MAPPING WILLOW AT CATCHMENT SCALE

comparison of ASTER, SPOT5 and aerial photography

SYDNEY CATCHMENT AUTHORITY

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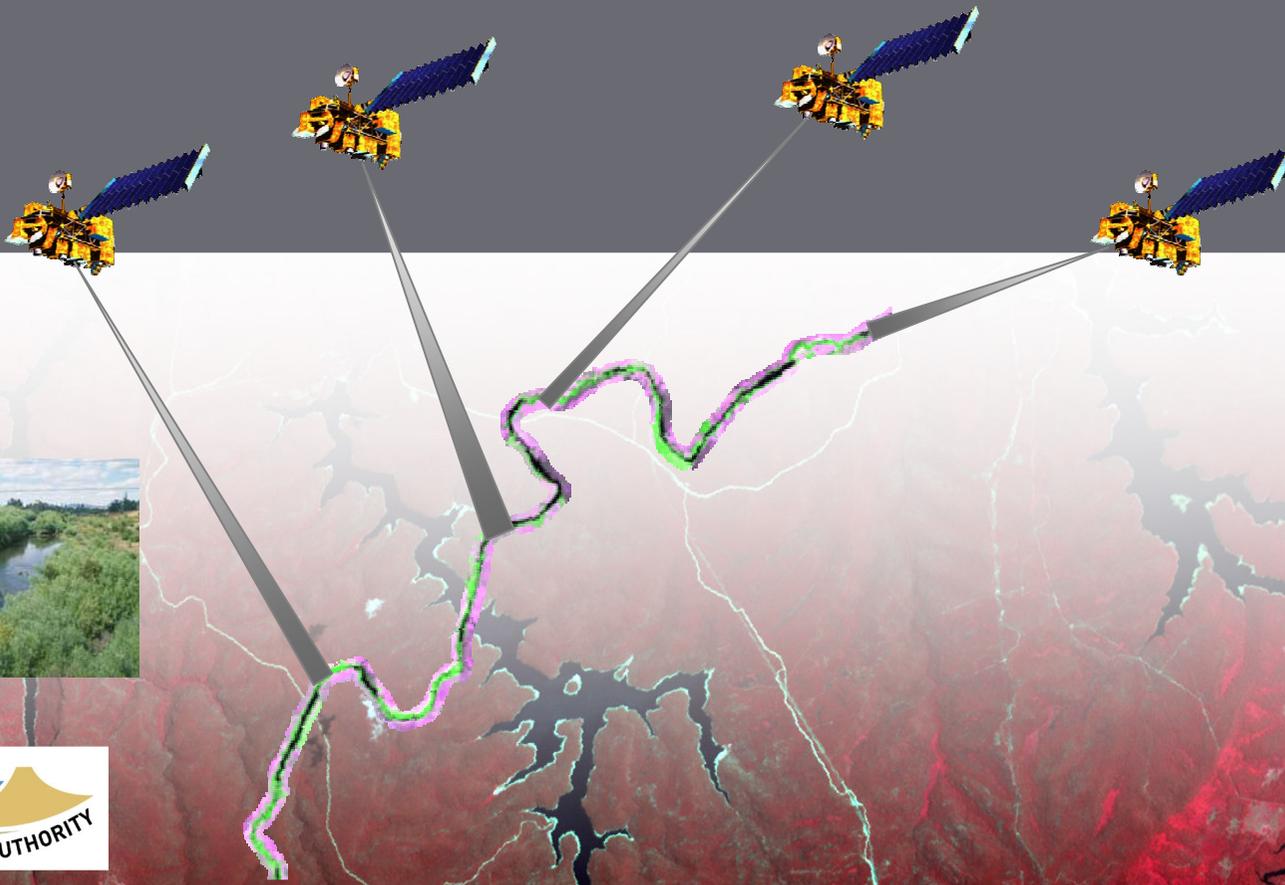
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Presentation of two studies: Wollondilly River (13 ARSPC Proceedings) and Cox's River (Weed Research Journal)

Willow & Water Quality/Quantity

- **Up to 8 megalitres of water per year (8 Olympic pools) – CSIRO**

- **(3 megalitres per crown per hectare than River Red Gum)**

- **Complete leaf fall in autumn/winter – reduces O_2 levels in streams**

- **Dense shade in summer reduces in-stream primary productivity**

- **Willow roots spread into channel and trap sediments**

- **Willows are aggressive and often replace native vegetation**
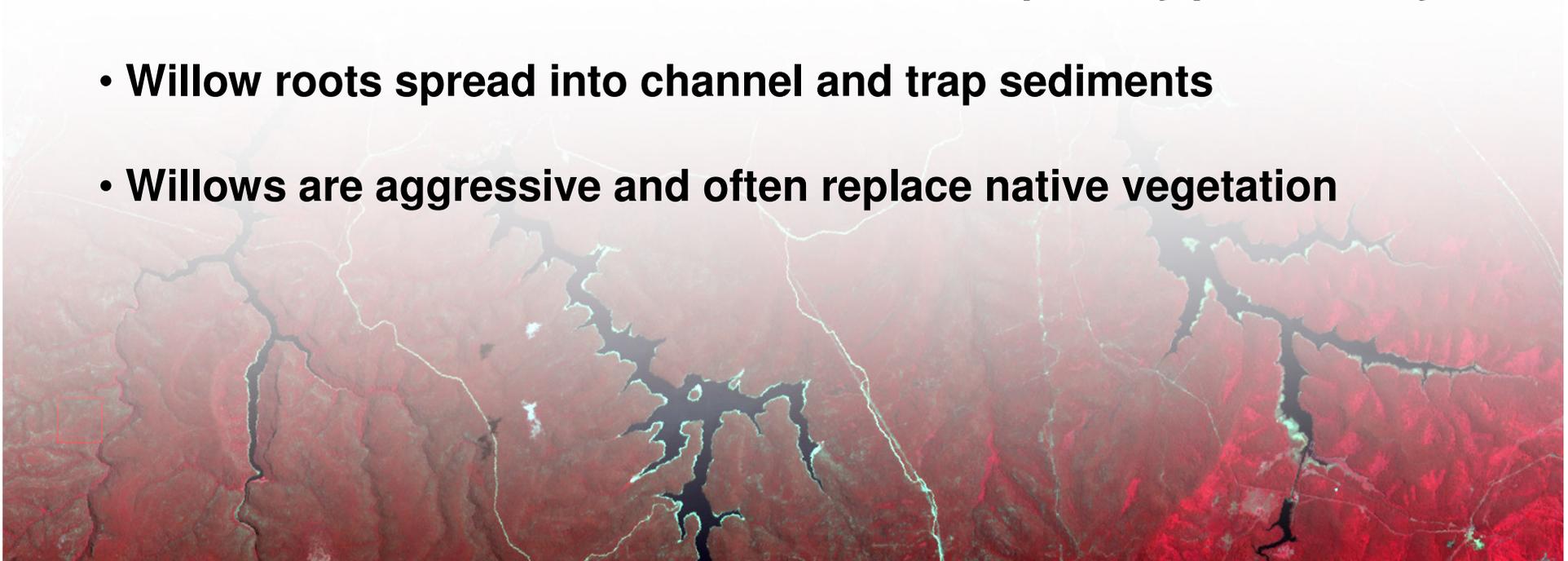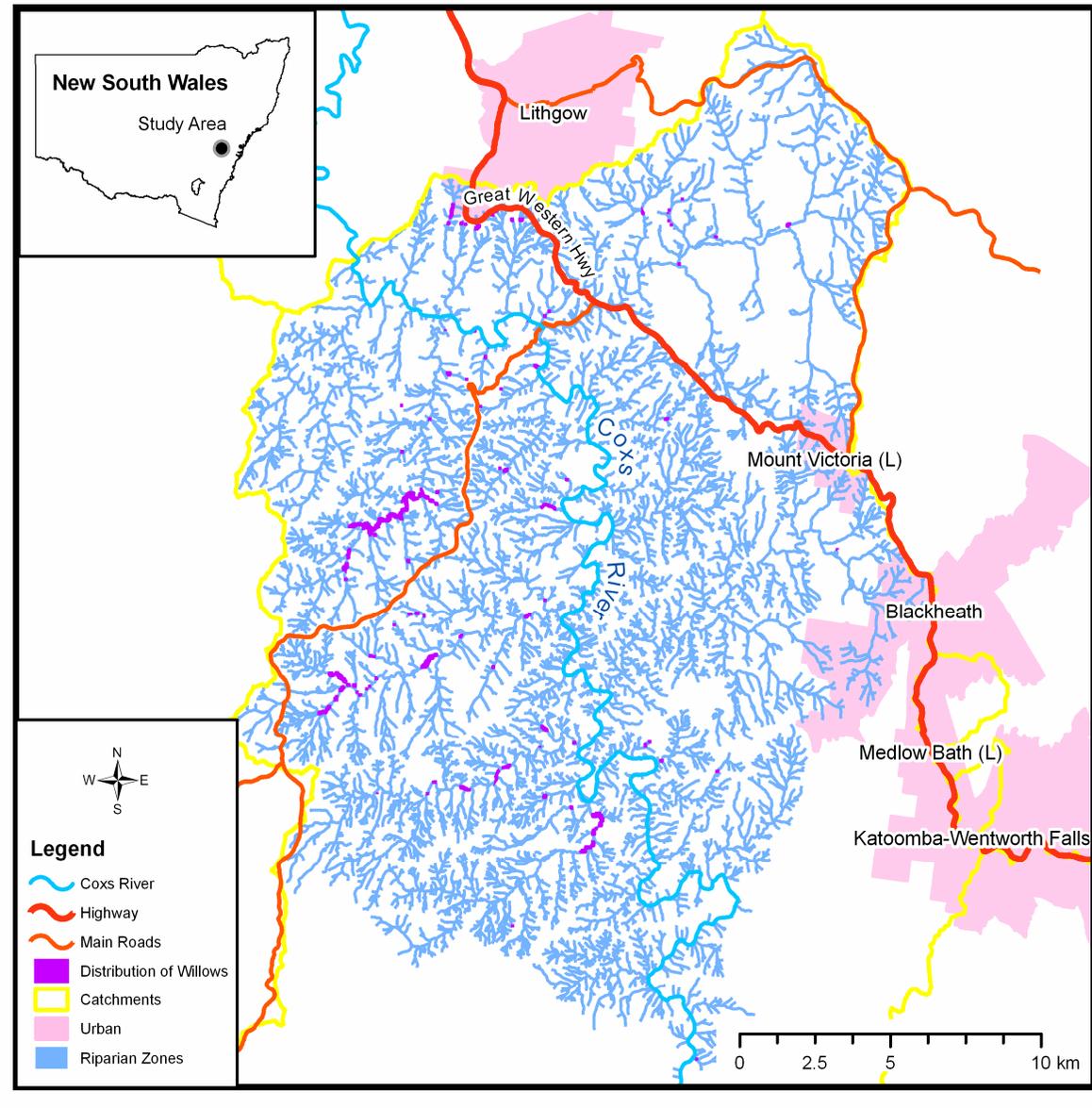
Project Aims

- Determine if remotely sensed imagery can be used to accurately map the distribution of Willow.

- Evaluate the potential of using high resolution SPOT5 imagery (whole of government collection program – NSW PANRIE).

- Evaluate ASTER and SPOT5 (10 & 5m) imagery

- Bi-seasonal imagery and Willow Phenology

Study Area – Wollondilly River
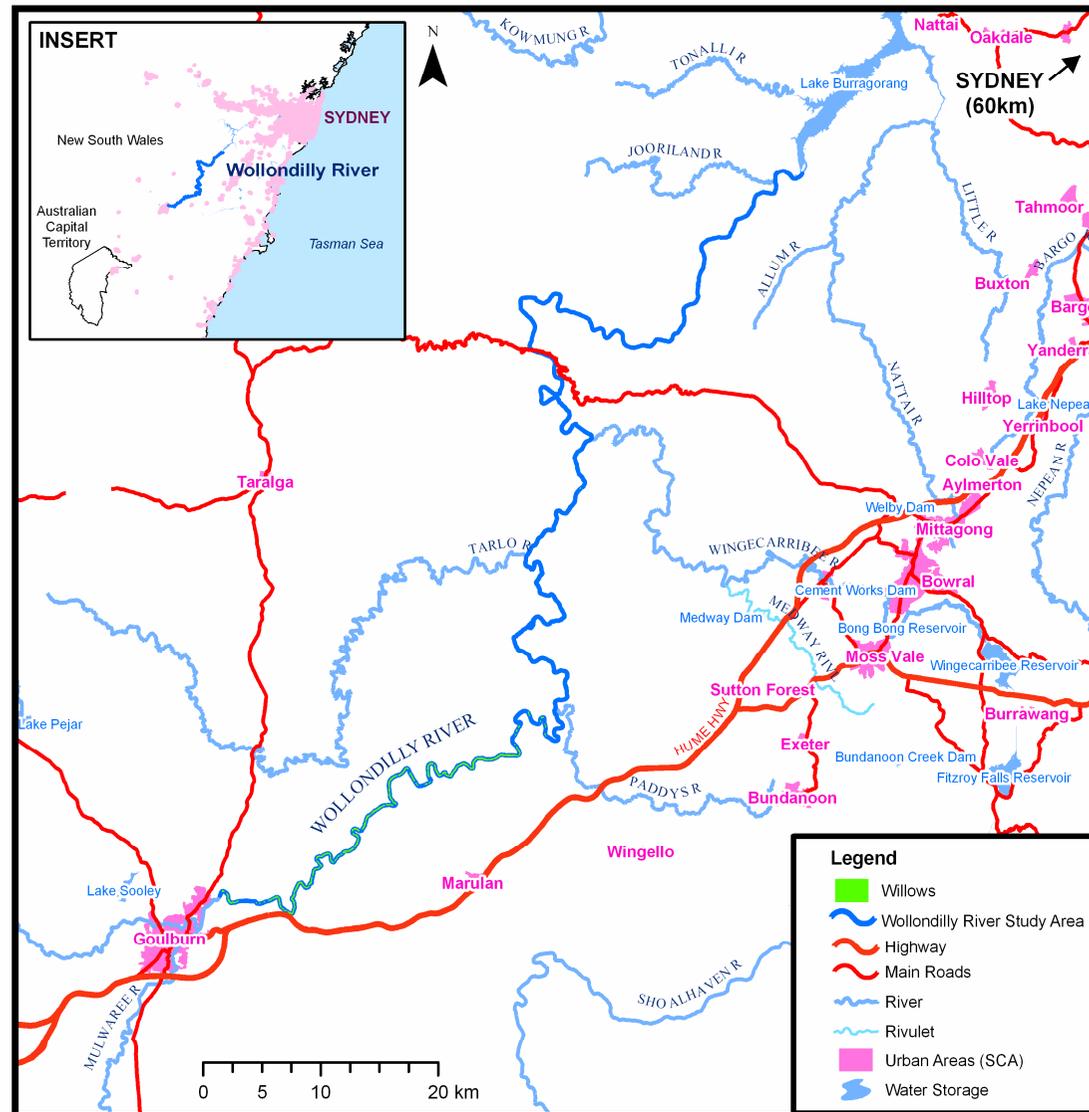
Study Area – Cox's River

What's unique about Willow?

- Greener than most native riparian vegetation

- Deciduous (phenology)

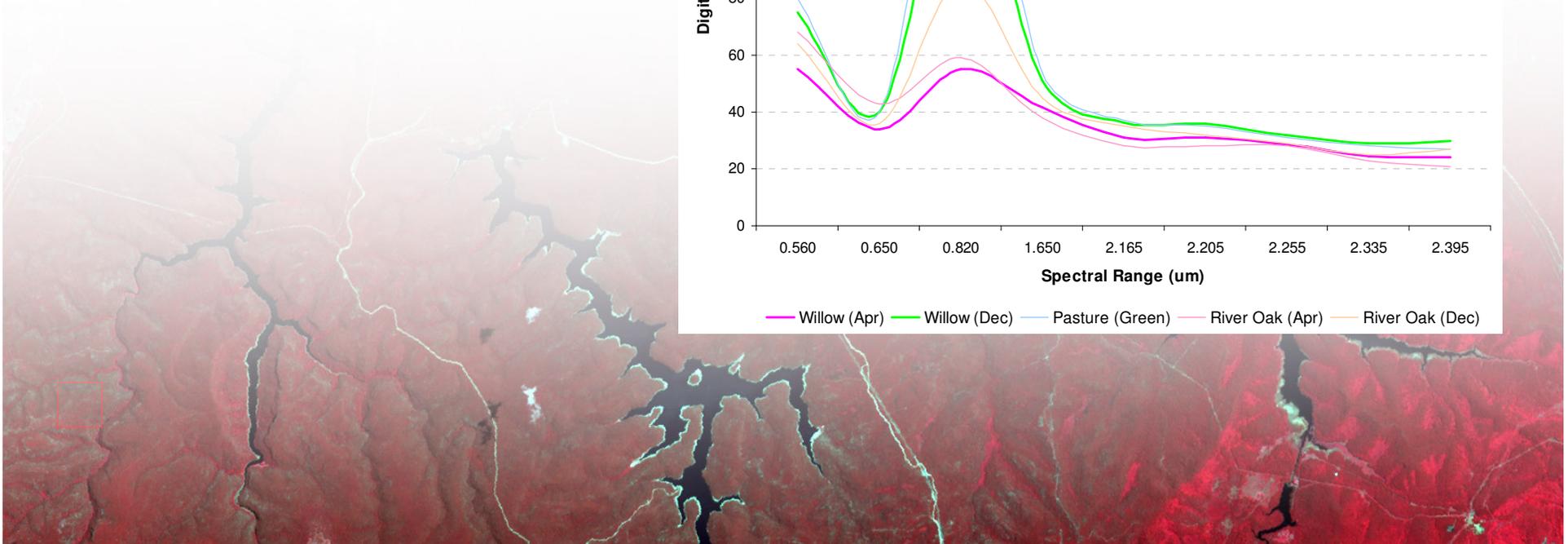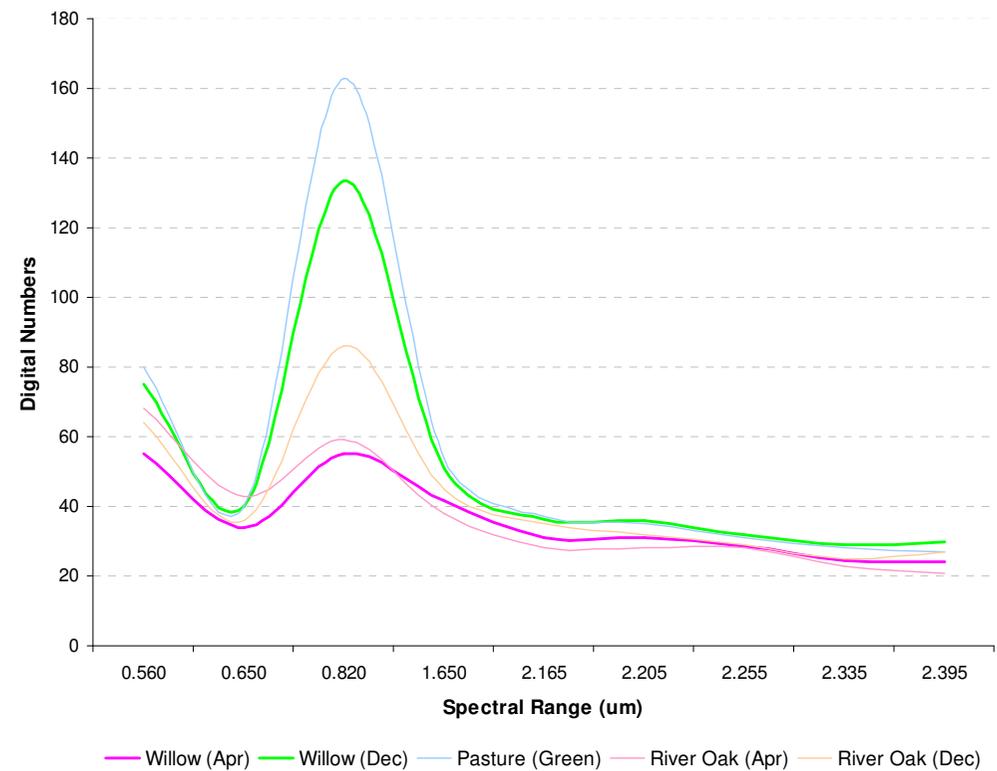- Mostly occurs within 50m of stream banks

ASTER (15m) and Willow

Summer (8 December 05)

Autumn (14 April 06)

Large difference in near-infrared reflectance between summer and autumn

ASTER spectral signatures for Willow

SPOT5 (5m & 10m) and Willow
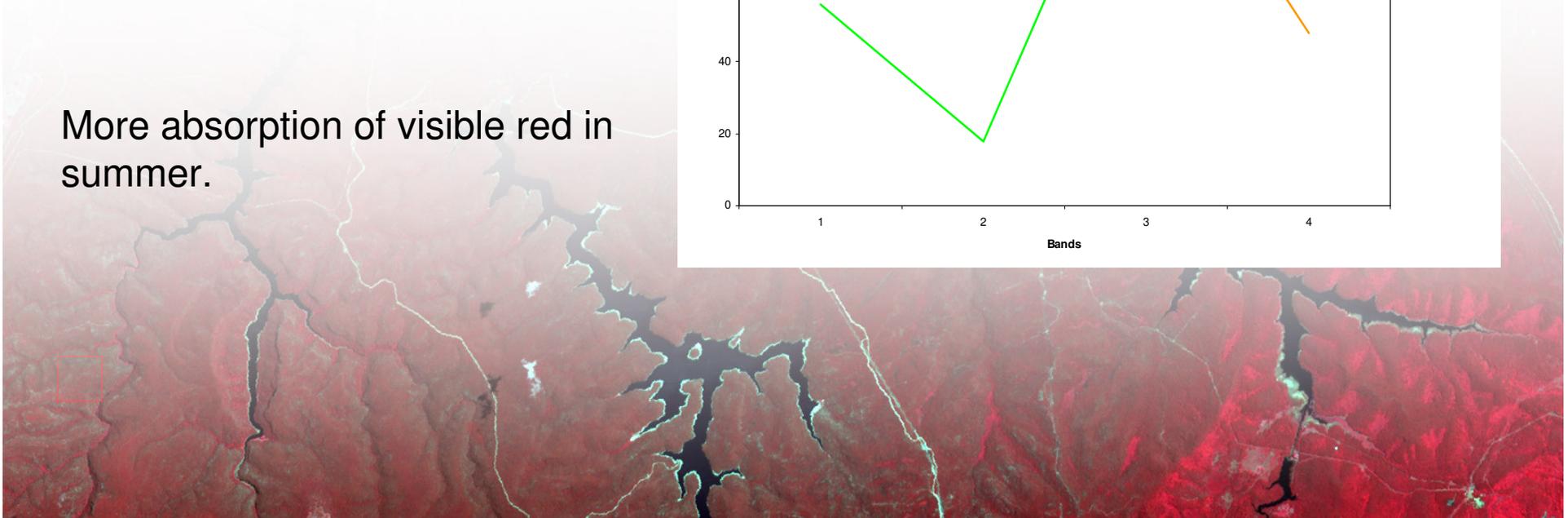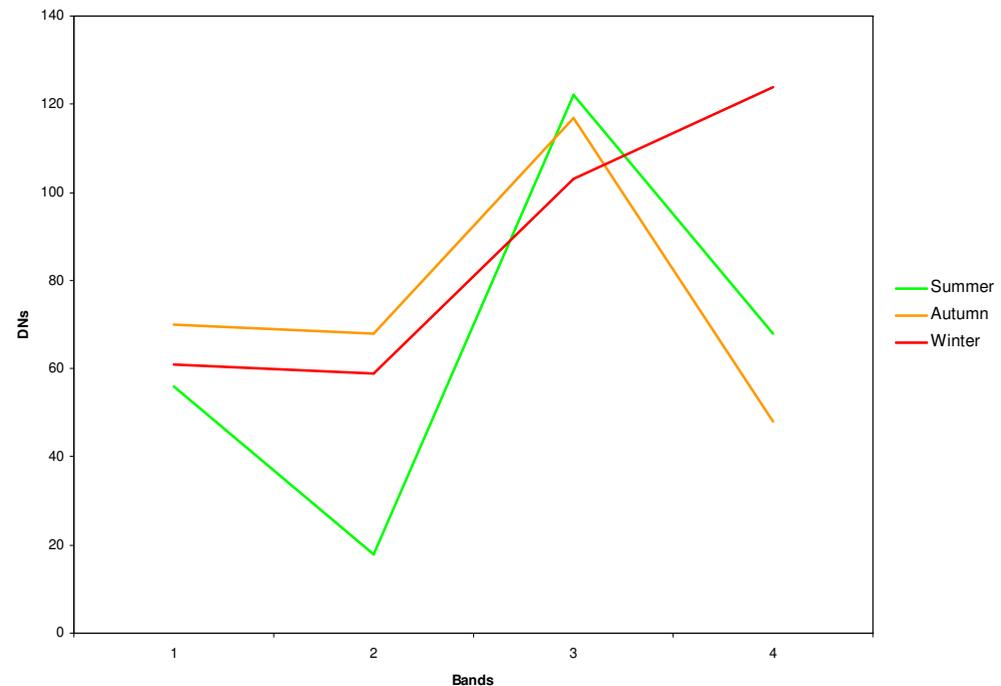
Summer (8 December 04) – 5m

Autumn (20 March 04) - 10m

Winter (22 June 05) – 10m

Large difference in shortwave infrared reflectance between autumn and winter

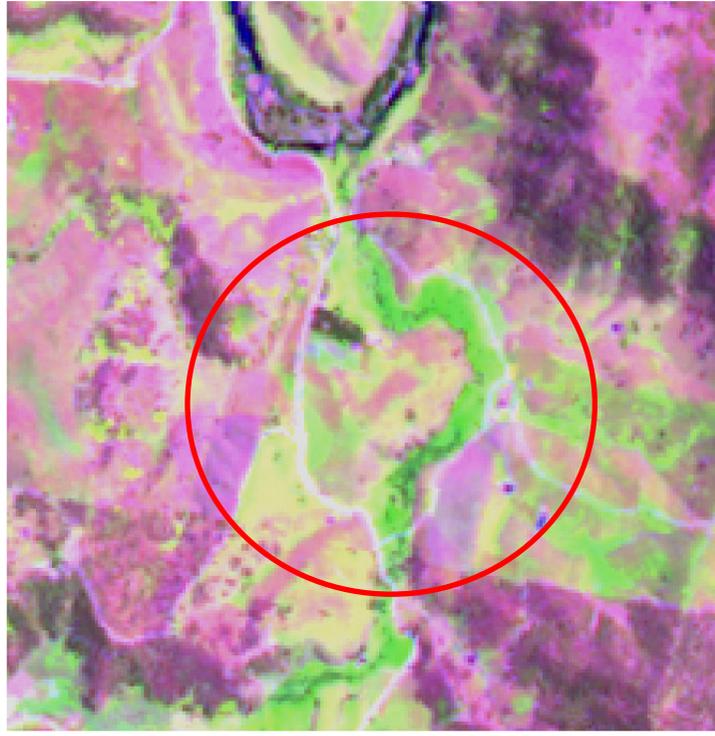More absorption of visible red in summer.

SPOT5 spectral signatures for Willow

Seasonal Changes

SPOT5 10m Images

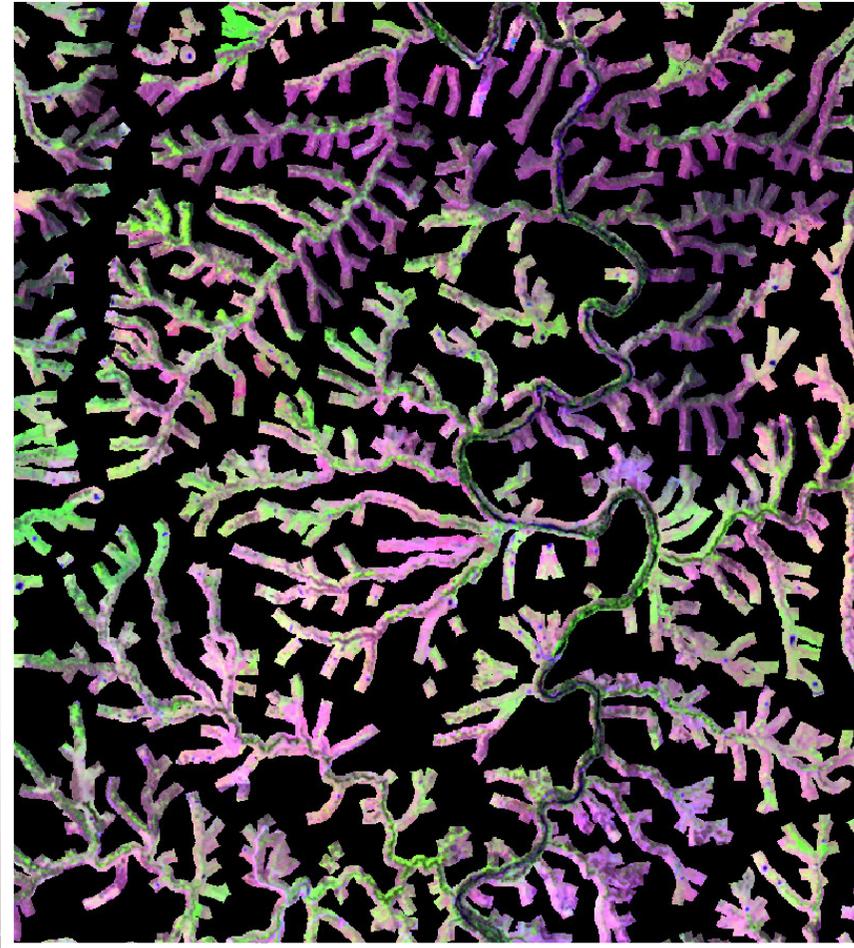20 March 2004   22 June 2005

Methods

Combine seasonal images into one

Mask areas outside 50-75m buffer of drainage network

Spectral training sites from imagery

Cox's River Example

Results

| Image	Classification Type	Pixel Size (m)	Accuracy (%)
ASTER Autumn	MLC	15	48.0
ASTER Summer	MLC	15	69.9
ASTER Bi-seasonal	MLC	15	72.4
SPOT5 Autumn *	MLC	10	41.8
SPOT5 Winter *	MLC	10	20.9
SPOT5 Bi-seasonal *	SAM-MNF-3Med	10	77.2
SPOT5 Summer	MLC	5	53.6

MLC = Maximum Likelihood Classifier
SAM = Spectral Angle Mapper
MNF = Minimum Noise Fraction Transformation
3Med = 3x3 Median Filter
* Cox's River Study

Classification Variability
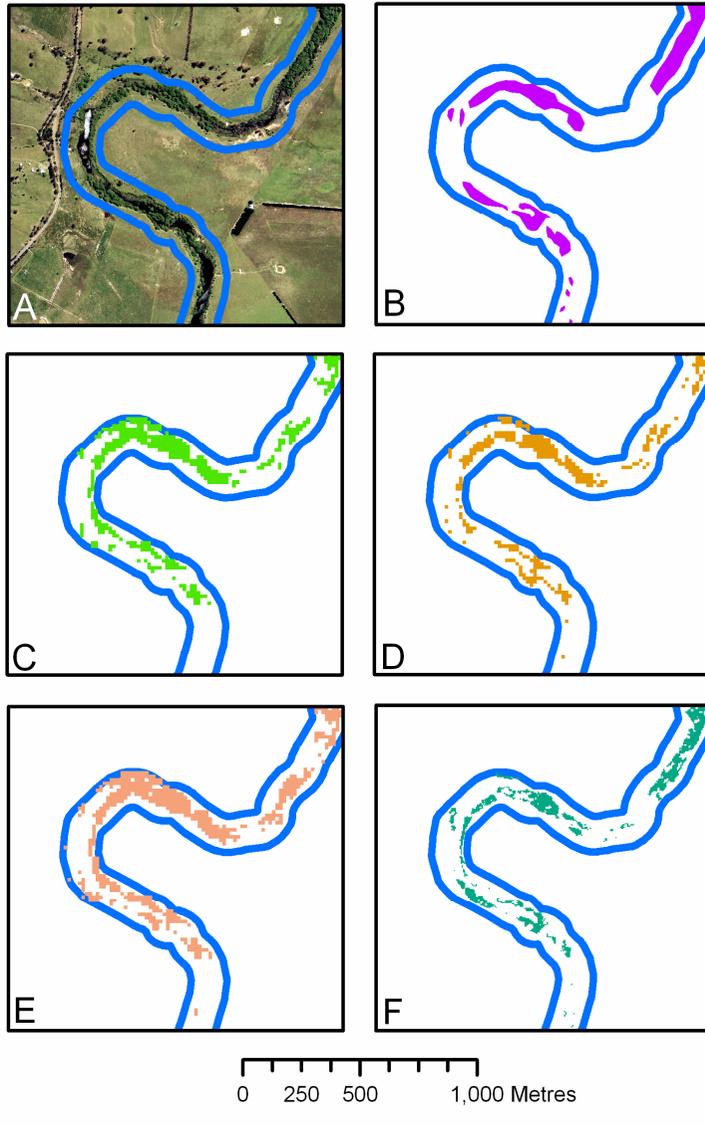
A: Aerial Photography
B: API Map
C: ASTER April 05
D: ASTER Dec 05
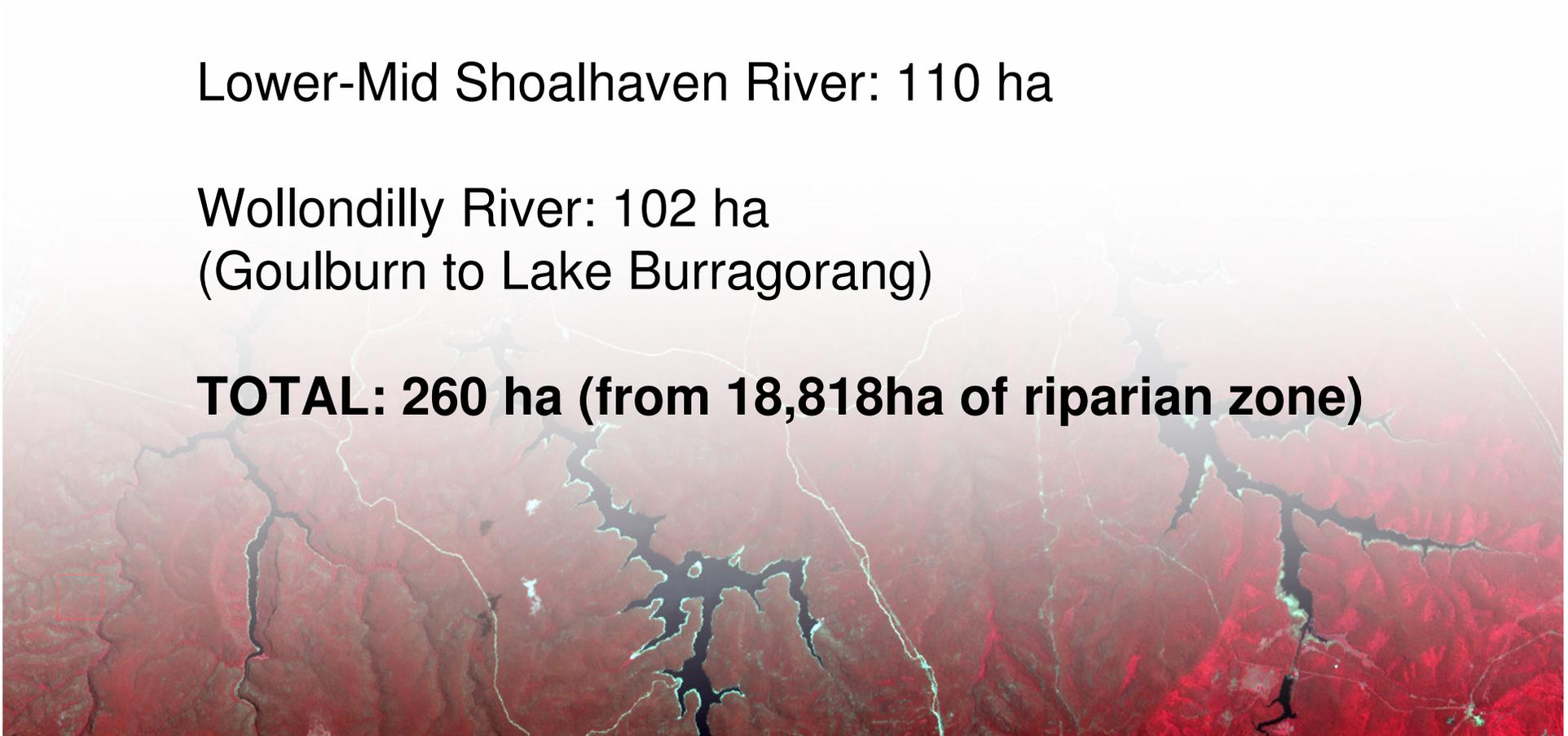E: Bi-Seasonal ASTER
F: SPOT5 5m

Mapping to date:

Cox's River: 48 ha

Lower-Mid Shoalhaven River: 110 ha

Wollondilly River: 102 ha
(Goulburn to Lake Burragorang)

TOTAL: 260 ha (from 18,818ha of riparian zone)

Discussion – Spectral Resolution

- Bi-seasonal composites improve classification results

- Summer & Autumn images better than winter due to shadowing

- Spectral resolution more important than spatial below 15m

Discussion – Spatial Resolution

ASTER
SPOT5

- Mixels

- Spectral variance

- Filtering used in Cox's River study increased accuracy by 30%

Questions?