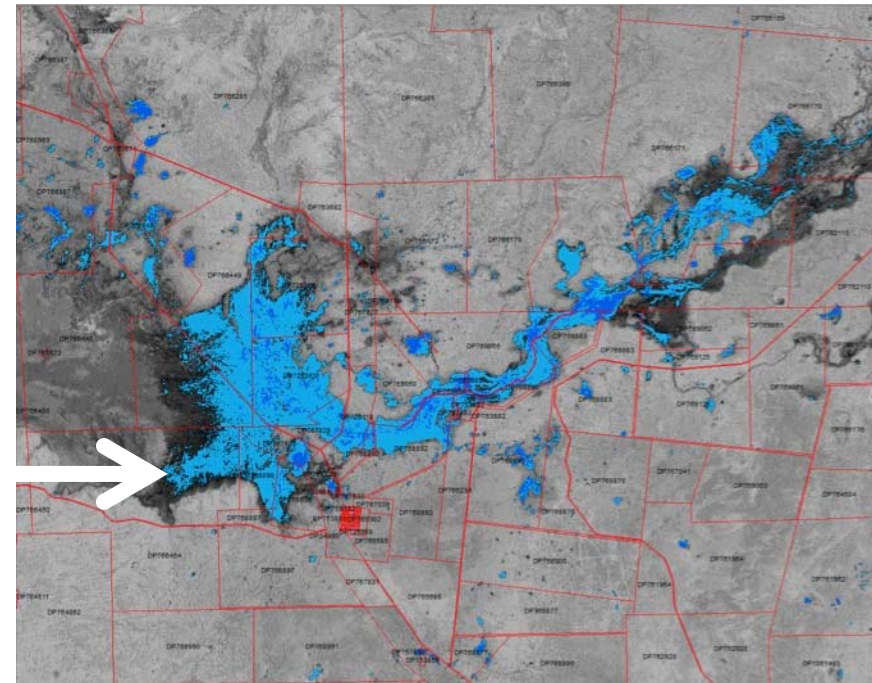
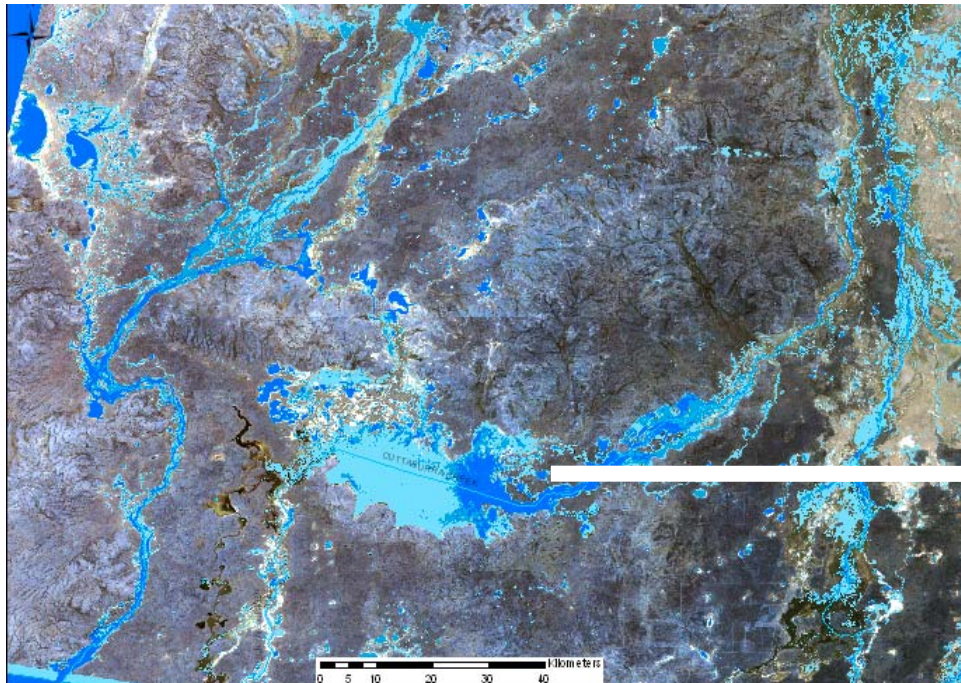




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## Flood Recession : Time series snapshot water flow in Cuttaburra Creek ??



**Time series: duration - permanence**

**Flow modelling potential: low relief - need DEM**

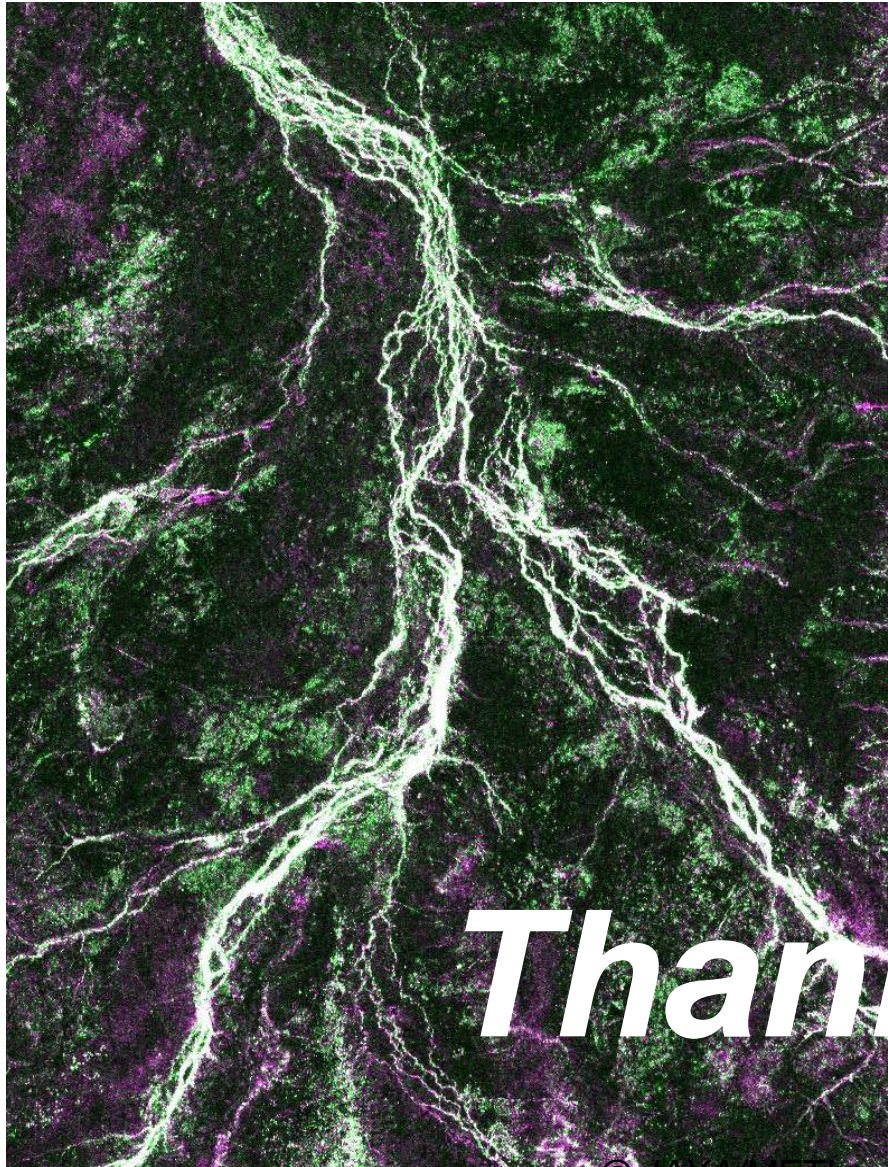
## Continuing Work 2013

- ☐ 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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Photograph by Vol Norris