



Report to the Commonwealth Department of the Agriculture, Water & Environment: Annual Performance Report (2021) against the Enlarged Cotter Dam Fish Management Plan Version 4

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Introduction

This report outlines Icon Water’s performance against Version 4 of the Enlarged Cotter Dam (ECD) Fish Management Plan (FMP V4) as required under the Commonwealth Department of Agriculture, Water & Environment 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.’

Icon Water has completed all the requirements of the ECD FMP V4 and associated sub-plans throughout the reporting period (2021 calendar year). This performance report is structured against each of the sub plans.

This Performance Report should be read in conjunction with the [ECD FMP V4](#) available on Icon Water’s website.

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 threatened species protected under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). The specific fish and crayfish species to be managed are listed below.

Species	EPBC Act Listing Status
Macquarie Perch (<i>Macquaria australasica</i>)	Endangered
Trout Cod (<i>Maccullochella macquariensis</i>)	Endangered
Murray Cod (<i>Maccullochella peelii</i>) ¹	Vulnerable
Two-spined Blackfish (<i>Gadopsis bispinosus</i>) ²	-
Murray River Crayfish (<i>Euastacus armatus</i>)	Endangered

Table 1 - EPBC Listing Status

Icon Water’s approach to manage threatened aquatic species is documented through a series of ECD Fish Management Plans and projects as shown in **Figure 1**. To date four versions of the ECD Fish Management Plan have been completed. The final version follows the completion of the dam construction and filling phases. The document will continue to be reviewed every 5 years, in line with Icon Water’s adaptive management principles.

The objective of FMP V4 is “*To ensure that operation of the Cotter Dam for the supply of community drinking water continues to support aquatic communities, particularly threatened native fish and crayfish species.*”

All monitoring objectives were achieved throughout the 2021 period.

Table 2. ECD Fish Management plan version 4 (and relevant sub plans) objectives and controls

Objective	Controls
Risks mitigation	Protect threatened aquatic fauna and their habitats arising from the construction and operation of the enlarged Cotter Dam
Adaptive Management	Scientifically based, using adaptive management, and use of expertise.
Stakeholder involvement	Robust peer review and public transparency
Compliance	Regularly updated on the basis specified in the approval conditions
	Developed as part of the overall requirements of the ECD

¹ Murray cod have not been detected in the Cotter River and are not included in this version of the FMP

² Listed as vulnerable in the ACT under Section 91 of the Nature Conservation Act 2014.

The following sub plans are contained in the following appendices to the FMP:

Appendix E	Cotter Reservoir EHN Virus Management Plan
Appendix F	Cotter Reservoir Destratification System Process Operating Plan
Appendix G	Enlarged Cotter Reservoir (ECR) Cormorant Management Plan
Appendix H	ECR Emergency Inspection and Translocation Plan
Appendix I	Cotter Reservoir Alien Fish Management Plan

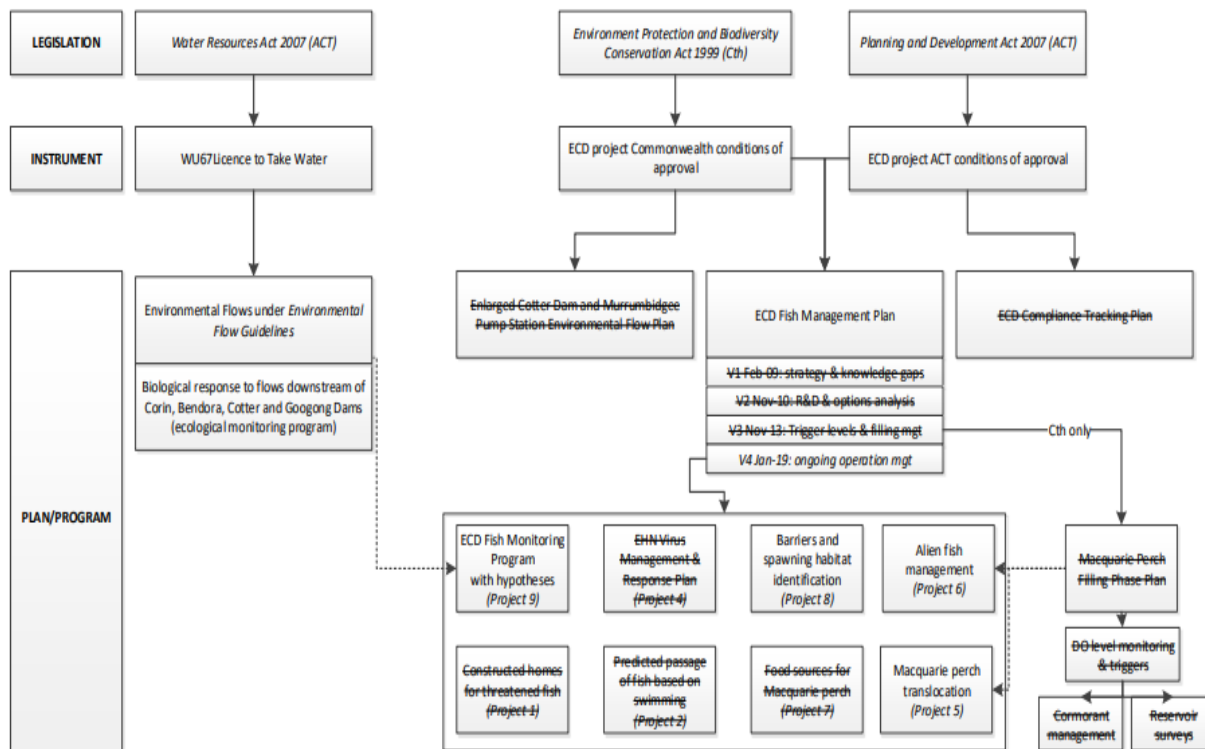


Figure 1. ECD framework

FMP Steering Committee and Working Group

The delivery of the FMP V4 was overseen by the FMP Steering Committee (SC) and Working Group (WG), chaired by Icon Water and comprising representatives and subject matter experts from the Commonwealth Government, ACT Government and the University of Canberra.

Icon Water has continued to meet with and report to the SC and the WG. During the reporting period, the WG met on the 7th of September 2021. In November 2021 Icon Water and the FMP WG conducted a review position paper of the Macquarie Perch Translocation Program. Stakeholder feedback was requested against preferred options going forward. As a result of these consultations, it was decided to cease further translocations from the ECD to other locations and maintain monitoring only for the remaining required timeframe.

ECD Fish Monitoring – Technical Report July 2021

The following key results from the monitoring were reported through the 2021 FMP technical report and the spring data report.

Adult Macquarie Perch (gill netting)

- Adult numbers in 2021 have increased, largely because of the capture of the cohort of individuals from the 2016 spawning event which have now reached adulthood.
- There was no difference in Catch-Per-Unit-Effort (CPUE) among monitoring phases.
- Condition of adult Macquarie Perch in 2021 has increased from 2020 but were not different to any other year (baseline, filling or operational).
- Relative abundance of adult Macquarie Perch captured between years was similar across all survey periods, though was high in 2020-21.

Young of Year (YOY) (Fyke netting & snorkeling)

- A continuation of improvement in CPUE of YOY compared to filling phase.
- Macquarie Perch recruitment was detected at three of the five riverine sites in 2021, indicating that conditions were suitable across the catchment for spawning and early development of young-of-year.
- Young of year (YOY) detected for the fifth year in succession.
- Operational years 2017 – 2021 show an improvement in CPUE of YOY compared to filling 2014 – 2015 and early operational year 2016.

Juveniles (1+ and older)

- There was a significant difference in juvenile Macquarie Perch abundance between years.
- There is a strong class of 1+ year old (juvenile) fish captured in the last three years.
- There is a strong class of 1+ year old (juvenile) fish captured in the last four years (2018 – 2021), suggesting good annual recruitment conditions through to 1 – 3-year-old individuals.

Summary (Macquarie Perch Cotter Reservoir)

- Likely recruitment shadow from spawning seasons of 2014 and 2015 (there were three years of recruitment failure). This resulted in low catches of adult Macquarie Perch in 2019 – 2020.
- Young of year detected for the fifth year in succession.

Summary (other monitoring results)

- Macquarie Perch YOY detected at every Cotter River site, though abundances of this size class were recorded at their lowest during 2019. More recent monitoring from 2020 – 21 has indicated successful spawning and recruitment to young-of-year.
- Rainbow trout size and abundance and size remains similar between years (for Cotter Reservoir and Cotter River).
- Brown trout continue to increase in abundance in ECR.
- Two Brown trout contained YOY Macquarie Perch (following the first ever detection of Macquarie Perch predation in 2018). This is a cause for some concern given the increase in abundance of Brown trout in the ECR since operational phase.
- Cormorant abundances were stable. Some shifts in their distribution within ECD driven by nesting aggregations of Little Pied Cormorants.
- Goldfish continue to decline since filling which indicates that productivity is slowing

- Declines in goldfish abundance, coupled with consecutive years of detection of Brown trout predation on Macquarie Perch suggest prey-switching may be occurring.
- If prey-switching is occurring in Brown trout, it may also be occurring in cormorants. Re-examination of cormorant diet may be helpful to confirm this. If cormorants are also shifting their food preference from Goldfish to Macquarie Perch, then management of cormorant breeding colonies becomes critical.
- Food resources variable across years, with decapod abundances very low during first three years of operational phase. Abundances increased in 2020 – 2021 to be like other phases.

Operational Risks to native fish and mitigation actions

Management measures and controls were identified in the FMP technical report 2021 and are presented in FMP V4 with their relevant number and risk rating according to the risk assessment.

This section shows the high (H) and medium (M) level risks and status of the management actions undertaken by Icon Water in 2021 to mitigate these risks.

H1. Loss of food resources

Current Controls

- Constructed rock reef provides substrate for food.
- Inundated native hardwood and shrub habitat left in-situ provides source of nutrient loads.
- Larger area of shallow fringing habitat in reservoir provides habitat for food.

Potential Additional Controls

- Trials of reed bed establishment and riparian revegetation around selected areas of the reservoir. The enlargement of the reservoir has altered reservoir food resources (loss of reed beds).

Status

- The current controls are considered adequate as there is a healthy native fish population in the reservoir. In addition, while the reservoir is being used as a water supply source the level is fluctuating which makes the potential additional controls impractical at this stage.

H2. Cold Water Pollution

Current Controls

- Monitoring of water temperature upstream and in the reservoir and selective environmental releases (as practicable) from Bendora Reservoir in accordance with Icon Water's License to Take Water.

Potential Additional Controls

- Explore options for use of variable offtakes and release at Bendora Reservoir.

Status

- Water temperature and other water quality parameters are monitored upstream and in the Corin and Bendora Reservoirs. Reservoir levels were very low in 2019 and 2020 which severely impacted the ability to selectively abstract water.
- All dams are at 100% capacity and have spilled through all 2021. For this period, there is no options as the catchment waterways are mostly natural flows.

M1. Increased abundance of Alien Fish

Current Controls

- Implement management options described in section 3.2 of the Alien Fish Management Plan (Appendix I) following approval by the FMP SC.
- Report illegal fishing to PCS (Parks and Conservation Service) who as the land manager is the delegated authority for pursuing compliance matters.
- Implement controls described in section 3 of the EHN Virus Management Plan related to fish vectors of EHN virus (e.g., Redfin Perch).
- Implement the ECR Fish Monitoring Program to define trigger levels and inform adaptive management controls of alien fish.
- Educate Icon Water contractors who are working in the catchment and inspect work sites to reduce the risk of transfer of alien fish eggs on vehicles and equipment.

Potential Additional Controls

- Monitor for trout predation on Macquarie Perch larvae, and if trout are demonstrated to impact larvae, implement additional management options described in the Alien Fish Management Plan following approval by the FMP SC.

Status

- Rainbow trout size and abundance remains similar between years and Brown trout continue to increase in abundance in the Cotter Reservoir. There have been previous confirmed cases of Brown trout predation on YOY Macquarie Perch.
- Trout and other alien fish will continue to be monitored by the ECD Fish Monitoring Program. Further meetings will also take place between EPSDD and IW to assess response actions if required.

M2. EHN Virus

Current Controls

- Report illegal fishing to PCS who as the land manager is the delegated authority for pursuing compliance matters.
- Implement controls described in Section 3 of the EHN virus management plan.
- Inspect Fish Monitoring Program Reports to inform potential management actions if threatened fish are exhibiting signs of infection.
- Educate (Toolbox Talk) Icon Water staff and contractors who are working in the catchment and enforce compliance with wash-down procedures.

Potential Additional Controls

- None identified.

Status

- All Icon Water staff who work in the catchment have attended a Toolbox Talk about the vehicle and equipment wash-down procedures in accordance with the Work Instruction in Icon Water's Integrated Management System.
- The Icon Water Catchment Protection and Land Management Team communicate regularly with PCS on catchment risks and actions relating to EHN Virus and other threats.

M3. Increased Great Cormorant Predation

Current Controls

- Constructed rock reef provides shelter/refuge habitat for Macquarie perch.
- Native submerged hardwood provides shelter/refuge habitat.
- Implement the monitoring and management actions specified in the Cormorant Management Plan.
- Operate the destratification mixers in accordance with the Destratification operation plan to reduce the impact of low dissolved oxygen in the water column.

Potential Additional Controls

- None identified.

Status

- Regular monitoring of the cormorant population is continuing. As reported in the latest ECD Fish Monitoring Technical Report, cormorant abundances are stable with some shifts in their distribution within the ECR, driven by nesting aggregations of Little Pied Cormorants.
- Destratification mixers were offline during first half of 2020-21. The units are currently being repaired with at least one unit operating in the latter half of the year and adequate dissolved oxygen levels are still being achieved.

M4. Drawdown of reservoir and sedimentation of river reach

Current Controls

- Reservoir operating level and inflow management during spawning informed by ECR Fish Monitoring Program monitoring report.
- Environmental flows including riffle and pool maintenance flushes.

Potential Additional Controls

- None identified.

Status

- Environmental flows from Bendora Dam have been released in accordance with the License To Take Water (WU67) and the associated Environmental Management Plan.

M5. Exposure of instream barriers during Macquarie Perch spawning season exacerbated by water level and flow

Current Controls

- Reservoir operating level and inflow management during spawning informed by ECR Fish Monitoring Program monitoring report and the Annual Spawning Management Plan developed in conjunction with subject matter experts and endorsed by the FMP WG.
- Compliance with licensed environmental flows in accordance with Icon Water's License to Take Water.

Potential Additional Controls

- Prepare guidelines that detail the target for spawning in successive years.
- Management of barriers (requires annual identification of relevant barriers) including mitigation options (e.g., flows, fishways, translocation).
- Continue to gather information and conduct research to inform the adaptive management of reservoir levels and river flows to mitigate the impact of instream barriers.

Status

- Annual spawning management plan developed and implemented.
- Compliance with licensed environmental flows in accordance with Icon Water's License to Take Water.

- Acoustic monitoring project has been implemented for a fifth year to increase knowledge about the potential impact of barriers during low river flow conditions.

References

Broadhurst, B. T., Clear, R. C., Fulton, C. and Lintermans, M. (2021). *Enlarged Cotter Reservoir ecological monitoring program: technical report 2021*. Institute for Applied Ecology, University of Canberra, Canberra.

Annexure 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) because 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 because 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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