

Developing northern Australia – scale of the opportunity



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EIANZ CONFERENCE, BRISBANE, NOV 4TH 2016

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Australian Government
Department of Agriculture
and Water Resources





Federal Parliamentary Enquiries into northern Australian agricultural development have a long history. Here the Federal Parliamentary Party visit the Government Demonstration Farm at Rum Jungle, Northern Territory during their tour in 1912 following the Federal takeover of the Territory from South Australia in 1911, which was driven in part by the slow progress of agricultural development.

Develop “the empty north” - a national imperative

“Beware of keeping your north empty, and remember an unmanned nation invites disaster”

- President Theodore Roosevelt’s warning to Australia, 1905

“The establishment of ... mixed farming ... [represents] ... a practical partial solution of this great question”

- The Hon Mr Justice Herbert, Government Resident, 1905

“The empty north is of immense strategic importance, and self-preservation demands that we devise means for introducing population into that vacant area.”

- Stanley Bruce, Prime Minister, 1926



Current CSIRO projects in northern Australia

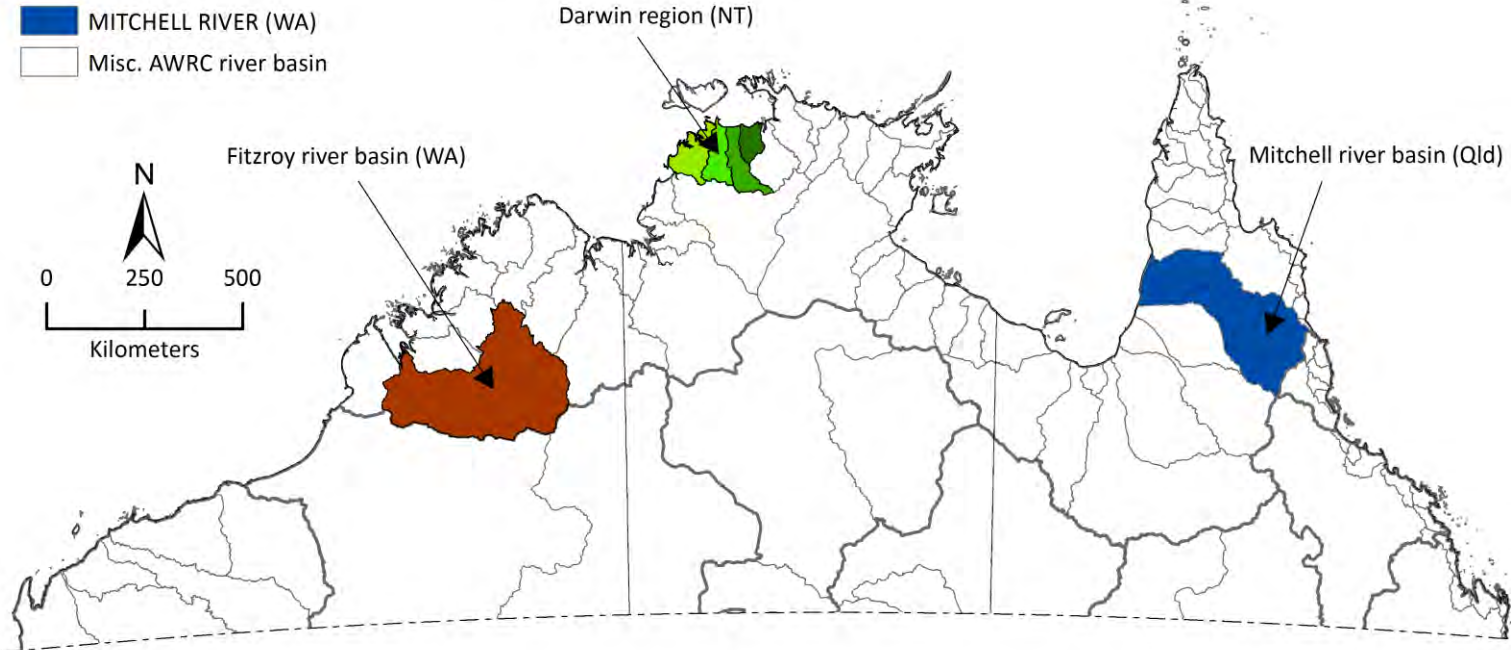
- *>150 projects, across most Business Units, > \$150M on a WoL basis*
- Water, soil, mineral & human resources
- Beef production & cropping systems
- Impacts of coal seam gas & coal mining
- Threatened species ecology
- Indigenous aspirations, enterprises
- Transport logistics, infrastructure
- Weeds & invasive insects
- Fisheries, GBR & reef catchments
- Human health, disease preparedness
- Fire, carbon
- Biodiversity, taxonomy, phylogeny

NAWRA (Northern Australia Water Resource Assessment)

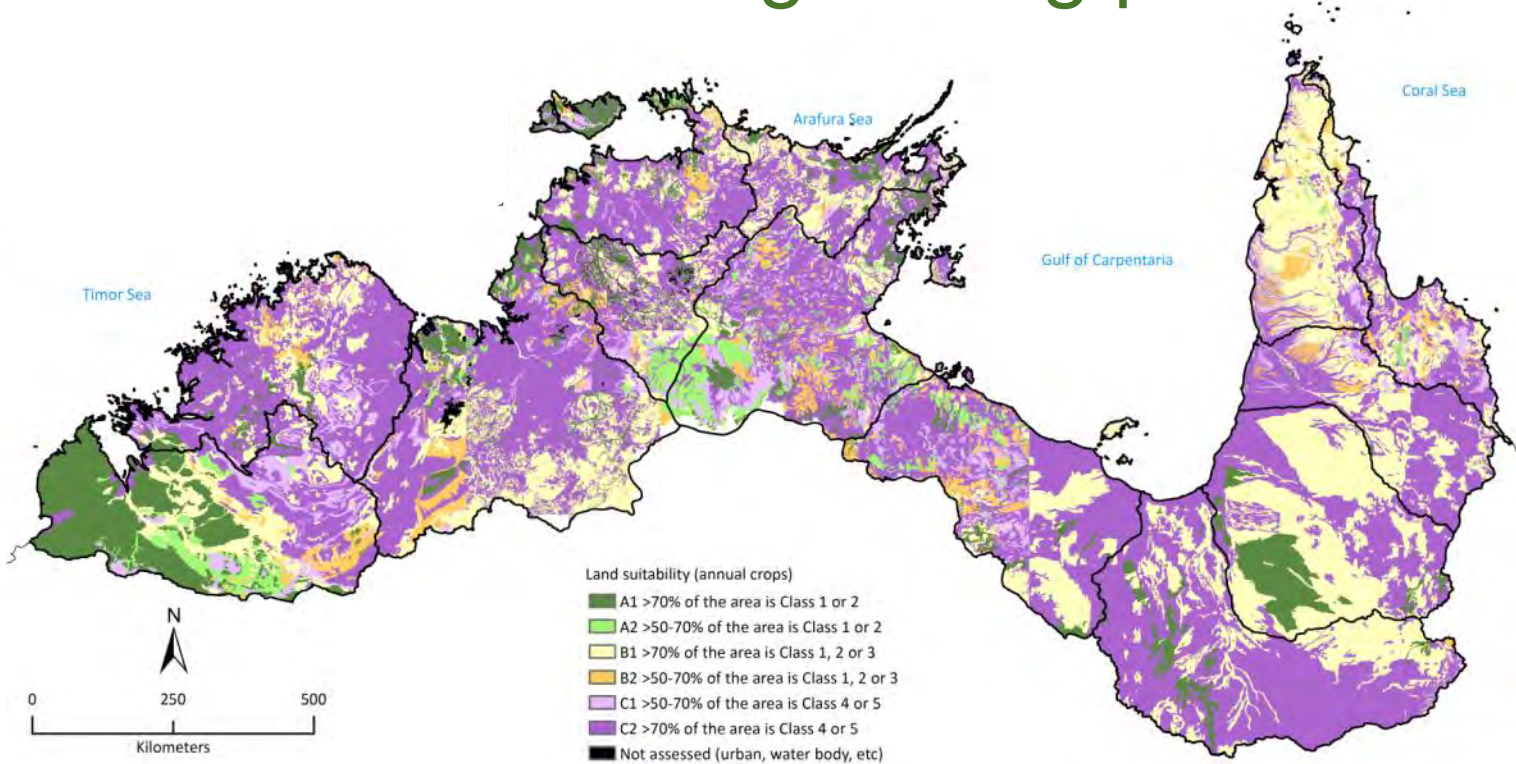
Delivery – June 2018

AWRC river basins

- FITZROY RIVER (WA)
- FINNISS RIVER
- ADELAIDE RIVER
- MARY RIVER (WA)
- WILDMAN RIVER
- MITCHELL RIVER (WA)
- Misc. AWRC river basin



16 Mha suitable for irrigated ag production



Rainfall

2,000,000 GL
rainfall



100%

Rainfall-streamflow

200,000 GL
streamflow



10%

Rainfall-streamflow-storage

can store more water, but reliability drops



40,000 GL
dam storage

2%

Rainfall-streamflow-storage-yield



Rainfall-streamflow-storage-yield-loss



15,000 GL
used by crop

0.75%

Most water can't be delivered to crops

200,000,000 ha



water sufficient for 0.4% of NA – 10% of suitable soil

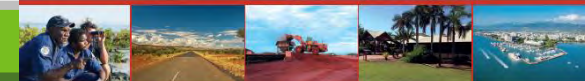
Determining the scale of the opportunity

- The Assessment will provide a comprehensive and integrated evaluation of the feasibility, economic viability and sustainability of water, agricultural development and regional industries for each of the three key regions of Northern Australia comprising the Mitchell River catchment (Queensland), West Kimberley (Fitzroy River catchment) (Western Australia) and the Darwin region (Northern Territory). The Assessments seek to:
 - evaluate the soil and water resources, including sustainable yield for consumptive purposes
 - identify and evaluate water capture and storage options and supply reliability
 - identify and test the commercial viability of agricultural opportunities, including but not limited to irrigated agriculture, aquaculture and forestry, and
 - assess potential environmental, social and economic impacts and risks.

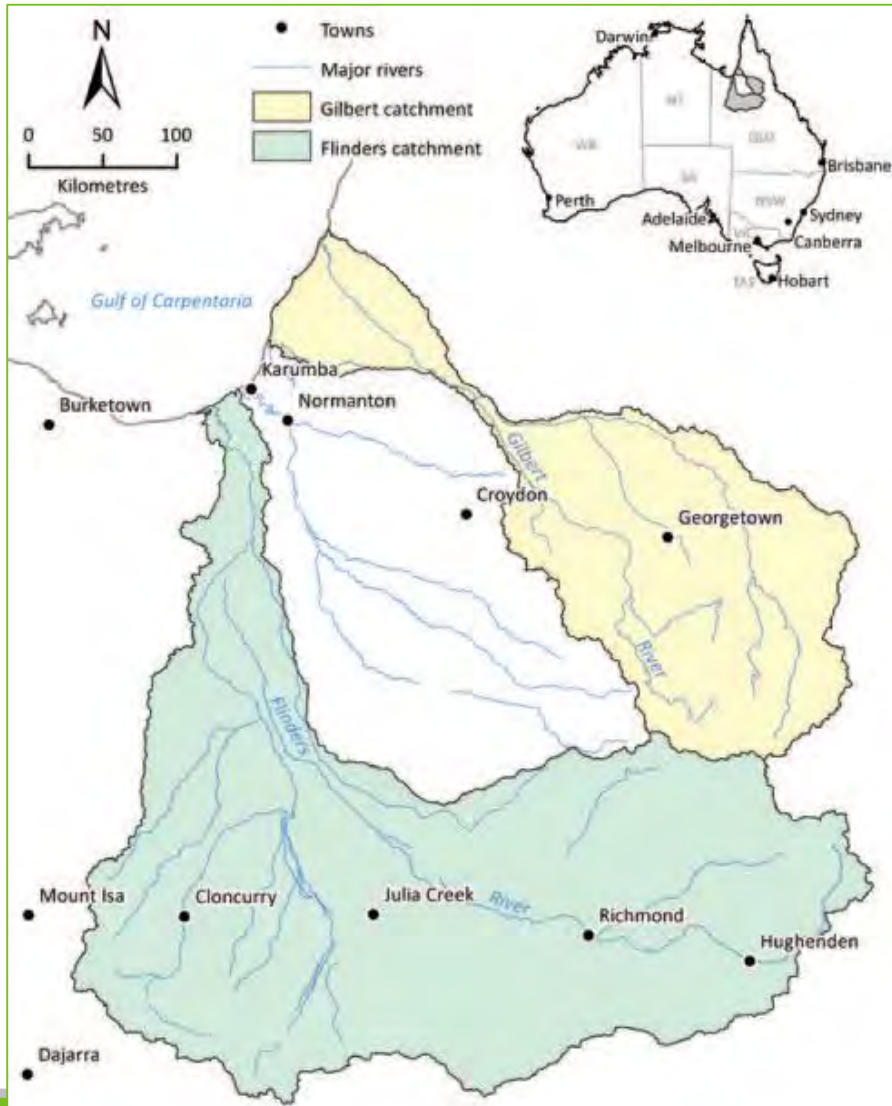
This work is funded through the Australian Government's Agricultural Competitiveness White Paper, the government's plan for stronger farmers and a stronger economy.

Project Background & context

- Built on previous work to come out of the Northern Australian Ministerial Forum (Office of Northern Australia)
- CSIRO led the Flinders & Gilbert Agricultural Resource Assessment (FGARA) project in the Gulf
- NAWRA direct from the Agricultural Competitiveness White Paper through the National Water Infrastructure Development Fund



Flinders and Gilbert catchments (FGARA)



Impact

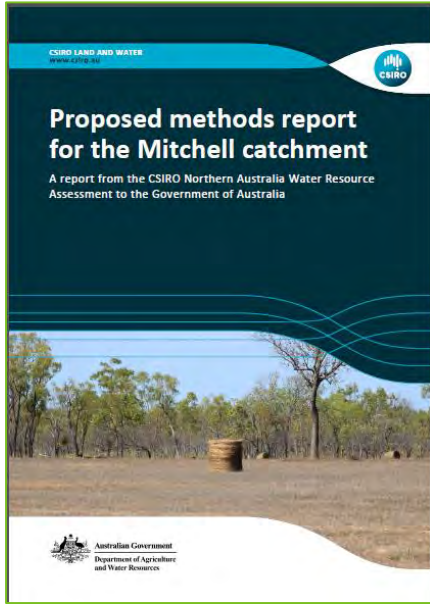
- Support deliberation and decisions concerning regional economic development
- Clarify the scale and nature of the opportunities for new agricultural development and industries
- Reduce uncertainty for investors and regulators, reduce start up costs, enhance the ability to attract capital
- Consider multi-development, multi-assets, across whole region
- Address local needs and aspirations



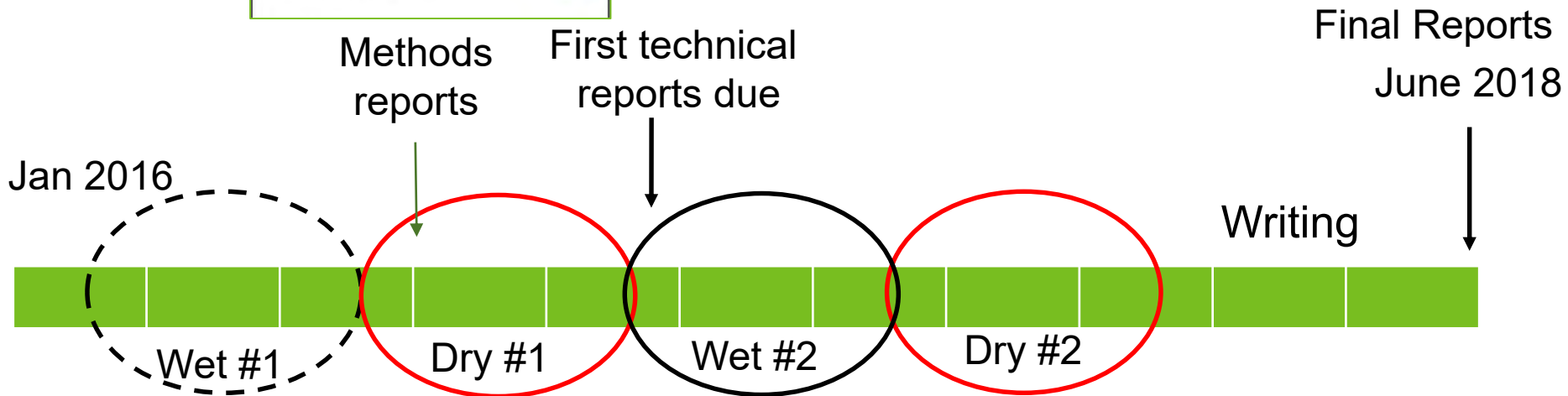
What the Assessment is not!

- Does not advocate irrigation development, nor recommend one development over another.
- Won't invest in infrastructure that may support irrigation enterprises.
- Doesn't assume any particular development pathway.
- Won't undertake small scale analyses required for specific developments. For example the Assessment will not map soils at the resolution required to plan or manage a particular irrigation development or enterprise.
- Doesn't replace or change planning and approvals processes.
- Not assuming a given regulatory environment, and limiting assessments to the current state.

Timelines - final reports due June 2018



Just Google NAWRA

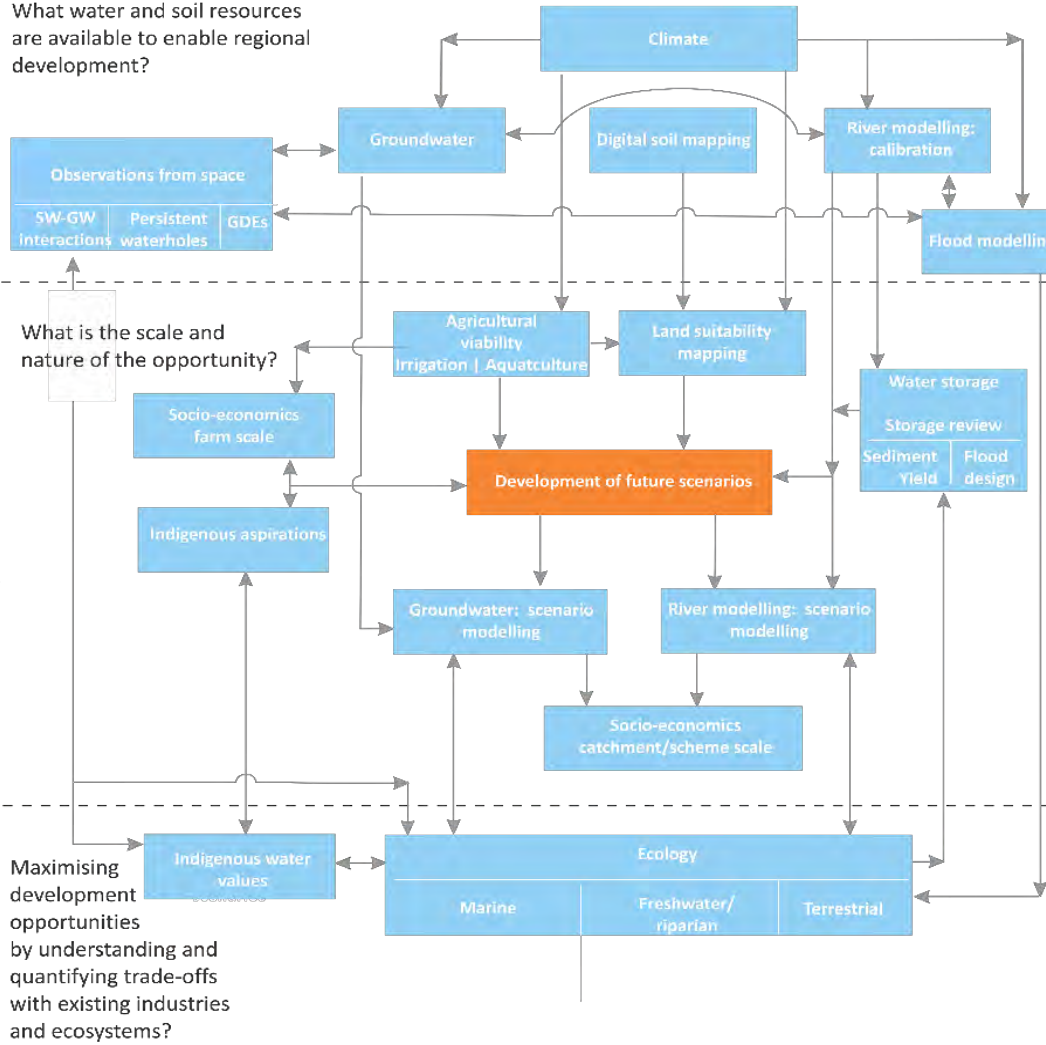


At least 80 CSIRO

Another ~30-40 jurisdictional, unis, consultants, etc

- Partners/collaborators**
- Jurisdictions
 - NESP
 - Federal Government
 - Local Government
 - Universities
 - NGOs
 - CSIRO strategic
 - CSIRO external
 - Private Industry

What water and soil resources are available to enable regional development?



What is the scale and nature of the opportunity?

Maximising development opportunities by understanding and quantifying trade-offs with existing industries and ecosystems?

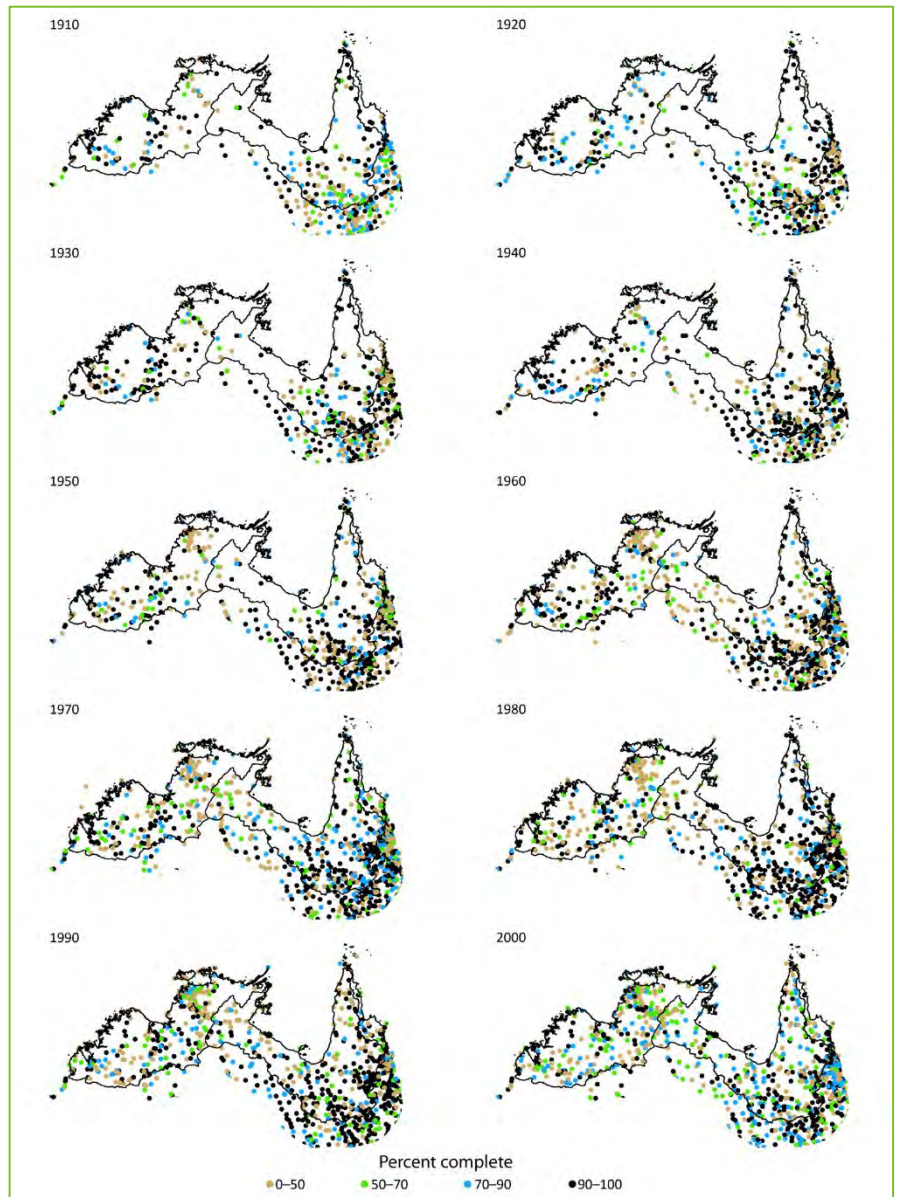
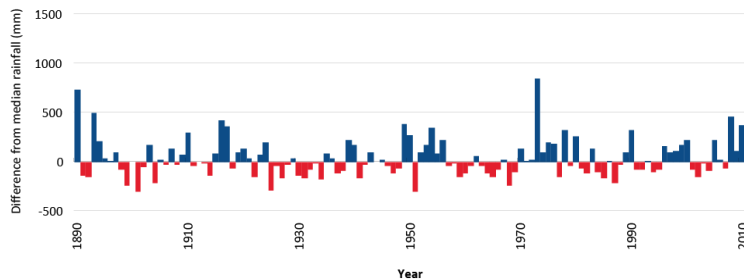
Project management

- Project director: Peter Stone
- Project leaders: Ian Watson, Chris Chilcott, Cuan Petheram
- Project coordinator: Caroline Bruce
- Communications: Chris McKay
- Project Support Advisor: Dharma Ariaratnam
- Contract manager: Sharyn Butts
- Activity leaders/ Science delivery leaders**
- Climate: Cuan Petheram (AL)
- Surface water (Flood modelling): Justin Hughes (JH), Dushmanta Dutta (SDL)
- Groundwater (MAR): Andrew Taylor (AL), Joanne Vanderzalm (SDL)
- Land suitability: Ian Watson (AL)
- Agricultural viability (Aquaculture): Andrew Ash (AL), Simon Irvin (SDL)
- Water Storage: Cuan Petheram (AL)
- Socio-economics: Lisa McKellar (AL)
- Indigenous aspirations/water values: Marcus Barber (AL)
- Ecology (Marine): Carmel Pollino (AL), Peter Bayless (SDL)
- Observations from space: Neil Sims (SDL)



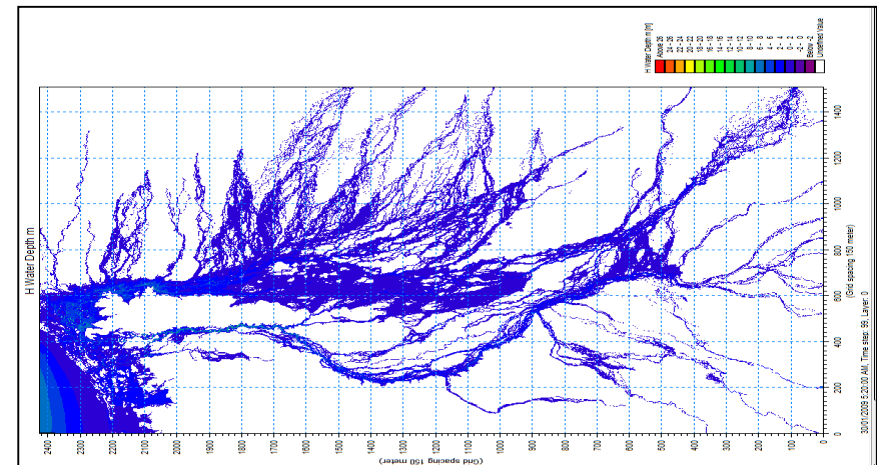
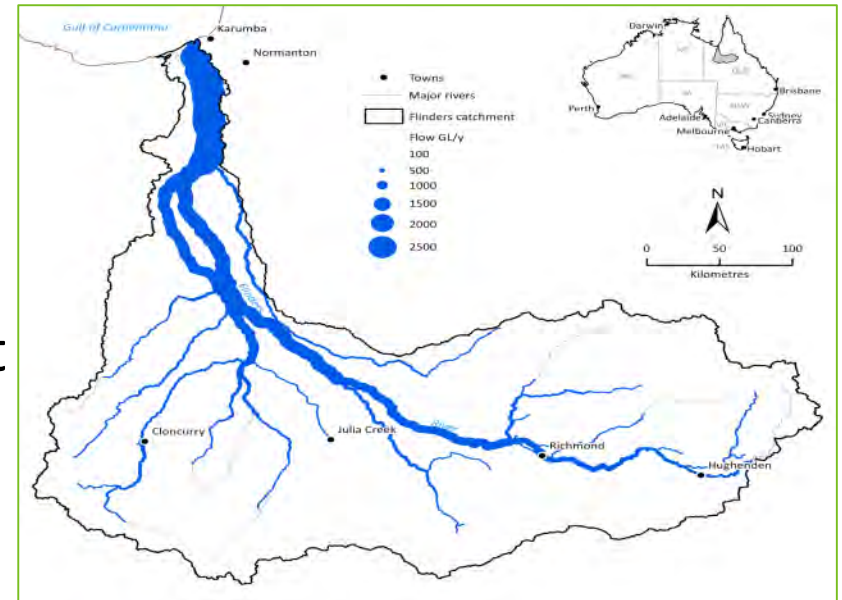
Climate Activity

- Current and future climate
- Produce standardised set of climate variables for the other activities
- 125 year runs (1890-2015)
- Climate change of 2.2 C temperature rise to ~2060 (IPCC 5th Assessment Report)



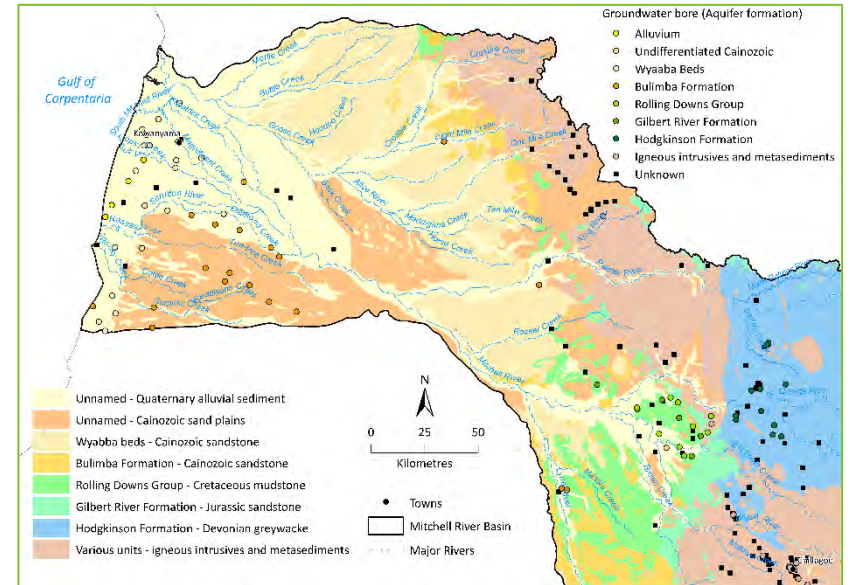
Surface water and flood modelling

- Three types of hydrological models
- Landscape (AWRA-L) to quantify water fluxes across the catchment
- river system model to model regulated system and explore perturbations
- hydrodynamic model (MIKEFLOOD) to model large and small floods and interactions with offshore wetlands



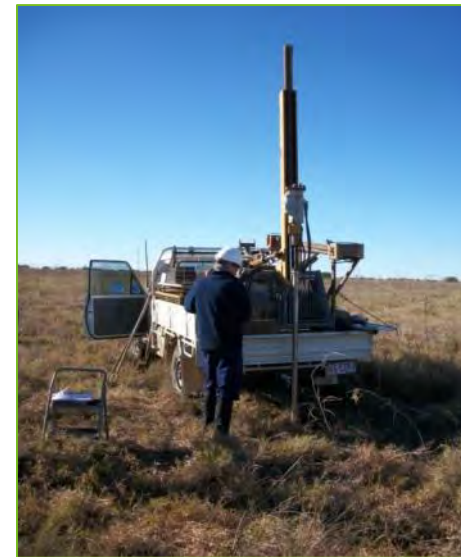
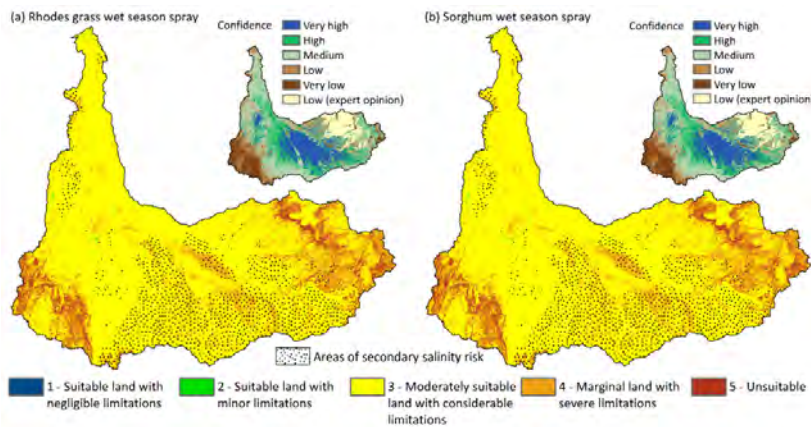
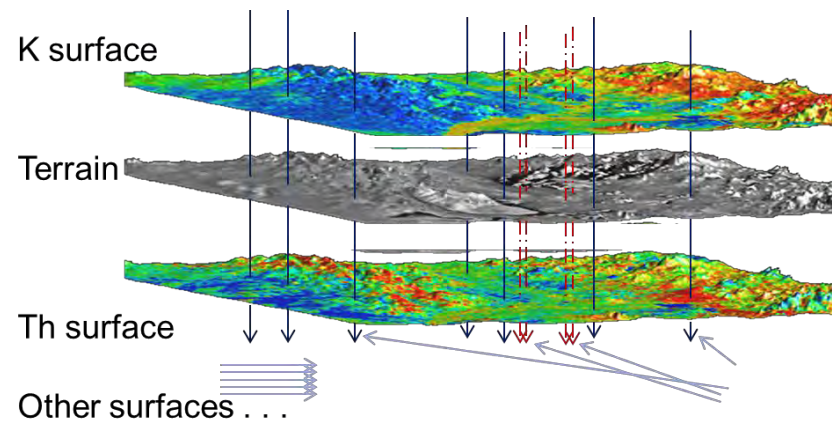
Groundwater and managed aquifer recharge

- Groundwater as a resource rather than just for ecological interactions and salinity risk
- Extensive drilling program in the Fitzroy and around Darwin, less so in Mitchell
- Characterising regional aquifers and bedsand resources
- Understanding groundwater-surface water interactions – stream flow and ecology
- Exploring possibilities for managed aquifer recharge (MAR)



Land suitability

- Develop maps of a range of soil and landscape attributes
- Use Digital Soil Mapping techniques
- Develop a land suitability framework for a range of crops and irrigation types
- Apply land suitability framework to the soil attributes to provide land suitability maps



Agriculture (& aquaculture) viability

- Crop and forage modelling analysis (APSIM & other)
- Integrated beef-forage modelling
- Gross margins, enterprise scale economic analysis
- Opportunities for double and multiple cropping
- Risks and production variability
- What cropping system will provide sufficient return?
- Aquaculture – ponds, marine & freshwater species



Water storage

- Different water storage options
- Pre-feasibility of large instream and offstream dams (incl. possibilities for hydro-electric)
- Assessment of large on-farm dams and ring tanks
- Reliability of water harvesting
- Yield, evaporation, transmission losses
- Opportunities with managed aquifer recharge



Indigenous values, rights and development aspirations

- Provide an overview of key indigenous rights, values, interests and aspirations with respect to water and irrigated agricultural development
- Not seeking an “agreed position” but range of views
- Direct consultation with indigenous Traditional Owners and others through a variety of means
- Communication of preliminary results to stakeholders



Socio-economics

- Economic viability of development
- Opportunities to use water for multiple purposes
- Extend the enterprise-scale work to scheme or precinct scale
- Regional econometric assessment
- Transport logistics and supply chains (TRaNSIT model)
- Values, perspectives and aspirations of individuals, groups and institutions
- Policy, legal and regulatory frameworks (+ approval processes)



Ecology and impacts

- Assess the potential for possible changes in flow regimes to affect freshwater and marine ecosystems
- Ecology focused on water (fresh & marine) rather than terrestrial
- Identifying priority assets
- Complementary with NESP
- Relationships between flow and ecological processes
- Groundwater dependent ecosystems and groundwater-surface water interactions



Case studies

- Purpose is to show the reader how it all might be put together
- Help readers understand the scale and type of opportunity
- Not designed to demonstrate, recommend or promote particular developments (CSIRO's or others)
- Are designed to be realistic – a fine line
- Will draw on information from all the above activities



Audience and stakeholders

Commonwealth Government

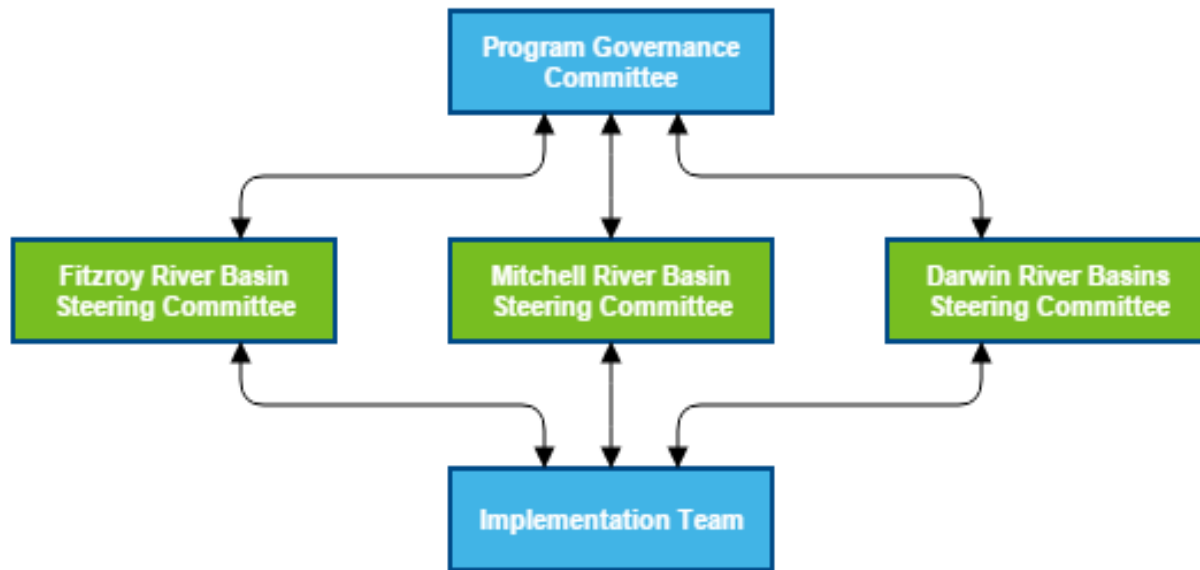
- State Government
- Local Government
- Regional development groups
- Large corporate investors
- Local landholders seeking to undertake small scale irrigation
- Share farmers
- NGOs
- Consultants
- Local businesses
- Individuals/general public



Intended products



3. Governance Arrangements




Methods Report and FactSheets (just Google NAWRA)

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Proposed methods report for the Mitchell catchment

A report from the CSIRO Northern Australia Water Resource Assessment to the Government of Australia



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Exploring agricultural potential in northern Australia

Part of the Northern Australian Water Resource Assessment

Northern Australia makes a substantial contribution to tourism. A number of opportunities have stimulated renewed interest in these opportunities from northern Australia's food and natural fibre. Australia's good reputation for sustainable regional communities. Millions of hectares of soil are potentially suitable for irrigated agriculture across northern Australia but access to water is one of several constraints to development. Following the successful Flinders and Gilbert Agricultural Resource Assessment, CSIRO has been engaged by the Australian Government to assess the opportunities for water and agricultural development in other priority regions in northern Australia. We will work with northern jurisdictions, research partners and communities to complete these assessments by June 2018.

About the Assessment

The Northern Australia Water Resource Assessment will provide a comprehensive and integrated evaluation of the feasibility, economic viability and sustainability of water and agricultural development in three priority regions. The Assessment will focus on the Mitchell catchment in Queensland, Darwin catchments (Adelaide, Flinders, Mary and Wildman) in the Northern Territory, and the Fitzroy catchment in Western Australia.

Assessment goals

For each of the three regions, the Assessment seeks to:

- evaluate the soil and water resources
- identify and evaluate water capture and storage options
- identify and test the commercial viability of irrigated agricultural and aquaculture opportunities
- assess potential environmental, social and economic impacts and risks of water resource and irrigation development.

While agricultural developments may be the most likely to proceed in the foreseeable future, the Assessment will also consider opportunities for and intersections between all types of water-dependent development, where these have potential. For example, the Assessment will explore the nature, scale, location and impacts of developments relating to industrial and urban development and aquaculture in relevant locations.

The Assessment does not seek to replace any planning processes, and will not recommend changes to existing plans or planning processes. The results, however, can be used to inform planning decisions by citizens, councils, investors and state.

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Northern Australia Water Resource Assessment

The Australian Government and CSIRO are partnering to investigate opportunities for water and agricultural development for three priority regions in northern Australia.

Northern Australia makes a substantial contribution to the Australian economy, particularly through agriculture, mining and tourism. There are opportunities to unlock significant new investment in the north. This will require confidence about the scale and nature of the opportunities and understanding of the risks involved. Millions of hectares of soil are potentially suitable for irrigated agriculture across northern Australia but access to water is one of several constraints to development. Following the successful Flinders and Gilbert Agricultural Resource Assessment, CSIRO has been engaged by the Australian Government to assess the opportunities for water and agricultural development in other priority regions in northern Australia. We will work with northern jurisdictions, research partners and communities to complete these assessments by June 2018.

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Assessing the suitability of land for irrigation

Part of the Northern Australian Water Resource Assessment

There are potentially thousands of hectares of soil suitable for irrigated agriculture across northern Australia. However, access to sufficient water is a constraint for development in this vast region that stretches from the Pilbara to Rockhampton and comprises 40 per cent of Australia's land mass. In recognition of some of the challenges and opportunities facing northern communities and primary producers, the Australian Government initiated the Northern Australia Water Resource Assessment to be completed by June 2018. The Assessment involves 10 different activities that will provide a comprehensive overview and integrated evaluation of the feasibility, economic viability and sustainability of water and agricultural development in the north. This factsheet explains one of these activities – the land suitability assessment. Our researchers will work with the Western Australian, Northern Territory and Queensland Governments and communities to complete an exploration of land suitability in three priority regions. We will produce maps of soil attributes for each of the three regions – the Mitchell catchment in Queensland, Darwin catchments (Adelaide, Flinders, Mary and Wildman) in the Northern Territory, and the Fitzroy catchment in Western Australia.

Land suitability assessment activity

Assessing the suitability of land is critical to the development of productive and economically viable irrigated agriculture. The activity will collect information on soil attributes such as type, structure, pH, carbon and salt content, water holding properties and erodibility in the three priority regions. This knowledge of soil types and their attributes will make it possible to evaluate how different soils and parts of the landscape could be economically and sustainably developed for irrigated agriculture. While some soil and land use assessments have been carried out in the past, key recommendations stated that further soils data were needed before detailed suitability assessments could be conducted, particularly for irrigated agriculture.

What does the activity involve?

The soil survey component of this activity will include the collection of new field observations and samples to complement the relatively small amount of existing soils data. This will result in the production of new maps indicating the type and extent of soils and their attributes in the priority regions. A statistical method will be used to identify the best locations to sample soil for the purpose of assessing the scale of the opportunity for irrigation across the regions. To interpolate between soil sampling locations requires an understanding of how the broader landscape formed. This requires soil to be assessed not just in the valleys, but also mid-slopes and ridge tops.



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Indigenous water values, rights and development goals in the Fitzroy catchment

An activity within the Northern Australian Water Resource Assessment

The Northern Australia Water Resource Assessment (NAWRA) is a large research project, led by CSIRO in partnership with the Australian Government. Scientists from CSIRO are investigating opportunities for water, agricultural and other related development in three priority regions of Northern Australia. One of these is the Fitzroy catchment in Western Australia. The work includes research focused on Indigenous people – the water values they have, the rights they hold, and the development goals that are important to them.

Indigenous people have lived on the country for many thousands of years. Throughout that time they have developed knowledge of the landscape and strong connections with it. Ongoing economic development can provide jobs and income opportunities for people. However, it can also put new pressure on the country as the number of people and businesses grow and water use increases. CSIRO is working at the different development possibilities, but CSIRO is not a developer and is not advocating for water development. Its role is to provide better information for the governments and communities when considering future water, agricultural and other related development options. One part of this role is listening to interested Indigenous people about what water issues exist and what kind of future development path they want for themselves and their communities.

Indigenous views might include the need to protect important or sacred places and to keep enough water in the rivers for Indigenous hunting and fishing. It might also include goals and ideas for Indigenous economic development. This could be an Indigenous-run business that needs a secure water supply or Indigenous employment in businesses run by others that also need water. This valuable information will provide foundations for better future water communication between Indigenous people, government planners, and private developers in the future.

Marcus Barber and Pethie Lyons are the CSIRO researchers who will be gathering these vital Indigenous views, interests, and ideas. Marcus has worked on Indigenous water projects across Northern Australia and Pethie is working on a National Environmental Science Project with Indigenous people that is also focused on the Fitzroy catchment. Marcus and Pethie are interested in talking to Indigenous people with cultural connections to the Fitzroy catchment and/or who are living in and around towns like Derby and Fitzroy Crossing. The main research will happen from late 2016 and in 2017, with results shared in early 2018.





Thank you

Ian Watson, CSIRO Townsville

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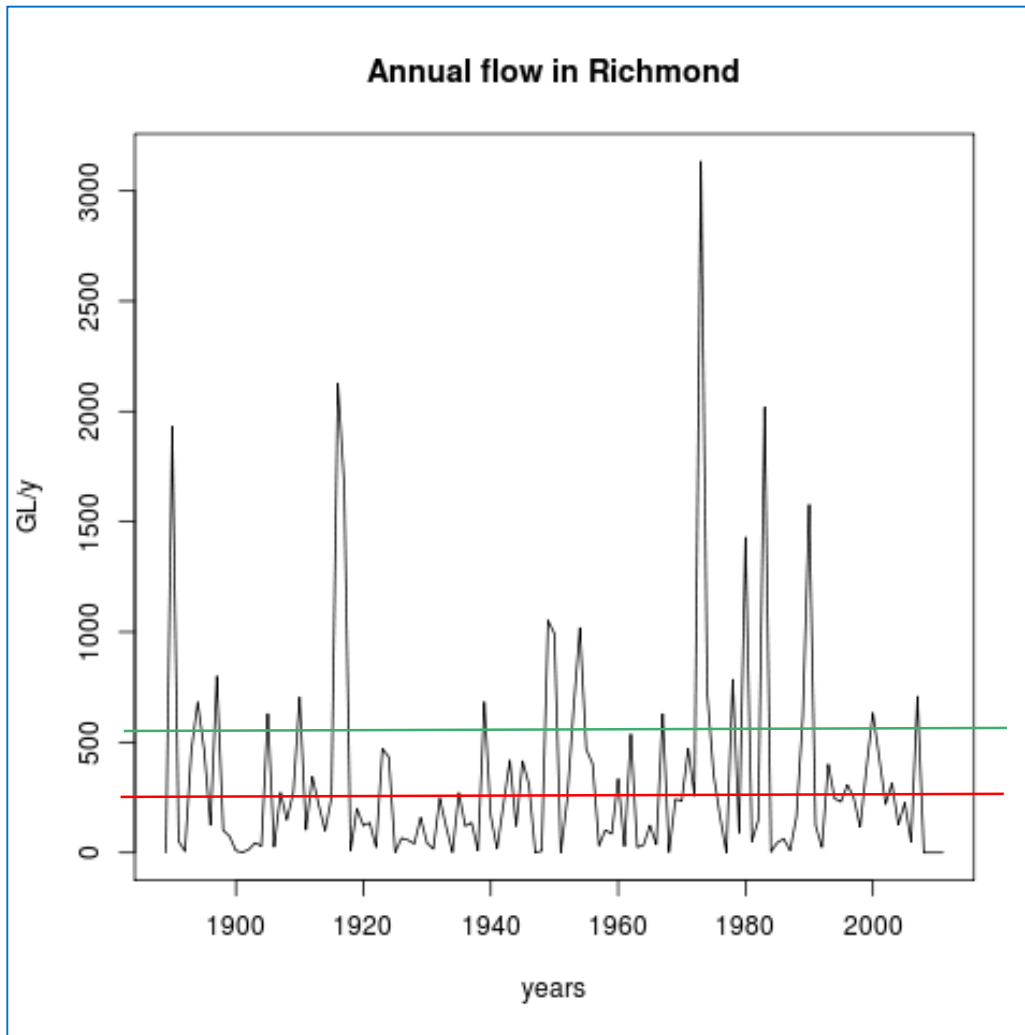
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Water is not guaranteed each year



Mean = 540 GL/yr

Median = 262 GL/yr