Redundant Weir Removal: The Branch River Crossing - A Case Study

THE BRANCH RIVER CROSSING

The Project

The removal of the Branch River Crossing is part of a larger weir removal project being undertaken by WWF Australia, the Environmental Trust of NSW and NSW Fisheries, with another 2 redundant weirs to be removed over the next 12 months. This project aims to increase public awareness of the environmental effects of in-stream barriers. It provides a framework to facilitate community-based weir removal projects and demonstrates the ecological benefits of improved river health. The weir removal framework will assist in the development of similar projects throughout Australia in the future.

Location

The Branch River Crossing is located near Port Stephens in the Karuah River Catchment, NSW, about 22 km NNE of Karuah. The crossing itself is situated on a natural rock bar at the upper end of the tidal limit. Water activities like boating and fishing are major contributors to the area's tourism industry and local economy.

Other industries that are important to the region include commercial fishing and oyster farming, which are strongly linked to local waterways and rely on a healthy catchment.

History

The Branch River Crossing was constructed in 1951 by the Colonial Sugar Refinery (CSR) for timber hauling to the mills. At that time a small township with a sawmill, school, several homesteads and a general store was located beside the crossing. Fishing was a popular activity for the locals as both fresh and saltwater habitats were available. People also travelled upriver, by boat, from Port Stephens to fish and to take advantage of social occasions (Anon. 1987).

Current Use

The Branch River Crossing is no longer used by CSR and is now the responsibility of the Great Lakes Council. Land adjacent to the crossing is currently used for primary production, predominantly stock grazing. A light vehicle bridge 300 m upstream provides a river crossing for local traffic and heavy vehicle access is now possible via Booral.

"A weir is a structure (including a dam, lock, regulator, barrage or causeway) across a defined watercourse that will pond water, restrict flow or hinder the movement of fish along natural flow paths in normal flow conditions (DLWC, 2001).

Habitat now re-opened upstream of the removed crossing on the Branch River. Photo: NSW DPI.

The Branch River Crossing during flood - note height of the structure. Photo: C. Thrupp.

Habitat upstream of the Branch River Crossing. Photo: C. Thrupp.

NSW Fisheries collecting data. Photo: C. Thrupp.

Why remove the crossing?

The crossing is acting as a weir across the Branch River. Construction of weirs such as this can detrimentally affect river structure by:

- preventing sediment and nutrient from moving along the waterway;
- favouring exotic species by reducing water quality and water level variability;
- preventing native fish from migrating to spawn or expand their habitat; and
- preventing the recruitment of native fish from other areas, thus resulting in genetic isolation.

The presence of one or more of these barriers can have a cumulative effect on the abundance of native fish species and may lead to local decline and even regional extinction of fish species (DLWC, 2001).

Removal of the crossing has re-instated fish access to upstream habitat. This is important for fish species that migrate between saltwater and freshwater (or vice versa) to complete stages of their life cycle. Other benefits include restoration of the natural water flow and tidal limit and improved water quality.

Removal of this structure is part of a strategy to improve the migration, breeding and survival of native fish populations throughout NSW.

Removing this crossing also eliminates public liability and on-going maintenance costs for the Great Lakes Council.

THE REMOVAL PROCESS

Pre-removal surveys

Pre-removal surveys were conducted to establish baseline information on water quality, fish habitat, fish species, terrestrial habitat and riparian vegetation. Fish sampling was undertaken above and below the crossing using gill nets and fyke nets at set points. Catch is shown in table 1.

Stakeholder consultation

NSW Fisheries were the 'determining authority' in the removal decision and were responsible for deciding if the weir removal was going to have a significant, detrimental effect on the environment. (Hobson 2003). The Department of Infrastructure, Planning and Natural Resources (DIPNR) also carried out a study and provided comments on the likely biophysical impacts of the proposed weir removal.

Letters were distributed to all nonagency stakeholders, including local landholders

Table 1. Fish species found in pre-removal surveys

Scientific Name	Common Name	Above Weir	Below Weir
Ambassis jacksoniensis	Port Jackson glassfish	0	237
Anguilla reinhardtii	Long-finned eel	5	11
Gerres subfasciatus	Silver bellies/ biddies	0	83
Hypseleotris sp.	Hypseleotris gudgeons	7	5
Liza argentes	Flat-tailed mullet	0	28
Macquaria novemaculeata	Australian bass	13	49
Mugil cephalus	Bully/Sea mullet	6	10
Myxus petardi	Freshwater mullet	2	1
Philypnodon grandiceps	Flat-head gudgeon	71	148
Philypnodon sp. 1	Dwarf flathead gudgeon	3	1
Pseudomugil signifer	Blue eye	0	49

Left: Table showing fish found before the survey.

Right: Excavator removing the crossing. Photo: C. Thrupp.

Far right: Australian bass (*Macquaria novemaculeata*). Photo: NSW Fisheries.

living around the project site, inviting comment on the proposed Branch River Crossing removal. Subsequently, there was significant support from local landholders and stakeholders. Their endorsement was evident during discussions at the time of removal and during interviews conducted for the production of a video on the weir removal process. Support from the local landholders and stakeholders contributed to the project's success.

Post-removal surveys

Fish surveys will be conducted by NSW Fisheries, in mid 2004, above and below the removed crossing at the same points used for the pre-removal survey.

Discussion

Native fish such as Australian bass and a number of mullet species are expected to benefit from the crossing removal as they regularly migrate between fresh and saltwater. Recreational anglers will also benefit from improved fish habitat and subsequent fishing opportunities within the Branch River.

A break-through

Day 1

An excavator and rock breaker were used to break through the top of the concrete cap on one side of the crossing so that the excavator could work back along the crossing. This enabled trucks to reverse along the crossing for loading.

Initial break of the crossing on Day 1. Photo: C. Thrupp.

The waiting game

Day 1

After breaking away a small section of the crossing, a 15 hour interval was required to allow water levels to drop to the new height. This minimised the movement of suspended solids during the removal and exposed the whole structure.

Allowing for the outflow of water, to reduce upstream water levels late on Day 1. Photo: C. Thrupp.

Exposed

Day 2

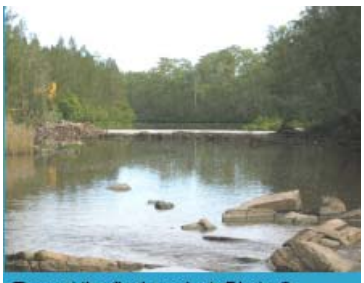
After the crossing was exposed, the excavator was able to break-up the structure and remove the debris with the help of 6 tip trucks. All potential issues were considered including the possibility of acid sulfate material within the debris. To minimise any risk, all spoil was taken off-site.

Collecting the debris, which was carted off-site to a council landfill. Photo: C. Thrupp.

Going….going….

Day 3

The old culverts also needed to be broken-up before being removed. Finally after 3 days of work the removal of the structure was nearly complete. The natural rock bar on which the crossing was originally built remained intact.



Toward the final product. Photo C. Thrupp.

…Gone…

Day 4

A couple of metres of the crossing was left near the edge to help maintain bank stability. The site was then cleaned-up and a clear fish passage reinstated. For the first time in 52 years, high tides are able to flood-out the natural rock bar.

Branch River, after the crossing removal. Photo: C. Thrupp.

Every effort was made to ensure minimal impact on the environment during the removal process. Increased turbidity (suspended solids) was initially identified as a potential issue during removal, so water quality sampling was conducted prior, during and after works. This sampling showed that after the heavy machinery work had stopped on Day 4, turbidity had returned to a similar level as that prior to removal. A downstream silt trap played an important role in minimising turbidity increases. Removing debris from the site also assisted in minimising environmental impacts in the vicinity.

There is potential for erosion of the upstream riverbank to occur after removal due to scouring downstream of the old crossing. To lessen the potential impact, a couple of metres of the crossing has been retained on both banks to promote stability under altered hydrological conditions.

Conclusion

The removal of the Branch Crossing has been one of the first in the Karuah Catchment. It is part of a strategy to improve the migration, breeding and survival of native fish populations in NSW. The success of this project will encourage similar projects in the future and promote the removal of redundant weirs as a new and exciting option for river rehabilitation. WWF Australia, Environmental Trust of NSW, the Great Lakes Council and NSW Fisheries have proven that a partnership approach to barrier removal can be extremely successful.

Table 2. Approximate budget for Branch Crossing removal

Activity	Quantity	Cost ($)
Sampling (Travel costs not included)		10,000
Sediment control + oil boom and emergency spill kits	1 silt net, 2 spill kits 1 oil boom	5,500
Excavator (plus site delivery)	1 x 4 days	13,000
Trucks	6 x 4 days	In Kind
Total		28,500

References

Hobson, M. (2003). Proposed removal of the Branch River crossing - Review of environmental factors. NSW Fisheries, Tamworth.

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DLWC (2001) NSW Weirs Policy, Department of Land and Water Conservation, NSW.

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Floodplain of the Branch River. Photo: C. Thrupp.

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