

In this issue:

- Welcome
- The Northern Australia Sustainable Yields (NASY) Project
- National Audience gains Insight into Burdekin Aquifer
- Professor Roland Schulze visits to share research experiences on climate change and agriculture
- The Ord and Burdekin Catchments to get some HELP
- Keeping a strategic focus in the Lower Burdekin
- A Groundwater Science Plan for the Future
- Understanding the processes that affect the Burdekin's Groundwater
- NAIF Post-Graduate Students submit theses

Visit our website at: <http://www.clw.csiro.au/naif/>

---

### Welcome

The past year has been full of challenges and changes within the water and irrigation sector and extremely hectic with the NAIF project team working towards the final closure of the CRC for Irrigation Futures (CRC IF).

We are now in the final stages of the CRC IF with the culminating conference being held this week in Sydney, co-hosted by Irrigation Australia Limited. The past year has been busily spent finalising projects, completing student commitments, and making preparations for the CRC's official closure on 30 June 2010.

Governmental decisions and changes throughout the past year have impacted the water and irrigation sector. The Queensland State Government merged the Department of Natural Resources and Water and the Environmental Protection Agency into the Department of the Environment and Resource Management (DERM). Further state government decisions regarding the future of many Queensland regional water boards were also made.

2009 also saw the abolishment of Land & Water Australia (LWA), one of Australia's key public environmental research funding organisations, and original major funder of the NAIF Project.

Our next NAIFnews will be the final edition, but in the meantime please enjoy some stories on the activities that have taken place over the past year.



Natural stream in NT

Keith Bristow  
NAIF Project Leader

## The Northern Australia Sustainable Yields (NASY) Project



The Northern Australia Sustainable Yields (NASY) project report was released by Dr Mike Kelly, Parliamentary Secretary for Water, last September at the 2009 Riversymposium in Brisbane. The report is part of the Australian Government's Northern Australia Water Futures Assessment (NAWFA), a five-year program to develop an enduring knowledge base to inform decisions about conservation and development of northern Australia's water resources, so that any development proceeds in an ecologically, culturally and economically sustainable manner.

The main findings from the Water in Northern Australia report are that:

- Despite popular perceptions that northern Australia has a surplus of water, the climate is extremely seasonal and the landscape may be described as annually water-limited;
- Northern Australia has little or no rain for three to six months every year, and potential evapotranspiration rates are very high;
- Northern Australia experiences high rainfall during the wet season but most falls near the coast and year to year amounts can be highly variable;
- Runoff follows a similar pattern to rainfall; hence potential inland dam sites receive less water and suffer very high evaporation rates;
- The few river reaches that flow year-round have high cultural, social and ecological value and are generally sustained by localised groundwater discharge;
- Groundwater may offer potential for increased extractions but shallow aquifers rapidly fill during the wet season and drain through the dry season, and provide little opportunity for increased groundwater storage; and
- In the near future, potential evapotranspiration is likely to increase whilst rainfall is likely to be similar to historical levels, which were generally drier than the last decade, especially in the west.

The NASY project was funded through the National Water Commission's Raising National Water Standards program and complements programs for water investigation, analysis and management being undertaken by state and territory governments, so that the results can be used in regional and statutory water management plans.

Link to the NASY project at <http://www.csiro.au/partnerships/NASY.html>

## National Audience gains Insight into Burdekin Aquifer

The Burdekin's unique groundwater systems were showcased to groundwater users, managers and policy makers from around Australia during 2009. Jointly hosted by Lower Burdekin Water and Irrigation Australia, the Groundwater Users and Managers Forum, held in August, enabled attendees to acquire a greater understanding of the lower Burdekin groundwater systems, and facilitated valuable interaction which will help the region to sustainably manage its resources into the future.



**Andrew Kelly (Lower Burdekin Water) with delegates at a pump station near the sand dams**

The program's presentations included an outline of National Water Commission groundwater research funding, details of the new Centre for Groundwater Research and Training and presentations from each state on their current groundwater situation, associated environmental and regulatory issues. Other presentations included: 3D hydrological mapping systems, groundwater modelling, and irrigation modernisation planning. Delegates toured the region to see recharge pits, aquifer recharge processes, sand dams, a modified lagoon system, and a farm where groundwater and recycled water are used for irrigation. Dr Keith Bristow, NAIF Project Leader was a key note speaker at the event.

## Professor Roland Schulze visits to share research experiences on climate change and agriculture

Professor Roland Schulze from the University of KwaZulu-Natal in South Africa spent two highly productive weeks interacting with various groups and organizations across Australia during August and September last year. Organised by Dr Keith Bristow and funded by the CRC for Irrigation Futures (CRC IF), Professor Schulze travelled to Canberra, Townsville, Brisbane, Adelaide and Perth to meet and interact with staff from a range of organisations and give a number of seminar presentations.

Professor Schulze has had a long and distinguished career and is an internationally recognised expert in hydrology. He has worked and lectured in several countries around the world and is particularly well known for his work on the ACRU hydrological model, the South African Atlas of Agrohydrology and Climatology, and more recently on climate change impacts on the water resources of South Africa.

Hosted by the Bureau of Meteorology Water Division and CSIRO Land and Water, Professor Schulze spent two days in Canberra, meeting with CSIRO hydrological modelers, National Water Commission staff and giving two seminar presentations on the topics of: *Projecting impacts of climate change and the local scale is what matters:* and *The estimation of Daily Penman-Montieth based reference crop evapotranspiration at one arc minute resolution*

Professor Schulze spent time in north Queensland meeting with members of the Burdekin Water Futures group sharing his knowledge and experience on integrated water resources management, and visiting the Burdekin River to inspect sand dams, pump stations, and recharge pits. CRC IF-CSIRO Townsville hosted a very well attended seminar on the topic of: *Climate Change and the Agriculture Sector in South Africa: To Stress or not to Stress? . . . That is the Question.* Brisbane was next on the agenda, where Professor Schulze met with and held in depth discussions with CRC IF and International Water Centre staff.



**BWF Deputy Chair Michael Hoey with Prof Roland Schulze and Dr Keith**

Flinders University in Adelaide hosted a two day visit which encompassed a visit to the lower Murray and the Murray mouth, discussions with Flinders University researchers who are working on downscaling outputs of Global Climate Models, and a presentation by Professor Schulze to over 50 attendees from Flinders and other universities, CSIRO and SARDI on *Projecting Impacts of Climate Change at the Local Scale is what Matters - Procedures for Downscaling and Applications of Agro-Hydrological Models at the Quinary (5th) Level of Spatial Disaggregation.* Professor Schulze also had opportunity to meet with the Board of the CRC IF while he was in Adelaide.



**Prof Schulze with Jeff Camkin in Perth**

The last stop was a jam-packed day in Perth, starting with discussions with CSIRO staff, and ending with a CRC IF-CSIRO-AWA hosted seminar held at CSIRO Floreat Laboratory. With a good attendance from about 15 different organisations, Professor Schulze's seminar on *Climate Change and the Agriculture Sector in South Africa: To Stress or not to Stress? . . . That is the Question* generated considerable discussion and debate.

Professor Schulze's time in Australia and his exchanges with researchers across our country proved highly valuable with those who interacted with him delighted with the opportunity to connect and keen to continue the dialogue, building further linkages with research in South Africa.

## The Ord and Burdekin Catchments to get some HELP

Late 2009 saw the Ord Catchment in Western Australia and the Burdekin catchment in north Queensland receive approval as Operational HELP Basins in the third phase of the UNESCO-IHP HELP program.

The United Nations Educational Scientific and Cultural Organisation (UNESCO) was founded in 1945 to promote international co-operation between member countries in the fields of education, science, culture and communication.



HELP (Hydrology for the Environment, Life and Policy) is an initiative of UNESCO through their International Hydrological Programme (IHP).

HELP was established to promote new approaches to integrated catchment management. These approaches include the creation of a framework that brings water law and policy experts, water resource managers and water scientists together to work on water-related challenges.

It is the aim of HELP to strengthen field-oriented experimental hydrology, to highlight the need for ecologically sustainable development and to encourage active involvement of policy experts and land and water resource managers to ensure scientific results benefit society and the environment.

Being part of the HELP network provides the Burdekin and the Ord the opportunity to share experiences, data and knowledge with a range of other catchments nationally and internationally, helping to implement more effective integrated water resources management.



**Aerial view, Ord WA**



**Prof. Shahbaz Khan**

Professor Shahbaz Khan, Chief of the Sustainable Water Resources Development and Management Section of the Division of Water Sciences, Natural Sciences Sector for UNESCO officially launched the Burdekin catchment at the Burdekin Water Forum on 15 February 2010. The forum enabled Burdekin stakeholders to hear more about the UNESCO-IHP HELP programme and emerging international water issues and how these relate to the local region.

Keith Bristow is the Coordinator of the Burdekin HELP Basin. Anna Price (Brolga Environmental Kununurra) is the Coordinator of the Ord HELP Basin.

Find out more about HELP at [http://portal.unesco.org/science/en/ev.php-URL\\_ID=1205&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/science/en/ev.php-URL_ID=1205&URL_DO=DO_TOPIC&URL_SECTION=201.html)



The Australian Irrigation Conference & Exhibition 2010 *One Water Many Futures* is being held at the Sydney Convention Centre from 8 to 10 June 2010. Co-hosted by Irrigation Australia and the CRC for Irrigation Futures, this event is the largest of its kind held in the southern hemisphere. Visit <http://www.irrigationaustralia.com.au/> for more information.

## Keeping a strategic focus in the Lower Burdekin

The value of integrated water resources management, the specific needs of the Burdekin catchment coastal floodplain, and a call for action on priority needs were focal points during discussions at the 2010 Burdekin Water Forum. The successful, two-day event, hosted by Burdekin Water Futures also highlighted the need for collaboration, accountability, transparency and participation.

The forum boasted two international speakers, Professor Shahbaz Khan (UNESCO, France) and Dr Ken Knox (URS Corporation, USA), and active involvement by community members, farmers, water service providers, scientists, NRM managers and government representatives.

It began with an evening forum on Monday, February 15, led by Dr Knox and Professor Khan sharing their international experience on groundwater, irrigation and water management. With more than 70 participants, the forum was very informative and set a positive grounding for the discussions to follow.



Shahbaz Khan, Keith Bristow and Ken Knox

Day two on Tuesday, February 16, was an interactive workshop with about 75 participants exploring the challenges within the catchment from various stakeholder perspectives. This allowed participants to hear first hand experiences and to view the interrelatedness of all sectors that form the region and that depend on access to fresh water to ensure the region's viability for future generations.

The Burdekin Water Futures (BWF) has been in operation since 2006 working on building a more collaborative and strategic approach to the management of water resources in the Burdekin region of North Queensland. BWF brings stakeholder organisations together to share knowledge, enthusiasm and a joint vision for the sustainable future of the Burdekin's water and associated systems.



For more information on the BWF visit:

<http://www.clw.csiro.au/naif/casestudies/burdekin-water-futures.html>

---

## A Groundwater Science Plan for the Future

The development of a Lower Burdekin Groundwater Science Plan is an integral step towards addressing the Burdekin's water resource management issues and challenges in a strategic and integrated manner.

Funded by North Queensland Dry Tropics, Consultants from Sinclair Knight Merz (SKM) worked with the Burdekin Water Futures group to develop the science plan. This included a review of existing literature and a series of workshops and meetings involving a range of stakeholders, researchers and local land and water managers with interests in the water resources of the Burdekin catchment in general and coastal floodplain in particular.



The Groundwater Science Plan identifies and promotes a shared view of the priority groundwater science needs of the lower Burdekin; captures stakeholder commitment towards addressing those priority groundwater science needs; and provides a focus for groundwater science investment in the lower Burdekin.

The Groundwater Science Plan is based on holistic, integrated thinking, underpinned by a set of core projects that will deliver on a clear set of over-riding objectives. Both the Prospectus and Groundwater Science Plan are available from the BWF website at <http://www.clw.csiro.au/naif/casestudies/bwf-activities.html>

## Understanding the Processes that affect the Burdekin's Groundwater



**Dr Matt Lenahan**

NAIF Team Member, Matt Lenahan, has been conducting research in northern Australia which is helping local land and water managers to understand and manage groundwater. Matt has focussed his attention on the lower Burdekin floodplain aquifer with particular emphasis on areas under irrigation. Matt's recent research has concentrated on gaining an understanding of the mechanisms within the groundwater system that lead to an increase in groundwater salinity and affect the distribution of subsurface solutes.

Matt's work involved a review of existing geochemical data and depositional history of the region. The existing data were then used to understand solute sources and salinisation processes in the floodplain aquifer. The data revealed that modern and relict seawater are the dominant solute sources to the aquifer and that enhanced mixing due to application of large amounts of surface water in some regions and extraction of large amounts of groundwater in others is causing the observed decline in water quality over time. Evapotranspiration and displacement of unsaturated zone solutes, although occurring, contribute less to the overall increase in salinity. These findings have helped local land and water managers to identify regions with high potential for salinisation and contribute to the general understanding of subsurface geochemical processes impacting groundwater quality in irrigated floodplains.

Matt has continued this work by conducting groundwater geochemical sampling in the lower Burdekin to gain a better understanding of solute sources to the floodplain aquifer and what controls the distribution and mobility of carbon and nitrogen within the aquifer. Matt has targeted bores in the region that displayed increases in salinity and nitrate over time. This research focuses on differentiating between unsaturated and saturated zone solute contributions from the different geologic units within the floodplain. He is also investigating the role of palaeochannels as conduits for the transport and discharge of nutrients and other solutes from the floodplain aquifer.



**Measuring & Monitoring in the Burdekin**

Matt Lenahan is a postdoctoral research scientist based at the CSIRO Davies Laboratory in Townsville. Matt received his PhD in aqueous geochemistry in 2008 from the Australian National University. He joined CSIRO Land and Water and the CRC for Irrigation Futures in December 2007.

### Science at the Shine Dome

NAIF Project Team Member, Matt Lenahan, was selected as the CSIRO Land and Water young researcher to participate in the 2009 Australian Academy of Science *Science at the Shine Dome* Program. The event was held in Canberra during May 2009. This was a great honour and experience for Matt, and provided him with the opportunity to hear presentations on research across the nation and across science disciplines. Matt also participated in the Symposium on Evolution which generated lively discussion and debate amongst the network of scientists.



For more information on this annual event go to  
<http://www.asta.edu.au/awards/shine>

## NAIF Post-Graduate Students submit theses



NAIF postgraduate student Bart Kellett (left) submitted his thesis titled "Navigating change in irrigation and water management systems of northern Australia: Resilience at the interface between policy and local practice" in February 2009. He received glowing reports from both national and international examiners of his thesis who praised the quality of his work. Bart's PhD degree was conferred at the University of Melbourne December 2009 graduation ceremony. Congratulations Bart on successful completion of an outstanding piece of work.



Peta Djidic (left) has also reached a major milestone in her PhD studies having recently submitted her PhD thesis titled "Influences of Worldviews, Values and Mythologies in Australian Rural Landscapes: The Changing Culture of Agriculture" to Curtin University for examination. Peta has put considerable effort into her studies and we look forward to also celebrating her successful completion in the near future.

## NAIF Post-Graduate Students attend CRC IF Writing Workshop

NAIF postgraduate students Lucy Reading and Steve Marchant have gained a new set of tools and skills that they can use to improve the quality, and consequently the quantity, of their future publications.



**Dr Brown assisting Steve Marchant,  
Lucy Reading in background**

The CRC IF Writing Workshop was held at ANU Canberra, and was delivered by Dr Robert (Rob) Brown. Eight CRC IF sponsored students, from Townsville, Brisbane, Armidale, Canberra and Wagga Wagga and CRC IF Education and Knowledge Manager Dr Kelvin Montagu attended the workshop.

The main focus of this course was raising the students' writing skills to a level that would ensure the key messages from their research findings were communicated in the most effective and efficient way.

Dr Brown's course was in effect "on the job training" for writers, as each of the participants worked on a draft of their own journal paper, with the aim of having the paper as close to publication standard as possible by the end of the week.

The course covered in detail:

- Structure of a journal paper
- Practical experience in reviewing articles
- Journal submission process
- Dealing with reviewer comments and submission rejection
- Exposure to a wide variety of papers and writing styles

Lucy and Steve would like to thank NAIF and the CRC IF for organising and sponsoring the writing workshop, and also Rob Brown, Kelvin and their fellow workshop participants for an interesting, informative and productive week.

## Presenting NAIF research internationally

During 2009, NAIF Project team members, Dr Keith Bristow and Jeff Camkin, had the opportunity to present NAIF research to international audiences.

During April, Jeff was invited through UNESCO to present at the 3<sup>rd</sup> Yangtze Forum which was held in Shanghai, China. This jointly hosted forum on Integrated River Basin Management (IRBM) focussed on innovation in IRBM in China and internationally, and specifically on the innovation, benefits and costs resulting from implementation of the EU Water Framework Directive in Europe.



**Jeff Camkin presenting at Yangtze**

Jeff's presentation "Integrated River Basin Management: the Role of Social Learning and Community Knowledge in Dealing with Complexity and Uncertainty" was well received and fostered considerable discussion. The presentation highlighted research being carried out through the Northern Australia Irrigation Futures project, the Lower Burdekin Water Futures and the development of the Lower Burdekin Knowledge Platform.

The UNESCO-IHP HELP program then convened a Seminar in the Guadiana River Basin, Portugal, in June which involved international and local participants addressing the topic "Strengthening water governance for sustainability". The main purpose of the Seminar was to discuss experiences relevant to the Guadiana River and other HELP Basins, focussing on water governance, sustainability, social learning and the role of community knowledge in integrated water resource management (IWRM).

Dr Keith Bristow presented *Integrated Water Resources Management in the Lower Burdekin, Australia*, an overview of the issues faced in the Lower Burdekin basin, highlighting that management of water systems is both an individual and collective responsibility. How to address issues within complex systems was keenly discussed.



*Dealing with complexity and uncertainty in water management: the role of community knowledge and social learning* was the topic presented by Jeff **Dr Keith Bristow** Camkin. Jeff spoke about the role of community knowledge in dealing with complexity and uncertainty in integrated water resource management. He presented on research and development of a platform to support sharing and use of community knowledge in the Lower Burdekin HELP basin which is now funded by the local community (Lower Burdekin Knowledge Platform).

**Mr Jeff Camkin**

It was a general conclusion from the discussions that it is important for scientific findings and research outcomes to be shared with stakeholders and society, to help support a better future for water.

The exchange of information and experiences across international basins is an integral part of increasing knowledge and understanding and to strengthening and improving water governance.

Please see Dr Bristow's report on these meetings by visiting <http://www.clw.csiro.au/naif/documents/2009/Report-UNESCO-IHP-HELP-Meetings-Portugal-June2009.pdf>

## NAIF CONTACTS

Project Team	Project Partners
Project Leader: Keith Bristow	Land & Water Australia
Sustainability Specialist: Jeff Camkin	National Program for Sustainable Irrigation
Hydrologist: Cuan Petheram	CRC for Irrigation Futures
Mathematician/Physicist: Freeman Cook	CSIRO Land and Water
Hydrogeochemist: Matt Lenahan	Department of Water, Government of Western Australia
PhD Student: Peta Dzidic	Northern Territory Department of Natural Resources, Environment and the Arts
PhD Student: Bart Kellett	Queensland Department of the Environment & Resources Management
PhD Student: Lucy Reading	
PhD Student: Steve Marchant	
Project Officer: Di Popham	

