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SCOPING STUDY:

Aire River estuary management plan

August 2009

CORANGAMITE CMA

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Abbreviations

Alluvium	Alluvium Consulting Pty Ltd
CCMA	Corangamite Catchment Management Authority
CRHS	Corangamite river health strategy.
DSE	Department of Sustainability and Environment
MERI	Monitoring, Evaluation, Reporting and Improvement

1 Introduction

The Corangamite Catchment Management Authority (CCMA) commissioned Alluvium Consulting Pty Ltd (Alluvium) to undertake a scoping study for the Aire River Management Plan. The objective of the scoping study was to develop a single spatially based activity plan that collates the recommendations of many existing plans and strategies and identifies gaps in understanding and/or projects for the Aire River estuary. The study area is defined as the waterways, wetland and floodplain of the Aire River valley downstream of the Great Ocean Road.

The primary outputs of the scoping plan are the spatial activity plan, the program logic and the activity / recommendations table. This report describes the approach adopted for, and the summary finding from this project. This report should be read in conjunction with the primary outputs. The primary outputs are appended to this report.

2 Approach

The scoping study involved five principle tasks:

1. Site familiarisation and inspection
2. Literature and legislative review
3. Review and collation of additional background information
4. Development of a program logic
5. Development of a spatial activity plan

Each of these tasks is discussed further in the sections below.

2.1 Site inspection and familiarisation

A site inspection and familiarisation was undertaken on Tuesday 31st March 2009. The inspection was undertaken by Ross Hardie and Mark Stacey of Alluvium, Simone Wilkie, Rhys Collins and Matthew Khoury of the CCMA, and Paul Millar of the Department of Primary Industries – Fisheries. On-site discussions were held with local landholders as part of the site inspection. Key findings from the site inspection, familiarisation and discussions included:

- Anecdotal reports suggesting the Ford River was channelised around 2004 and this caused significant sedimentation within Lake Hordern
- There are concerns that the mapped crown land boundaries and parcel records are not accurate, leading to an array of public and private land management issues
- Local landholders are concerned with the CCMA approval process for clearing drainage lines on private property
- Local landholders have expressed ongoing issues with the estuary opening strategy

2.2 Literature and legislative review

A literature review was undertaken primarily to identify and collate recommendations from past management reports. The key planning and management literature for the study area is documented in Table 1. Of these documents the Corangamite river health strategy (CRHS), Heritage Rivers management plan and the Great Otway National Park management plan are considered to be most relevant to the CCMA's requirements and responsibilities in the study area.

All the management recommendations outlined in the documents (from Table 1), relevant to the study area, have been compiled into a single table. This table is included with a program logic (Attachment A) as part of the primary project output. A copy of this table is presented in this report as Table 3. The table includes an assessment of the current status of the recommendation, categorised as follows:

- Completed: Recommendation has been completed
- In progress: Recommendation is currently being undertaken
- Not implemented: Recommendation has not been implemented
- Required to be ongoing: Recommendation is an ongoing requirement, but the status of ongoing implementation is not known
- Superseded: Recommendation has been superseded due to a change in land management or development of a new management plan
- Unknown: Implementation status of the recommendation is not known
- Unlikely to occur within study area: Recommendation is unlikely to require actions within the study area

Relevant legislation was also reviewed to determine land management boundaries, laws and restrictions and the definition of particular natural features (e.g. watercourses). The relevant legislation is summarised in Table 2. The specific outcomes of this review have included:

- Development of a more accurate spatial representation of the Heritage River area
- Development of a more accurate spatial representation of the Otway National Park boundary
- Development of a layer identifying watercourses that should be subject to works on waterway permits in the study area, for pragmatic administration of the Water Act

Table 1. Planning and management literature reviewed for the project

Title	Organisation	Date
Corangamite river health strategy	Corangamite CMA	2006
Corangamite river health strategy – Summary report – Draft for public comment	Corangamite CMA	September 2004
Heritage rivers and natural catchment areas – Draft management plans – Volume 1 (Western Victoria)	Department of Natural Resources and Environment	November 1997
Caring for Country – The Otways and You – Draft Management Plan	Parks Victoria	March 2008
Angahook-Otway Investigation – Final Report	Victorian Environmental Assessment Council	November 2004
South West estuaries coastal action plan	Western Coastal Board	2002
Victorian Coastal Strategy 2008	Victorian Coastal Council	December 2008
Aire River – Working together - Memorandum of cooperation	Various	April 2003
Great Ocean Road Estuary Restoration project[1]	CCMA	2009

[1] Summary of the project provided in email from CCMA

Table 2. Key legislation reviewed for the project

Title	Act No.	Key section(s)
Heritage Rivers Act 1992	36 of 1992	Sch. 1, Part 16 – Aire River Heritage Area Sch. 3 – Restricted land and water uses in Heritage River areas
Heritage Rivers (Amendment) Act 1998	32 of 1998	s. 6 – Aire River Heritage Area
National Parks Act 1975	8702 of 1975	Sch. 2, Part 31 – Great Otway National Park
National Parks (Otways and Other Amendments) Act 2005	60 of 2005	s. 28b – Aire River Heritage Area
Land Act 1958	6284 of 1958	s. 384 – Definitions
Water Act 1989	80 of 1989	s. 3 – Definitions
Wildlife Act 1975	8699 of 1975	s. 21 - Removing sand etc. from State Wildlife Reserve or Nature Reserve

Table 3. Relevant management recommendations identified in the literature reviewed for this project

DOC	ID	ACTION RECOMMENDATION	ACTION CATEGORY/S	STATUS
River Health Strategy	A1	Completion of the Aire River Estuary Wetlands Preliminary Management Plan	3	Not implemented
	A2	Rural drainage management - reduce the impact drainage may have on water levels in wetlands	3	Required to be ongoing
	A3	Stream bed survey of lower reaches of the Ford River	3	Not implemented
	A4	Stream stability investigation of the Ford River in the alluvial fan zone. This investigation will determine a) the level and cause of stream instability, and b) what actions (if any) are required to stabilise the stream.	3	Not implemented
	A5	Rural drainage management - protect existing habitat of Tasmanian Mudfish	3, 16	Required to be ongoing
	A6	Environmental best management practice -activities may include development of whole farm plans and implementation of on-farm actions to protect water quality such as pasture management, fertiliser usage, upgrading stream crossings/tracks or upgrading dairy effluent systems.	3, 17	Required to be ongoing
	A7	Rural drainage management - minimise water quality impacts to the estuary and wetlands (this could be through fencing drains to create a buffer from the adjoining agricultural land)	3, 17	Required to be ongoing
	A8	Estuarine botanical study to obtain information including mapping of existing vegetation, pre-European classes and extent, current species composition and recommendations for management	8	In progress
	A9	Wetland stock management - establishment of a number of grazing exclusion areas in native communities where grazing damage is apparent and monitor outcomes	7, 8, 11	Required to be ongoing
	A10	Riparian revegetation	7, 9	Required to be ongoing
	A11	Riparian fencing	11	Required to be ongoing
	A12	Monthly Waterwatch sampling at a number of locations	17	Unknown
	A13	Hydraulic modelling of Aire River estuary to obtain data to guide management towards a revised flow regime	20	In progress
Heritage River Mgt Plan	B1	Encourage the development of an Aire Valley Management Strategy in conjunction with the CCMA	1	In progress
	B2	Finalise the management plan for the Wildlife Reserve at Hordern Vale	1	Unknown
	B3	License all domestic and stock extractions and ensure licence conditions provide adequate protection of river banks	1, 3	Unknown
	B4	Establish an Integrated Catchment Management framework and catchment coordinating group.	2	Superseded
	B5	Liaise with Colac Otway Shire to ensure protection of heritage river values in the review of the planning scheme and adjacent areas by appropriate zoning so that any developments, activities or subdivisions have no impact on the river.	2, 6	Required to be ongoing
	B6	Consider alternative measures for protecting grazed areas from flooding	3	Unknown
	B7	Encourage the development of a SFMP (by SRW) prior to issuing any further diversion licences from this system	3	Unknown
	B8	Work with adjacent landholders, local government and other land managers (e.g. the CMA, Landcare groups) to develop an integrated and co-operative approach to management of introduced plants and animals, particularly Blackberry, Ragwort and foxes and rabbits.	3, 7	Unknown
	B9	Finalise the Aire River Estuary Wetlands Management Plan as a matter of priority and develop the Aire Valley Management Strategy to address water management issues and requirements. In each case give due weight to the Heritage River corridor status when determining actions. In particular, ensure that management does not degrade the habitat of significant fish species.	3, 16	Not implemented

DOC	ID	ACTION RECOMMENDATION	ACTION CATEGORY/S	STATUS
	B10	In consultation with relevant agencies and landholders, develop criteria to determine appropriate trigger level heights and flow regimes for the lower reaches of the Heritage River. Ensure that the criteria include seasonal, rainfall and river flow variables as well as environmental requirements and the effects of flooding on nearby properties. Emphasis should be given to maintaining a near-natural regime to ensure long-term protection of the adjacent wetlands and associated tourism values.	4	Completed
	B11	As a matter of high priority, conduct an assessment of the condition and management needs of Public Land Water Frontages (PLWF) on the Aire River in accordance with the LCC Recommendations (1991) and guidelines for establishing priorities for management strategies, and in accordance with other sections of this plan.	5	Superseded
	B12	Undertake flora and fauna surveys of the corridor including aquatic macroinvertebrates as part of an integrated survey program for the Otway State Forest and Otway National Park	8	Superseded
	B13	Monitor for the presence of Cinnamon Fungus in the HR corridor and manage infections in accordance with NPS guideline 2. 7.2 (NPS 1995). If these infections pose a threat to heritage river values, develop an action plan including hygiene and other management measures as part of a plan for the region, State Forest or National Park.	7, 8	Required to be ongoing
	B14	Record location and extent, and control major new outbreaks, of introduced plants, with priority given to Ragwort and Blackberry.	7, 8	Required to be ongoing
	B15	Monitor for the presence of Myrtle Beech and other fungus or pathogens, and take appropriate action to minimise risk of spread.	7,8	Required to be ongoing
	B16	Monitor known and potentially significant species including the Otway Stonefly, River Blackfish, Tasmanian Mudfish and significant flora and fauna species	7, 8, 16	Required to be ongoing
	B17	Manage FFG listed species, communities and threatening processes according to approved action statements	7	Required to be ongoing
	B18	Do not issue new licences for the PLWF areas for grazing or for any uses not compatible with the HR corridor status and ensure that naturally vegetated PLWFs are retained as uncleared.	7, 22	Required to be ongoing
	B19	Undertake revegetation works on PLWFs in Hordern Vale to stabilise banks.	9, 22	Not implemented
	B20	Continue to control weeds on PLWFs and monitor for the spread of weeds downstream.	10, 22	Required to be ongoing
	B21	When assessing PLWFs, consider stock exclusions (possibly seasonally) and establish filter strips for protection from nutrient run-off and bank erosion on PLWFs in Hordern Vale	11, 22	Required to be ongoing
	B22	Ensure road crossings do not form barriers to the upstream movement of fish	12	Required to be ongoing
	B23	Maintain the current level of vehicle access to the River. Do not permit new river crossings unless it can be demonstrated that they will not have a detrimental impact on heritage river values	12	Required to be ongoing
	B24	Continue to allow boat access and boating in the River in accordance with the Otway National Park Management Plan (NRE 1996d).	12	Superseded
	B25	Designate firewood collection areas outside the HR corridor for the Aire River east and west campgrounds in Otway National Park and promote alternative sources (NRE 1996d).	12	Superseded
	B26	Manage for tourism in accordance with the Great Ocean Road Tourism Development Strategy (NRE 1996e). Promote the Aire River estuary as a nature-based tourist location and provide associated facilities for canoeing, bird watching, walking and camping.	12	Superseded
	B27	Manage recreation activities and facilities including walking tracks, upgrades of existing campgrounds, particularly the promotion of alternative fuel and fireplaces, in accordance with relevant plans (NRE 1996dand 1996e) and the Forest Management Plan for the Otway FMA (DCE 1992)	12	Superseded
	B28	Include the Heritage River in any promotional or interpretation material for the Otway National Park and Otway State Forest.	12, 15	Required to be ongoing
	B29	Manage visitor information and interpretation in accordance with relevant plans	12, 15	Required to be ongoing

DOC	ID	ACTION RECOMMENDATION	ACTION CATEGORY/S	STATUS
	B30	Monitor impact on heritage river values from visitor activities, especially camping, angling and boating.	12, 16	Required to be ongoing
	B31	Minimise visual intrusions...in high visitor use areas such as...Hordern Vale	12, 19	Required to be ongoing
	B32	Allow for the construction of walking tracks in the HR corridor only if they are in keeping with and do not detract from natural values.	12, 18	Required to be ongoing
	B33	Ensure planning of new plantations takes into account the need to protect heritage river landscape values.	13, 18	Unlikely to occur within study area
	B34	As areas of significance are identified consider their permanent or temporary exclusion from mining and extractive industries in consultation with NRE Minerals and Petroleum	13	Unlikely to occur within study area
	B35	Ensure management of the softwood plantation provides optimum protection of the values of the river as identified by the LCC (1991).	13	Unlikely to occur within study area
	B36	Liaise with Colac Otway Shire to ensure that management of private forests is in accordance with the Code of Forest Practices	13	Unlikely to occur within study area
	B37	Liaise with private forest managers within the Aire catchment to minimise impacts of timber production harvesting and transport on heritage river values	13	Unlikely to occur within study area
	B38	Manage exploration and mining, extractive industries and fossicking in accordance with the LCC Recommendations (1991) and General Management Strategies	13	Unlikely to occur within study area
	B39	Maintain fire management practices in accordance with the Fire Protection Plan (CNR 1995b) and the Code of Practice (CNR 1995a). Ensure review of the Fire Protection Plan is in accordance with the General Management Strategies and that the Heritage River is included in Zone 5 exclusion of prescribed burning, which reflects the requirement that it should remain unburnt, except in cases of wildfire.	14	Unknown
	B40	Continue to liaise with local landholders and community groups, and involve them in co-operative programs for the River	15	Required to be ongoing
	B41	Continue to liaise with private landowners to minimise potential adverse effects on heritage river values.	15	Required to be ongoing
	B42	Encourage and support Friends groups, volunteers and other local groups, particularly those undertaking works in the estuary area.	15	Required to be ongoing
	B43	Promote awareness of heritage river values.	15	Required to be ongoing
	B44	Do not stock the River with non-indigenous fish species.	16	Required to be ongoing
	B45	Provide fishing opportunities in accordance with the protection of heritage river values.	16	Required to be ongoing
	B46	Continue water quality monitoring in the river at stream monitoring stations. In particular, assess the effects of track use, particularly sediment run-off near river crossings, and the effects of leachates from camping areas and effluent run-off from neighbouring farmlands.	17	Required to be ongoing
	B47	Encourage the establishment of a water quality monitoring program for the Aire River	17	Unknown
	B48	Establish water quality parameters for potential impacts that timber harvesting operations, including roading and landing areas, in the adjacent forest and plantations may have in the HR corridor.	17	Unlikely to occur within study area
	B49	Encourage adjacent landholders and managers to protect landscape values near the Heritage River corridor and along access roads into the corridor when undertaking management works	18	Required to be ongoing

DOC	ID	ACTION RECOMMENDATION	ACTION CATEGORY/S	STATUS
	B50	Ensure that management of the estuary and other important features along the Aire River maintains geomorphological values	18	Required to be ongoing
	B51	Manage existing and potential utilities and survey in accordance with the LCC Recommendation FIOA (Lee 1991). In assessing proposed uses give particular consideration to land capability and visual effects in the HR corridor	18	Unlikely to occur within study area
	B52	Continue to assess, manage and monitor Aboriginal archaeological sites in conjunction with Aboriginal Affairs Victoria and the Framlingham Aboriginal Trust	19	Required to be ongoing
	B53	Liaise with Aboriginal Affairs Victoria and the Framlingham Aboriginal Trust when undertaking works on river banks and frontage	19	Required to be ongoing
	B54	Continue to liaise with the Drainage Area Committee about the re-opening of the river mouth.	21	Superseded
	B55	Do not issue licences for the PLWF areas for grazing or for any uses not compatible with the Heritage River corridor status.	22	Required to be ongoing
	B56	Liaise with the CCMA to ensure that the results of the PLWF assessment and the General Management Strategies are incorporated into the assessment of PLWF licences.	22	Superseded
	B57	Following this consultation process, licence river mouth openings and manage flows in the Aire River, including trigger levels in accordance with approved criteria and guidelines.	20, 21	Required to be ongoing
Great Ocean Road Estuary Restoration	C1	Prepare Estuaries Research Recommendations report	3, 17, 18, 20, 21	Completed
	C2	Undertake key research and investigations in priority estuaries as recommended in the Deakin University Estuaries Research Recommendations report	3, 17, 18, 20, 21	Unknown
	C3	Gauge board installation	4, 20, 21	Completed
	C4	Undertake the Estuaries Impact project to determine the impact of estuaries on coastal environments	18	Unknown
Caring for Country. The Otways and you. Draft Management Plan	D1	In particular, park managers will work with Corangamite CMA to reduce the impacts of land use and management on the parks and the development of appropriate actions in the Regional Catchment Strategies	2	Required to be ongoing
	D2	Work with relevant agencies to facilitate fishery management, including the minimisation of impacts on natural cultural values	2, 16	Required to be ongoing
	D3	In cooperation with Corangamite CMA and adjacent land managers, projects that protect, enhance and link remnant vegetation and protect and enhance river health will be encouraged and supported where such projects complement park values	2, 18	Required to be ongoing
	D4	Monitor activities within the Aire Heritage River overlay and ensure compliance with legislation	6, 22	Required to be ongoing
	D5	Park managers will avoid clearing native vegetation for the development of visitor sites if possible. Development of visitor sites will be subject to a cost-benefit analysis, assessment of environmental and social impacts, safety risks and sustainability and is subject to policies for native vegetation management on public land.	7, 12	Required to be ongoing
	D6	Visitor sites catering for boating and water sports will be located designed and maintained to complement and provide access for enjoyment of these activities. Appropriate facilities will be provided for intended, sustainable use.	12	Required to be ongoing
	D7	Undertake periodic review of visitor sites, and undertake community consultation before implementing significant change	12, 15	Required to be ongoing
	D8	Where visitor activity is causing unacceptable damage to significant sites, review that activity and access to the site to minimise impacts, in consultation with the community	12, 15	Required to be ongoing
	D9	Fire management activities will avoid adversely affecting the ecological condition of wetlands, streams and catchments in the park	14	Required to be ongoing
	D10	People engaging in fishing in the park will be required to hold a Recreational Fishing Licence	16	Required to be ongoing
	D11	Map sites of geological and geomorphological significance and other earth science values and assess the condition of these sites and values	18	Not implemented

DOC	ID	ACTION RECOMMENDATION	ACTION CATEGORY/S	STATUS
	D12	Apply design guidelines to new developments which minimise impacts in landscape values	18	Required to be ongoing
	D13	Assess potential impacts of any proposed new development or use on landscape values, including rivers, and use that assessment to inform decisions	18	Required to be ongoing
	D14	Undertake the artificial opening of the river mouths as required and in accordance with relevant permits, policies, plans and guidelines	21	Required to be ongoing
Angahook-Otway Investigation Final Report	E1	That the following water frontages, and stream bed and banks, be used as natural features reserves… Aire River Catchment - Ford River Water Frontage Reserve	5,6	Unknown
	E2	That the following existing, enlarged or new natural features reserves be used as natural features reserves… Aire River Wildlife Reserve (219.2 ha) existing reserve with additions	6	Completed
	E3	Part of Aire Heritage River corridor was previously reduced to accommodate timber harvesting, council recommends that the width of the scheduled corridor be extended to form a consistent width.	6, 13	Completed
	E4	That the Aire River Heritage be retained and, together with a 100 metre wide addition on either side of the existing heritage river between the Aire River Gorge and public land plantations vested in the Victorian Plantation Corporation as indicated in Map A, continue to be managed under the Heritage Rivers Act 1992	6, 22	Completed
	E5	Where a water frontage or grazing licence has been issued, recreation use and access by the public can be facilitated	7 , 12, 22	Unknown
	E6	The Corangamite Catchment Management Authority, in cooperation with adjoining landowners, implement programs, including fencing, in accordance with priorities set down in the regional catchment strategy to restore frontages, protect remnant vegetation and encourage regeneration - in particular where there is uncontrolled sock access to streams and where stream-bank or frontage vegetation is degraded, frontage vegetation not regenerating, stream banks eroding or salt affected, or to protect natural, cultural, recreational and scenic values or water quality	7, 11, 17,18, 19	Required to be ongoing
	E7	It is recommended that commercial eel fishing not be permitted in the national park after a phase-out period of 10 years. It is also recommended that harvesting during the phase-out period be assessed to and modified to reduce by-catches, particularly of protected fish.	16	Unknown

Definition of a watercourse

Many of the drainage lines in the study area (i.e. artificial drains created to drain wetland systems) are classified as a watercourse under the provisions of the Water Act 1989 and Land Act 1958. Landholders are required to apply for a licence to undertake works (including drainage) on a waterway.

The CCMA recognise that the existing arrangements may not provide a pragmatic approach to works approvals on many drainage lines in the study area. Many drainage lines are very small excavations or depressions across cleared floodplain. Consequently, the CCMA has proposed that any watercourse with a catchment area less than 60 hectares be excluded from the works approval processes. While not specifically documented in the Water Act 1989, Land Act 1958 or associated Acts, the 60 hectare threshold is often applied by water licensing authorities under waterway determination guidelines to assess whether a particular site shall be deemed a waterway for the purpose of works approvals.

A component of this project has involved making a coarse assessment of the catchment area of all mapped drainage lines in the study area to assist the CCMA with future works permitting approvals. This process used Lidar survey supplied by the CCMA and Water Technology to manually estimate the catchment area of each drainage line. The results have not been field verified but are considered to provide an appropriate delineation at this stage. We have used this assessment to identify the drainage lines with a catchment area of greater than 60 Ha. These systems have been identified on the spatial activity plan. The catchment area assessment has been of a preliminary nature only. We recommend that the CCMA commission a project to more accurately delineate watercourses with a catchment area of 60 hectares or more.

2.3 Review and collation of additional background information

A variety of additional background information was reviewed and collated as an aside to the direct requirements for the spatial activity plan. Primarily this included a collation of historic ground and aerial photography and a review of the habitat requirements of Tasmanian Mudfish (*Neochanna Cleaveri*).

Historic ground photography

A search of the historic photograph catalogues of the State Library of Victoria and Department of Sustainability and Environment found 19 photographs of the study area from the 1900s. These are provided in Attachment B.

Historic aerial photography

Historic aerial imagery of the Aire River estuary dating as far back as 1946 has also been sourced for the project. A full coverage of aerial imagery for the years of 1946, 1952, 1967, 1972, 1983, 1994 and 2007 has been supplied in digital format. A brief snapshot of changes observed in the imagery is provided in Attachment C.

Tasmanian Mudfish

The review of the management documentation identified that the Tasmanian Mudfish (*Neochanna Cleaveri*) has been found within the study area. This species is listed as vulnerable and is therefore key environmental asset of the system. Its presence underpins several of the recommended actions in the CRHS. The habitat requirements of the Tasmanian Mudfish are known to conflict with the desire by landholders to clear drainage lines for flood alleviation purposes.

Given the relative importance of this species and conflicting habitat requirements we have collated a short review of background information on the Tasmanian Mudfish. This should be referred to in considering the impact of hydraulics and drainage management on the species. The review can be found as Attachment D.

LIDAR data

A digital terrain model of the project area created from LIDAR data was supplied to Alluvium by Water Technology. It should be noted that Water Technology undertook further thinning of the raw LIDAR data due to insufficient thinning of non-ground survey strikes. The thinning has not been validated by field survey and it is recommended that the data is not used in a flood study in its present form. We have applied the data to provide an approximation of the inundation extent at various water levels. These water levels include 1.2m AHD, a trigger level for the opening of the Aire River estuary. The analysis has been undertaken and included in the spatial activity plan outlined in Section 2.4.

Development of a program logic

A program logic has been developed for the system. The program logic was developed to identify how the array of past management recommendations (Table 3) will assist in achieving the Resource Condition Targets (RCTs) for the Aire and Ford Rivers and ultimately contribute to achieving the overall objectives of the CRHS. For the purpose of the program logic, the recommendations outlined in Table 3 were classified into one of 22 action categories. These categories include 16 different onground activities and 6 foundational activities. These foundational activities typically comprise the development of plans and establishment of institutional arrangements and are consistent with the terminology included in the National Framework for the monitoring and evaluation of natural resource management projects (MERI framework).

2.4 Development of a spatial activity plan

We have developed a spatial activity plan for the Aire River estuary. The spatial activity plan draws upon all the recommendations in Table 3 and maps those that refer to specific, determinable spatial locations within the study area. Unfortunately the vast majority of recommendations are not spatially explicit and therefore only a

small selection could be mapped. Those that can be mapped are classified as being related to one of the following:

- Stream be survey and stability investigation
- Riparian revegetation and fencing
- Policy and management
- Estuary mouth opening
- Gauge board installation
- Investigation
- Site of geomorphological significance
- Inundation extent at 1.2m, 1.6m and 2.0m AHD

An extract of the mapped management recommendations from Table 3 is provided on the spatial activity plan map. The labelling of each management recommendation allows a user to cross reference the table extract provided on the map to the details of that proposed recommendation. This table entry is also cross referenced to the program logic, allowing the user to identify how that action will lead to the overall objectives of the CRHS.

Public land boundaries

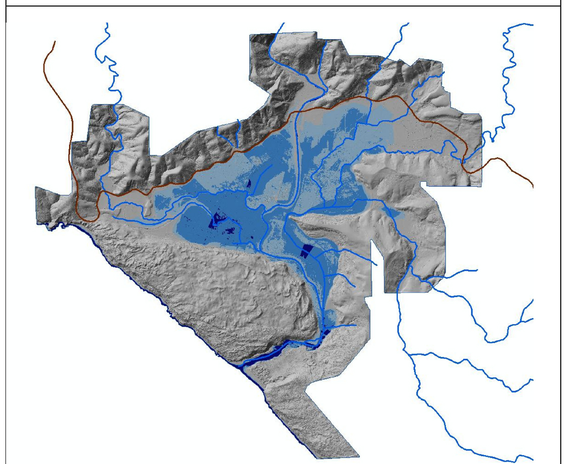
The spatial activity plan also includes updated mapping of public land management in the study area. In developing the spatial activity plan a number of public land management spatial databases were provided by staff at CCMA and DSE. Unfortunately the public land boundaries are inconsistent across these databases and also inconsistent with legislative boundary definitions and the gazetted maps. The mapped boundary of the Heritage River corridor and Great Otway National Park were particularly inconsistent.

For the purposes of this project the public land in the study area was remapped by comparing the spatial databases to legislative definitions, gazetted maps and the parcel spatial database. This mapping was based upon incomplete and inconsistent data and has not been field verified. Despite several requests to spatial database managers, no spatial database was available which identified publically owned parcels (e.g. crown allotments) under lease to private landholders – therefore such public land may not have been mapped or may be classified as “unnamed crown land”.

We consider that the revised public land management mapping undertaken for this project provides the most accurate and consistent boundary information at this stage. However we envisage that these mapped boundaries may conflict with the current community understanding. We recommend that the CCMA and partners commission a project to accurately survey and map public land management boundaries.

Attachment A
Spatial activity plan and program logic

DOCUMENT	ID	ACTION RECOMMENDATION	ACTION CATEGORY/S
River Health Strategy	A3	Stream bed survey of lower reaches of the Ford River	3
	A4	Stream stability investigation of the Ford River in the alluvial fan zone. This investigation will determine a) the level and cause of stream instability, and b) what actions (if any) are required to stabilise the stream.	3
	A5	Rural drainage management - protect existing habitat of Tasmanian Mudfish	3, 16
	A10	Riparian revegetation	7, 9
	A11	Riparian fencing	11
Heritage River Mgt Plan	B2	Finalise the management plan for the Wildlife Reserve at Hordern Vale	1
	B10	In consultation with relevant agencies and landholders, develop criteria to determine appropriate trigger level heights and flow regimes for the lower reaches of the Heritage River. Ensure that the criteria include seasonal, rainfall and river flow variables as well as environmental requirements and the effects of flooding on nearby properties. Emphasis should be given to maintaining a near-natural regime to ensure long-term protection of the adjacent wetlands and associated tourism values.	4
	B16	Monitor known and potentially significant species including the Otway Stonefly, River Blackfish, Tasmanian Mudfish and significant flora and fauna species	7, 8, 16
	B22	Ensure road crossings do not form barriers to the upstream movement of fish	12
	B23	Maintain the current level of vehicle access to the River. Do not permit new river crossings unless it can be demonstrated that they will not have a detrimental impact on heritage river values	12
	B50	Ensure that management of the estuary and other important features along the Aire River maintains geomorphological values	18
	B57	Following this consultation process, licence river mouth openings and manage flows in the Aire River, including trigger levels in accordance with approved criteria and guidelines.	20, 21
Great Ocean Road Estuary Restoration	C3	Gauge board installation	4, 20, 21
Caring for Country. The Otways and you. Draft Management Plan	D5	Park managers will avoid clearing native vegetation for the development of visitor sites if possible. Development of visitor sites will be subject to a cost-benefit analysis, assessment of environmental and social impacts, safety risks and sustainability and is subject to policies for native vegetation management on public land.	7, 12
	D14	Undertake the artificial opening of the river mouths as required and in accordance with relevant permits, policies, plans and guidelines	21
Angahook-Otway Investigation Final Report	E1	That the following water frontages, and stream bed and banks, be used as natural features reserves... Aire River Catchment - Ford River Water Frontage Reserve	5,6
	E7	It is recommended that commercial eel fishing not be permitted in the national park after a phase-out period of 10 years. It is also recommended that harvesting during the phase-out period be assessed to and modified to reduce by-catches, particularly of protected fish.	16



Approximate inundation extents

Aire River Estuary Scoping Plan

Spatial activity plan

N

GDA 94 - MGA Zone 55

0 0.45 0.9 1.8 Kilometers

* NB: Local landholders often refer to the official Calder River as Little Calder River and vice versa

Roads, tracks and waterways
- Major road
- Minor road
- 4WD track
- Walking track
- 10m contour
- Designated waterway
- Drainage line
- Minor watercourse outside study area

Land management
- Heritage River Corridor
- Great Otway National Park
- Wildlife Reserve
- Unnamed Crown Land
- Parcels
- Crown Water Frontage

Proposed actions
- Stream bed survey and stability investigation
- Riparian revegetation and fencing
- Riparian revegetation and fencing
- Policy and management
- Site of geomorphological significance
- Estuary mouth opening
- Gauge board installation
- Investigation
- Policy and management
- Site of geomorphological significance

LEGEND

Elevation (m)
- -0.73 - 1.2
- 1.2 - 1.6
- 1.6 - 2.0
- Road
- Designated waterways

CORANGAMITE CMA

alluvium

Corangamite River Health Strategy objectives

- Our waterways will flourish with continuous reaches of local indigenous vegetation radiating out to link with the broader catchment. Weeds and vermin will be managed to retain the natural quality of the landscape.
- Our waterways will be significantly protected from accelerated erosion by controlling the movement of stock.
- Our waterways will host a range of native fish species, making them popular and sustainable fishing spots. Frogs will be widespread and our wetlands restored, teeming with birds
- Our waterways will have the benefit of clean water and adequate flows that meet both human and environmental needs
- Our communities will be the foundation that ensures the sustained health of our waterways.

Regional River Health Strategy Resource Condition Targets (RCT) for the Aire River and Ford River

- 5 year RCT: Area of riparian land under management agreements: Aire River 23 ha and Ford River 8 ha
- 5 year RCT: Area of riparian land vegetated: Aire River 23 ha and Ford River 8 ha
- 10 year RCT: Length of river with improvement in riparian condition (ISC): Aire River 8km, Ford River 4km
- 10 year RCT: Representative reach in good or excellent condition (ISC): Aire River 1 reach
- 10 year RCT: Length of river in excellent or good condition (ISC): Aire River 13km, Ford River 15km
- 10 year RCT: Value of Heritage Rivers maintained: Aire River 1 reach
- 10 year RCT: Reduction in sediment load at Great Ocean Rd: Aire River one site, Ford River one site
- 10 year RCT: Number of people participating in river health management programs: Aire River 16 people, Ford River 10 people
- 10 year RCT: Number of people involved in community monitoring: Aire River eight people, Ford River two people
- 5 year RCT: Number of plans developed for high social value areas: Aire River one plan

Actions

- 7. Vegetation management
- 8. Vegetation survey
- 9. Revegetation
- 10. Weed management
- 11. Fencing
- 12. Tourism/ recreation management
- 16. Manage recreational and commercial fishing
- 13. Manage impact of mining and forest industries
- 14. Manage fire impacts
- 15. Community engagement
- 17. Improve water quality
- 18. Protect landscape values
- 19. Protect cultural sites
- 20. Manage flows in the Aire River
- 21. Artificial opening of river mouth
- 22. Manage Zoning including PLWF

Foundational activities

- 1. Vegetation management planning
- 2. Implement agency partnerships
- 3. Waterway management plans
- 4. Determine appropriate flow regimes for the Aire River
- 5. Assess the condition and management needs of Public Land Frontages (PLWF)
- 6. Park and development zoning

Attachment B
Historic ground photography

State Library of Victoria collection

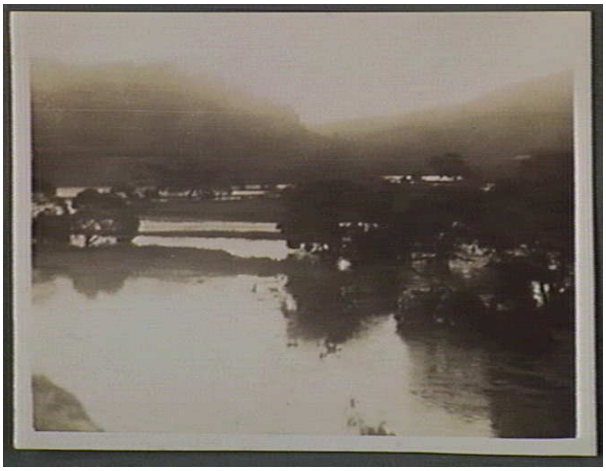
Aire River at mouth – 31 Jan 1901

Aire River at Glen Aire – Easter 1932

Aire River at Glen Aire – Easter 1932

Aire River at Glen Aire – Easter 1932

Aire River at Glen Aire – Easter 1932



Aire River at Glen Aire – Easter 1932

Aire River at Glen Aire – Easter 1932

Glen Aire – Easter 1932

Aire River - 1932

Glen Aire – date unknown (c.1932)

Aire River at Glen Aire – 5 December 1931

Aire River at Glen Aire – 5 December 1931

Department of Sustainability and Environment collection (dates unknown)

Panoramic view of mouth. River was flowing seawards at time of inspection along line shown. It was reported that the sand-bar had blocked the mouth during the previous weekend and a new channel through the bar had been excavated by the landowners affected.

View looking across sand-bar from left bank.
Note opening to sea. During the inspection the tide turned and sea water commenced to flow upstream.
AD 12042

Further view across sand-bar taken from seaward side at incoming tide.
AD 12043

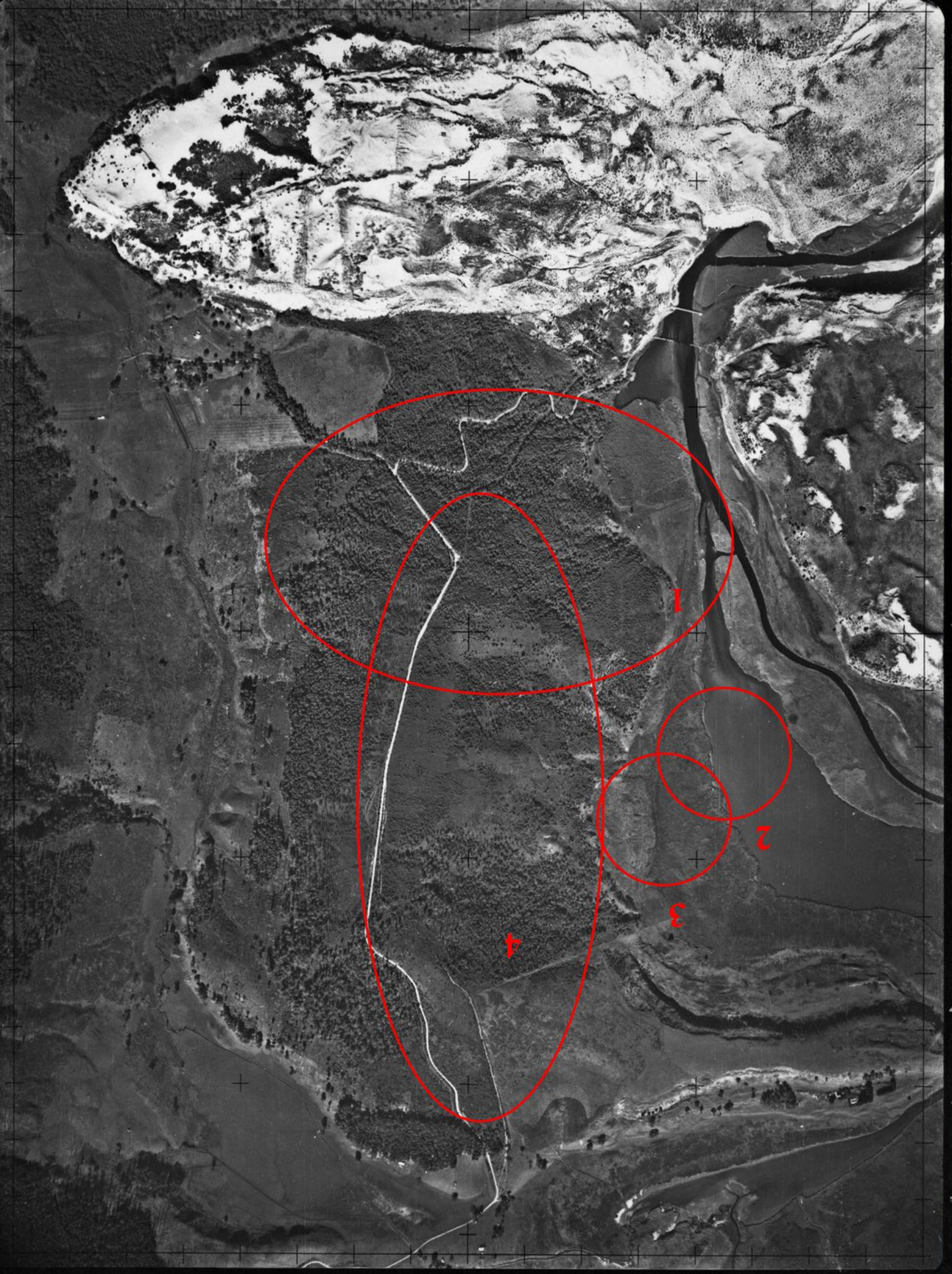
Closer view of river mouth.
Note wide sand-bar and heads of old pile groyne in centre of picture.
AD 12044

Distant view looking
towards the river mouth.
AD 12045

Attachment C
Historic aerial photography comparison


5
7
6
5
7047
11200 FT
VIC-337
10.5.46
RUN 2
AIRE OTWAY


5
7
6
5


1
2
3
4
VIC-339
70972
10.5.46
RUN 3
AIRE OTWAY


1
2
3
4

Examples of changes between the 1946 aerial photos (black and white) and the 1994 aerial photos (coloured)

Site number	Change / description
1	Since 1946 there has been an increase in the vegetation in this swampy area
2	Since 1946 there has been an increase in the vegetation in this riparian area
3	Since 1946 there has been a decrease in the vegetation in this area between the road and the Aire River
4	There has been a decrease in the vegetation in this area on the opposite side of the road from the Aire River. It is clear that a number of paddocks have been created in this area.
5	There was no noticeable change in the size and/or shape of Lake Craven or Lake Hordern between 1946 and 1994
6	Since 1946 there has been an increase in vegetation along this ridge on the inside of the Lake Craven U shape
7	Since 1946 there has been a decrease in vegetation in this riparian strip between the Aire River and Lake Hordern

Attachment D
Tasmanian Mudfish (*Neochanna Cleaveri)* information

Department of Sustainability and Environment

Action Statement

Flora and Fauna Guarantee Act 1988 No. 115

Australian Mudfish

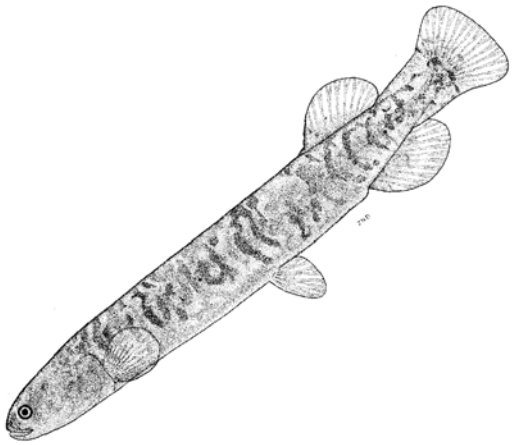
Neochanna cleaveri

Description and distribution

The Australian Mudfish, *Neochanna cleaveri* (Scott 1934) is a small scaleless, tubular fish. The head is short, rounded and broad with small eyes. Fins have fleshy bases and are generally rounded. The dorsal fin is situated well back and above the anal fin. The colour of the adult is greenish brown, brown or blackish above changing to grey or greyish green below. It can be distinguished from other *Galaxias* by small pelvic fins, very small eyes and large tubular nostrils. Adults are usually about 80mm in length but can reach 140mm (McDowall 1980). The species was previously known as the Tasmanian Mudfish *Galaxias cleaveri* (McDowall 1997, Waters 1997)

The Australian Mudfish has a patchy distribution in coastal areas of northern, southern and western Tasmania (Merrick & Schmida 1984). In Victoria it has been recorded from the south east side of Wilsons Promontory, the Yarra River below Dights Falls near Melbourne, Wye River and Glen Aire within the Otway Ranges (Koehn and Raadik 1991) and the Barwon River near Geelong (NRE Aquatic Fauna Database). The taxon has been recorded from one location on a small swampy tributary of Freshwater Creek on the south-eastern side of Wilsons Promontory on two occasions in 1980 (Jackson and Davies 1982).

In November 1992 one juvenile Mudfish was found among approximately 3 000 galaxiid whitebait samples during a survey on the impact of Dights Fall Barrier (Tarmo Raadik pers. comm.). In 1990 eleven specimens were collected from three sites on private land in the Aire and Calder River valleys (Glen Aire) (Koehn & Raadik 1991), 35km west of the locality on the Wye River where the species was recorded by Koehn & O'Connor 1990.



Australian Mudfish *Neochanna cleaveri*
(Actual size – up to 14cm)
(illustration by Jeff Davies from Jackson & Davies 1983)

Distribution in Victoria
+ before 1970, ■ since 1970
[source: Victorian Fish Database, NRE 2000a]

Victoria
The Place To Be

An adult Mudfish was located in a small drain leading to the Barwon River on the Belmont Common in September 1998 (Tarmo Raadik pers. comm.).

The location of specimens at three sites on private land and no records from public land at Glen Aire does not necessarily reflect the distribution of the taxa across these land categories. Much of the potential habitat on public land is relatively inaccessible and will require considerable survey time and effort. Surveys on public land are required to ascertain the relative importance of such areas to the species conservation at Glen Aire.

Current conservation status

NRE (2000) endangered (Vic.)

SAC (1991) threatened (Vic.)

The Australian Mudfish has been listed as a threatened taxon under the **Flora and Fauna Guarantee Act 1988**. Australian Mudfish have been located at only seven sites in Victoria. A total of 29 adult specimens have been found: at two sites in Wilson's Promontory; the Yarra River; Belmont Commons; and; at four locations in the Otway Ranges. Three of these sites have been discovered in the Otway Ranges west of Cape Otway (SAC 1991). Large areas of suitable wetland habitat have been lost due to drainage and development. Wetlands of the type suitable as Mudfish habitat have declined by 99% in South Gippsland (Koehn & Raadik 1991). Draining, clearing of swamps and stock access to habitat still remain a threat and can result in habitat degradation. Introduction of exotic species, application of herbicides and fertilisers may cause a significant threat to the health of habitat and continuation of species (SAC 1991).

Major conservation objectives

- To protect and enhance known populations and their habitat. To ensure the long term viability of Australian Mudfish through habitat protection and enhancement particularly at Glen Aire and Wilsons Promontory.
- To determine the location of any new sites containing populations of Australian Mudfish and provide protection for any new populations found.
- Protect and restore habitat at locations likely to have previously supported populations of Australian Mudfish.

Decline and threats

Wetland drainage and further degradation of wetland habitat is likely to remain a threat to Australian Mudfish. Habitat on public land in the Glen Aire area is contiguous with wetland systems on private land so management impacts are likely to be transferred across private and Crown land boundaries. Wetlands on other public land require protection as Australian Mudfish habitat (for example, Barwon Common).

Upstream Barriers, either natural or artificial, could limit fish access to suitable swampy habitat. Fish ladders, whilst efficient with normal water flow, may not work 100% during high or low water flow.

Survey is difficult due to the nature of the species habitat and the cryptic nature of the fish. Electro-fishing has been used successfully and enables release of fish after collection and identification. Use of this technique is likely to be the best available but will require a significant amount of time to conduct surveys. Removal of quantities of aquatic vegetation to aid sampling may be necessary in small isolated patches although this may impact on its preferred habitat.

Predation from exotic fish such as Brown Trout *Salmo trutta* may also impact on population size and therefore viability. No stockings of exotic species such as Brown and Rainbow Trout *Oncorhynchus mykiss*, or Redfin *Perca fluviatilis* should be allowed in Mudfish streams or catchments.

The breeding ecology of the taxon is not well known. It appears spawning occurs in the winter (Koehn and Raadik 1991). The spawning sites in Victoria are unknown. It is likely that juveniles spend at least part of their early life at sea and return to freshwater at approximately two months of age (Koehn and Raadik 1991). Artificial manipulation of estuarine water levels by opening the mouth of the river to drain low lying land for cattle grazing in the Glen Aire system may have an adverse impact on its life cycle.

The species is capable of at least partial aestivation (Koehn and Raadik 1991) and is therefore likely to survive some natural drying of its wetland habitat. This should be considered in management of billabongs and isolated swamps. Temporary exclusion of stock during summer months will avoid trampling of fish and maintain suitable habitat.

The preferred habitat of the fish contains dense aquatic or inundated terrestrial vegetation and a mud or silt substrate. Maintenance of these characteristics is necessary. One specimen has been collected from a recently excavated drain with little vegetation, however, it is likely that the fish were recolonising the area as vegetation re-established. In this case dense vegetation had re-established within four months (Koehn & Raadik 1991).

Wider Conservation Issues

The Aire River system and associated wetlands contain a variety of aquatic habitats and a high diversity of fauna. The Aire River has been listed as a Heritage River (LCC 1991). Land Conservation Council (LCC) approved recommendations for the Aire River include protection of Australian Mudfish habitat and native fish diversity. The estuary and wetland system is an important fish nursery. Estuarine wetlands play a key role in the life of many fish including Black Bream *Acanthopagrus butcheri*, Yellow-eye Mullet *Aldrichetta forsteri*, Short Finned Eels *Anguilla australis*, Common Galaxias *Galaxias maculatus* and Estuary Perch *Macquaria colonorum*.

Fencing to exclude stock may be difficult or inconvenient to landholders in many cases, particularly where habitat occurs in isolated swamps or billabongs within pasture paddocks. Temporary electric fences could be used to exclude stock from receding ephemeral wetlands where aestivating fish are likely to be at risk from trampling.

A number of other fish species have been recorded in association with Australian Mudfish. In habitat surveyed in Victoria associated *Galaxias* are free swimming, whereas Australian Mudfish are benthic therefore protection of the whole riverine habitat is necessary to conserve the whole aquatic community (Koehn and Raadik 1991).

Previous management action

Surveys have been conducted at a number of locations containing suitable habitat. In 1980, 15 specimens were captured at Freshwater Creek, Wilsons Promontory (Jackson & Davies 1982). In 1983 one specimen was recorded from Wye River (Koehn & O'Connor 1990a). In 1990 eleven specimens were collected from three sites in the Aire and Calder river valleys (Koehn and Raadik 1991).

Research efforts have consisted of studying aestivation behaviour under captive, controlled conditions and collection of information from specimens captured during surveys (Koehn & Raadik 1991). No management has been undertaken to determine accurately the distribution and abundance of the Australian Mudfish.

Potential habitat has been protected on public land at Glen Aire by excluding grazing from the Lake Horden Wildlife Reserve and by some fencing of permanently reserved river frontage on the west bank of the Aire River between the Ocean Road and Lake Horden.

Under the **Heritage River Act 1992** the heritage river corridor of the Aire River is to be retained free from impoundments, artificial barriers, or structures that impede in-stream fauna unless agreed to by the Governor in Council and any new diversions of water are only to be permitted if their volumes, timing and off-take do not significantly impair native fish habitat conditions.

Intended management action

Research, survey and monitoring

1. Conduct research into the life cycle of Australian Mudfish. Specifically determine more precisely the sequence and timing of events, and what adaptability the fish may have to environmental variations.

   Responsibility: NRE (PFF)

2. Undertake intensive, targetted surveys at Wilsons Promontory, Yarra River, Belmont Commons and Wye River and Glen Aire for Australian Mudfish.

   Responsibility: NRE (PFF), Parks Victoria

3. Identify appropriate habitat in data gap areas and conduct targeted surveys for Australian Mudfish, for example, between Geelong and Melbourne, Melbourne and Wilsons Promontory.

   Responsibility: NRE (PFF)

Habitat Protection

4. Continue to liaise with landholders to protect Australian Mudfish habitat on private land, especially protection and restoration of streamside vegetation. Provide information and advice to landholders as appropriate, including opportunities for assistance via grants programs, etc.

   Responsibility: NRE (SW Region), Corangamite Catchment Management Authority

5. Negotiate with the Committee of Management (City of Greater Geelong) to secure habitat on public land in Barwon Common.

   Responsibility: NRE (Port Phillip Region)

6. Where possible, include Australian Mudfish protection areas in Local Government Planning Schemes under Victorian Planning Provisions through the use of Environmentally Significant Overlays.

   Responsibility: NRE (SW Region, Port Phillip Region, Gippsland Region), relevant local government authorities

7. Fence remaining permanently reserved river frontage on the west bank of the Aire River between the Ocean Road and Lake Horden. The general area in which the species occurs at Glen Aire contains a complex layout of land

parcels of various status and tenure. There are a number of continuing planning and conservation issues which need to be linked in with actions for the Australian Mudfish.

Responsibility: NRE (SW Region), adjoining landholders

8. Protect Wilsons Promontory site from all forms of heavy machinery used for the purpose of fire protection works.

Responsibility: Parks Victoria

Education

9. Prepare, display and distribute information on Australian Mudfish, including brochures and displays. Include information on Australian Mudfish in general information and extension materials prepared for relevant areas, including Wilsons Promontory National Park and Glen Aire.

Responsibility: NRE (PFF, Regions), Parks Victoria

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Compiled by Wendy Skene, Steve Smith and Ian Smith (Colac), and Tarmo Raadik (Arthur Rylah Institute), Department of Sustainability and Environment.

Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: http://www.dse.vic.gov.au

This Action Statement was prepared under section 19 of the Flora and Fauna Guarantee Act 1988 under delegation from Chloe Munro, Secretary, Department of Natural Resources and Environment, December 2001.

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Australian Biological Resources Study

Neochanna cleaveri (Family Galaxiidae)

Tasmanian Mudfish, Australian Mudfish

Distribution Map

Attached Images

Distribution:

The Tasmanian Mudfish is found along low-lying coastal areas in the north, west, south, and south-east of Tasmania, on Flinders Island, in southern, coastal Victoria, Wilsons Promontory, Otway Ranges, and near Geelong and Melbourne) and far eastern South Australia and Naracoorte (VIC, TAS, SA).

Features:

The Tasmanian Mudfish is a small elongate, tubular and scaleless. It grows to 140 mm in length. Features that distinguish this species from other galaxiids are the presence of large, long tubular nostrils, a small head and eyes, large round pectoral fins and small pelvic fins, large flanges on the caudal peduncle, and a low, rounded to ovoid dorsal fin, elongated posteriorly.

Ecology/Way of Life:

The Tasmanian Mudfish is mostly found in well-vegetated, still waters, such as drains, ditches, swamps, and riverside billabongs. They can survive for a period of time when their habitat dries up by burying in the mud, or under logs or rocks. Spawning is thought to occur during winter, and in some populations the young are washed downstream to the estuary or sea, where they feed for two to three months before migrating back upstream to adult habitat. Aquarium observations indicated that Tasmanian Mudfish are nocturnal, with individuals relatively inactive during the day, resting either on the substrate or up in the water column amongst dense aquatic vegetation. Activity increased during the night, when individuals moved around more open areas, presumably browsing for food. Very little additional biological information is available for this species, such as diet, number of eggs or their size, or the maximum age attained. This appears to be the only native Australian fish that has a migratory phase to its life cycle and can also survive periods without water.

Interaction with Humans/Threats:

This is a cryptic, little known fish, due to its propensity for habitats with abundant aquatic vegetation. They are not listed as threatened nationally due to their broader distribution in Tasmania, but are listed as threatened on mainland Australian in Victoria, where they have been recorded from only five areas. The major threat to this species is the elimination of low-lying wetland areas near the coast, the continuing degradation of remaining wetlands by urban and agricultural development, instream barriers to migration, and cattle trampling. Predation by alien fish species at known sites may also be a threat.

Other Comments:

Neochanna cleaveri was named by Scott in 1934. Originally described as *Galaxias cleaveri*,

and moved to the genus *Neochanna* by McDowall (1997). The genus is derived from *Neos* (Greek) meaning new and *Channa* a genus of Asian fishes which are known to aestivate. The species name is *cleaveri*, in honour of its collector, Mr. F. Cleaver.

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Text: Tarmo A. Raadik. Distribution map: Peter J. Unmack. Photographers: Tarmo A. Raadik & Neil Armstrong.

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Fact Sheet for Tasmanian mudfish

Common Name:

Tasmanian mudfish

Species Name:

Neochanna cleaveri

Credits:
Ron Mawbey

Other Names:

Formally known as Galaxias cleaveri; Mud galaxias

Commonwealth Conservation Status:

Fishing Status:

This species may not be taken without a permit, unless captured by the use of a bush pole. A bush pole is defined as a length of wood that is not less than one metre in length and does not have a reel and running line. Juveniles are often found in whitebait runs, for which there is a restricted recreational season requiring a Whitebait Licence.

Distingushing Features:

Small elongated fish that have a single soft-rayed dorsal fin on their back. There are no scales present, but they do have a lateral line. The anal fin starts a little behind the dorsal fin

Colour:

It is usually brown to greenish-brown on the back and sides with numerous darker stripes and patches. The belly is usually greyish in colour.

Size:

Commonly about 80 mm, but up to 125 mm

General:

Native to Tasmania and southern Victoria. They are capable of living in marginal swamps and ditches with no noticeable flow. The swampy areas that they inhabit is under continual threat from drainage and marsh reclamation practices

Life Cycle:

Spawning habits are unstudied, but it is believed to spawn in winter. The juvenile fish then

form part of the whitebait run returning in spring after about two or three months at sea. They then take up residence in the lower reaches of coastal streams

Habitat:

A secretive fish that is rarely seen except for feeding. Found mostly in still waters in heavily vegetated mud-bottom swampy areas near the coast, and the lower parts of coastal streams. Tends to be mostly nocturnal. During dry periods it is able to burrow into the mud, or hide under logs and stones, and survive for extended periods

Diet:

Although unstudied, it is presumed to feed on terrestrial and aquatic insects and other small animals

Why is it Threatened?:

In-stream barriers preventing migration runs; Drainage of large areas of swamp and wetlands; Contaminants entering rivers and streams; Loss of instream and marsh habitat.

Tasmanian Distribution:

Reasonably common at low elevations all around the coast, although adults are not often seen