

An analysis of the timing of floodplain harvesting events in northern NSW and cease-to-flow periods in the Barwon–Darling system

Some people have suggested that floodplain harvesting extractions cause, or at least contribute to, cease-to-flow events in the Barwon–Darling river system. This fact sheet explores what evidence exists to support this.

The last 30 years of observed flows at Walgett have been compared to modelled estimates of unconstrained floodplain harvesting. During this period, most floodplain harvesting is not occurring during months with cease-to-flow conditions downstream.

A closer inspection of prospective cases of significant floodplain harvesting and cease-to-flow conditions occurring in the same month showed that floodplain harvesting takes a portion of the inflow event and the remainder continues downstream to break the cease-to-flow event.

Methodology

We have summed modelled daily floodplain harvesting diversions across the Border Rivers, Gwydir and Namoi valleys and compared these to observed flows at Walgett. The comparison happens primarily at a monthly time scale as a simple way to consider flow travel times.

The Macquarie River was not included in the analysis because the Macquarie Marshes will generally consume inflows until a large flow event has occurred and the system is generally quite wet.

We selected observed flows at Walgett because Walgett is the closest Barwon–Darling gauge with a high-quality record that is downstream of the 3 selected tributary valleys.

We have used observed flows over approximately the last 30 years to avoid using modelled flows, which have difficulty representing cease-to-flow events. We have also limited the analysis to the last 30 years to capture the period of ‘modern’ levels of development.

The last 30 years also feature extensive and representative periods of cease-to-flow events. While many key headwater dams were appearing along with growing levels of irrigation development from 1960 and on, there were few cease-to-flow periods between 1960 and 1990. This provided limited opportunity to demonstrate co-incident floodplain harvesting and cease-to-flow events.

For this analysis, we have assumed that floodplain harvesting volumes include volumes taken from overbank flows and water taken from local or regional runoff events. We have excluded rainfall runoff capture from developed farm areas, which is also known as exempt rainfall runoff harvesting. We made this choice because we understand that the proposition is generally that floodplain harvesting is either emptying the river or intercepting all the water before it reaches the rivers. Our experience is that if we incorporate exempt rainfall runoff harvesting, it will be difficult to identify the timing of key periods of floodplain harvesting extraction if that is obscured by frequent small rainfall runoff captures occurring within crops.

No attempt has been made to consider travel time of flow events. Typically, there are weeks of travel time between the locations of floodplain harvesting take in the tributary valley and the flow

Floodplain harvesting and cease-to-flow events in the Barwon–Darling



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measurement point at Walgett. This analysis does not attempt to describe how the shape of flow events at Walgett may have been altered by upstream floodplain harvesting actions.

This analysis uses unconstrained estimates of floodplain harvesting, so no licencing or other restrictions are placed on floodplain harvesting access. We expect this will be a reasonable representation of how floodplain harvesting and cease-to-flow events interact in the absence of the licencing framework that has been proposed.

Results

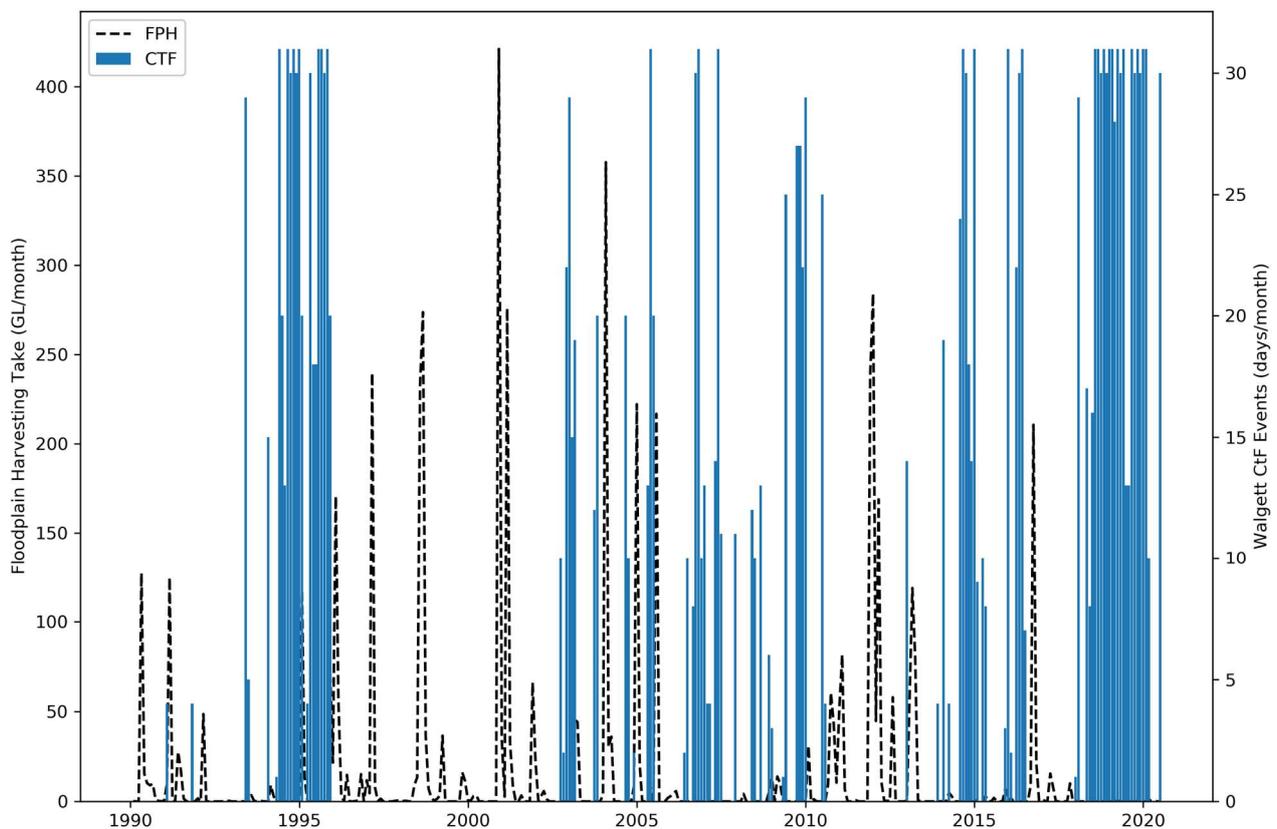


Figure 1. Cease-to-flow at Walgett versus combined floodplain harvesting volumes

In Figure 1, the dotted line represents the total modelled floodplain harvesting volume and the filled blue lines are the number of cease-to-flow days in that month. The figure shows that floodplain harvesting events rarely overlap with cease-to-flow events, although they can be adjacent to each other in time. There are some small floodplain harvesting events in the same month as cease-to-flow events.

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Table 1. Listing of months with cease-to-flow events and floodplain harvesting

Date	Cease-to-flow days	Floodplain harvesting volume (ML)
31/01/1995	20	117,388
30/11/1995	20	75,221
28/02/2003	19	45,741
31/12/2008	3	12,923
31/01/1991	4	9,651
30/11/2004	2	8,257
30/06/2005	20	7,861
30/11/2015	3	7,016
30/11/2008	6	5,018
31/03/2014	4	4,835
30/04/2015	8	2,984
31/01/2016	2	1,739
29/02/2020	10	1,147
31/01/2015	9	876
31/03/2019	31	476
31/12/2012	14	435
30/09/2004	10	361
31/12/2017	1	272
31/12/2009	29	135
31/12/2015	31	70
31/01/2014	19	18
31/03/1995	4	5
31/10/2003	20	1

Table 1 separates and lists all months with both cease-to-flow events and any floodplain harvesting extraction in the Border Rivers, Gwydir and Namoi catchments. An additional 17 months have been excluded because the volume of take was less than 1 megalitre.

The volumes of floodplain harvesting take are ‘at source’ and any contribution to downstream flow outcomes is unlikely for the bottom half of the flows mentioned in Table 1 due to the consumption of flows by natural processes along the route.

We further analysed the first 4 events listed in Table 1 to understand how the timing of cease-to-flow has aligned with the floodplain harvesting take. These events were selected because the volume of floodplain harvesting take is large enough that it is plausible to expect that the take could contribute to downstream flow outcomes and the period of cease-to-flow is sufficiently long to indicate that it was part of an important cease-to-flow occurrence.

Floodplain harvesting and cease-to-flow events in the Barwon–Darling

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Event 1 – January 1995

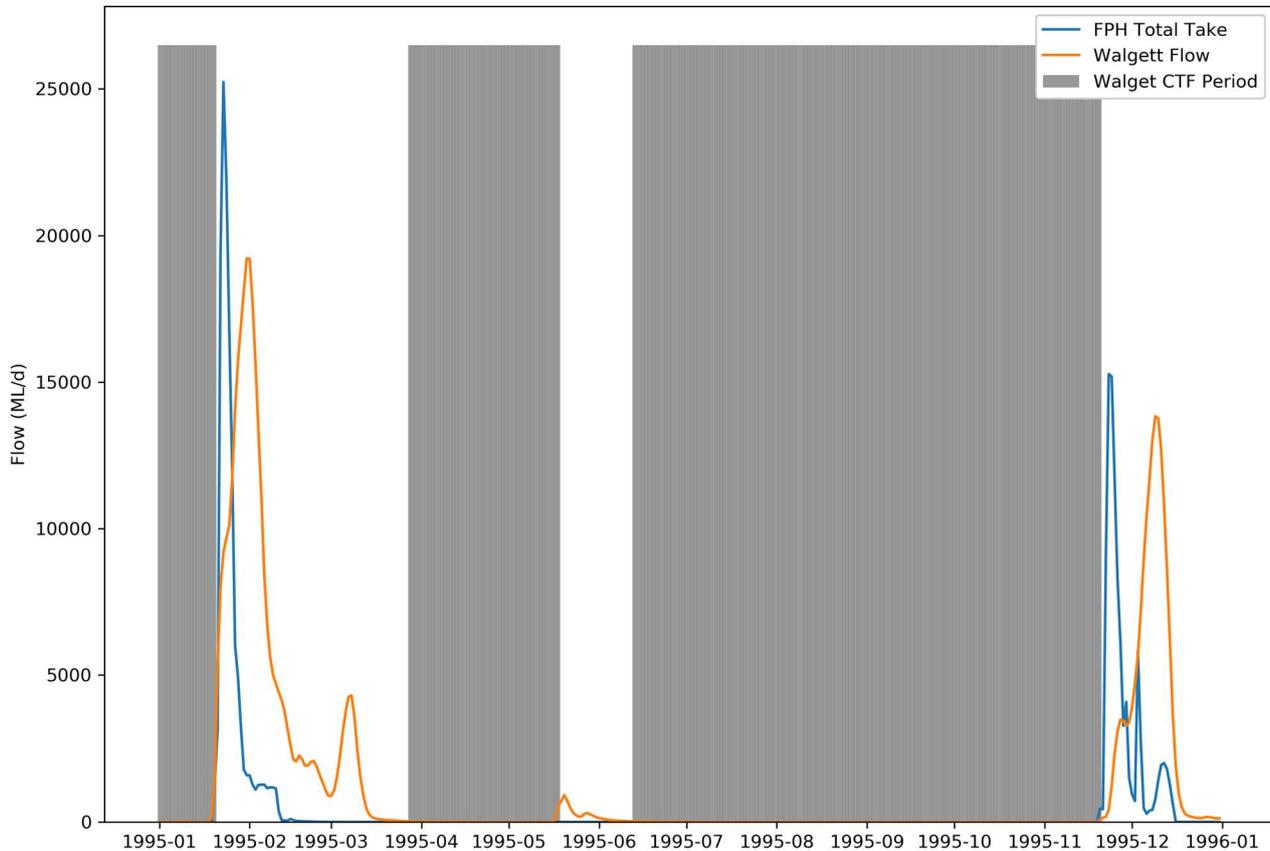


Figure 2. Event analysis for 1995

In January 1995, a significant inflow event occurred that broke a cease-to-flow period. The same thing happened again in December 1995. In both these cases, a large inflow occurred with some of that inflow captured by floodplain harvesting activities and some continuing down the river to break up the general cease-to-flow conditions.

In this year, the estimated floodplain harvesting was 47% of the volume that ultimately reached Walgett. Under perfect conditions, the flows at Walgett could have been 47% higher if we assume that all the floodplain harvesting take would have otherwise reached Walgett. In practice we know that natural processes will result in channel losses and that flows on the floodplain often do not return to the river and instead contribute to ecological functions on the floodplain.

The timing of flows does not support the contention that floodplain harvesting either delayed the end of a cease-to-flow event or hastened a return to cease-to-flow conditions in a material way.

Event 2 – March 2003

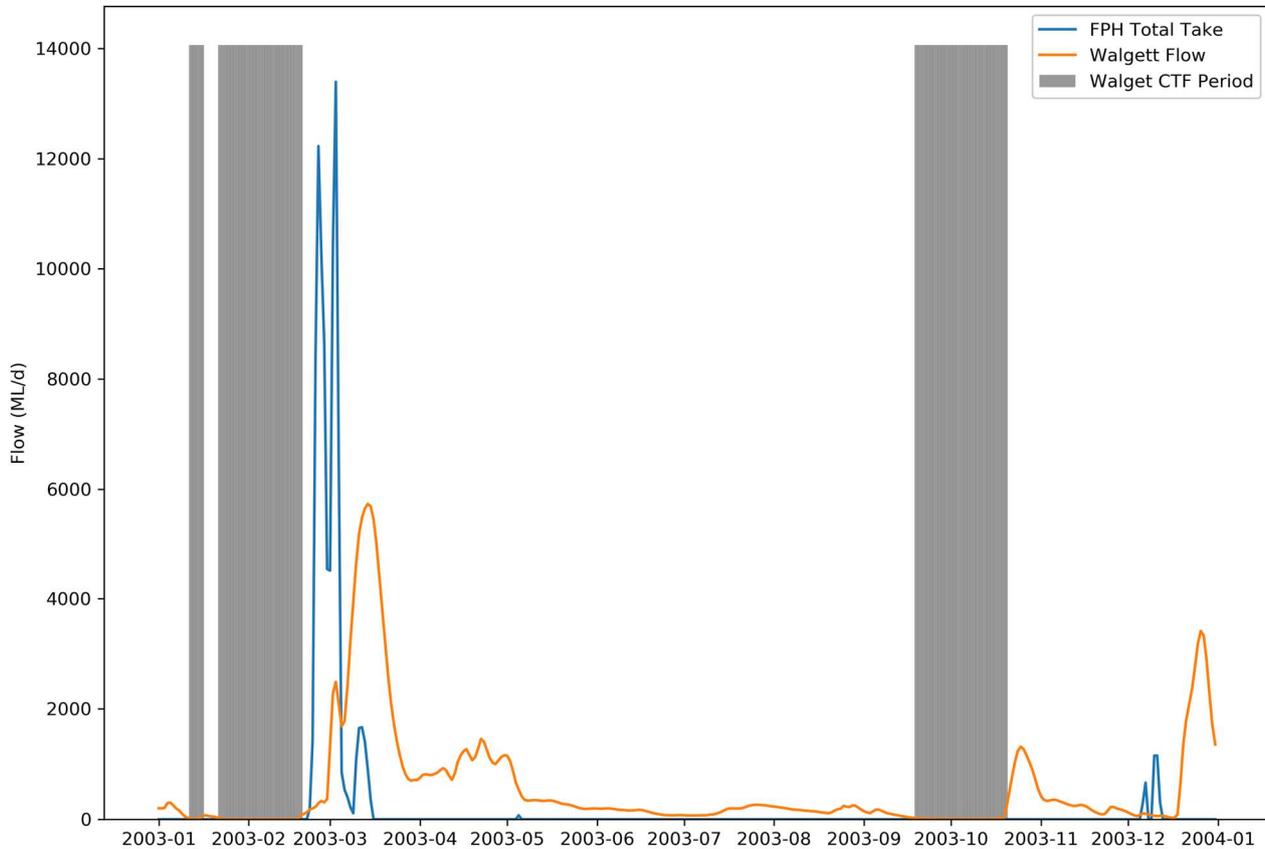


Figure 3. Event analysis for 2003

In late February 2003 a significant inflow event occurred that broke a cease-to-flow period starting in late January. Continued small inflows kept the river at Walgett flowing until mid-September, with no floodplain harvesting take after the first month of the flow event.

The flow that triggered floodplain harvesting access also ended the prevailing cease-to-flow conditions and no floodplain harvesting access occurred anytime near the recommencement of cease-to-flow conditions.

In this year, the estimated floodplain harvesting was 46% of the volume that ultimately reached Walgett. Under perfect conditions, the flows at Walgett could have been 46% higher if we assume that all the floodplain harvesting take would have otherwise reached Walgett. In practice we know that natural processes will result in channel losses and that flows on the floodplain often do not return to the river and instead contribute to ecological functions on the floodplain.

The timing of flows does not support the contention that floodplain harvesting either delayed the end of a cease-to-flow event or hastened a return to cease-to-flow conditions in a material way.

Event 3 – July 2005

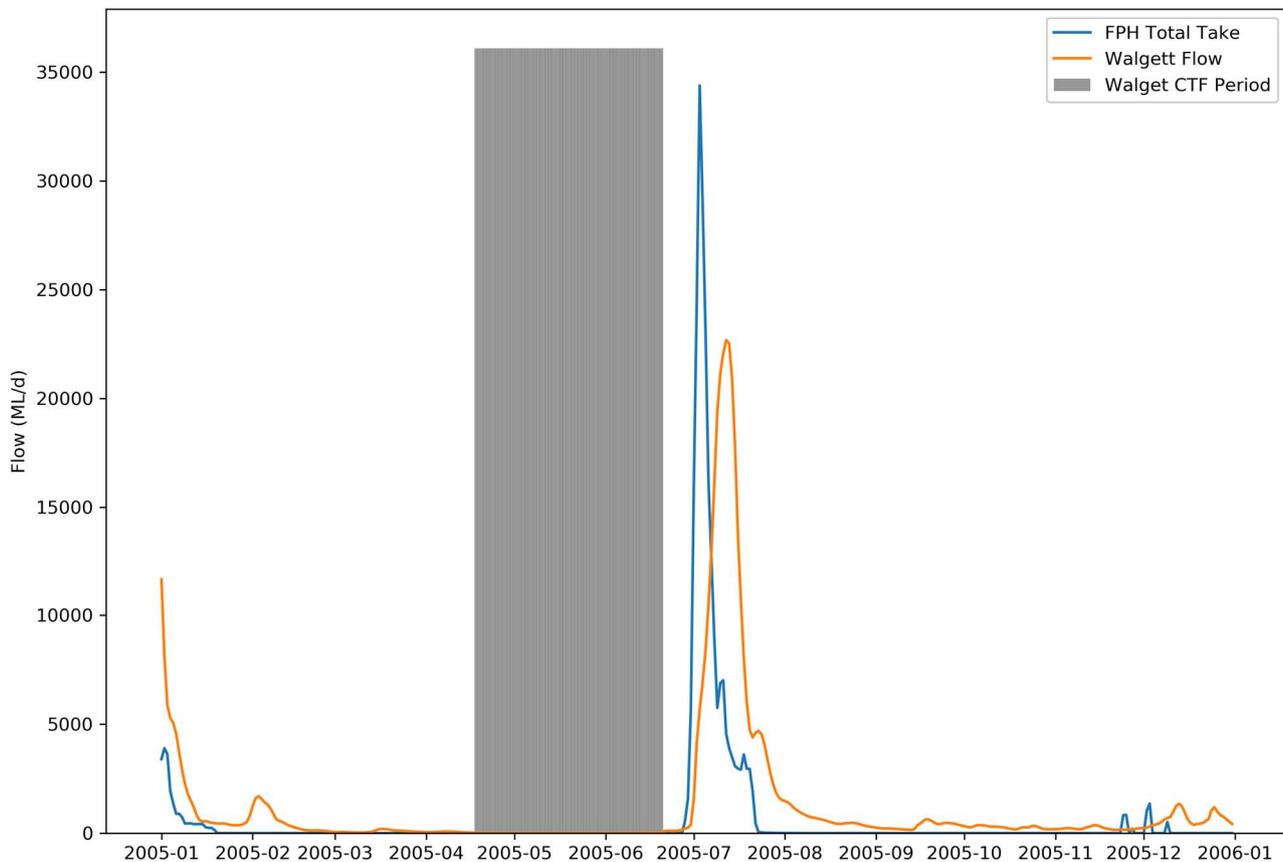


Figure 4. Event analysis for 2005

In late July 2005, a significant inflow event occurred that broke a cease-to-flow period starting in April 2005. Continued small inflows kept the river at Walgett flowing past the end of the calendar year.

The flow that triggered floodplain harvesting access also ended the prevailing cease-to-flow conditions.

In this year, the estimated floodplain harvesting was 56% of the volume that ultimately reached Walgett. Under perfect conditions, the flows at Walgett could have been 56% higher if we assume that all the floodplain harvesting take would have otherwise reached Walgett. In practice we know that natural processes will result in channel losses and that flows on the floodplain often do not return to the river and instead contribute to ecological functions on the floodplain.

The timing of flows does not support that floodplain harvesting either delayed the end of a cease-to-flow event or hastened a return to cease-to-flow conditions in a material way.

Conclusions

During the 30-year period covered by this analysis, there is no evidence to support a proposition that floodplain harvesting is occurring during cease-to-flow events and could be considered to be contributing to either starting the cease-to-flow period sooner, or extending the event in a meaningful way

During periods when floodplain harvesting is occurring with similar timing as cease-to-flow events, that floodplain harvesting accesses a portion of the flow event and the remainder continues downstream to relieve the cease-to-flow conditions which are occurring.

In each case we looked at in detail, the return of cease-to-flow conditions is determined by the existence of follow up rainfall and flows and is not related to floodplain harvesting actions.

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