



LANDSCAPE LOGIC

Newsletter of the Landscape Logic CERF Hub

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1. SIMPLICITY ON THE OTHER SIDE OF COMPLEXITY.

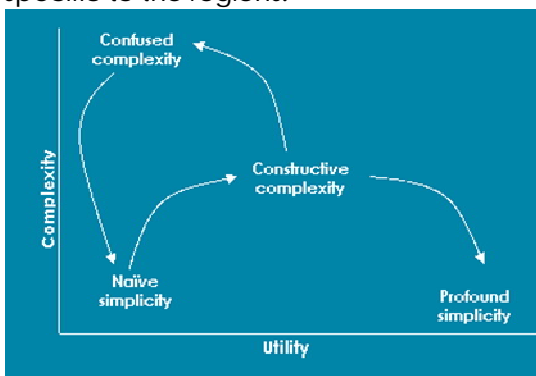
"I don't give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity" Oliver Wendell Holmes

At the first annual conference of the CERF program in Canberra on October 22 & 23, Landscape Logic was described by one observer as having the most ambitious research agenda of the 8 Hubs. That agenda is to establish relationships between the way we have managed landscapes in the past and the current state of the environment. Over the last 15 months we have gone through 3 distinct stages in preparation. We spent almost 5 months negotiating research issues with our regional partners, attempting to understand their roles and opportunities for research to complement their efforts. We then went through a 5 month period when each project identified specific research questions and put their research plans up for review to regional partners and an external panel. The third stage since May has been a period of contracting, recruiting and getting down to the detailed research.

One exception to that pattern has been our integration team (Project 6) led by Prof. Tony Jakeman at ANU. This project got off to an early start, particularly through the efforts of postdocs Carmel Pollino and Jenifer Ticehurst. They have now run 15 workshops over the last 12 months introducing research teams and



regional staff to Bayesian Decision Networks. This is the platform we are using to organise our knowledge of landscape function. It is providing us with a process and language to connect our understanding across disciplines, scales and jurisdictions to produce influence models of the way we think landscapes function in an ecological, social and economic sense. Inevitably the first attempts at capturing this understanding even at small scales are producing complex sets of influence diagrams. In time however, our aim is to refine those models and remove those components to which our environmental targets are relatively insensitive, paring these models down to those states and variables of greatest influence. Eventually, as the figure below suggests, our aim is to achieve representations of functional simplicity that guide us to where and when we can most usefully invest in environmental repair and management. This refinement and simplification will require input from other projects to populate the Decision Networks with data and knowledge, some of which will be generic, some specific to the regions.



Adapted from Ward, D. (2005) *The Simplicity Cycle: simplicity and complexity in design*. Defense AT&L. Nov-Dec 2005 pp. 18-21.

It turns out there is an Australian connection to the man who gave us the quote at the top about profound simplicity. The Hobart lawyer, politician and advocate of federation Andrew Inglis Clark was a great admirer of America, its democratic institutions and the writer Oliver Wendell Holmes. Clark traveled to Boston in 1890 to meet Holmes and joined the American Society of Political and Social Science. On his return he submitted the first draft of what became the Australian Constitution to the Federation Convention of 1891. He corresponded with Holmes for the rest of his life, named his third son Wendell after his North American friend, gave us the Hare-Clark voting system and was Vice Chancellor of UTAS from 1901-03. While we don't aspire to that level of political influence, we are pursuing our own North American connections. Through Paul Bierman, professor of Geography at the University of Vermont we are setting up an exchange for graduate students and staff. We are keen to visit their watershed studies of Lake Champlain and compare notes on our different approaches to the application of landscape science to environmental management.

Over future editions of this erratical publication we will feature different members of our research teams and their work. In the meantime, visit our website at www.landscapelogic.org. To learn more about our research projects you can subscribe to the intranet by contacting Jennifer Hemer on (03) 6226 1940 or Ted Lefroy on (03) 6226 2626.

Ted Lefroy, Landscape Logic Director, Centre for Environment UTAS.



2. WATER RESEARCH IN TASMANIA

Two separate exercises have been used to select catchments for research into managing water quality in Tasmanian catchments.

The Catchment Nutrient and Sediment Management Project (Project 5) set out to find a site to test our understanding of the processes driving nutrient and sediment transport. A high frequency water analyzer capable of recording N and P concentrations (as NO₃-N + NO₂-N, NO₂-N, NH₃-N, PO₄-P TP, and TN) at up to 30 minute intervals is to be installed in one catchment. Criteria included significant downstream nutrient or sediment impacts, connection to estuaries studied in Project 4, absence of major industrial developments, frequent flow events, hydrologically discrete, good supporting data and of interest to local NRM groups. The selection process involved 1) consultation with the three Tasmanian NRM regions, 2) screening by representatives from different LL projects, and 3) a detailed desktop and field assessment. Starting with 48 water management catchments the process identified a short list of 13 (Duck, George, Huon, Little Swanport, Don, Ansons, Pitt Water-Coal, Rubicon, Great Forester-Brid, Inglis, Montagu, Pipers, and Prosser) and subsequently identified the Duck and as the most suitable for intensive monitoring.

The Tasmanian Retrospective Project (Project 4) used a similar process to identify a set of 11 catchments suited to multiple studies. The first step was to eliminate those catchments unsuited to a generalized understanding of water quality management in mixed use catchments (major dams and reservoirs

on headwaters, major industrial developments or mining, catchments prone to extensive flooding, in pristine condition or with difficult access). The second step was to identify paired river-estuary catchments with a history of data collection on water quality, water flow and estuarine condition. A third step identified catchments suited specifically to studies of riparian vegetation processes and river health.

Catchments selected for multiple studies

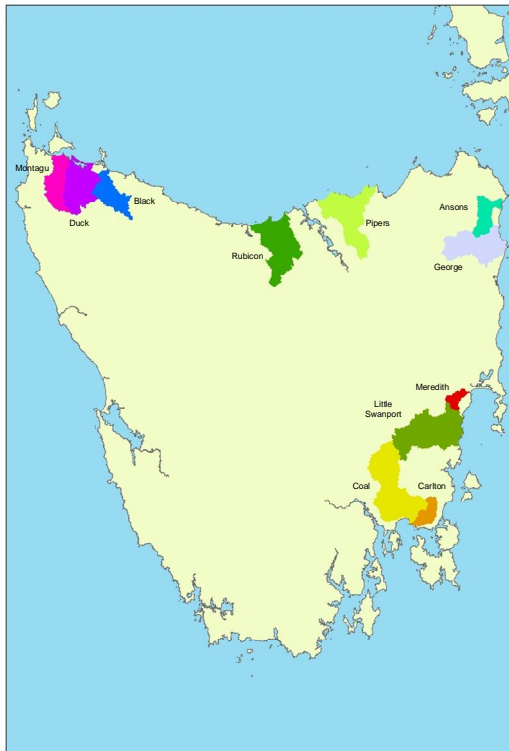
Catchment	Region
Ansons Bay	North
Black	Cradle Coast
Carlton	South
Coal/Pitt Water	South
Duck	Cradle Coast
George	North
Little Swanport	South
Meredith	South
Montagu	Cradle Coast
Pipers	North
Rubicon/Port Sorrell	Cradle Coast

The catchment selection reports are available on the registered-users website Go to the *Documents* menu and then the *Project Docs* file. To register, contact Jennifer Hemer (03) 6226 1940

Dr Hamish Cresswell, CSIRO Land and Water (P5) and Dr Bill Cotching, Tasmanian Institute of Agricultural Research, UTAS (P4).



Montagu Catchment
North West Tasmania,
Landscape Logic
Tour Oct 2006



Catchments selected for integrated studies in the Tasmanian Retrospective Project and the Catchment Nutrient and Sediment Management Project.

3. NATIVE VEGETATION CONDITION WORKSHOP

Some of Australia's leading experts on the management of native vegetation met recently at the Cradle Coast campus of the University of Tasmania (UTAS) to discuss current understanding of the health or condition of native vegetation in Tasmania and Victoria.

The workshop participants included catchment land and resource managers from our partner regions,

State and Australian government vegetation scientists and Landscape Logic researchers. They discussed scientific methods to assess and monitor the health of vegetation across south east Australia and new research required to help ensure that native vegetation is managed on a sustainable basis.



Meet the participants, Cradle Coast campus of UTAS, 18-19 October 2007.

The meeting was convened by the Landscape Logic Spatial Analysis project team at UTAS and RMIT, led by Professor Tony Norton, and with assistance from Dr Kerry Bridle of the Tasmanian Institute of Agricultural Research at UTAS.

Tony says 'healthy landscapes and vegetation communities are vital to the prosperity of Australia and for the conservation of our natural and cultural heritage. By monitoring native vegetation over time we can check to ensure that land management practises are compatible with catchment and regional management goals. This is particularly important in southern Australia and Tasmania where the nature and rate of land use change is



increasing due to factors like drought, climate change and restructuring in the agricultural sector.'

The workshop discussed major priorities for new research on assessing and monitoring the condition of vegetation communities across Tasmania and Victoria, including the use of new ground survey techniques and satellite imagery to monitor vegetation. This research will help to identify and mitigate threats to vegetation and inform the selection of private land with significant vegetation warranting enhanced protection through measures such as covenants.

You can view the presentations given at the meeting by logging on to the Landscape Logic registered users site. A report on the outcomes of the meeting will be available soon.

Prof. Tony Norton, Tasmanian Institute of Agricultural Research, UTAS.

4. GETTING OUT AND ABOUT: CONFERENCES

ESA 2007

Adapting to Change

Society - Environment - Science

25 - 30 November 2007, Perth WA.

This conference aims to explore the place of ecology and ecologists in our changing world. By highlighting three key elements - society, environment, and science - the conference organizers hope to broaden the debate about change, and explore the way we view, understand, manage and influence change.

Landscape Logic researchers from the Spatial Analysis and Victorian Retrospective Projects (Projects 1 and 3) will attend the conference. They will give a joint presentation on their research into native vegetation condition assessment. Landscape Logic Director Ted Lefroy will also present a paper on the outcomes of the conference held in Launceston in June this year '*Biodiversity: Balancing conservation and production. Case studies from the real world*' which featured landholders experiences of nature conservation in production systems.

MODSIM07 Land, Water and Environmental Management: Integrated systems for sustainability

10 - 13 December 2007, Christchurch NZ.

Two Landscape Logic research papers will be presented at the MODSIM07 conference. Drs Jenifer Ticehurst and Carmel Pollino of the Landscape Logic Decision Networks Project (Project 6) will present a paper 'Build Models or Capacity? Comparison of Techniques for Building Bayesian Networks for the Natural Resource Management Regions of Australia.'

Drs Ulrike Bende-Michl and Hamish Cresswell of the Catchment Nutrient and Sediment Management Project (Project 5) will present a paper, 'Supporting natural resources management in Tasmania through spatially distributed solute modeling with JAMS/J2000-S'. This paper is the product of collaboration with researchers at Ulrike's former University, FSU Jena, Germany.

Both papers will be available on the Landscape Logic website immediately after the conference.



5. COLLABORATIONS

Landscape Logic postdoctoral researcher David Duncan, is working with Brendan Wintle of the AEDA CERF Hub to improve NRM decision making. David works at the Arthur Rylah Institute for Environmental Research (the Victorian Department for Sustainability and Environment) on the Victorian Retrospective project to inform future regional decision making and reporting about native vegetation condition. This collaboration will see David spend time at the University of Melbourne over the next three years. The collaboration will marry Landscape Logic's interest in improved NRM decision making and resource allocation with AEDA's expertise on adaptive management, decisions theory and optimal monitoring. Native vegetation management and restoration is a major area of investment at all levels of government. It is characterised by great institutional and ecological complexity making it an important area of research for AEDA and Landscape Logic. (David and Brendan are currently working on a chapter for a forthcoming book on Landscape Analysis and Visualisation.)

David Duncan, Arthur Rylah Institute, Dept. of

6. LIBRARY

Sustainability and Environment Victoria.

New from the Australian Government – the NRM Toolbar and Regional Knowledge Resource Kit

NRM Toolbar

Feel like you're trying to find a needle in a haystack? Want better internet search results? The NRM Toolbar is an Australian

first featuring an NRM-specific search engine. You can also access NRM-specific databases of professional bodies, events, e-networks and more. To access the NRM Toolbar go to www.nrmtoolbar.net.au and download your own personal NRM Toolbar. If you are having difficulty with the download due to lack of access to broadband a CD version is available. To order a copy of the CD contact the Knowledge for Regional NRM help desk on 1300 307 457.

7. IN FOCUS

Shane Broad
Postdoctoral Research Fellow at the Tasmanian Institute of Agricultural Research, UTAS



Shane

Shane Broad grew up on a mixed farming operation at Gawler on Tasmania's North West coast. After finishing secondary school, which included a year as an exchange student on the Faroe Islands in the north Atlantic, Shane worked on his parent's farm, growing vegetables under contract.

At age 22 Shane attended the University of Tasmania and was awarded a Bachelor of Agricultural Science with First Class Honours. After time spent working



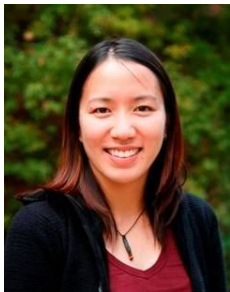
for the University as a research assistant, the Tasmanian Water Management Branch and for private consultants, Shane returned to University of Tasmania to complete his PhD which investigated methods for reducing chemical use in vegetable production systems using crop diversification strategies.

Shane's Postdoctoral research interests have included the implications of globalisation and intensification on agricultural production systems and natural resource management, designing sustainable vegetable systems and insect/host plant interactions. As part of the Landscape Logic team, Shane will be investigating links between land use, land management practices and water quality.

You can contact Shane by email, shane.broad@utas.edu.au

8. MODELLING FISH COMMUNITIES IN THE MURRAY DARLING BASIN USING BAYESIAN NETWORKS

Serena Chen is a PhD Student at the ANU. Her Supervisors are Carmel Pollino, Tony Jakeman, Keith Walker, and Martin Lambert. Here, she tells us about her research project.



The widespread deterioration of riverine ecosystems and the subsequent decline in many of the important goods and services they provide, has led to mounting pressure to improve their management. There

has been increased interest in the development of predictive models to examine the potential effects of system changes (e.g. management activities) to enhance the effectiveness of decision-making and management of river systems. However, few models have been developed to explicitly deal with the ecological component of river systems, largely due to its high complexity and variability.

Bayesian networks are increasingly being used in ecological modelling as they are able to integrate different sources of evidence (including both qualitative and quantitative data) and different system processes (e.g. climate, hydrology, water quality etc.), represent uncertainties in knowledge and inherently variable environments, and explicitly link ecological outcomes with management activities and system changes. Bayesian networks are also adaptive models that can be easily updated with new or revised knowledge and monitoring data (Pollino 2005). BNs represent the studied system in the form of a graphical network from primary cause to final outcome, explicitly showing all causal assumptions, which provides clarity to model users (Borsuk et al. 2006). This transparency is a valuable characteristic that will enhance the model's effectiveness as a decision support tool; rather than just providing the user with an output, BNs also communicate how the output was produced.

This PhD project will involve the development of a Bayesian network model for predicting the ecological condition of river systems in selected



Victorian catchments in the Murray-Darling Basin (MDB), using native fish communities as an indicator. Fish communities are considered a good indicator of the ecological condition of river systems due to their sensitivity to catchment disturbances and their ability to integrate several stream processes over a wide range of spatial and temporal scales (Harris 1995; Joy and Death 2002). This ability to integrate a range of processes is a result of their different habitat requirements throughout their relatively long lives and their occupancy of various trophic classes. In the MDB, it has been estimated that native fish have dropped to 10 % of their pre-European settlement levels, with the main causes of decline including: the modified flow regime, in-stream barriers to movement, habitat loss, water quality decline, over-fishing and introduction of alien species (Lintermans 2007).

The outcome of the project will be a decision support tool that will guide users in making better decisions about the management of the river systems, as well as examine changes in fish communities in response to system changes such as climate change, modifications to the flow regime (such as alternative environmental flow and climate scenarios), and alternative catchment management activities (such as rehabilitation of riparian zones). The model can also be used to identify key knowledge gaps, target monitoring and prioritize investments in catchment management.

You can contact Serena by email, serena.chen@anu.edu.au

- Borsuk, M. E., P. Reichert, A. Peter, E. Schager and P. Burkhardt-Holm (2006). "Assessing the decline of brown trout (*Salmo trutta*) in Swiss rivers using a Bayesian probability network." *Ecological Modelling* **192**(1-2): 224-244.
- Harris, J. H. (1995). "The use of fish in ecological assessments." *Australian Journal of Ecology* **20**: 65-80.
- Joy, M. K. and R. G. Death (2002). "Predictive modelling of freshwater fish as a biomonitoring tool in New Zealand." *Freshwater Biology* **47**: 2261-2275.
- Lintermans, M., Ed. (2007). *Fishes of the Murray-Darling Basin: An introductory guide*. Canberra, Murray-Darling Basin Commission.
- Pollino, C. (2005). Murray Irrigation Limited Area of Operation: Case Study. *NPSI Project: Delivering Sustainability through Risk Management*, Water Studies Centre.

On the website

A post-graduate student page is now available on the Landscape Logic website. It provides links to student research profiles and presentations. You'll find it in the knowledge exchange and training menu item.

9. FROM THE ADVISORY BOARD

The role of the Landscape Logic Advisory Board is to provide strategic guidance and advice to assist the Hub achieve its goals. At their September meeting the Board discussed ways to



ensure that Government policy makers engage with our research. Arising from this discussion will be a series of seminars presented to DEW and DAFF. To start off in early 2008, Wendy Minato (photographed), a PhD student at Charles Sturt University under the



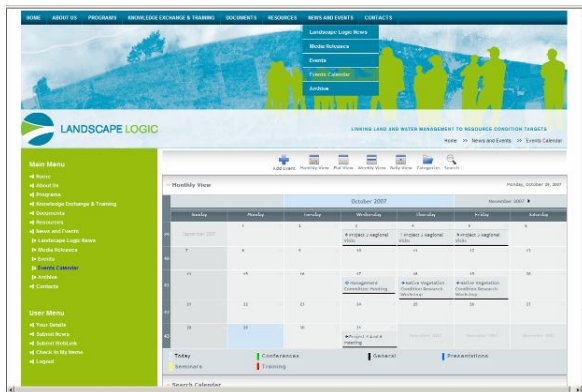
Landscape Logic Social Research Project (Project 2) will outline her research on the relative impact of demographic change and NRM investments on native vegetation condition in Northern Victoria.

Wendy Minato, Institute for Land, Water and Society, Charles Sturt University. Email wendy.minato@csiro.au

10. A WORD ABOUT OUR WEBSITE

The Landscape Logic website allows us to share information between our research teams, partners and the world. It was designed so that our registered users can contribute stories, links, event notices, documents and discussions. In each of our Landscape Logic newsletters we will feature one of our interactive website components.

The Events Calendar



The Events Calendar is located in the *News and Events* menu item in the public view of the website. It can be viewed monthly, weekly and daily or you can list the events by category. You can also search the calendar using key

words. The event categories include conferences, seminars, training workshops, presentations and a general category for meetings and field days.

Registered users can add events to the Calendar. To do this, just log in from the home page and go to the calendar. Click the 'Add an Event' icon, then enter the details. Once you've submitted your event, it will be reviewed and published by your website administrator.

MORE ABOUT LANDSCAPE LOGIC

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