

Gwydir Selected Area: Research

Research project title	Date of completion	Objectives	2020-21 progress/findings
GW1: Modelling inundation extent - Gwydir Wetlands and Gingham Watercourse	31/03/2021	* Train WD MER project staff in Data Cube and MDB Sat access and use.	Project complete. Findings presented in Appendix I: Gwydir Hydrological Research
		* Access the Geoscience Australia Data Cube and wetland/water related indices.	
		* Capture a set of high-resolution satellite and aerial images to compare against the derived Data Cube products.	
		* Provide a quantitative accuracy assessment of products derived from the Data Cube.	
		* Develop a range of products specifically for the Western Floodplain, incorporating field data, local knowledge, data from LTIM derived system maps, depth loggers and vegetation communities.	
GW2: Building resilience: understanding ecological thresholds in low flow refugia	31/6/2022	* Define, identify and describe chemical and biophysical characteristics of refuge habitats.	Three field sampling trips were undertaken for this project in 2020-21 (October 2020, November 2020, February 2020) that collected water quality data and invertebrate samples. Remaining Temperature, PAR, atmospheric pressure and dissolved oxygen loggers downloaded in November and December. Future fieldwork will be undertaken in collaboration with the food webs indicator of the MER project, in Spring/Summer 2021. Project is on schedule.
		* Characterise biogeochemical processes, foodweb structure and target species they support, and how these change over time with refuge maintenance, or disconnection, contraction and then reconnection.	
GW3: Developing a model to predict food web responses to environmental water delivery	31/03/2022	* Develop a bioenergetic food web model using Ecopath.	Three field sampling trips were undertaken for this project in 2020-21 (October 2020, November 2020, February 2020) that collected water quality data and invertebrate samples.
		* Model food web response under different environmental flow scenarios.	

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			<p>Remaining Temperature, PAR, atmospheric pressure and dissolved oxygen loggers downloaded in November and December.</p> <p>Specific primary productivity and metabolism field experiments undertaken in May 2021 to gather data that will improve northern basin metabolism models in collaboration with MER Basin scale food web researchers.</p> <p>Future fieldwork will be undertaken in collaboration with the food webs indicator of the MER project, in spring/summer 2021.</p> <p>Project is on schedule.</p>
GW4: Ecosystem Response to fire and the influence of environmental water	30/06/2022	* What is the response of wetland vegetation communities to fire of differing severity (from DPIE-EES mapping)?	<p>17 burnt and unburnt sites within Gingham watercourse surveyed for vegetation diversity in October 2020. Due to time and access constraints, sites were not surveyed in Winter 2021, but will be surveyed in line with future MER vegetation surveys.</p> <p>Mesocosm experiments complete and data analysed. Preliminary findings on seedbank study presented at 10ASM conference (Vincent <i>et al.</i> 2021)</p> <p>Project is on schedule.</p>
		* What is the water quality (nutrient and algae) and microinvertebrate response to rewetting in sediments exposed to differing fire intensity?	

Research project title	Date of completion	Objectives	2020-21 progress/findings
GW5: Biodiversity responses to environmental water (multiple projects)	GW5.1: Fish Movement - 31/12/22 (revised project description)	* What is the broad scale movement patterns of golden perch in response to the delivery of water for the environment and natural flows in the Gwydir River system?	Tagging of relocated fish completed April 2021. Batteries replaced in receivers in May 2021 (Appendix F: Fish Movement). Data download planned ASAP. Project is on schedule.
	GW5.2: Turtle capture-mark-recapture - 31/12/2021	* To assess the recruitment and size distribution of turtles in northern-western populations of freshwater turtles in the MDB.	Transmitters are still active on tagged turtles. However, Masters student currently on a leave of absence.
		* To quantify the density of turtles and distribution of species in habitats with different flow characteristics.	
GW5.3: Frog Recruitment - 31/12/2021	* To quantify the behaviour of north-western turtle species in relation to environmental variables.		
		* To quantify frog diversity and abundance and breeding activity of frogs in the Gwydir region.	Masters thesis has been submitted for assessment Project is on schedule.

Gwydir Selected Area: Contingency Monitoring

Monitoring element	Indication of monitoring	2020-21 progress
Connectivity events	Opportunities to monitor connectivity events are expected in drier years following a wetter year (to replenish water availability). The monitoring would track water quality and fish responses to connectivity events released from Copeton Dam along the length of the Gwydir River, and in the Mehi River and/or Carole Creek. Outcomes will help better understand the response of water quality and fish to 'first flush' flows through to monitoring fish recruitment from connection events.	No specific monitoring of connectivity events was undertaken in 2020-21.
Waterbird recruitment	Opportunities to monitor waterbird recruitment are expected in wetter years. The well-known colonial bird rookeries within the Gingham-Gwydir Watercourse rookery areas will be the target of event-driven survey effort. Surveys of colonial bird breeding events and fledgling success will be assessed using standard methods in collaboration with DPIE-EES. Surveys will be initiated by confirmed commencement of bird breeding events and continue to fledgling.	No colonial waterbird breeding was identified 2020-21.
Fish recruitment	Monitoring of fish recruitment could occur in any year. Additional fish methods and evaluation over and above standard methods will target event-based fish recruitment in the lower Gwydir, and follow spawning through time to successful recruitment. This monitoring would focus on specific flow releases with targeted fish objectives, monitoring the hydrology, habitat and food resources and otoliths to tie to flows that are supporting recruitment events in the lower Gwydir.	No specific monitoring of connectivity events was undertaken in 2020-21.
Low flow refuges	The focus of this monitoring of refuges will be in drier years. This monitoring will consider the duration of cease-to-flow events at waterholes, and monitor how the habitat and food changes.	Extensive monitoring undertaken throughout 2020-21. Please see Appendix H: Gwydir Low Flows, for further details and results.

Monitoring element	Indication of monitoring	2020-21 progress
Watercourse biodiversity	This monitoring could occur in all years. The monitoring will help to develop a holistic biodiversity response to specific environmental watering events.	Sampling for Watercourse Biodiversity was undertaken in June 2021. A follow-up trip is planned for Spring/Summer 2021 with reporting to be completed within 2 months of sampling.
Incident response monitoring	This monitoring could happen in any year. Opportunistic monitoring can be undertaken for water quality (spot measures and samples) or ecological indicators (fish, frogs, turtles, birds, mussels, platypus, other) as agreed between UNE and the CEWO.	One incident response monitoring trip was undertaken in 2020-21. Please see Appendix G: Barwon Contingency Monitoring for further details and results.

Gwydir Selected Area: Communications and Engagement

Outcomes and Outputs 2020-21

1 Objectives

1.1 Pre-COVID-19 restrictions

- Teleconference (or face to face meeting if possible) with CEWO team including the northern LEOs, and any other representatives of government agencies or the community nominated by the CEWO (e.g. possibly DPIE EES and MDBA Regional Engagement Officers)
- Regular flow of photographs that can be used in CEWO products (such as ‘updates’) and which include people and researchers in some photographs. This would include unusual species – possibly Hyrtl’s tandan – or charismatic species such as brolgas and magpie geese
- Selected Area newsletter (as per the Basin-scale contract)
- Northern Basin Research workshop
- Annual communications and engagement report
- Meeting with northern Local Engagement Officers, face to face in Moree (November 2020), to share progress, receive feedback
- Meeting with northern Local Engagement Officers, face to face in Bingara (February 2021), to share progress, receive feedback
- Contribute to the Basin scale web site
- Cultural Advisor pilot program developed in cooperation with CEWO Local Engagement Officers Jason Wilson and Jane Humphries – Liz Taylor appointed as Cultural Advisor
- Regular conversations with the northern LEO’s to discuss opportunities
- Academic events (conference presentations and papers)

1.2 Post-COVID-19 restrictions (version 2)

- Increased to monthly for the broader team (measure - conferences conducted)
- Regular flow of photographs that can be used in CEWO products (such as ‘updates’) and which include people and researchers in some photographs. May be limited if field restrictions remain long term
- Selected Area newsletter (as per the *core monitoring* contract)
- Northern Basin Research workshop

- Participation in community events partly undertaken in early 2020, restricted at present – alternative effort on online engagement. (measure – online stories developed and shared)
- Annual communications and engagement report
- Contribute to the Basin scale web site
- Curriculum development (in conjunction with the northern LEOs)
- Collaborating with Gwydir Cultural Advisor, Liz Taylor to enhance Aboriginal engagement
- Regular conversations with the northern LEO's to discuss opportunities
- Field events are highly restricted, radio interviews undertaken with 2WEB and online story sharing approach developed (measure – stories shared)
- Academic events - conferences postponed in 2020, papers ongoing. Continue preparing academic papers, participate in online fora.

2 Outcomes

Period	Deliverable	Reflections
Ongoing	<ul style="list-style-type: none"> At least one videoconference per quarter with CEWO team including Canberra staff and the northern LEOs, and any other representatives of government agencies or the community nominated by the CEWO Monthly (approximately) teleconferences with CEWO LEO's and MDBA REO's for planning, sharing progress and receiving feedback Regular flow of photographs that can be used in CEWO products (such as 'updates') and which include people and researchers in some photographs Continue to publish flow event updates produced by the CEWO on the 2rog website. Engagement of an Aboriginal Cultural Advisor to help inform Indigenous communication and engagement. Currently for 2021 only 	<ul style="list-style-type: none"> Achieved. Achieved. Achieved and ongoing. Achieved and ongoing. Achieved and ongoing.
Annual	<ul style="list-style-type: none"> In-person catchup with REO's and LEO's to workshop communication and engagement priorities and strategies Teacher training with Moree East Central School On-Country event sharing science and culture with the broader community in the Gwydir wetlands. To be held in either 2021 or 2022 whenever the gods are willing 	<ul style="list-style-type: none"> Achieved. Hindered by COVID-19 outbreak. Underway.
Every three months (starting March 2021)	<ul style="list-style-type: none"> Selected Area newsletter (as per the Basin-scale contract) 	<ul style="list-style-type: none"> Achieved.
February 2021 /February 2022 (TBC)	<ul style="list-style-type: none"> Northern Basin Research workshop Participate in a community event / knowledge sharing / field day (or events) if COVID-19 restrictions allow 	<ul style="list-style-type: none"> Achieved. Achieved and ongoing.
Ongoing	<ul style="list-style-type: none"> Develop and publish at least six online stories for the Gwydir Selected Area per year, including at least one per quarter with introductory text and links to these online stories to be included in the quarterly newsletters. This introductory text would cover one of the below aspects: description of monitoring and research activities and why the findings matter; emerging trends and outcomes; staff and community monitoring experiences; and integrating monitoring data into a broader ecological narrative Develop and implement strategies for sharing these stories, including working with local media such as radio and newspapers. 	<ul style="list-style-type: none"> Achieved and ongoing. Ongoing.

	This may include press releases and local radio presentations linked to key outcomes or events	
September 2021 and 2022	<ul style="list-style-type: none"> Annual communications and engagement report included in the Annual Selected Area Evaluation Report. This report will provide a summary and evaluation of Aboriginal engagement activities undertaken across the period of the work order, including: <ul style="list-style-type: none"> the approaches used to support engagement activities over the period; outcomes from the engagement activities; and an evaluation of the different approaches and techniques undertaken through the Aboriginal engagement activities 	<ul style="list-style-type: none"> Underway.
On going	<ul style="list-style-type: none"> Contribute to the Basin scale Flow-MER web site Aboriginal engagement planning and delivery – including through listening with LEOs and others. Working with Aboriginal communities to build and share knowledge through the wetland resources table/guide 	<ul style="list-style-type: none"> Achieved. Achieved and ongoing.
As requested/arranged	<ul style="list-style-type: none"> Meetings and field events (can be held online if COVID-19 travel restrictions in place) Academic events (conference presentations and papers - can be held online if COVID-19 travel restrictions in place) 	<ul style="list-style-type: none"> Achieved. Achieved.

3 Lessons learned

This section reflects on activities that were achieved in the water year.

The November trip to meet with and listen to Aboriginal community groups (JMAC, LALC, Maranguka and local schools in the Gwydir catchment) was a great start to our engagement. Unfortunately, travel restrictions meant that we had to postpone planned on-country activities but these are ready for 2022 with any luck. In-person engagement always seems to be best.

Regular meetings with the LEOs and REOs proved beneficial and we will look to continue these throughout the project. The online meeting platforms work well for regular meetings considering the distances people are apart. However, it will be nice to re-engage face to face when possible. A combination of both face to face and online will work best.

The Northern Basin Research Workshop has been a feature of our learning and engagement with cognate agency groups. The event in February 2021 was well received and we will endeavour to hold this type of meeting annually.

In regard to our online work, social media post interactions have been variable during the 2020-21 water year. Posts 3 and 9 both highlighted our cultural collaboration with Gamilaraay artist, Lakkari Pitt, and attained the best performance across our social media platforms as indicated by high rates of post interaction (Table 1, Figure 1). There is currently immense support for increased Aboriginal representation and leadership within the Australian water space. The commissioning of artwork from Lakkari Pitt seemed to

work in with this growing support. Posts 5 and 8 were of a more scientific theme and received the least online interaction. We believe that a diversity of material is best to capture diverse interest in the community more broadly.

Note that Figure 1 draws from interaction with the 2rog social media accounts only. It doesn't include interactions from the UNE accounts or individual team members so the numbers of interactions with these posts is likely to be much higher than reported here.

Lastly, a number of these communications focussed on the Warrego-Darling and Gwydir Selected Areas simultaneously to efficiently distribute attention across the two sites.

Table 1 Titles and total online performance of the Flow-MER 'stories' published online from July 2020 to June 2021. Total interactions is the sum of total likes, comments and shares each story acquired after being posted on the media platforms managed by 2rog Consulting (i.e. Twitter, Facebook and LinkedIn).

2020-21 publications	Title	Date published online	Total online interactions
1	Big dry survivors	1/7/20	19
2	Wading through the Warrego	15/7/20	43
3	Flow-MER x Lakkari Art	16/9/20	145
4	Murray cod: an icon of the Murray-Darling Basin	9/12/20	56
5	When wetlands boom	26/2/21	14
6	A turtles go with no flow	6/3/21	17
7	A guide: monitoring river systems during a global pandemic	14/3/21	19
8	Restarting dry rivers: risks to water quality	18/3/21	16
9	A look at the Gwydir march 2021 flows	4/5/21	21
10	White-bellied sea-eagle spotted at Warrego River's Boera Dam	10/6/21	22
11	Migratory birds in the Warrego: a home away from home	28/6/21	24
12	Q&A: Lakkari Pitt	7/7/21	61

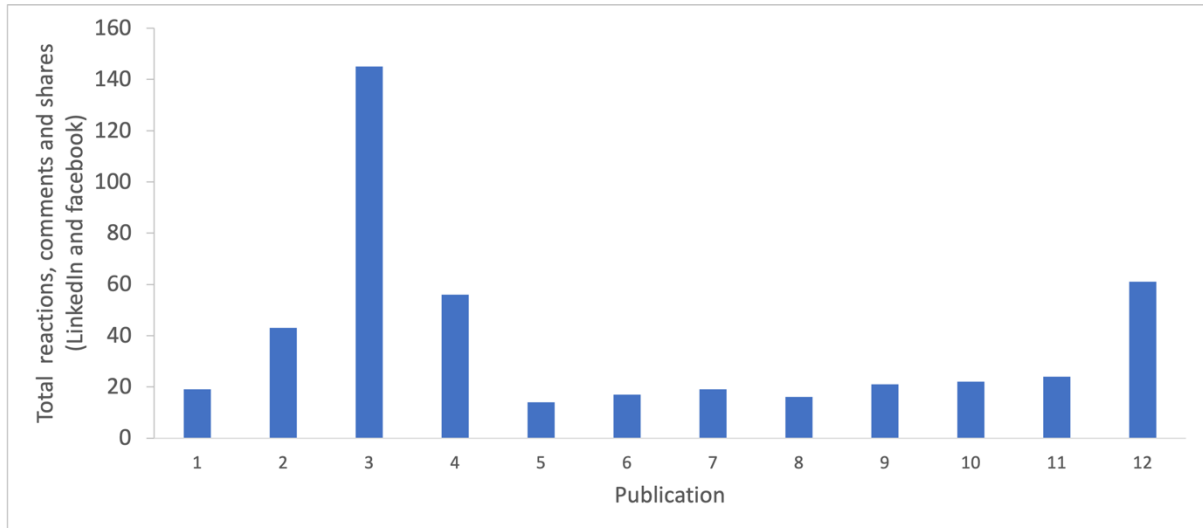


Figure 1 Reactions, comments and shares across LinkedIn and Facebook social media platforms from July 2020 to June 2021.