



June 2019

#WAestuaries

An aerial photograph of a coastal town, likely in Australia, featuring a large waterway with numerous houses and boats. A large white circle is overlaid on the center of the image, containing text. The background shows a mix of residential buildings, green spaces, and a clear blue sky.

System stewardship

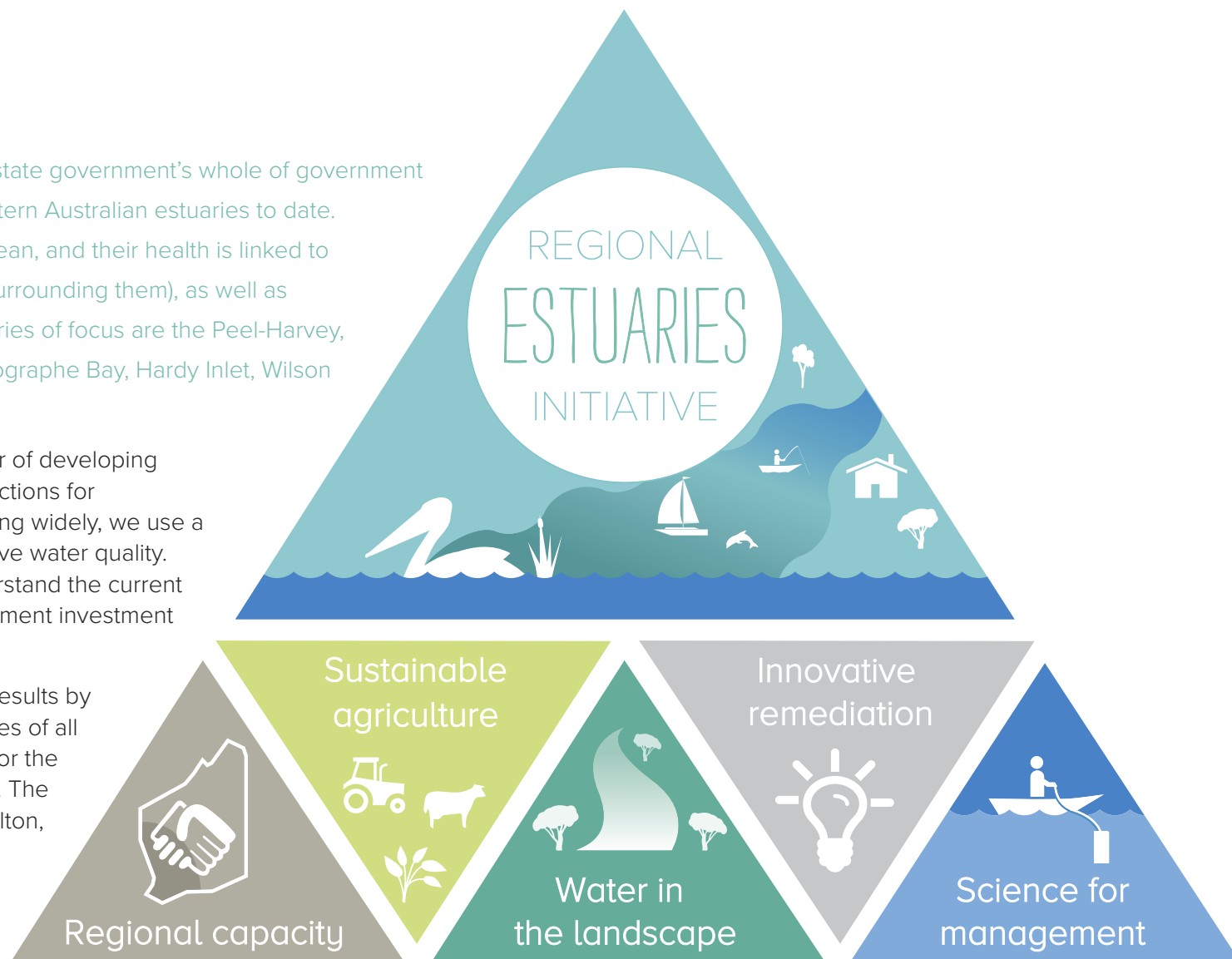
For the Department of Water and Environmental Regulation, system stewardship means harnessing the capability of all sectors to achieve long term outcomes for the environment, economy and community.

Overview

The Regional Estuaries Initiative is the state government's whole of government investment in the health of six key Western Australian estuaries to date. Estuaries are where rivers meet the ocean, and their health is linked to conditions in the catchment (the land surrounding them), as well as conditions in the water itself. Our estuaries of focus are the Peel-Harvey, Leschenault, Vasse-Wonnerup and Geographe Bay, Hardy Inlet, Wilson Inlet and Oyster Harbour.

The four-year initiative is in its third year of developing innovative, integrated and on-ground actions for catchment-scale outcomes. By partnering widely, we use a system-stewardship approach to improve water quality. Our world-class science helps us understand the current health of our estuaries and direct catchment investment where it will have the biggest impact.

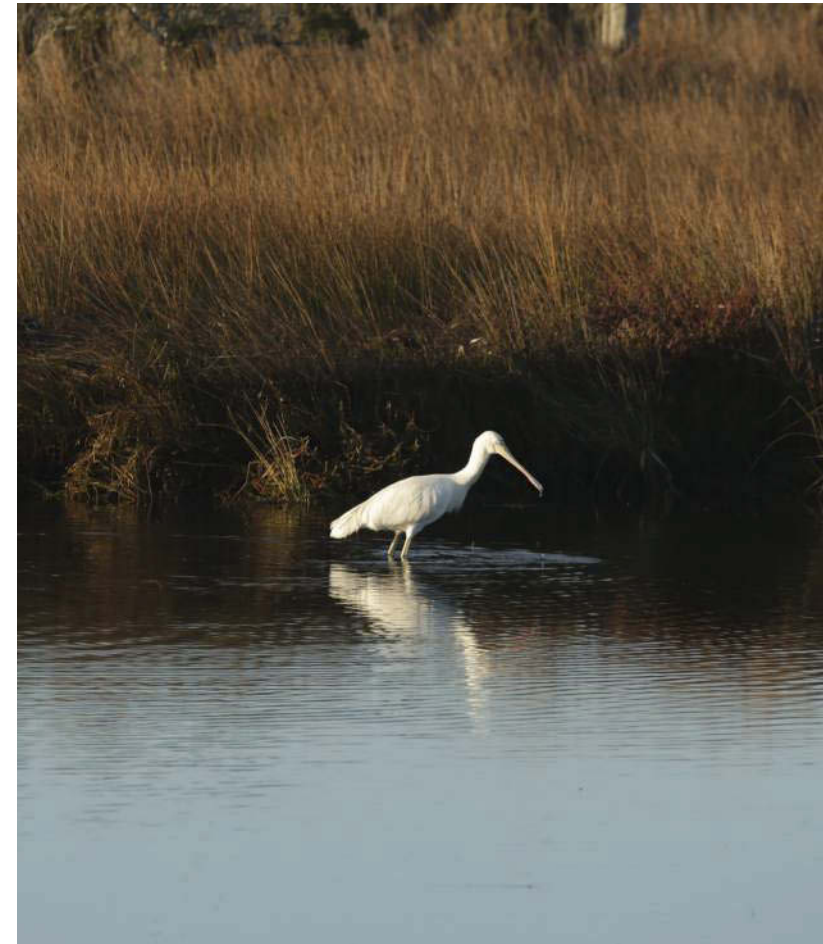
We know we cannot achieve the best results by working alone, so we use the capabilities of all relevant sectors to achieve outcomes for the environment, economy and community. The residents of Mandurah, Bunbury, Busselton, Augusta, Denmark and Albany benefit from this approach – as do farmers in the rural catchments and the 2.1 million visitors to these areas.



Why this investment is important

Symptoms of poor estuary health include fish kills, low oxygen water and the unhealthy proliferation of algae. These conditions can threaten the livelihoods and lifestyles of people that depend on and enjoy our estuaries. Poor estuary health harms the fishing, hospitality and tourism industries, negatively affects local councils and real estate values, and may prevent people from using the estuary for recreation. Estuary plants and animals can also suffer, including water birds, dolphins and seagrass beds which capture carbon and nurture the next generation of fishing stocks. The initiative works to address the long-term challenge of excessive nutrient inputs that lead to poor estuary health.

Australia's south-west is one of the places most affected by climate change in the world. Lower rainfall totals in the south-west since the 1970s have reduced river flows to estuaries and increased water temperatures. These altered conditions have further increased the likelihood of algal blooms and fish kills. By reducing the loss of nutrients and organic matter from the catchments the initiative's actions are helping to build resilience in our south-west estuaries to withstand the changes, and remain healthy places to swim, fish, crab, live beside, bird watch, boat and enjoy.



Celebrating success

Now in its third year, the initiative is in full swing – delivering action on the ground and creating local jobs. We have established 11 formal partnerships and many other informal ones.



More than **200 stakeholders** are directly involved in steering or delivering the program.

Our funding directly employs more than **100 people**



about 70 of whom **live in the regional communities.**

Our success stems from our ability to connect diverse stakeholders, who continue to work towards the common goal of improved water quality for the state's estuaries. The initiative has enabled the department to partner with groups the government has not previously worked with, developing win-win solutions that support regional economic productivity and making improvements that will lead to better estuary health.

We work with people who can make changes to their practices – farmers, industry representatives, local government staff, gardeners and members of catchment groups. We support farmers to construct better dairy effluent systems and offer soil testing to help them reduce nutrient losses from land. We are restoring and replanting riverbanks, installing fencing and improving stormwater drainage in regional towns. We are learning more about our estuaries than ever before, and trialling new technologies to lock up nutrients before they reach our waterways.

The initiative also drives great science. New investigations are underway to give us a more contemporary understanding of our estuaries. These will build on 20 years of data and our expertise to inform actions and create plans for the future. Our information provides the evidence base to target investment and informs our advice to other government agencies, in turn influencing policy and regulatory frameworks for improved water quality.



Our partners

Since the initiative's launch in April 2016, we have established many partnerships with industry, community groups, government agencies, local government and universities. Our formal delivery agreements with regional catchment groups support their work with landholders to promote sustainable agricultural and natural resource management practices.





In addition to our partnerships, many organisations support the initiative through technical advice, in-kind support and complementary programs. (These include CSBP, Summit Fertiliser, Meat and Livestock Australia, Iluka Resources Pty Ltd and the South West Catchment Council, Landmark, Murdoch University, Southern Dirt.) We are also thankful for the support of individual farmers and consultants.

Our diverse partnerships and supporters allow the initiative to deliver innovative, integrated programs for catchment-scale outcomes.

“The initiative has enabled us to reconnect with our coastal plain farming community on soil testing, fertiliser management and drainage water reuse projects... all critical projects to improve water quality and support sustainable agriculture.”

– Peel Harvey Catchment Council

“The Regional Estuaries Initiative program has allowed WICC to provide farmers throughout our catchment with the capacity to implement best management practice, keeping nutrients on their farms and out of our waterways.”

– Wilson Inlet Catchment Council



Regional capacity



Creating partnerships and supporting people in our regions to deliver water quality improvement

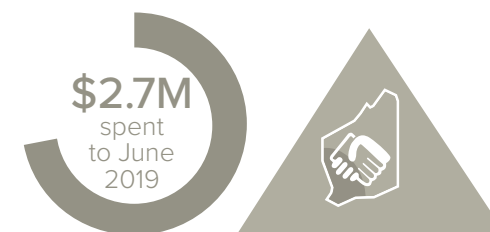
Restoring and protecting the health of our estuaries is only possible if people with the right skills, knowledge and experience work together. The initiative has **supported training and employment opportunities** for regional communities, targeting local practices to improve estuary condition. Resources are provided to project officers and catchment coordinators to deliver on-ground actions. More than 200 people are involved in steering or delivering our projects.

Building our regional capacity

Partnerships with our regional catchment councils and their committed staff are critical for delivering the initiative's programs. We have directly contributed to the **employment of 14 staff in regional landcare organisations** who interact with landholders and farmers to improve fencing, stream revegetation and fertiliser management, as well as deliver behaviour change programs to benefit our estuaries.

Catchment and project staff have received training to increase the effectiveness of their program delivery. This has included media and presentation skills, as well as behaviour change approaches.

We have **established project reference and technical working groups** that enable industry, government, and catchment council staff, as well as scientists and landholders, to meet, learn from each other and provide program advice and steering. To date we have held 23 of these stakeholder meetings.



The initiative hosted a nutrient summit with more than 100 attendees in August 2017. This event brought together some of the most innovative and successful farmers in Australia and New Zealand to share their experiences and stories. Among the speakers was a Queensland sugar cane farmer, a New Zealand dairy farmer and an industry representative from Fertilizer Australia, who all shared a wealth of knowledge on water and land management, science, policy and innovation.

www.rei.dwer.wa.gov.au

50 000 page views



600 subscribers

Community knowledge-sharing

More than **35 workshops and community events** have been run across the south-west. We hold community forums to update our stakeholders in each catchment on our progress. Eighty-four people attended the last forum for Leschenault Estuary and more than 50 attended the forum for Wilson Inlet.

We have also been conducting **workshops for urban gardeners in best fertiliser management** in the Bunbury region. We have had 340 attendees at these workshops, with surveys suggesting that 84 per cent of them would start to, or were already using eco-friendly fertilisers.

#WAestuaries

185 tweets

Two urban fertiliser behaviour change programs are complete – Love the Leschenault and Bay Ok (in partnership with Revitalising Geographe Waterways). About 480 households participated, making commitments to 902 actions to reduce nutrient inputs. Avoiding fertilising over winter and switching to controlled-release fertiliser were two stand-out actions. We estimate that due to these programs, **3200 kilograms of fertiliser was not applied** to gardens in Busselton and Australind in 2018.

In leading the Yakamia Creek Fish Friendly Farms project, South Coast Natural Resource Management is engaging local people to develop an action plan, with a focus on Aboriginal community members and landholders along the creek. Participating school children, youth trainees and adults alike have contributed to Yakamia Creek's values with field events, planting and weeding days, planning days and stalls at local festivals.



Better fertiliser decisions on 300 farms

Sustainable agriculture



Creating resilient farming futures and excellent estuaries

Given that nutrient runoff from agricultural land represents the largest source of nutrients entering south-west estuaries, we are working closely with farmers to create win-win solutions for farms and the environment. The sustainable agriculture program has the benefit of scale, working across **71 183 hectares of farmland**, with farmers, local catchment groups, industry and government partnering to achieve change in farming practices.

Our project reference group ensures that our **actions on farmland support improved water quality, profitability and productivity, and nutrient management**. People from 13 organisations (government, industry and community) make up this 29-member group. The unique collaboration and co-design of projects with the fertiliser industry constitutes a significant achievement of the group.

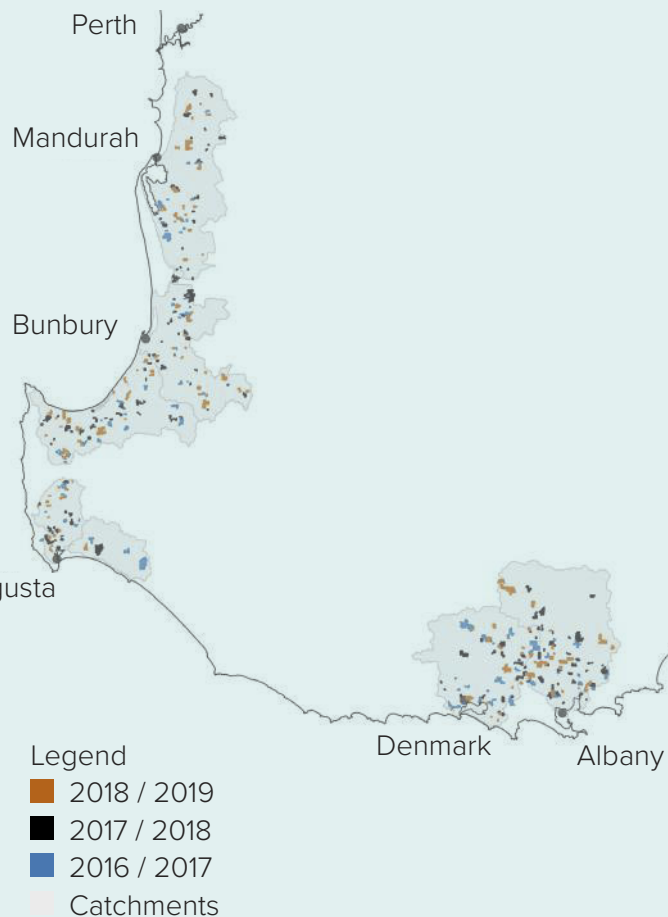
Fertiliser program

About 300 farmers have become involved in the initiative's soil testing programs. Another 60 farmers are engaged through our partner program Revitalising Geographe Waterways.

Nearly **200 people participated in nine Accu-spread field days** run by a Fertcare® accredited specialist to test and calibrate the accuracy of fertiliser spreaders.

For the Peel-Harvey, we estimate that **phosphorus entering the estuary could be reduced by 32 per cent** if all beef and dairy farms optimise their fertiliser application.

We have established a panel of Fertcare® accredited agronomists to help farmers interpret the results of their soil testing and develop tailored fertiliser plans. Follow-up plant tissue testing allows farmers to assess their fertiliser decisions. The panel consists of representatives from major fertiliser companies and various independent agronomists.





The initiative has leveraged an additional **\$2.35 million** in ongoing funding from the Australian Government to improve farmer and industry confidence in evidence-based fertiliser decisions. The Smart Farming Partnerships project, **uPtake**, will establish **36 on-farm trials**, with 19 already set up, and continues until 2022.

A 20-member communications and extension group is raising awareness of our sustainable agriculture programs and the uPtake trials that are now underway.

Dairy program

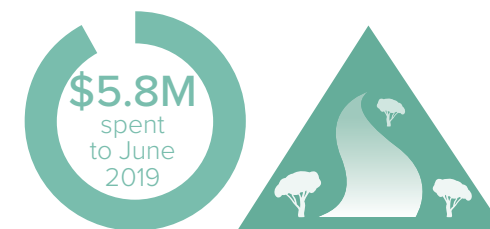
We partner with Western Dairy to offer funding **incentives to south-west dairy farmers to upgrade their effluent systems**, with a 50 per cent farmer contribution.

Of 20 priority farms, three effluent upgrades have been constructed and another eight are underway. Forty-eight farm effluent system reviews are complete.

Reviews and farmer feedback prompted us to examine what is needed to move more farms towards better effluent management. Systems must be practical to maintain and ideally deliver a return on investment, such as offsetting fertiliser costs. The Initiative has invested in an on-farm trial of a Z-filter, a new technology to separate dairy effluent for reuse as fertiliser and washdown water and a register of technologies and practices for managing dairy effluent – tailored to what is practical for the state's south-west.



Water in the landscape



Improving water quality as it moves across the land on the way to rivers and estuaries.

As water flows across the landscape it can be filtered and cleaned in natural systems like streams and wetlands, but it can also mobilise contaminants, nutrients and sediments from rural and urban land. There are many ways we can improve how water moves through the catchment to improve water quality. Projects in this strategy include stock exclusion fencing, selective revegetation of streams, drainage upgrades and water sensitive urban design projects.

Our fencing and stream revegetation project met its four-year target a year and a half ahead of schedule and under budget, with **38 hectares of foreshore planting and 110 kilometres of fencing**. Landowners have contributed more than half of the cost through either cash or in-kind contributions.

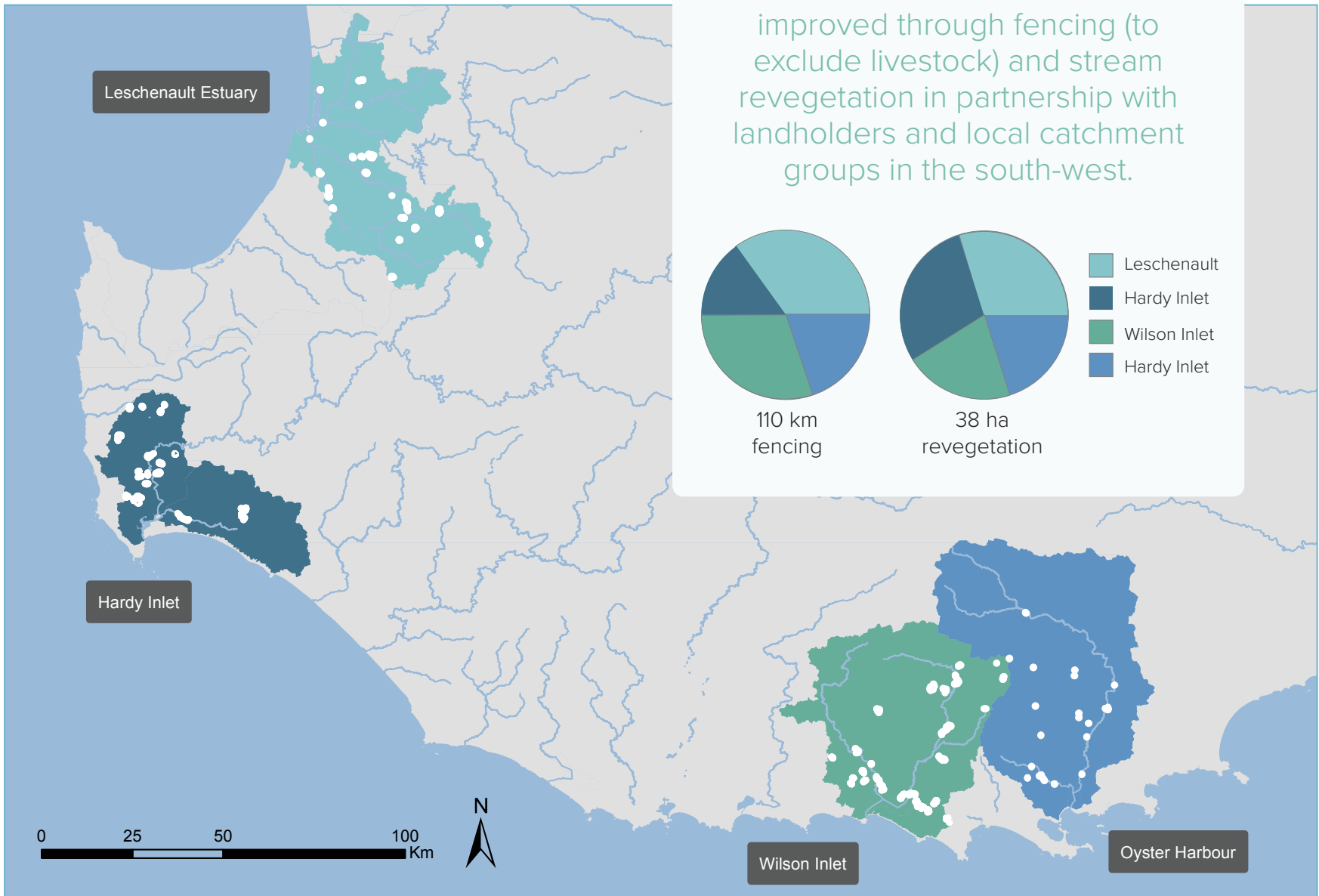
In partnership with the City of Albany, 1.1 hectares of Yakamia Creek has been transformed into a **new wetland system in Albany's Centennial Park precinct**.

Water sensitive urban design projects have also been constructed with the City of Bunbury and the Water Corporation at Brockman Park, which will clean stormwater and create a vibrant urban parkland.

In the Peel-Harvey, on-ground works have been targeted at **six major drainage sites** to trap nutrients and improve water quality.

An ambitious project at Peel Main Drain is underway with the Peel Harvey Catchment Council and the Water Corporation. Six swales have been built to **treat more than 40 per cent of the 5.4 gigalitres of water** flowing past the site each year. Eighteen months of baseline water quality monitoring has been completed.





Innovative remediation



Developing and trialling new treatment options for reducing nutrient losses to watercourses, improving soil health and preventing algal blooms within streams

Our soil amendment trials target high phosphorus (P) loss areas using high P-retaining bulk material Iron Man Gypsum produced by Iluka Resources Pty Ltd in Capel (with our learnings transferable to other high P-retaining materials). We are trialling different rates of application and soil incorporation techniques to understand what works best with least cost and maximum environmental benefit.

Farmers are integral to setting up and running these trials. **We are working on one farm each in the Peel-Harvey and Vasse estuaries.** We have also treated soil at a sportsground in partnership with the City of Busselton.

Our trial areas span 9.1 hectares to date. We have tested five different application rates and four incorporation techniques using farm machinery.

We have taken more than 400 soil, leachate, groundwater, runoff and plant material samples and conducted about 9000 analyses to track benefits and risks.



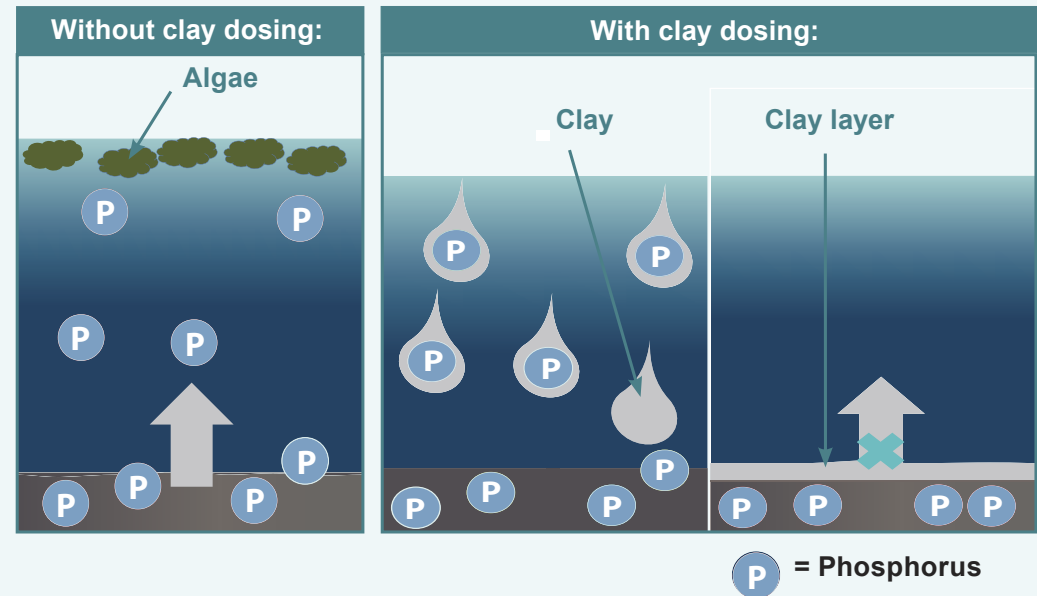
We have achieved a 95 per cent reduction in leachable P from paddock-scale soil amendments.

Treatment has resulted in up to 20 kilograms of P being retained per hectare on these sites in the first year, which if expanded to larger areas of farmland, could reduce P losses by tens of tonnes per farm per year.



We are trialling water treatment techniques to improve conditions in waterways prone to algal blooms. A new high-capacity phosphate-binding clay (HT-clay) is being tested.

HT-clay is a natural bentonite clay modified with a coating of the mineral hydrotalcite, which binds P within its structure. It is applied to the water as a slurry and binds P from the water, and as it settles on the sediments, further acts to block P release from the river bed.



We have analysed **about 4300 samples for more than 16 000 analytes** to help build our understanding of the behaviour and efficiency of the HT-clay under different environmental conditions with laboratory and field testing.



Quantities of clay have grown as the scale of trials has progressed from laboratory through to river, starting at only a few litres of clay through to tens of thousands of litres.

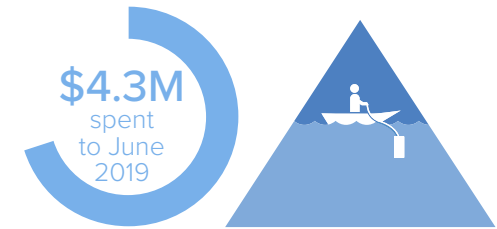
For a trial in the Lower Vasse River, in Busselton, 40 000 litres of clay were produced. Soluble P was immediately reduced to about 0.005 mg P per litre after clay application, well below the target, and stayed low for several months – reducing algal biomass.

Clay application has also been effective at reducing P concentrations in fast-flowing waters of Punrak Drain in the Peel-Harvey.

Our trials have increased our practical knowledge of how to use these clays to remediate watercourses and we hope to advance the HT-clay from an experimental product to a water treatment option suitable for widespread application.



Science for management



Creating the knowledge-base for understanding and managing these dynamic ecosystems.

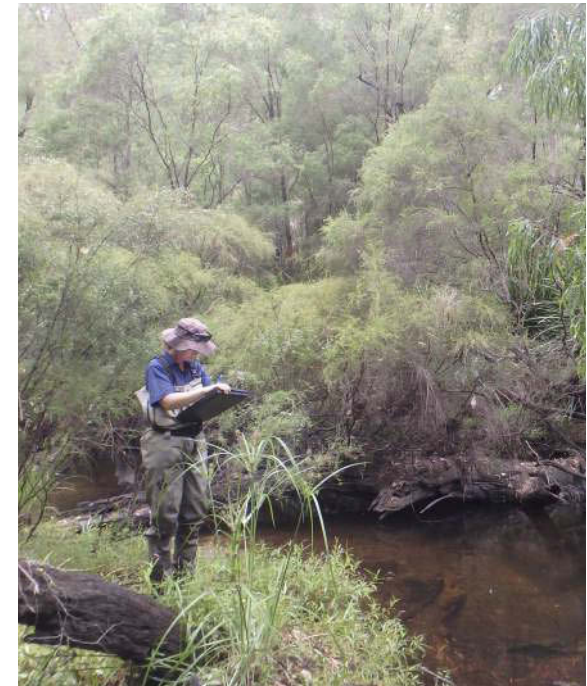
Our understanding of the best way to manage our estuaries is supported by the high-quality data our scientists collect. We **focus on water quality and biotic indicators of health**. Information on water quality is collected fortnightly in most estuaries and their catchments.

The initiative has allowed us to expand our monitoring efforts – the data collected is invaluable to understand current condition, as well as to track the effectiveness of actions taken. We communicate our understanding through community updates and our website, and work with other agencies to deliver outcomes based on sound science.

We have identified more than 300 phytoplankton species (microscopic algae) in about 2300 water samples to date. Of these, **363 samples showed an over abundance of algae** or the presence of harmful algae. These could affect the aesthetics of a waterbody or endanger fish. They may also affect human health through direct contact with the algae or through shellfish consumption.

River health assessments of more than 50 sites in the catchments of our regional estuaries show that most of these are **dominated by native fish and crayfish not found anywhere else on earth**. We collect information on fringing vegetation, aquatic biota, water quality and land use, which guides our management decisions.

Seagrasses are an excellent indicator of estuary condition as they require good water quality and sediment quality in order to thrive. To date, our scientists have monitored seagrass condition and extent in four estuaries with about **1300 observations of the five species commonly found**.

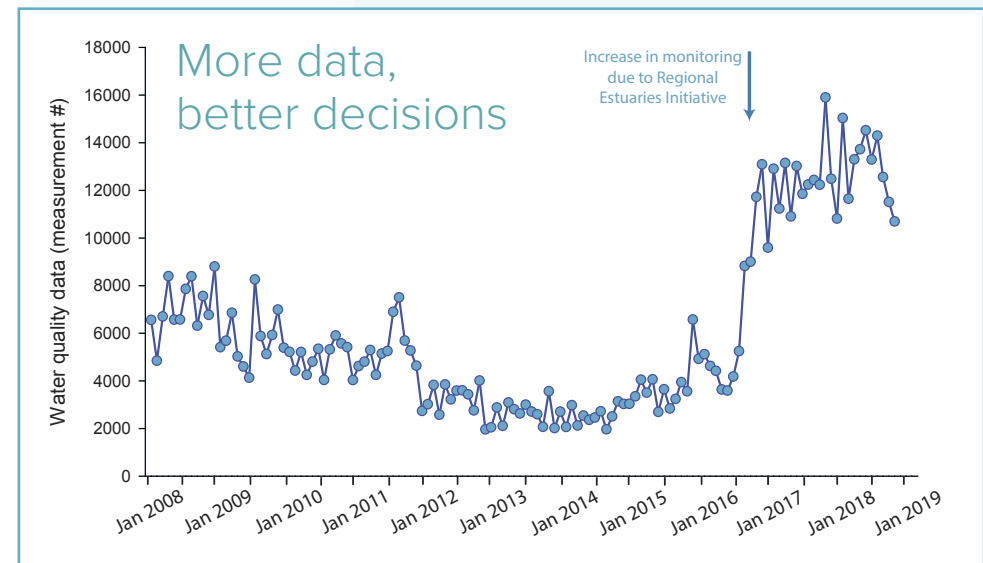


We are preparing a series of catchment nutrient reports that will summarise water quality in 50 subcatchments of the initiative. Similarly, our estuary condition reports summarise annual water quality measured in the estuaries. Our website rei.dwer.wa.gov.au has the most up-to-date information.

Work on **five numerical models spanning 17 600 square kilometres** of catchments in the south-west is underway. These models synthesise data on land use, hydrology and water quality to estimate the amount of nitrogen and phosphorus in surface water delivered to the estuary from the catchment. Our calibrated models are then used to quantify the influence that nutrient management actions, land use change and climate change will have on nutrients reaching the estuary.

Water quality improvement plans are the main tool used to guide our catchment management actions. We consider the scenarios from our models in terms of cost and feasibility to guide which investments provide the best value for water quality improvement outcomes. An updated plan for the Peel-Harvey is well underway, informed by 14 modelled catchment scenarios. We are also developing a new plan for the Wilson Inlet.

Estuary response models are being developed or updated for five of our regional estuaries.



These numerical models predict water levels, currents, salinity, water temperature, and the residence time of the water in the estuary. In the Vasse-Wonnerup, we use the model to inform the operation of the gates at the surge barriers. A complex model has been developed for the Peel-Harvey, in partnership with the University of Western Australia, that can also predict nutrient and oxygen status. These models are invaluable for understanding the future response of the estuary to climate change and proposed management actions.

Science from the initiative is also supporting development of the Peel-Harvey estuary protection plan. This plan will outline the current health of the estuary and the actions needed to improve and protect its condition in the future.

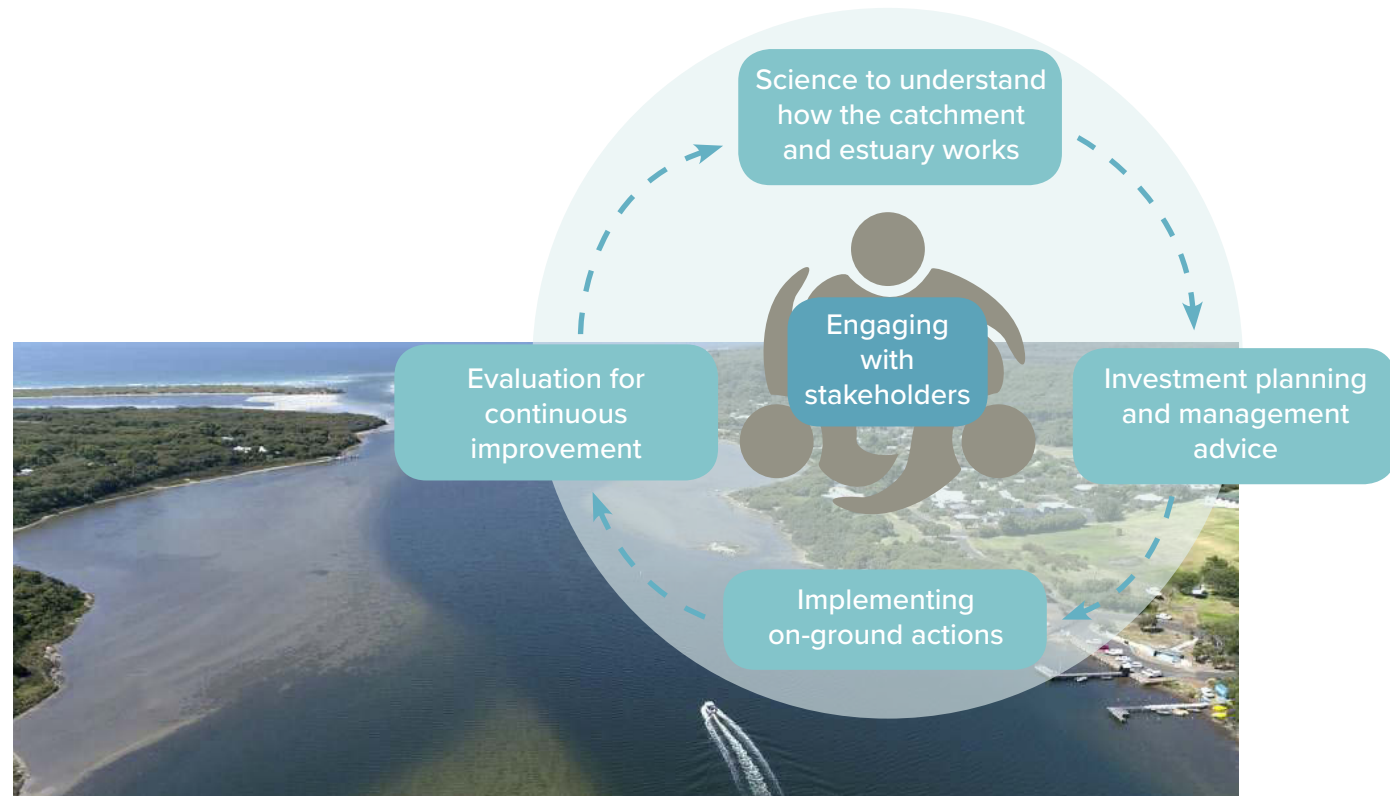


Wilson Inlet estuary model grid showing the individual cells where equations are resolved to determine water circulation and physical properties.

Looking forward

We are excited about building on what we have started and the direction we have set for improved water quality. The strong partnerships forged in the past three years have increased awareness of the issues facing our estuaries and connected people who can help. Now our partners are using the initiative to find partners of their own, creating further momentum for change.

The initiative spans problem definition to finding new solutions and taking actions. This style of management is an iterative process that requires regular engagement with all the people who value and use our estuaries.

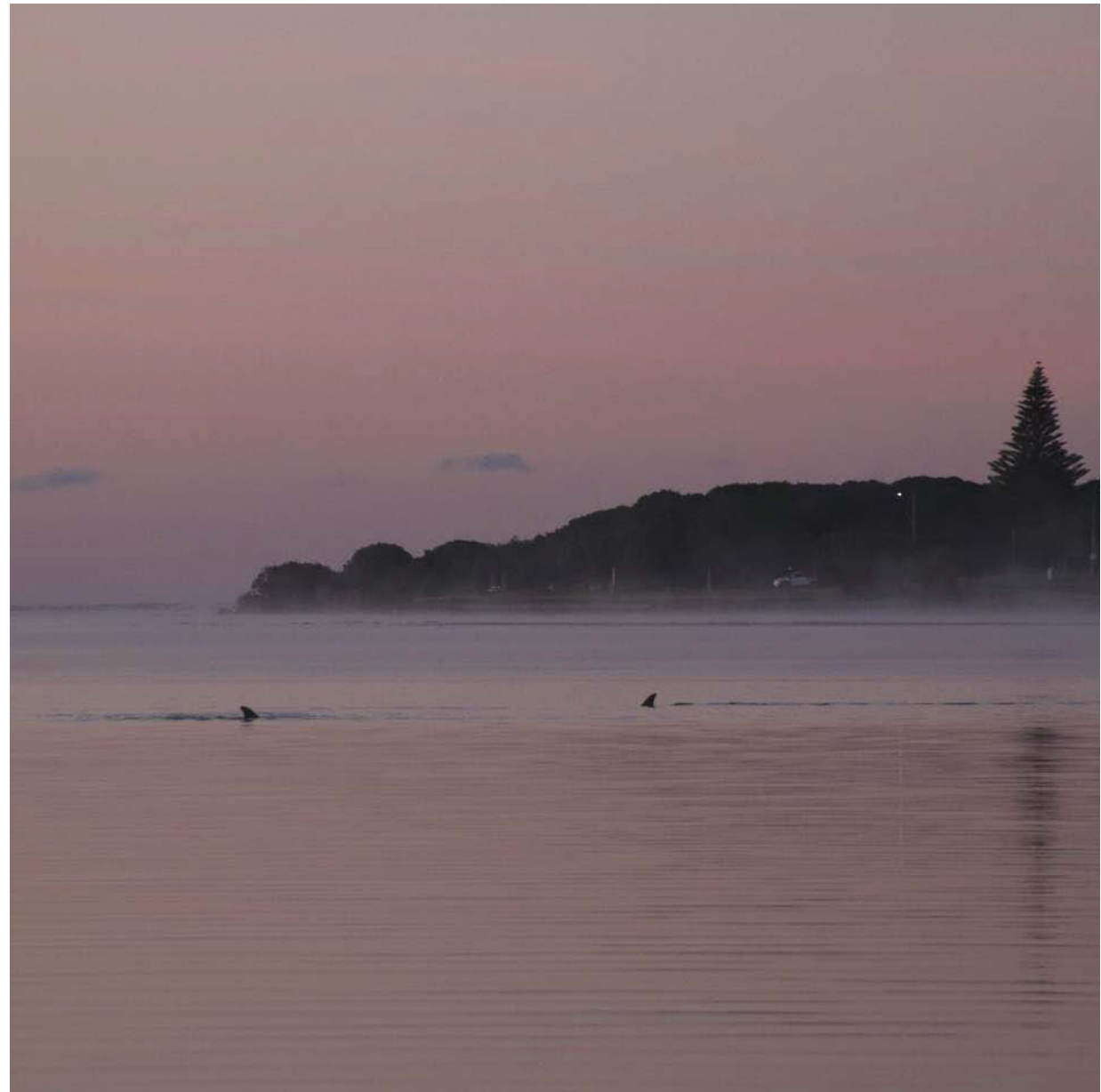


In the coming months, we will be focused on delivering the final milestones for the first four years of the Regional Estuaries Initiative and consolidating what we have learned.

Improving and maintaining estuary health needs sustained effort. We have shown that the initiative, with its regional scale, has sufficient influence to attract industry partners and drive sustainable change in practices through normalising the behaviours that benefit estuaries.

As we look beyond the initial four-year program, we aim for continuous improvement and enduring partnerships. With ongoing funding support, we can maintain momentum to continue to build healthier, more ecologically resilient estuaries that support Western Australia's economic development and way of life.

We are on the right path to ensure the homes and holiday destinations that people love can be enjoyed by future generations of Western Australians and our visitors.





REGIONAL
ESTUARIES
INITIATIVE

#WAestuaries

Department of Water and
Environmental Regulation

Prime House
8 Davidson Terrace
Joondalup WA 6027

+61 8 6364 7600

For further information
please visit our website
rei.dwer.wa.gov.au
estuary@dwer.wa.gov.au

