



FLOODPLAIN HARVESTING – GWYDIR VALLEY

Rainfall run-off exemption & modelling outcomes

Supplementary report

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Executive summary

The department has proposed a regulation to exempt some of the rainfall runoff that is collected in a tailwater return drain from requiring a water access licence and a water supply works approval. [Further information about this exemption is available on our website.](#)

The successful commencement of this exemption impacts the way floodplain harvesting is modelled in the Gwydir Valley, as its practical effect is to exclude this volume from the definition of floodplain harvesting.

The proposed rainfall run-off exemption has the potential to impact floodplain harvesting modelling in the Gwydir Valley. This report clarifies the scale of this potential impact on entitlements, the environment, and downstream outcomes.

This report shows that the most significant changes resulting from the exemption relate to the volume estimates of floodplain harvesting and the entitlements required to deliver the outcomes of the NSW Floodplain Harvesting Policy.

Environmental outcomes are predominately driven by changes in overbank flows and hence are insensitive to the proposed rainfall runoff exemption.

Likewise, downstream outcomes are insensitive to the proposed rainfall exemption, because of the volumes involved and because the rainfall runoff exemption will only apply at times when there is no other overland flow being taken.

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Effect of the rainfall run-off exemption on floodplain harvesting modelling Gwydir Valley

The proposed rainfall run-off exemption has the potential to impact floodplain harvesting modelling in the Gwydir Valley. This report clarifies the scale of this potential impact on entitlements, the environment, and downstream outcomes.

This report should be read in conjunction with the report: [Floodplain harvesting entitlements for the Gwydir Valley regulated river system \(DPIE Water\)](#).

Rainfall run-off exemption

The department has proposed a regulation to exempt rainfall runoff that is collected in a tailwater return drain from requiring a water access licence and a water supply works approval. The successful commencement of this exemption impacts the way floodplain harvesting is modelled in the Gwydir Valley.

A tailwater return drain is used to collect used irrigation water. When water is applied to a field, the water that does not soak into the soil runs off and is collected in a tailwater drain for reuse. This water has already been measured and accounted for under a relevant licence. When it rains, rainfall run-off mixes with the used water in the tailwater drain. It is impossible to confidently and accurately measure and account for the rainfall run-off separately from the volume of used irrigation water.

Run-off from land that has been developed for irrigation can be up to four times higher, on average, than undeveloped land due to levelling and drainage earthworks, and the regular application of water for irrigation. It is not yet resolved whether all or part of the rainfall runoff water collected in irrigation tailwater systems constitutes a diversion. This runoff can also contain silt, nutrients, and other agricultural products that should be kept out of rivers and streams.

The department has committed to the development of a state-wide policy for assessing and managing the growth in runoff collected through tailwater drains as an interception activity under the Basin Plan 2012. This policy will also consider the approach being taken by other Basin States through their Water Resource Plans and will ensure NSW farmers can manage their properties efficiently, while ensuring that overall water take is within legal limits.

The proposed regulation clarifies when rainfall run-off harvested from tailwater return drains needs to be measured. Measuring the volume of rainfall-runoff captured in tailwater return drains would not be required when the drains are the only structure intercepting water. At all other times, the exemption would not apply, and the volume of water collected in tailwater return drains must be measured and accounted for under a water access licence.

For modelling, the following practical definitions have been applied¹:

Exempt rainfall runoff harvesting is defined as that which occurs from fallow or cropped areas on days when no water is being harvested from outside the farm.

Non-exempt rainfall runoff harvesting is defined as all runoff harvesting that occurs when water is being harvested from outside the farm.

The Water Management (General) Amendment (Exemption for Rainfall Run-off Collection) Regulation 2020 is expected to commence in March 2021.

¹ Rainfall run-off from undeveloped land on a farm is not exempt and is modelled separately to run-off from developed land on the farm.

Impact on floodplain harvesting modelling

Modelling undertaken by the department was used to estimate the volume of water taken by floodplain harvesting in the Gwydir Valley regulated river system. This modelling work is described in the Gwydir Model Build² and Gwydir Scenarios³ reports that are now available on the DPIE Water website. These reports should be read in conjunction with this report.

The modelling results in the Gwydir Scenarios report have assumed that the rainfall run-off exemption will not be in place when licensing of floodplain harvesting formally commences. Should the exemption be in place:

- the diversion limit set by the water sharing plan will need to be revised to exclude the exempt rainfall run-off harvesting
- assessment of growth in water use in the valley will need to be revised to exclude the exempt rainfall run-off harvesting
- licences will need to be recalculated to exclude the impacts of growth in exempt rainfall run-off harvesting.

Plan Limit Scenario – the version of the Gwydir Valley model that estimates the limit on diversions set by the water sharing plan.

Current Conditions Scenario - the version of the Gwydir Valley model that estimates the current level of diversions.

(Valley Scale) Compliance Scenario - the version of the Gwydir Valley model that estimates the level of diversions with the proposed licences and management rules in place.

Results from the Gwydir Scenarios report are shown in in [Table 1](#). Additional details have been included to show the exempt and non-exempt rainfall run-off harvesting model results. A Valley Scale Compliance scenario without the exemption in place (column C) and a Valley Scale Compliance scenario with the exemption in place (column D) is provided.

The additional model results at column D show how the compliance results change if the exemption is in place, and the growth in exempt rainfall run-off is managed separately. This is the intended approach for licensing floodplain harvesting.

The modelling results that have previously been published in the Scenario report are also included in column E for reference.

Table 1: Modelled long term (1895 to 2009) average diversions (GL/year) under the Plan Limit, Current Conditions and Valley Scale Compliance Scenarios

Diversions category	(A) Plan Limit Scenario (1993/94 Cap)	(B) Current Conditions Scenario	(C) Compliance Scenario (without exemption)	(D) Compliance Scenario (with exemption)	(E) Compliance Scenario ⁴ (Published Scenarios Report)
General and high security	216.5	213.5	218.0	216.6	217.8

² Building the river system model for the Gwydir valley regulated river system.

³ Floodplain harvesting entitlements for the Gwydir valley regulated river system.

⁴ Included for reference

Supplementary access	111.2	92.9	93.6	92.7	92.8
Floodplain harvesting					
Overbank flow harvesting	66.1	122.2	80.4	82.2	68.9
Exempt rainfall run-off	27.6	36.3	n/a	41.1	42.3
Non-exempt rainfall run-off	10.0	15.5	38.0	11.0	9.5
Total Diversions (less exempt RR)	403.8	444.0	430.0	402.5	389.0
Total Diversions	431.4	480.3	430.0	443.7	431.3
Estimated floodplain harvesting licence shares			130,000	108,000	90,000

Note: Totals may have slight differences due to rounding.

These results show that, without the exemption, the Plan Limit for the regulated river system would be adjusted to be 27.6 GL/year higher, with a total Plan Limit of 431.4 GL/year.

The results at column C show that, without the exemption, the volume of rainfall run-off that would be licensed would be larger. However, the total volume of rainfall harvesting permitted would be lower than with the exemption (exempt plus non-exempt rainfall run-off at Column D).

The results at Column D show that total diversions (less exempt rainfall run-off) are within the Plan Limit equivalent total.

The number of floodplain harvesting licence shares that would be issued also varies between compliance scenarios modelled.

The number of shares is lowest for the existing Scenarios report (Column E), with 90,000 shares. This is because the licence shares are scaled back to account for growth in *all* rainfall run-off, but the exempt rainfall run-off is not licensed.

The number of floodplain harvesting licence shares for the intended approach with the exemption in place (column D) is 108,000 shares. Growth in use by exempt rainfall run-off will be managed separately, hence only non-exempt rainfall run-off harvesting is reflected in the number of floodplain harvesting shares reported against the licence. The number of floodplain harvesting licence shares would increase further without the exemption in place (column C) to 130,000 to reflect that all rainfall run-off harvesting would be reported against the licence.

Impact on environmental outcomes

The assessment undertaken by the department to estimate the environmental outcomes from licensing floodplain harvesting on the Gwydir Valley floodplain is described in the Gwydir

Environmental Outcomes report⁵ that is available on the department's website. This analysis uses the same methods to assess any changes to the hydrological and environmental outcomes with and without the exemption. The results reflect predicted changes across eight breakout zones in the Gwydir valley (**Error! Reference source not found.**).

Predicted hydrological outcomes

Magnitude (e.g., flood volume), frequency, duration and timing are all ecologically important hydrological features of the floodplain flow regime. A range of ecologically relevant flow metrics were used to describe high-level changes to floodplain hydrology.

The results in [Table 2](#) show the variability in modelled hydrological outcomes with and without the exemption. On average, the without exemption scenario provides slightly better outcomes for most metrics but reduced outcomes for others, although the average change across all metrics was only 1-2%. Seven of the ten metrics reported in [Table 2](#) increased without the exemption applied when averaged across the eight breakout zones. The mean annual volume in flood years⁶ also increased by 1-2% in half of the breakout zones (**Error! Reference source not found.**). The improvements to spring and summer flood volumes and total flow days are of particular importance for floodplain ecosystems due to the increased biological activity in these periods.

Predicted environmental outcomes

The predicted ecological responses to changes in floodplain hydrology provide an assessment of the potential environmental outcomes. The ecological responses are based on the achievement of the environmental water requirements for documented assets and values on the floodplain. The percent change results in **Error! Reference source not found.** provide a high-level summary of the average change to a number of metrics important for waterbirds, native vegetation and native fish across the floodplain breakout zones.

The achievement of key environmental water requirements is predicted to increase in some breakout zones with the exemption, whilst others remain unchanged or are reduced (**Error! Reference source not found.**). This is contrary to the predicted hydrological outcomes in [Table 2](#) which suggest better outcomes without the exemption. The exemption is predicted to increase outcomes for waterbirds in two zones and native fish in four zones. Removing the exemption improved outcomes for waterbirds in two zones and native fish in one zone. Achievement of native vegetation environmental water requirements reduced by 1% in two zones without the exemption applied.

Table 2 Percentage change in ecologically relevant flow metrics after implementation of the policy with and without the rainfall run-off exemption. Averages are calculated from results across the 8 breakout zones in [Figure 2](#).

Hydrological feature	Flow metric	Exemption	Largest % change	Smallest % change	Average % change	Breakout with the greatest % change
Magnitude	Total autumn volumes	With	63	9	24	Deadmans/Biniguy
		Without	65	10	25	Deadmans/Biniguy
	Total winter volumes	With	19	2	11	Mehi/Moomin
		Without	18	2	10	Deadmans/Biniguy
	Total spring volumes	With	43	2	13	Deadmans/Biniguy
		Without	45	2	15	Deadmans/Biniguy
Total summer	With	31	7	19	Mehi/Moomin	

⁵ [Environmental outcomes of implementing the Floodplain Harvesting Policy in the Gwydir valley](#)

⁶ A flood year is considered any year where flow was modelled on the floodplain

Hydrological feature	Flow metric	Exemption	Largest % change	Smallest % change	Average % change	Breakout with the greatest % change
	volumes	Without	32	7	21	Mehi/Moomin
Duration, frequency and timing	Number of events	With	101	0	19	Gwydir/Gingham
		Without	89	0	20	Gwydir/Gingham
	Total autumn days with flow	With	63	1	14	Gwydir/Gingham
		Without	54	1	13	Gwydir/Gingham
	Total winter days with flow	With	18	2	7	Gwydir/Gingham
		Without	15	1	5	Gwydir/Gingham
	Total spring days with flow	With	16	-2	3	Gwydir/Gingham
		Without	15	-2	5	Gwydir/Gingham
	Total summer days with flow	With	57	2	13	Gwydir/Gingham
		Without	58	2	14	Gwydir/Gingham
	Mean inter-event period*	With	-51	0	-12	Gwydir/Gingham
		Without	-49	0	-14	Gwydir/Gingham

*Negative % change is a good outcome for the value or asset as the mean period between floods (inter-event period) has reduced

Although most of the tested metrics improved slightly without the rainfall run-off exemption applied, overall the predicted hydrological and environmental changes of implementing the policy are unlikely to change substantially with or without the exemption applied. This information should be considered alongside the findings in the downstream outcomes section below.

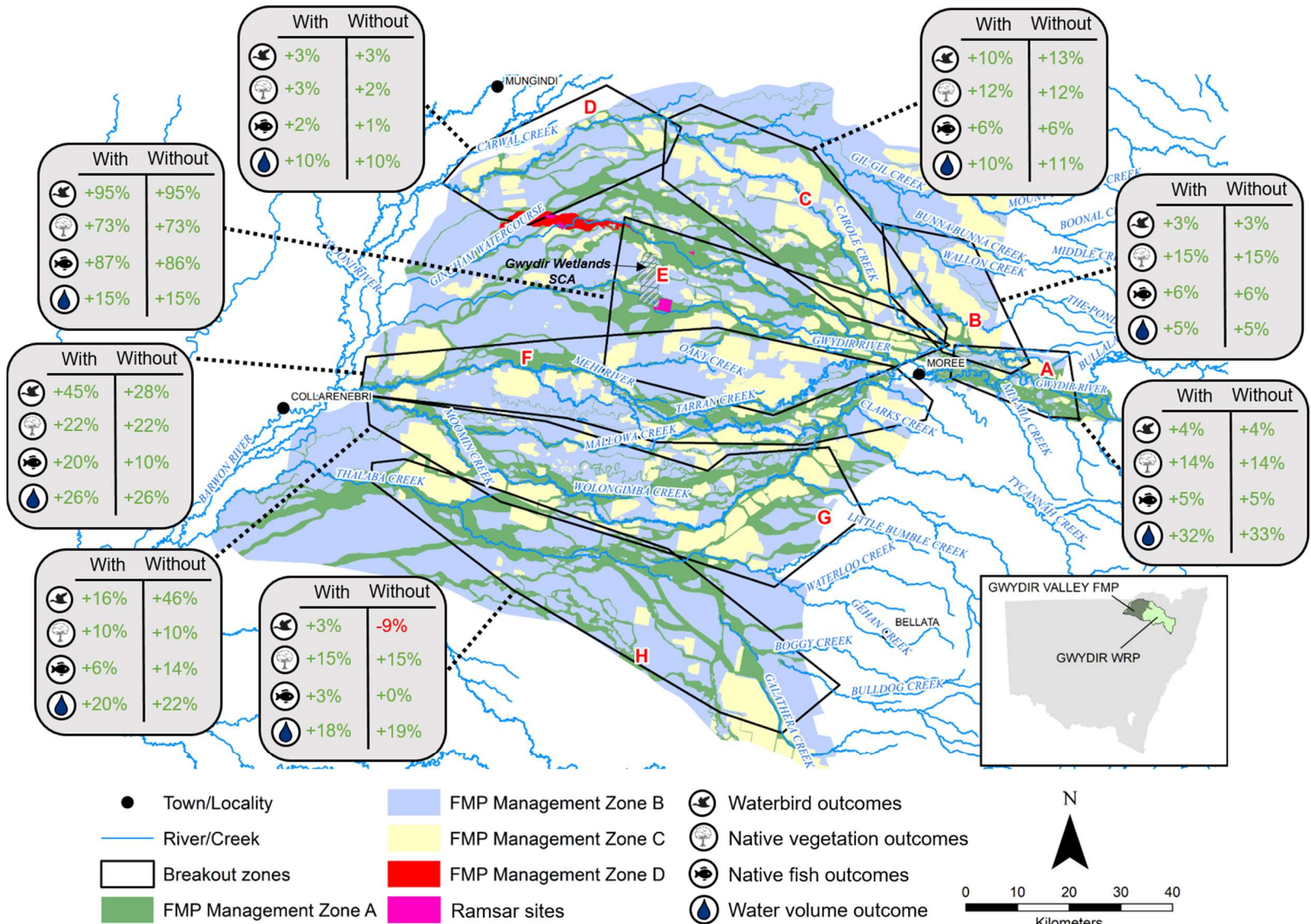


Figure 1 Mapped summary of predicted outcomes for waterbirds, native vegetation, native fish and water volumes for the 8 breakout zones on the Gwydir valley floodplain. Percent change values show the predicted change from current (no policy) to current with policy implemented based on a 121-year simulation period. Values for waterbird, native vegetation and native fish outcomes are the average percent change in achieving key EWRs at each breakout zone. Water volume outcomes are the percentage change in mean annual volumes during flood years. FMP = Floodplain Management Plan. Breakout zones from most upstream to most downstream: A Deadman/Biniguy, B Marshall, C Carole/Gil Gil, D Gil Gil/Carole, E Gwydir/Gingham, F Mehi, G Moomin Creek, H Thalaba

Impact on downstream outcomes analysis

The licencing of floodplain harvesting, and its return to within statutory limits, will restrict the volume of water that can be taken from the floodplain and provide gains to the system through foregone diversions. It is not yet possible to estimate what improvement to flows in rivers and creeks may occur from this restriction to water taken on the floodplain. However, any improvements in upstream systems such as the Gwydir (which provides on average 6% of Barwon-Darling inflows) may translate to improvements further downstream in the Barwon-Darling River system.

The assessment undertaken by DPIE Water to estimate the downstream outcomes of implementing the policy is described in the Gwydir Downstream Outcomes Report⁷ now available on the DPIE Water website. This assessment tested what the outcomes would be if all reductions in floodplain harvesting resulted in water being returned to river flows. This represents an upper limit to the potential improvements in river flows that is unlikely to actually occur in practice, as we know that not all water that flows on the floodplain will return the river. However, the results are shown to provide affected communities important context regarding the potential for downstream benefits to occur.

In the Gwydir, the upper limit to potential improvements in average end-of-system flows are 27.9 GL/year (16.4%) with the rainfall run-off exemption and by 41.4 GL/year (24.3%) without the rainfall run-off exemption.

Whilst this may appear to be a large change within the Gwydir, this system contributes a very small proportion of the Barwon-Darling inflows. Once flows make their way down the Barwon-Darling to Walgett, the difference between with and without the rainfall runoff exemption represent 1.0% (+3.5% vs +2.5%). As you move further south, this differential continues to decrease and by the time flows reach Wilcannia only a 0.6% difference exists (+2.1% vs +1.5%).

This change is based on the assumption that any change in the capture of rainfall run-off from land developed for irrigation would directly increase river flows. However, in reality the exemption is not expected to change river flows because it will only apply at times when there is no other overland flow being taken.

Next steps

The department will update the model build and scenario report to accompany the making of the water sharing plan. These updates will reflect whether the tailwater exemption has been made.

Updates will not be made to the environmental outcomes or downstream outcomes reports as the purpose of these reports was to inform public submissions on draft rules.

⁷ [Modelled downstream effects of licensing floodplain harvesting in the Gwydir Valley report](#)