Extension Phase Proposal

Two components

- **Completion of work from Phase 1 on Mekong Wetlands with a new sub-task;**

Detecting changes in the magnitude and frequency of flood events in selected wetland sites in the Lower Mekong Basin using PALSAR FB time series. Identification of land cover changes over time.

- **New Task Australian Murray-Darling Basin,**

Investigating the use of PALSAR for Wetland Assessment in a Semi-arid Environment: Macquarie Marshes.

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Extension Phase Proposal

Australian Murray-Darling Basin, Investigating the use of PALSAR for Wetland Assessment in a Semi-arid Environment: Macquarie Marshes

Objectives

- ***To undertake a multi-scene stack analysis (20 scenes+) of FB PALSAR data over the Macquarie Marshes to identify hydrologic and vegetation response to changed flood and in-channel discharge conditions in a semi-arid environment.***
- ***Evaluate ScanSAR efficiency in detecting and mapping the regional distribution of semi-arid wetland distribution in the MDB.***

Description

To apply selected image processing routines to a PALSAR multi-stacked image dataset in order to differentiate between permanently flooded, saturated soil areas and seasonally inundated floodplains and marshlands in a semi-arid environment. Flooding dependent largely on the release on environmental flows by catchment managers. Apply methodology regionally,

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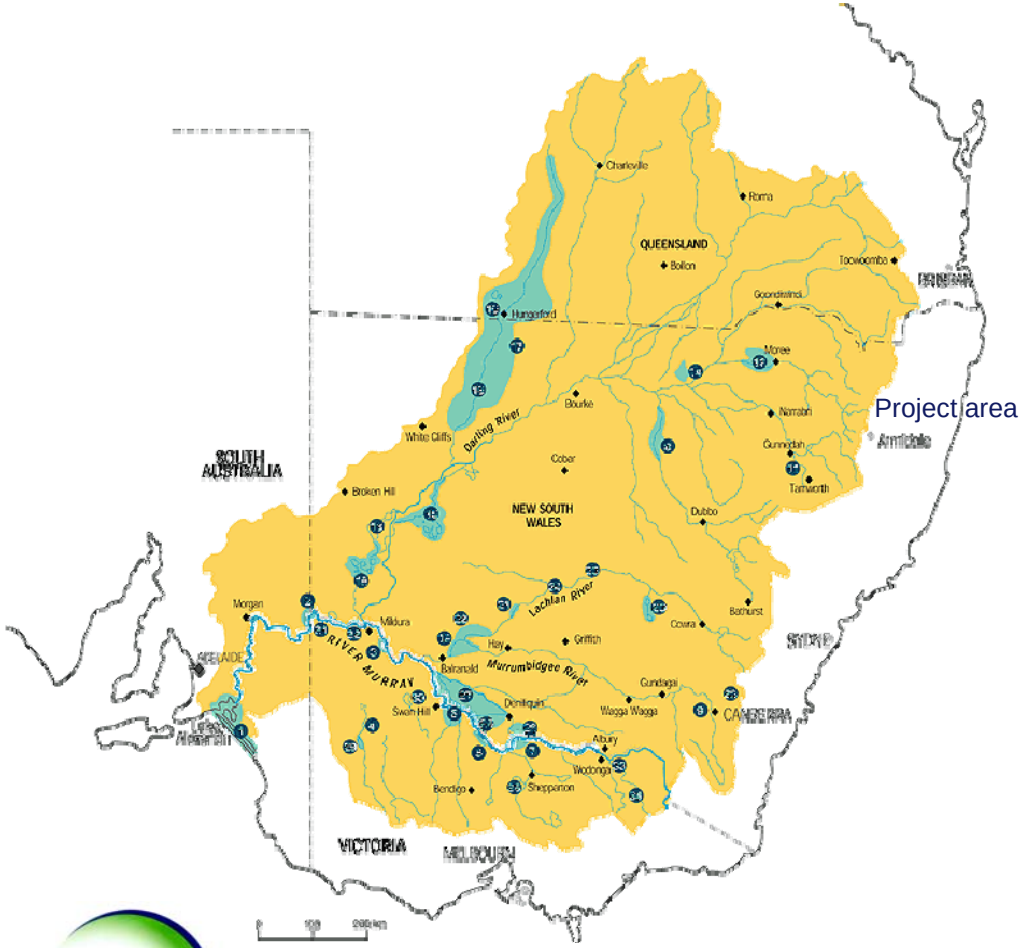
Project area - Murray Darling Basin



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

35 significant wetland sites

10 Ramsar Sites Listed In MRD

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Summary of wetland reduction indicating the recent condition of selected floodplain wetlands in the Murray-Darling Basin (MDBMC 1995a,)

State	River	Floodplain Wetland Type	Original Area of Wetland Type	Current Area of Wetland Type	% Reduction in Wetland Type
Vic	State-wide	Shallow freshwater marsh	33,531 ha	9,814 ha	**71**
Vic	State-wide	Shallow freshwater marsh	2,131 individual wetlands	988 individual wetlands	**54**
Vic	State-wide	Deep freshwater marsh	109,315 ha	30,226 ha	**72**
NSW	Macquarie River	Intermittently flooded floodplains including 40,000 ha of perennial marsh	190,000 ha uncleared	95,000 ha uncleared	**50**
NSW	Gwydir River - Gingham Watercourse	Couch meadow wetland	10,000 ha	1,000 ha	**90**

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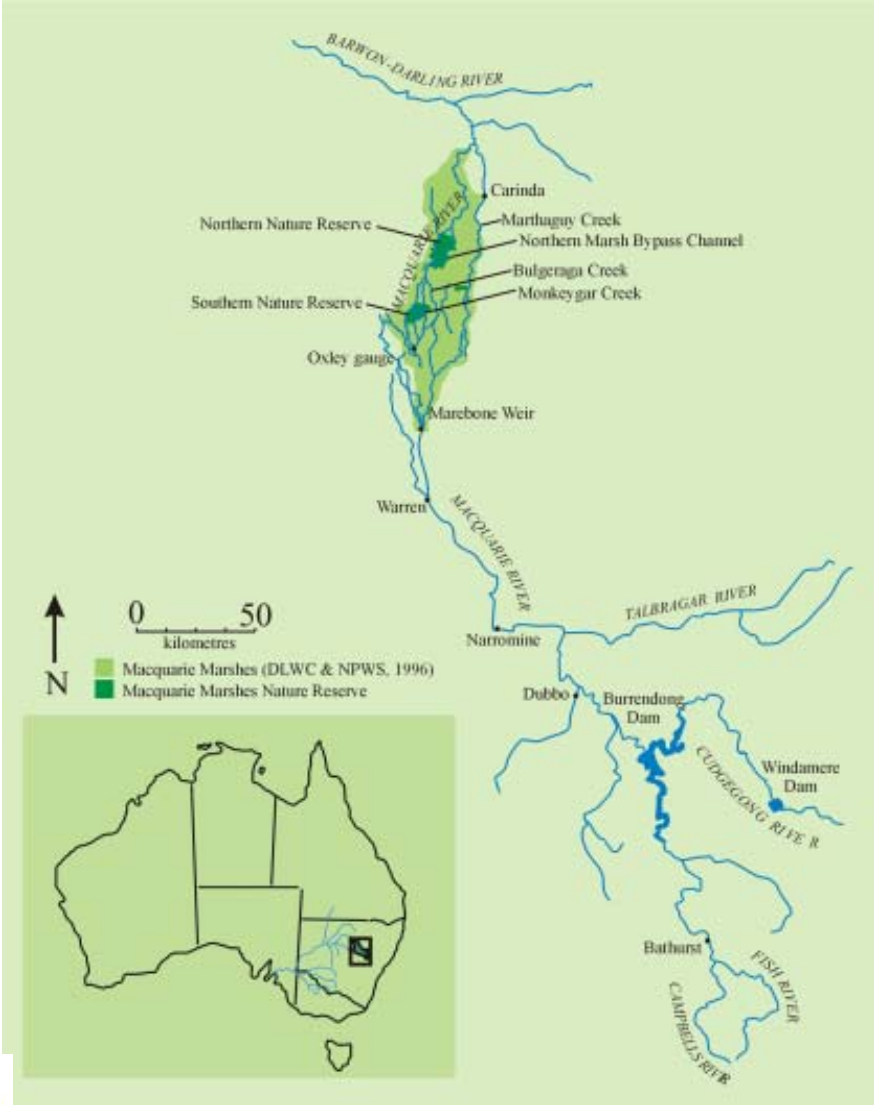

Map showing the location of the Macquarie River catchment, major tributary rivers, distributary creeks, large dams, Macquarie Marshes floodplain including the Nature Reserve.

The river flows northwest.

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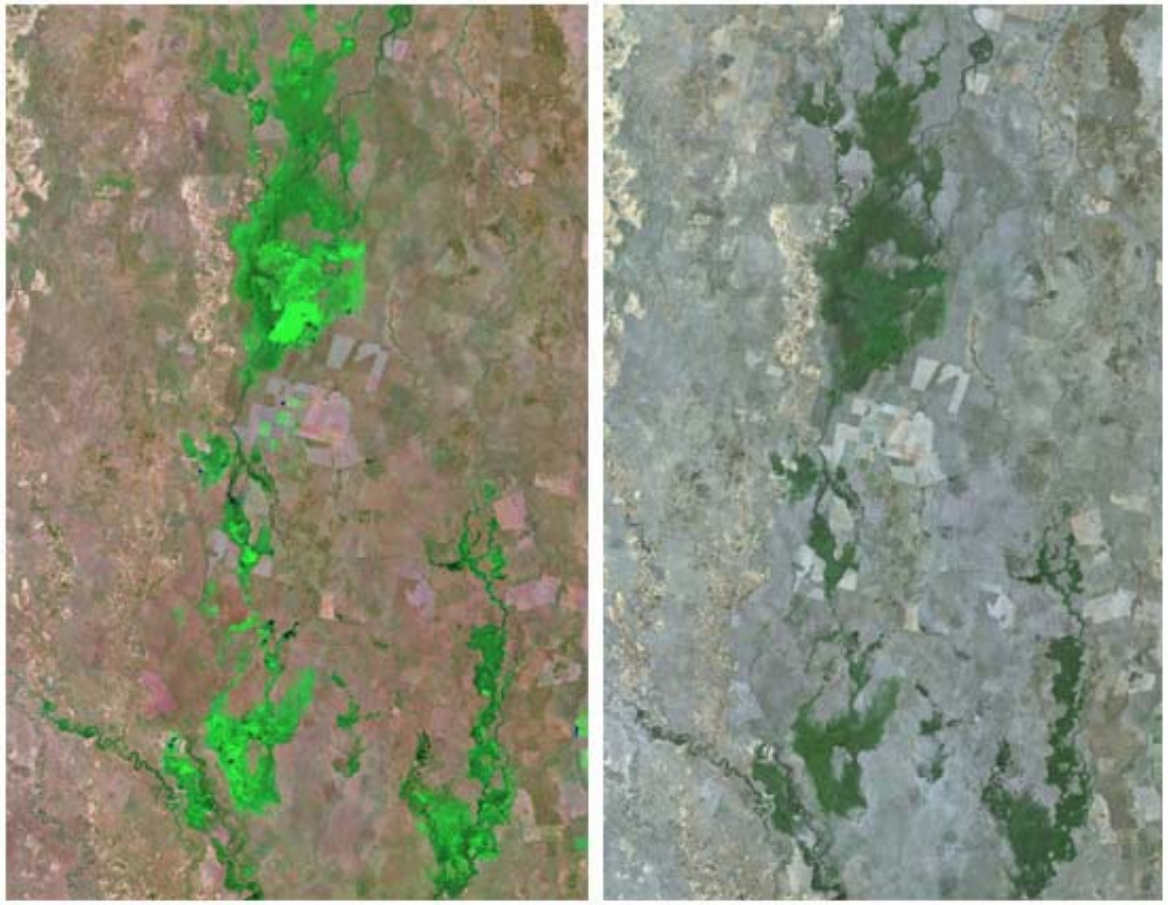

Landsat (CIR) and true colour (R,G,B) images of the Macquarie Marshes

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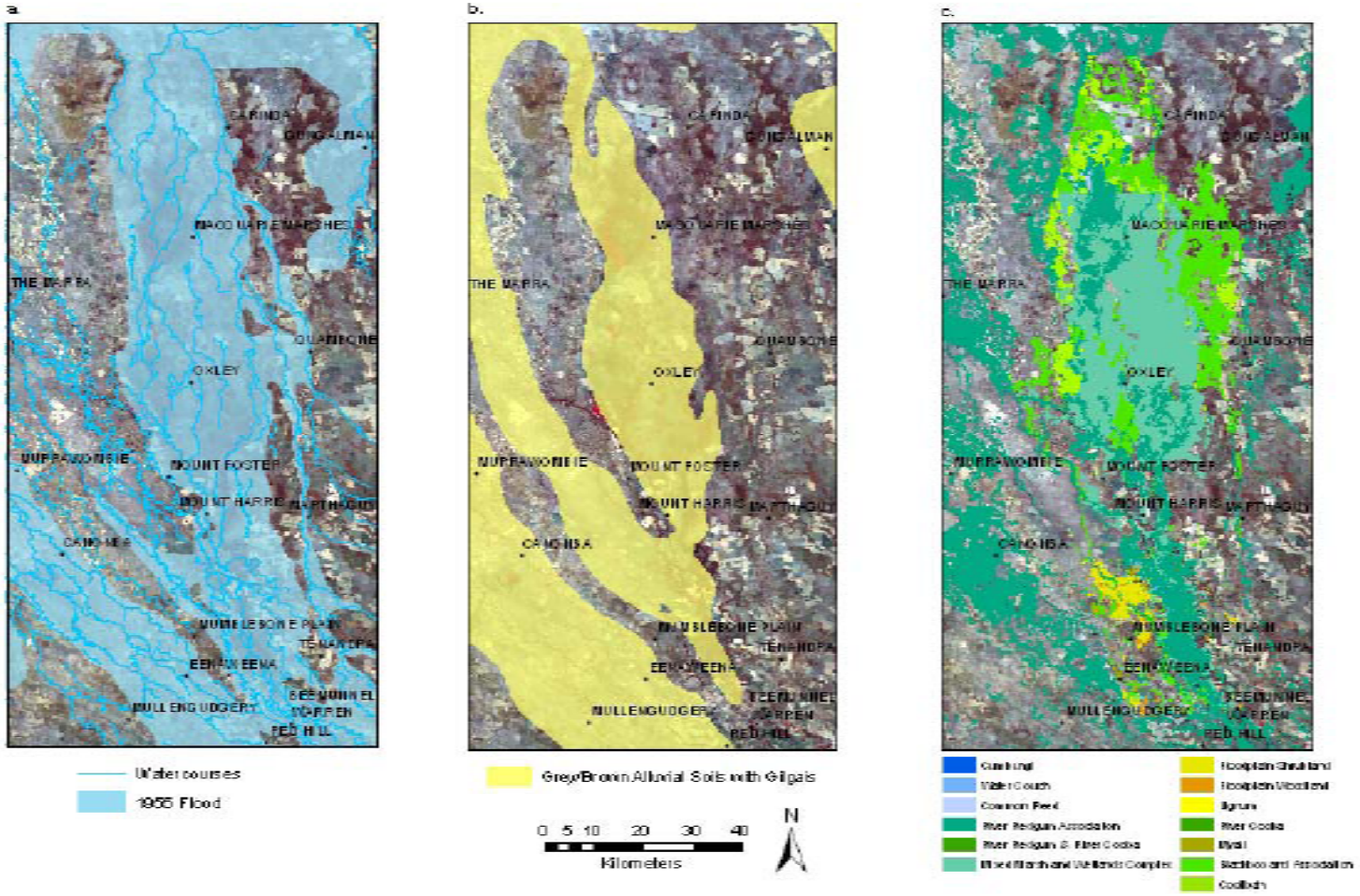

Three datasets were used to define the Macquarie Marshes floodplain : (a) hydrological watercourses and 1955 flood boundary(BRS,2000); (b) geomorphological soils and landforms (SKP, 1984); and (c) available flood-dependent vegetation layers.

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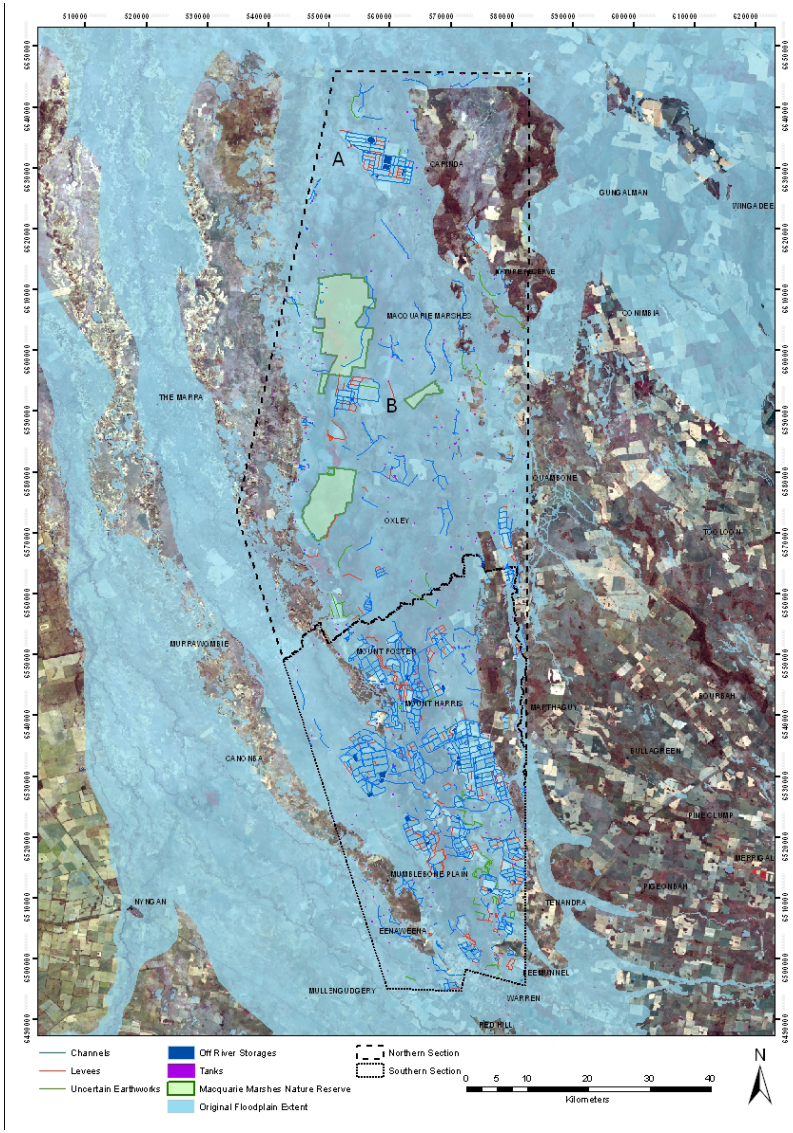

The distribution of earthworks (levees, channels, off- river storages, tanks) on the original Macquarie floodplain.

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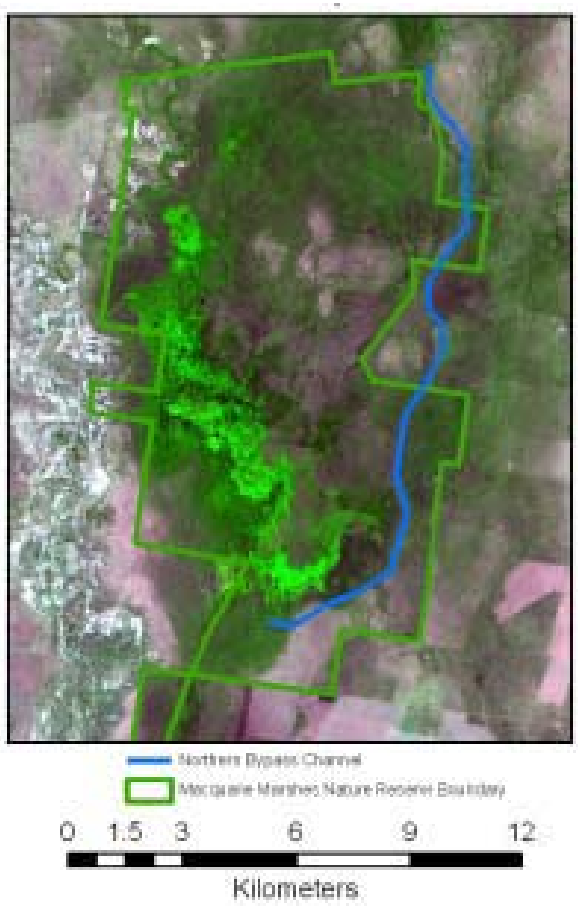

Black box enclosed by irrigation works are alienated from fluvial processes. This vegetation patch relies on tailwater surge, irrigation recycling water, rainfall and groundwater to maintain health.

A 18km Northern Bypass Channel diverts flow away from the inner wetlands in the Macquarie Marshes Northern Nature Reserve. The Bypass Channel rejoins the Macquarie. River downstream (north) of the Nature Reserve.

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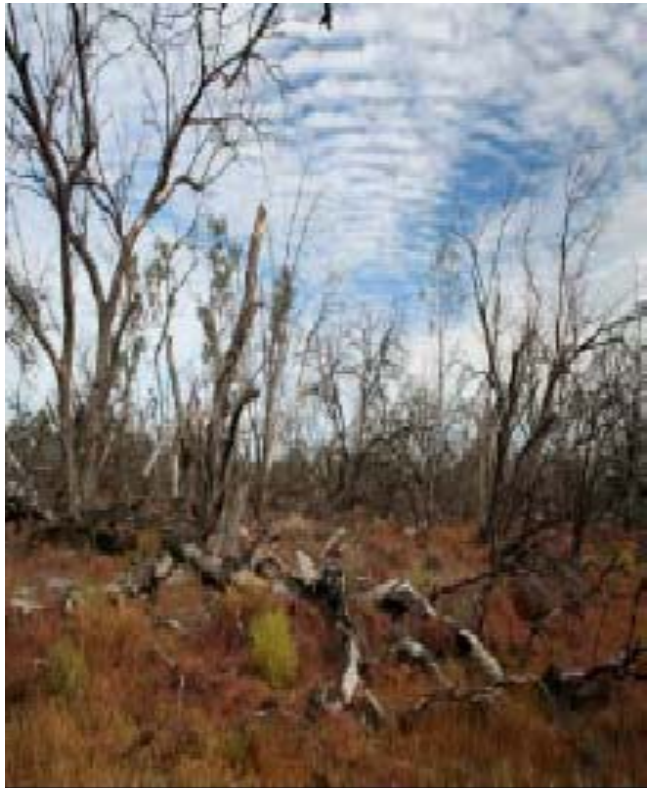
A healthy river redgum Eucalyptus camaldulensis forest in the Macquarie Marshes Northern Nature Reserve (May 2006).



A wetland in ruin

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River red gum forest

Floodplain grasses, Black roly poly an

Lagoon and dead stumps

Surrounding wetland veg

Dryland plants – Black roly poly, buck bu
(50 m out from edge of floodplain)

Occasional Red gum

Dense Phragmites reed, <2 m high

Primrose along edge of lagoon

Bora creek. 1 – 1.5 m deep, smooth ban

Erosion channel

Floodplain vegetation near Macquarie River

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Macquarie Marshes Field Sites

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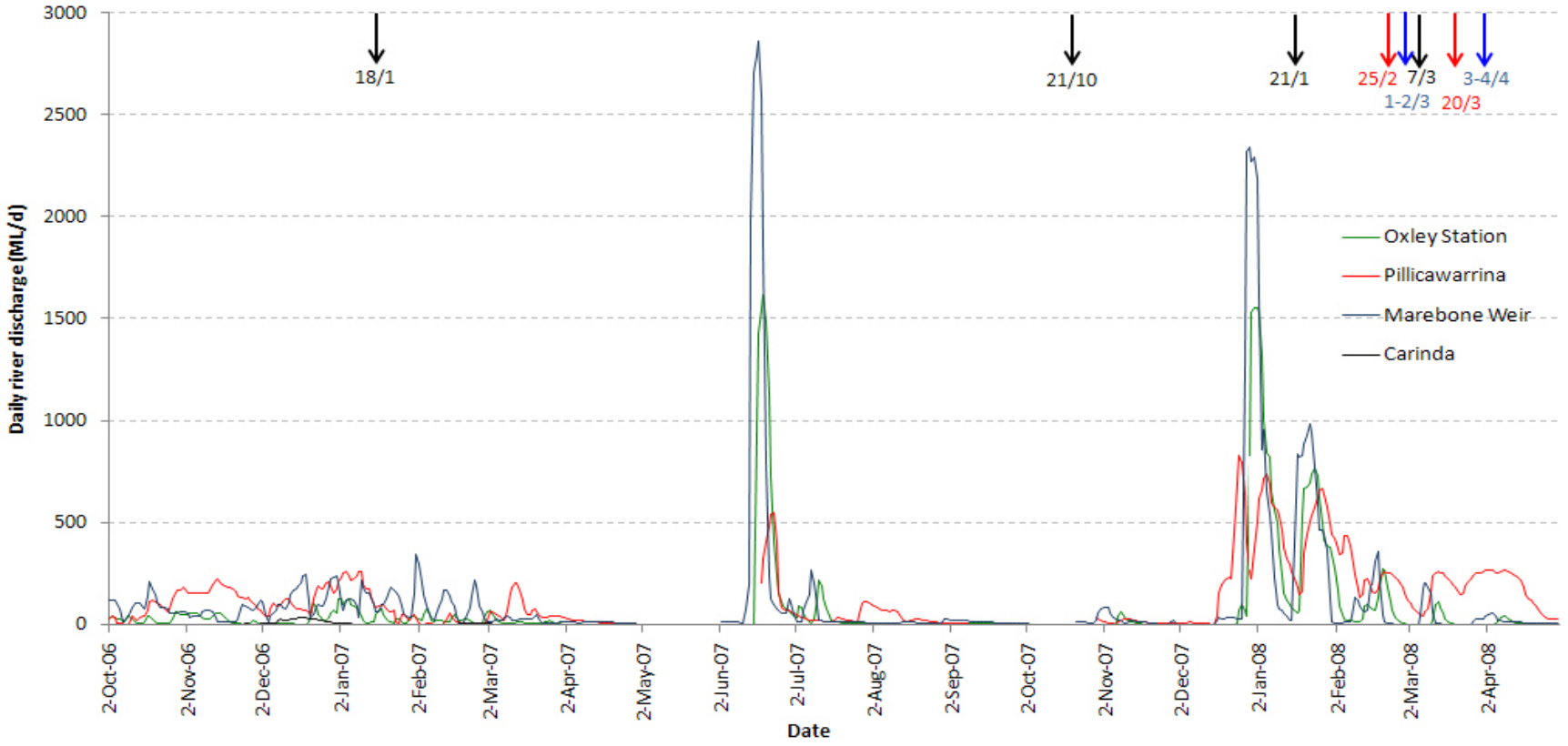

Macquarie River Gauging Stations,
Daily Discharges (mean ML/day)

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Outline of project plan

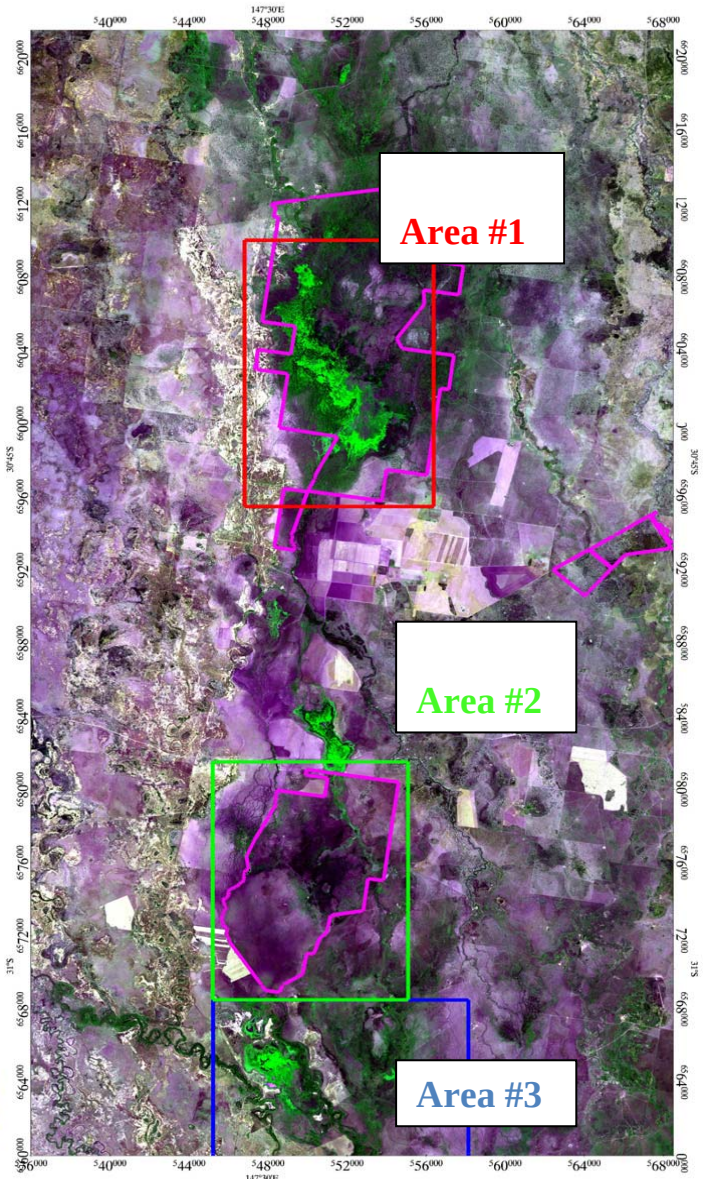
1.1 Sub-task - Process a registered and calibrated time-series PALSAR dataset of both FBS and FBD imagery acquired over a 3-5 year time period.

1.2 Sub-task - Apply suitable image processing routines to enable class discrimination to be established between open water, saturated soil areas, bare ground and seasonal grasslands.

1.3 Sub-task - Apply suitable image processing routines to enable class separation between different wetland vegetation types, assess vegetation condition over time.

1.4 Sub-task - Relate class separation in 3.1.2 and 3.1.3 to periodicity and magnitude of flood events occurring over the same period.

1.5 Sub-task – Evaluate the suitability of methods developed for transfer to ScanSAR imagery for monitoring wetlands within the Murray Darling Basin.



Target areas in the Macquarie Marshes Nature Reserve overlain on SPOT-5 imagery (bands Red:NIR:Green in R:G:B):

Area #1 (red) in the northern reserve;

Area #2 (green) in the southern reserve;

Area #3 (blue) to the south of the marshes.

The boundary of the Nature Reserves are shown in magenta.

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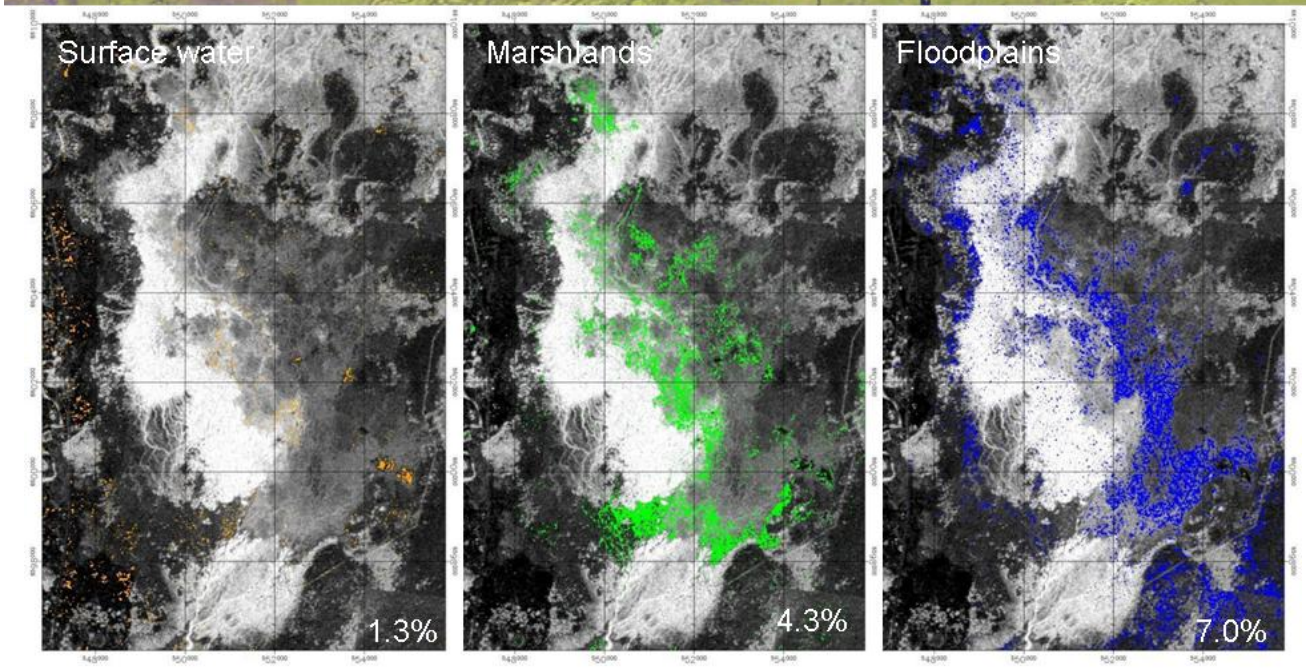
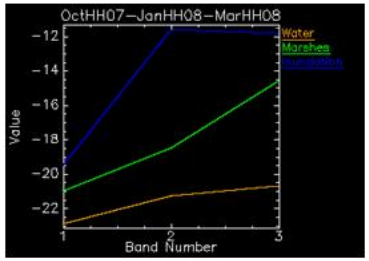


Spectral Angle Mapper (SAM) image- based on PALSAR OctHH07:JanHH08:MarHH08 data of the Macquarie Marshes.

End-member spectra



Shows separation of 4 cover types, surface water (orange), marshlands (green) adjacent to the red-river gums (white) and floodplains subject to inundation (blue)A median filter has been applied to suppress spuriously classified pixels. Classes are overlain on MNF#1 image derived from the 3 dates.

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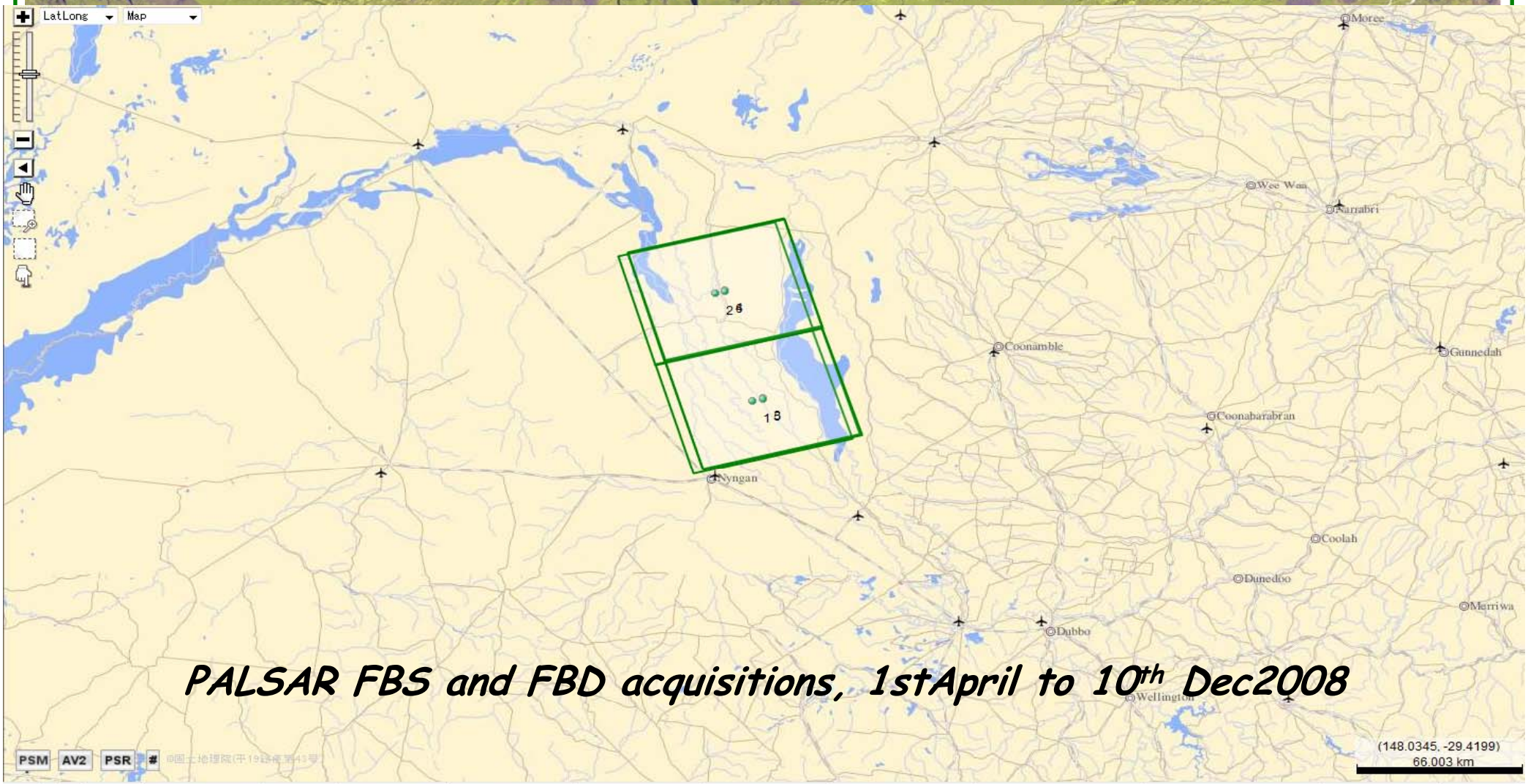
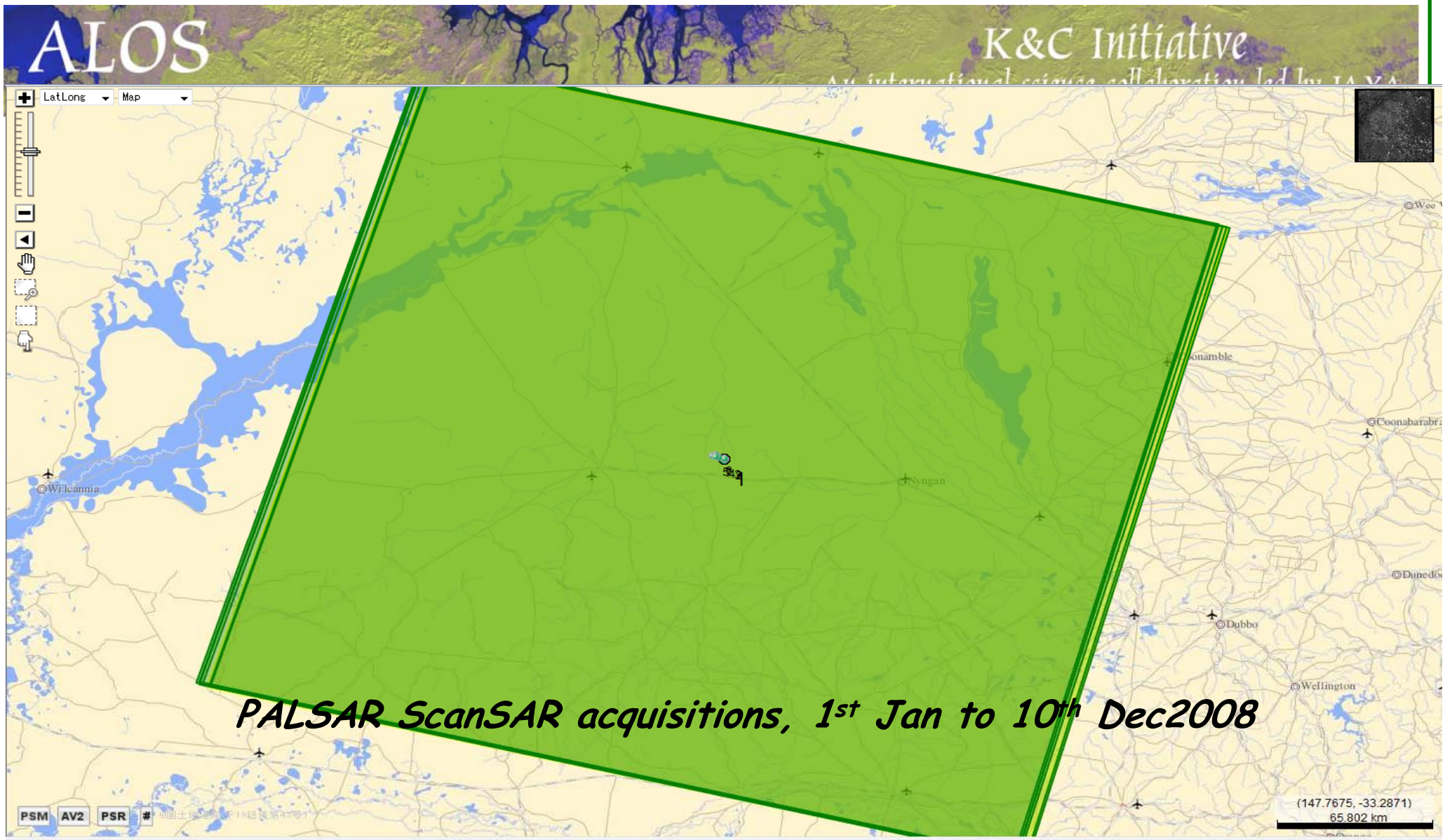


PALSAR FBS and FBD acquisitions, 1stApril to 10th Dec2008

Cart	#		Sensor	Scene ID	Obs. Mode	Obs. Path No.	Center Frame No.	Orbit Direction	Scene Center Day	Scene Center Time	Scene Center Latitude	Scene Center Longitude	Pointing Angle	Off-nadir
	1	☑	PALSAR	ALPSRP119536550	FBS	374	6550	Ascending	2008/04/22	13:18:39.796	-31.213	147.362	-	34.3
	2	☑	PALSAR	ALPSRP119536560	FBS	374	6560	Ascending	2008/04/22	13:18:48.033	-30.723	147.204	-	34.3
	3	☑	PALSAR	ALPSRP139666550	FBD	374	6550	Ascending	2008/09/07	13:18:47.279	-31.197	147.405	-	34.3
	4	☑	PALSAR	ALPSRP139666560	FBD	374	6560	Ascending	2008/09/07	13:18:55.516	-30.707	147.245	-	34.3
	5	☑	PALSAR	ALPSRP146376550	FBD	374	6550	Ascending	2008/10/23	13:19:40.019	-31.201	147.404	-	34.3
	6	☑	PALSAR	ALPSRP146376560	FBD	374	6560	Ascending	2008/10/23	13:19:48.256	-30.711	147.245	-	34.3



PALSAR ScanSAR acquisitions, 1st Jan to 10th Dec2008

Cart	#		Sensor	Scene ID	Obs. Mode	Obs. Path No.	Center Frame No.	Orbit Direction	Scene Center Day	Scene Center Time	Scene Center Latitude	Scene Center Longitude	Pointing Angle	Off-nadir
	1	☑	PALSAR	ALPSRS111434250	WB1	19	4250	Descending	2008/02/27	00:06:07.949	-31.473	146.393	-	27.1
	2	☑	PALSAR	ALPSRS118144250	WB1	19	4250	Descending	2008/04/13	00:05:23.592	-31.474	146.400	-	27.1
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	4	☑	PALSAR	ALPSRS131564250	WB1	19	4250	Descending	2008/07/14	00:04:26.340	-31.463	146.368	-	27.1
	5	☑	PALSAR	ALPSRS138274250	WB1	19	4250	Descending	2008/08/29	00:05:09.255	-31.458	146.341	-	27.1
	6	☑	PALSAR	ALPSRS144984250	WB1	19	4250	Descending	2008/10/14	00:06:02.654	-31.453	146.352	-	27.1
	7	☑	PALSAR	ALPSRS151694250	WB1	19	4250	Descending	2008/11/29	00:06:51.345	-31.460	146.354	-	27.1

Deliverables

Extension Phase Proposal

- ***Methods for detecting and characterisation vegetation, soil and water class in semi-arid wetland environments.***
- ***Development of an operational system using PALSAR data for monitoring wetlands and assessing the effect of environmental flows on vegetation and soil response in semi-arid wetland environments.***
- ***Evaluation of Scansar efficiency in detecting and mapping the regional distribution of semi-arid wetland distribution in the MDB.***

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Extension Phase Proposal

Data requirements

- ***Single scene FBS/FBD and full Polarimetric (if ever available) data -10 Cycle coverage***
- ***Continued ScanSAR coverage of MDB for 2009-10***

- ***Acquisition strategy requirements - opportunistic***

i) Flooding in the Macquarie Marshes is dependent on the release of "environmental flows" from upstream.

ii) Over the MRB rainfall is variable with a slight summer maximum in the northern section of the and a winter maximum in the southern section. Wetlands along the western section are dependent on "exotic"discharges.

Extension Phase Proposal

Data requirements

- ***Single scene FBS/FBD and full Polarimetric (if ever available) data -10 Cycle coverage***
- ***Continued ScanSAR coverage of MDB for 2009-10***

WHY - cannot look at change over time with archival data alone
- archival data restricted to 9 possible coverages Sept-07 to Dec-08
- 2007-08 was a drought period in eastern Australia
- variability of rainfall over the basin

- ***Acquisition strategy requirements - opportunistic***
  - ***i) Flooding in the Macquarie Marshes is dependent on the release of "environmental flows" from upstream.***
  - ***ii) Over the MRB rainfall is variable with a slight summer maximum in the northern section of the and a winter maximum in the southern section. Wetlands along the western section are dependent on "exotic"discharges.***

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