Geographe Catchment Management Strategy 2019-29

Geographe Catchment Council

GeoCatch

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About GeoCatch

The Geographe Catchment Council (GeoCatch) is a community based natural resource management group formed in 1997 to protect, restore and enhance the natural resources of the Geographe catchment.

GeoCatch is made up of nine community members and six members representing government agencies and local government. GeoCatch works in close partnership with the Department of Water and Environmental Regulation and receives funding from a range of sources, including Federal and State Governments, South West Catchments Council, Local Government and Lotterywest. The organisation employs professional staff who support GeoCatch to implement this strategy and coordinate a wide range of environmental projects.

Vision

A Geographe Catchment where water, land and biodiversity are healthy, protected and supported by an engaged and involved community.

Mission

To provide leadership, raise awareness and collaborate with our partners, stakeholders and the community to protect and enhance the natural values and support sustainable growth of the Geographe Bay Catchment.

Guiding Principles

- We show leadership in natural resource management in the Geographe catchment.
- We engage, inform and involve the community in natural resource management issues.
- We foster a collaborative approach and seek partnerships with the community and stakeholders to achieve natural resource management outcomes.
- We seek funding to implement the GeoCatch Strategy and support on-ground action, communicate and engage with the community and fill knowledge gaps of our natural resources.
- We show resilience and flexibility in a changing natural resource management environment (political, financial, organisational, community, environmental).
- We are mindful of, and incorporate environmental resilience to climate change into project design, development and implementation.
- We use the best available science to guide project planning and implementation.

Introduction

Since 1997 GeoCatch has worked with community and partners to protect and enhance the natural resources of the Geographe catchment.

Officially formed in July 1997, The Geographe Catchment Council (GeoCatch) was created in response to the need for a coordinated, community-based approach to managing the natural resources of the Geographe Bay catchment. GeoCatch continues to have a vital role working with the community and partners to conserve the environment, and be the community's voice to enhance and protect Geographe Bay and its catchment.

Geographe Bay is situated approximately 250 km south of Perth in the south west of Western Australia. Its catchment area covers approximately 2,000 km2 and lies within the boundaries of four local government authorities (LGAs), mainly the Busselton and Capel Shires with small portions lying in the Donnybrook-Balingup and Augusta-Margaret River Shires. Towns within the catchment include Capel, Kirup and Dunsborough, with Busselton being the main urban centre (see map 1).

The Geographe Bay catchment supports a thriving urban and rural community with residential, recreational, agricultural, industrial and commercial activities. These uses, combined with a rapidly increasing population and intensifying agriculture continue to place strain on the natural environment with resultant land and water degradation.

This catchment management strategy seeks to address these and other threats, and develop a holistic approach to managing our natural resources in a sustainable way into the future.

The story so far

Concerns from the community on the water quality of valued waterways like the Lower Vasse River and Geographe Bay were central to the formation of GeoCatch. Many early initiatives, including the Lower Vasse River Cleanup Program, focused on improving water quality in the Lower Vasse River. Activities including dredging, water treatment trials, bank stabilisation and revegetation were carried out in the early days of GeoCatch. Despite considerable efforts, GeoCatch realised that to see improvements in water quality, nutrients off the catchment would also need to be dramatically reduced.

GeoCatch have also been active in the areas of protecting and enhancing biodiversity and contributing to expanding knowledge of the natural resources.

Understanding impacts

In 2006 GeoCatch implemented a comprehensive, fortnightly water quality monitoring program for the Geographe catchment that has been used to monitor long term trends and assess the effectiveness of management actions to improve water quality.

GeoCatch, in partnership with the Department of Biodiversity Conservation and Attractions and Water Corporation, have also been delivering the 'Keep Watch' seagrass monitoring project since 2012. Monitoring changes to seagrass health over time is important to gauge any impacts of the catchment on seagrass health.

Reducing nutrient loss off farms

Over the last fifteen years GeoCatch has worked in partnership with farmers, industry groups and state government agencies to support local farmers improve fertiliser use and dairy effluent management. In this time GeoCatch has

- Worked with over 80% of Geographe Dairy farmers to improve dairy effluent management
- Developed a 'Code of Practice for Dairy Shed Effluent Western Australia'.
- Worked with nearly 50% of beef and dairy farms on soil testing and nutrient mapping projects to improve fertiliser management

> "I could not have undertaken a system upgrade if the incentive funds were not available. Participating in the project gave me the extra push to start improving our effluent management system."
>
> Rodney May. Geographe Dairy Farmer

Reducing nutrient loss off urban areas

GeoCatch began working in the urban catchment in the mid-2000s through the Bay OK program that focuses on the link between nutrient loss off urban areas and the health of Geographe Bay. The Bay OK program to date has worked with schools, businesses, gardeners and the broader community to reduce nutrient loss off urban areas.

- 10 schools, 64 businesses 22 gardeners recognised as being "Bay OK".
- Over 2000 community members involved in Bay OK gardening workshops and community seminars
- Completed 15 stormwater upgrades with local and state government project partners

Protecting and improving riparian habitat

Protecting and enhancing riparian (streamside) vegetation has been a priority for GeoCatch since its early days. Fencing waterways, erosion control and revegetation has been undertaken in partnership with private land holders to protect riparian vegetation and improve water quality. GeoCatch has also led the development of River Action Plans for all major waterways and facilitated river health assessments to better understand and manage the values of our waterways. Key highlights include:

- Over 300 kilometres of stock exclusion fencing installed
- 155 hectares of riparian revegetation
- 36 Stock crossings
- 51 off stream watering points
- 202 hectares of weed control
- 14 River Action Plans
- 12 River health assessments

Peppies for Possums

"Peppies for Possums" is an iconic GeoCatch project helping protect the critically endangered western ringtail possum. Launched in 2005 at a time of rapid decline of western ringtail possum habitat, "Peppies for Possums" aims to enhance the protection of ringtails by increasing community awareness, monitoring possum numbers, and enhancing habitat through revegetation. This has been done through:

- Over 1,000+ school children involved in tree planting
- Over 25,000 peppermint trees planted
- 40 ha restored with native understory plants
- 1,300 participants enjoying possum spotting on possum nightwalks
- Over 80 residents contributing to counting 1,300 ringtail possum sightings over 243 community ringtail surveys.

> "We had fun looking for possums in our garden. They are a threatened species and we are lucky to have them in our backyard."
>
> Gracie Hall, student

Partnerships

The natural values of the Geographe catchment are important to many people in the community. Over the last 20 years GeoCatch has fostered partnerships with community members, local environmental groups, government agencies, schools, industry, and local businesses to work together to protect Geographe Bay and its catchment. The long-standing partnership with the Department of Water and Environmental Regulation has enabled GeoCatch to have a constant presence in actions to improve water quality and protect waterways, wetlands and Geographe Bay.

Catchment Overview

The Geographe Catchment has rich and diverse landscapes, reflecting its geological, climatic and human history. The natural resources of our region are critical to sustaining the lifestyle of its residents and visitors, as well as providing important habitat for flora and fauna. They support valuable industries such as agriculture and nature-based tourism.

The Geographe catchment is rich in biodiversity and ecological value, with many species of migratory birds visiting the area and a number of endemic, rare flora and fauna. It is part of the unique biogeographic region of Southwest Australia listed as one of 30 international biodiversity hotspots and the Busselton-Augusta area is one of 15 national biodiversity hotspots identified by the Australian Government.

The catchment is bounded by the Darling Range, the Whicher Range and the Leeuwin-Naturaliste Ridge. Below these ridges lies the southern-most part of the Swan Coastal Plain extending south and west to Dunsborough. The coastal plain is characterised by predominantly sandy-loam surfaced soils as well as poorly drained flats and palusplain wetlands. It has been extensively cleared and drained to support agriculture and urban development. The ranges and ridges around the coastal plain retain a larger area of native vegetation, of which a significant proportion has been protected within areas of national park and state forest. These higher areas also contain gravelly and loamy soils and therefore have a better nutrient-retention capacity than much of the coastal plain.

Key catchment values

- A range of coastal environments, including sandy beaches, rocky headlands, estuaries and the bay
- Seasonal humpback, southern right and blue whale populations
- Rivers, waterways and an internationally significant wetlands
- Conservation parks and reserves including the Ngari Capes Marine Park, Meelup Regional Park and the Yelverton, Tuart Forest and Whicher National Parks
- Productive landscapes supporting forestry, grazing, horticulture, viticulture and dairy enterprises.
- Significant Aboriginal and European cultural values and significant sites

Population and Economy

The economy of the region reflects its mix of agriculture and other primary industries, tourism and service industries.

The combined population of the City of Busselton and Shire of Capel is over 54,000 people. (ABS 2016)

The population of the region is:

- Culturally diverse and partly urbanised, with around two-thirds of people residing in the urban centres of Busselton, Capel, Dalyellup and Dunsborough.
- Growing at a fast rate, increasing by 18,000 since 2005 and with a growth rate of almost 3% since 2012. The projected 2026 population will be around 80,000 (WAPC, 2012).

Employment and Industry

The economy of the region reflects its mix of agricultural and other primary industries, tourism and service industries.

Agriculture/Horticulture

Agriculture is the main land use across the catchment, with beef and dairy grazing the dominant industries. Approximately 25% of the state's dairy farms are located within the Geographe catchment. Horticulture is also growing with the Geographe area producing 14% of the total grape tonnage within the Margaret River wine region.

Tourism

Domestic and international tourism are a significant industry and employer in the catchment. Nature-based tourism destinations include the beaches, marine environment and National Parks. The value of tourism for the South West Development Commission region was $1,557 million in 2017 (SWDC). An estimated 900 000 tourists visit the City of Busselton every year contributing an around $300 million per year to the local economy.

Traditional Owners

"The Wadandi people are Saltwater People and they live by the six seasonal changes in harmony with their environment. The significant coastal areas are important to the Wadandi people and their connection to land and sea through songs, stories, spirituality and Cultural lore."
Traditional Owners and Custodians

Aboriginal people have occupied this region for at least 50,000 years. Prior to European contact, the Aboriginal people of the south west region formed a distinctive socio-cultural group collectively known as Noongar. The group of Noongar people that occupied the Geographe area are known as the Wadandi people, 'the people that lived by the ocean and followed the forest paths' (Wardan means ocean) (Collard, 1994).

Today, many Noongar people maintain cultural and familiar ties in the Geographe catchment, with interests including identification and management of ethnographic and archaeological sites, native title claims, research, and community education.

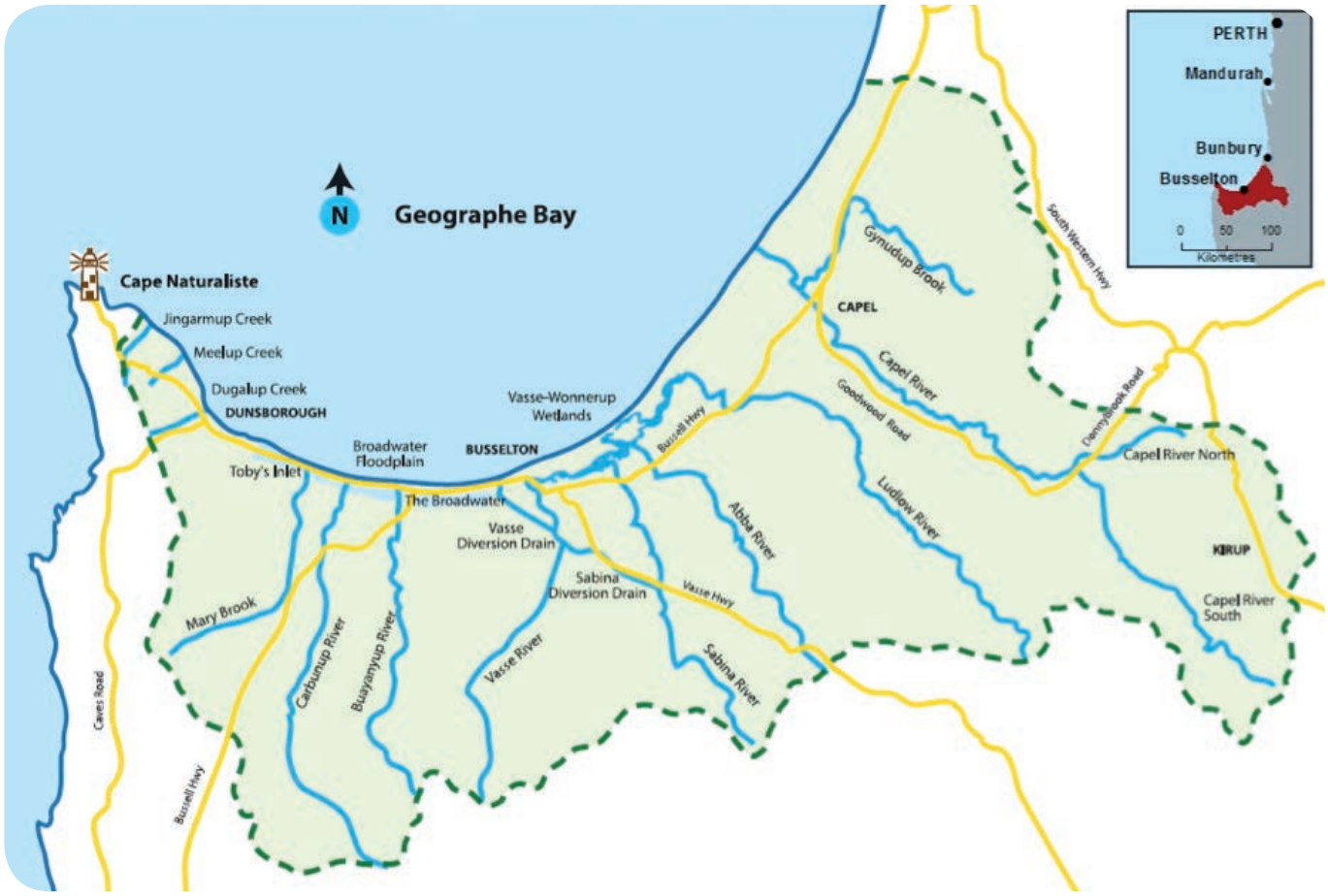
There are extensive and significant Indigenous values in the catchments area with a large number of both ethnographic and archaeological sites registered with the Department of Indigenous Affairs. These include artefacts scatters, middens, scarred trees, and camps, mythological and ceremonial sites. The Geographe catchment area has been used by the Wadandi people over a long period of time and is of importance to remaining community members.

European Cultural heritage

The first recorded European visitors to the Geographe Bay shores were French explorers aboard the ships 'Naturaliste' and 'Geographe' in 1801. European settlement commenced in the 1830s when early settlers such as the Molloys and Bussells moved into the Vasse River area from Augusta and established farms (Hasluck, 1955). During the same period many hundreds of American whaling ships frequented the Geographe Bay coast using the sheltered waters for repairs and replenishment. Along with agriculture, whaling became an important local industry from 1846 to 1872, with operations based at Castle Bay. Later a growing timber industry also brought more permanent settlers to the area.

During the 1920s and 1930s, a joint venture between the British Government and the Western Australian State Government introduced the Group Settlement Scheme to establish a dairy industry within the State. The scheme 'opened up' land and provided the incentive to establish community and servicing infrastructure.

There are numerous locations of European historical significance within the Geographe catchment that are listed by the Heritage Council of Western Australia and the National Trust WA.



Map 1 Map of the Geographe Bay Catchment

Natural Resources

Natural resources are naturally occurring, tangible elements of the landscape. They occur at or across a particular geographic location and are valued for their environmental, social and economic benefits and values.

Water

Key facts

- 16 waterways dissect the catchment
- Contains the southern end of the Swan Coastal Plain and the Ramsar listed Vasse-Wonnerup Wetlands
- Surface water quality has been a major management issue in the Geographe catchment for many years.
- The catchment is underlain by three aquifers- Superficial, Leederville and the Yarragadee

Waterways, wetlands and groundwater

The catchment's headwaters occur within the Darling and Whicher Ranges and, to a lesser extent, within the Leeuwin-Naturaliste Ridge. Geographe Bay receives ephemeral surface flow from 16 waterways that dissect the catchment, however European settlement has seen many changes to the catchment's hydrology. Of these, only the Lower Vasse, Lower Sabina, Abba and Ludlow rivers drain into the Vasse-Wonnerup Wetlands before discharging through the Wonnerup Inlet into Geographe Bay. A network of seasonal streams flow into the Toby Inlet before draining into the bay. All other waterways flow directly into Geographe Bay either through their natural outlets or artificially constructed drains, with the exception of Gynudup Brook and Tren Creek, which flow first to the Capel River.

The severity of water quality issues in the Geographe catchment varies widely depending on the waterway and receiving waterbody. In some locations the problems are clearly expressed by visible algal blooms and fish kills or noxious odours. In other waterways, such as the Carbunup and Capel Rivers, riparian vegetation and water quality in still in relatively good condition.

The Geographe catchment supports a significant number of wetlands on the coastal plain, however extensive clearing and drainage modification has led to the degradation or loss of many wetlands. One of the most important wetland areas is the Vasse-Wonnerup wetland system. The wetlands provide habitat for thousands of waterbirds every year, including over 80 different species and were included on the list of wetlands of international importance under the Ramsar Convention in 1990. The wetlands have been highly modified through river diversions, the installation of surge barriers on the exit channels of the Vasse and Wonnerup estuaries and excess nutrients off the catchment. These modifications have contributed to poor water quality in the wetlands over summer months characterised by large macroalgae and phytoplankton blooms and frequent major fish kills.

Other important wetlands within the catchment include the Stirling wetlands, Ludlow wetlands (including McCarley's Swamp), Ludlow-Abba wetlands, New River, Broadwater floodplain (including Toby's Inlet), and the Naturaliste Lake wetlands.

The seasonally waterlogged flats on ironstone country at the base of the Whicher Range between the Capel and Carbunup Rivers are particularly important because they support rare and threatened plant communities.

The catchment is underlain by the Superficial aquifer, which is approximately 10 m thick. Below this lies the Leederville aquifer, which in turn is underlain by the older and larger Yarragadee aquifer. Both the Leederville and Yarragadee are confined aquifers that are recharged by direct infiltration of rainfall on the Blackwood Plateau. All three of these aquifers flow towards the coast (WAWA 1995). The Capel River is the only waterway that actually intersects the Leederville aquifer, which is the reason it is a perennial river system. All other waterways receive contributions only from the Superficial aquifer and surface runoff.

Vasse estuary

Land

Key facts

- There are three main land systems-Quindalup Coast, Ludlow plain and Abba Plain areas.
- The escarpments are granite and sedimentary based
- The coastal plain soils are sandy-loam surfaced soils

Soils and Agricultural Land

The Geographe Bay catchment is part of the Swan Coastal Plain and Darling Upland landscape character types. The Swan Coastal Plain is a strip of land on the lower western coastline of the state. It consists of three distinctive landform types: foothills, alluvial plains and successive coastal dune systems (CALM, 1994). The Darling Uplands is bordered on the west by the Darling Scarp. The land is undulating and dissected with pale, orange laterite soils and gravels (CALM, 1994).

The Geographe Bay catchment is an important productive agricultural area and agriculture has been the predominant economic mainstay with over half of the catchment area used for this purpose. In recent years horticulture and viticulture have experienced an increased growth compared to the more traditional agricultural practices of sheep and cattle grazing.

Native vegetation

The vegetation of the Swan Coastal Plain varies in its species composition and structure. Only 15.5% of remnant vegetation remains on the Swan Coastal Plain, approximately 15,400 hectares. In the Geographe Bay catchment there are forests of marri (Corymbia calophylla) mixed with jarrah (Eucalyptus marginata) and blackbutt (Eucalyptus patens). Closer to rivers and streams flooded gum (Eucalyptus rudis) mixes with swamp paperbark (Melaleuca rhaphiophylla). Peppermint (Agonis flexuosa) occurs closer to the coast while on the Darling Uplands forests of jarrah dominate in association with marri.

Many of the plant communities in the Geographe catchment are now considered to be 'poorly represented', i.e. there is less that 30% remaining of the original pre-European extent. The Abba system is particularly important as less than 10% remains; it does not extend beyond the Geographe catchment; and almost all of its remnant vegetation is situated on private land.

A further eleven of the soil landscape systems within the Geographe catchment have less than 30% of their original extent of native vegetation (in the South West) remaining.

Clearing of land for agricultural purposes has led to the loss of much of the vegetation in the south west of the state and this is also the case in the Geographe Bay catchment area.

It has been estimated that only 746sq km or 37% of remnant vegetation remains in the catchment. Approximately 513 km2 or 69% of this remnant vegetation is retained on public land (Connell, et al, 2000).

Threatened species-flora and fauna

The flora of south west is unique with a high number of species and a high level of endemism. As a result of extensive clearing and modification of the environment many species have become rare and prone to extinction.

The fauna of the catchment is a significant environmental resource. Christensen et al (1985) list 16 marsupial species, 10 mammal species, 7 introduced mammal species, 12 amphibians, and 44 reptile species likely to occur in the region. Less is known of the invertebrate fauna however it appears to be extremely diverse (Bradby, 1997).

Ambergate Reserve

Marine and Coasts

Key facts

- The Bay is part of the Ngari Capes Marine Park (Wonnerup to Cape Naturaliste)
- It's a sheltered north facing embayment
- Contains the second largest seagrass beds in WA

Geographe Bay

Geographe Bay is a north-facing embayment that marks the southern end of the Swan Coastal Plain. The Geographe Bay seabed is a shelf that slopes gently seaward, reaching a depth of 18 m at a distance of 9 km offshore (WAWA, 1992). Ocean currents vary throughout the year and in summer the cool West Australian Current flows northward along the Leeuwin-Naturaliste coast and sweeps into Geographe Bay (Wilson, 1994). In summer, the Leeuwin Current flows southwards off the coast outside the catchment boundary. The seabed of Geographe Bay is known to be dominated by seagrasses and rock substrates with the outer part being mostly sandplain (Wilson, 1994).

The west coast of Australia has the highest diversity of seagrasses and some of the largest seagrass beds in the world (Kirkman and Walker, 1989). Geographe Bay supports the most extensive seagrass meadows in temperate Western Australia that provide vital habitat for more than 70 species of fish and other marine life. The seagrass meadows support 10 different species of seagrass, some of which are found at unusually great depths of up to 45m. The seagrass meadows play a vital role in stabilising sediments within the Bay, utilising nutrients in the water column and store more than estimated $83 million worth of carbon.

Geographe Bay is believed to be an important calving and nursery area for the Hump Back Whale and a feeding ground for the Blue Whale. It also provides important spawning and nursery habitat for at least thirteen recreationally and commercially important fish species. Well-developed coral communities occur between Dunsborough and Cape Naturaliste among low relief rocky substrate. Fourteen coral species of seven genera are known to occur in this area. Two species are endemic to WA, ten are tropical and of these five have their southern limit at Cape Naturaliste.

Recreational fishing and diving is popular in Geographe Bay. Some commercial fishing still occurs though has reduced in recent years.

Southern Geographe Bay (from Capel River and extending south west) is included in the Ngari Capes Marine Park. The zones within the park were gazetted in April 2018.

Coastline

The dominant landform on the Geographe Bay coast is the Quindalup Dune System. The dunes here are low (1-2m), located on a soft sandy and predominantly north facing coastline. A small area of gneiss rocky coastline also occurs at Cape Naturaliste with small sheltered sandy beaches (at Meelup Regional Park).

While predominately a low energy area, the Geographe Bay coast is regularly affected by north westerly storm exposure and long-shore sediment transport also occurs from west to east.

There is extensive coastal development along much of the Geographe Bay coastline. The remaining areas of coastal reserve are important to retain from a coastal stability and community amenity perspective. The vegetation that occurs in these areas also provides important linking habitat for the endangered Western Ringtail Possum and other conservation dependent fauna such as the Quenda (Southern Brown Bandicoot).

The Geographe Bay coastline is one of the most threatened coastlines in the nation to rising sea levels. Considering the impacts of climate change and sea level rise are integral to current and future management of our coastlines.

Beach clean-up, Busselton

Themes and Strategies

There are many natural resource management issues in the Geographe Catchment and not all are covered in this strategy. Issues not covered here are addressed by other organisations including government and local environment groups.

Healthy waterways, wetlands, and Geographe Bay

Waterways

The catchment's waterways are diverse and complex ecosystems. They provide habitat for native fish, invertebrates and water birds, while supporting riparian vegetation communities. They provide healthy landscapes, which are valued for recreation and tourism and provide water for farming and industry.

Management Objective:

To protect and enhance riparian areas and improve water quality and ecology in Geographe waterways.

Issues

- Loss and degradation of native fringing vegetation through clearing, grazing and weed invasion.
- Channel straightening and removal of large woody debris.
- Erosion of stream banks and sedimentation.
- Eutrophication, salinity and other water quality impacts.
- Loss of floodplain habitat.
- Obstruction to migration of native fish through dams and weirs.
- Invasion of exotic weeds in waterways.
- Reduction in cultural values of waterways for Indigenous people.
- Importance of riparian vegetation as linking habitat corridors for fauna.

Geographe waterways have important aquatic values, some providing habitat for threatened and priority species, and are of high value to both the local community and visitors to the area. In the Geographe catchment extensive areas of riparian vegetation have been cleared, though some systems still retain sections of riparian zones in good condition. Other impacts include removal of large woody debris and straightening of stream channels, activities which remove important habitat for aquatic animals such as marron and can lead to stream bank erosion due increased water velocity. Areas of good quality riparian vegetation are still being cleared or degraded. It is much more cost effective to protect riparian areas now than to restore them later.

Retention of riparian vegetation is a strategic way of retaining and establishing linking corridors of vegetation between patches of remnant vegetation in the landscape, since the waterway network has extensive coverage in the catchment.

GeoCatch has been working with local farmers and landholders for the last twenty years to protect and rehabilitate Geographe waterways with over 320 km of riparian vegetation fenced and over 150 ha of vegetation established or improved. River Action Plans have also been developed for key waterways describing the ecological and social values of the waterways, condition of riparian vegetation and management actions.

Management Strategies

- Implement key recommendations of the Vasse-Wonnerup wetland and Geographe Bay water quality improvement plan (2010) to reduce nutrients entering waterways
- Encourage and support private landholders to protect and improve riparian areas.
- Identify knowledge gaps in aquatic fauna and commission research for priority waterways.
- Continue to facilitate River Health Assessments on Geographe waterways.
- Work with partners to continue to monitor water quality in Geographe Waterways.

Vasse-Wonnerup wetlands

Wetlands and estuaries

Wetlands and estuaries are significant and diverse natural ecosystems with plants and animals that have adapted to cycles of flood and drought. They are among the most productive and degraded ecosystems on Earth.

Management Objective:

To protect and improve the natural values and function of Geographe wetlands and estuaries.

Issues

- Changes in hydrology with associated impacts on fringing vegetation and waterbird habitat.
- Fragmentation of wetland chains via clearing, urban development and road construction.
- Eutrophication, salinity and other water quality impacts.
- Weed invasion.
- Loss of fringing vegetation.
- Disturbance to waterbirds within wetlands on the urban fringe.
- Predation of wetland fauna by foxes and cats.
- Potential impacts of groundwater abstraction.
- Potential impacts from disturbance of acid sulphate soils.
- Rubbish dumping and unauthorised access.

The Geographe Bay catchment area has been extensively cleared or modified by drainage and therefore many wetlands and estuaries have been modified. Many wetlands on private land are grazed periodically. Some wetlands such as Broadwater, New River and Toby Inlet are located in very close proximity to urban areas and are therefore subject to a range of additional impacts. These include hydrological change via connection with the urban stormwater system; disturbance of waterfowl from traffic, pedestrians and domestic animals; reduced buffers of native vegetation; rubbish dumping and unauthorised access. The catchment contains some wetlands with very high conservation values including the Ramsar listed Vasse-Wonnerup wetland system which is recognised as one of the most important areas in the state for waterbird habitat. More than 30,000 waterbirds visit the estuary each year, including a range of migratory species.

Management Strategies

- Support the review and update of the 2010 water quality improvement plan (WQIP) for the Vasse-Wonnerup wetland and Geographe Bay.
- Implement key WQIP priorities to reduce nutrients entering wetlands and estuaries.
- Encourage and support private landholders to protect and improve priority riparian areas.
- Identify knowledge gaps and commission research for priority wetlands.

Geographe Bay

There is a direct link between catchment processes and the health of the marine ecosystem. This is especially so for ecosystems close to the shore, lower energy marine ecosystems and embayments.

Management Objective:

To protect Geographe Bay from adverse land-based impacts and maintain healthy seagrass meadows.

Issues

- Excess nutrients and sediment off the catchment can impact seagrass health through smothering and epiphyte growth.
- Debris and pesticides, herbicides and fertilisers can wash down stormwater drains from urban areas into nearshore areas.
- Marine debris such as fishing line, rope and plastic packaging tape can cause entanglement and death of marine mammals and seabirds.
- Geographe Bay is part of Ngari Capes marine park, for which mitigation of catchment sources of pollution is a key management issue.

Geographe Bay is highly valued by the local community and visitors to the area due to its high ecological, recreational and social values. The sheltered waters of the Bay provide a range of recreational opportunities including safe boating, fishing, swimming, whale watching and many other water based pursuits.

Geographe Bay supports an extensive array of marine fauna – ranging from the large and charismatic Humpback whales to highly diverse and unusual species of sponges. The sheltered north facing embayment and the influence of the Leeuwin Current enables a combination of tropical and temperate fauna species to occur in the Bay. These high ecological values were recognised with the inclusion of Geographe Bay in the Ngari Capes Marine Park.

Geographe Bay also supports the most extensive seagrass meadows in temperate Western Australia that provide vital habitat for more than 70 species of fish and other marine life. The seagrass meadows support 10 different species of seagrass, some of which are found at unusually great depths of up to 45m. The seagrass meadows play a vital role in stabilising sediments within the Bay, utilising nutrients in the water column and store more than an estimated $83 million worth of carbon.

Seagrasses can be severely affected by ecosystem changes, thereby providing a useful indicator of the state of the marine environment. GeoCatch has been monitoring seagrass health in the bay annually since 2012.

Management Strategies

- Support on-going research on the health of seagrass in the bay through 'Keep Watch' seagrass monitoring program.
- Continue to work with the community and partners to reduce land based impacts on the marine environment.
- Support marine debris initiatives to minimise the impact of marine debris on marine life.
- Support the implementation of the Ngari Capes Marine Park management plan.

Drainage Systems

The purpose of drainage is to provide a mechanism to control the level of seasonal inundation of arable and urban areas throughout the catchment. Drainage channels are designed to convey larger surface flows and reduce flooding that follows the more frequent and heavier winter rains.

Management Objective:

To improve the quality of water conveyed by the rural and urban drainage systems to reduce impacts on receiving waterbodies and optimise ecological benefits provided by the drainage network.

Issues

- Drains provide a critical function in this catchment to reduce flood risk and ensure agricultural land remains arable that would otherwise be inundated in winter months.
- Drains are an expressway for nutrients and sediments to enter receiving waterbodies.

Following European settlement in the Busselton area in 1830, the area was developed for agricultural and urban uses. Land clearing greatly increases water

yield, so from 1900 onwards artificial drains were constructed to control water logging of farm land.

The Vasse and Wonnerup surge barriers, constructed in 1908, stopped saltwater flooding the low-lying areas around the estuaries. By 1927 major diversion drains, including the Vasse Diversion Drain, were efficiently conveying excess water from the upper Sabina and Vasse catchments to the ocean to reduce flooding in Busselton. Extensive drainage works in the Geographe Catchment including over 400 kilometres of rural drains, river diversions, floodgates and culverts have enabled development of water inundated land and reduced the risk of flooding to the township of Busselton. The drainage network efficiently conveys not only water but also quickly transfers nutrients and sediment off the catchment into waterways.

Water Sensitive Urban Design (WSUD) Guidelines provide technical designs and direction for the development of urban drainage systems, such as rain gardens and swales, which have the capacity to infiltrate water at source and reduce the transport of nutrients and other pollutants.

Management Strategies

- Work with partners (LGAs, DWER and developers) to continue to increase adoption and implementation of WSUD through demonstration sites and education opportunities.
- Work with partners to review and optimise current drainage network to maximise water quality and ecological benefits.
- Continue to support the installation of stock exclusion fencing of rural drains on farmland, and where appropriate implement 'living streams' principles.
- Establish and monitor rural drainage Best Management Practices (BMPs).

Prince Street , Busselton

Sustainable Growth

Sustainable Agriculture

Soils underpin the health of all land-based natural resources in the catchment. Much of the land is privately owned and used primarily for agricultural production. The management of soils and agricultural land influences environmental outcomes across the whole catchment.

Management objective

Facilitate the productive and sustainable use of natural resources by increasing the participation of landholders and industry in on-ground activities and programs that reduce the impacts of agricultural practices.

Issues

- Fragmentation and clearing of native vegetation.
- Offsite impacts including nutrient and sediment runoff.
- Soil acidity and excess soil nutrients.
- Intensification of agriculture.
- Balance between productivity, profits and environment.
- Limited planning mechanisms, regulation and technical extension to support farmers adopt BMPs.

Agriculture is the catchment's largest land use with dairy and beef grazing the most widespread. Viticulture has expanded in the western part of the catchment while intensive horticulture including vegetable production and avocados is expanding across the catchment.

Sustainable agriculture is concerned with managing agricultural production within land use capabilities to maximise production and avoid damage to the natural resource base.

Sustainable agriculture projects in the Geographe catchment aim to reduce nutrients leaving agricultural land whilst maintaining productivity by working with farmers and industry to improve fertiliser and dairy effluent management. A number of other projects across the catchment complement these, including soil amendment trials, riparian management and rural drain management.

Management Strategies

- Promote and provide incentives for widespread adoption of best management practices (BMP) for agricultural land.
- Work with industry partners to develop programs and tools to reduce nutrients off farm.
- Continue to evaluate effectiveness, uptake and long term behaviour change of nutrient reduction programs.
- Work with farmers and industry to develop and update best practice guidelines to support sustainable agriculture practices.
- Work with farmers and industry groups to improve soil health, biodiversity and carbon storage on agricultural land.
- Explore innovate techniques to foster behaviour change.

Urban development

Urban development is a major driver of environmental change. Urban areas contain threats to, and opportunities for, biodiversity. The conversion or degradation of natural ecosystems in urban areas has the most obvious and immediate impacts on biodiversity. (SoE 2016). Urban development is also estimated to be the main source of future nutrients entering Geographe Bay (DoW 2010).

Management Objectives:

To work with the community and government agencies to reduce impacts on the environment from existing and new urban areas.

Issues

- Loss of native vegetation and habitat.
- Increase in invasive species.
- Impacts from pets on native plants and animals.
- Nutrients entering waterways from urban areas.
- Impacts on urban reserves and wetlands from rubbish dumping, fire, and unrestricted access.

Population in the region is growing at a fast rate. The City of Busselton's population has had an average annual growth rate 3.5% in the last five years and is the fastest growing region in the State. The projected 2026 population will be around 80,000 for the City of Busselton and Capel Shire. (WAPC, 2012). The population of the Shire of Capel, 2016 was 17,123, an increase of nearly 10,000 people. The Shire has been one of the fastest growing local government areas in Western Australia, with an average annual growth rate of 9.3% between 2001 and 2016.

As a result, land use in the catchment is also changing quickly. In some cases change or intensification of land use can lead to adverse impacts on natural resources and the character of the area, and in some cases loss of viable agricultural land, and loss of habitat through clearing of remnant vegetation. Incompatible land uses can also create land use conflicts between owners.

Management Strategies

- Raise awareness and deliver Bay OK behaviour change program to promote low nutrient gardening practices.
- Work with developers and residents in new urban developments to establish low nutrient and waterwise developments.
- Facilitate connection to catchment by fostering and enhancing the community's sense of place.
- Work with the community, schools and Friends groups to "Adopt a patch" to maintain and restore habitat and native vegetation in urban areas.
- Deliver educational programs on living next to urban wetlands and reserves including signage and information to residents.

Hands-on wicking-bed garden participants

Peri-urban/lifestyle development

Peri-urban areas are those that are on the periphery of the urban centres. These areas generally have a lower population density, larger block sizes and are prized for their unique lifestyle whilst still being connected to an urban centre and amenities.

Management Objective:

Facilitate and promote sustainable land practices that protect and enhance the environment in peri-urban areas.

Issues

- Landowners often lacking in knowledge, skills and time for land management issues.
- Loss of native vegetation and habitat
- Impacts from pets on native plants and animals.
- Increase in invasive species impacts on remnant vegetation and corridors.
- Nutrients entering waterways from peri-urban areas.

The peri-urban areas and rural residential land are also termed lifestyle blocks as residents seek to have more space for larger gardens or small hobby farms. This land is often old agricultural land close to urban centres or small towns and its growth and positioning is governed by local planning laws. These areas are prized for their environmental aesthetics, quietness and local community.

Peri-urban landholders can have similar management issues to larger farming enterprises, but may not have the knowledge, skills, time or equipment necessary to tackle them.

Management Strategies

- Tailor existing urban and rural nutrient management programs to smaller landholdings to reduce nutrients and increase biodiversity in peri-urban areas.
- Encourage sustainable living-e.g. Living Smart program.

Tourism

Tourism is the movement and activities of people who are making a visit to another destination outside their usual environment, which can have direct benefits to the economy of an area.

Management objective:

To promote and support eco-tourism opportunities in the catchment to increase awareness and protection of the natural resources.

Issues

- Pressure on coastline and marine environments from pedestrian and vehicle access, littering, erosion, damage to seagrass beds from anchorages, boat discharges, marine debris entanglements.
- Impacts from visiting pets on native plants and animals.
- Direct impacts on habitat from tourism-related construction and infrastructure.
- Impacts associated with events such as triathlons, mountain biking, festivals and concerts.
- Spread of dieback and invasive weeds from high visitor numbers.
- Lack of fire risk awareness.

The South West has significant native forests, established wine regions and a coastline with some of the best beaches in Australia. The region's mild climate and diverse natural attractions draw more domestic and international visitors than any other part of regional Western Australia.

It is expected that tourism will continue to develop as a major contributor to the economy, as visitors are increasingly attracted to the South West lifestyle.

There are many types of visitors to the area from backpackers to luxury escapes, each with their particular impact on the environment.

The Geographe Bay area is the most visited region in WA, attracting over 500,000 tourists spending an estimated $300 million per year.

There was an annual average of 1.5 million overnight visitors from 2015 to 2017 to the Margaret River Region with 71% here for holidays and leisure. (Tourism WA, April 2018). There are also many events held annually within the catchment with several large events such as the triathlon, marathon and x-Adventure held within the fragile coastal environment.

Without careful management, tourism can impact on the natural values that visitors come to experience. Tourism can also provide an opportunity for greater awareness, management and value of our natural resources.

Management Strategies

- Encourage visitor participation in awareness raising activities such as possum night walks and surveys.
- Develop a 'green stamp' type program to endorse Bay OK events and activities.
- Develop information materials for accommodation and holiday rental providers encourage visitors to be environmentally aware.
- Work with partners to develop educational products including signage to support tourists and the local community appreciate our natural resources.

Geographe Bay supports the annual Jetty Swim with over 2000 participants each year

Protected Biodiversity

Loss of natural vegetation and habitat for wildlife has been associated with European settlement and agricultural development, resulting in isolated fragments remaining in a landscape dominated by open pasture and agricultural activity.

Native vegetation

Australia's biodiversity is currently in decline; in Australia, more than 1,700 species and ecological communities are known to be threatened and at risk of extinction.

Management Objectives:

Protect and improve biodiversity values and threatened flora across the catchment.

Issues

- Highly cleared catchment with isolated pockets of remnant vegetation on private and public land.
- Reduction in ecological health of native vegetation.
- Fragmentation and loss of effective corridors of native vegetation
- Fire, pest plants and animals and disease.

It has been estimated that only 746sq km or 37% of the catchment area, has remnant native vegetation. However, the condition and quality of this vegetation varies considerably due to impacts such as dieback; frequent fires; invasive weeds; and loss of understorey from grazing. The retention and maintenance of biodiversity remains a key issue for native vegetation management.

The amount of remnant vegetation remaining on private land accounts for 14% of the catchment while public land contains 23%. The retention and management of remnant vegetation on private land should be encouraged and there are a number of incentives offered to assist in this area.

The Government Gazette Wildlife Conservation (Rare Flora) Notice (2016) lists 24 Declared Rare species in the catchment and numerous Priority Listed species. As further research is undertaken new species may be found which could be added to these lists.

Thirteen threatened ecological communities occur within the Geographe catchment. They are:

- Banksia Dominated Woodlands of the Swan Coastal plain IBRA Region
- Calothamnus graniticus heaths on south west coastal granites (Meelup granites);
- Swan Coastal Plain (SCP) Community 1b -Corymbia calophylla woodlands on heavy soils of the Swan Coastal Plain;
- SCP Community 2 - Southern wet shrublands of the Swan Coastal Plain
- SCP Community 3a-Eucalyptus calophylla-Kingia Australia woodlands on heavy soils, Swan Coastal plain
- SCP Community 3b-Eucaluyptus calophylla-Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal plain
- SCP 3c-Eucalyptus calophylla-Xanthorrhea preissii woodlands and shrublands , Swan Coastal Plain
- SCP Community 7-Herb rich saline shrublands in clay pans

- SCP Community 8-Herb rich shrublands in clay pans
- SCP Community 9-Dense shrublands on clay flats
- SCP Community 10a - Shrublands on dry clay flats; and
- SCP Community 10b - Shrublands on southern Swan Coastal Plain ironstones.
- Subtropical and Temperate Coastal Saltmarsh

Management Strategies

- Identify and promote important biodiversity values and appropriate mechanisms for their protection
- Promote the use of local native plants in landscaping and revegetation projects
- Assist landholders to manage and protect high value biodiversity areas through technical advice and funding incentives
- Work with government agencies and partners to protect and enhance remnant vegetation on public land
- Provide technical advice and support to landholders to manage dieback on their properties
- Raise awareness in the community on the biodiversity values of the catchment through wildflower and wetlands walks
- Reduce the adverse impacts of pests, weeds and diseases on native vegetation.

Wildlife

Since 2001, the number of threatened mammals in the region has increased by 22% and there has been a 69% increase in the number of threatened birds.

Management Objectives:

Support and encourage the protection of native wildlife and its habitat.

Issues

- Loss, degradation and fragmentation of habitat.
- Invasive species.
- Altered fire regimes.
- Changing and unsustainable landuses.
- Impacts from domestic pets.
- Changes to hydrology.

Christensen et al (1985) list 16 marsupial species, 10 mammal species, 7 introduced mammal species, 12 amphibians, and 44 reptile species likely to occur in the region. Less is known of the invertebrate fauna but it appears to be extremely diverse (Bradby, 1997).

The fauna of the area is under pressure from several threats. As a result of these pressures population numbers of faunal species have reduced and several species have become extinct. Among those that have been afforded special protection status are: the Western Ringtail Possum, Chuditch, Quokka, Australian Bittern, Carter's Freshwater mussel, Dunsborough Burrowing Crayfish, Baudin's Black Cockatoo, Carnaby's Black Cockatoo, and the Forest Red-tailed Black Cockatoo. There are also a range of threatened fish species, migratory birds and whales.

Recovery Plans are in place for the Chuditch, Carnaby's, Baudins and Forest Red-tailed Black Cockatoos, Australian Bittern, Dunsborough Burrowing crayfish and for Western Ringtail Possum, which is listed as critically endangered through the Environment Protection and Biodiversity Conservation Act. The Western Ringtail Possum is of particular significance in the catchment as the species is locally abundant in the Busselton to Dunsborough area and yet this represents one of the last remaining viable populations of the species. The possum's primary habitat of peppermint woodland is under increasing threat from urban expansion.

Management Strategies

- Continue to develop and implement programs such as 'Peppies for Possums' to restore habitat of threatened species.
- Promote and support 'Land for Wildlife' to protect remnant vegetation and habitat on private land.
- Support land managers to implement incentive mechanisms for protection of high value native vegetation.
- Assist landholders to manage high value biodiversity areas with habitat critical for threatened species.
- Develop awareness campaigns for responsible pet ownership and native wildlife.
- Continue to support Western Ringtail possum habitat assessment and citizen science programs.

Western Ringtail Possums

Coastal foreshore Areas

The coastline is an important attraction for local residents and visitors, contributing social and economic values and outcomes to the area. Coasts are fragile ecosystems subject to pressures such as climate change, access, population growth and an expanding tourism industry.

Management Objective:

To protect and enhance coastal areas.

Issues

- Anticipated sea level rise caused by climate change.
- Increased frequency of damaging storm events causing foreshore damage and loss.
- Loss of lands and drainage ability.
- Impact from coastal development.
- Damage and degradation of coastal foreshore vegetation through unrestricted access.
- Marine debris.
- Invasive species.

Geographe Bay has a sandy shore which has been accreting during the Holocene geological period in the shelter of Cape Naturaliste. Being north-facing it is sheltered from the strong regional sea breezes, thus wind forces have not played a significant part in shaping the beach profile. The shore is known to experience a net eastward littoral sand drift, in response to a dominant swell wave which is reversed by wind waves associated with winter gales on a few occasions in most years.

The coastline of Geographe Bay is one of Australia's most vulnerable to the future potential impacts of sea level rise and climate change. The area from Point Peron to Cape Naturaliste has been identified as an area vulnerable to the impacts of coastal climate change with a 200m wide strip at risk from erosion. (Peron Naturaliste Partnership, 2016). The significant risk of adverse impacts is due to the low topography and the proximity of extensively developed coastline, particularly within the City of Busselton (Damara, 2011).

Management of coastal public reserves is predominantly the role of local government and both the Shire of Capel and City of Busselton have Foreshore Management Plans in place for parts Geographe Bay coast.

Management Strategies

- Support private landholders to manage coastal vegetation
- Support land managers to work with 'Friends of' groups on the coast
- Support Local Government to manage impacts from events run in the coastal strip
- Support beach clean-ups.

Engaged, informed, involved community and partners

Awareness Raising

Awareness campaigns are organised communication activities and are an effective way of conveying messages to a large number of people. Raising awareness of environmental issues is a useful first step when it is part of a larger effort to drive social change.

Management Objectives:

To inform and communicate natural resource management issues to the Geographe community.

Issues

- Different levels of understanding and interest of natural resources and their management in the community
- Competing interests and information overload
- Ease of access to information

Participants attending a Responsible Pet Ownership workshop

Community understanding of the local environmental and natural resource management issues is an essential first step essential in effecting change.

GeoCatch's role in addressing this need should be one of leadership and advocacy of NRM in the community, liaison with other agencies and development of management strategies.

GeoCatch has, for over 20 years played a key role in linking the community to management agencies as 'the Voice in the Community'.

GeoCatch regularly communicates and reports back to the community through social media, written media, the GeoCatch website, information sessions, events and displays. GeoCatch has representation on the Vasse Taskforce, ensuring the community has a voice in waterway health, management and water quality.

Management Strategies

- Expand the variety of communication avenues utilised to raise community awareness including written media, social media, radio, video, displays and workshops
- Regularly review and update the GeoCatch communication strategy
- Regularly 'report back' to the community on catchment health and management issues
- Ensure a clear call for action is included in all awareness raising activities
- Assist local NRM groups to encourage greater participation

Community and Partner engagement

Community engagement describes a broad range of techniques designed to promote behaviour change in a target audience. It aims to take communication of information to the next level of understanding through involvement, collaboration and empowerment.

Management Objectives:

Engage with the community and partners to promote ownership and action to protect and enhance the natural resources of the Geographe catchment.

Issues

- Real opportunities for community involvement in NRM planning and decision making.
- Capacity to facilitate meaningful engagement activities for the community.

Soil testing with farmers

Community participation in the management of the Geographe Catchment is long-standing and substantial and constitutes a major investment in the conservation of our natural resources. Individuals, as well as community environment groups and schools have contributed in many forms from on-ground activities, workshop and planning, to best-practice farm management.

Farmers and other private landholders make considerable investments in time and money to manage their land in more sustainable ways through fencing waterways, revegetation riparian areas and dairy effluent upgrades.

In the last five years GeoCatch has been involved in a water quality and waterway improvement program that has fostered a model of water stewardship. Working in a collaborative framework across government agencies, industry, scientists, catchment groups and the community has resulted in greater outcomes than would have been achieved through traditional consultation processes.

Management Strategies

- Provide opportunities for the community to be involved with natural resource management strategies and decision making.
- Empower current and future GeoCatch board members to actively contribute to the future of GeoCatch.
- GeoCatch members actively engage with the broader community to bring in wider community perspectives and views to GeoCatch.
- Provide opportunities for the community to take action to protect and enhance natural resources – eg. tree planting days, beach clean-ups and citizen science.
- Foster a collaborative culture within GeoCatch and within the broader community
- Utilise innovative community engagement techniques including Community Based Social Marketing.

Cultural Heritage

The traditional owners of this area hold a strong connection to country. Working with local elders and custodians will help retain knowledge and enhance the way we all interact with the natural resources of the catchment.

Management objectives:

To work with Traditional Owners in natural resource management in the Geographe Catchment.

Issues

- Protection of Aboriginal sites under the Aboriginal Heritage Act 1972.
- Condition of cultural heritage sites and preservation.
- Opportunities to work with local Aboriginal groups.
- Little formal involvement of Aboriginal groups in catchment management.
- Uncertainty through native title process

The Geographe Catchment falls within two regions of Noongar country- the Gnaala Karla Boodja Ilua, north of Ludlow, and the South West Boojarah #2 Ilua. The Noongar people have been in the southwest for tens of thousands of years and have a strong connection to country and culture. Aboriginal culture revolves around the environment in which we live. Water is seen not only as an essential resource for people to live but also as a key element that has moulded the landscape and provides life to the flora and fauna that inhabit it and its surrounds. Water therefore plays an important part in the lives of past and present day Aboriginal people and is central to many of their customs and spiritual beliefs.

GeoCatch recognises that all water resources are of cultural and traditional value to the Aboriginal community. Therefore, in cases where GeoCatch is the proponent of works that may impact upon these values, GeoCatch must assess the works in relation to possible statutory requirements of the Aboriginal Heritage Act 1972.

The work GeoCatch undertakes has the objective of ensuring long-term environmental and/or ecological benefit, and as such there is a commonality with the philosophy of 'caring for country' that is intrinsic in Aboriginal culture. This common goal has been taken into account with all activities. GeoCatch supports the engagement of Aboriginal people in natural resource management in the Geographe Catchment.

Management Strategies

- Protect Aboriginal cultural heritage through information and consultation on project work.
- Acknowledge Traditional Owners through Welcome to Country at events.
- Investigate ways to work with the local aboriginal community.
- Increase understanding and promote Aboriginal values of natural resources.

Welcome to Country

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natural resource
management program

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The Geographe Catchment Council (GeoCatch) is a community based natural resource management group formed in 1997 to protect, restore and enhance the natural resources of the Geographe Catchment.

72 Duchess Street, Busselton | (08) 9781 0111 | PO Box 269 Busselton WA 6280 | geocatch.asn.au