A2.2 PPM for Aquatic Biodiversity

AQUATIC BIODIVERSITY	Objectively Verifiable Indicators	Means of Verification	Assumptions
Overall Outcome To contribute substantially to the understanding, conservation and protection of targeted aquatic biodiversity assets in the South West NRM region so as to ensure that the abundance, diversity and structure of all aquatic ecosystems and their component fauna and flora species occurring naturally in the South West NRM region are maintained or improved.	**Indicators for the Overall Outcome** **AI-1a** By 2020, no known aquatic species becomes extinct if conservation action is being undertaken. **AI-1b** Management and/or control plans have been drawn up and are being implemented for 75% of aquatic invasive pest species and diseases identified as being significant at national and/or State levels in the period up to 2020. **AI-1c** Potential impacts of climate variability, exploitation of groundwater resources and other key threats on aquatic ecosystems identified and defined by 2013 and this knowledge is incorporated into management programs by 2015. **AI-1d** By 2020, the effects of climate variability on aquatic species are understood and adaptation and/or mitigation strategies developed to deal with them. **AI-2** By 2020, comprehensive knowledge systems are developed for 20% of identified priority aquatic habitats. **AI-3** Community awareness about the issues impacting on aquatic biodiversity is continually evolving in the period up to 2020.	• State of Environment Report WA • Annual reports (SWCC) • Report cards or State of Environment reports (SWCC)	
Management Outcomes **AM-1** Appropriate management programs are being implemented for all aquatic species and aquatic ecological communities in the South West region that are either representative and/or endangered. **AM-2** Biodiversity conservation work in the South West NRM region is underpinned by comprehensive knowledge systems (inventories of, and management plans for, aquatic species and aquatic ecological communities). **AM-3** The South West community is aware of the key threats to, and supports action to mitigate their effects on, the region's priority aquatic biodiversity assets.	**Management Outcome Indicators** **AMI-1a** Actions to maintain, enhance and/or restore aquatic habitats initiated on 20% of identified priority aquatic habitats by 2020. **AMI-1b** Significant invasive pest species identified and prioritised by 2013 and control strategies commenced by 2015. **AMI-1c** SWCC and its partners identify and define the potential impacts of climate variability and other key threats on aquatic species and ecosystems by 2013 and this knowledge is incorporated into management programs by 2015. **AMI-2** An inventory of, and monitoring program for, aquatic species, communities, habitats and ecosystems is developed by 2015 and used to document and re-evaluate their conservation status in priority areas (e.g. every 5 years). **AMI-3** Awareness for the conservation of the Region's priority aquatic biodiversity assets increased by 10% as compared to baseline levels in 2011 by 2020.	• Annual reports (SWCC) • Report cards or State of Environment reports (SWCC)	• Political and public support for conservation remains strong • No new invasive species or diseases take hold that have the ability to wipe out one or more species. • The rate of change induced by climate variability is not so rapid as to negate adaptation and/or mitigation work.

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Appropriate Management Actions **AA-1a** **Title (what)**: Maintain, enhance and restore aquatic habitats. **Target (why)**: Increase available habitat and contribute to conservation of aquatic biodiversity. **Appropriate actions (how)**: • Implementation of habitat improvement programs in priority areas, focusing on actions that improve connectivity and restore ecological functions of ecosystems at the landscape scale. Appropriate activities include the creation of fish passages and redirection of trout stocking programs to dams and mining voids, the objective being to create and restore corridors, and to maintain or increase populations of endangered species and ecological communities. • Support for the development of a collaborative, strategic approach to aquatic ecosystem protection and management that includes full aquatic and terrestrial life-cycles of aquatic species with key partners, e.g. WALGA, DEC. DoW, DOF and NGOs such as WWF, UNEP and IUCN. • Support for programs to maintain natural flow regimes in rivers. • Support for programs to preserve the lentic water bodies of the peat flats. **Contributes significantly to AM-1**. In addition, contributes significantly to objectives WM-1.	**Potential Management Actions Indicators** **AAI-1a** Numbers of towns/groups/schools involved in adopting a species/stream/river. **AAI-1b** Numbers of towns/groups/schools involved in implementing a monitoring and/or surveillance program for one or more aquatic species and/or ecosystems. **AAI-1c** Number of species and/or aquatic environments monitored. **AAI-1d** Behaviour change – adoption by industry and local government (bye-laws, codes of practise, protocols).	• SWCC (annual, quarterly and other reports) • Local governments and WALGA. • Schools. • Education Department, universities. • Landcare and other community groups. • Government agencies (DEC, DoW, DoF, BOM). • Museums and the Perth Zoo. • Landholders. • NGOs.	• Schools and communities are interested (is it “sexy enough”). • Sufficient time available. • Funding is available. • Lack of priority (political) can be addressed – perceived importance or lack thereof. • Unrestricted water extraction can be managed. • Funds for research can be accessed, as is not cheap. • Lobby groups pressuring politicians can be “contained”, e.g. trout fishermen.
AA-1b **Title (what)**: Pest management and control. **Target (why)**: Reduce impact of invasive pest species on indigenous aquatic species and ecosystems. **Appropriate actions (how)**: • Support for, and implementation of, management programs for pest species in priority areas, i.e. yabbies and *Gambusia*. • Implement buffer zone protection, enhancement and management projects and control of weed and invasive species to increase ecosystem resilience. **Contributes significantly to AM-1**. Does not contribute significantly to objectives of other programs.	**AAI-1e** Number of management and/or control programs for pest species implemented.		

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Appropriate Project Activities contd.) **AA-1c Title (what)**: Managing the effects of climate variability on aquatic biodiversity. **Target (why)**: To improve our understanding of the effects of climate variability on aquatic species and ecosystems and increase their resilience to these. **Appropriate actions (how)**: • Support for research and planning activities into how best to mitigate and/or adapt to the effects of climate variability on local species and ecological communities. • Identify and incorporate risk management strategies for the effects of climate variability into all projects and programs, utilising "best management practice". **Contributes significantly to AM-1**. In addition, contributes significantly to objectives of BM-4.	**AAI-1f** Number of cooperative projects to assess or plan for the effects of climate variability on aquatic species and ecosystems. **AAI-1g** Number of projects designed to increase ecosystem resilience.		

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Appropriate Management Actions contd.) **AA-2 Title (what)**: Improve understanding of aquatic species and ecosystems. **Target (why)**: Freshwater aquatic species and ecosystems are poorly understood in the SW, which means that appropriate research is important to ensure that adequate knowledge is obtained to allow for the development of appropriate management strategies in the future. **Appropriate actions (how):** • Support research to identify of those aquatic species and communities that are at risk. • Support research to use this information to assess feasibility of programs for "*captive breeding and restocking*" and "*relocation*" for the most threatened aquatic species and provide support where considered to be feasible and cost-effective (to include relevant genetic research on pygmy perch and other threatened species). • Support research to assess interactions between surface aquatic habitats and groundwater systems to determine dependencies and requirements. • Development of in-house database (biological data record centre) of relevant biodiversity information to be used to monitor, report on and evaluate progress. • Support for general research into aquatic species and ecosystems re: o temperature dependency as it relates to life cycles and the effects of climate variability; o cave-dependent species (stygofauna, troglofauna); o impacts of exotic species on indigenous fauna and flora (aquatic weeds, carp and yabby); and o pollutants and contaminants. **Contributes significantly to AM-3**. Does not contribute significantly to objectives of other programs.	**AAI-2a** Report(s) on "at risk" aquatic species and ecosystems finalized. **AAI-2b** Feasibility reports on restocking and relocation finalized. **AAI-2c** Report(s) on interactions between surface waters and groundwater finalized. **AAI-2d** Reports and publications on the four subject areas listed. **AAI-2e** Biological data record system (database) developed; number of organizations contributing data and information to database.		

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Appropriate Management Actions contd.) **AA-3 Title (what)**: Improve community-based aquatic monitoring. **Target (why)**: Increase awareness and involvement of community in conservation of aquatic biodiversity. **Appropriate actions (how)**: • Support for "Adopt a species/stream/river" programs (e.g. birth certificate/totem species; River restoration action groups, Friends of native mussel group). • Implementation of education, conservation training, awareness raising and monitoring/surveillance programs for and with schools, community members and groups involved in supporting biodiversity conservation work in priority areas to develop a sense of "ownership". • Implementation of awareness program for freshwater anglers about the consequences of translocating rainbow trout, aquatic plants and other species. **Contributes significantly to AM-3.** In addition, contributes significantly to objectives of BM-3, PM-1.	**AAI-3a** Number of habitat improvement programs implemented. **AAI-3b** Number of programs implemented to maintain natural flow regimes in streams/rivers and to preserve lentic water bodies on peat flats. **AAI-3c** Strategic partnership developed with key partners (at least WALGA, DoF, DEC and DoW) to ensure aquatic species and ecosystems are managed collaboratively and according to best practise; number of species/ecosystems targeted. **AAI-3d** Number of waterways that are trout-free; number of alternative recreational fishing areas developed. **AAI-3e** Species diversity increased (richness and abundance).		

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Priority Assets for Management Action
• **Species**:
  o Tier 1 – Balston's Pygmy Perch (*Nannatherina balstoni*), the Black Stripe Minnow (*Galaxiella nigrostriata),* Margaret River Burrowing Crayfish *(Engaewa pseudoreducta)* and Hairy Marron (*Cherax tenuimanus*); and
  o Tier 2: Western Mud Minnow (*Galaxiella munda*) and Pouched Lamprey (*Geotria australis*); all marron stocks; all freshwater fish, crayfish and jellyfish species.
• **Ecosystems**:
  o Ramsar wetlands: Vasse-Wonnerup and Muir-Byenup.
  o Estuaries in the South West: Leschenault Estuary & Inlet, Hardy Inlet and Broke Inlet.
  o Rivers: All waterways leading into the wetlands and estuaries listed above (based on the need to address the causes not symptoms of major threats to systems); Margaret River (significantly different biodiversity, including the Hairy Marron); Shannon, Deep and Warren rivers (near pristine, need to maintain status); and refuge and breeding sites for endemic fish species (Brockman River, Ellen Brook, Milyeabrup Brook, Milyeannup Brook and Poison Gully); and other waterways for their biodiversity values (Donnelly, Meerup and Gardner rivers; Lower Blackwood, Chapman, Upper Chapman, McLeod and Rushy Creeks).
• Lake Jasper and the associated coastal belt.
• Commercial aquaculture.
	Priority threats:
	• climate change, e.g. reduced rainfall causing drying out of refuges such as permanent pools;
	• introduction of non-native species, e.g. yabbies and *Gambusia*;
	• ecosystem fragmentation;
	• loss of habitat required for different stages of species' life cycles;
	• eutrophication;
	• groundwater abstraction;
	• inappropriate development on acid sulphate soils;
	• movement of species, e.g. marron from one catchment to another;
	• pollution from point sources;
	• inappropriate land use planning;
	• salinity; and
	• coastal development (including the development of oil and gas fields and other mining activities).
	
	Secondary threats include intensive agriculture; water abstraction; water development; aquaculture and boating facilities; and recreational and commercial fishing.	