# Report to the Commonwealth Department of the Environment and Energy: Annual Performance Report (2016) against the Enlarged Cotter Dam Fish Management Plan Version 3

Version 1.1, 8 February 2017

# Document management

### Document summary

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| Approved by | Bronwen Butterfield | Manager Environment and Sustainability | 14/3/2017 |

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# Contents

# Introduction

This performance report outlines Icon Water's performance against Version 3 of the Enlarged Cotter Dam (ECD) Fish Management Plan (FMP) V3 as required under the Commonwealth Department of the Environment and Energy's conditions of approval:

'*The person taking the action must implement the Plan. Every year the person taking the action must submit to the Minister a report covering performance against the Fish Management Plan. The date of the first report must be provided on 19 January 2011, with each subsequent report to be provided 12 months from the date of the previous report'*

Icon Water has completed all the requirements of the ECD FMP V3 and associated sub-plans throughout the reporting period (2016). This performance report is structured against each of the sub plans.

This Performance Report should be read in conjunction with the ECD FMP Version 3 available on Icon Water's public website at http://www.iconwater.com.au/Sustainability-and-Environment/Environmental-compliance/Operational%20compliance%20reports/Cotter-Dam-operational-compliance.aspx.

# Background

As a condition of approval for Icon Water to construct and operate the ECD, the Commonwealth Environment Minister directed Icon Water to manage the potential environmental impacts to five threatened native aquatic species in the Cotter River system, particularly the rare and threatened species protected under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*. The specific fish species to be managed are listed below.

**Table 1 - EPBC Listing Status**

| Species | EPBC Act Listing Status |
|---|---|
| Macquarie Perch (Macquaria australasica) | Endangered |
| Trout Cod (Maccullochella macquariensis) | Endangered |
| Murray Cod (Maccullochella peelii) | Vulnerable |
| Two-spined Blackfish (Gadopsis bispinosus) | |
| Murray River Crayfish (*Euastacus armatus*). | Endangered |

Icon Water's approach to minimise and manage threats to threatened aquatic species is documented through a series of ECD Fish Management Plans and projects as shown in **Figure 1**. To date three versions of the ECD Fish Management Plan have been completed. The final plan (ECD Fish Management Plan V4) is under development and is planned for release in 2017/18.

Version 1 of the Fish Management Plan (FMP) documented the projects that provide information required for the management of threatened aquatic species. Version 2 of the FMP provided information and measures, based on the results of Version 1 projects, to help protect aquatic communities in the Reservoir and Cotter River during the construction of the ECD. Version 3 of the FMP, valid since November 2013, has focused on the ongoing management of threatened aquatic species during the filling and operational phase of the ECD.

The objective of FMP V3 is "*To ensure that the filling and operation of the Enlarged Cotter Reservoir does not compromise the maintenance and rehabilitation of native fish and crayfish species*." The FMP (and associated sub-plans) is:

- designed to prevent or mitigate risks to threatened aquatic fauna and their habitats arising from the construction and operation of the enlarged Cotter Dam

- scientifically based, using adaptive management
- robust in terms of stakeholder involvement, peer review and public transparency
- timely and updated on the basis specified in the approval conditions
- developed as part of the overall requirements of the Enlarged Cotter Dam, and
- effective in terms of use of resources and expertise whilst at the same time ensuring the protection of threatened species.

The sub plans and key activities of the FMP are:

- Barriers and spawning habitat identification (project 8)
- ECD Fish Monitoring Program (project 9)
- Management of Macquarie perch During Filling Phase Plan
- Alien Fish Management Plan (project 6)
- EHN Management & Response Plan (project 4)
- Macquarie perch translocation (project 5).

The delivery of the Fish Management Plan 3 is overseen by the Fish Steering Committee and Working Group, Chaired by Icon Water and comprising representatives and experts from the ACT Government, Commonwealth Government, and University of Canberra.

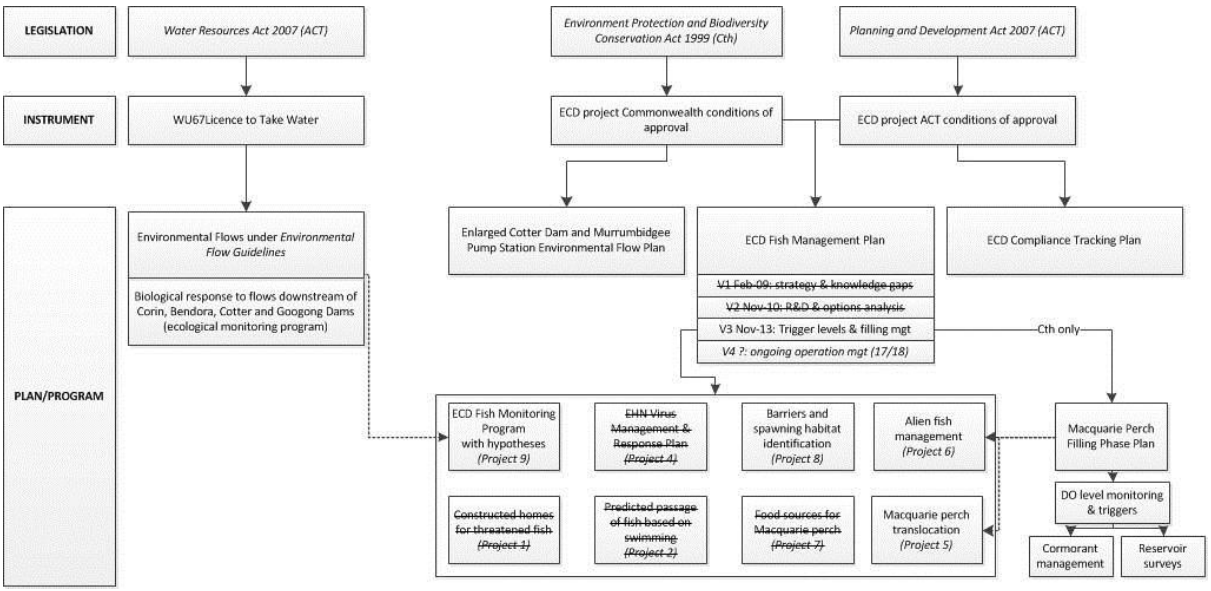


Figure 1. ECD FMP Framework[1]

## Fish Steering Committee and Working Group

Icon Water has continued to meet with and report to the Fish Steering Committee and the Working Group. During the reporting period, the Fish Steering Committee has met twice and the Working Group has met twice times.

[1] Strike-through means completed or achieved.

On 22 March 2016, Icon Water facilitated a tour of the Cotter Dam and river with representatives from the ACT Government, Commonwealth Government and University of Canberra to review the fish management and research programs in place. The tour provided a great opportunity to discuss future strategies that focus efforts on better understanding the movement of Macquarie perch during the spawning season, and to manage the flows and water levels of the reach between Angle Crossing and full supply level of the Cotter Reservoir.

# Barriers and spawning habitat identification project

In June 2016, Icon Water funded the first year of a two-year research project with the University of Canberra that involved acoustic tagging of 40 Macquarie perch and installation of monitoring gateways along the Cotter River upstream of the full supply level of the Cotter reservoir.

The additional components of the research project include monitoring and analysis of the various habitat available to Macquarie perch upstream, and includes broader conservation research of Macquarie perch in the whole Cotter River system. The funding for this part of the project has not yet been provided by Icon Water or Government conservation researchers.

In December 2016, the University of Canberra scientists provide preliminary data from the research project that indicated that the tagged Macquarie Perch had moved upstream in efforts to spawn. The official outcomes of the 2016 spawning season will be confirmed following Icon Water's mandatory fish monitoring program in 2017, conducted by the University of Canberra under contract to Icon Water. The outcomes will be formally reported to the Commonwealth in the *2017 Annual Performance Report against the ECD FMP*.

# ECD Fish Monitoring Program

The ECD Fish Monitoring Program is a key requirement of the ECD FMP V3. The Fish Monitoring Program focusses on 10 management questions (provided at **Attachment 1**) that aim to:

- determine the impact of the filling and operation of ECD on populations of the two focal species (Macquarie perch and Two-spined blackfish) and potential threats (predators and competitors) in the ECD and river upstream
- inform management actions to minimise and/or mitigate the impact to those populations.

A team from the University of Canberra and the Australian National University undertake the monitoring program on behalf of Icon Water. The report titled *Enlarged Cotter Reservoir Ecological Monitoring Program: Technical Report 2016* describes the results of the monitoring conducted in 2015/2016. The findings presented in this ECD FMP performance report relate to the period of monitoring conducted in 2015/16 and draws comparisons with previous monitoring period reports and related scientific knowledge.

**Macquarie perch (Question 1 and 2)**

The abundance and distribution of Macquarie perch in the Cotter River upstream of the Cotter Reservoir has remained relatively stable since monitoring began in 2010. Abundance of young-of-year Macquarie perch was different among years. These differences were mixed between years of baseline and filling phases, suggesting that spawning of Macquarie perch in the Cotter River is sporadic and likely reflects the small resident riverine population.

No discernible change was detected in the population of Macquarie perch in the ECD between Phase 1 (2010-2013 - construction) and Phase 2 (2014 onwards – filling and operation), with an important exception being none or extremely low levels of young-of-year detected in the first three years of filling (and consequently yearlings in year 2 and 3). This indicates spawning or early recruitment failure in the lower catchment during this period.

During the 2013/14 spawning season (late spring to early summer) the Cotter Reservoir was in a filling phase and the headwaters were in the middle of a series of natural barriers which were

impassable by Macquarie perch and prevented them moving to upstream spawning areas. This is the likely cause of the spawning failure in that period.

In the 2014/2015 spawning season the water level of the reservoir had risen and was close to a medium-sized barrier which may have restricted access to suitable upstream spawning habitat.

During the 2015/2016 season, the reservoir had filled further and Icon Water was able to manage the water level so that the medium barrier was inundated and access to at least two or three pools and their associated riffles was available. Icon Water engaged a fish passage consultant who recommended minor physical modifications to some small barriers immediately upstream of the reservoir to optimise fish passage. These recommendations were implemented with the assistance of staff from ACT Conservation Research and ACT Parks and Conservation Service. This may have resulted in some small scale spawning as only seven young-of-year individuals were captured in fyke nets in the reservoir during the 2016 monitoring.

The limited recruitment identified in the ECD since filling commenced appears to be related to unfamiliarity with new potential spawning habitat (the former spawning habitat has been inundated) or restricted access to suitable spawning habitat. Other factors such as environmental conditions and food availability did not appear to be significantly different from the period when spawning and recruitment were successful.

Monitoring results show that the body condition of Macquarie perch has increased. Fish in better condition can produce more, and better quality eggs, but without access to spawning sites this potential advantage is not being realised.

**Two-spined blackfish (Question 3)**

Two-spined blackfish are still rare in the reservoir, with only a few individuals being detected in the newly inundated section of the reservoir in the three years of Phase 2 monitoring so far. It is likely that this species is persisting in the newly-inundated section of the reservoir, though to date there is no evidence to suggest that a recruiting population will establish. Continuation of targeted monitoring over the coming years will provide further insight into these aspects of the reservoir population.

**Trout (Question 4,5, and 6)**

The abundance of Rainbow trout in Cotter Reservoir in 2016 was no different to any other year of monitoring. Of some concern is the increasing abundance of Brown trout captured in 2016 (n = 14) which was far greater than any other year (only a total of three Brown trout had been caught in monitoring efforts in years between 2010-2015). This could be due to the increased abundance of food sources since inundation. Brown trout are more piscivorous than Rainbow trout and a change in the species composition of trout in Cotter Reservoir could lead to changes in predation upon Macquarie perch and Two-spined blackfish in the catchment.

Predation by trout on post-larval Two-spined blackfish and Macquarie perch has not been detected since filling began, though it must be noted that the reduction in Phase 2 sampling effort compared to the Phase 1 monitoring regime has resulted in capture of only a few adult trout in the Cotter River. The current monitoring program has no capacity to detect predation of larval Macquarie perch.

**Non-native Fish (Question 7)**

Alien species other than trout continue to be detected in the reservoir, with Goldfish accounting for the vast majority of captures. The abundance of Goldfish has increased since filling commenced, most likely in response to increased availability of food resources (though this appears to be declining toward stable). Although Goldfish probably pose little direct threat to Macquarie perch and Two-spined blackfish, the effects of abundant food resources on increasing the size and abundance of trout, as potential predators and competitors, could be of concern.

**Piscivorous birds (Question 8)**

Piscivorous birds have been relatively stable in their species composition and abundance in the reservoir since filling commenced, though some subtle differences in distribution has occurred. There has been an increased number of Great cormorants and Little pied cormorants in an upstream section of the enlarged reservoir, which is most likely due to the establishment of a nesting site and associated roost. Breeding colonies of cormorants have far higher energy requirements than non-breeding colonies and the establishment of a breeding colony of cormorants could increase predation

pressure on adult and juvenile Macquarie perch. Cormorant management activities were undertaken as part of the Cormorant management strategy in 2014 and 2015, with mixed results. No cormorant management was triggered or conducted in 2016. Cormorant thresholds triggers have been revised to encompass the increase in shoreline of the enlarged Cotter Reservoir.

**Macrophyte beds (Question 9)**

Monitoring of macrophite beds has not yet commenced as the reservoir has only recently filled and macrophites have not yet established at the new water level.

**Food resources (Question 10)**

Food resources of Macquarie perch (primarily decapods and microcrustaceans) showed minor differences between Phase 1 and Phase 2 monitoring. There was variability in abundances between monitoring years, with low abundances recorded in autumn 2015 (likely related to low water temperatures leading up to sampling). Monitoring in subsequent seasons has revealed a small increase in microcrustacean abundances.

**ECD Monitoring Program 2016/17**

The Fish Monitoring Program for 2016/17 is still underway and the next monitoring event is planned for March 2017. Early indications are promising that Macquarie perch have spawned successfully in the recent spawning season, with many fingerlings observed in the Cotter River by ACT Government ecologists during December 2016. However, it has not been confirmed whether these fish have moved downstream into the Cotter Reservoir and become part of the viable breeding population. The official outcomes of the 2016 spawning season will be confirmed following Icon Water's fish monitoring in 2017, conducted by the University of Canberra under contract to Icon Water.

# Management of Macquarie Perch During Filling Phase Plan

The *Management of Macquarie Perch During Filling Phase Plan* (a sub plan of the ECD FMP) describes the management actions and mitigation measures undertaken in the ECD to manage the potential impacts of adverse dissolved oxygen (DO) conditions on the Macquarie perch population.

Icon Water has three monitoring buoys in the reservoir which continuously measure temperature and DO levels at a depth of three metres. Data from the buoys is available for monitoring and analysis by Icon Water staff via an online portal. SMS alerts are also sent automatically to Icon Water when DO levels approach or exceed trigger values. During 2016 none of the DO triggers defined in the Filling Plan were exceeded and consequently none of the management actions defined in the Plan were activated.

The enlarged Cotter Reservoir reached Full Supply Level (FSL) of 550.8m on 7 July 2016. Modelling by Icon Water indicates that it is likely to remain at or near FSL for 2016/17 as Cotter River water will continue to be drawn from the gravity fed pipeline from Bendora Dam.

This sub-plan is now no longer relevant as the reservoir is at FSL. Formal confirmation of this will be requested at the next FMP Steering Committee meeting.

# Alien Fish Management Plan

The Cotter Dam Enlargement Fish Risk Assessment identified a likely increase in alien fish numbers in the Cotter Reservoir following construction of the ECD and identified the importance of managing trout and Redfin perch impacts on Macquarie perch and Two-spined blackfish

The risk assessment also identified the need for an Alien Fish Management Plan (under the ECD Fish Management Plan), which was consequently developed (November 2013) and includes management and mitigation measures to ensure predation risks to native fish are managed. The development and implementation of the adaptive Alien Fish Management Plan ensures Icon Water meets its regulatory

obligations with regard to the management of alien fish species in the Cotter Reservoir and upstream Cotter River.

The Alien Fish Management Plan identifies the need for monitoring of alien fish numbers in the Cotter Reservoir and river. This work was undertaken in 2016 though the ECD Fish Monitoring Program (specifically related to management questions 4, 5, 6 and 7). Refer to the summary of the monitoring results related to these questions in the ECD Fish Monitoring Program section above.

Should alien fish numbers increase to unsustainable levels, options to address the issue will be discussed further at the Fish Management Plan Working Group and Steering Committee meeting(s) in 2017 in order to better understand the environmental, social and financial implications of their implementation. Several management options have already been proposed for more detailed consideration, and include:

- Targeted netting of trout spawning runs for consequent removal the Cotter River directly upstream of Cotter Reservoir
- A trout trap on the Cotter River immediately upstream of Cotter Reservoir, designed to trap spawning trout for consequent removal from the Cotter system
- Targeted angling efforts during trout spawning season for consequent removal from the Cotter system
- Targeted riverine electrofishing in the Cotter River directly upstream of Cotter Reservoir.

# EHN Management & Response Plan

Epizootic Haematopoietic Necrosis (EHN) Virus is a ranavirus, a member of the Iridoviridae Family, and is associated with sudden high fatality rates in fish (especially during spring and summer). The Macquarie perch is a species known to be highly susceptible to EHN mortality.

Icon Water operates within the Cotter catchment, where EHN Virus is not known to be present. While Icon Water was constructing the ECD, the risk of transporting the virus into the reservoir and catchment was far greater than during standard operations; and consequently, rigorous protocols and mitigation measures were applied throughout the construction period. It is accepted that Icon Water's operations post construction of the ECD are not a major contributor to the risk of EHN Virus entering the catchment in contrast to other land management practices and recreational pressures. In order to ensure appropriate mitigation of the risk, Icon Water has established the EHN Management & Response Plan to ensure that the risk, albeit small, is monitored and managed.

The EHN Management & Response Plan requires Icon Water to monitor for signs of EHN Virus infection in fish in the Cotter Reservoir and upstream river. This requirement was fulfilled via the Cotter Fish Monitoring Program in 2016. During the course of the 2016 monitoring, all fish collected were inspected for signs of EHN infection (e.g. bleeding near the fins or gills, swelling of the stomach and erratic swimming near the surface of the water). No evidence of the virus was detected in the fish samples collected.

Icon Water has developed a work instruction for staff and contractors working near or in waterways in the Cotter catchment. This work instruction includes measures to be taken to avoid the spread of the EHN Virus and is a mandatory induction requirement for staff and is included in contractors' contract conditions.

Icon Water is also required to notify the ACT Government of any suspected EHN Virus infections; however no signs of infection were identified in 2015.

It is noted that Icon Water's controls are not exhaustive, considering the Cotter catchment is largely open to the public. Therefore efforts to prevent introduction of the EHN Virus to the catchment need to be met by other land managers of the area, such as the ACT Parks and Conservation Service.

# Fish Management Plan V4

The enlarged Cotter Reservoir reached Full Supply Level (FSL) of 550.8m on 7 July 2016. Modelling by Icon Water indicates that it is likely to remain at or near FSL for 2016/17 as Cotter River water will continue to be drawn from the gravity fed pipeline from Bendora Dam. This an indicator for completion of the FMP V3 (to address the period of post construction to full inundation).

During 2017 Icon Water will review the achievements against FMP V3 and commence development of Version 4 to address the ongoing operational requirements for the Cotter reservoir and any outstanding or ongoing activities required to minimise and/or mitigate the impact to the protected fish populations.

# References

Broadhurst, B. T., Clear, R. C., Fulton, C. and Lintermans, M. (2016). Enlarged Cotter Reservoir ecological monitoring program: technical report 2016. Institute for Applied Ecology, University of Canberra, Canberra

## Attachment 1

The 10 management questions that underpin the Enlarged Cotter Reservoir Ecological Monitoring Program are:

1. Has there been a significant change in the abundance and body condition of Macquarie perch in the enlarged Cotter Reservoir (Young-of-Year, juveniles and adults) as a result of the filling and operation of the ECD?
2. Has there been a significant change in the abundance, body condition and distribution of the Macquarie perch in the Cotter River above and below Vanity's Crossing as a result of the filling and operation of the ECD?
3. Have Two-spined blackfish established a reproducing population in the enlarged Cotter Reservoir and are they persisting in the newly inundated section of the Cotter River?
4. Has there been a significant change in the abundance, distribution and size composition of adult trout in the enlarged Cotter Reservoir as a result of the filling and operation of the ECD?
5. Has there been a significant change in the abundance and size composition of trout in the Cotter River upstream of the enlarged Cotter Reservoir as a result of the filling and operation of ECD?
6. Are Two-spined blackfish and Macquarie perch present in trout stomachs in the Cotter River?
7. Has there been a significant change in the abundance and distribution of non-native fish species in the enlarged Cotter Reservoir as a result of the filling and operation of the ECD?
8. Has there been a significant change in the abundance, distribution and species composition of piscivorous birds in the vicinity of the enlarged Cotter Reservoir as a result of the filling and operation of the ECD?
9. Have macrophyte beds re-established in the enlarged Cotter Reservoir?
10. Are there adequate food resources (particularly decapods) for the Macquarie perch following the filling and operation of the enlarged Cotter Reservoir?

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