Williams' Cage

ANS Control: Williams' Cage

Targeted Species: This method is effective in controlling the upstream movement of some fish. Specific ANS of Concern – CAWS[1] that may be controlled include the silver carp (*Hypophthalmichthys molitrix)* and the sea lamprey (*Petromyzon marinus).*

Selectivity: This Control was designed to manage some species of fish, but it is non selective. See *Brief Description* and *General Effectiveness* sections for more details.

Williams' Cage is a selective control device used to separate jumping carp from non-jumping fish.

Developer/Manufacturer/Researcher: Researchers and developers include Ivor Stuart, Alan Williams, John McKenzie, and Terry Holt of the Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Heidelberg, Victoria, Australia.

Brief Description: The Williams' Cage is a simple device that automatically separates jumping common carp from non-jumping fish. Its use has been experimentally tested under field conditions on common carp (*Cyprinus carpio)* in Australian waterways (Stuart et al. 2006b). According to Stuart et al. (2006a), common carp display an escape behavior of jumping out of the water, which is not exhibited by most Australian native fishes. The idea for the Williams' Cage was developed based on this observation and designed to exploit this unique behavior to aid in selective removal. Of the 3 species of Asian carp, only the silver carp demonstrates leaping behavior, however, it may be possible that attractant flow patterns could be adjusted to lure other species into a Williams' Cage.

Prior Applications: Stuart et al. (2006a) experimentally tested the Williams' Cage in a fishway in the Murray River in Australia.

General Effectiveness: Stuart et al. (2006a) found the Williams' Cage in a fishway (a fish ladder) to be effective at separating adult common carp (88% caught) from non-jumping native fish (99.9% native fish passage). Conversely, a trial of the Williams' Cage in a non-fishway setting produced opposite results, with common carp actively avoiding entering the cage (Stuart et al. 2006b). The authors noted that this avoidance behavior warrants further research for the use of Williams' Cages in riverine settings. It appears that the Williams' Cage would be most effective in a confined setting. Outlets and drains in wetland areas may be effective locations for Williams' Cages because their flows attract many fish species. This technique has not been applied outside of Australia or with species other than common carp.

[1] For a complete list of the 39 specific ANS of Concern – CAWS, please see Table 1 of the main report.

Operating Constraints: A Williams' Cage must be operated in flowing water to stop upstream moving fish. Williams' Cages are designed for use in fishways. They would only work in a natural channel or canal if a screen across the channel were used to divert fish into the cage. This screen would be an obstacle to navigation traffic and would require frequent maintenance to remove accumulated debris. A non-automated version of the Williams' Cage would require manual removal of fish from the basket and manual disposal of fish.

Cost Considerations:

Implementation: Implementation costs would include the construction of the barrier or modification of an existing dam to create a sluice for the Williams' Cage. Planning and design activities in this phase may include research and development of this Control, modeling, site selection, site-specific regulatory approval, plans and specifications, and real estate acquisition. Design will also include analysis of this Control's impact to existing waterway uses including, but not limited to, flood risk management, natural resources, navigation, recreation, water users and dischargers, and required mitigation measures.

Operations and Maintenance: Operations and maintenance costs would involve regular inspections, removal and disposal of fish and debris, and repair of mechanical parts.

Mitigation: Design and cost for mitigation measures required to address impacts as a result of implementation of this Control cannot be determined at this time. Mitigation factors will be based on site-specific and project-specific requirements that will be addressed in subsequent, more detailed, evaluations.

Citations:

Stuart, I. G., A. Williams, J. McKenzie, & T. Holt. 2006a. Managing a migratory pest species: a selective trap for common carp. *North American Journal of Fisheries Management*, vol. 26, pp. 888-893

Stuart, I. G., A. Williams, J. McKenzie, & T. Holt. 2006b. The Williams' Cage: a key tool for carp management in Murray-Darling Basin fishways. A Final Report on the Williams' Carp Separation Cage to the Murray-Darling Basin Commission, Australia. Project R3018SPD.