Monitoring Surface Flows with Remote Sensing
Megan Lewis

Defining landscape options to better manage our landscape resources now, and for the future.

Life Impact  The University of Adelaide
Springs & wetlands are under threat

- Iconic wetlands fed by artesian surface flows
- Economic, cultural & ecological significance
- Threatened by aquifer drawdown – reduced pressure
  - Artesian bores & wells
  - Dewatering for mining/petroleum operations
  - Mining expansion

Need monitoring tools
Wetland area is related to spring flow volume

Relationship between spring flow and wetland area, sample springs, Dalhousie Springs Complex, 2006, 2009, 2010

Wetland area is related to spring flow volume

- Wetland area mapped accurately from high resolution imagery
- Wetland area correlated with spring flow
- Provides a surrogate for spring flow
- A tool for monitoring spring flow over time
  - Objective
  - Cost-effective
  - Spatially comprehensive

Dalhousie Springs Complex
Wetland area mapped from QuickBird satellite imagery
Landscape Futures Program

- Seasonal fluctuations in total wetland greenness & area under natural conditions
- Influence of variable rainfall
- 10 year decline in area, recent recovery
- "Baseline" conditions are highly variable – need to consider when assessing impacts

Wetland area changes over time

[Graph showing wetland area changes over time]

MODIS NDVI 16-day composites

Landscape Futures Program


- Spatial Survey of Springs
- Characterising Spring Groups
- Temporal Dynamics of Spring Complexes
- Associating Wetland Extent and Spring Flow Rates
- Evaluation of Remote Sensing Approaches
Landscape Futures Program

- Receives Drain L inflows

- Need information on past and present inundation regime
  - Timing, frequency, area
  - Key influence on wetland communities
  - Changes, trends?

- No past records, anecdotal information

Lake Hawdon, south eastern SA
Inundation mapped from Landsat images

Drain L flow
(ML/Month)

1989  Nov 20
Inundation mapped from Landsat images

Drain L flow
(ML/Month)

1992 Aug 24
Drain L flow
(ML/Month)

Inundation mapped from Landsat images

1992 Oct 11
Inundation mapped from Landsat images

Drain L flow
(ML/Month)

1999 Oct 24
Inundation mapped from Landsat images

Drain L flow (ML/Month)

2001 Jul 09
Inundation mapped from Landsat images

Drain L flow
(ML/Month)

2001 Jul 25
Inundation mapped from Landsat images

- Drain L flow
  (ML/Month)

2001  Sep 07
Inundation mapped from Landsat images

Drain L flow (ML/Month)

2002  Sep 14
Inundation mapped from Landsat images

Drain L flow (ML/Month)

2003 Aug 16
Drain L flow
(ML/Month)

Inundation mapped from Landsat images

2005  Jul 20
Inundation mapped from Landsat images
Inundation mapped from Landsat images

Drain L flow
(ML/Month)

2007 Jul 26
Drain L flow
(ML/Month)

Inundation mapped from Landsat images
Inundation mapped from Landsat images

Drain L flow
(ML/Month)

2010 Oct 06
Inundation mapped from Landsat images

Drain L flow
(ML/Month)

2011 Jul 21
Inundation mapped from Landsat images.
Drain L flow
(ML/Month)

Inundation mapped from Landsat images
Relationship to drain inflow

- Lake Hawdon area of inundation highly correlated with Drain L flows in preceding month
- Lake fills and empties or dries quickly

<table>
<thead>
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<th>Region</th>
<th>0 months</th>
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<tr>
<td>North only</td>
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<td>South only</td>
<td>0.71</td>
<td>0.66</td>
<td>0.21</td>
<td>0.08</td>
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Inundation frequency & duration determined from MODIS NDVI time-series
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