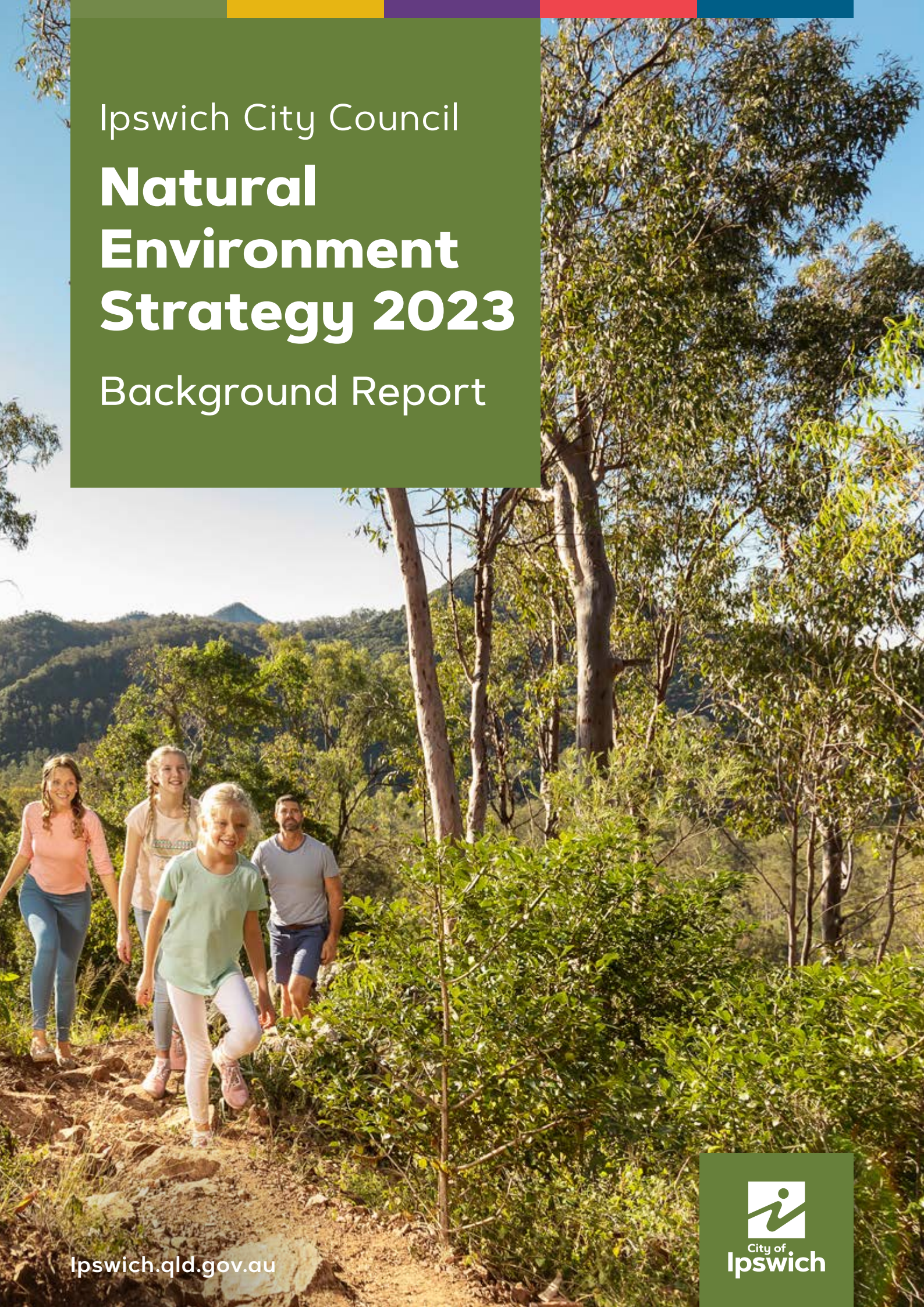
Ipswich City Council

Natural Environment Strategy 2023

Background Report



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City of Ipswich

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ACKNOWLEDGEMENT OF COUNTRY

Trails across Ipswich and beyond traverse the cultural landscape of the Traditional Owners. Ipswich City has cultural significance for the Traditional Owners who have always had and have maintained a spiritual connection with their country. This relationship remains strong and important to the people today.

Ipswich City Council recognises and respects the connection between Traditional Owners and their country.

1. BACKGROUND AND CONTEXT

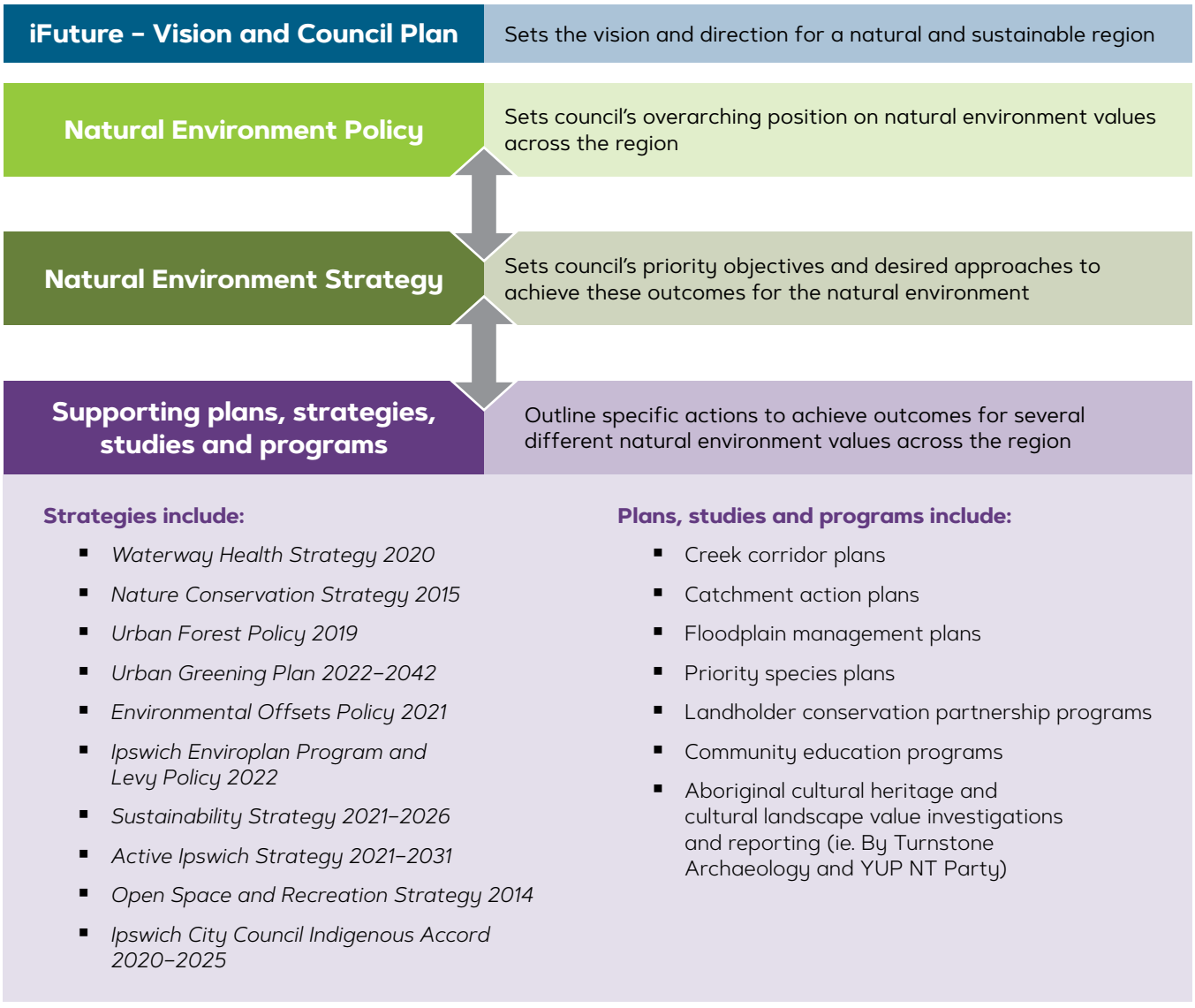
Purpose and use

The Natural Environment Strategy Background Report describes the technical background information used to inform the development of the strategy document. It is set out in 7 parts:

1. Background and context
2. Waterways and wetlands health improvement
3. Biodiversity and threatened species recovery
4. Aboriginal cultural heritage and cultural landscape values recognition
5. Urban biodiversity enhancement
6. Rural biodiversity enhancement
7. Sustainable nature-based recreation.

The Natural Environment Strategy builds off over 20 years of planning and investment from council in the protection and enhancement of natural assets across the region and is the first time that all these natural assets and values are being considered in a combined strategy document. This strategy puts the spotlight on key priorities that are important for council and the community and will help to drive strategic investment in the years to come. Achieving these priority objectives will ensure that the outcomes of many existing strategies, plans and studies will be delivered as shown in Figure 1.

Figure 1 – Framework of other council plans, strategies, studies and programs which support the Natural Environment Strategy.



Strategy development

The Natural Environment Strategy has been development through coordinated consultation across multiple council departments and other external stakeholders as summarised below.

Council stakeholders across the following subject matters:

- Aboriginal cultural heritage
- biosecurity planning and compliance
- destination development
- development assessment
- environmental and sustainability education and awareness
- infrastructure planning
- land-use planning
- natural areas planning, projects and management
- natural environment and land management
- open space design
- outdoor and nature-based recreation
- sustainability
- urban greening.

External stakeholders including:

- community survey (Shape your Ipswich)
- community panel workshop
- external stakeholder workshop.

A key outcome of the extensive stakeholder engagement was the development of the priority objectives in the strategy. More information on the consultation approach and outcomes can be found in the *Natural Environment Strategy – Stakeholder Engagement Report 2022*.

Strategy context

International, national and state strategies and legislation

The Natural Environment Strategy will help to deliver on Australia's commitments to national and international conventions and targets such as Sustainable Development Goals (SDGs). Specifically, it was identified that council can deliver outcomes related to the following six SDGs via implementation of this strategy:

Ensure healthy lives and promote well-being for all at all ages

Take urgent action to combat climate change and its impacts

Make cities and human settlements inclusive, safe, resilient and sustainable

Ensure availability and sustainable management of water and sanitation for all

Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

This strategy also recognises that council has an obligation to meet several statutory requirements and regional targets for the protection and management of the natural environment. It also must fulfil state government devolved responsibilities through regulatory enforcement on public and private land. These legislative requirements which have been considered in the development of this strategy are outlined in Figure 2. Attachment 1 provides a more comprehensive list and description of these documents.

Figure 2 – Summary of international, national and state legislation and policies which help to protect natural environment values.

INTERNATIONAL

United Nations Sustainable Development Goals | The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 1999 | UN Declaration on the Rights of Indigenous Peoples

NATIONAL

Australia's Strategy for Nature | Environmental Protection and Biodiversity Conservation Act | Aboriginal and Torres Strait Islander Heritage Protection Act 1984 | Native Title Act 1993

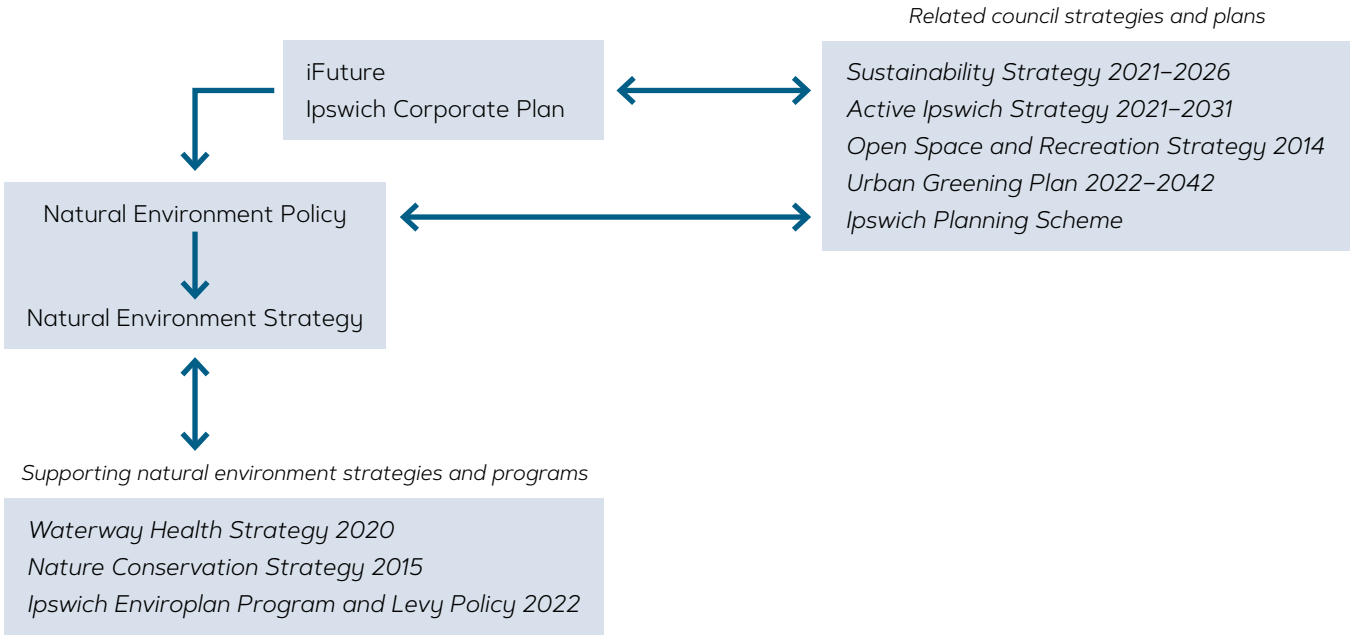
STATE

Biosecurity Act 2014 | Environment Protection Act 1994 | Fisheries Act 1994 | Flinders Karawatha Corridor Management Strategy 2014–19 | Local Government Act 2009 | Nature Conservation Act 1992 | Planning Act 2016 | SEQ Regional Plan 2017 | SEQ NRM Plan 2009–31 | State Planning Policy | Vegetation Management Act 1999 | Water Act 2000 | Environmental Offsets Policy (act and regulation) | SEQ Koala Conservation Strategy 2020 | Aboriginal Cultural Heritage Act 2003 | Human Rights Act, 2019 | Nature Conservation and Other Legislation (Koala Protection) Amendment Regulation – Amended the Environmental Offsets Regulation 2014 | Planning Regulation 2017 | Nature Conservation (Koala) Conservation Plan 2017 | Vegetation Management Regulation 2012

Local policy and strategy framework

This strategy helps to deliver the community vision for a natural and sustainable region in alignment with iFuture and other council policies, strategies and plans including the *Ipswich Planning Scheme*, *Sustainability Strategy 2021–2026*, *Active Ipswich Strategy 2021–2031* and the *Urban Greening Plan 2022–2042*.

It is a non-statutory document which provides strategic and operation focus for environmental protection across Ipswich. It will inform short and long-term decision making, planning and management of the natural environment and help to deliver actions outlined in supporting plans including the *Waterway Health Strategy 2020* and *Nature Conservation Strategy (NCS) 2015* through the Ipswich Enviroplan Levy program.



Council's role and responsibilities

In the protection and restoration of the natural environment, council has an important role as both an owner and/or manager of natural areas as well as a regulator, advocate and supporter for improved outcomes on land owned by others.

Council's responsibilities are guided by Commonwealth and state legislation as well as regional and local policies and plans.

Council is a key government stakeholder and authority in the management of Ipswich's natural environment and has a responsibility to implement and advocate real change at a local level. Council develops and delivers policies, strategies and programs. Best practice management techniques, data-driven decision making and community input and sentiment are used to inform these.

Council's natural environment management aims to promote, protect, and enhance the local environment and cultural landscape values, as well as create community awareness, engagement and opportunities for connection with nature. To achieve success, council seeks to work closely with the community to build awareness and engagement.

Community education and engagement

Council has a team dedicated to environmental education and partnerships aimed at instilling behaviour change and sharing awareness across the Ipswich community. Achievements in 2021/22 include:

- 18 landholders received grants to undertake targeted habitat restoration projects
- six community groups received grants to support environmental initiatives
- two education events attended by 60+ residents to raise awareness on habitat restoration
- seven Bushcare groups comprising 56 volunteers actively restoring approximately 3ha of natural habitat areas
- 22 'Experience Nature Events' in natural areas totalling 376 participants
- 133 attendees participated in the Enviroforum – changing landscapes.

The current program has been developed to enable and empower partners and the community by providing lifelong learning opportunities for an enriched environment and sustainable city. Activities and opportunities include:

- Enviroforum – inform and educate on topical matters
- Bushcare Site Community Days – a tool for education and achieving environmental outcomes on site
- Community tree planting days – on-ground restoration and information sharing
- Kids go Wild – create behaviour change
- Guided walks – conservation and nature messaging in natural areas
- QuestaGame – encouraging engagement with nature outdoors
- Youth Sustainability Summit – awareness raising targeted at Ipswich youth
- Landholder Conservation Partnership Incentives – workshops and support activities to increase knowledge.

2 Waterways and wetland health improvement

Important definitions:

Waterway – This is a channel which conveys water and can include rivers, creeks, streams and other drainage features. They can be freshwater or tidal and be both permanent and ephemeral waterways. The waterway channel can be defined by the highest points of land in the channel which are covered by water either permanently or intermittently[1].

Wetland – These are areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres. To be a wetland the area must have one or more of the following attributes:

- at least periodically, the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle
- the substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers
- the substratum is not soil and is saturated with water or covered by water at some time.[2]

Achieving healthy catchments, waterways and wetlands is a key priority for the Ipswich residents and has been a long term focus for council through decades of investment in their protection and enhancement. The *Waterway Health Strategy 2020* identifies the strategic priorities and actions moving forward for improved waterway and wetland health across Ipswich. The Waterway Health Strategy also provides a snapshot of the health, condition and actions for all the creek sub-catchments across the region.

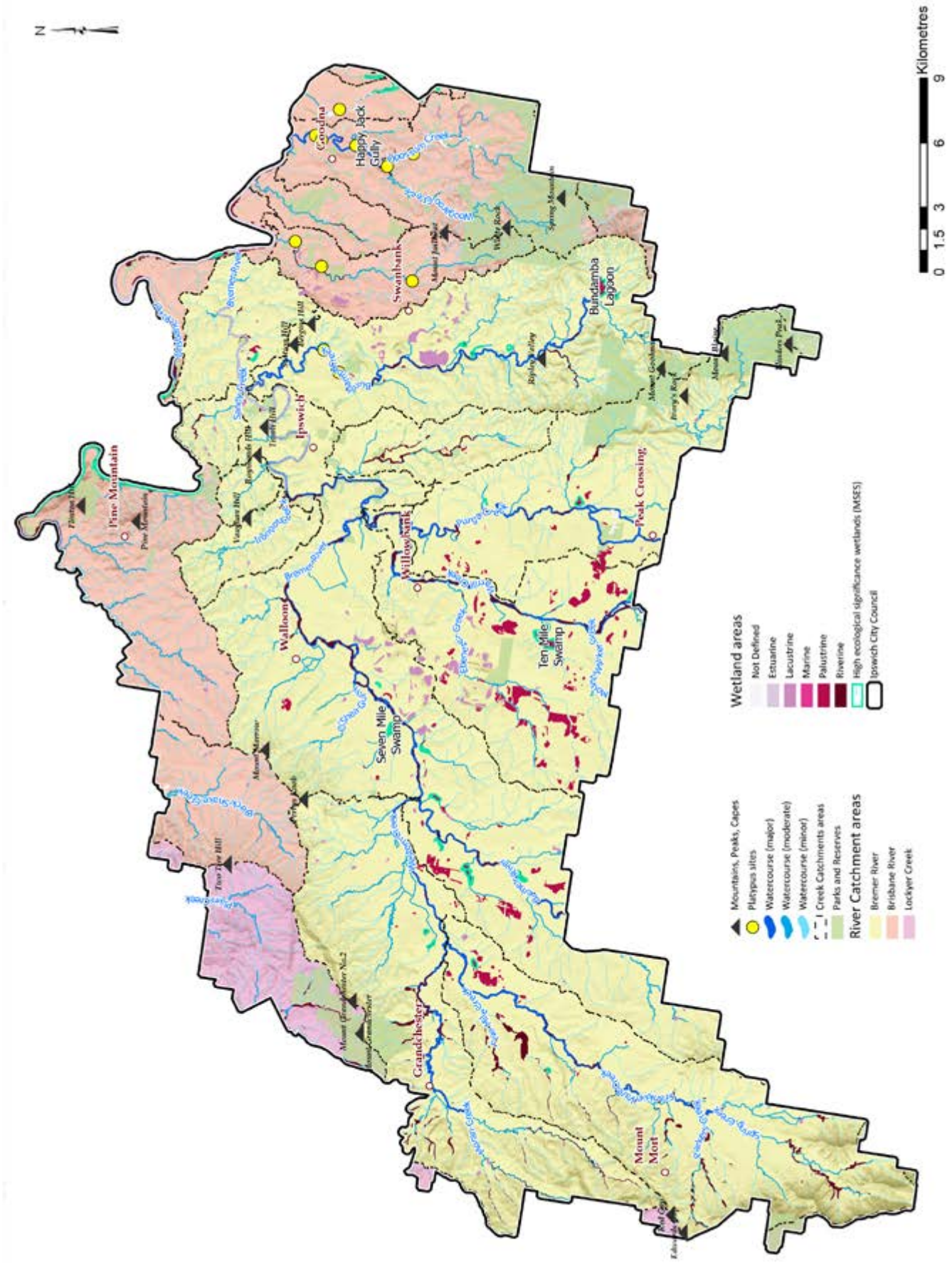
Overall, most Ipswich waterways have been impacted by past and current land uses and land management practices. Despite this, these waterways continue to support many important ecosystem services including water supply, habitat for important local species, flood mitigation, recreation and amenity. Waterways are also identified as a cultural landscape feature that is protected under the *Aboriginal Cultural Heritage Act 2003*. This reflects the spiritual and customary living relationship Australia's First Nations have with water in all its forms, through creation stories, use of water as a resource, and knowledge about sharing and conserving water (NSW Office of Water, 2012).

1 Based on *Fisheries Act 1994* and Survey and *Infrastructure Mapping Act 2003* definitions

2 Queensland Wetlands Program wetland definition

Figure 3 – Ipswich waterways and wetlands

**Please note the information presented is based on a range of available mapping data and doesn't represent all waterways and wetlands.*



The health of waterways and wetlands reflects on land and water resource management within the waterway corridor as well as the broader catchment. Typical negative influences on waterway health include pollution (point source and diffuse), changes in hydrology, loss of riparian and floodplain vegetation and erosion and sedimentation.

Waterway management over the past decade has focused on water quality, through the management of point source pollution (e.g. direct discharge of pollution from wastewater treatment plants and industry) and requiring new urban developments to better manage stormwater to protect downstream environments. While point source pollution is still a concern for Ipswich waterways, this can be easier to target than diffuse pollution which is a result of catchment land uses and clearing of vegetation. Many point source discharges are also regulated as Environmentally Relevant Activities (ERA's) under the Queensland Government's *Environmental Protection Act 1994*. An example of the past success in point source pollution reduction is the investments in wastewater treatment plants since the early 2000s which addressed ongoing poor water quality results in SEQ waterways and bays. Healthy Land and Water have identified that more investment and action into activities such as restoring streambank vegetation and managing urban run-off is now critical to improve waterway and wetland health[3].

The focus of this strategy's waterway and wetland objectives is on sediment reduction and riparian revegetation, with the aim of addressing diffuse pollution and the stability of Ipswich waterways and wetlands. These priority objectives also reflect the outcomes of the broader stakeholder feedback (refer to the Natural Environment Strategy – Stakeholder Engagement Report 2022) and Strategic Priorities 4 and 5 in council's Waterways Health Strategy 2020.

Key outcomes sought: Improving the health and resilience of Ipswich waterways and wetlands by focusing on reducing sediment loads and improving riparian vegetation condition.

3 SEQ's much loved waterways in decline – Healthy Land and Water (**Hlw.org.au**)

Council's achievements to-date:

Council has been very active in the protection and improvement of waterway and wetland health over the past 20 years delivering the following types of outcomes:

Partnerships

- involvement in the SEQ Healthy Waterways Partnership (now Healthy Land and Water) and other regional and local initiatives
- establishment of the Landholder Partnerships Program with incentives for private landholders to undertake rehabilitation works on their properties
- partnership with other organisations in the Resilient Rivers Initiative to develop coordinated action plans for the Bremer River and Mid Brisbane River catchment.
- integrated and long term planning with other organisations to develop strategic floodplain management plans for the Brisbane and Bremer Rivers
- engaging First Nation businesses through the Habitat Connections program to undertake restoration works.

Strategies, plans and assessments

- implementation of the 2020 Waterway Health Strategy, 2015 Integrated Water Strategy and 2015 Floodplain Management Strategy
- assessment of waterway and wetland health condition, geomorphic condition, water quality, fish populations and platypus surveys
- development and implementation of waterway improvement plans/corridor plans for Black Snake, Bundamba, Deebing and Iron Pot creeks
- extensive mapping and validation has been undertaken to identify all stream orders across Ipswich which can be used to inform stream order protection
- undertake sediment tracking to identify and map priority sediment sources.

Development requirements and guidance

- development and promotion of waterway management guidelines including Riparian Corridor Revegetation Guidelines and Waterway and Channel Guidelines
- Ipswich Planning Scheme requirements for waterway protection, including requirements related to the protection of natural hydrologic behaviour of catchments and protection of water quality.

On-ground works

- investment in on-ground programs and partnerships in catchment improvement projects, including the Franklin Vale Initiative, Small Creek and other water quality offset projects.
- community engagement and education:
- community engagement schemes are also being used, such as development of publicly accessible educational materials and waterway planning documents
- supporting on-ground works including community planting days.

SEDIMENT

What is sediment?

Sediment is the soil particles collected and transported by water movement, including gravel, sand, silt and clay.

Key threatening processes

Suspended and deposited sediments have a major impact on the aquatic environment including:

- altering and smothering habitats for aquatic organisms
- smothering submerged plants and reducing plant growth through reduced light penetration
- reducing water quality due to the addition of other pollutants such as nutrients, microbes, heavy metals and other chemicals which are attached to sediment particles.

This increased turbidity and water quality degradation can lead to algal blooms and fish kills due to low oxygen levels. Poor water quality also impacts on the cost of drinking water due to the level of treatment required. The smothering of habitats and food sources and reduced light penetration also has dramatic influences on the biodiversity in these aquatic environments, making it difficult for animals to locate food, detect predators or find appropriate places to breed.

Ipswich City Council have recognised that sedimentation is one of the greatest threats to the condition of Ipswich waterways (City of Ipswich, 2021b).

Summary of key threats:

- **altered habitats** – smothering in-stream habitats and reducing channel habitat diversity
- **reduced light penetration** – reducing plant growth and increasing risk of algal blooms
- **increased pollutant loads** – pollutants such as nutrients, heavy metals, microbes and other chemicals attach to sediments meaning that increased sediment loads also results in increased loads of other pollutants
- **reduced biodiversity** – reducing food, shelter and breeding opportunities for local fauna
- **increased risk to drinking water supplies** – high sediment loads can increase the requirements and costs for the treatment of drinking water supplies.

Sediment sources

Healthy Land and Water have identified that the Bremer Catchment is one of the main catchments in South-East Queensland contributing sediment into waterways and ultimately Moreton Bay and it is therefore a key priority catchment for their investment in land and waterway rehabilitation works (Healthy Land and Water, 2018).

Council have identified that the main sources of sediment in the Bremer River are:

- erosion from building/construction sites
- erosion from cleared or poorly managed agricultural land.

(City of Ipswich, 2022)

Erosion from building/construction sites

Development sites are at a high risk of erosion due to the widespread clearing of vegetation across the site, exposing large areas of soil during the building and construction phase. Healthy Land and Water have stated that

> *"while less than one per cent of land area across South-East Queensland is under construction at any given time, erosion from construction sites contributes 40 per cent of the sediment pollution that enters Moreton Bay"* (Healthy Land and Water, 2021).

If this trend continues, this will be highly problematic for waterway and wetland health in a fast-growing region like Ipswich.

Erosion from agricultural land

Most of the sediment entering the Bremer River is due to cleared agricultural land within rural areas (City of Ipswich, 2022). The source of this sediment includes:

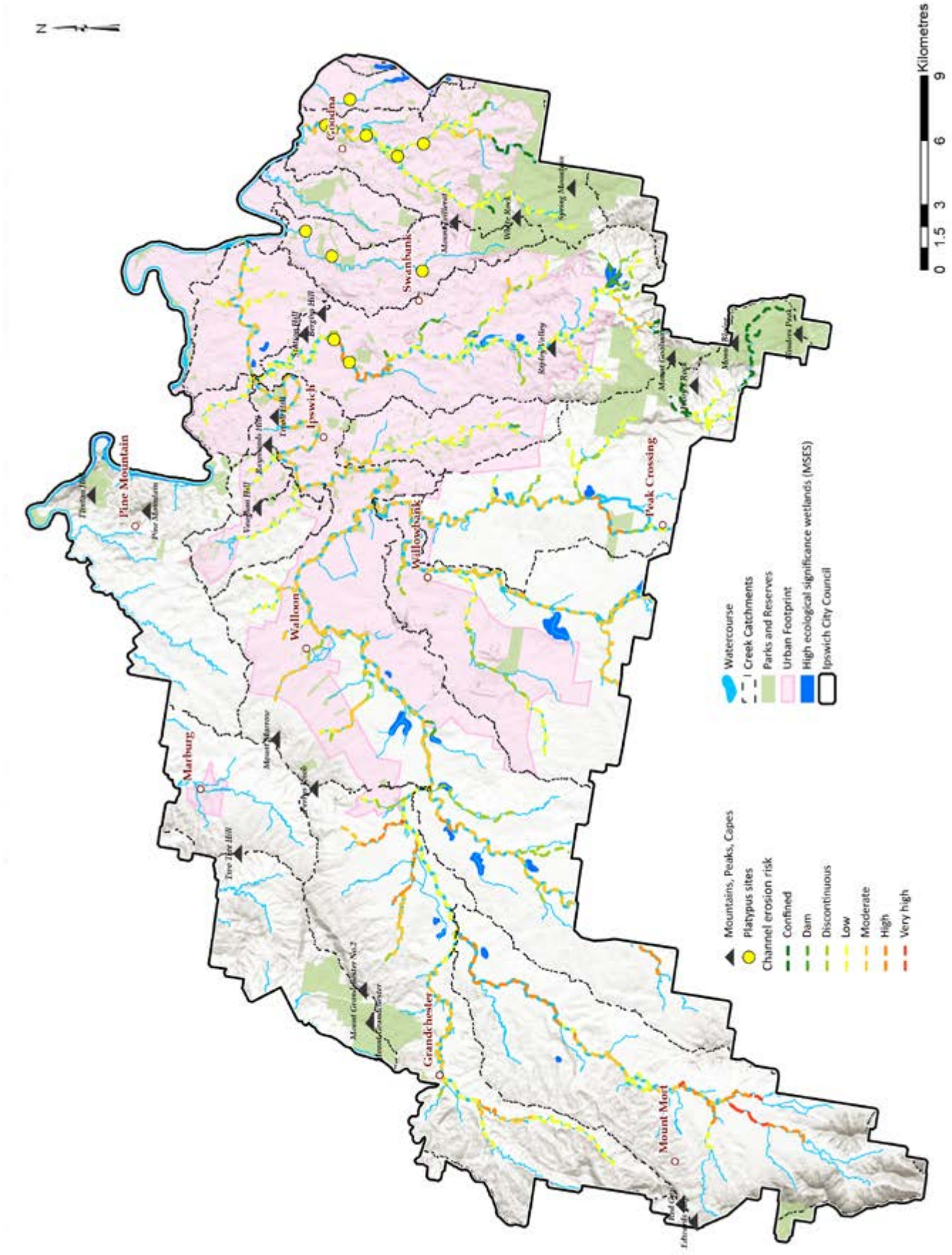
- **surface erosion** – exposed soils across the agricultural land are transported to the waterways during rain events in surface runoff
- **bed and bank erosion** – due to creek banks slumping or scouring, especially in areas where there is limited riparian vegetation to hold the sediment in place, high velocity flows and/or steep, exposed banks.

Healthy Land and Water have identified that the Bremer Catchment is one of the main catchments in South-East Queensland contributing sediment into waterways and ultimately Moreton Bay during intense rainfall events and it is therefore a key priority catchment for their investment in land and waterway rehabilitation works (Healthy Land and Water, 2018).

Ipswich City Council have identified several local creeks which are contributing high sediment loads including Franklin Vale Creek which led to the creation of the Franklin Vale Creek Initiative to stabilise the creek channel and reduce erosion. Council is currently undertaking an erosion risk and sediment tracking project which will provide a current understanding of where the key sediment sources are across the region (see Figure 4).

Figure 4 – Overview of Ipswich waterways and wetlands, identifying channel erosion risk due to channel instability and future urban development.

**Please note the information presented is based on a range of available mapping data and doesn't represent all waterways and wetlands.*



Summary of approaches to reduce sediment entering waterways and wetlands

There are several activities already happening across South-East Queensland to reduce sediment loads entering the waterways and Moreton Bay including:

- improved rural land management practices
- erosion and sediment control
- improved urban stormwater management
- channel stabilisation.

These best practice approaches are described in more detail in the following section.

Improved rural land management practices

Sediment can be generated several ways on rural lands including hillslope erosion and exposed and degraded soils (from overstocking etc). The appropriate management action will need to suit the site conditions and threats. Existing Best Management Practice benchmarking can be used to inform the selection. There are several best practice approaches to address rural land management practices which are currently occurring across the Bremer and other South-East Queensland catchments including:

- keeping stock away from waterways and riparian zones through fencing and off-stream watering points
- use of contour banks, strip tillage and buffer strips to control flows and capture sediments
- improved soil and ground cover management through tillage approaches, stocking rates and soil conservation
- use of on-site treatment systems such as high efficiency sediment basins, bioreactors and constructed wetlands.

Erosion and sediment control in new developments

Erosion and sediment control is a requirement for new applicable developments under the *Planning Act 2016* and the State Planning Policy which outlines stormwater management design objectives for sediment control on construction sites. It is also an offence under the *Environmental Protection Act 1994* to unlawfully deposit soil or other contaminants in waters, a roadside gutter or stormwater drain.

There are several approaches to provide erosion and sediment control including:

- **cover soil (including stockpiles of soil)** – to prevent soil being transported in surface flows
- **sediment barriers** – to stop suspended sediments leaving the construction site
- **sediment basins** – to capture and store sediments on-site
- **divert flows** – to control where stormwater moves across the site.

The selection of the appropriate sediment and erosion control approaches should be in accordance with International Erosion Control Association (IECA) best practice (**Austieca.com.au**). Healthy Land and Water have also developed many useful tools to assist in sediment and erosion control (**Hlw.org.au/project/erosion-and-sediment-control-esc/**).

Compliance is critical to ensure these best practice sediment and erosion control approaches are being used on the new development and building sites. Sediment and erosion control compliance is authorised under the *Environmental Protection Act 1994* which allows compliance officers to undertake compliance inspections and apply enforcement provisions.

Improved urban stormwater management

Urban stormwater flows also transport sediment. The increased velocities and flow volumes generated from urban areas also increase the risk of erosion in the receiving waterway channels. Therefore, appropriate management of urban stormwater is also required to address sediment.

The State Planning Policy outlines the stormwater management requirements for applicable new developments. Typically, bioretention or stormwater treatment wetland systems are required to achieve these objectives. Healthy Land and Water's, Water by Design program have best practice design guidelines to inform the delivery of these systems – **Waterbydesign.com.au**. These systems can also be retrofitted into existing urban areas to improve water quality and slow flows entering the local waterway.

Channel stabilisation

Channel stabilisation refers to works which aim to improve the bed and bank stability of the channel to reduce the risk of erosion. This can be achieved in several ways including 'soft engineering methods' (such as battering and riparian revegetation) and 'hard engineering methods' (such as concrete mats, gabions and rocks) (Witheridge 2021).

Julie McClellan, CEO of Healthy Land and Water, recently highlighted the importance that the revegetation of riparian zones could have on sediment reduction, stating that:

> *"If we could find the investment to restore stream bank vegetation to just 6,000km of stream length across SEQ, we would have the potential to reduce sediment loads to the coastal areas by as much as 50%."*
>
> *(Healthy Land and Water, 2021)*

The choice of channel stabilisation method will depend on the channel and catchment conditions and should be determined based on best practice guidance such as the Creek Erosion Field Guide (Witheriedge, 2021) and council's Waterway and Chanel Rehabilitation Guidelines (2010).

There have been several recent projects which have used different approaches for channel stabilisation including:

- **Franklin Vale Creek Initiative** – planting of native species in the riparian zone to stabilise banks
- **Laidley Creek** – riparian revegetation and use of log jams to stabilise banks
- **Upper Warrill Creek** – use of log jams to stabilise creek banks.

Summary of key approaches to address sediment:

- improved land management practices to improve soil condition and ground cover conditions
- erosion and sediment control and compliance in new developments
- controlling urban stormwater quality, flow volumes and velocities in new development and through retrofits
- stabilisation of streambanks through riparian revegetation and bed and bank stability works (e.g. log jams, pile drives and bank battering).

What does success look like?

To measure success, the volume of sediment prevented from entering Ipswich waterways and wetlands needs to be measured. Currently council measures the reduction in sediment achieved in projects through its stormwater offsets framework, such as channel naturalisation, stream bank stabilisation and other WSUD retrofit projects. This sediment reduction is typically modelled and reported with other nutrient reductions including total nitrogen and total phosphorus. These reductions are tracked in a live dataset by council which can be used to extract sediment reduction tracking data as part of this objective. The data used in the development of the objectives current, milestone and desired states is based on this existing dataset.

Moving forward, it would be beneficial if council could start to measure or model sediment reductions achieved by projects, which are delivered through other council programs which may also reduce sediment loads entering the local waterways and wetlands.

Objective development:

Priority objective 1: Reduce sediment entering our waterways and wetlands

Indicator: Sediment load reduction (kg/yr) due to council led projects.

Current state: 339,090kg/yr of sediment removed to-date through stormwater offsets projects.

Milestone: 342,000kg/yr reduction in sediment loads entering waterways and wetlands across Ipswich.

Strategy target: 345,000kg/yr reduction in sediment loads entering waterways and wetlands across Ipswich.

RIPARIAN CORRIDORS

What are riparian corridors?

Riparian corridors are the area of land adjoining a waterway, providing a buffer between terrestrial and aquatic environments and providing important connections along the length of the waterway. Healthy riparian corridors have the following characteristics (ICC, 2020b):

- contain structural and species diversity of native vegetation
- exist in continuous stands along the waterway
- be of a minimum width to perform specific functions.

What should they look like?

The width of the riparian corridor influences how effectively it can filter surface flows, stabilise banks, and provide habitat and shade. The wider the riparian corridor, the more services it will be able to provide. For example, to increase biodiversity and support native flora and fauna, the corridor needs to be wide enough to reduce edge effects, while bank stability can be provided by a narrower width of vegetation. Optimal riparian widths can range from 5–200m depending on the landscape context for the waterway (e.g. urban vs rural), the management objective (e.g. surface water filtering vs terrestrial habitat) and the size of the waterway (e.g. lower order stream vs high order stream). Minimum riparian corridor widths from the top of bank have been developed and provided in council's Waterway Health Strategy and range from 10–50m as the minimum width on each side of the waterway depending on stream order and the intended benefit. For example, a 10m wide riparian corridor will have considerable influence on the stability and water quality of a small, lower order stream, but would have limited influence on these functions in a wide, major waterway (ICC, 2020b). A current lack of riparian widths definition and requirement in planning and policy documents makes it difficult to provide a consistent message and outcome for these important riparian areas.

Ideally, riparian zones will have a mix of vegetation types to provide a structure which includes groundcovers (grasses), midstory (shrubs and small trees) and canopy (large trees). This optimises the benefits the riparian zone can provide including surface runoff filtering, habitat, bank stability and shade.

Summary of key attributes:

- contain structural and species diversity of native vegetation
- exist in continuous stands along the waterway
- be of a minimum width to perform specific functions (ideally between 10–100m on each side of the waterways).

Current condition and key threatening processes

Riparian corridors have been mapped by the state government and in recent mapping work undertaken by council on local biodiversity habitat corridors (see Ecological Corridors for more details). These riparian corridors are shown in Figure 5.

The Healthy Land and Water report card shows that the riparian (stream bank) vegetation across the Bremer Catchment is in very poor condition with only 55per cent cover, dropping slightly from 56 per cent in 2020 (Figure 6). It is not clear what this riparian extent data is based on and the spatial variability of this across the Bremer Catchment.

Figure 5 – Mapped riparian corridors across Ipswich

**Please note the information presented is based on a range of available mapping data and doesn't represent all waterways, wetlands or riparian corridors.*

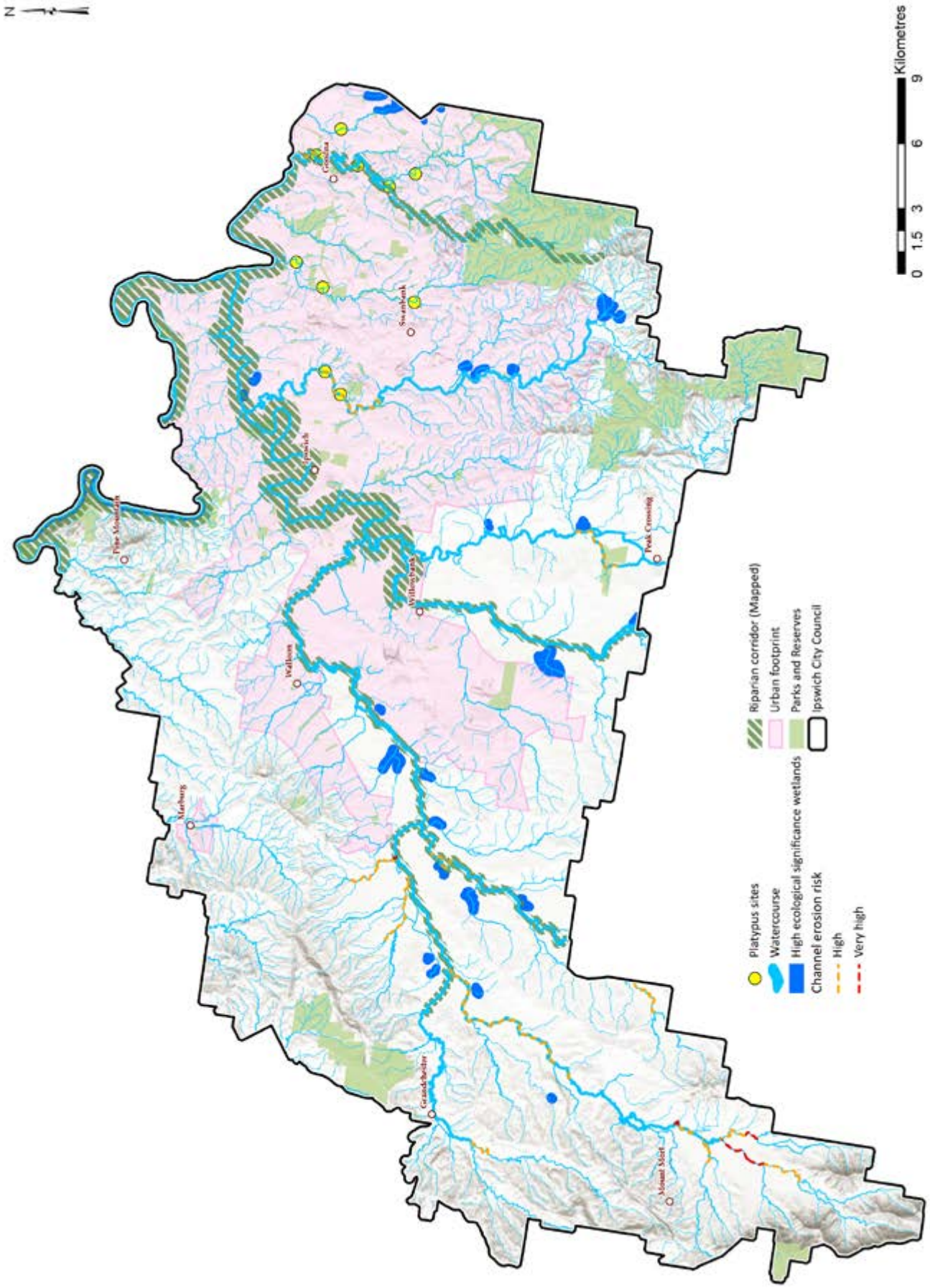
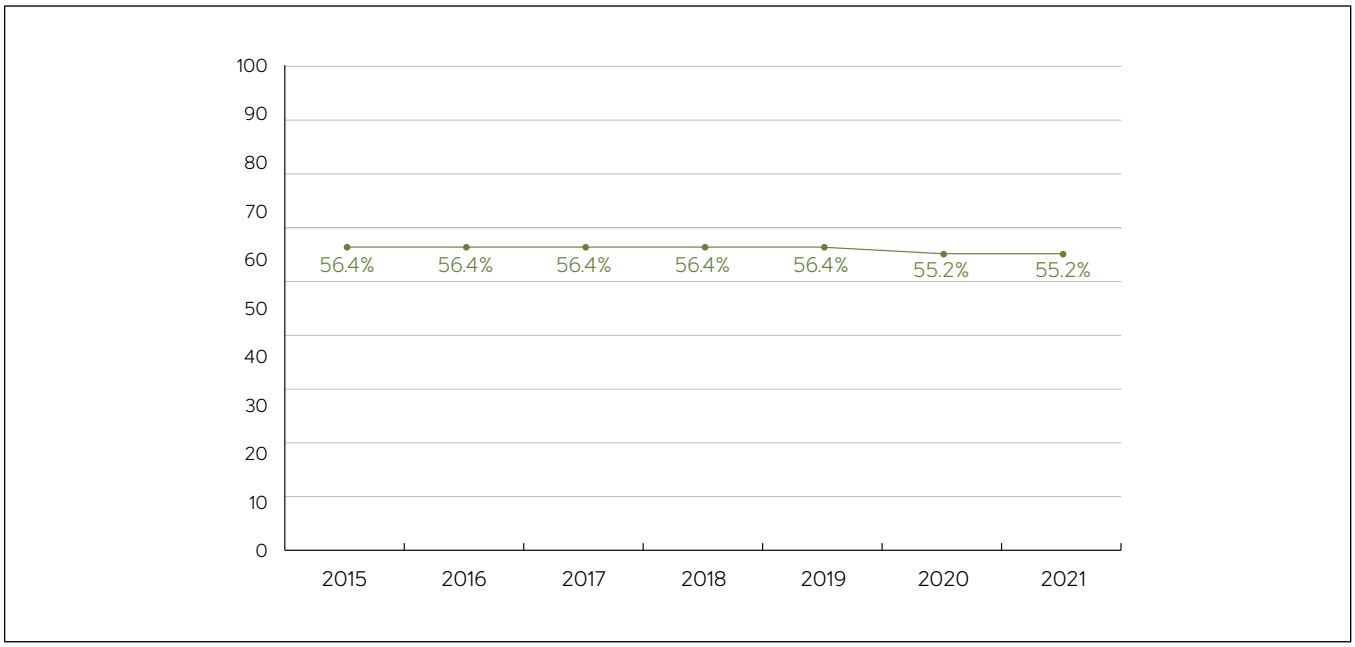


Figure 6 – Healthy Land and Water report card results for riparian extent (as % of total) in the Bremer Catchment



Previous studies undertaken by council have provided a high-level overview of the condition of the riparian vegetation in more detail across all the Ipswich waterway sub catchments. This work highlighted that the condition of the riparian zones varied greatly across the region and quite often over short distances (Alluvium, 2014). Typically, the following trends in riparian condition was identified:

- good condition riparian zones typically found in:
  - upper catchments where there is sloping land which has not been cleared (e.g. Deebing and Bundamba Creek)
  - catchments where land use planning requires vegetated setbacks for development (e.g. Woogaroo, Mountain, Opossum Creeks).
- poor condition riparian zones typically found in:
  - rural floodplain grazing areas (e.g. Warrill, Western and Franklin Vale Creeks)
  - older industrial and urban areas.

Table 1 provides a summary of the riparian condition of each of the Ipswich sub catchments from this study.

Table 1 – Summary of riparian condition assessment results across Ipswich sub catchments (Alluvium, 2014)

CATCHMENT	SUB-CATCHMENT	RIPARIAN CONDITION
Bremer River	Bremer River (freshwater)	🔴
	Bremer River (estuarine)	🟡
	Bundamba Creek	🟡
	Deebing Creek	🟡
	Franklin Vale Creek	🔴
	Iron Pot Creek	🟢
	Mihi Creek	🟡
	Purga Creek	🔴
	Sandy Creek (Tivoli)	🟡
	Warrill Creek	🟡
	Western Creek	🟡
Lockyer Creek	Woolshed and Plain Creek	🟡

CATCHMENT	SUB-CATCHMENT	RIPARIAN CONDITION
Mid Brisbane River	Black Snake Creek	🔴
	Mid Brisbane River: inc. Sandy Creek (Pine Mountain) and Watercress Creek	🔴
Lower Brisbane River	Goodna Creek	🟡
	Lower Brisbane River	🔴
	Sandy Creek (Camira)	🟡
	Six Mile Creek	🔴
	Woogaroo Creek: inc. Mountain Creek and Opossum Creek	🟢

Condition: 🟢 Good 🟡 Moderate 🔴 Poor

More detailed riparian condition assessments have been undertaken along Franklin Vale Creek by Griffith University to inform council's Franklin Vale Initiative project (McMahon et al, 2021) (Figure 7). This work highlighted that the upper catchment area retained the most remnant vegetation while the grazed alluvial zones are heavily cleared (Table 2). Field visits identified over 20 weed species across the riparian zone.

Figure 7 – Riparian buffer canopy cover within the Franklin Vale catchment (McMahon et al, 2021)

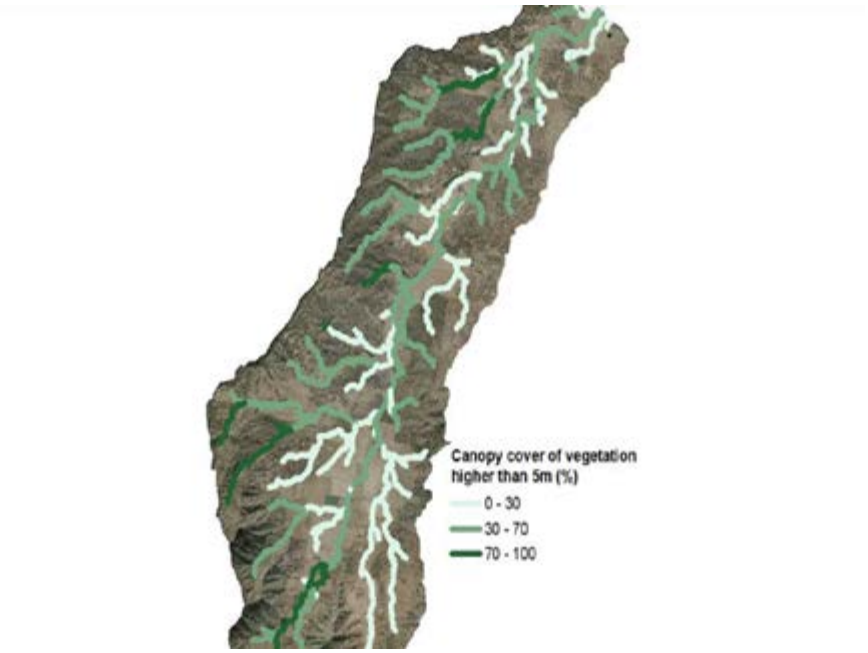
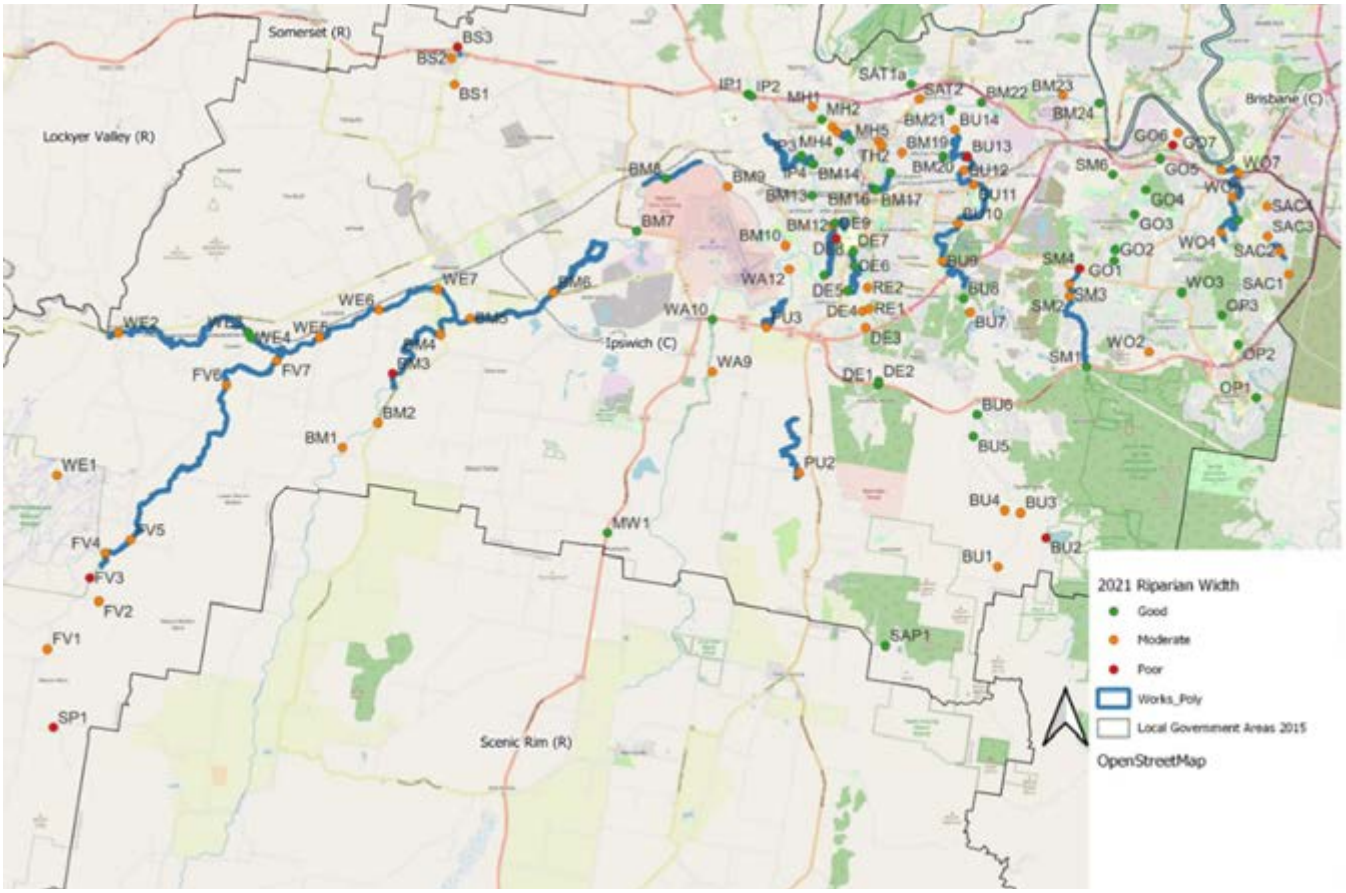


Table 2 – Per cent of remnant and cleared vegetation across different zones in the Franklin Vale Creek sub-catchment (McMahon et al, 2021)

ZONE	REMNANT	CLEARED
Uplands	47%	53%
Foothills	30%	70%
Alluvium – Upper Catchment	1%	99%
Alluvium – Lower Catchment	7%	93%

The Ipswich River Improvement Trust (IRIT) also undertakes riparian condition assessments across their sites in Ipswich. Figure 8 shows the location of these assessments and the extent of weed control undertaken by IRIT in the past. These assessments are undertaken on up to 128 sites across Ipswich waterways and were completed in 2009 and 2021. These assessments highlighted the dominance of weeds across all sites with *Chinese celtis* remaining the most dominant and frequent woody weed across the area being present at 67 per cent of all sites. Other frequent weeds include lantana (45%), glycine (34%), leucaena (28%), balloon vine (26%), broad-leaved pepper tree (21%), wait-a-while (21%), and tipuana (19%) (Faulkner, 2021). These weed species were more prevalent in the urban and per-urban sites. These results showed that ongoing weed control and active revegetation of these sites with native vegetation is required to control these pest species (Faulkner, 2021).

Figure 8 – IRIT weed control sites (blue) and riparian width scores at assessment locations (coloured dots) across Ipswich waterways (Faulkner, 2021)



Summary of key threats to functional and healthy riparian zones across Ipswich include:

- reduced width through clearing of vegetation for urban, peri-urban and rural land use practices
- invasion by exotic grasses and woody weed species (e.g. Chinese elm).

Summary of approaches to improve riparian corridor extent and condition

The improvement of riparian zone condition across Ipswich will require a combination of:

- improved knowledge of current condition
- clarity on requirements and approaches for riparian protection
- delivery of on-ground works such as revegetation and weed control.

Improved knowledge of current condition

The current understanding of the extent and condition of Ipswich's riparian zones is outdated and incomplete and a new assessment is required. This should ultimately build off the work that Healthy Land and Water are doing and strengthen this as required with more refined, local assessments. This may include a combination of mapping and ground-truthing approaches.

Requirements for protection

A strong policy and planning position is required to define the riparian zone width requirements for different waterway types. This should build off the recommendations in the *Waterway Health Strategy 2020* and reflect any updated riparian corridor condition assessments to ensure these are suitable for the different sub catchments.

Council's planning scheme can provide requirements for new developments for the protection, rehabilitation and enhancement of riparian zones as part of a waterway corridor overlay code. This approach has proven beneficial for other councils such as Logan City Council in the past. These planning scheme requirements can include:

- protection of any native vegetation
- protection of minimum riparian distance area
- exclusion of development and unsuitable activities within riparian areas, and
- ensuring adjacent development doesn't impact on the natural function of the riparian zone.

Vegetation Protection Orders (VPOs) can also be used by council to protect vegetation of extensive value which can include individual trees, a cluster of trees or a large, wooded area with undergrowth. These VPOs can be made through council's Local Law No. 49 – Protection of Important Vegetation.

Restoration of native riparian vegetation communities

The removal of weed species and re-establishment of native species within riparian zones is critical to improve the condition of these corridors. This can either be achieved through natural regeneration, assisted regeneration or reconstruction/revegetation:

- **Natural regeneration** – this approach can be used if the riparian zone vegetation is relatively intact and native plants can regenerate without human intervention. Active planting can interfere with natural regeneration.
- **Assisted regeneration** – this approach is appropriate if the riparian zone has a relatively healthy native plant community, but natural regeneration is being impacted by factors such as weeds or land use practices (e.g. grazing etc). Weed control and improved land use practices should be enough to allow natural seedling germination and recruitment of native plants occur with the need for active replanting.
- **Reconstruction/revegetation** – this approach is appropriate if the riparian vegetation community is highly altered or degraded. Active planting of native species will be required to re-establish a functioning riparian vegetation community (Chenoweth EPLA and Bushland Restoration Services, 2012).

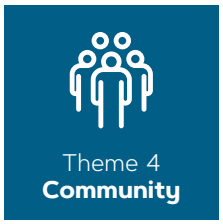
These works will need to occur on both public and private land to ensure there are connected riparian corridors. Council can assist in this through a range of programs including:

- **free plant program** – ensure local native plants are provided with guidance on preferred species for riparian corridors
- **Corridor Conservation Agreements** – continue to work with landholders to best understand how to protect and restore riparian vegetation and fund on-ground works
- **weed control works** – support ongoing weed control programs to be supplemented with appropriate native vegetation restoration approaches
- **vegetation requirements in council projects** – protect and restore native riparian vegetation communities on council projects adjacent to waterways
- **strategic planning and investments** – identify strategic locations for investment in revegetation works along waterways which can provide multiple benefits (e.g. channel stability, habitat corridors, flood mitigation etc.)
- **other partnerships** – continue to work with other external stakeholders to identify priority waterways for riparian enhancement.

Table 3 provides a summary of sub catchments where riparian protection, revegetation and weed control were a priority action in the *Waterway Health Strategy 2020*.

Table 3 – summary of priority actions identified in council's *Waterway Health Strategy 2020* highlighting sub catchments where riparian protection, revegetation and weed control are a priority action

ACTION TYPE	CATCHMENT / SUB-CATCHMENT																			
	Bremer River											**Mid Brisbane River**		**Lower Brisbane River**						**Lockyer Ck**
	Bremer River Est	Bremer River FW	Bundamba Ck	Deebing Ck	Franklin Vale Ck	Iron Pot Ck	Mihi Ck	Purga Ck	Sandy Ck (Tivoli)	Warril Ck	Western Ck	Black Snake Creek	Mid Brisbane River	Goodna Ck	Lower Brisbane River	Sandy Ck (Camira)	Six Mile Ck	Woogaroo Creek, including Mountain and Opossum creeks	Lockyer Ck
Channel stabilisation / naturalisation	■	■	■	■	■	■	■		No actions – low priority sub-catchment			■	■		■	■	■	■	
Best practice stormwater management – new development			■	■						■								■	
Lower order stream protection			■	■						■									
Protect waterway corridor / riparian buffer widths			■	■	■			■											
Riparian revegetation / weed control	■		■		■		■	■			■	■	■	■			■	■	
Floodplain engagement / enhancement		■				■		■		■		■							
Wetland protection / enhancement		■						■		■									
Vegetation protection / enhancement	■	■						■		■		■							
Land management best practice – private land					■		■					■							■
Community education		■						■		■						■			■
Community events	■		■											■					
Community access	■														■				
Support landholders	■	■			■		■	■		■	■		■		■				



Summary of key approaches to improve riparian condition and extent:

- improved understanding of the current extent and condition of Ipswich riparian zones
- protection and provision of suitable riparian corridor widths and remnant vegetation
- revegetation of riparian zones with a diversity of native species on council land
- weed control
- partnerships to control weeds and revegetate riparian zones with native species on private land.

What does success look like?

To measure success, the extent and condition of riparian corridors needs to be measured. Currently, the only dataset available on riparian extent is the Healthy Land and Water report card data. However, it is not clear how this data has been generated and there is no detail on the spatial variability of this extent or the condition of the riparian vegetation. However, as the only available data, this data will be used to measure the extent of riparian zone in the Bremer River for this objective. As a milestone, it would be good to have an improved understanding of the local extent and condition of Ipswich riparian corridors which can be used to improve this dataset.

Objective development:

Priority objective 2 – Increase extent and condition of vegetation cover around waterways

Indicator: Riparian extent as measured by the Healthy Land and Water report card. This will be supplemented in the future with council mapping and data of riparian extents and condition as data becomes available.

Current state: 55.2% riparian extent for the Bremer River (HLW Report Card 2021).

Milestone: Improved understanding of ICC riparian extent and condition.

Strategy target: >56% riparian extent with improved condition.

3 Biodiversity and threatened species recovery

Important definitions:

- **biodiversity** – the variety of native plant and animal life within the city. The number of native species across plant, fungi and animal kingdoms (City of Ipswich, 2015b)
- **threatened species** – flora and fauna species listed under the state government's *Nature Conservation Act 1992* or *Commonwealth Government's Environmental Protection and Biodiversity Act 1999*.

Ipswich contains a unique and diverse system of native vegetation tracts across the landscape. These tracts contain a variety of ecosystems, ecological communities and ecological processes supporting a diversity of native species including:

- 38 mapped regional ecosystems having existed
- four ecosystems make up 80% of the mapped cover
- one semi-evergreen vine thicket ecosystem has 100 per cent of its SEQ extent within Ipswich
- 70 per cent of the SEQ extent of endangered *Melaleuca irbyana* ecosystem is within Ipswich
- 1,651 native plants and animal species recorded
- 65 threatened species under the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) are potentially present
- three ecosystems of national significance are found mapped in Ipswich – brigalow (endangered), Swamp Tea-tree Forest (critically endangered) and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered)
- 15 ecosystems classed as endangered according to the *Vegetation Management Act 1999* are mapped in Ipswich
- two species, Cooneana olive and regent honeyeater, are critically endangered under the EPBC
- 31 species are listed as threatened under Queensland's *Nature Conservation Act 1992* (NCA)
- eight endangered species under the NCA are found in Ipswich
- five species are classed as strategic priority species in council's *Nature Conservation Strategy 2015* – including the brush-tailed rock wallaby and plunket mallee
- 38 species have been identified by council as significant local species – 26 are priority species.

The condition and extent of current native vegetation tracts has been shaped by several historical factors. Being one of the longest European settlements in the state has consequently resulted in modification of the landscape over an extended period from activities such as urban settlement, mining, forestry and agriculture. It's also likely that Aboriginal cultural land practices have influenced the composition of native plant species.

Despite the extensive modification, the city has managed to retain important areas of native vegetation containing high conservation values. Since initiating an environmental levy in 1996 and initial conservation strategy in 2000, council has traditionally focused on establishing a large Natural Area Estate and working in partnerships with landowners to protect and undertake management actions within these areas.

The *Nature Conservation Strategy 2015* recognised that native vegetation is fragmented. This fragmentation is mainly because of continued human settlement activities but also impacts from changing climatic conditions, inappropriate fire regimes, introduced pests, dryland salinity and poor land management practices. It identifies strategic actions and priority areas for conservation which are typically located outside of the urban area. Since this time there has been additional work undertaken to improve the understanding of the habitat and biodiversity value of vegetation and corridors within the urban areas.

Council continues to recognise areas of remnant vegetation and ecological corridors are important for providing ecosystem services to the city i.e. refuge and movement for wildlife. This strategy's focus is on the protection and enhancement of natural habitat areas and the corridors connecting them. Together these aim to improve the biodiversity of Ipswich and protect the threatened species in the region. These priority objectives also reflect the outcomes of the broader stakeholder feedback (refer to stakeholder engagement plan) and the strategic outcomes in council's *Nature Conservation Strategy 2015*.

Key outcomes sought: Protecting and connecting natural habitat areas to improve the health and resilience of Ipswich's biodiversity.

Council's achievements to-date:

Council has been very active in the protection and management of Ipswich's biodiversity and threatened species delivering the following types of outcomes:

Partnerships:

- for almost 25 years council has delivered a landholder conservation partnership program that comprises several types of agreements and support
- over such an extensive timeframe, the program focus, direction and priority has evolved however, a constant theme throughout has been the enhancement of environmental stewards and providing 'seed' support towards self-reliance/sufficiency
- a review in 2021 saw an update to program direction and legibility, council offers:
  - Habitat Gardens – non-legally binding program aimed at restoring backyards
  - Land for Wildlife – non-legally binding agreement targeted towards properties with intact vegetation
  - Corridor Conservation Agreement – protection and support to restore fragmented landscapes
  - Biodiversity Conservation Agreement – high level protection through planning scheme zones
  - Voluntary Conservation Covenant – permanent protection mechanism in perpetuity.
- in the 2020–2021 financial year, 18 landholders received grants through the Ipswich Enviroplan program to undertake targeted habitat restoration projects.

Strategies, plans and assessments:

- Council has a solid background delivering a strategic approach to nature conservation. Over several decades, council has implemented three Nature Conservation Strategies. The initial strategy in 2000 focused on identification and preservation. The strategy in 2008 concentrated on enhancement and protection. The current 2014 strategy focuses on promoting resilience.
- Over the last few years council has developed and started implementing recovery plans targeted at three key threatened species:
  - Koala Conservation and Habitat Management Plan
  - Brush-tailed Rock Wallaby Recovery Plan
  - Platypus Recovery Plan (2020).
- These plans informed on-ground conservation works within the Natural Area Estate.

On-ground works:

- Council conducted its second ever BioCondition assessment of the Natural Area Estate in 2020–2021. Council conducted its original assessments in 2015 to create an objective, replicable and quantitative way of determining the conservation value and ecological condition of the estate and their biodiversity values. The 2020/2021 surveys revaluated all the previous sites done in 2015. While the results remained strong, there was a definite downward trend at many sites while a select few improved. The results are not necessarily a cause for major concern as the results largely reflect the significant drought period that persisted between 2015 and 2021. Three out of four sites in the Mt Grandchester Conservation Estate increased in overall BioCondition score despite the drought. This is fantastic news for the estate and signs of continued rejuvenation of that site after cattle were removed following council acquisition.

Community engagement and education:

- 133 attendees to the Enviroforum 2020 – Changing Landscapes webinar
- 22 experience nature events comprising a total of 376 participants in 2020–2021.

NATURAL HABITAT AREAS

What are natural habitat areas?

For the strategy, natural habitat areas are defined as tracts of natural vegetation across Ipswich's landscape. They are typically described as comprising larger natural vegetated areas of varying age, health and condition with corridor patches and stepping-stones of vegetation.

Important biodiversity values, notably habitat for a diversity of significant plant and animal species, are commonly associated with these areas within Ipswich. These areas contain varying natural elements that support native species to live or disperse through the city.

What should they look like?

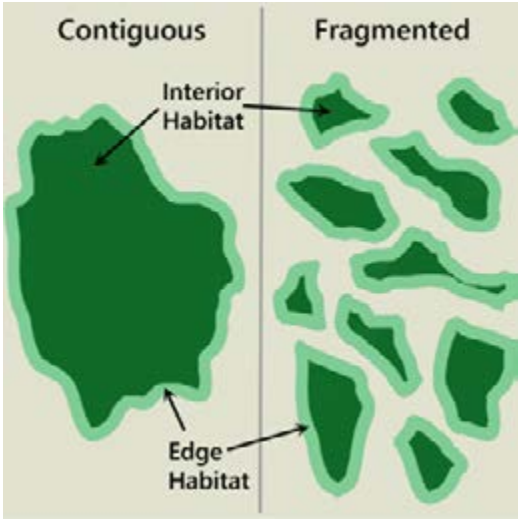
Functional natural habitat areas are typically composed of ecosystems, ecological communities and ecological processes that are indigenous to a location. Structural attributes, characteristics and species diversity is individualised to each ecosystem and community. For instance, a natural habitat area within the city may comprise complex patches of eucalypt forest, native grassland, dry vine forest gullies and rainforest fringing along a watercourse – each different to the other.

Each ecosystem typically comprises structural layers particular to it i.e. canopy, understorey, small shrubs, groundcover species and leaf litter. Some ecosystems may have limited to no species of a certain structure.

Ideally the natural habitat areas will have the following attributes:

- **Be large, contiguous areas of native vegetation** (College of agriculture and life sciences, 2022) – larger areas are better equipped to provide habitat and are more likely to adapt to disturbances such as climate change. Landscapes with 30–35 per cent native vegetation cover are considered relatively healthy (Radford et al, 2004) and support resilient faunal populations more capable of withstanding environmental fluctuations.
- **Reduced proportion of edges in relation to its total area** (Aspelin, 2018) – the edges of habitat areas are exposed to adjacent land uses and activities compared to the protected inner areas (British Columbia Nature Trust, 2022). These edge areas are exposed to increased risks such as invasive species and harsh weather that creates changes in the native species composition (Figure 9).
- **Be connected across the landscape** – connectivity of habitat areas will maintain and restore ecosystem integrity (Worboys and Pulsford, 2011). Systems of core protected areas that are linked and buffered to maintain ecosystem processes and allow species to survive and move are needed.
- **Be representative of the range of natural ecosystems across Ipswich** – it is important to protect all types of ecosystems, enough of each ecosystem and reflect the biodiversity of the ecosystem (ANZECC, 1997). This maintains ecological processes, viable examples, viable populations and genetic diversity. Patchiness, such as being made up of a mosaic of small ecosystems, of an area is a dominant theme of landscape ecology planning. Diverse patches of habitat created by natural disturbance regimes are critical to the maintenance of diversity within a landscape mosaic.

Figure 9 – Comparison of contiguous and fragmented habitat areas showing the increase proportion of edge habitat (British Columbia Nature Trust, 2022)



Summary of key natural area attributes:

- be large, contiguous areas of native vegetation
- reduced proportion of edges in relation to its total area
- be connected across the landscape
- be representative of the range of natural ecosystems across Ipswich.

Current condition

The current understanding of the location and extent of Ipswich's natural habitat areas is based on a combination of existing mapping and condition assessments as described in the following sections.

Extent of natural habitat areas

The extent of natural habitat areas is based on the following mapping:

- **remnant vegetation** – Queensland Government mapping
- **core habitat areas** – mapped in the *Nature Conservation Strategy 2015*
- **strategic remnants** – mapped in the *Nature Conservation Strategy 2015*
- **urban nodes** – mapped in the *Nature Conservation Strategy 2015*
- **locally significant priority species habitat** – mapped in 2022 to inform the Draft Ipswich Planning Scheme – Matters of Local Environment Significance trigger map.

Remnant Vegetation

The latest Queensland Government mapping of Ipswich's remnant vegetation ecosystems and regrowth is an underpinning dataset used to inform several of the mapping layers. For mapping of layers associated with the *Nature Conservation Strategy 2015*, the government's Remnant Regional Ecosystem Mapping Version 7 (2009) was applied. Locally significant priority species habitat mapping utilises Remnant Regional Ecosystem Mapping Version 12.1 (2019).

Core Habitat Areas (2015)

Core habitat areas are larger vegetated areas which provide habitat for a variety of the city's biodiversity and shelters most of the matters of environmental significance identified – local, state and national.

Due to their size and generally good condition, these areas assist in ensuring conservation of a diverse range of native species and ecosystems as well as providing a variety of functions resulting in the services fundamental for human well-being. These provide the most critical areas for nature conservation measures across the local government area. The criteria used to map these areas for the Nature Conservation Strategy 2015 are:

- areas with over 400ha of remnant vegetation and high-value regrowth
- the land-use zoning within the Ipswich Planning Scheme:
  - conservation zone
  - Rural E (Special land management zone).

Strategic remnants (2015)

Strategic remnants are patches of remnant vegetation or high-value regrowth strategically located within the Ipswich habitat network (NCS 2015) to facilitate the movement of biodiversity across the landscape by providing steppingstones within identified corridors. These steppingstones are located close enough to each other for some species to be able to move from one patch to the next. They are mostly suitable for highly mobile animals. Patches are mapped using the following criteria:

- mapped remnant or high value regrowth under state mapping
- located within an identified rural local corridor.

Urban nodes (2015)

Urban nodes are patches of remnant vegetation providing important wildlife habitat within the urban footprint. The Nature Conservation Strategy 2015 defines these as:

- Conservation zoning within the Ipswich Planning Scheme; or
- Existing parks/reserve with environmental values.

Locally significant priority species habitat (2022)

In addition to threatened species at a Commonwealth or state government level, there are several species significant to the Ipswich region. Council determined a criteria for species considered locally significant, including:

- local abundance: number of occurrence records in the Ipswich area
- local decline: at risk of extinction in the South-East Queensland region
- non-local decline: decline in NSW
- distribution limits: limit of geographic or altitudinal range in the region
- restricted/low population: limited in geographic range or uncommon in the region
- disjunct population: widely separated populations across a geographic range
- cultural/iconic species: cultural values or iconic to local community
- ecologically important species: important ecological role in local ecosystems.

Using the criteria, 38 species were selected as having local significance (City of Ipswich, 2022c).

This list was further refined to 26 priority species (see Table 4) to inform the Draft Ipswich Planning Scheme – Matters of Local Environment Significance trigger map. Species were excluded at the time due mainly to modelling and mapping limitations. One species was removed due to it being listed by the state.

Table 4 – List of locally significant priority species

TAXONOMIC NAME	COMMON NAME	TYPE
Flora (Plants)		
Acacia obtusifolia	Blunt leaf wattle	Tree
Asplenium paleaceum	Scaly asplenium	Forb
Atalaya hemiglauca	Whitewood	Tree
Elattostachys bidwillii	Northern white tamarind	Tree
Eleocharis dulcis	Chinese water chestnut	Aquatic
Ficus rubiginosa forma rubiginosa	Small-leaved fig	Tree
Grahamia australiana	Grahamia	Forb
Indigofera baileyi	Bailey's indigo	Forb
Melaleuca comboynensis	Cliff bottlebrush	Tree
Melaleuca quinquenervia	Broad-leaved paperbark, swamp paperbark	Tree
Stephania renifolia	Kidney-leaved snake vine	Vine
Tephrosia juncea	Rush-leaved tephrosia	Forb
Zornia floribunda	Narrow-leaved zornia	Forb
Fauna (Animals)		
Aepyprymnus rufescens	Rufous bettong	Macropod
Biziura lobata	Musk duck	Waterbird
Chalinolobus picatus	Little pied bat	Microbat
Cyclorana alboguttata	Green stripe frog, striped burrowing frog	Frog
Cyclorana brevipes	Superb collared frog, short-footed frog	Frog
Limnodynastes salmini	Salmon striped frog	Frog
Litoria brevipalmata	Green-thighed frog	Frog
Litoria tyleri	Tyler's tree frog, southern laughing tree frog	Frog
Melithreptus gularis	Black-chinned honeyeater	Passerine Bird
Notamacropus dorsalis	Black-striped wallaby	Macropod
Oxyura australis	Blue-billed duck	Waterbird
Phascogale tapoatafa	Brush-tailed phascogale	Dasyrid
Pomatostomus temporalis	Grey crowned babbler	Passerine Bird

Potential habitat has been mapped for each species distribution. Rules used to map habitat are:

- regional ecosystems – remnant and regrowth RE mapping
- wetland habitat type
- stream order, stream characteristics and proximity to water
- canopy height
- altitude limits
- patch size and distance.

Mapped habitat is important to species' long-term survival and maintaining the city's range of species.

Figure 10 presents all the mapped vegetation and habitat data which has been considered in the creation of a single natural habitat area map for the purposes of this strategy (Figure 11).

**Please note the information presented is based on a range of available mapping data and doesn't represent all natural habitat or vegetation cover.*

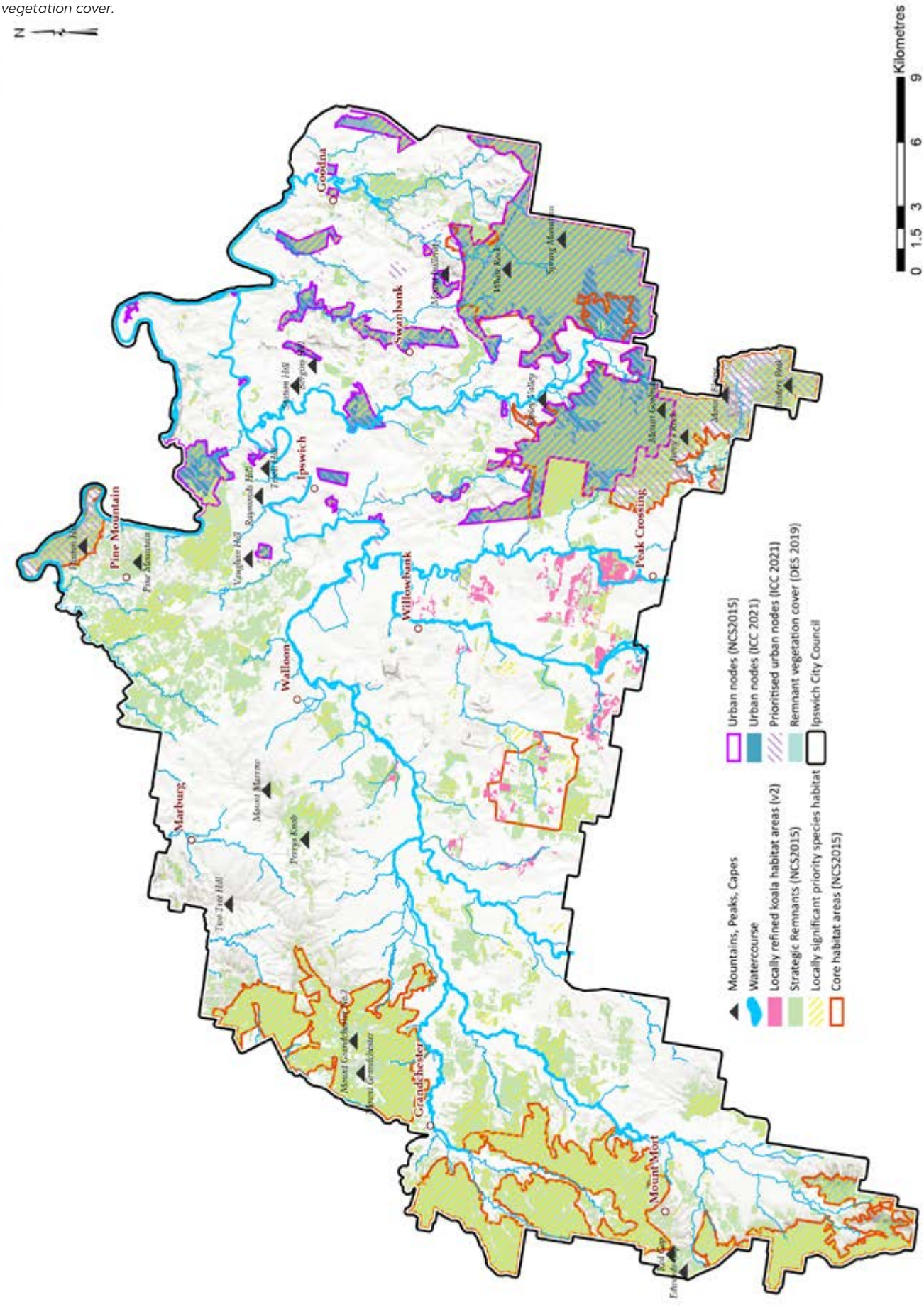
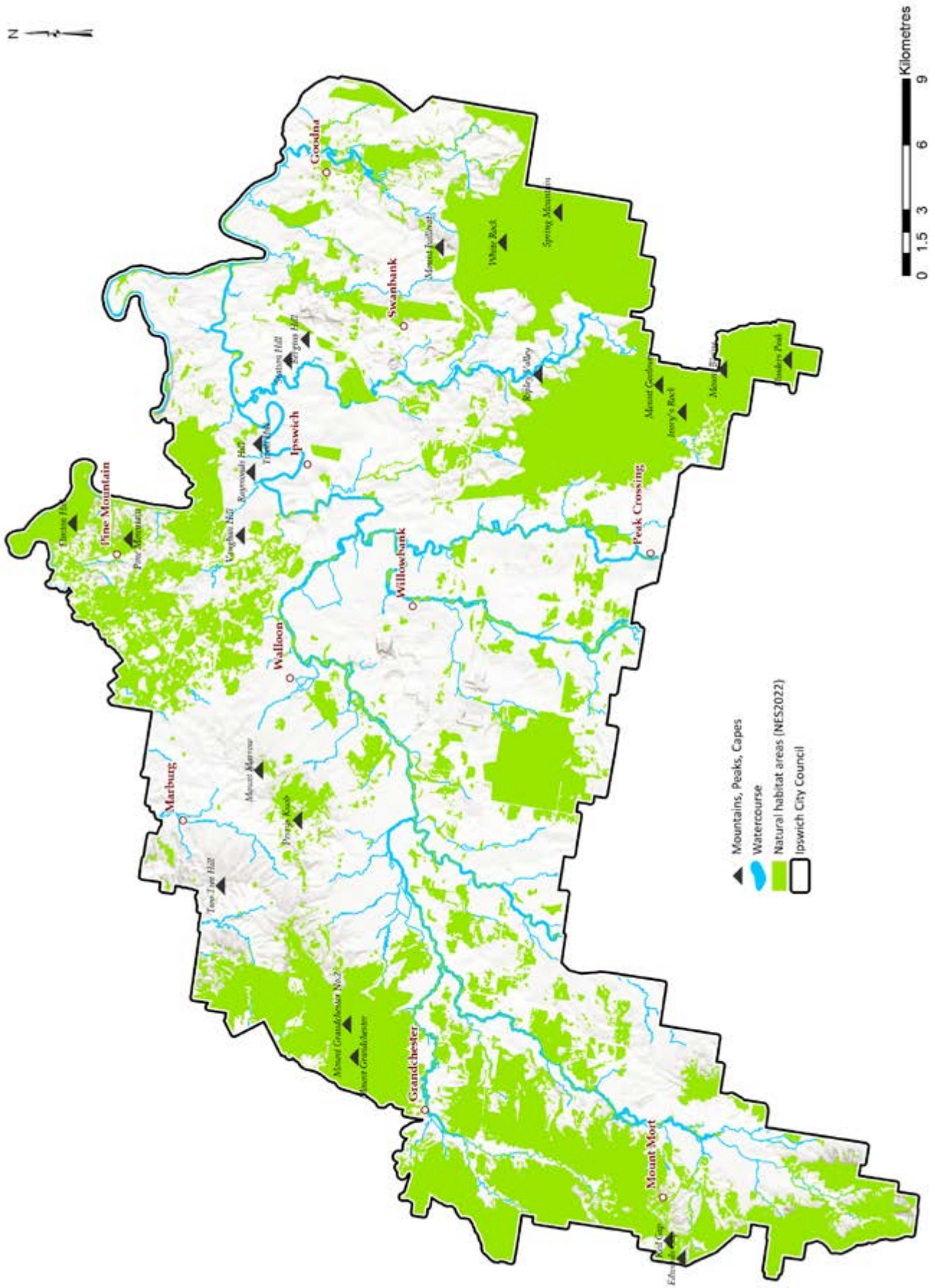


Figure 11 – Consolidated natural habitat areas across Ipswich

**Please note the information presented is based on a range of available mapping data and doesn't represent all natural habitat or vegetation cover.*



Condition of natural habitat areas

Council's knowledge and understanding of the condition of the city's natural habitat areas is predominately for areas located on several properties within the Natural Area Estate. Measure of Biocondition has been used to understand state and trends.

Biocondition Assessment (2021)

In 2015/16 and again in 2021, council commissioned environmental consultants to undertake a Biocondition assessment of natural habitat area sites located within several Natural Area Estate properties. Biocondition is a condition assessment framework for Queensland that provides a measure of how well a terrestrial ecosystem is functioning for biodiversity values. The process involves vegetation condition monitoring, broad flora and fauna assessments plus targeted species-specific assessments (Eyre et al, 2015).

Council uses Biocondition to measure the ecological success of its activities within the estate. Properties assessed included:

- **White Rock–Spring Mountain Conservation Estate** – nine sites within a core habitat area
- **Flinders–Goolman Conservation Estate** – 10 sites within a core habitat area
- **Mount Grandchester Conservation Estate** – four sites within a core habitat area
- **Stirling Road Reserve** – one site within a strategic remnant
- **Cameron's Scrub** (also known as **Kholo Enviroplan Reserve**) – four sites within a core habitat area
- **Purga Nature Reserve** – two sites within a strategic remnant.

A snapshot of the findings reported:

- total score across the sites is significantly lower – down from 0.772 in 2016 to 0.740 in 2021
- nine spotted gum-ironbark sites were assessed to be in good condition – scored >0.80
- two vine scrub and one *Melaleuca irbyana* site are in poor to very poor condition – scored <0.60
- average non-native plant cover rose from 12 per cent in 2016 to 19.7 per cent in 2021
- 394 flora – 346 native and 48 introduced species
- 180 fauna species were detected – a high diversity of birds and mammals was noted.

The consultant's report noted possible factors for the lower score included low rainfall across four of the five years and increased levels of weed infestation. Recommendations were for council to consider:

- weed management works should be targeted to maximise biodiversity benefits, including targeting weed species of greatest concern, targeting communities that are rare or provide critical habitat across the reserves
- increased monitoring of feral species abundance and distribution across the reserves, including a regular camera monitoring program for each reserve and species-specific designed feral cat monitoring.

Key threatening processes

The Queensland Government's Department of Environment and Science published a State of the Environment 2020 Report (Qld Government, 2020). The report highlighted the condition and pressures facing the environmental values within South-East Queensland. A snapshot includes:

- South-East Queensland has one of the highest densities of terrestrial threatened fauna and flora species habitat in the state
- South-East Queensland had the third lowest remnant vegetation in the state – just 44.2 per cent remained
- South-East Queensland experienced ongoing habitat loss for all threatened flora groups between 1997 and 2017
- more than 70 per cent of the state's population is living in South-East Queensland
- of the 134,184 dwellings approved in Queensland in 2016–2019, 117,573 were in South-East Queensland
- South-East Queensland is the most urbanised region – 15.5 per cent.

The report paints a frank picture for South-East Queensland's natural environment. It highlights the challenges facing local governments such as Ipswich in supporting continuing viability of its natural environment and accommodating urbanisation.

Ipswich's Nature Conservation Strategy 2015 identifies six key threatening processes impacting Ipswich's broader natural environment, and subsequent natural habitat areas which are:

- loss of native vegetation
- climate change
- introduced pest plants and animals
- inappropriate fire regimes
- dryland salinity
- lack of community awareness and engagement.

When considering the scale, potential effects and difficulty to recover from, urgency is needed to address vegetation loss, climate change and pest species as priorities for council. Incompatible activities that are undertaken within and adjacent to natural habitat areas including illegal dumping, illegal tracks and motorised vehicle access and inappropriate recreation activities are also key threats recognised by council.

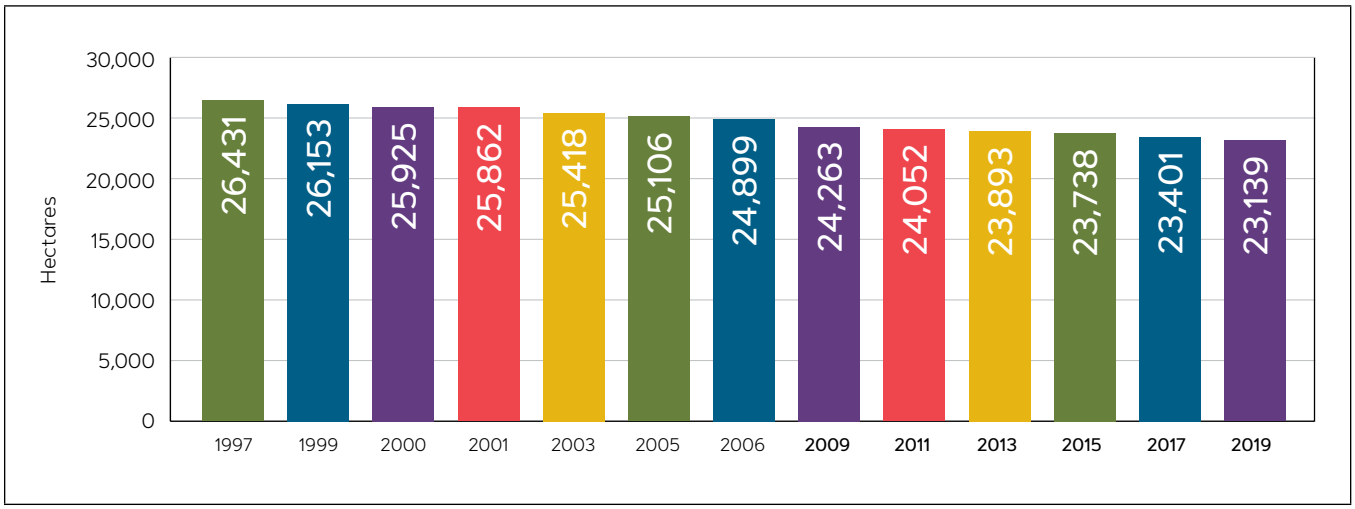
Vegetation Loss

The Nature Conservation Strategy 2015 details impacts, challenges and opportunities associated with vegetation loss including:

- **impacts**
  - leads to the loss of ecosystem services i.e. flood control and climate regulations
  - reduces habitat for the city's native flora and fauna i.e. species cannot survive
  - causes fragmentation within the landscape
  - reduces carbon sequestration capacity.
- **challenges**
  - balancing the need for development because of population growth and environmental outcomes
  - extent of state and Commonwealth legislation protection and management support.
- **opportunities**
  - Ipswich's large bushland areas located outside of the urban footprint provide opportunities for offset delivery
  - preservation and restoration of ecosystem services has the potential to assist in cost reduction and disaster risk reduction.

The Queensland Government has been monitoring the loss of remnant vegetation in Queensland since 1997. The latest Queensland Government mapping of vegetation and analysis in 2019 found 23,139ha, or 21 per cent, remaining of the pre-clear 109,124ha of the city's remnant vegetation. Figure 12 highlights a 22-year trend from 1997 to 2019 with respect to the extent of remnant vegetation mapped in the city. The extent has declined by 12 per cent over this period.

Figure 12 – Over the 22-year period from 1997 to 2019 the extent of remnant vegetation in the city decreased by 12 per cent (Source: Queensland Government – Bioregion and Subregion Analysis of Remnant Regional Ecosystem Vegetation 1997–2019)



Remnant vegetation in the eastern section's urban areas has experienced considerable change in this period. The main cause of the change was vegetation loss from land clearing due to urban settlement (i.e. residential housing). Images 1 and 2 demonstrate the vegetation change during the period 1997 and 2019.

Image 1: 1997 aerial photography

Image 2: 2019 aerial photography

Climate Change

The impacts of climate change in the NCS 2015 and associated technical report highlight the need for urgency to act now and build resilience in the city's natural habitat areas. Points of note include:

- Ipswich is projected to face a potential 0.58°C average temperature increase by 2030, under a low emission scenario, to a 4.05°C increase by 2070 under a high emission scenario.
- The total average rainfall in Ipswich is expected to face a higher decrease than the Queensland average, which, even under a low emission scenario, will decrease by 33.3mm by 2030.
- Intensity and frequency of extreme events such as storms, droughts and floods are predicted to change.
- Due to the current rate of change, the natural environment is highly vulnerable to climate change as it is limiting a high number of species' ability to adapt. This may lead to biodiversity in Ipswich experiencing changes such as: shifts in genetic composition, changes in migration patterns of some birds, altered life cycles, changes in vegetation compositions, increased extinction risks and changes in fire regimes, leading to severe losses of ecosystem services.
- Areas large, stable and accessible to sustain viable populations of species are becoming increasingly important – climate change refugia.
- Climate change refugia need to be sufficient in size, accessible (i.e., connected by corridors) and protected from other impacts.

NCS 2015 mapped areas using a model to identify Ipswich's refugia. The criteria were then overlapped to identify areas which provided the most aspects. This resulted in the following climate change refugia areas being identified:

- White Rock-Spring Mountain Conservation Estate
- Flinders-Goolman Conservation Estate
- Little Liverpool Range
- Sapling Pocket.

Two bodies of works by the Queensland Government provide increased understanding of potential impacts and management responses needed:

- Climate Change in South-East Queensland Region Fact Sheet (Queensland Government, 2019)
- Climate Change and Queensland Biodiversity Report (Low, 2011).

The factsheet identifies four broad impacts council should consider:

- existing threats to flora and fauna will be exacerbated
- changes to habitat
- altered disturbance regimes
- changing dynamics of invasive species.

Besides impacts, the factsheet also proposes four key responses that informs council's strategy development:

- develop strategies to respond to new and emerging diseases and pests
- increase green urban infrastructure and urban biodiversity
- link habitats to allow species to move
- consider moving selected vulnerable populations to new areas.

The report investigates impacts on bioregional areas across the state such as South-East Queensland. Notable findings from the report relevant to Ipswich's natural habitat area values include:

- The near threatened Plunkett mallee *(Eucalyptus curtisii)*, council's floral emblem, has a limited distribution to SEQ and is the sole remnant of an ancient lineage. It's likely ability to adapt to climate change may therefore be limited.
- Many rare plants could be threatened by altered competitive relationships and severe droughts, especially species confined to higher altitudes.
- Rare rainforest plants in the lowlands with relict distributions, for example square-stemmed myrtle *(Gossia gonoclada)*, could also suffer from altered competitive relationships, if not from climate change directly.
- Most of the dominant eucalypts found in in South-East Queensland have distributions extending far to the north and west into drier regions, suggesting good prospects for survival under climate change. However, regular die-offs can be expected during severe droughts, as have occurred in recent decades.
- Species found in arid zones of Australia and also found in isolated populations within South-East Queensland, i.e. brigalow *(Acacia harpophylla)* which is found in patches within Ipswich, should the climate become drier, these species should be advantaged, since they tolerate hot drier conditions elsewhere.
- Dry rainforest communities, such as those which are found around the Bluff and Pine Mountain, should prove relatively tolerant of lower rainfall and higher temperatures because most of the essential species have distributions that extend further west to the Darling Downs, where droughts are more severe.
- Dry rainforests do face a serious risk from hotter fires. They have mostly been damaged and dense flammable weeds often grow around their margins. Climate change will also alter competitive relationships between dry rainforest species, to the possible disadvantage of threatened species.
- Rainforests and eucalypt forests face high risks from weed invasion mediated by climate change. Under a scenario of more extreme droughts, fires or floods killing native plants, a wide range of weeds could take their place.
- More severe droughts and declining food quality from rising CO2 levels will contribute to ongoing declines in koala *(Phascolarctos cinerea)*. Foliage feeding animals will benefit if forests growing on fertile soil are prioritised for their conservation.
- Rising temperatures will benefit exotic fish in waterways. Most aquarium fish prefer high temperatures, and several escaped species present in the bioregion are probably limited in numbers by cool temperatures.
- Fire management, weed management, pig control, and pollinator conservation will become increasingly important.

Climate risk and mitigation – what is the risk and what is needed?

Climate change is a key threat to Ipswich's biodiversity as it will limit a high number of species' ability to adapt. This may lead to biodiversity in Ipswich experiencing changes such as: shifts in genetic composition, changes in migration patterns of some birds, altered life cycles, changes in vegetation compositions, increased extinction risks and changes in fire regimes, leading to severe losses of ecosystem services.

Council's strategic direction will need to give due consideration to climate change impacts and responses for the viability of the natural environment and the liveability of the city. Based on science and management principles, there are three interconnected and overarching priorities that council is well positioned to respond to in its strategy:

- **build knowledge** – know what the impacts are specifically to the city's biodiversity
- **build corridors** – link corridors across the city – especially in urban areas
- **increase management** – more targeted restoration, fire and pest management

Pest species management

The invasion of pests is recognised as one of the greatest threats to terrestrial ecosystems within Queensland. Pests compete with native species for food and habitat, prey on native species, alter habitats and spread diseases. The NCS 2015 provides insight, at the time, into the state of pests and pest management in the city's natural environment:

- 27 pest animals are recorded to occur, four of which are of particular interest:
  - red fox
  - wild dogs
  - rabbits
  - feral pigs.
- 347 pest plants are found in the city, nine are priority Weeds of National Significance:
  - asparagus fern
  - cat's claw creeper
  - fireweed
  - lantana
  - madeira vine
  - parthenium weed
  - parkinsonia
  - salvinia
  - water hyacinth.
- many introduced species are so entrenched that the complete eradication is near impossible. Determining when when controlling a species is value for money will always provide a major challenge
- control is primarily focused on protection of natural assets.

The Biocondition Assessment in 2021 provided more recent insight into pest plant abundance across Ipswich's natural areas. The assessment report highlights pest plants as being a 'major concern'. Several notable observations include:

- pest plant cover increased at numerous sites – at one site 30 per cent of plants were pests
- average non-native plant cover rose in just five years from 12 per cent in 2016 to 19.7 per cent in 2021
- the greatest increases in non-native plant cover were recorded in Flinders-Goolman and Cameron's Scrub reserves and in scrub community sites – at one site in Flinders-Goolman, weed cover rose from 40 per cent to 75 per cent and native species richness from 96 to 50 species
- 12 per cent of the overall diversity of plants species were pests – at one site within Cameron's Scrub, weeds likely have caused a reduction in richness of native grasses and forbs (dropping from 42 to 15 species)
- several sites had seen increased levels of pest plant infestation, especially lantana, creeping lantana and coral berry
- eight restricted pest plants under the *Biosecurity Act 2014* were recorded
- ten pest animals were observed
- cane toads were the most prevalent pest animal found – majority of sites recorded high numbers
- red foxes were only detected at two sites, compared to all surveys in 2016.

Summary of key threats to functional and healthy natural habitat areas across Ipswich:

- vegetation loss leading to fragmentation, increased edge impacts and loss of habitat; much of this vegetation loss has been in the eastern areas of Ipswich due to urbanisation
- climate change impacts on highly vulnerable plant and animal species due to changing temperatures, rainfall patterns and increased disturbance risk due to extreme events such as bushfires and floods
- pest plants and animals competing with native species for food and habitat, preying on native species, altering habitats and spreading diseases
- incompatible activities within and adjacent to natural habitat areas including illegal dumping, illegal tracks and motorised vehicle access and inappropriate recreation activities.

Summary of approaches to improve protection and condition of natural habitat areas

There are a range of approaches to both protect and enhance the biodiversity across Ipswich which are described in the following sections. This section also describes how some of these actions which are delivered by council are currently funded through the Enviroplan Levy (City of Ipswich, 2002d).

Protection approaches

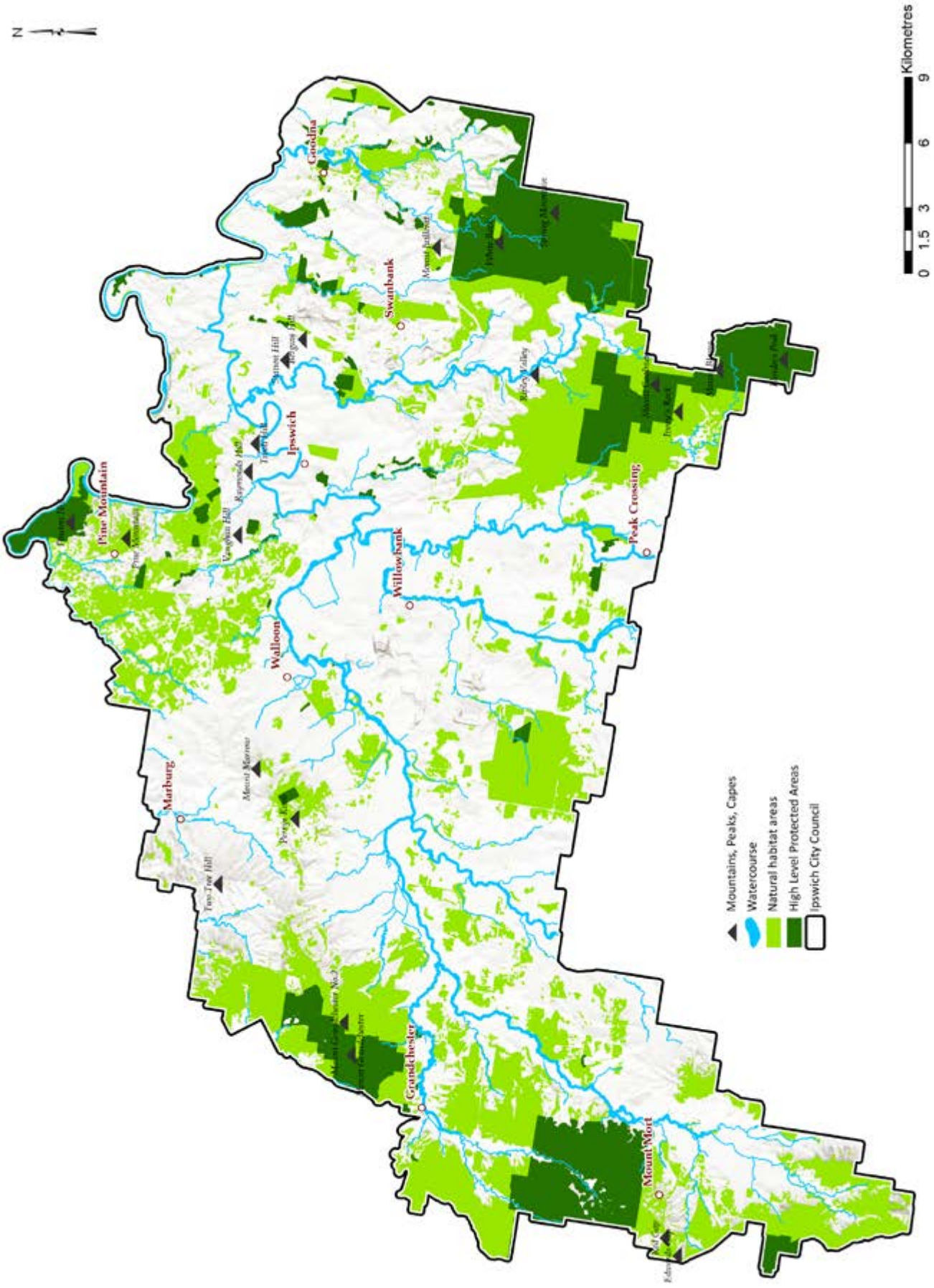
There are several approaches to protect natural habitat areas across Ipswich which range in their level of protection:

- **high level of protection** – land owned and/or managed by council or the state government for conservation purposes including:
  - land acquired by council through the Enviroplan levy, or contributed to, and managed in the Natural Area Estate
  - conservation/regional parks and key reserves managed by council in the Natural Area Estate, under trustee from the state
  - local bushland reserves managed by council under trustee from the state
  - nature refuges under agreement between private landowners and the state
  - covenanted under a voluntary conservation between the private landowners and council.
- **medium level of protection** – protected vegetated land through planning and regulatory processes including:
  - regulated under the Ipswich Planning Scheme through zones that conserve natural values i.e. Conservation, Rural D or Rural E zones
  - mapped by the state with Category X (not remnant vegetation).
- **low level of protection** – green areas with limited ongoing protection for biodiversity outcomes including:
  - regulated under the Ipswich Planning Scheme through zones that integrate preservation of natural values with other purposes i.e. recreation and industry buffer zones.
  - under a voluntary conservation agreement between the private landowners and council
  - council controlled land (through ownership, lease or trustee) that contains natural values that are maintained along with other activities i.e. waterside parks, linear parks, recreation parks, road reserves and utility land.

Figure 13 presents the areas of the natural habitat network which have a high level of protection due to government ownership for the purposes of conservation.

Figure 13 – Map showing natural habitat areas with high level of protection across Ipswich

**Please note the information presented is based on a range of available mapping data and doesn't represent all natural habitat or vegetation cover.*



A number of these protection mechanisms and how they have been used by council in the past is described in the following sections.

Areas owned and managed for conservation purposes

Land acquisition

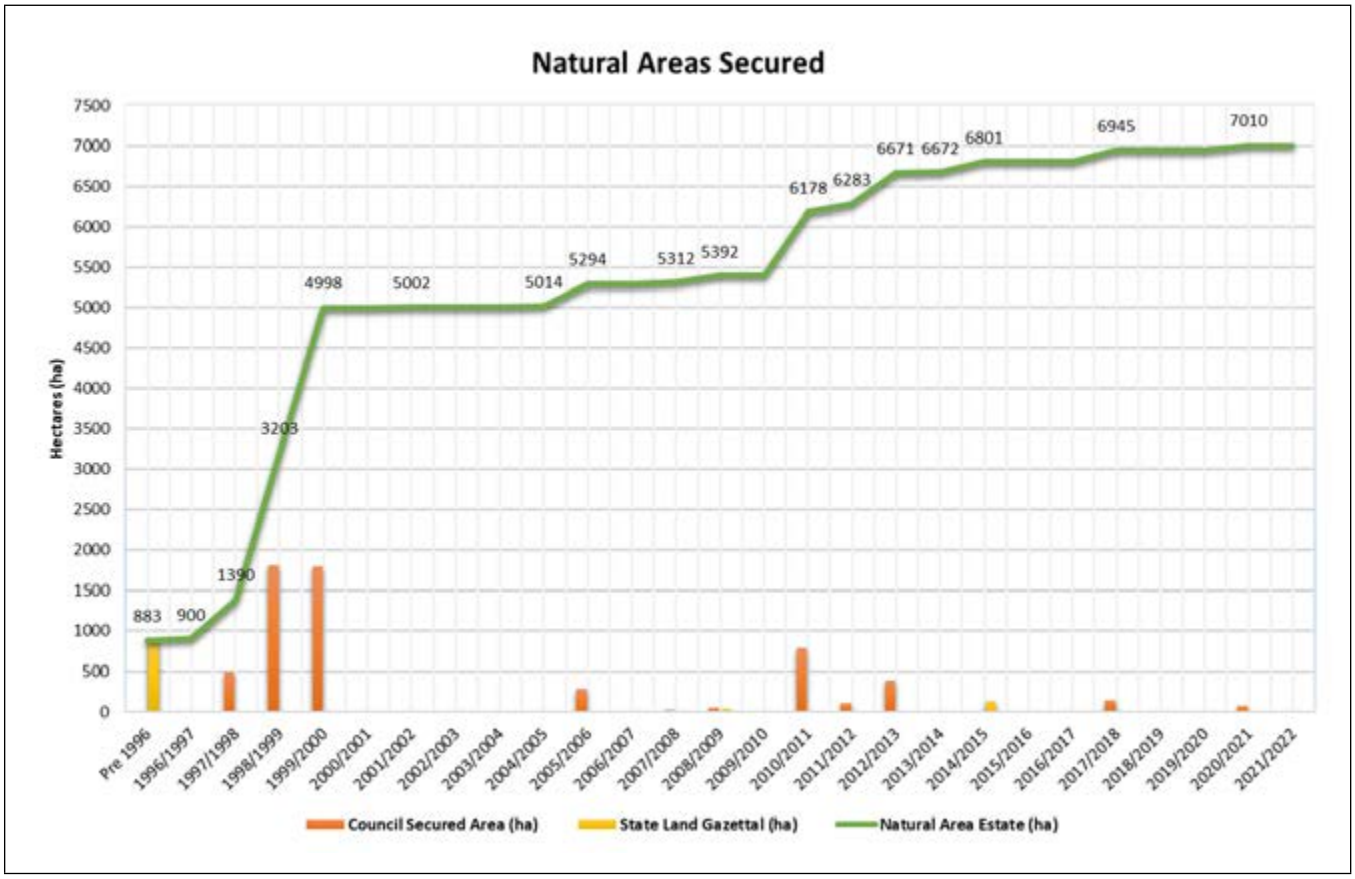
For several decades council has implemented a program to strategically acquire significant bushland habitat for its long-lasting protection and management. Priorities were based on securing areas containing the highest ecological, Aboriginal cultural landscape values and features and nature-based recreation opportunities. Land has been acquired through three main mechanisms or opportunities:

- **Voluntary acquisition** – by negotiation between the owner and council. The most frequently used mechanism, it is funded from council's Ipswich Enviroplan Levy. Land is assessed for its strategic importance using a criteria based on the Ipswich Enviroplan Program and Levy Policy (City of Ipswich, 2022e) and related procedure.
- **Developer contributed land** – opportunistic and by arrangement between developer and council. Outside and above contributions such as parks.
- **Transfer of state conservation areas and key reserves** – certain lands gazetted by the state are managed by council via trustee agreement. Includes reserves of notable conservation value and size (i.e. Redbank Plains Rifle Range), as well as conservation parks (i.e. Flinders Peak Conservation Park).

To date, approximately 7,010ha of bushland habitat has been secured. Figure 14 shows the progressive securement of areas and subsequent growth of the Natural Area Estate.

Notable securement increases occurred through the implementation of the voluntary acquisition program. Funded through the levy and utilising additional loan borrowings from Queensland Treasury Corporation, council was able to proactively secure larger intact habitat around White Rock Conservation Park and Flinders Peak Conservation Park (1997–2000) and within the Little Liverpool Range (2010–2013).

Figure 14 – Progressive securement and growth of council's Natural Area Estate



Council's Enviroplan Capital Investment Strategy 2017–2022 sets out its current approach to voluntary land acquisitions. The focus is on consolidating and linking existing conservation estates and establishing new areas suitable for the primary purpose of nature-based recreation. Five priority areas for acquisition are:

- **Grandchester** – land adjoining the Mount Grandchester Conservation
- **South Ripley** – link between Flinders Goolman and White Rock-Spring Mountain Conservation Estates
- **Pine Mountain** – land on or directly surrounding Pine Mountain and land between Pine Mountain and Cameron's Scrub Conservation Reserve
- **Ten Mile Swamp** – land on or surrounding the swamp at Mutdapilly
- **Seven Mile Swamp** – land on or surround the swamp at Rosewood and Thagoona.

The prioritisation of land for purchase is guided by council's Nature Conservation Strategies and based on the CAR (Comprehensive, Adequate and Representative) system for vegetation protection. In addition, scenic amenity and the provision of nature-based recreation opportunities is used as secondary factors to assess acquisition priorities.

Securing land is primarily through opportunistic purchase via market sales or voluntary contact from landowners – reactionary rather than proactive.

Key challenges to its current approach that council will need to address include:

- increasing cost of land
- being reactionary rather than proactive
- capacity to purchase habitat requiring restoration – offset receiving sites
- availability of land.

Natural Area Estate

Once a natural habitat area has been secured it is then provided sufficient management to ensure its continuous viability. The area is incorporated into Natural Area Estate which comprises:

- **Flinders-Goolman Conservation Estate** – largest remaining tract of lowland eucalyptus forest in South-East Queensland
- **White Rock-Spring Mountain Conservation Estate** – habitat to over 260 fauna species and 400 native flora species and is very important to traditional owners
- **Mount Grandchester Conservation Estate** – part of the important Little Liverpool Range link
- **Cameron's Scrub Reserve (Kholo Enviroplan Reserve)** – extensive area of significant semi-evergreen vine thicket
- **Purga Nature Reserve** – largest remaining stands of the endangered swamp tea-tree *(Melaleuca irbyana)*
- **Haig Street Quarry Bushland Reserve** – wildlife refuge and steppingstone habitat within an urban landscape, particularly for bird species
- **Denmark Hill Conservation Park** – home to mobile fauna species, particularly bird species such as owls, wrens and finches
- **Hillview Drive Reserve** – mixed eucalypt forest of habitat for 135 native fauna and 40 native flora species
- **Ric Nattrass Environmental Park** – eucalypt forest refuge for mobile urban species such as the common dunnart *(Sminthopsis murina)* and swamp wallaby *(Wallabia bicolour)*
- **Stirling Road Reserve** – habitat for the nationally listed black breasted button quail *(Turnix melanogaster)* and rare Bailey's cypress pine *(Callitris baileyi)*
- **Redbank Rifle Range** – Refuge for an urban population of the significant koala *(Phascolarctos cinereus)*[4]
- **Mount Beau Brummell Conservation Park** – state park containing the significant giant spear lily *(Doryanthes palmeri)*.

Figure 13 shows the location of these secured areas. Further information on values and significance is detailed in the Ipswich Nature Conservation Strategy 2015 (City of Ipswich, 2015), Ipswich Nature Conservation Strategy 2015 Background Report (City of Ipswich, 2015b) and Ipswich City Council's Conservation Estates and Reserves website: **Ipswich.qld.gov.au/about_council/initiatives/environment/enviroplan/conservation**.

Land within the Natural Area Estate are zoned for conservation purposes under the Ipswich Planning Scheme, providing the highest level of land use protection available.

4 Based on area query of Atlas of Living Australia - Ala.org.au)

Local bushland reserves

There are several local bushland reserves managed by council across the city. Though often smaller in size and typically located in urbanised areas, natural habitat area values remain protected within these reserves, for example:

- habitat for the significant green-thighed tree frog (*Litoria brevipalmata*) in Moodia Reserve, Bellbird Park
- platypus (*Ornithorhynchus anatinus*) habitat in Eugene Street Reserve, Bellbird Park
- koala presence in Church Street Reserve, Goodna.

Emphasis within reserves is typically on fire management and weed removal along bushland edges. The importance of some reserves to council is continually increasing when considering the presence of natural habitat areas within and the changing landscape around. They provide important steppingstones, corridor links and refugia for wildlife.

Planning and regulation controls

Environmental legislation

Extensive environmental legislation places legal obligation on council for the protection and management of natural environment values. The main legislation relevant to values represented in the city include:

- **Commonwealth**
  - *Environmental Protection and Biodiversity Conservation Act 1999* – protects and manages nationally and internationally important flora, fauna, ecological communities and heritage places.
- **Queensland**
  - *Nature Conservation Act 1992* – protects and maintains aspects of nature, while allowing for its ecologically sustainable use
  - *Vegetation Management Act 1999* – regulates clearing of certain vegetation types
  - The Nature Conservation and Other Legislation (Koala Protection) Amendment Regulation – Amended the *Environmental Offsets Regulation 2014*, *Planning Regulation 2017*, *Nature Conservation (Koala) Conservation Plan 2017* and *Vegetation Management Regulation 2012* to provide increased protection to koala habitat areas in South-East Queensland
  - *Environmental Offsets Act* – regulates environmental offsets to replace values lost.

Planning scheme zones

The purpose of a planning scheme is to provide a framework for managing development. The Ipswich Planning Scheme reflects matters of national, state and local significance. This is achieved through the scheme's environmental policies, zones, overlays and codes. The highest level of protection is via zoning. Council's conservation and special land management zones contain natural habitat areas to conserve:

- areas or features of habitat significance
- the diversity of habitats for flora and fauna
- land which acts as wildlife corridors
- important areas of remnant, endangered, vulnerable, rare and other significant species
- significant wetlands
- natural areas of importance in terms of scenic amenity.

The updated planning scheme for Ipswich intends to carry forward environmental zoning, as well as incorporate increased recognition of locally significant priority species.

Local laws

Local laws are statutory instruments made by council to regulate a broad range of issues such as the protection of the natural environment. A local law protects matters or regulates activities typically not controlled through council's planning scheme – for instance selective removal of large habitat trees in a stand of vegetation adjacent to a waterway. In comparison a planning scheme manages and regulates what type of land use development happens in an area.

A small number of South-East Queensland local governments use local law instruments to protect vegetation or trees on private land, namely:

- **Brisbane City Council** – *Natural Assets Local Law 2003* – protects natural assets, including bushland areas, wetlands, waterway corridors and trees in urban areas
- **Redland City Council** – *Local Law 6 Protection of Vegetation* – provides for the protection of vegetation with significant amenity, cultural or heritage values.

Ipswich City Council's Local Law 49 (Protection of Important Vegetation) protects vegetation that in its opinion is:

- a valuable part of the natural heritage of the area or
- an example of a threatened species or a species that may be, or may be about to become, a threatened species or
- a valuable scientific resource or
- valuable source of propagating stock or of other horticultural value or
- of historic or cultural significance or
- a valuable educational or recreational resource or
- an important habitat for native animals (including native or migratory birds) or a part of a fauna and flora corridor or
- a key part of a vegetation system or other ecological system or
- important for protecting a water catchment area or
- important for its aesthetic value or its beneficial effect on the amenity of the locality in which it is situated or
- planted for the purpose of meeting obligations under offsets or related environmental management schemes or legislation.

Over several decades of this law being in place, council has applied three vegetation protection orders over mainly specimen trees:

- a **Port Jackson fig** (*Ficus rubiginosa*) – for natural heritage, aesthetic and wildlife habitat values
- a **Queensland blue-gum** (*Eucalyptus tereticornis*) – for its natural heritage, historical and cultural significance and wildlife habitat
- a **hoop pine** (*Araucaria cunninghamii*) – for its age, position, historical, cultural and habitat value.

Targeted strategically and giving due consideration to planning scheme controls, Local Law 49 provides council with an opportunity to protect important vegetation on private land – i.e. vegetation stands or habitat trees in corridors. A holistic approach would be achieved when application of this law is coupled with landholder education and management support programs.

Environmental offsets

Environmental offsets are a compensatory mechanism for unavoidable impacts on significant environmental matters on one site, by securing natural assets at another site and replacing the environmental matters lost. The site is secured through a mechanism that provides protection in perpetuity such as (but not limited to):

- statutory environmental covenants under the *Land Titles Act 1994* (Qld)
- nature refuges under the *Nature Conservation Act 1992* (Qld)
- environmental offset protection area under Section 30 of the *Environmental Offsets Act 2014* (Qld)
- voluntary declarations made under the *Vegetation Management Act 1999* (Qld).

Council's policy position recognises that 'environmental offsets' are to mitigate and compensate for the loss of natural environmental values where:

- it has been established that all opportunities to avoid and mitigate impacts have been exhausted
- the impacts will not significantly affect the conservation status of natural environment value(s) (City of Ipswich, 2021c).

Environmental offsets have been delivered on behalf of a third-party proponent on council land. At properties such as Purga Nature Reserve (an offset receival site), offsets contributed to restoration of significant vegetation communities.

Image 3: (Left – pre-offset delivery 2012) (Right – Offset site 2022)

Delivery of offsets provide opportunities and challenges. When established and maintained properly, they provide opportunity to restore extensive natural habitat areas at reduced costs to council. A challenge for delivery on council land is the availability of suitable and aptly located properties i.e. property containing land suitable for revegetation/ restoration of the type of ecosystem requiring offset.

Private land protection – covenants

Voluntary Conservation Covenant Agreements, the highest level of protection on private land, are available as part of council's landholder conservation partnership program to permanently protect in perpetuity intact vegetation. Introduced because of the program review in 2020, the covenant is a statutory conservation partnership that requires attachment of the agreement to the property title under the *Land Titles Act 1994*. This provides permanent conservation protections attached to the property title and binds future owners of the land to the terms of the agreement.

Though council has only recently introduced covenant agreements, several local governments have successfully rolled out similar programs for some time – including Brisbane, Gold Coast, Logan and Sunshine Coast.

Nature refuges (Queensland Government)

Nature refuges are a voluntary agreement between a landholder and the minister to protect natural and cultural values on private land in perpetuity. Once declared, the agreement area must be managed to:

- conserve the area's significant cultural and natural resources
- provide for the controlled use of the area's cultural and natural resources
- provide for the interest of landholders to be considered.

Nature refuges present within Ipswich are:

- Bowman Park Koala Nature Refuge
- Old Hiddenvale Nature Refuge
- Tir Na Crann Nature Refuge
- Edward Corbould (Reserve and Retreat) Nature Refuge/Sapling Pocket
- Gum Tips Nature Refuge.

Other council-controlled land (through ownership, lease or trustee)

Recreation parks, waterside parks, linear parks, road reserves and utility land across the city also provide opportunities to protect and manage natural habitat values. This may include parts of the land being protected or managed to protect values (i.e. riparian vegetation), while the balance is used for other purposes i.e. active recreation. Examples of these values include:

- riparian vegetation on the peninsula at Colleges Crossing Recreation Reserve, Chuwar
- riparian vegetation along Bundamba Creek in Worley Park and Bremervale Park, Raceview
- tall eucalypt forest remaining within the unmade road reserves in Karalee.

Council inspects several of these areas on a six-monthly cycle and identifies projects/works for funding consideration. Like local bushland reserves, the importance of these areas is ever increasing. Further identification of values and subsequent management intervention is needed to help increase the level of protection provided for the natural habitat values on this council land.

Enhancement approaches

There are a range of approaches and mechanisms to enhance the condition of natural habitat areas on both public and private lands including:

- appropriate restoration and climate change management approaches to enhance existing natural values and increase resilience to impacts
- pest species management
- management of council's natural areas
- working with landholders to protect and enhance natural habitat areas on private land.

Key planning documents provide guidance on biodiversity and threatened species management for council such as:

- **international**
  - **United Nations 2030 Agenda for Sustainable Development (Sustainable Development Goals)** – global blueprint to systematically improve quality of life through its social, environmental and economic determinants.
- **national**
  - **Australia's Strategy for Nature 2019–2030** – a framework for all national, state and territory and local strategies, legislation, policies and actions that target nature
  - **Australia's State of the Environment Report (2016)** – national assessment of the condition of the environment
  - **National Standards for the Practice of Ecological Restoration in Australia (2018)** – principles underpinning restoration philosophies and methods, and outlines the steps required to plan, implement, monitor and evaluate a restoration project to increase the likelihood of its success.
- **state**
  - **Queensland State of the Environment Report (2020)** – overview of the extent and condition of environmental assets and the pressure facing them.
- **regional**
  - **SEQ Regional NRM Plan 2009–2031** – a non-statutory document that articulates targets for the condition and extent of environment and natural resources; as of 2022, the plan is under review
  - **SEQ Regional Plan (2017)** – provides the framework for growth management
  - **Appropriate ecological restoration approaches** – similar to appropriate climate change management approaches

Removing pest plant species and re-establishing indigenous native species is critical to enhancing natural habitat areas. This can be achieved through approaches that are tailored to each situation:

- **Natural regeneration** – used where vegetation is relatively intact and native plants can regenerate without human intervention, active planting can interfere with natural regeneration.
- **Assisted regeneration** – appropriate where there is a relatively healthy native plant community, but natural regeneration is being impacted by factors such as weeds or land use practices (e.g. grazing etc.). Weed control and improved land use practices should be enough to allow natural seedling germination and recruitment of native plants to occur without the need for active replanting.
- **Reconstruction/revegetation** – this approach is appropriate if the vegetation community is highly altered or degraded. Active planting of native species will be required to re-establish a functioning vegetation community (Chenoweth EPLA and Bushland Restoration Services (2012).

In addition to re-establishing indigenous native plants, it is increasingly important to widen approaches to include techniques that encompass habitat elements (i.e. reconstructing ground wood debris, habitat stacks, ground litter, upright pole habitat, glider poles and ladders and nest boxes). Including these elements in restoration reduces the gap of hundreds of years it takes to produce these elements.

Ensuring council consistently and wholly assesses sites to determine the best approach prior to undertaking restoration, will contribute to achieving more effective outcomes.

Appropriate climate change management approaches

The Climate Change and Queensland Biodiversity Report (Low, 2011) is one of the most relevant and insightful reviews of climate change impacts on the natural environment. Though it looks at matters at a state-wide scale, several of its recommendations are applicable to council's management of natural habitat areas within Ipswich – and are summarised in Table 5.

Table 5: Summary of approaches to build environmental resilience

CATEGORY	DESCRIPTION
Focus on climatic spaces	▪ the conservation of rare climatic spaces should become a management goal ▪ they should be prioritised in future reserve aquisitions, selection of offsets, investments in conservation agreements, and management intervention ▪ climatic refuges can be enhanced or created on degraded land
Consider soil properties	▪ consider soil fertility when adding to the conservation estate because eucalypt communities and rainforests on nutrient-rich soils are more likely to conserve species in the face of climate change
Promote pollen migration	▪ protect long-range pollinators such as flying foxes, migratory honeyeaters and lorikeets ▪ manage woodlands to reduce noisy miners ▪ fill gaps in annual nectar availability for pollinators ▪ plan corridors to conserve pollen flow
Recognise west-east corridors	▪ when planning for corridors the importance of inland to coast movement should receive more emphasis
Monitor increasing species	▪ increasing species should be monitored to see if they are reducing biodiversity by displacing wildlife that might otherwise survive or replacing species that have no future
Increase protection of refugia	▪ because refugia conserve the rarest climatic spaces and the largest climatic gradients, climate change justifies a stronger focus on their protection
Increase fire management	▪ climate change justifies more investment in fire management
Increase weed control	▪ climate change justifies more investment in weed management ▪ flammable pasture grass should be prioritised for control where they worsen fire risk
Increase invasive animal control	▪ climate change justifies more investment in pest animal control

Pest species management

The Biosecurity Plan 2018–2023 provides strategic direction for the management of pest species within the city. Based on inherent risk, the plan prioritises species management strategies that includes:

- prevent new infestations of species previously not recorded in the city
- undertake targeted management to eradicate the species from Ipswich
- stop extension (contain) of range and begin to reduce distribution and size of known infestations
- manage infestations to reduce the risk to social amenity, the environment and built assets.

The plan includes the management of prohibited and restricted biosecurity matters as prescribed by the *Biosecurity Act 2014*. Council has two key responsibilities:

- control of invasive pest on council land
- regulate to ensure landholders are compliant on their land.

The plan recognises the significant threat pests pose to the natural environment as a strategic objective.

Pest plant and animal control in Ipswich is primarily focused on protecting natural areas, such as the Natural Area Estate and local bushland reserves, as well as educating and supporting residents with areas on their properties (e.g. grants through Voluntary Conservation Agreements).

The plan identifies four management strategies for invasive biosecurity matters – prevention, eradication, containment and asset-based protection. A risk-based approach was undertaken to assess each invasive species and provide their subsequent management strategy. The plan identifies four key strategic actions to manage invasive pest impacts in the Natural Area Estate and public open spaces including:

- educate the community on what species represent the greatest risk to each conservation estate
- provide internal mechanisms for reporting these species to ensure infestations are managed as quickly as possible
- investigate if reporting avenues exist within existing applications and programs
- investigate the feasibility of risk assessments specific to conservation estates and the adjacent properties, within buffered proximity.

A future review of the plan provides council with an opportunity to identify gaps and improve approaches, particularly in cross boundary coordination between council's Natural Area Estate management and neighbouring properties.

Recent work undertaken for the Biocondition Assessment in 2021 recommended two key approaches to improve the management of pests in the Natural Area Estate:

- pest plant works should be targeted to maximise biodiversity benefits, including targeting pest species of greatest concern, targeting communities that are rare or provide critical habitat across the reserves
- increased monitoring of pest animal species abundance and distribution across the reserves, including a regular camera monitoring program for each reserve and species-specific designed feral cat monitoring.

Supporting council's strategic objective to educate the community, in 2022 council developed a community guide of the 100+ invasive weeds of Ipswich. Based on council officer understanding of plant prevalence and perceived environmental risk, the 100+ species were selected to provide information for identification and control. It includes species listed under the *Biosecurity Act 2014*, as well as several species not listed.

Natural Area Estate Management

Council has management plans for Natural Area Estate properties to undertake best practice conservation management principles. Council has also commenced developing master plans for properties i.e. White Rock-Spring Mountain Conservation Estate.

Management is funded predominately through the Ipswich Enviroplan Program and Levy. Embellishing capital and operational investment within the estate is one of the four program funding themes. Funding supports council's nominated environmental operational management activities within the estate in accordance with their strategies, plans and service levels including:

- fire management
- pest plant and animal management
- service tracks, recreational trails and signage
- habitat restoration works
- Aboriginal cultural heritage and cultural landscape features
- nature-based recreation, environmental education signage and facilities
- visitor management.

A five-year plan of conservation works, nature-based recreation works and capital projects is developed and reviewed annually. A key challenge council faces is balancing the pressures/demands on areas while maintaining the values.

Landholder Conservation Partnerships

For several decades, council has delivered conservation partnerships with landholders on private land. Funded through the Ipswich Enviroplan Levy, several types of partnerships are available to landholders. There are several voluntary agreements which are not permanent protections but support landholders to protect and enhance ecosystems by:

- fostering stewardship
- facilitating on-ground projects
- upskilling landholders.

Several agreements exist including:

- **Habitat Gardens** – assists smaller block landholders make positive on-ground outcomes
- **Land for Wildlife Agreements** – provides recognition to landholders committed to conservation
- **Biodiversity Conservation Agreements** – suited to landholders with a commitment to a high level of protection
- **Corridor Conservation Agreements** – for landholders wanting to restore fragmented areas and waterway corridors.

Programs are tailored to the level of protection, support and the condition of the vegetation. Habitat Gardens and Land for Wildlife provide limited protection. Conservation Agreements have higher levels of protection. Conservation Covenants provide the highest level of protection and in perpetuity. Council has several active partnerships across Habitat Gardens, Land for Wildlife and Conservation Agreements. As a result of a review, where eligible, some landholders are transitioning to new agreements i.e., are adjacent to or within priority corridor areas.

Council's funding approach

Ipswich Enviroplan Levy and Program (Enviroplan)

Funded through the environment levy, council uses funds to deliver the Enviroplan program and its associated projects (City of Ipswich, 2022d). Council's primary investment stream in natural environment management projects, directly address the protection and enhancement of Ipswich's natural environmental values including (but not limited to):

- significant habitat for flora and fauna
- vegetation communities
- Aboriginal cultural landscape values and regional landscape corridors.

The program comprises four funding themes:

- acquisition of significant nature conservation land
- community nature conservation partnerships and support
- nature conservation planning
- embellishment, capital and operational management investment within the Natural Area Estate.

Since its inception in 1996, the program has successfully delivered extensive outcomes such as:

- purchasing properties that make up the Flinders-Goolman Conservation Estate
- the construction and maintenance of an extensive walking trail network
- grants for landholders to deliver on-ground projects
- threatened species research and recovery activities.

In recent years council introduced a policy, procedure and annual report. The most recent Ipswich City Council annual report for the 2020–2021 financial year highlights the following about the environmental levy:

- $46.00 per rateable property
- $3,991,768 revenue raised
- $4,900,000 investment in projects
- $4,571,320 reserve balance.

A review of publicly available information on South-East Queensland city local governments with environment levies indicates Ipswich has the lowest levy per rateable property and collects the second lowest amount of revenue (Table 6).

There is potential to increase this levy amount and the funding criteria to increase potential future investments in natural environment outcomes.

Table 6: Summary of environmental levies across South-East Queensland city local governments

COUNCIL	LEVY AMOUNT – PER RATEABLE PROPERTY (ANNUAL)	LEVY REVENUE (MOST RECENT AVAILABLE)
Redlands	$148.92	Not available
Moreton Bay	$84.00	Not available
Brisbane	3.5% of general rate	$32.3m
Logan	$80.40	$9.5m
Sunshine Coast	$80.00	$10.8m
Noosa	$70.00	$2.1m
Gold Coast	$52.50	$14.4m
Ipswich	$46.00	$3.9m

Summary of key approaches to improve habitat area protection and condition:

- increased council ownership and management of high value natural habitat areas
- clear and strong legislative and regulation protection of high value natural habitat areas
- restoration and enhancement of natural habitat areas using appropriate restoration and management approaches
- continued funding of council-led protection and restoration outcomes for the natural habitat network.

What does success look like?

To measure success, the extent and condition of habitat areas which are protected needs to be measured. This requires two main datasets:

1. **Natural habitat areas** – mapped as a combination of:
   - remnant vegetation
   - core habitat areas (NCS)
   - strategic remnants (NCS)
   - urban nodes (NCS)
   - locally significant priority species habitat.
2. **Areas within these habitat areas which are protected** – mapped as a combination of the following to represent a high level of protection due to government protection, ownership and management:
   - Natural Area Estate
   - local bushland reserves
   - nature refuges
   - covenants.

The overlay of these datasets measures the extent of habitat areas which are protected. Additional assessments of these areas will be required to gain an understanding of their condition.

Objective development:

Priority objective 1: Increased protection and enhancement of natural habitat areas across Ipswich

Indicator: Extent of natural habitat area which is protected. This should be supported with an understanding of condition of the natural habitat areas.

Current state: 10,493ha of natural habitat areas protected.

Milestone: Improved understanding of protected area condition through assessments.

Strategy target: 11,500ha of natural habitat areas protected across Ipswich.

ECOLOGICAL CORRIDORS

What are ecological corridors?

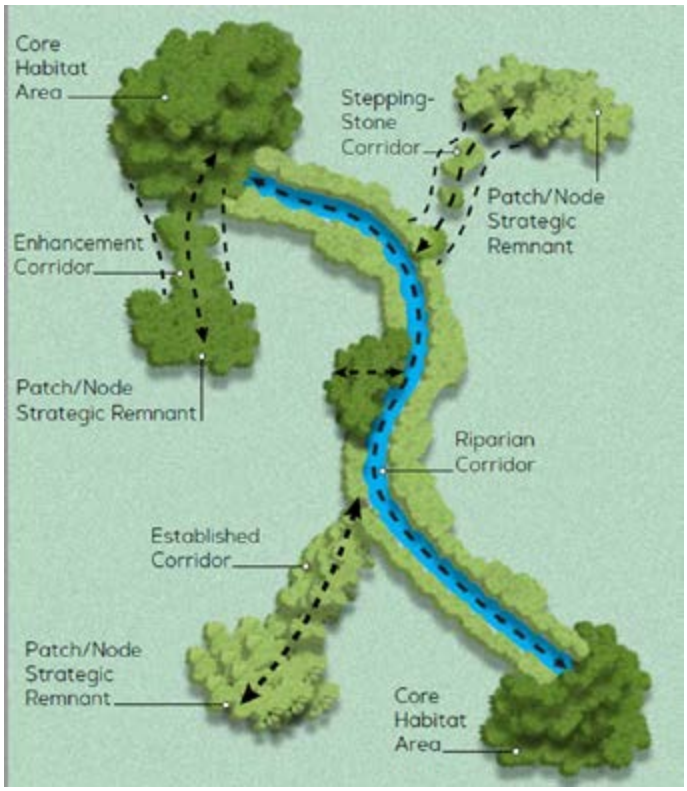
Ecological corridors are areas which can provide connectivity across the landscape (especially between large habitat areas) and often follow natural landforms (e.g. watercourses, ridges). These corridors are typically identified based on the existing biodiversity values and the potential for these areas to be connected to support ecological and evolutionary processes. Corridors can sit over areas with existing values as well as cleared areas where rehabilitation efforts should be focused to restore habitats and connections between remnant vegetation.

Ecological corridors are areas of ecological value which must be protected and/or reinstated to provide a range of important functions including:

- connecting natural habitat areas across the landscape
- providing opportunities for migration, colonisation and interbreeding of native plants and animals
- providing habitat, food and shelter for native plants and species.

Corridors can comprise a series of steppingstone patches across the landscape, continuous strands of vegetation and habitat (i.e. such as along a watercourse) or they can be a part of a larger habitat area selected for its known or likely importance to local fauna (NSW Department of Environment and Conservation, 2004) (Figure 15).

Figure 15 – Diagrammatic representation of different corridor types connecting habitat areas



What should they look like?

Corridors can range in size, shape and condition – from smaller local corridors to larger corridors that stretch across many different landscapes. Generally, the wider the corridor the better as this reduces impacts from adjoining land uses and edge effects (e.g. weeds, predators, impacts to microclimate etc.) on the condition of the corridor. Wider corridors

also support greater habitat area and species diversity. Table 7 summarises ecological corridors widths at several different spatial scales (DEC 2004).

Table 7 – Summary of corridor types, widths and functions (DEC 2004)

CORRIDOR TYPE	WIDTH	CORRIDOR DESCRIPTION
Regional corridors	>500m wide	These provide primary landscape connections between larger important areas of habitat. They are generally substantial in width (>500m) and provide not only for dispersal of individual species but act as habitat for a range of species.
Sub-regional corridors	300–500m wide	These provide landscape-scale connections, facilitating species movement and dispersal opportunities. However, the corridor itself does not contain enough habitat to support viable populations of most species.
Local scale corridors	<50m wide	These function as a conduit for fauna movement between patches of remnant vegetation and often follow landscape features such as creek lines, gullies, wetlands and ridgelines. They can be strongly influenced by edge-effects.

Appropriate habitat corridor widths need to consider numerous aspects, including the home-range area of species using the corridor, length to width ratio of the corridor, topography and vegetation within the corridor, weeds and pest/domestic animals within/adjoining the corridor and adjacent human land use (DEC 2004).

For example, a small corridor might be an area along a waterway that has been revegetated by a local Bushcare group to link two patches of forest. Native animals could then move more freely between these forests to find food, shelter and opportunities to breed. Large-scale corridors might span across the city to other areas and include a diversity of landscape types (DCCEEW, 2021).

The vegetation communities and structure in the ecological corridor should also reflect the target species requirements and the remnant local vegetation communities in the area. Different species will require different structural and functional aspects in the corridor. For example, trees will be important for arboreal species such as koalas, while groundcovers will be important for some ground dwelling species. Having a diversity of native trees, small shrubs and grasses, will provide suitable habitat for a greater number of native species using the habitat corridors (Redland City Council 2018).

Summary of key ecological corridor attributes:

- connect natural habitat areas across and beyond the Ipswich landscape
- be wide enough to reduce edge impacts
- contain native species with a diversity of structural and functional aspects to support the needs of the targeted species.

Current condition

As part of developing the Nature Conservation Strategy 2015 and a follow-up corridor study in 2021, council has identified ecologically significant corridors at various scales within the city. The work in 2021 has built a good understanding of where the local urban biodiversity corridors are. These rural corridors are not as well understood. An overview of this mapping is provided in the following section.

Being such an extensive network, with most areas being on private land, council has a limited understanding of the condition of corridors across the network. Being on larger size lots and containing more intact remnant vegetation protected from development, corridors in rural areas are more likely to be in better condition than those in urban areas. Corridors in urban areas are typically more fragmented including steppingstone corridors, typically comprising a mix of native and introduced plant species. Corridors across the city's floodplain can also demonstrate steppingstone qualities.

Ecological corridor mapping

The following mapping has been used to identify the extent of ecological corridors across Ipswich.

- state-wide/SEQ regional biodiversity corridors – Queensland Government mapping
- Ipswich regional corridors – mapped in the Nature Conservation Strategy 2015
- rural local corridors – mapped in the NCS 2015
- urban local corridors (and nodes) – mapped in both the NCS 2015 and recent priority urban biodiversity corridor mapping (Red leaf 2021)
- Draft Planning Scheme biodiversity overlay map (2022).

Ipswich regional corridors

The Nature Conservation Strategy 2015 recognises three terrestrial corridors linking core habitats within a regional context:

- **Little Liverpool Range Corridor** – connects Main Range National Park to the south, running towards the west of Aratula and north towards Hatton Vale
- **Flinders Karawatha Corridor** – extends from the Karawatha Forest in Brisbane, through the Greenbank Military Area, to Flinders Peak in Ipswich and down to Wyaralong Dam just north of Boonah
- **D'Aguilar Range Terrestrial Corridor** – follows the ridgeline of the D'Aguilar Range just north of the Ipswich suburb of Pine Mountain and has the potential to provide a vital connection between Ipswich and the state significant corridor.

These corridors support mobile species with abilities to travel larger distances.

Rural local corridors

The mapping of rural local corridors was undertaken as part of the development of the Natural Environment Strategy 2015. By analysing high concentrations of natural environment values and connectivity levels, corridors were able to be identified across the rural landscape. Corridors typically contain steppingstone patches of remnant vegetation, close enough for some species to be able to move from one patch to the other.

Two priority corridors connect:

- The Bluff to Perry's Knob and Mount Marrow
- Mount Forbes to Purga and Mount Goolman.

Rural local corridors are suitable for highly mobile species.

Urban local corridors (and nodes)

Urban corridors and nodes can provide connectivity and sanctuary within the urban landscape for a diversity of robust and highly mobile species. As part of the Nature Conservation Strategy 2015, corridors and nodes were mapped based on a spatial criteria:

- **urban local corridors**: areas zoned recreation, industry buffer and conservation under the Ipswich Planning Scheme, these areas could provide opportunities to preserve vegetation and other community uses
- **urban nodes**: conservation zoned areas within the Ipswich Planning Scheme or existing parks/reserves with environmental values.

It was recognised at the time of developing the strategy that mapping urban local corridors would require further refinement overtime to ensure protection and enhancement is targeted and defensible.

In 2021, council took further steps in refining the mapping of priority urban biodiversity corridors and nodes within a discrete study area (mostly covering the urban footprint in the eastern part of the city) (Redleaf, 2021)[5]. Using desktop modelling, an expert panel and a rapid field validation process, an indicative network of priority urban biodiversity corridors (and nodes) was identified for further investigation. The network comprises:

- **riparian regional corridors** – major riparian corridors (Brisbane and Bremer Rivers) – 400m wide
- **established corridors** – containing relatively intact vegetation, with good pre-existing biodiversity values – 200m wide
- **enhancement corridors** – moderately intact with sufficient but limited biodiversity values – 100m wide
- **steppingstone corridors** – patchwork isolated vegetation providing some potential connection – 100m wide
- **established urban node** – relatively intact patch of remnant vegetation of moderate size
- **enhancement urban node** – some remnant vegetation, lacking some values and of moderate size.

This extensive corridor mapping data (Figure 16) has been consolidated for the purposes of this strategy to show the corridor areas, nodes and the strategic links connecting these across the region (Figure 17). This is based on the following consolidation of ecological corridor mapping:

- strategic corridor links:
  - state-wide and regional terrestrial corridors (Queensland Government)
  - priority local corridors and regional corridors (NCS 2015).
- corridor areas and nodes:
  - corridor urban (NCS 2015)
  - corridor area (NCS 2015)
  - priority urban biodiversity corridor and nodes (Redleaf, 2021).

5 Urban Biodiversity Corridors of Ipswich City Council – Technical Report (2021) Redleaf

Figure 16 – All ecological corridors across Ipswich

**Please note the information presented is based on a range of available mapping data and doesn't represent all vegetation or ecological corridors.*

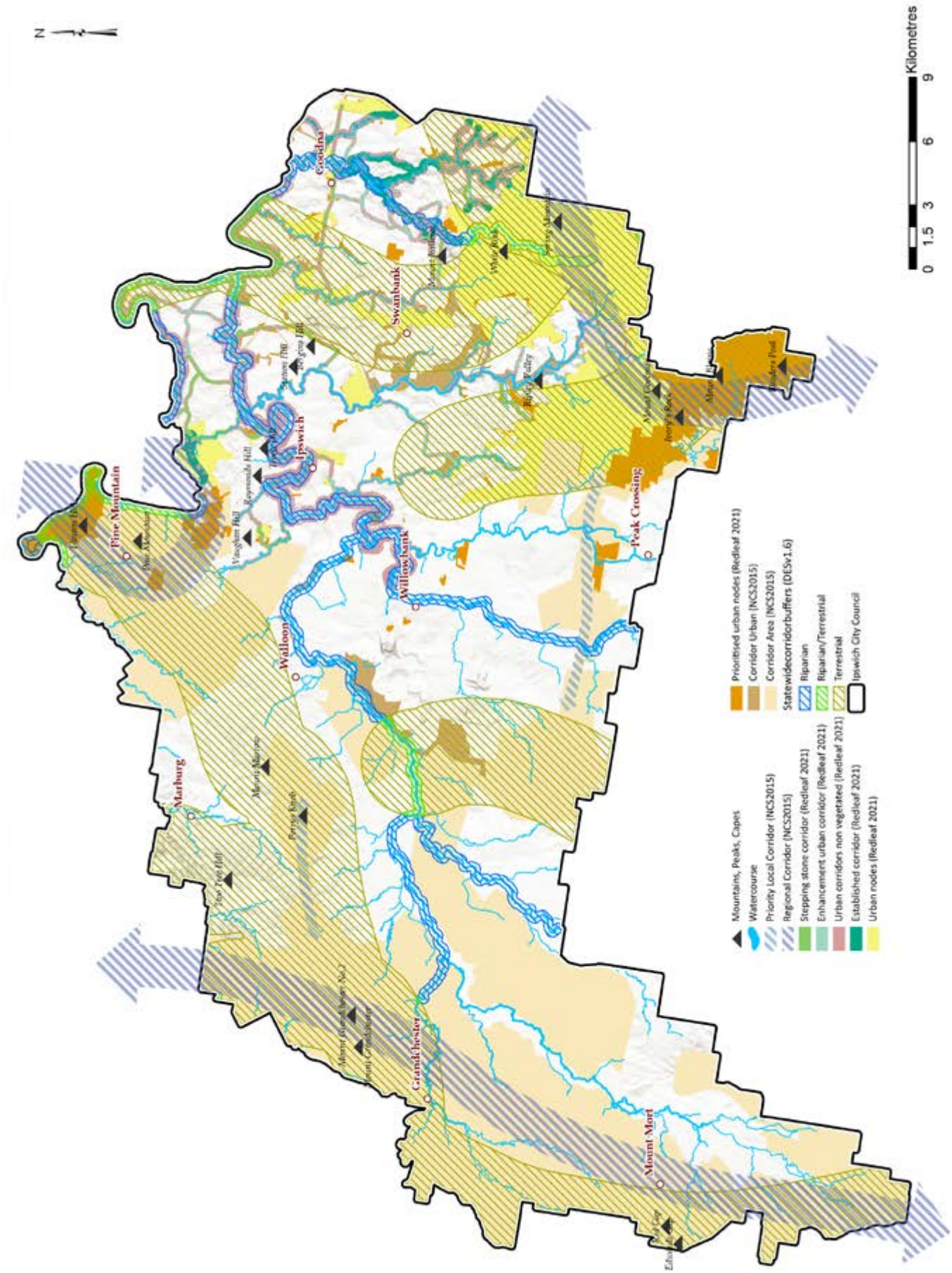
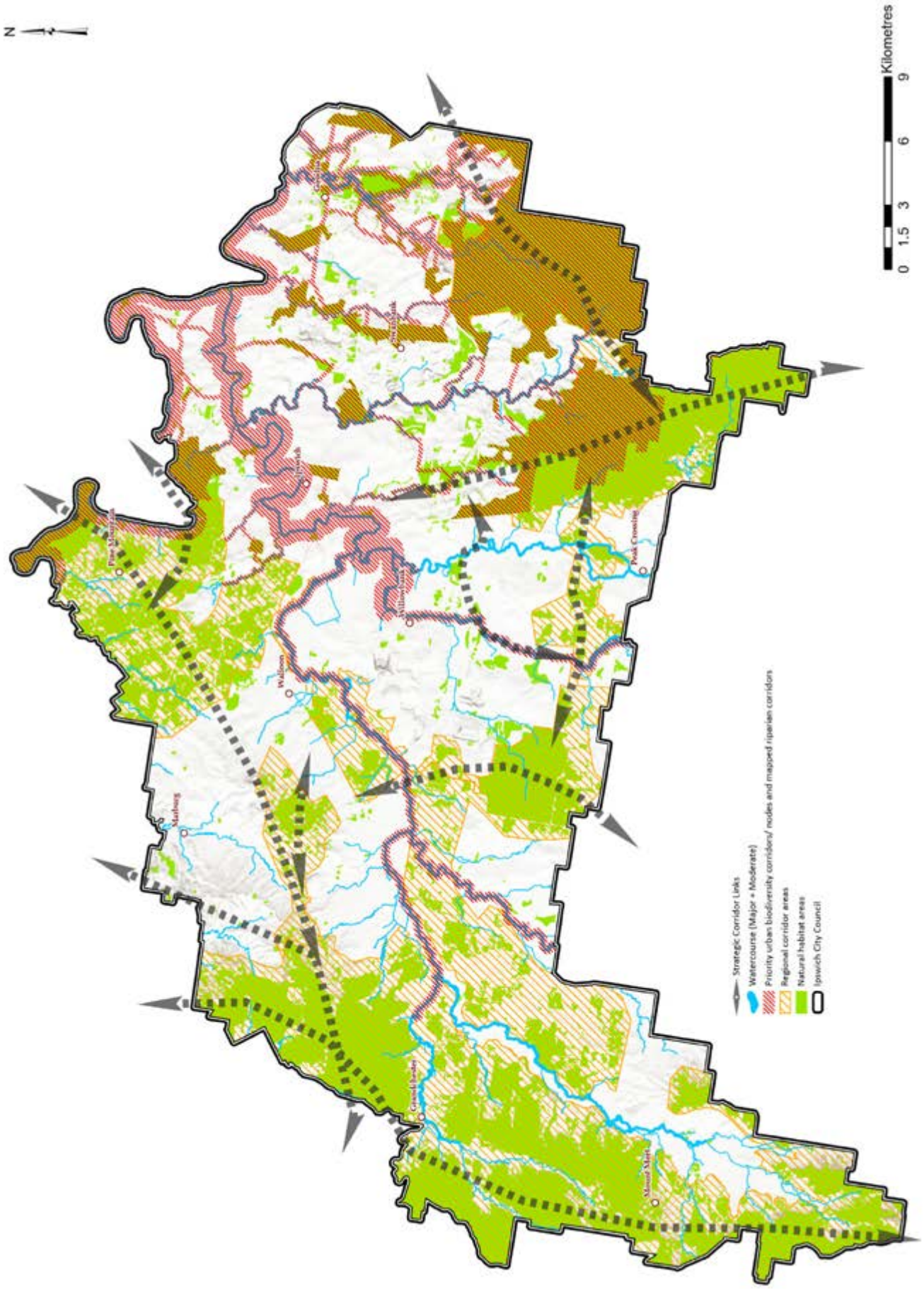


Figure 17 – Consolidated ecological corridors across Ipswich

**Please note the information presented is based on a range of available mapping data and doesn't represent all vegetation or ecological corridors.*



Key threatening processes

Key threats to corridors are:

- removal, degradation or fragmentation of vegetation
- thinning of corridors
- increased disturbances due to climate change
- changes to natural surface water flow regimes
- incompatible land uses and activities adjacent to and within corridors.

Further removal, degradation or fragmentation of vegetation

Fragmentation of vegetation within the corridor causes several impacts, particularly to the species that use them. Species movement can be far more difficult through a fragmented corridor; it may be even fatal for species to cross between patches. For instance, gliders lose the ability to move through corridors when vegetation to glide between is too far apart, is of insufficient height or not dense enough to protect from predators.

Typically, as corridors experience further fragmentation their species populations decrease. Species with smaller populations tend to lose genetic diversity and biodiversity, and in some instances, species become extinct in patches.

Patches and fragmentation in corridors increase edges; increased edges generally create environments for more predators, invasive pests and house pets.

Thinning of corridors

Corridors are far more susceptible to edge effects than larger core habitat areas. Quality of habitat along the edge of corridors is commonly far lower. Thinning or narrowing of corridors has a negative effect on the corridor's values and the species that pass through or reside within it.

Corridors with a high ratio of edge to area may be detrimental to species using the corridor. Species tend to behave differently at edges and are at increased risk to predation.

Increased disturbance due to climate change

Corridors contribute to the resilience of the landscape from climate change impacts however, they will also be at risk from disturbance due to climate change. Higher temperatures, more extreme droughts, altered fire regimes, floods and more extreme weather will disturb corridor vegetation and the species that rely on it. As corridors are relatively smaller and constrained than larger core habitat areas, disturbances will further increase edge effects.

Typically, the existing threats to corridors will be exacerbated by climate change i.e. increase in invasive species that thrive in altered environments. Additionally, changes in habitat may be detrimental for some species that rely on corridors and the benefit of others – altering biodiversity.

Changes to natural surface water flow regimes

Altering surface water flows (e.g. concentrating or reducing flows) can lead to changes in vegetation cover, composition and structure within a corridor. It can impact species' ability to access habitat, food and shelter. Modifying flows can lead to increased soil erosion which can lead to more disturbed areas for invasive species.

Incompatible land-uses and activities adjacent to and within corridors

Land-uses and activities that modify vegetation or encroach on the corridor width can impact biodiversity. Activities associated with increased noise and vibration can interfere with the ability of some species in the corridor to communicate, detect prey or avoid predators. Roads can increase pest plant distribution, promote erosion, create fish barriers and pollute water within the corridor. Additionally, roads can directly affect species numbers and distribution through road mortality.

Corridors can be created by adjusting land use practices and development to help retain, restore and manage natural connections and interactions across the landscape.

Important consideration should be given to the possibility of negative, unintended consequences of protecting and enhancing corridors such as increasing dispersal of unwanted species, increased predation and movement of disease and pests.

Summary of key threats to functional ecological corridors across Ipswich:

- further removal, degradation or fragmentation of vegetation due to urban, peri-urban and rural activities
- thinning/narrowing of corridors which increases the risk of edge effects including the invasion of pest species
- increased disturbances due to climate change (e.g. bushfire, storms and flooding events)
- changes to natural surface water flow regimes
- incompatible land uses and activities adjacent to, and within corridors.

Summary of approaches to improve protection and condition of ecological corridors

There are a range of approaches to both protect and enhance ecological corridors across Ipswich including:

- improved knowledge of Ipswich ecological corridors
- protection of ecological corridors
- delivery of on-ground projects to improve ecological corridor condition.

Improved knowledge of Ipswich ecological corridors

A more detailed assessment of the current condition of the mapped ecological corridors across Ipswich would be beneficial to improve the understanding and knowledge of the existing biodiversity and connectivity values within these corridors. Initially, this could involve a more detailed assessment and mapping of the ecological corridors which were not included in the Redleaf, 2021 priority urban biodiversity corridor project. This more detailed corridor mapping could be used to inform where protection and enhancement opportunities within ecological corridors should be focused across Ipswich.

Protection of ecological corridors

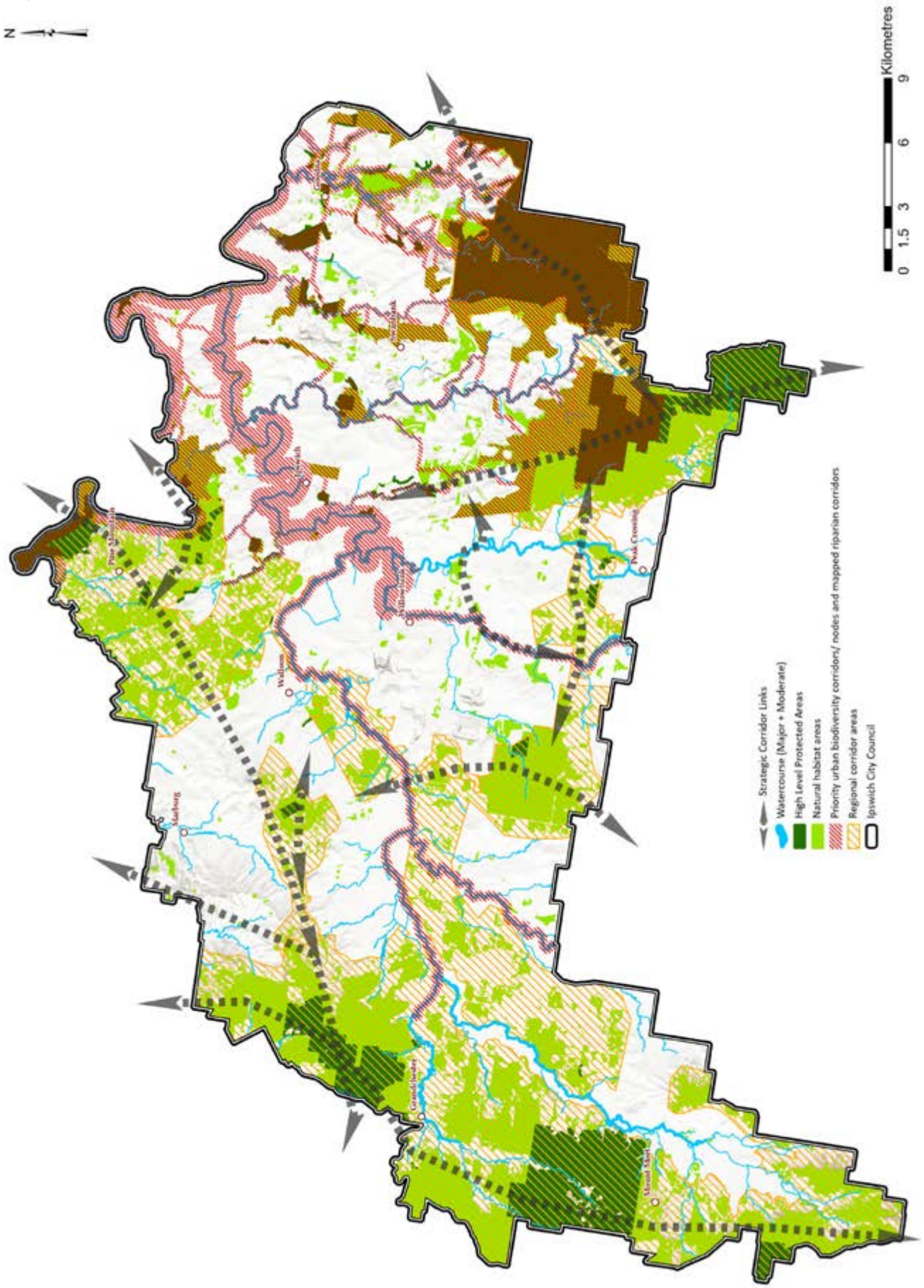
The protection of ecological corridors can occur through several approaches including:

- **Council ownership and management for conservation purposes (high level protection):**
  This will typically be focused on the acquisition and protection of high value natural habitat areas within corridors. See Natural Habitat Areas for more information.
- **Private land protection – covenants (high level protection):**
  Voluntary Conservation Covenants are also available as part of council's Landholder Conservation Partnership Program to permanently protect in perpetuity intact vegetation on private land. Some of these areas may sit within ecological corridors.
- **Planning and legislative regulation (medium level protection):**
  - **Planning scheme zones**: can be used to identify and protect ecological corridors across Ipswich. These zones can be used to identify suitable activities within these areas which will help to protect existing ecological values. Relevant zoning criteria can include conservation, environmental management zones and special land management zones.
  - **Planning scheme overlay codes**: Biodiversity overlays can identify where development needs to provide biodiversity outcomes including protection of native vegetation and provision of suitable connectivity between natural habitat areas.
- **Other environmental legislation:**
  There is a range of other national and state legislation as well as vegetation protection orders as part of council's Local Law which can protect the natural environmental values within corridors. See Natural Habitat Areas for more information.

Figure 18 presents the areas within the ecological corridors which have a high level of protection due to government ownership for the purposes of conservation.

Figure 18 – Protected areas within ecological corridors

**Please note the information presented is based on a range of available mapping data and doesn't represent all vegetation or ecological corridors.*



Restoration and enhancement of ecological corridors

The restoration and enhancement of ecological corridors should aim to restore native vegetation and fauna movement within currently cleared and degraded areas within ecological corridors. Approaches to support the restoration of and native vegetation and fauna movement include:

- offsets – prioritise locating receival sites within these corridors
- restoration works on other council owned land, in or across corridors – e.g. conservation reserves, bushland reserves, waterside parks, linear parks, road reserves etc.
- refined mapping and planning of corridors
- updated design specification and guidelines for restoration of native species..

In a time of such significant growth, it is important to take a strategic approach to corridor planning and management. It is key is to ensure corridors are connected, identified, values understood, and threats and actions recognised.

Aware of the need for a strategic approach, several councils have plans for corridors including:

- **Redland City Council** – *Wildlife Connections Plan 2018–2028*
- **Gold Coast City Council** – *Critical Corridor and Substantial Remnant Mapping 2016*
- **Logan City Council** – *Natural Environment Strategy 2021–2031.*

Councils typically use these documents to inform their decision making, land-use planning and on-ground delivery programs. These documents are also available for landholders to use and can direct community group action.

Summary of key approaches to improve ecological corridor condition and extent:

- improved knowledge of Ipswich ecological corridors biodiversity and connectivity values
- clear and strong protection of ecological corridors
- restoration and enhancement of ecological corridors on public and private lands.

What does success look like?

To measure success, the extent and condition of biodiversity corridors which are protected needs to be measured. This requires two main datasets:

1. Biodiversity corridors – mapped based on a combination of:

- strategic corridor links (combination of state terrestrial corridors and NCS priority local corridors and regional corridors as dotted arrows showing connectivity)
- corridor areas (as a combination of):
  - NCS corridor urban (only for the area outside of the Redleaf study)
  - NCS corridor area.
- priority urban biodiversity corridor and nodes (as a combination of the Redleaf mapping layers):
  - riparian regional corridors
  - established corridors
  - enhancement corridors
  - steppingstone corridors
  - established urban node
  - enhancement urban node.

2. Areas within these ecological corridors which are protected – mapped as a combination of the following to represent a high level of protection due to government ownership and management:

- Natural Area Estate
- local bushland reserves
- nature refuges
- covenants.

The overlay of these datasets measures the extent of biodiversity corridors across Ipswich which are protected. Additional assessments of these areas will be required to gain an understanding of their condition.

Objective development:

Priority objective 2 – Increase in ecological corridor land protected and restored across Ipswich

Indicator: Area of mapped corridors (including riparian, urban habitat and ecological corridor areas) which has had restoration works undertaken. This should be supported with an improved understanding of the condition of the corridor and the amount of it that is protected.

Current state: 11,018ha of ecological corridors protected.

Milestone: Improved understanding of protected area condition through assessments

Strategy target: Restoration of over 400ha of ecological corridor area each year.

4 Aboriginal cultural heritage and cultural landscape values recognition

Important definitions:

- **Aboriginal cultural landscape:** can be defined as 'natural areas which are identified as being valued by an Aboriginal group (or groups) because of their long and complex relationship with that land. It expresses their unity with the natural and spiritual environment. It embodies their traditional knowledge of spirits, places, land uses, and ecology.'[6]
- **Aboriginal cultural heritage:** is anything that is a significant Aboriginal area in Queensland; or a significant Aboriginal object; or evidence, of archaeological or historic significance, of Aboriginal occupation of an area of Queensland.
- **Significant Aboriginal area:** is an area of particular significance to Aboriginal people because of Aboriginal tradition and/or the history, including contemporary history, of any Aboriginal party for the area.
- **Significant Aboriginal object:** is an object of particular significance to Aboriginal people because of Aboriginal tradition and/or the history, including contemporary history, of an Aboriginal party for an area.

Aboriginal and Torres Strait Island people have a special relationship with nature, based on a strong spiritual connection. This is a complex and multi-layered connection where all-natural features make up 'country'. Sites are not seen in isolation, instead all the environmental, spiritual, and physical attributes that connect people to the earth are valued. This strong connection to country guides cultural practices and decisions related to the natural environment. There are a number of identified natural landscapes across Ipswich which are significant Aboriginal areas as they are places where important Aboriginal traditions, observances, customs and beliefs of the Aboriginal people are held including waterways, wetlands, waterholes, rock outcrops, caves, ridges, sandy terraces, gravel bars and food trees.

These cultural areas do not necessarily contain significant Aboriginal objects. The *Aboriginal Cultural Heritage Act 2003* provides protection of these areas and objects. Historically, the protection of Aboriginal cultural heritage has focused on the registration of significant Aboriginal objects. However, this is now changing to recognise the importance of the cultural landscape areas and the important role that Aboriginal and Torres Strait Island people can play in protecting the natural environment and heritage.

> *"Strengthening relationships among Aboriginal, Torres Strait Islander and non-Aboriginal people and drawing on traditional ecological knowledge can lead to improved outcomes for the natural environment."*
>
> *From Australia's Strategy for Nature 2019–2030*

Ipswich City Council is committed to reconciliation as outlined in the 2020–2025 Indigenous Accord which provides an agreement between council and the Aboriginal and Torres Strait Island peoples and communities of Ipswich as to how they will work together. Actions in this document include increasing recognition of cultural values and history as well as involvement in programs for Traditional Owners to care for country.

The focus of this strategy is therefore to focus on increasing recognition and protection of Aboriginal cultural heritage and cultural landscape values across Ipswich and increasing the use of Aboriginal ecological knowledge in the management of these areas. These priority objectives also reflect the outcomes of the broader stakeholder feedback (refer to the Natural Environment Strategy – Stakeholder Engagement Report 2022).

Key outcomes sought: Recognising and embedding the important relationship between the natural environment and the local Traditional Owners of Ipswich.

6 From Buggey S 1999, *An approach to Aboriginal cultural landscapes*

Council's achievements to-date:

Ipswich City Council acknowledges the ongoing challenges faced by Aboriginal and Torres Strait Islander peoples and recognises the importance of community and government coming together to achieve the best outcomes for the Ipswich community. Over the last decade, council has been working with the Traditional Owners and with the wider Aboriginal and Torres Strait Islander community from the Ipswich region to:

- formulate a reconciliation initiative in 1995 which became the Ipswich City Council Indigenous Australian Accord Working Party
- develop the 1995 Accord, 2015–2018 Accord and the current 2020–2025 Accord to guide how Ipswich City Council and the Aboriginal and Torres Strait Islander community would work together on shared issues and on a common agenda for change
- increase traditional ecological knowledge through cultural land-use practice workshops and cultural burn training
- undertake cultural landscape assessments to identify Aboriginal cultural landscapes, European cultural landscapes and ecological assessments in key conservation areas
- incorporate cultural burns in property management plans and supporting Indigenous people to deliver them
- design sensitive infrastructure to protect cultural landscape values (e.g. boardwalks in White Rock-Spring Mountain Conservation Estate)
- develop and implement the Aboriginal Cultural Heritage Clearance and Native Title (future acts) procedures.

ABORIGINAL CULTURAL HERITAGE AND CULTURAL LANDSCAPE VALUES RECOGNITION

Where are Ipswich's Aboriginal cultural heritage and cultural landscape values?

The Aboriginal cultural heritage and cultural landscape values across Ipswich have been mapped for the Draft Ipswich Planning Scheme (Figure 19). This mapping does not identify the condition or details of these Aboriginal cultural heritage and cultural landscapes.

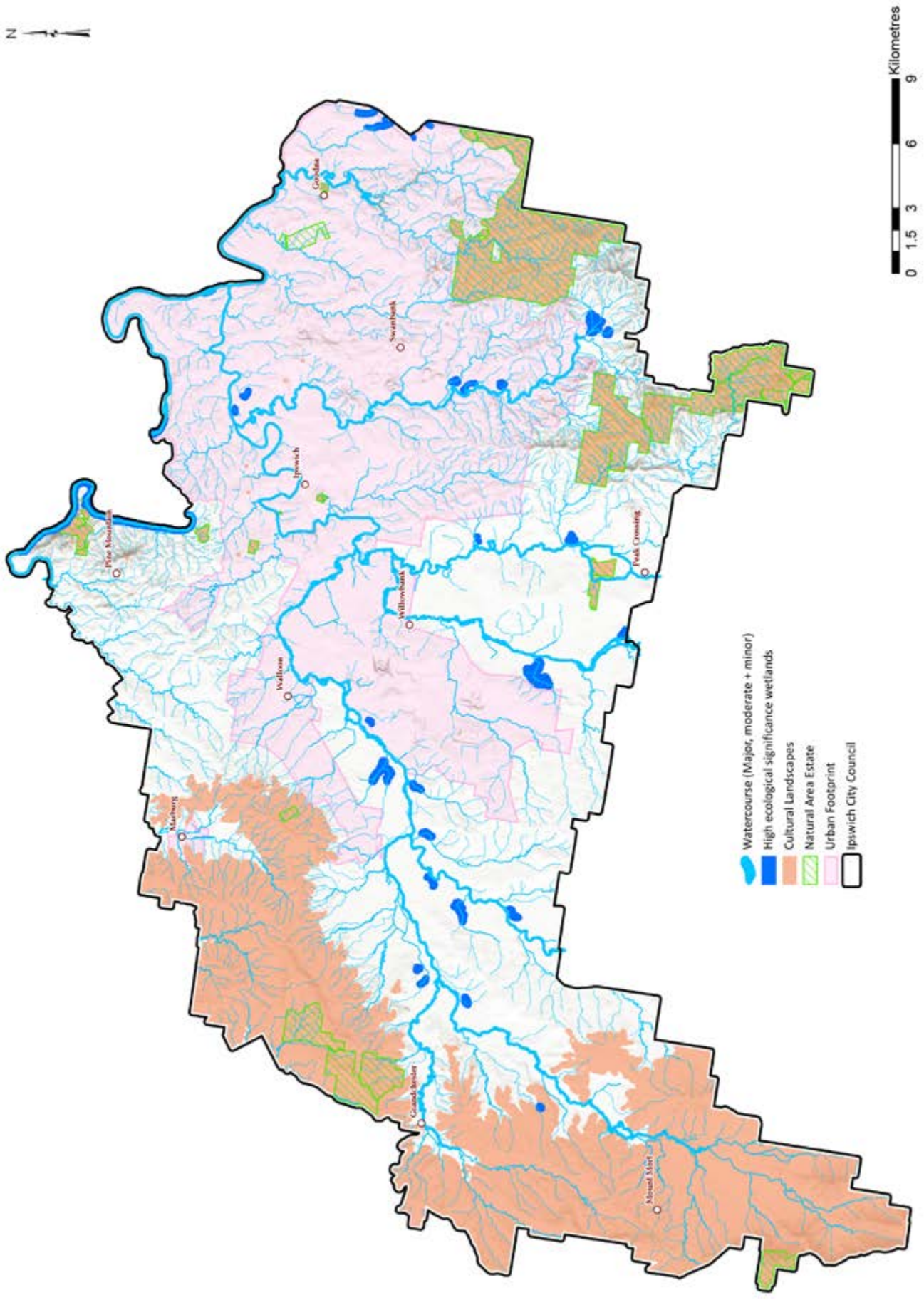
Turnstone Archaeology has been engaged by council to undertake the cultural landscape values investigations and reporting as part of the White Rock-Spring Mountain Conservation Estate Master Plan to identify Aboriginal cultural heritage and cultural landscape values as well as European cultural landscapes and ecological features. Having this refined understanding of the Aboriginal cultural heritage and cultural landscape values allows for better planning and design of these natural areas to recognise and protect these important cultural values.

Summary of key attributes:

Places where important Aboriginal traditions, observances, customs and beliefs of the Aboriginal people are held including waterways, wetlands, waterholes, rock outcrops, caves, ridges, sandy terraces, gravel bars and food trees.

Figure 19 – Map showing Aboriginal cultural heritage and cultural landscapes across Ipswich.

**Please note the information presented is based on a range of available mapping data and doesn't represent all Aboriginal cultural heritage and cultural landscape values.*



Key threats to Aboriginal cultural heritage and cultural landscapes

Key threats to Aboriginal cultural heritage and cultural landscapes include:

- **Lack of knowledge** – there is a risk that Aboriginal cultural heritage and cultural landscapes will be lost or impacted due to lack of awareness of their presence.
- **Inappropriate access and use** – access may need to be prevented or controlled to protect significant Aboriginal areas from either direct impacts due to compaction or erosion or to protect important sacred sites.
- **Removal and degradation** – the natural environment is subject to many issues associated with urbanisation and poor land management, practices which can lead to clearing of vegetation, erosion of waterways, poor water quality and invasive pest species. Vandalism by visitors to sites is also deeply disrespectful and damaging.
- **Bushfire, drought and floods** – a changing climate is likely to lead to increased risk of extreme weather including bushfires, floods and droughts. Droughts and floods can lead to significant impacts on important Aboriginal cultural landscape values (such as wetlands and waterways). Cultural burning can reduce fuel loads in vegetated areas and reduce the risk of hot and rapid bushfires (Wadawurrung Traditional Owners Aboriginal Corporation (2020)).

Summary of key threats to Aboriginal cultural heritage and cultural landscapes across Ipswich include:

- lack of awareness and understanding of the cultural heritage and cultural landscape values
- inappropriate access and use of culturally significant areas
- removal and degradation due to urbanisation and poor land management
- bushfires, drought and floods associated with climate change.

Summary of approaches to improve recognition of Aboriginal cultural heritage and cultural landscape values

The improved recognition of Ipswich's Aboriginal cultural heritage and cultural landscapes can occur through a range of approaches including:

- improved knowledge of Ipswich's Aboriginal cultural heritage and cultural landscapes
- clarity on requirements and approaches for Aboriginal cultural heritage and cultural landscape recognition
- delivery of on-ground works to improve recognition and protection of Aboriginal cultural heritage and cultural landscapes.

Improved knowledge of Ipswich's Aboriginal cultural heritage and cultural landscapes

The current mapping of Ipswich's Aboriginal cultural heritage and cultural landscape values, which was undertaken to inform the new planning scheme, is the first time this has been done in Ipswich. This is an important first step in recognising these important values, however it is recognised that further engagement and consultation with the registered Native Title Party is required to inform and strengthen this mapping.

Council has started to engage specialists to undertake cultural landscape investigations and reporting across their conservation estates to identify Aboriginal cultural heritage and cultural landscape values as well as other cultural landscapes and ecological assessments. The first of these has already commenced at White Rock-Spring Mountain Conservation Estate. These reports will increase the understanding of the different types of cultural values across the estates which will inform the development of appropriate management strategies to protect and recognise these values.

Ideally, these cultural heritage and cultural landscape investigations will be undertaken across more landscapes across Ipswich outside of the conservation estates. Currently investigations are planned for White Rock–Spring Mountain, Flinders and Grandchester Conservation estates. Cultural flows (water entitlements that are legally owned and managed by First Nations peoples to improve the spiritual, cultural, environmental, social and economic conditions of these Nations) can also be included in investigations across Ipswich catchments. An example of this is the Wurundjeri Woi Wurrung Cultural Flows Assessment for the Upper Merri Creek in Melbourne. The outcomes of this assessment, combined with ongoing input from the Traditional Owners of the area, is informing the development of a place-based Integrated Water Management (IWM) Strategy on Wurundjeri Woi Wurrung Country. More information on this can be found in the following case study: **Wsaa.asn.au/publication/iwm-case-study-5b-case-place-based-planning-wurundjeri-woi-wurrung-country**. It should be noted that cultural flows and cultural water rights are only available if a Native Title Determination has been successful.

An overarching Healthy Country Plan can also help to strengthen the recognition and understanding of the Aboriginal cultural heritage and cultural landscape values, history and peoples across the region. These plans are developed by the local Traditional Owners and set out a clear vision, objectives, and strategies to look after council owned and managed land and keep it healthy into the future. It can be used to strengthen the local cultural knowledge and education and help to guide partnerships with other groups such as council in land management decision-making. Examples of Healthy Country Plans in Victoria and Western Australia can be found here:

- Wadawurrung.org.au/_files/ugd/d96c4e_72611327c6a54d3198c0499ac5c26e54.pdf
- Wunambalgaambera.org.au/wp-content/uploads/2020/06/Healthy-Country-Plan.pdf.

Requirements for recognition of Aboriginal cultural heritage and cultural landscape values

A strong policy and planning position will help to recognise Aboriginal and Torres Strait Islander interests, identify matters of knowledge, culture and traditional values in the region and outline the requirements for their protection. Council's Planning Scheme can provide requirements for new developments for the protection and recognition of cultural heritage and cultural landscape values as part of a cultural landscape overlay code or planning scheme policy as examples (State of Queensland, 2019). An example of this is Moreton Bay Regional Council's Heritage and Landscape Character Planning Scheme Policy which was adopted in 2017 and outlines requirements for preparing cultural heritage impact assessment reports and management plans. This document recognises significant sites which includes natural reserves which hold significant remnant vegetation and cultural significance. This Planning Scheme Policy can be found here: **Moretonbay.qld.gov.au/files/assets/public/services/building-development/mbrc-plan/psp/v4c/heritage_landscape_character.pdf**.

These requirements should also be reflected in council projects. The development and adoption of internal processes to assess, recognise and appropriately manage Aboriginal cultural landscapes will assist council with this.

Improved recognition, awareness and protection of Aboriginal cultural heritage and cultural landscape values on council owned land

Increase public awareness and appropriate access to significant sites can help to reduce the risk of damage to Aboriginal cultural heritage and cultural landscape values. The types of approaches can include:

- **Use of cultural interpretive signage** – signs that acknowledge people are coming onto country, to help them understand the local Aboriginal culture and how to care for country can increase understanding of aboriginal culture and how to care for country (Wadawurrung Traditional Owners Aboriginal Corporation, 2020). These should be developed in collaboration with the Registered Native Title Party to respectfully communicate the locations of cultural significance on the site. Interpretive signage can also be used to inform visitors about the Aboriginal cultural heritage within the estate. The registered Aboriginal cultural heritage can only be afforded protections/enforcement powers for council if the signage complies with Section 7 of Ipswich City Council – Local Law No.7
- **Community events** – these can be used to celebrate and communicate Aboriginal cultural heritage and cultural landscape values at sites, such as the Community Open Day at the cultural hub at Harding's Paddock to celebrate the new cultural facilities, and experience traditional Kupmurri cooking and other cultural practices.
- **Embellishment and protection of landscape features** – suitable pathways and facilities such as boardwalks should be used to provide safe and sustainable access which protects Aboriginal cultural heritage and cultural landscape values.

Summary of key approaches to improve Aboriginal cultural heritage and cultural landscape values recognition:

- improved understanding of Aboriginal cultural heritage and cultural landscape values through investigations and reporting
- requirements for recognition of Aboriginal cultural heritage and cultural landscapes in the planning scheme and council projects
- increased community awareness and recognition of Aboriginal cultural heritage and cultural landscapes though signage and events
- increased protection of Aboriginal cultural heritage and landscape values through appropriate visitation and access.

What does success look like?

To measure success, the increased recognition of Aboriginal cultural heritage and cultural landscapes needs to be measured. This can be achieved by measuring the number of activities which council is supporting to achieve this goal, through a combination of cultural heritage assessments, cultural landscape investigations, Aboriginal cultural events and development and delivery of new cultural interpretive signage.

Objective development:

Priority objective 1: Improved recognition of Aboriginal cultural heritage and cultural landscape values across Ipswich's natural areas

Indicator: Combination of datasets including number of cultural interpretive signage in council natural areas, Aboriginal cultural events and number of cultural heritage assessments and cultural landscape investigations undertaken as part of council projects in natural areas.

Current state: First cultural landscape investigation and reporting being undertaken for White Rock-Spring Mountain Conservation Estate.

Milestone: Interpretive signage developed to communicate cultural heritage and cultural landscape values within council owned and managed land.

Strategy target: Cultural landscape investigation and reporting across Ipswich region, in locations of known cultural significance (conservation estates and reserves).

ABORIGINAL ECOLOGICAL KNOWLEDGE APPLICATION

What are Aboriginal ecological management approaches?

Traditional knowledge of the local plants, animals, country and how they relate to each other is important to improve the understanding of the history of the local natural environment and to help inform appropriate future management practices, including landscape restoration, pest species management and threatened species protection. A common traditional ecological management practice is the use of cultural burns to manage vegetation, reduce bushfire risk as well as reconnect the local Aboriginal people to country. Improving the understanding of cultural flows can also help to improve how waterways and wetlands are managed across the region.

Current use of Aboriginal ecological management practices and key threats

Key threats to the application of Aboriginal ecological knowledge include:

- **Loss of traditional knowledge** – this can result from a breakdown in the handing down of knowledge from one generation to the next. This loss of opportunity to pass on ecological knowledge to future generations can also be due to exclusion from cultural lands and the poor quality of areas of cultural significance such as waterways.
- **Lack of capacity and resources** – a lack of time, funding, and resources to build this knowledge and then apply this.

(Wunambal Gaambera Aboriginal Corporation (2010)).

Council is working with local First Nation businesses from the Ipswich region to increase the knowledge and application of cultural burns across Ipswich. This includes:

- cultural burn training being delivered by Firestick through Wirrinyah Conservation Services
- cultural burns are also being incorporated into property management plans as part of council's Landholder Conservation Agreements
- restoration works (e.g. via Habitat Connections) across Ipswich are delivered by local First Nations businesses (e.g Wirrinya Conservation Services).

Summary of key threats to Aboriginal ecological knowledge application across Ipswich include:

- loss of traditional ecological knowledge shared across generations
- lack of resources and capacity to build this knowledge through training and apply these traditional practices through projects and programs.

Summary of approaches to improve Aboriginal ecological knowledge application

The improved application of Aboriginal ecological knowledge across Ipswich will require a combination of:

- improved knowledge of traditional land management approaches
- support for on-ground application of Aboriginal ecological knowledge.

Improved knowledge of traditional land management approaches

Recording and sharing the traditional knowledge of plants, animals, their interactions and management approaches will help to improve the Aboriginal ecological knowledge across Ipswich. Council has already taken steps in this space which should be continued and built upon to include:

- workshops to increase local Aboriginal peoples understanding and capability to deliver traditional land management practices (such as the cultural burn workshops currently delivered)
- inclusion of cultural burns and other traditional land management techniques into Property Master Plans as part of council's Landholder Conversation Agreements
- engaging local Traditional Owner businesses with restorative work programs – e.g. revegetation projects for waterways.

Support of on-ground application of Aboriginal ecological knowledge

Engaging local First Nations businesses to deliver traditional land management practices is important to improve knowledge and environmental health, but to also strengthen connection to country. Continuing to engage local First Nations businesses in cultural burns is an important first step. However, these practices are delivered only when identified by others in projects and programs.

Having local First Nations businesses who are responsible for the ongoing management of natural areas will further strengthen the on-ground application of Aboriginal ecological knowledge. Indigenous ranger programs are used across Australia to build capacity and deliver traditional natural resource management approaches. The Queensland Government provides funding for land and sea rangers, including the Kombumerri rangers who care for country within the Guanaba Indigenous Protected Area and the hinterland of the Gold Coast and the Minjerribah land and sea rangers on Minjerribah (North Stradbroke Island). These groups undertake a range of natural area conservation activities including cultural burns, feral animal and pest plant control, soil conservation, cultural heritage site protection and biodiversity monitoring (Queensland Government, 2022). There are several steps that will need to be taken in Ipswich if funding for this program was desired, including Native Title determination. Another option is for council to provide its own program with designated positions created to plan and deliver the land management and maintenance of areas that are culturally significant due to registered Aboriginal cultural heritage and/or cultural landscape values.

Summary of key approaches to improve Aboriginal ecological knowledge application:

- improved knowledge of traditional land management approaches through workshops and other training
- support of on-ground application of Aboriginal ecological knowledge through engagement of local First Nations businesses and/or persons to manage cultural landscapes across Ipswich.

What does success look like?

To measure success, the increased application of Aboriginal ecological knowledge needs to be measured. This can be achieved by measuring the number of activities which council is supporting to achieve this goal, through funding training sessions and positions for the application of ecological knowledge.

Objective development:

Priority objective 2: Increased use of Aboriginal ecological knowledge in the management of Ipswich's natural environment

Indicator: Combination of datasets including training for local First Nations business and/or persons in Aboriginal ecological knowledge approaches and delivery of land management by Traditional Owners.

Current state: Funding received to support First Nations businesses fire management capacity building and training and to deliver cultural burning techniques and programs.

Milestone: First Nations businesses and/or person engaged to undertake land management using traditional ecological approaches.

Strategy target: Local First Nations businesses and/or persons leading the management of council owned or managed land that contains Aboriginal cultural heritage and/or cultural landscape values.

5 Urban biodiversity enhancement

Important definitions:

- **Urban biodiversity** – refers to the diversity of plants and animals and their inter-relationships with the land, air, water, people and other infrastructure within an urban environment.[7]

The natural environment within urban areas (such as stands of remnant vegetation, waterways, open space and gardens) is interesting as it provides both local biodiversity as well as other benefits for the community. It provides these benefits despite being comprised of a network of both locally native and introduced species.

The important role urban areas are providing in maintaining biodiversity is becoming increasingly recognised by local governments across Australia. The City of Melbourne's Draft Urban Ecology and Biodiversity Strategy highlights the contribution made by cities and urban areas to biodiversity – recognising that urban areas are far from being barren concrete jungles and can be havens for many species of plants and animals (City of Melbourne, 2022). Like Melbourne, Ipswich's urban green space networks are also becoming increasingly more important to biodiversity. They support significant species such as koalas, platypus and white-bellied sea eagle and populations of the vulnerable powerful owl are known to frequent urban green space. Locally significant frogs reside in a bushland reserve in the highly developed Bellbird Park, pinkeye mullet in the deeper sections of Bundamba Creek and squirrel gliders in forest located in residential Blackstone.

Urban biodiversity supports a range of ecosystem services which are critical for the survival of humans as well as native plants and animals including clean air, clean water, temperature and climate regulation, habitat, healthy soils and spiritual and cultural values. Therefore, the protection of existing natural environment areas as well as the provision of new natural environments in urban areas is critical for people, plants and animals.

Key threats to urban biodiversity include:

- **urbanisation** – the removal, reduction and further fragmentation of existing urban natural areas for urban development including houses, businesses, roads and other infrastructure
- **pest species** – introduced plant and animal species in the urban area can have detrimental impacts on the native plants and animal species
- **climate change** – rising temperatures and altered rainfall patterns will impact urban biodiversity as there will be less water for vegetation to survive and increased heat stress on plants and animals.

Historically, urban biodiversity initiatives have focused on remnant vegetation and locally native plants and animals. However, the latest research in this area highlights that all biodiversity plays a role in contributing to healthy and resilient urban ecosystems (Melbourne, 2022). The focus of this strategy is therefore on the protection, creation and connection of urban natural habitats and corridors to improve the overall biodiversity of Ipswich. These priority objectives also reflect the outcomes of the broader stakeholder feedback (refer to the Natural Environment Strategy – Stakeholder Engagement Report 2022) and Focus Area 3: Enhance Biodiversity and Waterway Health in council's Draft Urban Greening Plan 2022–2042.

Did You know?

Studies have demonstrated that over 30 per cent of Australia's threatened species are found in 99 of the country's largest urban areas – a disproportionately high occurrence when compared to the physical extent of land these areas represent (Ives et al, 2016).

Key outcomes sought: Creating a connected and functional urban biodiversity network to support local plants and animals.

7 Based on Moonee Valley Urban Ecology Strategy definition for Urban Ecology

Council's achievements to-date:

Council is continuing its past work in improving the health of urban waterways and natural areas with a renewed focus on the importance of urban forests and canopies. In summary council has undertaken a range of urban biodiversity actions including:

- investing heavily in the revegetation and improvement of urban riparian corridors
- working in partnership with landholders through its conservation partnership programs, including corridor conservation agreements and Habitat Gardens
- the adoption of an Urban Forest Policy in 2019 to guide council's future investments in urban trees
- currently developing an Urban Greening Plan to outline its vision, key objectives and actions to support a greener Ipswich.

URBAN CANOPY COVER

What is urban canopy cover?

Canopy cover is widely used as a measure of green (natural) spaces in urban areas across Australia. This measurement is used in many jurisdictions and studies as a benchmark to measure how many green spaces are being created or lost in urban areas. This is important as it is recognised how important urban green spaces are for both the community (e.g. amenity and cooling) and environment (e.g. habitat, air and water quality) (Green Spaces, Better Places (2014).

Many projects and programs across Australia use this canopy cover to define all types of green spaces, including stands of remnant vegetation, street trees, backyards, parks and other. In this instance, the focus of canopy cover is to measure how much tree and shrub cover there is across the Ipswich region to support urban biodiversity outcomes. In this strategy, urban canopy cover refers to the extent of shrubs and trees within the urban footprint in Ipswich.

How does it support biodiversity outcomes?

Urban canopy cover areas can support local biodiversity by providing the following services for many local native species including:

- habitat (roost sites, hollows etc.) for a variety of bird species and arboreal mammals/marsupials
- habitat for insects which provide food for insectivorous animals
- food (pollen, nectar, fruit and seeds) for birds, flying foxes, insects and other animals that are critical for pollination and resilience of local plant communities
- shade, leaf litter and other woody debris which fall on the ground to support a complex groundcover which supports the growth of other local groundcover species and provides food and habitat for animals.

A recent study in 2018 by Charles Sturt University concluded that to enhance the biodiversity values of this urban natural environment, ideally this vegetation would be consolidated into larger natural area reserves in the urban area rather than spread out as isolated vegetation across suburbs (Geschke et al, 2018).

Summary of canopy cover key attributes:

- contain a mix of native shrubs and trees species
- be in larger urban forests rather than spread out as isolated trees and other vegetation as this is more likely to support a higher diversity of native fauna.

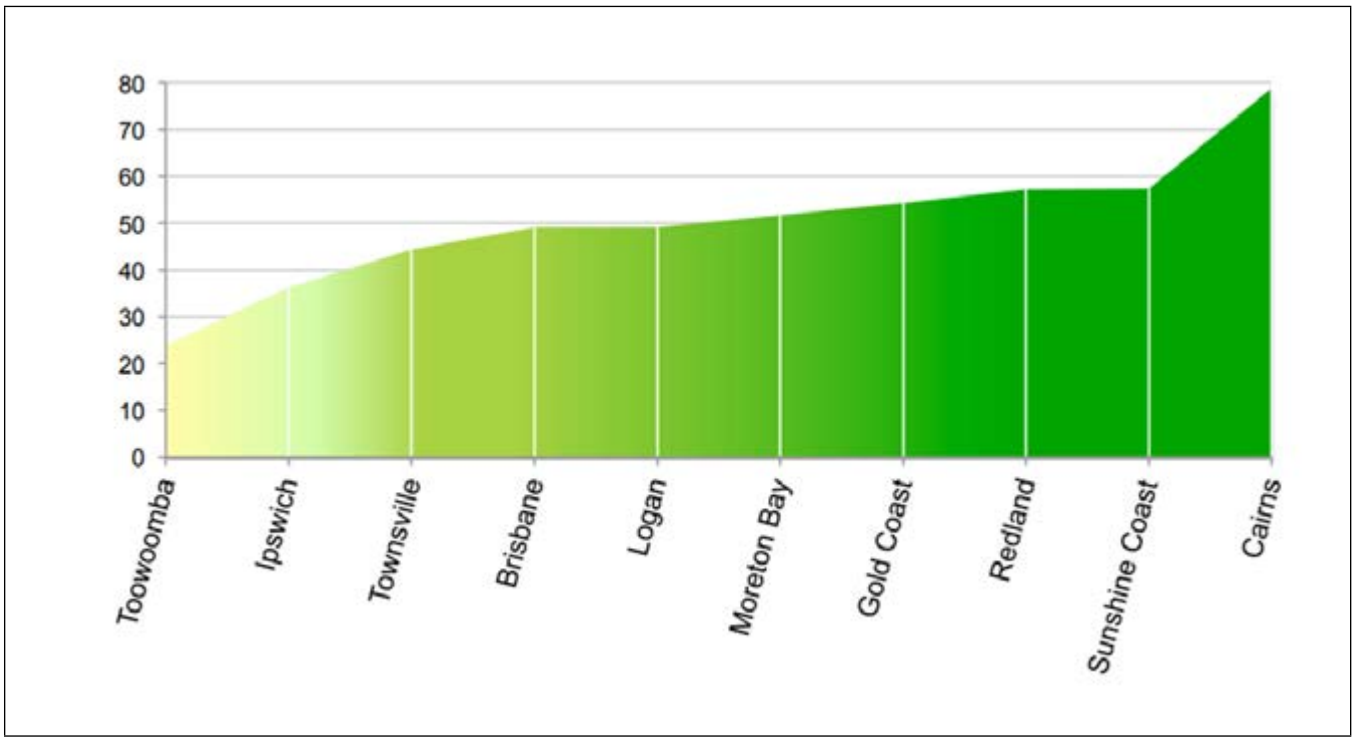
Current condition and key threatening processes

A study undertaken in 2014 by the Institute for Sustainable Futures was done to benchmark the urban tree canopy in cities across Australia (Jacobs et al, 2014). This canopy assessment was done using i-Tree Canopy which is a free-use software tool which uses Google Earth imagery. For Ipswich, the assessment was undertaken using aerial imagery data from 2009 within the Ipswich Local Government Area boundary which was then imported into the i-Tree Canopy software to calculate the canopy cover results. Results from this assessment of the 2009 aerial data for Ipswich showed the following percentage cover for each surface cover category across the entire LGA:

- **hard surfaces** – 5.2 per cent
- **grass and bare ground** – 54.9 per cent
- **shrubs** – 3.7 per cent
- **tree canopy cover** – 36.2 per cent.

Figure 20 compares the Ipswich tree canopy cover to other selected LGAs in Queensland. These results show that in 2009, Ipswich had one of the lowest percentage tree canopy cover results across Queensland and one of the highest percentage covers for grass and bare ground results. This reflects the extent of rural land across the Ipswich and Toowoomba LGAs when compared to some of the other selected government areas. This canopy data does not identify if these species are native or introduced.

Figure 20 – Percentage (%) tree canopy cover for selected Queensland Local Government Areas (Jacobs et al, 2014)



Ipswich City Council has recently completed their own mapping of canopy cover across the urban footprint area within Ipswich to inform the development of the Draft Urban Greening Plan 2021–2026. This canopy cover data has been derived from 2019 LiDAR information from state government mapping and was used in the Draft Urban Greening Plan to compare percentage canopy cover of suburbs in the urban footprint. This data showed a different % canopy cover than the 2014 study as it used a different method and was focused on the urban footprint area only.

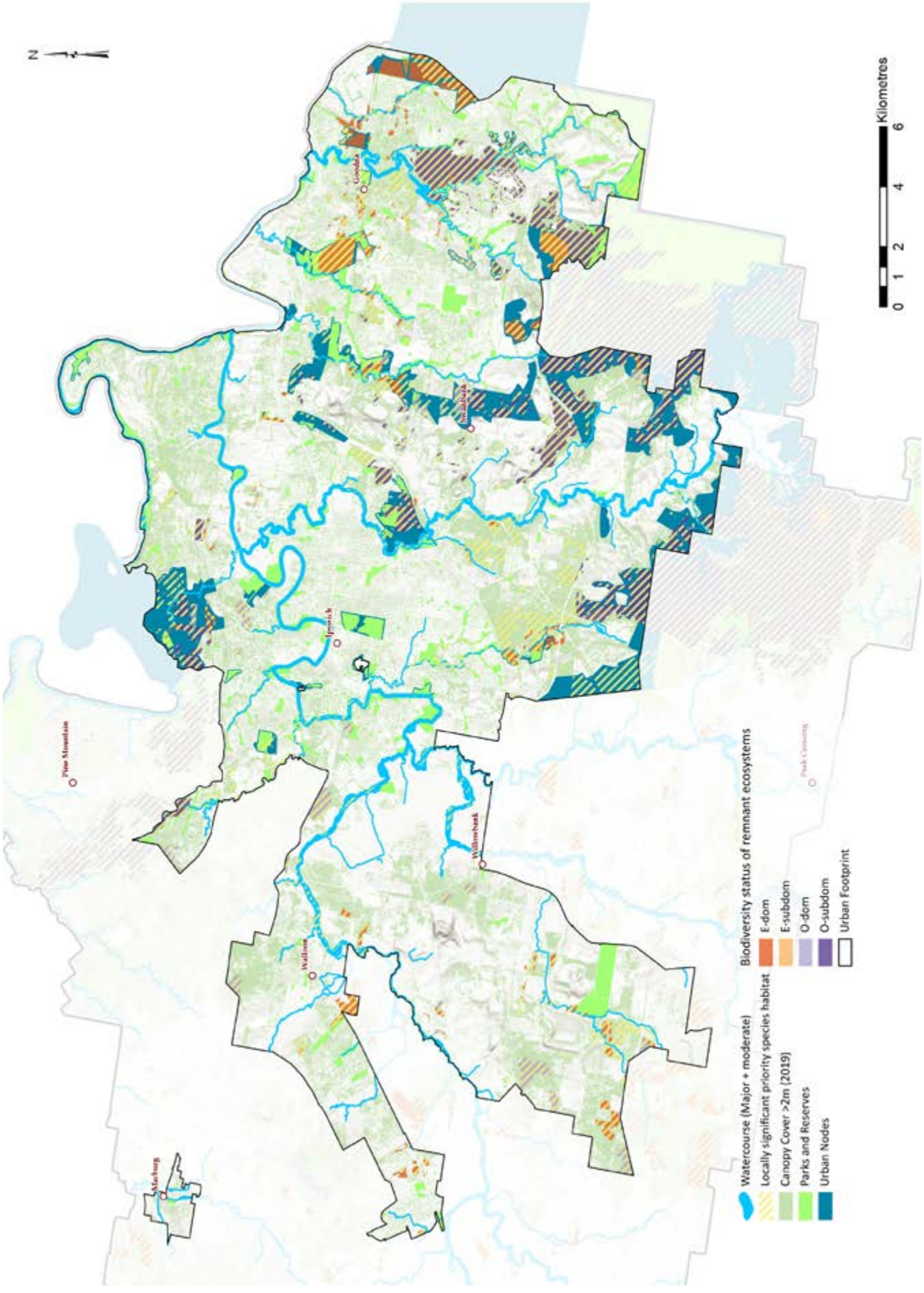
The *Nature Conservation Strategy 2015* also identified and mapped urban nodes, patches of remnant vegetation, which are providing important wildlife habitat within the urban footprint. The Nature Conservation Strategy 2015 defines these as:

- conservation zoning within the Ipswich Planning Scheme or
- existing parks/reserve with environmental values.

Council has also recently completed work to identify several locally significant species and potential habitat across the urban landscapes in Ipswich (City of Ipswich, 2022c) (refer to Natural habitat areas for more information). Figure 21 presents a range of canopy cover, vegetation and urban habitat data gathered and reviewed across the Ipswich urban footprint.

Figure 21 – Urban habitat, vegetation and canopy cover across Ipswich

**Please note the information presented is based on a range of available mapping data and doesn't represent all natural habitat or vegetation cover.*



Key threats to the extent of native vegetation across the urban footprint of Ipswich include:

- **clearing** – the removal of existing vegetation in the urban footprint for urban development including houses, businesses, roads and other infrastructure
- **poor growing conditions** – urban areas are highly modified and can make it difficult for healthy trees due to lack of water, compacted soils and increased temperatures
- **disease** – diseases such as myrtle rust can have a significant impact on urban trees
- **pest species** – introduced weeds and animals impact the extent and condition of native species
- **climate change** – rising temperatures and altered rainfall patterns will place urban trees at risk due to heat stress and lack of water. Interestingly if these risks can be overcome, having healthy native vegetation within urban areas will help to mitigate climate change impacts on the community by creating cooler environments to mitigate urban heat island impacts.

Summary of key threats to functional and healthy urban vegetation across Ipswich:

- **clearing** – the removal of existing vegetation in the urban footprint for urban development including houses, businesses, roads and other infrastructure
- **poor growing conditions** – urban areas are highly modified and can make it difficult for healthy trees due to lack of water, compacted soils and increased temperatures
- **disease** – diseases such as myrtle rust can have a significant impact on urban trees
- **pest species** – introduced weeds and animals impact the extent and condition of native species
- **climate change** – rising temperatures and altered rainfall patterns will place urban trees at risk due to heat stress and lack of water. Interestingly if these risks can be overcome, having healthy native vegetation within urban areas will help to mitigate climate change impacts on the community by creating cooler environments to mitigate urban heat island impacts.

Summary of approaches to improve urban native vegetation cover

Improved urban native vegetation cover can be achieved through a combination of:

- improved knowledge of current condition
- development of measurable and realistic canopy targets
- clarity on requirements and approaches for protection and provision of urban vegetation cover
- delivery of on-ground works such as revegetation and weed control.

Improved knowledge of current condition

The current understanding of the extent and condition of Ipswich's urban vegetation cover is based on an aerial assessment of vegetation taller than two metres. This percentage canopy cover data does not identify the species or condition of this vegetation. Undertaking assessments of this vegetation to understand species present would assist in the future planning, protection and improvement of Ipswich's vegetation to optimise its biodiversity values. As a priority, these assessments could be completed on the larger fragments of urban vegetation which are likely to be providing the highest biodiversity value.

Development of a measurable and realistic canopy target

Having a clear and defined goal of canopy cover for Ipswich will also help to drive investment and delivery of urban native vegetation protection and provision. This has been the case in other Australian states such as Victoria where the provision of canopy targets for urban areas in urban forest strategies areas (e.g. 40 per cent public realm canopy target for City of Melbourne) has helped to drive broadscale tree planting programs and also planning scheme requirements and guidelines for new development (e.g. 30 per cent canopy targets for public realm in new developments in Victorian planning guidelines). Ipswich Draft Urban Greening Plan 2022–2042 has set a target for an increase of canopy cover in high priority suburbs by a minimum of 10 per cent by 2042 for streets, road reserves and active transport routes.

Requirements for protection and provision

A strong policy and planning position is required to define the requirements for the protection of existing native vegetation and the provision of vegetation in new developments. Council's Planning Scheme can provide requirements for new developments to protect, rehabilitate and enhance matters of environmental significance as part of a biodiversity overlay code. These planning scheme requirements can include:

- protecting native vegetation and wildlife habitat
- protecting the biological diversity of matters of environmental significance
- minimising fragmentation of matters of environmental significance
- protecting the ongoing health and resilience of vegetation
- ensuring development incorporates revegetation and landscaping with native vegetation that is suitable for the area and enhances the local biodiversity values.

Vegetation Protection Orders (VPOs) can also be used by council to protect vegetation of extensive value which can include individual trees, a cluster of trees or a large, wooded area with undergrowth. These VPOs can be made through council's Local Law No. 49 – Protection of Important Vegetation.

On-ground urban native vegetation projects

The improvement of the biodiversity value of the vegetation within the Ipswich urban areas will require a combination of weed control, regeneration or revegetation of native species which are resilient to the challenges of growing in urban environments. These works will need to occur on both public and private land to ensure there are connected riparian corridors. Council can assist in this through a range of programs including:

- **Native vegetation in backyards and streetscapes** – council can support programs which aim to increase the biodiversity of landholders backyards and streetscapes such as the existing Habitat Garden program (one of the landholder conservation programs) which is focused on improving the environmental outcomes in backyards. Council also has an Urban Greening Program, which has a Garden Verge Policy as well as a street tree program. This program supports residents in planting native species in their backyards and streetscapes to increase urban biodiversity. Council's Free Plant Program provides locally native species which support local birds, animals and insects.
- **Weed control works** – support ongoing weed control programs to be supplemented with appropriate native vegetation restoration approaches in council areas, with a focus on large urban forests/natural areas.
- **Community gardens** – potential for community gardens supported by council to enhance local biodiversity by providing additional species to attract pollinators.
- **Vegetation requirements in council projects** – protect and restore native vegetation communities on council projects in the urban footprint.
- **Strategic planning and investments** – identify strategic locations for investment in urban vegetation protection and improvement which will provide the highest biodiversity outcomes (e.g. in urban biodiversity corridors or in larger fragmented areas).

Summary of key approaches to improve urban native vegetation cover and condition:

- improved understanding of the current extent and condition of Ipswich's urban native vegetation
- development of a measurable and realistic canopy target for the region to help drive investment and outcomes
- protection and provision of native vegetation in new urban developments optimising biodiversity values
- protection and provision of native vegetation in council projects optimising biodiversity values
- partnerships and education to increase cover of native vegetation species on private land.

What does success look like?

To measure success, the extent and condition of native vegetation cover (trees and shrubs) in the Ipswich urban footprint needs to be measured. Currently council has a canopy cover dataset which can measure the canopy cover taller than two metres. This dataset does not provide details on the species or condition of this vegetation. However, as the only available data currently, this data will be used to measure the urban canopy cover. As a milestone, it would be good to have an improved understanding of the biodiversity value of this canopy (e.g. species and condition) which can be used to improve this dataset.

Objective development:

Priority objective 1: Increased native canopy in urban areas

Indicator: Percentage canopy cover in the urban footprint (above two metres) and use of local native species in council urban greening projects within priority urban habitat area nodes and corridors.

Current state: 27 per cent canopy cover in urban footprint.

Milestone: Improved understanding of urban canopy biodiversity values.

Strategy target: Local native planting used for all urban greening projects in priority urban habitat areas and corridors.

URBAN HABITAT CORRIDORS

What are urban habitat corridors?

Urban habitat corridors provide ecological connectivity within and between urban green spaces. Rehabilitation is a focus for these corridors as these spaces play a key role in biodiversity by supporting natural processes including the movement of species to find food, water, shelter and opportunities to breed. Urban habitat corridors are typically located along urban waterways however they can also be found across the urban landscape where there are valuable patches of vegetation which would benefit from connectivity.

What should they look like?

Urban habitat corridors should have the following attributes to support ecological connectivity:

- diversity of habitats and food to support a variety of native animals
- support ecosystem functions such as pollination, water treatment and air quality improvement
- structural complexity to support movement and shelter for a range of animals. The movement of individuals across the landscape supports gene flow and recruitment which increases genetic diversity and resilience of the local native species.

The ideal width for habitat corridors will depend on the target species. As a rule, the wider the corridor the better. Local scale habitat corridors are typically smaller than regional habitat corridors and can be 50m or less, meaning they can be strongly influenced by edge effects (DEC, 2004). The width adopted for the corridor should be wide enough that human/edge effects do not negatively influence the movement of target species along the corridor (Ford et al. (2019).

Summary of key attributes of urban habitat corridors:

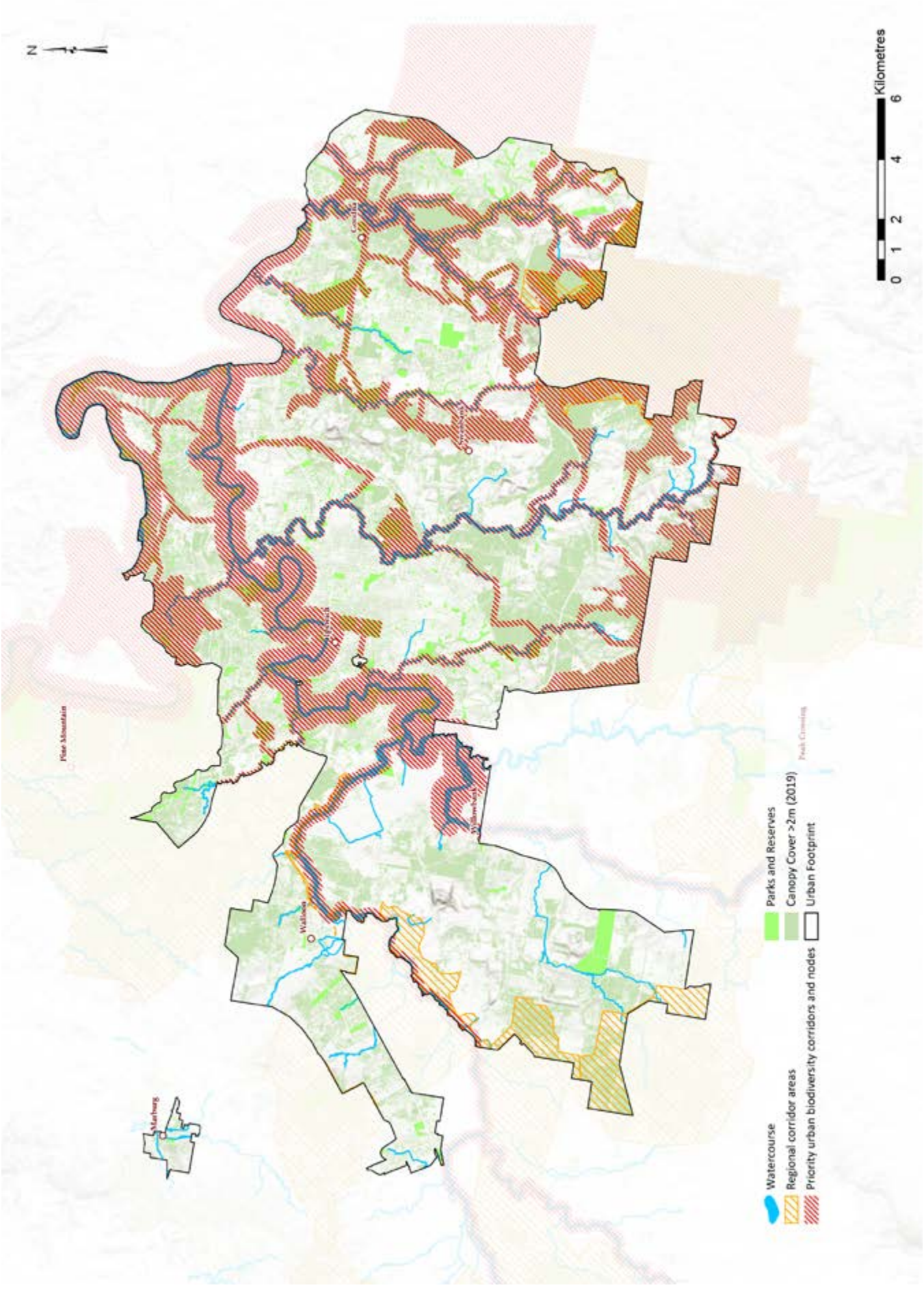
- contain structural and species diversity of native vegetation
- connect key fragments of vegetation with urban areas
- be of a minimum width to support movement of the target species.

Current condition and key threatening processes

Ipswich's urban biodiversity corridors and nodes were mapped in the Nature Conservation Strategy 2015. Further refinement of these urban biodiversity corridors and nodes has recently been completed by council (Redleaf, 2021) (See Ecological Corridors for more information) (Figure 22).

Figure 22 – Urban habitat corridors across Ipswich

**Please note the information presented is based on a range of available mapping data and doesn't represent all vegetation cover or habitat corridors.*



Key threats to urban habitat corridors include:

- **Clearing and degradation resulting from urban development** – clearing of vegetation for urban development including buildings and roads results in further degradation, fragmentation and minimised corridor widths which will increase edge impacts and negatively impact the function of the corridor.
- **Construction of barriers** – the construction of roads, buildings, fences and other urban infrastructure across corridors can create a barrier which can restrict fauna movement.
- **Climate change** – rising temperatures and altered rainfall patterns will place small urban habitat corridors, which are subject to edge effects, at risk due to heat stress and lack of water. On the flip side, if habitat corridors can be provided across the landscape that are of suitable width and genetic diversity, they will help to improve the resilience of the local biodiversity and also improve the resilience of the local communities to urban heat island impacts.

Summary of key threats to functional urban habitat corridors across Ipswich include:

- reduced width and connectivity due to vegetation removal and degradation from urban development
- creation of movement barriers in the form of roads, fences and other urban infrastructure.

Summary of approaches to improve urban habitat corridor extent and condition

The improvement of urban habitat corridor extent and condition across Ipswich will require a combination of:

- improved knowledge of the current condition
- clarity on the requirements for urban habitat corridor protection and enhancement
- delivery of on-ground projects to improve urban habitat corridors biodiversity value.

Improved knowledge of current condition

A more detailed assessment of the condition of the mapped urban habitat corridors across Ipswich would be beneficial to improve the understanding of the existing biodiversity values of the vegetation currently within these corridors. This could include assessments of vegetation communities within council land, development land and/or private allotments as part of council's Landholder Conservation Agreements that sit within the mapped urban habitat corridors. This information could then be used to inform appropriate management plans and priority actions to protect and enhance these urban biodiversity values.

Requirements for protection and connectivity

Planning scheme zones and overlays

A strong policy and planning position is required to define and protect urban habitat corridors. This should build off the assessment and mapping of locally significant species habitat and urban habitat corridors across Ipswich. Council's Planning Scheme can provide requirements for new developments to include ecological connectivity through the protection, rehabilitation and enhancement of vegetation and ecological linkages to provide safe and viable wildlife habitat movement within and between habitat areas. These planning scheme requirements can include ensuring new development:

- provides ecological linkages of sufficient size to facilitate feeding, nesting, breeding, refuge and the movement of wildlife between environmental areas
- retains and restores native vegetation to maintain ecological connectivity
- do not include barriers that may impede the safe movement and dispersal of wildlife except where such barriers are necessary for the safety of people or wildlife
- use local native vegetation species that replicate pre-clearing remnant vegetation composition and structure.

Environmental assessments and management plans should be prepared for sites within the mapped corridors to ensure the new development and infrastructure can safely and efficiently facilitate the movement of the range of the expected local wildlife in the area.

Other protection approaches

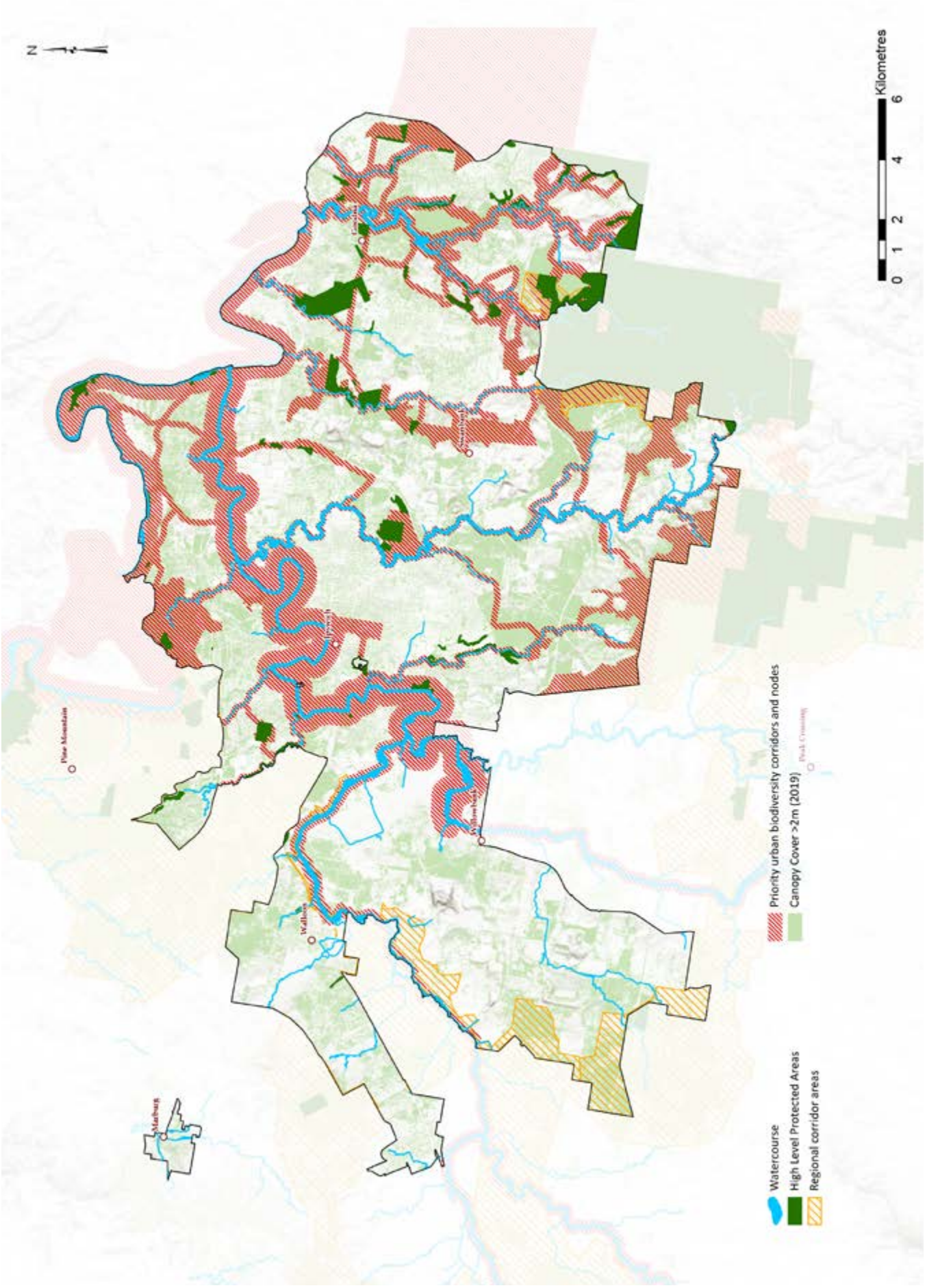
There are a range of other protection measures which can protect vegetation within urban habitat corridors including:

- **Council ownership and management for conservation purposes:** This will typically be focused on the acquisition and protection of high value natural areas within corridors. See Natural Habitat Areas for more information.
- **Private land protection – covenants:** Voluntary Conservation Covenants are also available as part of council's Landholder Conservation Partnership Program to permanently protect in perpetuity intact vegetation on private land. Some of these areas may sit within ecological corridors.
- **Other legislative protection:** There is a range of other national and state legislation as well as vegetation protection orders as part of council's Local Law which can protect the natural environmental values within corridors. See Natural Habitat Areas for more information.

Figure 23 presents the areas within the urban habitat corridors which have a high level of protection due to government ownership for the purposes of conservation.

Figure 23 – Protected areas within Ipswich's urban habitat corridors

**Please note the information presented is based on a range of available mapping data and doesn't represent all vegetation cover or habitat corridors.*



On-ground urban native vegetation projects within mapped corridors

The improvement of the biodiversity value of the urban habitat corridors across the Ipswich urban areas will require a combination of rehabilitation of degraded areas and revegetation in cleared areas. These works will need to occur on both public and private land to ensure connected habitat corridors. Council can assist in this through a range of programs including:

- **Riparian corridor revegetation** – this can either be achieved through natural regeneration, assisted regeneration or reconstruction/revegetation (see section 2: Waterways and wetlands health improvement – Riparian corridors, for more information)
- **Targeted rehabilitation and revegetation on private properties with native vegetation** – council can support programs which aim to increase the biodiversity of private allotments within mapped urban habitat corridors using the existing Habitat Garden program which is focused on improving the environmental outcomes in backyards.
- **Vegetation requirements on all council land** – any council projects which are completed on council land within mapped urban habitat corridors should ensure that the works protect and rehabilitate native vegetation and ecological linkages to provide for safe and viable wildlife habitat movement.
- **Strategic investments and other partnerships** – strategic investments within urban habitat corridors can help to improve biodiversity outcomes in strategic locations. This can include the use of environmental offsets to rehabilitate urban biodiversity corridors in key locations and/or acquisition of key locations to protect and enhance key locations within the urban habitat corridor.

Summary of key approaches to improve urban habitat corridor condition and protection include:

- improve understanding of the current biodiversity value of the urban habitat corridors
- protection and provision of suitable urban habitat corridor widths and remnant vegetation
- rehabilitation and revegetation of native plant species within urban habitat corridors.

What does success look like?

To measure success, the extent and condition of urban habitat corridors which are protected needs to be measured. This requires two main datasets:

1. Urban habitat corridors – mapped based on:
   - NCS corridor urban (only for the area outside of the Redleaf study)
   - priority urban biodiversity corridor and nodes (as a combination of the Redleaf mapping layers):
     - riparian regional corridors
     - established corridors
     - enhancement corridors
     - steppingstone corridors
     - established urban nodes
     - enhancement urban nodes.
2. Areas within these urban habitat corridors which are protected:
   - Natural Area Estate
   - local bushland reserves
   - nature refuges
   - covenants.

The overlay of these datasets measures the extent of urban habitat corridors which are protected. Additional assessments of these areas will be required to gain an understanding of their condition. Data on any works completed in these areas can be used to measure improved condition (e.g. weed control and/or revegetation projects).

Objective development:

Priority objective 2 – Increase the extent and condition of protected urban habitat corridors

Indicator: Area of urban habitat corridors protected and enhanced through restoration works. Ideally this would be supported with a condition assessment of protected corridor areas.

Current state: 759ha of urban habitat corridors protected.

Milestone: Improved understanding of protected area condition through assessments.

Strategy target: Restoration of over 10ha of urban habitat corridor area each year.

6 Rural biodiversity enhancement

Important definitions:

Rural lands – rural land sits outside of the urban footprint and includes the following across Ipswich:

- **agricultural and pastoral land** – areas of good quality soil where rural production is or could be carried out
- **rural living areas** – un-serviced rural lots that provide for non-urban living
- **rural townships** – smaller un-serviced settlements with a limited mix of uses and detached housing
- **natural areas** – areas which contain important nature conservation values such as remnant vegetation[8].

There is a rich rural history in the region which includes many activities and land uses such as timber, sugar cane, dairy, cropping and grazing. There are areas identified by the state government as currently being used for broadacre cropping and poultry farms across Ipswich particularly along the Bremer River, Franklin Vale Creek and Western Creek. While grazing still occurs across the region, it is not generally the primary income for the household. This reflects the use of this land across South-East Queensland with the Queensland Government recognising that:

> *"this land is typically now valued more for its amenity by those seeking a rural lifestyle than its productivity capacity for agriculture"*
>
> *(Queensland Government, 2013).*

Agriculture is a state interest for the Queensland Government in the State Planning Policy. A land audit in 2013 was completed to identify land which was important to current and future agricultural production across Queensland. Agricultural land classifications are used to identify agricultural land that can be used sustainably for a wide variety of uses with minimal land degradation, including Class A and B land which have soil and land characteristics that can support successful crop and pasture production:

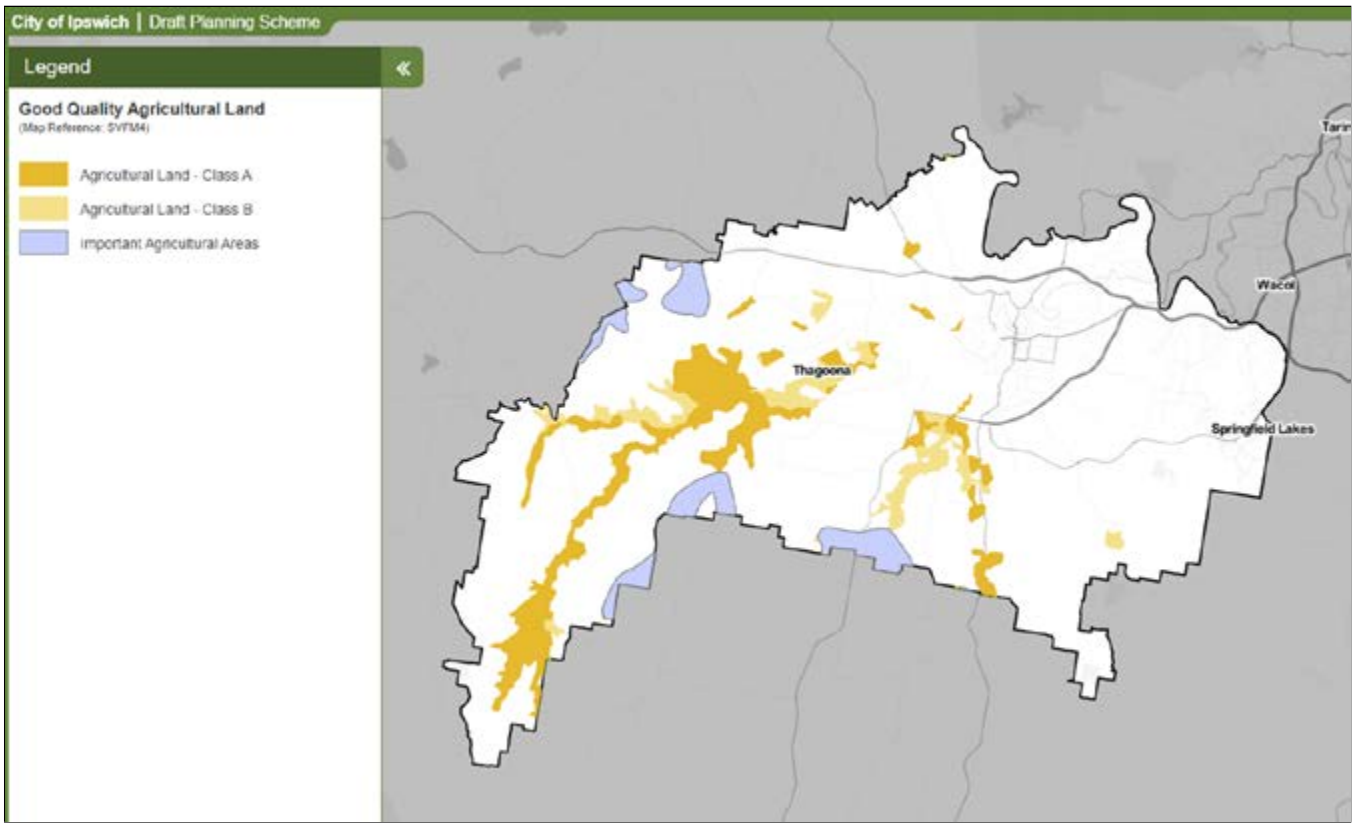
- **Class A** – crop land that is suitable for a wide range of current and potential crops with nil to moderate limitations to production
- **Class B** – limited crop land that is suitable for a narrow range of crops. The land is suitable for sown pastures and may be suitable for a wider range of crops with changes to knowledge, economics or technology.

(Queensland Government, 2022b)

Protecting Class A and B land for sustainable agriculture into the future is a key outcome sought in the State Planning Policy. Strategic cropping areas are also protected under the *Regional Planning Interests Act 2014* which has a trigger map for land that is likely to be highly suitable for cropping. Within Ipswich, most of this high-quality agriculture and cropping land is located along the Bremer River, Franklin Vale Creek, Western Creek, Warrill Creek and Purga Creek. This aligns with the Ipswich City Council land zoning (Figure 24).

8 Based on ICC Planning Scheme and the Ipswich Transect (Ipswich.qld.gov.au/__data/assets/pdf_file/0004/114097/Ipswich_Transect.pdf)

Figure 24 – Good quality agricultural land across Ipswich (from Draft Planning Scheme – Maps.ipswich.qld.gov.au/draftplanningscheme/)



The location of high value rural land along the Ipswich creeks and rivers is not surprising as floodplains are generally the most fertile and productive areas in catchments. Many important ecological corridors are located in these rural areas connecting key natural habitat areas across this rural landscape (see *Rural Ecological Corridors*). Balancing the role of floodplains to convey and store water during floods with the protection of agriculture and the environment has become a key focus for the governments in Queensland since the 2011 floods (QRA, 2011).

Key threats to both land productivity and the natural environment in rural areas include:

- **Pest species** – weeds and pest animals can cause significant economic loss to farmers as well as cause degradation of the natural environment and local biodiversity.
- **Poor land management practices** – overstocking and poor animal management practices, poor soil cover and poor soil condition can all result in erosion and loss of soil. The loss of productive soil has an impact on both the land productivity as well as impacting receiving waterways and wetlands.
- **Salinity** – tree clearing and excessive irrigation can increase the risk of salinity in certain rural landscapes across Ipswich which can significantly impact rural productivity and water quality.
- **Peri-urbanisation** – the transition of once predominately rural areas into mixed peri-urban and rural can have several impacts. These impacts include fragmentation of vegetation and rural lands, as well as social impacts such as incompatibility of agricultural activities alongside other land uses and increased land costs.
- **Climate change** – increased seasonal variability and uncertain availability of water makes it difficult for existing and new rural activities.
- **Mining** – large areas of rural land across Ipswich are under mineral and coal exploration licences.

(Queensland Government, 2013)

The natural environment has traditionally been modified to accommodate rural activities including draining floodplain wetlands and the removal of native vegetation. New approaches such as regenerative farming which puts a focus on conserving and rehabilitating soil health, biodiversity and water resources, recognises the important role that the natural environment plays in supporting rural land productivity. This holistic approach to rural land management also opens additional investment opportunities for the rural areas including carbon farming. As an example, the Queensland Government's Land Restoration Fund supports rural landholders in generating income using land management approaches which provide carbon capture outcomes.

They have identified the following as the most relevant carbon farming methods in South-East Queensland:

- environmental plantings
- human-induced regeneration
- native forest from management regrowth
- avoided clearing
- soil carbon methods.

More information on the Land Restoration Fund can be found at: **Qld.gov.au/environment/climate/climate-change/land-restoration-fund**.

The focus of this strategy is on the improved condition and connection of important natural environment features across the rural landscapes, including ecological corridors and floodplains. These priority objectives also reflect the outcomes of the broader stakeholder feedback (refer to the *Natural Environment Strategy – Stakeholder Engagement Report 2022*).

Key outcomes sought: Connecting vegetation, water and soil to improve the productivity and biodiversity of our rural lands.

Council's achievements to-date:

Council has been completing assessments, developing plans and working with landholders to improve the condition of the natural environment across the Ipswich rural landscape to benefit both the residents and the environment. In summary, council has worked in partnership with many stakeholders to help improve rural biodiversity including:

- development of the Black Snake Creek Improvement Plan with the local community and other stakeholders to identify actions to improve flooding, water quality and salinity issues across the catchment
- co-development of Catchment Action Plans for the Bremer and Mid—Brisbane Rivers as part of the Resilient Rivers Initiative to identify actions on rural lands to protect waterways and keep soil on the land
- funding and delivery of actions across the rural catchments of the Bremer River and Black Snake Creek including floodplain revegetation
- development of the Ipswich Integrated Catchment Plan to identify actions to improve flood resilience across the region including opportunities for floodplain protection and revegetation
- planning and investment in the Franklin Vale Creek Catchment Initiative through council's Stormwater Quality Offset scheme which supports partnerships with landholders to improve waterway health through revegetation, bank stabilisation and improved land use practices
- worked in partnership with landholders through its conservation partnership programs, including Corridor Conservation Agreements, Land for Wildlife and Biodiversity Conservation Agreements.

RURAL ECOLOGICAL CORRIDORS

What are rural ecological corridors?

Rural ecological corridors are areas which have been identified and mapped as important connectors across the rural landscape in Ipswich that link important habitat areas. These ecological corridors across rural areas can support many more functions in addition to biodiversity and ecological connectivity including:

- **wind breaks** – continuous vegetated corridors can reduce soil erosion as the vegetation slows wind velocities and diminishes its energy to dry out soil and plants and to dislodge and transport soil particles
- **soil stabilisation** – the roots of the vegetation within the corridors also stabilise the soil and banks of waterways
- **improved soil condition and carbon storage** – vegetation increases carbon storage in soil which can lead to improved cropping productivity in the local vicinity
- **improved water quality** – vegetation within corridors intercept surface and sub-surface flows, allowing for removal of sediments and agricultural chemicals before they flow into receiving waterways and wetlands
- **soil moisture and groundwater recharge** – vegetation slows flows and acts as a sponge in the landscapes, retaining soil moisture and in some locations, recharging groundwater supplies

- **shade and shelter** – vegetated corridors provide shade and cooling benefits for livestock, reducing heat stress
- **reduced flooding** – the slowing and attenuation of flows within vegetated corridors can also improve downstream flooding and the potential for flood damage by reducing flood volumes and velocities.

(USDA, 1999)

What should they look like?

Ecological corridors should reflect the features identified in section 3: Biodiversity and threatened species recovery – ecological corridors.

These corridors should have structural complexity, both vertically and horizontally as outlined below:

- **Vertical structure** – this is important to provide habitat for a diverse range of native species. Ideally, this vertical structure will compose canopy, midstory and groundcovers. Changes in this structure will decrease some of the rural corridors functions, for example, removing the shrub layer will dramatically impact the corridors function as a windbreak (USDA, 1999).
- **Horizontal structure** – ecological corridors come in many shapes, including linear corridors, steppingstones or landscape mosaics (Berges et al, 2011). These different ecological corridors can support safe movement of different species. Typically, the corridors with the fewest gaps will have the greatest level of ecological connectivity (USDA, 1999).

The ideal width for rural ecological corridors will depend on the vegetation structure, diversity and condition as well as the adjacent land uses, edge effects and the target fauna species. As a rule, the wider the corridor the better. A study for Moreton Bay Regional Council (Cardno Chenoweth, 2012) identified that to allow regional scale movement for a diverse range of wildlife and to support viable communities of species in the corridor itself, it should be at least 350–500m. The minimum width of 350m provides an adequate buffer to the corridor from degrading edge impacts such as invasive species. It is recognised that it can be difficult to achieve this width across the landscape and the corridor may be made up of some bare patches (which will not pose a gap for species such as koalas in rural areas) between patches of vegetation (which are important steppingstones for birds etc.) (Cardno Chenoweth, 2012).

Summary of key attributes of rural ecological corridors:

- contain vertical and structural diversity of native vegetation communities
- be of a minimum width to support movement of the target species and reduce edge impacts.

Current condition and key threatening processes

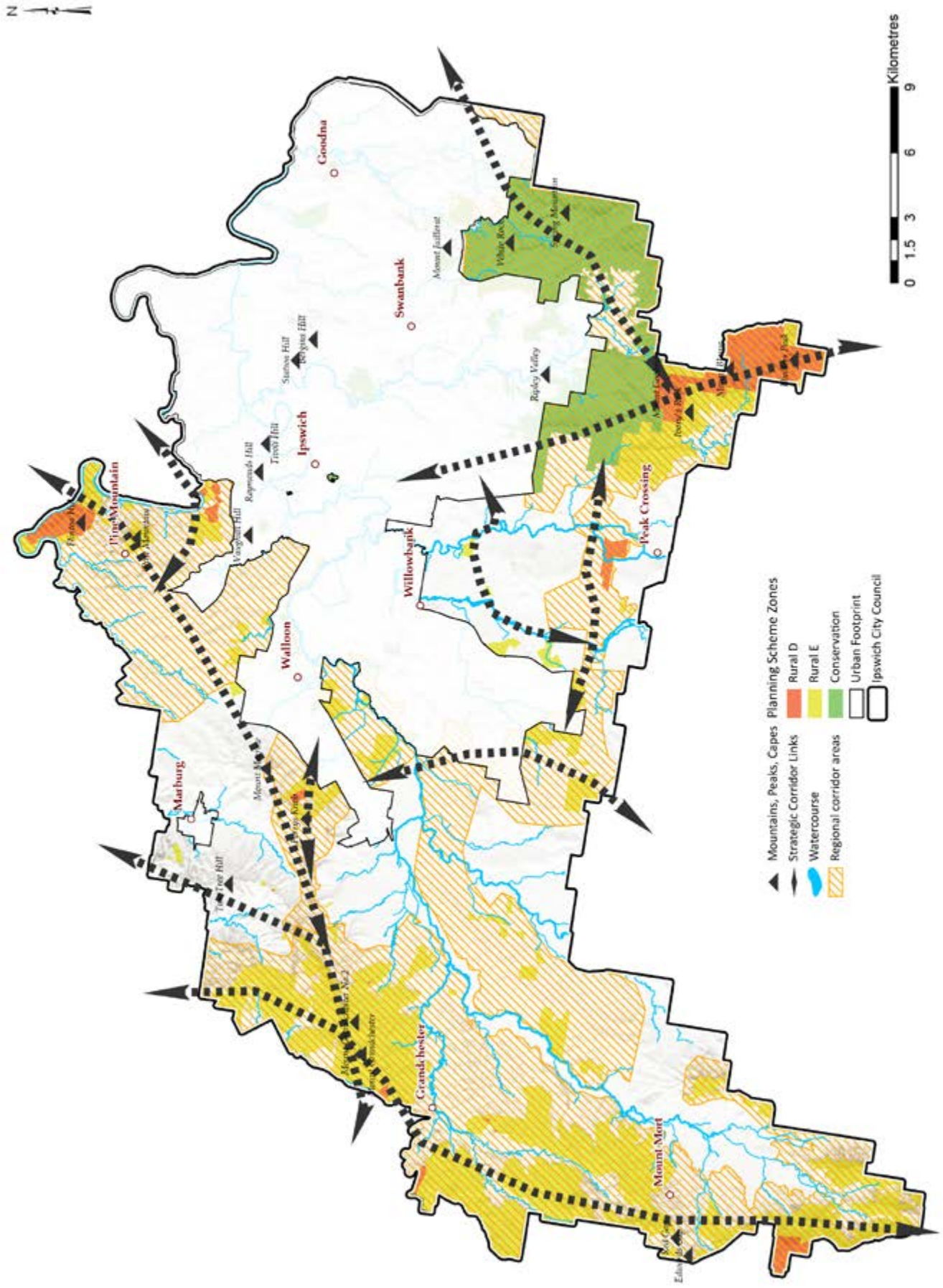
Work undertaken as part of council's Nature Conservation Strategy 2015 identified rural corridors as an important component of Ipswich's habitat network. These rural local corridors were identified within the rural landscape to "increase the local connectivity and provide focal points for rehabilitation, aimed at battling fragmentation by encouraging increases of the current vegetation cover". The corridors in the Habitat Network Plan also includes regionally significant corridors which support wildlife movement into neighbouring areas including:

- Flinders Karawatha Corridor
- Little Liverpool Range
- D'Aguilar Range.

Updated ecological mapping has been completed for this strategy which has reviewed the mapping undertaken for the Nature Conservation Strategy with recent Queensland Government corridor mapping. This assessment is described in more detail in Ecological corridors. Figure 25 shows the rural ecological corridors across Ipswich.

Figure 25 – Ipswich's rural ecological corridors

**Please note the information presented is based on a range of available mapping data and doesn't represent all rural ecological values.*



Key threats to rural ecological corridors include:

- **clearing** – clearing of vegetation for rural activities results in further fragmentation and/or minimised corridor widths which will increase edge impacts and negatively impact on the function of the corridor
- **pest species** – reducing corridor widths and the occurrence of pest species in rural areas degrades the ecological value of the corridor
- **construction of physical barriers** – the construction of fences, roads, rail corridors and other infrastructure across corridors can create fauna movement barriers limiting fauna movement
- **climate change** – increased risk of bushfires can lead to reluctance from the rural community to undertake revegetation works on their properties. The drying climate and potential limited water supplies for irrigation may also make it difficult to establish and maintain healthy vegetation in the corridors.

Summary of key threats to functional rural ecological corridors across Ipswich include:

- increased fragmentation and edge impacts due to clearing and thinning of vegetation within corridors
- pest species and grazing reducing the native species diversity and quality and function of the corridor
- physical barriers to fauna movement due to linear infrastructure such as roads and rail corridors
- bushfires and water availability due to a changing climate.

Summary of approaches to improve rural ecological corridor protection and condition

The improvement of rural ecological corridor extent and condition across Ipswich will require a combination of:

- improved understanding of the current condition and appropriate ecological restoration approaches
- strong protection of rural ecological corridor values
- clear standards for ecological restoration
- delivery of on-ground projects to improve rural ecological corridor biodiversity value.

Improved understanding of current condition and appropriate restoration approaches

Having an improved understanding of the current condition of the mapped rural ecological corridors across Ipswich would be beneficial to identify the existing biodiversity and connectivity values and recovery potential of these corridors. This could include assessments of vegetation communities on private allotments as part of council's Landholder Conservation Agreements that sit within the mapped rural ecological corridors. This information can then be used to build the understanding of the **benefits of rural ecological corridors to rural landholders** and inform appropriate management plans and priority actions to protect and enhance these rural ecological values.

Protection of rural ecological corridors

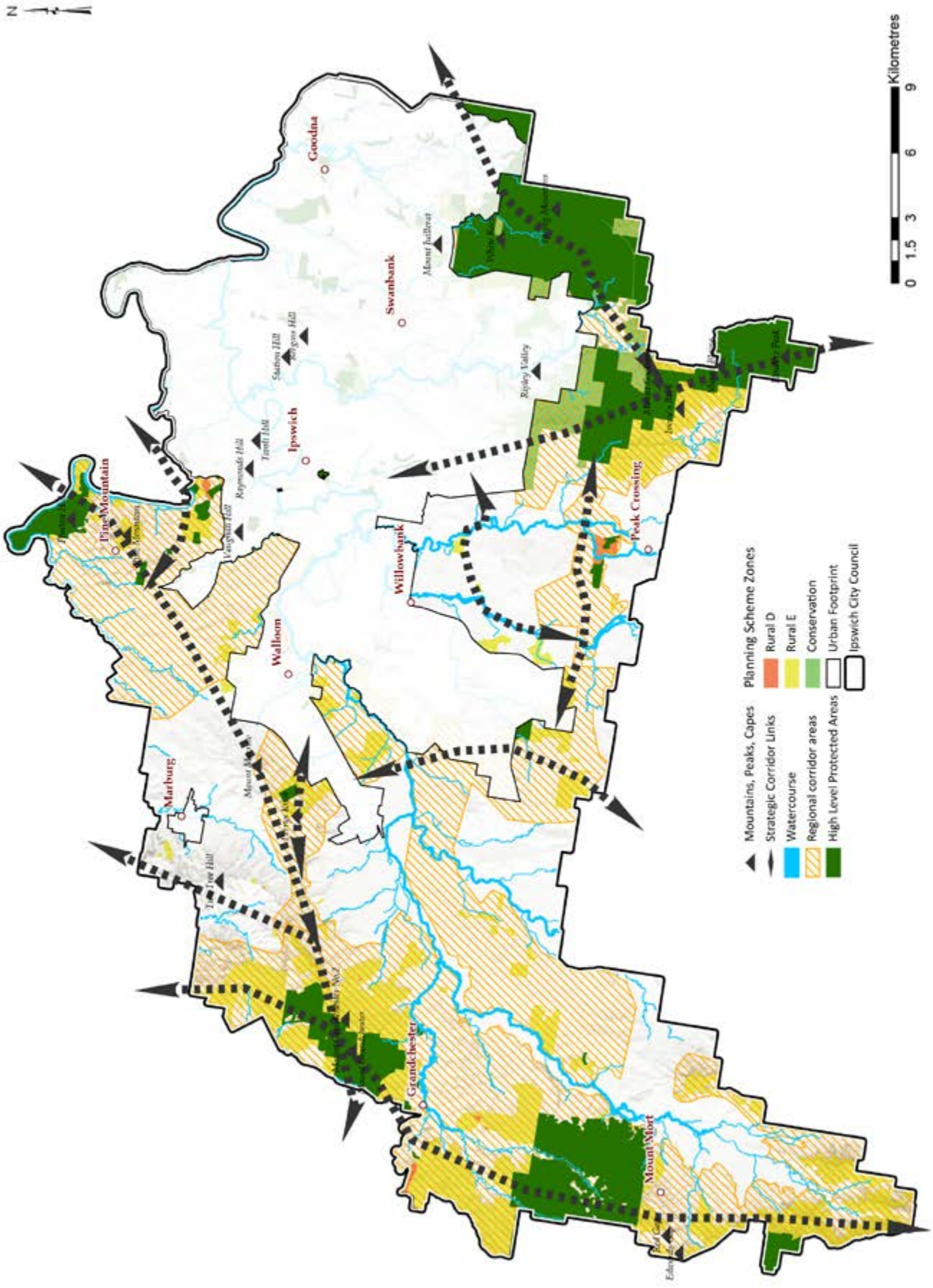
The protection of high value ecological corridors across rural lands can be achieved several ways including:

- **Government ownership and management for conservation purposes (high level protection)**:
  This will typically be focused on the acquisition and protection of high value natural habitat areas within corridors. See Natural Habitat Areas for more information.
- **Private land protection – covenants (high level protection)**:
  Voluntary Conservation Covenants are also available as part of council's Landholder Conservation Partnership Program to permanently protect in perpetuity intact vegetation on private land. Some of these areas may sit within ecological corridors.
- **Legislative and planning scheme regulations (medium level protection)**:
  - Planning scheme overlay codes: Biodiversity overlays can identify where development needs to provide biodiversity outcomes including protection of native vegetation and provision of suitable connectivity between natural habitat areas. There is limited development in these areas which would trigger these overlays and development codes.
  - There is a range of other national and state legislation as well as vegetation protection orders as part of council's Local Law which can protect the natural environmental values within corridors. See Natural Habitat Areas for more information.
- **Private land as offset receival sites**:
  There is a potential for receiving offsets for vegetation offsets to be located across the rural landscape. The legal mechanism to protect these offsets on private land needs to ensure this is protected into the future.

Figure 26 presents the areas within the rural ecological corridors which have a high level of protection due to government ownership for the purposes of conservation.

Figure 26 – Protected areas within rural ecological corridors

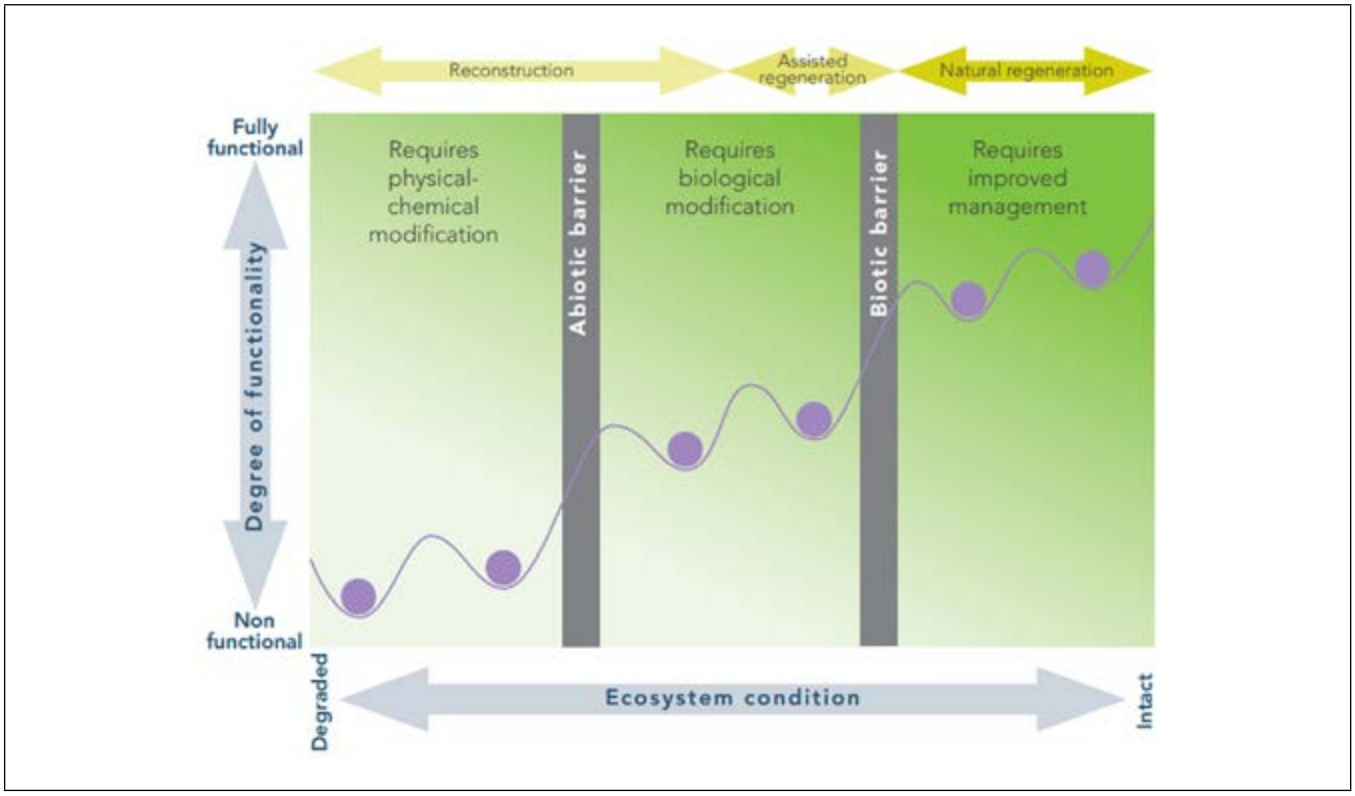
**Please note the information presented is based on a range of available mapping data and doesn't represent all rural ecological values.*



Clear standards for ecological restoration

The condition of the rural ecological corridors ranges from areas with remnant vegetation to areas which are completely cleared. The restoration, rehabilitation and revegetation work within these corridors should be informed by an appropriate ecological restoration approach based on the recovery potential of the site. For example, a natural regeneration approach may be suitable for a site with good recovery potential, but reconstruction or revegetation might be required on highly degraded sites with limited recovery potential (Figure 27).

Figure 27 – Conceptual model of ecosystem degradation and restoration highlighting different restoration approaches that may be required based on the existing ecosystem condition (from SERA, 2018).



More information on this ecological restoration approach and guidance on how to best achieve it on projects can be found in:

- South-East Queensland Ecological Restoration Framework Guideline (Chenoweth EPLA and Bushland Restoration Services (2012)
- National Standards for the Practice of Ecological Restoration in Australia (SERA, 2018).

Adopting this approach, council and landholders can optimise the planning, delivery and monitoring of works within the rural ecological corridors to ensure that optimal ecological outcomes are achieved.

On-ground restoration works within mapped corridors

The improvement of the biodiversity value of the ecological corridors across privately owned rural landscapes across Ipswich will require a strong partnership with landholders to deliver a combination of protection and restoration of existing high value areas, rehabilitation of degraded areas and revegetation in cleared areas. Council can assist in this through a range of programs including:

- **Landholder Conservation Agreements** – council can support landholders in the protection and enhancement of ecological values on rural land through agreements such as the Biodiversity Conservation Agreement, Corridor Conservation Agreement and Voluntary Conservation Agreements. The Corridor Conservation Agreement is of relevance as this is the only agreement that is established to support restoration of landscape and waterway corridors in land that is not currently zoned for conservation in the planning scheme. However, the land must be in a mapped zone in the Nature Conservation Strategy. This should be reviewed to ensure that this mapping is current to ensure all opportunities for corridor enhancement are included across the rural landscape.
- **Strategic investments and other partnerships** – strategic investments within rural ecological corridors can provide benefits for multiple stakeholders and the natural environment. For example, targeting vegetation offsets within mapped ecological corridors can optimise the outcomes of this investment.

Summary of key approaches to improve rural ecological corridor condition and protection include:

- providing an understanding of the biodiversity benefits of rural ecological corridors and effective ecological restoration approaches to rural landholders
- providing protection of rural ecological corridors
- targeted restoration within rural ecological corridors.

What does success look like?

To measure success, the extent and condition of rural ecological corridors which are protected needs to be measured. This requires two main datasets:

1. **Rural ecological corridors** – mapped based on ecological corridors (consisting of the following) occurring on land outside of the urban footprint:

- strategic corridor links (combination of state terrestrial corridors and NCS priority local corridors and regional corridors as dotted arrows showing connectivity)
- corridor areas (as a combination of):
  - NCS corridor urban (only for the area outside of the Redleaf study)
  - NCS corridor area.
- priority urban biodiversity corridor and nodes (as a combination of the Redleaf mapping layers):
  - riparian regional corridors
  - established corridors
  - enhancement corridors
  - steppingstone corridors
  - established urban nodes
  - enhancement urban nodes.

2. **Areas within these rural ecological corridors which are protected** – mapped as a combination of the following to show areas with high level protection:

- Natural Area Estate
- local bushland reserves
- nature refuges
- covenants.

The overlay of these datasets measures the extent of rural ecological corridors which are protected. Additional assessments of these areas will be required to gain an understanding of their condition.

Objective development:

Priority objective 1: Restoration and protection of rural ecological corridors

Indicator: Area of ecological corridors on rural lands that have had restoration works undertaken. Ideally this should be supported with an improved understanding of the condition of the corridor and the amount of it that is protected.

Current state: 10,082ha of biodiversity ecological corridors across rural landscapes with high level protection.

Milestone: Increase understanding of extent and requirements for rural corridors.

Strategy target: Restoration of over 390ha of ecological corridor area each year.

FLOODPLAINS

What are floodplains and why are they important?

Floodplains are areas of land adjacent to a waterway which stretch from the banks of the waterway channel to the base of the enclosing valley walls including wetlands and riparian corridors. They are periodically inundated with water from the waterway when flows exceed the channel capacity.

Ipswich's Waterway Health Strategy 2020 Background Report identifies that healthy floodplains should have the following characteristics:

- longitudinal connectivity along waterways
- lateral connectivity with the waterway
- species diversity of native vegetation, capable of responding to the different frequencies of inundation
- broad, wide and shallow landscapes, often comprising of wetlands.

Ideally, floodplains will function in a manner which supports the native vegetation which was present prior to clearing. Within the riparian and floodplain corridor this vegetation would be include a mix of eucalyptus (such as Queensland blue gum), casuarinas and melaleuca species and a mix of shrubs and ground covers (refer to Image 4 for an example of floodplain vegetation).

Image 4: Example floodplain vegetation (City of Ipswich, 2021)

Healthy and connected floodplains support a range of important ecosystem services such as:

- flood mitigation by slowing, conveying and storing floodwaters
- improved water quality by reducing soil erosion, and capturing and treating pollutants when inundated
- provide important landscape connectivity and habitat for many plants and wildlife (e.g. important fish nurseries)
- sustainable agriculture through productive and fertile soil
- recharging of aquifers.

Summary of natural and healthy floodplain attributes:

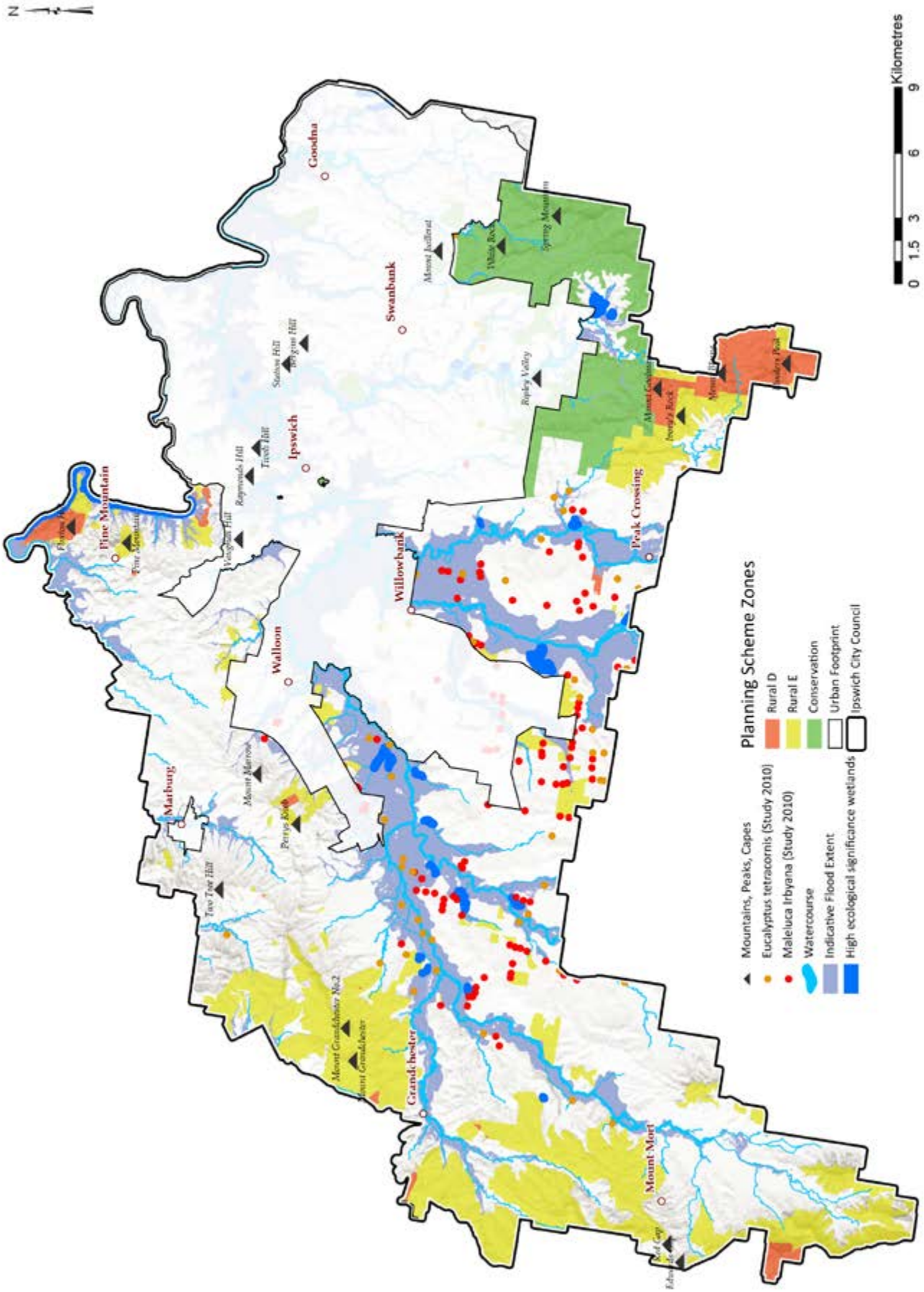
- longitudinal connectivity along waterways
- lateral connectivity with the waterway
- species diversity of native vegetation, capable of responding to the different frequencies of inundation
- broad, wide and shallow landscapes, often comprising of wetlands.

Current condition and key threatening processes

There has been an increased focus on building an understanding of the region's floodplains and the role they play in flood management since the 2011 floods. Flood assessments (such as the Ipswich River Flood Study) and flood risk assessments (as undertaken in the Ipswich Integrated Catchment Plan) have been a key focus for these floodplain assessments. This modelling can be used to identify the floodplain extent based on the land adjacent to the waterways of Ipswich which may be inundated in these large flood events (such as 1 in 100 (1% AEP) up to the probable maximum flood extent (PMF)). The flood modelling can also show the level of engagement between the channel and the floodplain by looking at the extent of inundation in the lower flow events (ideally less than 1 in 10 (10% AEP)). Figure 28 shows the floodplain extent based on the best available data over the entire Ipswich region which is currently represented using the hydraulic risk mapping (using all levels except the highest risk) from the Ipswich Integrated Catchment Plan flood modelling. For this strategy the hydraulic risk mapping is used to define floodplain. Ideally this floodplain extent will be updated based on current flood modelling of the region.

Figure 28 – Ipswich rural wetlands, important vegetation and indicative floodplain extent (based on hydraulic risk mapping)

**Please note the information presented is based on a range of available mapping data and doesn't represent all vegetation or wetlands.*



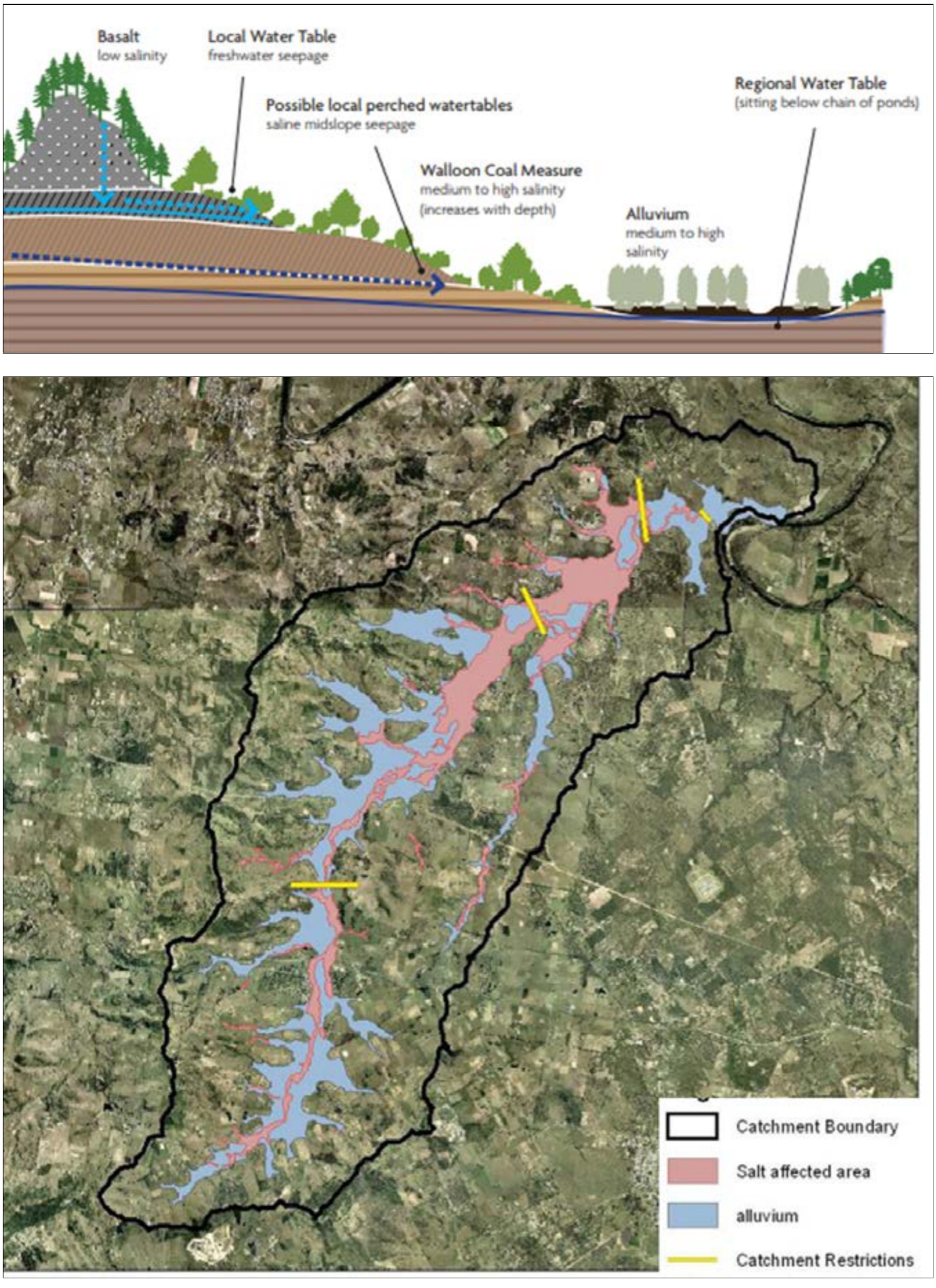
While the flood modelling can highlight floodplain areas which are well connected and engaged with the waterway flows, there is limited understanding of the ecological condition of these floodplains. The Queensland Wetlands program have identified that there are over 500 wetlands within the Ipswich City Council LGA, with most located within the floodplain areas. These wetlands are a combination of lacustrine wetlands (open water bodies such as farm dams) and palustrine wetlands (floodplain vegetated wetlands which only experience periodic wetting). There are a number of these which have been identified as high value wetlands (Figure 28).

There are also several significant plant species located across the floodplains of Ipswich including threatened ecological community swamp tea-tree *(Melaleuca irbyana)* and Queensland blue gum (*Eucalyptus tereticornis*). Swamp tea-tree is listed as critically endangered in the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*. Queensland blue gum is one of the most important koala food trees in Queensland. The potential location of a number of these significant tree species across Ipswich is shown in Figure 30 based on a study undertaken in 2010.

Many floodplains across Ipswich have been heavily modified due to urbanisation and farming practices. Threats to rural floodplains include:

- **Disconnection of flows** – eroded waterways result in less frequent inundation of floodplains with catchment flows due to deeper and wider channels which convey most of the storm flow volume. Building of levees and other such infrastructure also disconnects the waterway flows from the floodplain. This disconnection of flows reduces the capacity of the floodplain to deliver its many important ecosystem services.
- **Filling and draining of floodplain wetlands** – many floodplains and their wetlands are ephemeral in nature, meaning that they are typically dry and only hold water after rainfall events. These areas which can be seen as 'boggy' can be subject to draining or filling as part of agricultural practices, transforming them into more permanent terrestrial environments.
- **Removal of native floodplain vegetation** – clearing and grazing of native floodplain vegetation communities for farming purposes reduces the biodiversity and also the ability of these areas to slow and retain flows.
- **Salinity** – despite being caused by tree clearing and changes in hydrology across the catchment, salinity can be a key issue in the flat alluvial floodplains across Ipswich. Figure 29 shows an example of how surface salinity in the floodplains of Black Snake Creek is generated by shallow water tables which have a high concentration of dissolved salts from the underlying geology. Figure 29 also shows the extent of this salinity within the Black Snake Creek floodplain.

Figure 29 – Section showing salinity processes (top) and salinity affected floodplains (bottom) in the Black Snake Creek catchment (Upper Black Snake Creek Improvement Plan (City of Ipswich, 2014))



Summary of key threats to functional and healthy floodplains in rural lands across Ipswich:

- disconnection of the floodplain from waterway flows due to eroded channels and/or the creation of infrastructure such as levees
- filling and draining of floodplains and their wetlands to support rural activities
- removal of native floodplain vegetation due to clearing or grazing
- salinity in the alluvial plains due to shallow groundwater with high concentrations of dissolved salts which is influenced by tree clearing and hydrology changes across the catchment.

Summary of approaches to improve rural floodplain function and protection

The improvement of rural floodplain function across Ipswich will require a combination of:

- improved understanding of the current condition
- protection of floodplains and significant wetlands
- strategic investments into multi-functional floodplains
- support landholders to restore functional floodplains.

Improved understanding of current condition

A more detailed assessment of the ecological condition of the rural floodplains and wetlands across Ipswich would be beneficial to better inform strategic decision making and investments. For example, the Waterway Health Strategy 2020 (City of Ipswich, 2020) identifies that wetland condition assessments in the Purga catchment is a priority action within the floodplain theme. It would also be good to get an improved understanding of the floodplain extent in terms of natural values as most of the existing flood modelling data is based on hydraulic risk.

Protection of floodplains and significant wetlands and vegetation

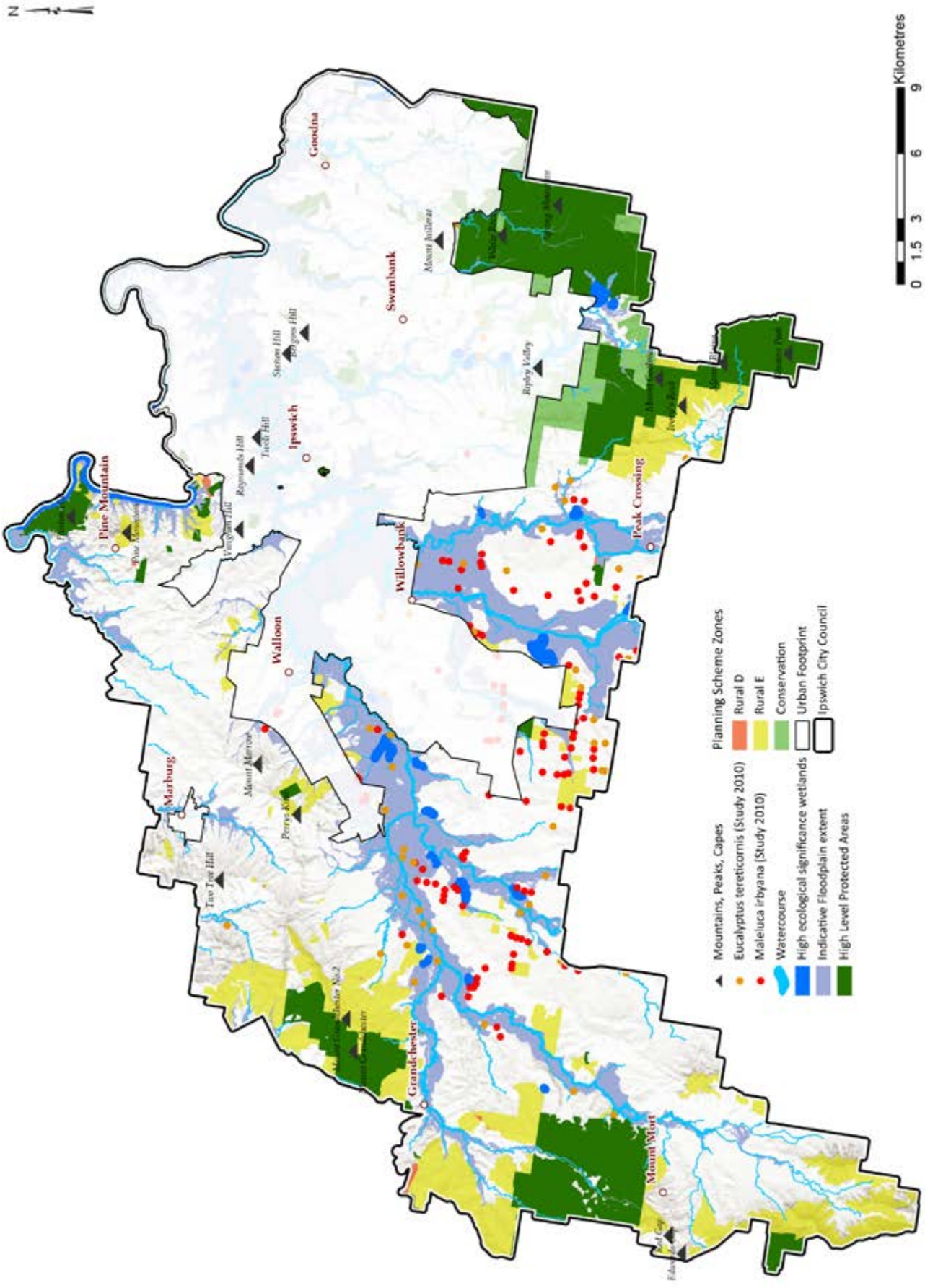
Protection of Ipswich floodplains and wetlands can be achieved several ways including:

- **Acquisition (high level protection)** – acquisition of key floodplain areas such as high value floodplain wetlands can ensure council protects and has the potential to restore these important ecosystems.
- **Covenanted (high level protection)** – under a voluntary conservation between the private landowners and council.
- **Planning scheme overlays and codes (medium level protection)** – waterway and wetland overlay maps and codes can help to protect existing floodplain wetlands and waterways values. The flooding overlay map and code can also identify the extent of the floodplain based on probable maximum flood event to help preserve the extent of the floodplains so they continue to support flood storage and other floodplain functions.
- **Other legislation** – federal and state legislation can also trigger protections of nationally and state significant wetlands and wetland vegetation.

Figure 30 presents the rural areas, including floodplains which have a high level of protection due to government ownership for the purposes of conservation.

Figure 30 – Protected areas within Ipswich's rural landscape including floodplains

**Please note the information presented is based on a range of available mapping data and doesn't represent all vegetation or wetlands.*

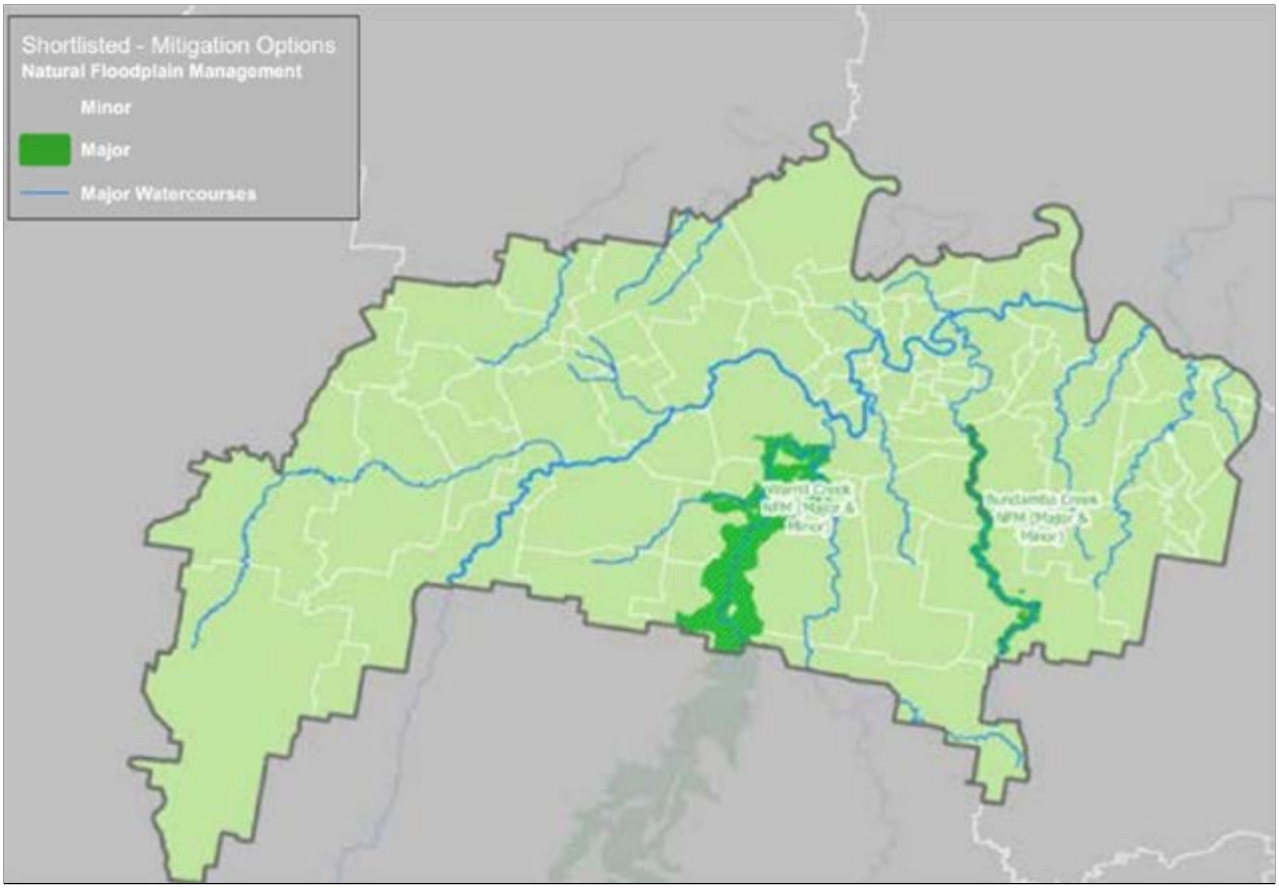


Strategic investment and delivery of multi-function floodplains

Floodplains can support a range of functions including flood mitigation, water quality improvement and habitat provision. There are a range of strategic investment opportunities to achieve improved natural floodplain function and condition across Ipswich including:

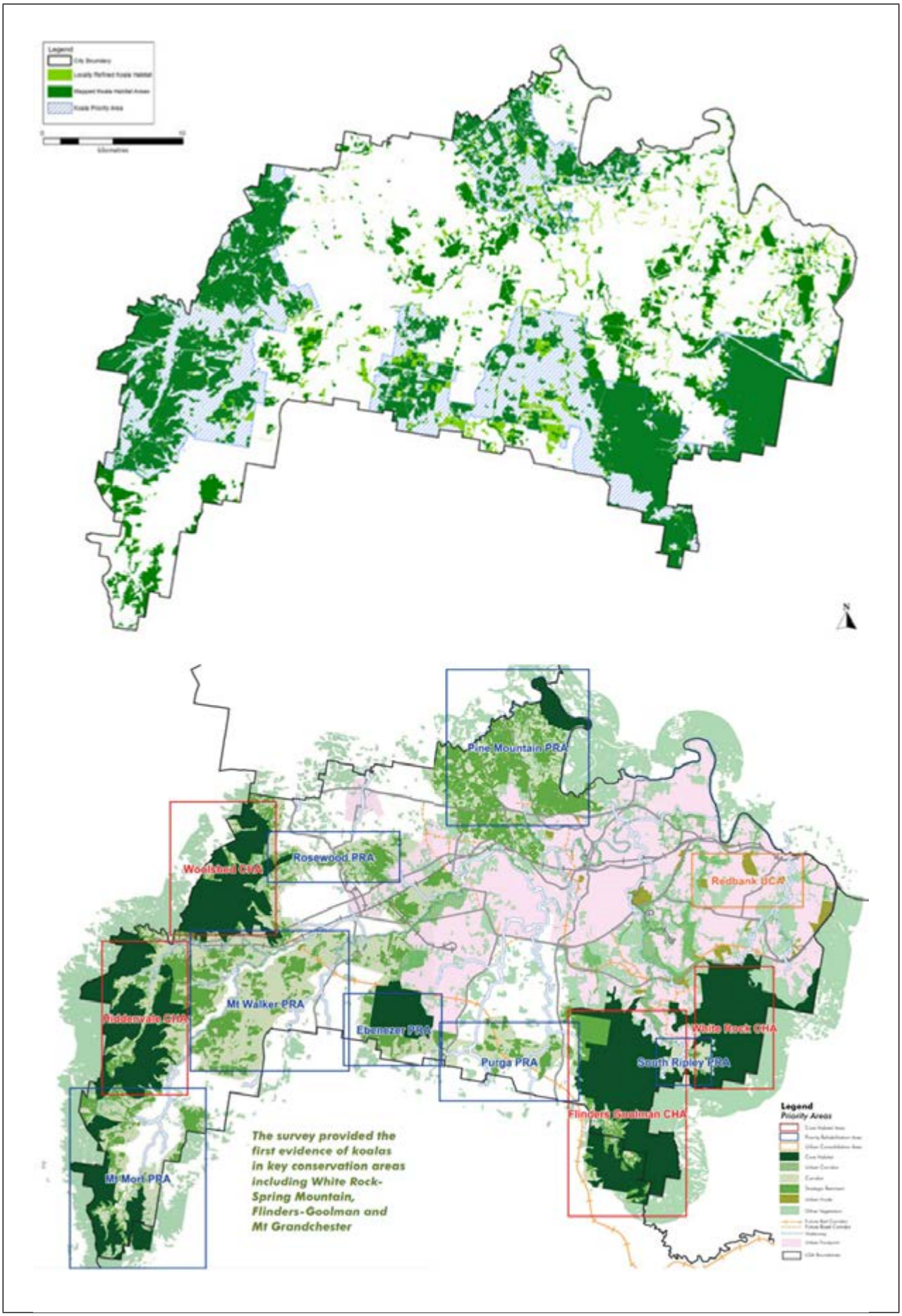
- **Flood mitigation** – natural floodplain measures (NFM) such as revegetation and floodplain re-engagement have been identified as physical flood mitigation options as part of the Ipswich Integrated Catchment Plan (IICP). These NFM options were shortlisted as part of the IICP project due to the many benefits they provide including significant ecological, waterway health and social outcomes as well as significantly reducing the impact of flooding downstream. Figure 31 shows the location of the shortlisted NFM projects in the ICCP in the Bundamba Creek and Warrill Creek catchments.

  Figure 31 – Location of shortlisted Natural Floodplain Management options from the Ipswich Integrated Catchment Plan (City of Ipswich, 2021)



- **Koala habitat** – council's Waterway Health Strategy 2020 and the Koala Conservation and Habitat Management Plan both identify areas across Ipswich which support koala habitats and should be a focus for restoration and protection within floodplain areas. The Queensland Government also has mapping of koala priority areas, koala habitat areas and locally refined koala habitat areas as part of the South-East Queensland Koala Conservation Strategy 2019–2024 (Figure 32) These could be strategic floodplain locations where koala offsets and other restoration projects are undertaken.

Figure 32 – Queensland Government Koala priority areas (top) and Koala Conservation and Habitat Management Plan overview map (bottom) showing key areas for koala protection and restoration across Ipswich



The development of an investment plan or similar for Ipswich floodplains could help to direct investments for floodplain re-engagement and revegetation that will deliver multiple outcomes across Ipswich. This plan could identify areas, programs and implementation pathways for floodplain re-engagement and revegetation projects across Ipswich which is a priority action in the Waterway Health Strategy 2020.

Table 8 provides a summary of sub catchments where floodplain engagement and enhancement of floodplain wetlands and vegetation were a priority action in the Waterway Health Strategy 2020 (City of Ipswich, 2020).

Table 8 – summary of priority actions identified in council's Waterway Health Strategy 2020 highlighting sub catchments where floodplain engagement and enhancement of floodplain wetlands and vegetation is a priority action

ACTION TYPE	CATCHMENT / SUB-CATCHMENT																		
	Bremer River											**Mid Brisbane River**		**Lower Brisbane River**					**Lockyer Ck**
	Bremer River Est	Bremer River FW	Bundamba Ck	Deebing Ck	Franklin Vale Ck	Iron Pot Ck	Mihi Ck	Purga Ck	Sandy Ck (Tivoli)	Warril Ck	Western Ck	Black Snake Creek	Mid Brisbane River	Goodna Ck	Lower Brisbane River	Sandy Ck (Camira)	Six Mile Ck	Woogaroo Creek, including Mountain and Opossum creeks	Lockyer Ck
Channel stabilisation / naturalisation	■	■	■	■	■	■	■		No actions – low priority sub-catchment			■	■		■	■	■	■	
Best practice stormwater management – new development			■	■						■								■	
Lower order stream protection			■	■						■									
Protect waterway corridor / riparian buffer widths			■	■	■			■											
Riparian revegetation / weed control	■		■		■		■	■			■	■	■	■			■	■	
Floodplain engagement / enhancement		■				■		■		■		■							
Wetland protection / enhancement		■						■		■									
Vegetation protection / enhancement	■	■						■		■		■							
Land management best practice – private land					■		■					■							■
Community education		■						■		■						■			■
Community events	■		■											■					
Community access	■														■				
Support landholders	■	■			■		■	■		■	■		■		■				

Theme 1 **Channel**

Theme 2 **Riparian**

Theme 3 **Floodplain**

Theme 4 **Community**

Support landholders to enhance rural floodplains

Working in partnership with the rural landholders will be critical to restore the natural function and condition of the rural floodplains. Key activities that council can help to support include:

- **Landholder Conservation Agreements** – council can support landholders in the protection and enhancement of ecological values on rural land through Landholder Conservation Agreements. Based on the current criteria, the protection of key wetlands and vegetation stands may be possible using some of the conservation agreements if the land is zoned as conservation or rural – special land management. A review of the partnership types and criteria may be required to support broader floodplain re-engagement and revegetation works that are not currently identified in priority areas in the Nature Conservation Strategy 2015. Enabling the Landholder Partnership Program to include wetland and floodplain stewardship was a key action in the Waterway Health Strategy 2020 (City of Ipswich 2020).
- **Education and awareness** – broad engagement on the value and role of floodplains for improving rural land productivity, environment outcomes and flood mitigation across Ipswich is a key action which will help to protect floodplains from further degradation. Targeted engagement with landholders of rural properties which contain significant wetlands and vegetation species to provide guidance and support as required to appropriately protect these important assets would be a priority.

Summary of key approaches to improve rural floodplain function and protection include:

- **Improve understanding of the current ecological condition of floodplains and wetlands** – a more detailed assessment of the ecological condition of the rural floodplains and wetlands across Ipswich would be beneficial to better inform strategic decision making and investments.
- **Provide protection of floodplains and significant wetlands and vegetation** – this protection can be achieved through the planning scheme in overlays and codes for waterways, wetlands and flooding. National and state legislation also provide protection for high ecological value wetlands and threatened vegetation communities. The acquisition of wetlands as government controlled areas and/or covenants with private landholders can also provide a high level of protection to these wetlands.
- **Strategic investment in multi-function floodplains** – a strategic approach to the identification and prioritisation of floodplain re-engagement and revegetation sites should be taken to optimise benefits for the natural environment as well as flooding, water quality and koala habitat.
- **Rural landholders engagement, guidance and support** – improving landholders awareness and ability to protect and restore floodplains through partnerships, conservation agreements and the development of education and guidance material.

What does success look like?

To measure success, the extent and condition of rural floodplains which are protected needs to be measured. This requires two main datasets:

1. **Rural floodplains** – mapped based on hydraulic risk (1–9) flood extent in rural land (lands outside of the urban footprint).
2. **Area of rural floodplains which are protected** – mapped as a combination of the following to show areas of high level of protection:
   - Natural Area Estate
   - local bushland reserves
   - nature refuges
   - covenants.

The overlay of these datasets measure the extent of rural floodplains which are protected. Additional assessments of these areas will be required to gain an understanding of their condition. Data collected through works completed in these areas to improve floodplain function can be used to measure improved function (e.g. revegetation works to re-engage catchment and waterway flows).

Objective development:

Priority objective 2 – Restoration and protection of functional floodplains on rural land

Indicator: Rural floodplain extent and area of this protected and/or restored through re-engagement or revegetation works.

Current state: 135ha of rural floodplain protected.

Milestone: Improved understanding of floodplain condition and function.

Strategy target: 50ha of rural floodplain protected restored.

7 Sustainable nature-based recreation

Important definition:

Sustainable nature-based recreation – activities that help people access the outdoors and are dependent on the natural environment and have an appreciation of nature as a motivational factor. For these to be sustainable, they need to protect the natural environment and culturally significant areas.

Connecting with nature is important for the communities' physical and mental wellbeing, however this access can have unintended consequences on the natural environment if it is not well considered. Sustainable nature-based recreation refers to the provision of opportunities for the community to connect with nature in a way that minimises impact on the natural environment values and can include activities such as:

- bushwalking or trail running
- Mountain bike riding and horse riding
- rock climbing and bouldering
- orienteering and rogaining
- picnicking
- birdwatching
- camping
- kayaking, boating and fishing.

These activities can occur on both council and private land which contain natural values such as council's conservation estates and bushland reserves. The importance and value of these natural recreational opportunities will continue to increase as the region's population and visitation continues to grow. The 2021 update of the South-East Queensland Natural Resource Management Plan (2009–2031) by Healthy Land and Water identified that while there has been an increase in the number of green spaces across South-East Queensland, the amount of green space per person has decreased from 0.16ha/person in 2011 to 0.13ha/person in 2021 (Healthy Land and Water, 2021b). This means that additional recreational land is required across the region to improve this proportion of greenspace for the community.

Ipswich has over 550 parks and reserves offering a range of recreational opportunities ranging from playgrounds, sports fields and walking trails. Over 6,000ha of beautiful bushland is earmarked for a wide range of recreation activities (City of Ipswich, 2022g). Council plays a key role in the provision of sustainable nature-based recreation including:

- management of important natural environment estates which provide access for sustainable nature-based recreation
- support of landholders to deliver sustainable nature-based activities on private land
- promotion and delivery of sustainable nature-based activities across Ipswich.

Council's Active Ipswich Strategy 2021–2031 is council's commitment to improving the health and wellbeing of the community by creating a more active Ipswich. This strategy recognises the importance of the natural area network and outdoor/nature-based recreation in achieving this outcome.

It is important that nature-based recreation is well planned for and managed to reduce some of the following key threats that can otherwise occur to the natural environment (Buckley, 1990):

- **Unmanaged access** – unmanaged access to natural areas can result in soil erosion and compaction damage to vegetation and geological features. Appropriate pathways and access for the target activities need to be provided in areas which are susceptible to these impacts.
- **Vandalism and damage** – this includes vandalism to culturally sensitive sites, damage to pathways and other infrastructure.
- **Litter and water pollution** – pollutants can be generated and left by visitors including litter, fuel residue and human waste if appropriate waste management solutions are not provided.
- **Anti-social behaviours** – insensitive visitors may establish unauthorised trails, be linked to litter and vandalism and can potentially deter legitimate visitors.

The focus of nature-based recreation in this strategy is on the provision and promotion of opportunities for participation in sustainable nature-based activities for the community. These priority objectives also reflect the outcomes of the broader stakeholder feedback (refer to the Natural Environment Strategy – Stakeholder Engagement Report 2022) and the goals of council's Active Ipswich Strategy 2021–2031.

Key outcomes sought: Creating and encouraging opportunities for the community to sustainably connect with nature.

Council's achievements to-date:

Ipswich City Council is committed to supporting a healthy and active community that can access and enjoy the natural environment in the region. Key achievements include:

- development of Active Ipswich Strategy 2021–2031 to provide strong direction and commitment to improving participation in, and increasing opportunities for physical activity in Ipswich
- owning or controlling more than 8,440ha of open space across Ipswich, of which 7,774ha (92 per cent) is publicly accessible[9]
- over 6,000ha of bushland is earmarked for a wide range of recreation activities[10]
- development of the White Rock-Spring Mountain Conservation Estate Master Plan to ensure safe and accessible nature-based recreation is delivered which protects conservation and cultural values. This master plan has led to the installation of site responsive infrastructure to showcase and protect important natural and cultural values across the site, including boardwalks and signage.[11]

SUSTAINABLE NATURE-BASED RECREATION OPPORTUNITIES

What is sustainable nature-based recreation?

Sustainable nature-based recreation can be described as activities that help people access the outdoors whilst protecting the natural environment and culturally significant areas. These activities can be physical, which elevate the heart rate, like bushwalking, mountain biking and rock climbing or more passive such as picnicking or birdwatching.

What is needed to provide sustainable nature-based recreation?

The provision of sustainable nature-based recreation needs to balance the demand for activities in a way which minimise impact on environmental and cultural values. This approach needs to recognise that not all nature-based recreational activities are equal in terms of their environmental impacts and therefore the provision of facilities and activities in natural areas across Ipswich should balance the recreational impact and the environmental value using a framework similar to the one presented in Table 9.

Table 9 – Potential framework to determine appropriate nature-based recreation activities based on natural area conservation value

CONSERVATION VALUE	POTENTIAL SUITABLE RECREATIONAL ACTIVITIES
Low value	High impact recreation
Medium value	Medium impact recreation
High value	Low impact recreation
Very high value	Nil or very low impact recreation

9 Advance Ipswich (City of Ipswich, 2015)

10 Ipswich.qld.gov.au/live/healthy_lifestyle/recreation

11 Ipswich.qld.gov.au/about_council/media/corporate_publications/white-rock-masterplan#:~:text=The%20purpose%20of%20the%20White,are%20attracted%20to%20the%20estate.

It is also important that appropriate facilities are provided to support the recreational activities as well as protect the sites conservation values. For example, the choice of pathway materials and design (e.g. gravel path vs boardwalk) should reflect the needs of the user as well as protecting the sensitive environments. Ideally, the nature-based recreation should also look for opportunities to provide positive conservation outcomes such as signage to increase community awareness and management partnerships with local recreation groups. The ongoing management of these facilities is critical to ensure they continue to deliver these services into the future.

Summary of key attributes of sustainable nature-based recreation:

- provide nature-based recreational activities which do not impact the environmental or cultural values
- balance the demand and potential impact of nature-based recreational activities with the environmental values of council's open space network
- provide suitable facilities and assets to protect natural environment values
- be monitored and maintained to ensure recreational use doesn't result in environmental harm
- use interpretive signage and partnerships with community recreation groups to improve conservation outcomes through community awareness and stewardship.

Current condition and key threatening processes

Council's open space network includes a range of green spaces, ranging from sportsgrounds, local parks and natural areas (Table 10). The public park network which includes the citywide, district and local recreation, waterside and linear parks as well as sportsgrounds are all part of council's trunk infrastructure network which are captured in the Local Government Infrastructure Plan (LGIP). This public park network has clear desired standards of service (DSS) which directs the location, size and facilities provided in these open spaces. Most of the natural area network, which includes conservation estates and local bushland reserves, are currently not part of the LGIP. There are however some sites within this natural area network which have been identified through site specific studies and master plans as being able to accommodate public park infrastructure (City of Ipswich, 2021d).

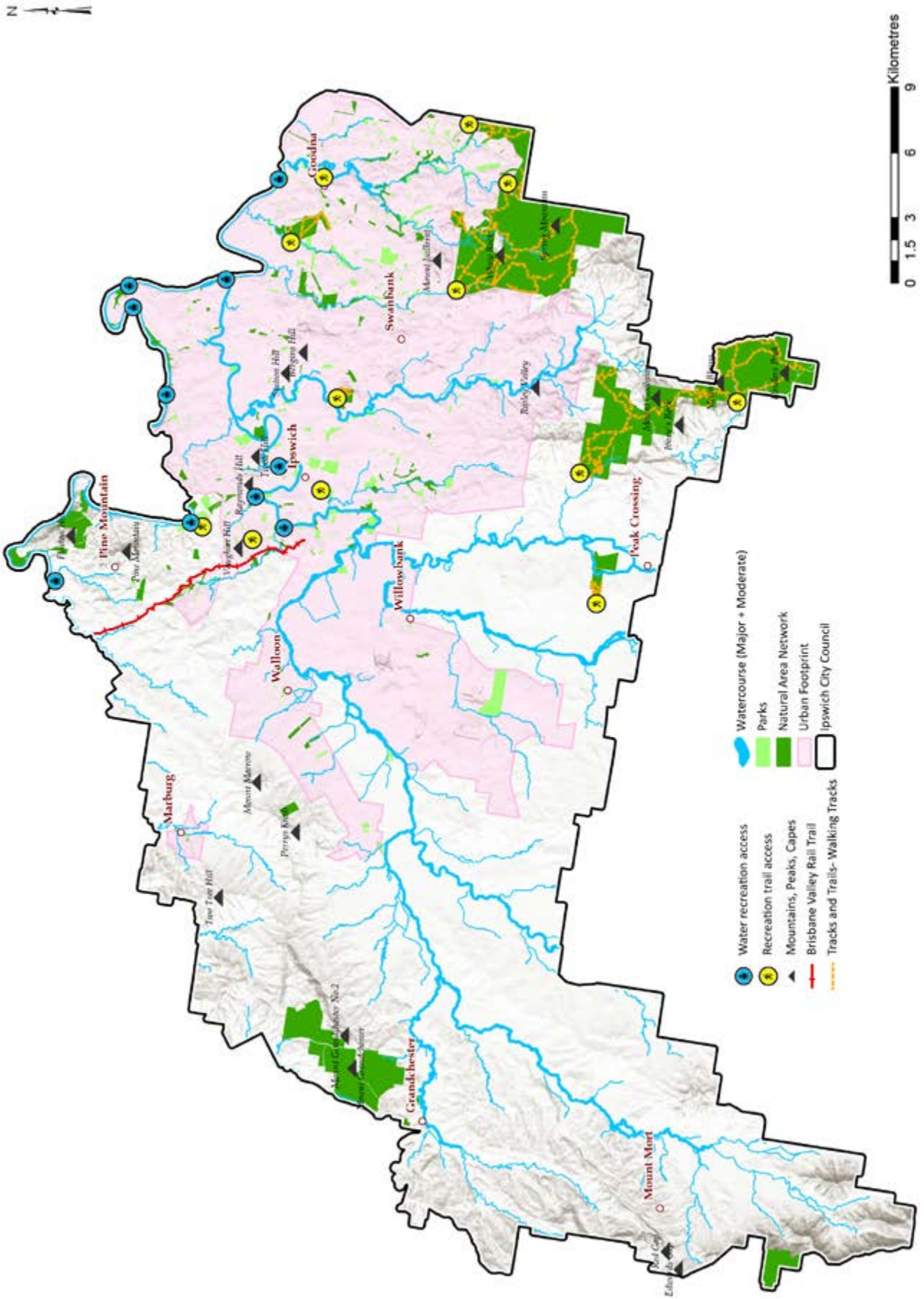
Table 10 – Council's open space network including areas classified in the natural area network (from Ipswich Local Government Infrastructure Plan – Supporting Document: Public Parks, Update 2016)

	OPEN SPACE CLASSIFICATION	HIERACHY	PUBLIC PARKS TRUNK INFRASTRUCTURE NETWORK (INC. IN LGIP)
PUBLIC PARK NETWORK	Recreation parks	Local	✓
		District	✓
		Citywide	✓
	Waterside parks	District	✓
		Citywide	✓
	Sportsgrounds and courts	Local	✓
		Citywide	✓
	Linear parks	Local	✓
		Citywide	✓
NATURAL AREA NETWORK	Natural areas	Local bushland reserve	Other*
		District conservation reserves	Other*
		Citywide conservation estates	Other*
ANCILLARY OPEN SPACE NETWORK	Specialised sport and recreation facilities	N/A	Other
	Amenity land	N/A	Other
	Utility land (drainage, power easement, etc.)	N/A	Other
	Unallocated open space	N/A	Other

*Some sites in the Natural Area Network have been identified as being able to accommodate Public Park infrastructure based on investigations that have determined that the natural area environmental values will not be impacted and the site is the best available location to provide public park embellishment to service the community.

Figure 33 – Ipswich open spaces showing the location of the natural area network (mapped as reserves), access points and trails

**Please note the information presented is based on a range of available mapping data and doesn't represent all nature-based recreation opportunities.*



While it is recognised that many of the open spaces listed in Table 10 may contain important natural and cultural values, this strategy is focused on the natural area network and the recreational activities delivered within them. Figure 33 presents the location of the natural area network (reserves) and public park network (parks).

Figure 33 and Table 11 also highlight that many of the natural areas have a range of recreational settings, facilities and activities, with a vast array of trails and wayfinding that can be accessed from strategic access points. Figure 33 and Table 11 also identify a range of boat launching locations that can be used to access the waterways across Ipswich. It should be noted that this map does not include nature-based recreational activities provided by private landholders or companies.

Table 11 – Summary of Ipswich's natural areas and recreational activities provided within them (based on City of Ipswich, 2022f)[12]

SITE NAME	NATURAL ENVIRONMENT VALUES	ACTIVITIES SUPPORTED
Flinders – Goolman Conservation Estate	▪ largest remaining tract of lowland eucalypt forest in SEQ ▪ critical habitat for several key species, including the vulnerable brush-tailed rock wallaby	Birdwatching, walking/hiking, mountain biking, horse riding, camping, barbecues, picnics, trail running, orienteering, rogaining and rock climbing
White Rock–Spring Mountain Conservation Estate	▪ sacred to the Traditional Owners of Ipswich ▪ core habitat area within the Flinders Karawatha Corridor and holds some of the highest natural and conservation values in the region	Bushwalking/hiking, birdwatching, horse riding, mountain biking, trail running, nature study, orienteering, rogaining and bouldering
Purga Nature Reserve	▪ largest protected area of endangered swamp tea-tree forest *(Melaleuca irbyana)* in the world	Bushwalks along raised boardwalks, picnics and nature study
Hillview Drive Reserve	▪ bioregional corridor connecting across the Brisbane River	Bushwalking, mountain biking, birdwatching and picnics
Haig Street Quarry Reserve	▪ rehabilitated dry eucalypt forest. ▪ the reserve assists to maintain a north south corridor that allows for wildlife movement from the Pine Mountain area through to the Bremer River	Birdwatching, walking, hiking, BBQ, picnics and lookout
Denmark Hill Conservation Park	▪ over 11ha of natural environment ▪ long mining history	Walking, birdwatching, picnics, barbecues and nature-inspired play area
Woodend Nature Centre	▪ home to one of the largest flying fox colonies in SEQ ▪ Ipswich Pteropus Conservation Park	Walking, viewing deck and fauna watching
Ric Nattrass Environmental Park	▪ protection for native vegetation and the significant ecological values of the area	Walking/hiking and nature study
Kholo Enviroplan Reserve (Cameron's Scrub)	▪ dry vine forest vegetation complex that has almost completely disappeared from South-East Queensland	No onsite facilities or public access, council approved permit for selected activities only
Mount Grandchester Conservation Estate	▪ provides essential habitat connectivity to the Main Ranges National Park and the Great Eastern Ranges	No public access, council approved permit for selected activities only
Stirling Road Reserve	▪ regenerating dry vine forest that includes the rare Bailey's cypress and the vulnerable black-breasted button quail.	No public access, council approved permit for selected activities only

12 Available at: Ipswich.qld.gov.au/about_council/initiatives/environment/enviroplan/conservation

SITE NAME	NATURAL ENVIRONMENT VALUES	ACTIVITIES SUPPORTED
Mount Beau Brummell Conservation Park	▪ abundance of giant spear lilies ▪ montane eucalypt forest and heath, which provides natural habitat for the wedge-tailed eagle, brush-tailed rock wallaby, whiptail wallaby and pale-headed rosella	No public access, council approved permit for selected activities only
Colleges Crossing Recreational Reserve	▪ this is the most accessible place for a paddle on the mid Brisbane River	Canoe launch area, picnic and barbecue facilities, kiosk, fishing
Burton's Bridge to Kholo Bridge Reserve	▪ more adventurous paddle from Burton's bridge to Kholo Gardens and Kholo Bridge	Canoe launch areas
Shapcott Park, Cribb Park and Joseph Brady Park	▪ these locations allow you to access the Bremer River for a paddle	Canoe/boat launch areas
Richardson Park	▪ large riverside park with easy access to the Brisbane River for a paddle	Boat ramp for boats and canoe launch
Castle Hill Blackstone Reserve	▪ district recreation and local bushland reserve ▪ long mining history ▪ very popular mountain bike location ▪ look out views	Mountain biking, bush walking, trail running

While Figure 33 and Table 11 present the location of facilities provided to support nature-based recreational activities, they do not provide detail on the condition of these areas or other areas which may be used for activities without the supporting infrastructure (e.g such as illegal tracks). This condition information is typically picked up during natural area monitoring and maintenance activities.

Key threatening processes to the provision of sustainable nature-based recreation across Ipswich's natural area network include:

- **High demand for nature-based recreation** – as population grows and the demand for nature-based recreation increases, the pressure on existing assets and facilities increases. For example, parts of the walking trail network provided in the natural area network are being impacted from a steep upsurge in use, which coupled with a shortfall in the condition of trails, is causing an exponential negative effect on the surrounding natural values.
- **Inappropriate infrastructure to support recreation demand and impact** – nature-based recreational assets and facilities such as pathways, bins and parking need to be fit-for-purpose and designed to address the demand and potential impacts of the activities on the surrounding environment. For example, older walking trails which are not up to current design standards put both users and the natural site values at risk.
- **Inappropriate resources for maintenance** – natural areas and the recreational assets within them also require ongoing maintenance to ensure they are continuing to operate as intended. Lack of resources to support this growing network of recreational activities will result in increased risk to the natural environment supporting these activities and assets.
- **Illegal access and use** – lack of facilities and access does not necessarily stop the public from undertaking recreational activities in natural areas. Illegal access and use of sensitive natural and culturally important areas for activities such as walking, bike riding, motor vehicle access and rock climbing can cause erosion, trample significant vegetation and damage rock faces.

Summary of key threats to sustainable nature-based recreation:

- high demand for nature-based activities which places increasing pressure on existing nature-based recreation areas and assets
- inappropriate infrastructure to support recreation demand and impact
- inability to provide ongoing monitoring and maintenance of assets and values
- illegal access and use of sensitive environmental and cultural sites
- limited number of locations with suitable visitor infrastructure which can be impacted by closures for environmental or public safety reasons.

Summary of approaches to improve sustainability of nature-based recreation assets

There are a range of approaches which can help to provide sustainable nature-based recreation including:

- understanding the current condition and additional demand for nature-based recreation assets
- clear guidance on planning and delivery of appropriate nature-rebased recreation assets
- delivery of multi-functional open space networks
- suitable monitoring and maintenance of nature-based recreational assets and activities
- improved community appreciation and stewardship.

Understand current condition and additional demand for nature-based recreation assets

Before any nature-based recreational assets are designed and constructed, an inventory of the existing assets is required. An inventory of existing assets should include condition assessments of both the assets and the surrounding natural environment. The demand for nature-based recreational activities and the required supporting assets should consider both current and future needs of the community. The current demand should be informed by improved knowledge of the current use of the assets provided within natural areas and the impact this may be having on the natural environment. This assessment may identify how existing assets can be upgraded to help meet demand. Future demand should be informed through collaboration with local nature-based recreation groups to understand their requirements for facilities to support their activities. This forward planning should consider accessibility to ensure there are opportunities for all community members to access and experience the natural environment across Ipswich.

Clear guidance on planning and delivery of appropriate nature-rebased recreation assets

Having a clear nature-based recreation framework can help to identify suitable recreational activities across the natural area network. This framework should consider the ecological and cultural values of the site as well as the potential impacts from the proposed recreational activities.

1. **Ecological/cultural value** – ecological and cultural assessments of Ipswich's natural areas will help to determine the suitability of these locations to accommodate nature-based recreational activities. This should include an understanding of the threshold of disturbance that these ecosystems may be able to withstand (Thomas and Reed, 2019). This will help to identify areas that are of high conservation value and where recreation should be avoided/limited and areas that are more resilient or with lower conservation value being able to accommodate higher impact recreational assets.
2. **Recreational impact** – understanding the relative potential impact of different recreational activities is important to balance demand with environmental conservation (Thomas and Reed, 2019). This can help to inform the appropriate design of supporting recreational assets to minimise the disturbance risk.

Having a good understanding of the environmental and cultural values within each natural area helps to inform the location and design of the recreational assets. A zone of influence is created when trails and recreation sites are introduced to an area, Trails and recreation sites create a zone of influence within the natural areas which may alter animal behaviour, this will be different for each species. Locating trails to avoid highly sensitive communities and avoiding fragmentation of important habitat area should be a priority. The design of recreational assets across the natural areas should also aim to balance the user needs and the environmental protection requirement. For example, the trail surface should support safe recreational use but also be designed to protect the requirements of the surrounding environment (e.g. drainage and weed control requirements).

The development of a clear framework and/or site evaluation checklist would help to inform both council nature-based recreation planning and investments. This could also be integrated into Ipswich's Planning Scheme to influence the planning and delivery of suitable nature-based recreational outcomes on private land.

Delivery of multi-functional open space networks

Council's Active Ipswich Strategy (City of Ipswich, 2021d) recognises that open spaces can provide a range of functions, council is looking to take an integrated, cross functional and cross disciplinary approach to the planning and delivery of Ipswich's open space network into the future. The strategy identifies the development of an overarching Open Space Strategic Plan which will inform the delivery of these multi-functional spaces. Open Space Strategic Masterplans will be developed to inform diverse open space networks in key suburbs.

The delivery of this multi-use open space network may need to be supported with new open space network classifications and associated desired standards of service (DSS) which will allow a combination of recreation and conservation outcomes to be delivered in natural areas. Sunshine Coast Regional Council currently have several projects

underway to expand their green spaces while balancing these recreational activities with improved environmental outcomes including:

- **Blue Heart** – balancing recreation with enhancement of a previously cleared floodplain
- **Sunshine Coast Ecological Park** – balancing recreation with ecological restoration of a cleared land adjoining the Mary Cairncross Scenic Reserve.

These projects are being delivered on land purchased by council through both their LGIP and their Environment Levy programs. A similar approach could be taken by Ipswich City Council to co-fund the acquisition of land which has the potential to enhance environmental and cultural outcomes and support sustainable nature-based activities.

Suitable monitoring and maintenance of nature-based recreational assets and activities

Ongoing monitoring and maintenance is important to ensure the recreation activities and assets are protecting the surrounding natural values. Adaptive management of the recreation assets will be important to ensure they are appropriate as recreation demands and environmental conditions change. Monitoring and maintenance should be prioritised based on the asset class which should reflect the user demand and environmental significance.

Improved community appreciation and stewardship

Creating an informed community will help to ensure that the nature-based recreation assets are used as intended, reducing the risk of impact on the natural environment and cultural values. This can be achieved several ways including provision of interpretive signage and clear wayfinding within the natural areas as well as working in partnership with local outdoor recreation clubs and groups in the planning, design and management of nature-based recreation areas and assets. Empowering and supporting private landholders to deliver sustainable nature-based recreation will also be beneficial for the health and wellbeing of the community and local environment.

Summary of key approaches to improve sustainable nature-based recreation opportunities across Ipswich include:

- understanding the current condition of nature-based recreation assets, the natural areas surrounding them and additional demand
- providing clear guidance with a clear nature-based recreation framework to inform selection and design of nature-based recreation sites
- delivery of multi-functional open space networks
- suitable monitoring and maintenance of nature-based recreation sites
- improved appreciation and stewardship of the natural environment by nature-based recreation users.

What does success look like?

To measure success, the number of sustainable nature-based recreation opportunities needs to be measured. This can be measured by a combination of the facilities, embellishments and other access opportunities that council implements to support sustainable nature-based recreation opportunities including:

- combination of trail lengths, trail heads, canoe launch and other nature-based recreational facilities and signage
- data should be supported by listing the activities these recreational facilities support (including activities and events provided by council and those that require recreational permits) and the level of accessibility provided.

Objective development:

Priority objective 1 – Increase in sustainable nature-based recreation opportunities across Ipswich

Indicator: Combination of trail lengths, trail heads, canoe launch and other nature-based recreational facilities which have been designed to protect the sites natural and cultural values. Data should be supported by listing of the activities these recreational facilities support (including activities and events provided by council and those that require recreational permits) and the level of accessibility provided.

Current state: 129km of trails provided.

Milestone: Improved understanding of condition, threats and appropriate recreation activities and facilities that protect site values.

Strategy target: Recreation infrastructure manages increased nature-based activities and protects the sites' natural, cultural heritage and cultural landscape values.

NATURE-BASED RECREATION USE

Why is nature-based recreation important?

Outdoor and nature-based recreation provides a range of values for the community as well as the economy. Physical and mental health benefits provided from physical activities are listed in Figure 34. These physical and mental health benefits are potentially a large contributor to avoided health costs in Queensland. Outdoor recreation has also been estimated to provide over $2 billion to the Gross State Product of Queensland (Synergies Economic Consulting, 2012).

Figure 34 – Summary of physical and mental health benefits associated with physical activity (from: City of Ipswich, 2015c)

PHYSICAL HEALTH

- Reduced risk of chronic diseases
- Reduced risk of developing and dying from a variety of cancers
- Prevention of weight gain (when coupled with healthy nutrition) and improved weight management
- Reduced risk of osteoporosis and osteoarthritis
- Increased energy
- Improved sleep quality
- Improved mobility, flexibility and functional ability
- Reduced risk of falling and fracturing bones

MENTAL HEALTH

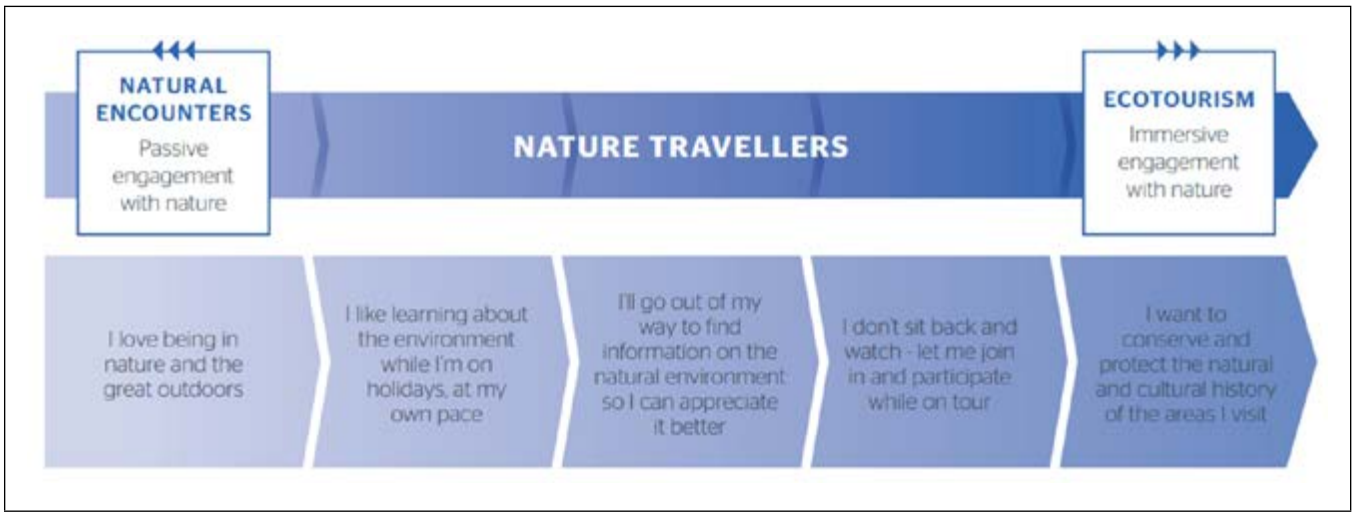
- Prevention and treatment of anxiety and depression
- Stress reduction
- Improved mood and sense of well-being
- Improved concentration, enhanced memory and learning and better performance
- Increased vitality, psychological well-being and improved body image
- Improved cognitive functioning (including motor function, cognitive speed, auditory and visual attention)
- Reduced risk of developing dementia

How do you increase nature-based recreation participation?

The Ipswich community has always wanted access to natural areas for recreation including walking tracks and picnic facilities. A recent survey by council of more than 1,500 residents identified current trends and participation levels in different recreation activities across the region. These results show that walking, hiking, bushwalking and outdoor recreation were in the top 10 physical activities for adults (City of Ipswich, 2022h).

Increasing participation rates in nature-based recreation should recognise the range of motivations and perspectives of people that might consider engaging in these activities. Figure 35 provides a spectrum of motivations for 'nature travellers' ranging from those who are happy to sit and passively experience nature to those who would like a more immersive experience and actively contribute to conservation outcomes. There are other motivations for people to access natural areas for recreation including those who are after more physical recreational activities such as trail running, mountain biking and rock climbing.

Figure 35 – Nature-travellers spectrum showing the range of visitor perspectives and motivations for participating in nature-based recreation activities (from: Tourism and Events Queensland, 2021)



Key attributes:

- provide a range of nature-based recreational experiences to cater for different user needs ranging from provision of pathways and picnic areas through to organised events and activities.

Current participation rates and key threatening processes

Ipswich supports many nature-based activities, ranging from the provision of an extensive network of trails and facilities in natural areas (see sustainable nature-based recreation opportunities) but also providing extensive community active and environmental education programs. Key programs include:

- **Active programs** – council provides free recreation sessions within council parks and natural areas for all community members including beginner running groups and park run in White Rock Conservation Park, **Ipswich.qld.gov.au/live/healthy_lifestyle/active-programs**.
- **Environmental education programs** – council provides a range of education resources and opportunities for schools, community groups and families across Ipswich including The Environmental Education Centre at Queens Park, **Ipswich.qld.gov.au/about_council/initiatives/sustainable-ipswich/sustainability-in-the-suburbs/EnviroEd/environmental-education-centre.**
- **Other nature-based activities** – council supports local community groups and individuals to participate in more immersive nature-based activities such as tree planting days.
- **Provision of infrastructure to support activities** – council provides a range of infrastructure within the natural areas to support many recreation activities including trails for walking, mountain biking and horse riding and access to waterways for kayaking and canoeing.

Key threats to people participating in sustainable nature-based recreation activities includes:

- **lack of awareness** – lack of knowledge of the programs and activities available will inhibit participation rates across some key groups across Ipswich
- **inappropriate location and/or timing of activities** – recreational activities need to be in locations and/or at times that people would be likely to use them
- **limited opportunity for all-ability participants** – lack of appropriate access for everyone
- **illegal access and use** – unmanaged recreation activities resulting in damage of sensitive natural areas.

Summary of key threats to people participating in nature-based recreation:

- lack of awareness of nature-based recreational activities and programs provided
- unsuitable locations and/or timing of nature-based recreational activities and programs
- limited opportunity for all-ability participants
- illegal and damaging use of sensitive natural areas for unmanaged recreation activities.

Summary of approaches to improve nature-based recreation use

Improving the use of nature-based recreational activities and programs across Ipswich will require a range of approaches including:

- improved knowledge of current use and additional demand for nature-based recreational activities and programs
- provision of a range of suitable programs and activities to meet the demand.

Improved knowledge of current use and additional demand for nature-based recreational activities and programs

An inventory of the current use of nature-based recreation areas and activities would help to inform a strategy to increase participation rates. There are several tools that can be used to measure these visitation rates including:

Use of monitored natural areas:

- **pedestrian and vehicle counter data** – council have used these in the past to gain an understanding of visitation to key natural areas
- **camping data** – council provide camping at Harding's Paddock in Flinders Goolman where visitation is already measured
- **nature-based recreation permit** – council also provide permits to access several natural areas for recreational activities. This data can be captured and monitored to understand use.

Broader use of nature areas:

- **mobile data geo-fenced people movement tool** – Tourism Events Queensland are piloting this currently. This would monitor mobile phone data and provide a breakdown of personas that are using the different areas. This could identify where people are accessing natural areas which are currently not monitored and potentially also identify where unmanaged access and use is occuring to understand where additional facilities or programs might be useful.
- **other mobile app data** – mobile phone applications such as Strava can also provide data on the use of areas by people using the app for trail running or mountain bike riding etc.

Participation in council programs:

- sign-on sheets and datasets can be used to monitor the participation in council run events and activities focused on the natural environment.

Provision of a range of suitable programs and activities to meet the demand

Once the demand for nature-based recreation activities is understood, the supporting programs and facilities can be delivered. These may include the provision of additional recreational assets such as walking trails etc. (refer to Sustainable nature-based recreation opportunities). It may also require additional programs and activities to be provided to support more immersive nature-based activities such as guided bushwalks, citizen science programs, community planting days which can be delivered through council's Environment and Sustainability Education and Awareness team.

Summary of key approaches to improve nature-based recreation use:

- improved understanding of current use of nature-based recreation activities and programs and additional demand
- provision of a diversity of programs and activities to suit user needs.

Objective development:

Priority objective 2 – Increased community participation in nature-based activities

Indicator: Visitation rates to natural areas (e.g. pedestrian data, vehicular data and georeferenced mobile data) and participation rates in experience nature events (e.g. recreational permits, council program attendance data).

Current state: Over 155,000 visitors across White Rock–Spring Mountain, Mount Flinders, Castle Hill and Hillview Natural Area Estates in 2021.

Milestone: Improved understanding of visitation and participation rates in nature-based events and activities.

Strategy target: 5 per cent increase in participation in nature-based activities across Ipswich[13].

13 Available at: **Ipswich.qld.gov.au/about_council/initiatives/environment/enviroplan/conservation**

TERMS AND DEFINITIONS

For this strategy the following terms are defined.

Aboriginal cultural heritage: is anything that is (in accordance with the *Aboriginal Cultural Heritage Act 2003*) – (a) a significant Aboriginal area in Queensland; or (b) a significant Aboriginal object; or (c) evidence, of archaeological or historic significance, of Aboriginal occupation of an area of Queensland (*Ipswich Enviroplan Program and Levy Policy: ICC*).

Aboriginal cultural landscape feature: is a feature valued by an Aboriginal group (or groups) because of their long and complex relationship with that land. Features include, but are not limited to rock outcrops, caves, areas of biogeographical significance, waterholes, springs, types of vegetation and some hill and mound formations. Aboriginal cultural landscape emphasises the landscape-scale of history and the connectivity between people, places and heritage items. It recognises that the present landscape is the product of long-term and complex relationships between people and the environment (*Ipswich Enviroplan Program and Levy Policy: ICC*).

Bushland: natural or semi-natural vegetation communities providing ecological services.

Biodiversity: the variety of native plant and animal life within the city. The number of native species across plant, fungi and animal kingdoms (*Ipswich Nature Conservation Strategy – Background Report 2015: ICC*). Includes the variety of ecosystems.

Core habitat areas: larger vegetated areas which provide habitat for a variety of the city's biodiversity. Generally, the areas are in good condition and contain high conservation values. The criteria used to identify these areas are areas with over 400ha of remnant vegetation and high-value regrowth; and generally zoned conservation, environmental management or rural (R4 – special land management) through the planning scheme (*Ipswich Nature Conservation Strategy and Background Report 2015: ICC*).

Conservation estates: council open space land that contain the city's core conservation lands and have a diverse range of highly significant conservation values (*City of Ipswich Open Space and Recreation Strategy: ICC*).

Conservation reserves: council open space lands that have medium to high conservation values, and as such are somewhat more appropriate for low-impact recreational use (*City of Ipswich Open Space and Recreation Strategy: ICC*).

Corridors (incl. ecological): areas providing local connectivity or external linkages across the city. Includes types such as steppingstone corridors, wildlife corridors, urban corridors, priority local corridors and regional corridors (*Ipswich Nature Conservation Strategy and Background Report 2015: ICC*). Links between core habitat areas, urban nodes and strategic remnants. Though typically vegetated it is not a requirement. May comprise non-contiguous vegetated patches that provide steppingstone links.

Ecosystem services: benefits people obtain from ecosystems such as products (e.g. fresh water), regulating (e.g. water purification), cultural (e.g. aesthetic) and supporting (e.g. primary production) (*Ipswich Nature Conservation Strategy – Background Report 2015: ICC*).

Ecosystem: a system formed by the interaction of a community of organisms with their environment (*Ipswich Nature Conservation Strategy – Background Report 2015: ICC*). Includes terrestrial (land based) and aquatic (waterway or wetland based).

Environmentally sustainable: acting in a way to conserve natural assets and protect ecosystems for current and future generations.

Floodplains: are areas of land adjacent to a waterway which stretch from the banks of the waterway channel to the base of the enclosing valley walls including wetlands and riparian corridors (*Ipswich Waterway Health Strategy Background Report 2020: ICC*).

Habitat (native/natural): the area or natural home in which a native plant (flora) and animal (fauna) or group of closely associated organisms live.

Habitat network: ecosystems which comprise a system of core habitat areas, urban nodes and strategic remnants connected through the landscape by corridors (*Ipswich Nature Conservation Strategy 2015: ICC*).

Highly developed areas (incl. urban areas/places): areas highly modified from a natural state with built infrastructure such as houses, commercial buildings, roads, bridges etc. Typically located within the SEQ Regional Plan's mapped urban footprint.

Iconic species: flora and fauna species found to occur locally that due to their importance and conservation status, are a priority focus for council's conservation planning and recovery activities. They are the brush-tailed rock wallaby *Petrogale penicillate*, koala *Phascolarctos cinereus*, platypus *Ornithorhynchus anatinus*, Plunkett mallee *Eucalyptus curtisii* and Cooneana olive *Notelaea ipsviciens*i (*Ipswich Nature Conservation Strategy 2015: ICC*).

Local bushland reserves: council open space lands that still contain conservation values and some recreational facilities, although due to their smaller size and generally highly urbanised locations, are the most suitable for multiple-use, nature-based recreation activities (*City of Ipswich Open Space and Recreation Strategy: ICC*).

Locally significant species: species significant to the Ipswich region and important to the environment's long-term viability, determined through an assessment criteria of:

- local abundance: number of occurrence records in the Ipswich area
- local decline: at risk of extinction in the South-East Queensland region
- non-local decline: decline in NSW
- distribution limits: limit of geographic or altitudinal range in the region
- restricted/low population: limited in geographic range or uncommon in the region
- disjunct population: widely separated populations across a geographic range
- cultural/iconic species: cultural values or iconic to local community
- ecologically important species: important ecological role in local ecosystems.

Locally significant priority species: matters of local environmental significance (MLES) means natural values and/or areas identified by a local government in the Ipswich planning instrument as MLES, that are not the same, or substantially the same, as matters of national environmental significance or matters of state environmental significance (state government definition).

Matters of local environmental significance: a matter prescribed through the Ipswich Planning Scheme.

Matters of national environmental significance: a matter prescribed in the Commonwealth Government's *Environmental Protection and Biodiversity Act 1999*.

Matters of state environmental significance: a matter prescribed in the state government's *Environmental Offsets Act and Regulation 2014*.

Native vegetation: all Indigenous terrestrial or aquatic plants in the Ipswich Local Government Area, incorporating all living and non-living components. In the context of native vegetation, Indigenous refers to vegetation that is within its natural geographic distribution and occurs naturally in Ipswich. This includes Ipswich's diverse natural vegetation and permanent native plantings for biodiversity and sustainable land management purposes.

Natural Area Estate: collection of council's public open space lands comprising conservation estates and conservation reserves (excluding local bushland reserves) that are specifically managed by council for their nature conservation values and ecological importance (*Ipswich Enviroplan Program and Levy Policy: ICC*).

Natural area network (incl. nature reserves): a collection of council's open space lands containing significant local, regional, state, or Commonwealth ecological importance. Comprises conservation estates, conservation reserves and local bushland reserves (*City of Ipswich Open Space and Recreation Strategy: ICC*).

Natural capital: the stock of natural assets, including geology, soil, air, water and all living things, from which the community derives ecosystem services that make living in the city possible (**Soe.environment.gov.au**).

Natural environment: collective term used to describe the diverse terrestrial and aquatic ecosystems that make up the city's habitat network (*Natural Environment Policy: ICC*).

Natural habitat areas: an extensive system of diverse vegetated tracts across the landscape, that collectively encompasses core habitat areas, strategic remnants, urban nodes and locally significant priority species habitat.

Natural values: with reference to the Natural Environment Policy, natural values are special qualities such as uniqueness, rarity, typicality, representivity, scientific or education importance, have useful features or recreation value. Includes:

- habitat for iconic, significant and threatened species
- core habitat areas as home for a diverse range of wildlife
- nodes of remnant vegetation in urban areas providing wildlife refuge
- strategic remnants vegetation patches as steppingstones for wildlife movement
- corridors providing connectivity for wildlife, recreation and active transport
- increasing vegetation condition and animal abundance within core habitat areas
- biological diversity, natural capital and ecosystem services
- waterways, wetlands, riparian and aquatic ecosystems and floodplains
- improving health of waterways
- Aboriginal cultural heritage and cultural landscape features and
- scenic amenity (*Natural Environment Policy: ICC*).

Nature-based recreation: activities that are dependent on the natural environment; have an appreciation of nature as a motivational factor; do not require substantial modification to the natural environment; and are environmentally sustainable (*Ipswich Enviroplan Program and Levy Policy: ICC*).

Offset/s (environmental): an environmental offset is an activity undertaken to counterbalance a significant residual impact of a prescribed activity on a prescribed environmental matter (from *Environment Offsets Act 2014*).

Pest species (incl. invasive species): are species that occur beyond their natural range and have the potential to cause significant adverse economic, environmental and social impacts. Includes pest plants and animals. Pest plants are often referred to as "weeds" and pest animals as "feral animals" (**Parks.des.qld.gov.au/management/programs/pest-plants-animals**).

Protected matters (incl. species): ecological matters regulated under Commonwealth, state or council legislative mechanisms. This includes matters of national, state or local environmental significance. May consist of certain types or classifications of plants (flora), animals (fauna), ecosystems and habitat.

Refugia (incl. climate change): an area of habitat in which wildlife can survive through a time of unfavourable conditions i.e. climate change. Has generally remained unaltered by change (Based on Florian Wittmann, in Reference Module in *Earth Systems and Environmental Sciences, 2022*).

Regional corridor: cross-border terrestrial corridors that support mobile species to support mobile species to travel larger distances. Larger landscape scale connections, linking core habitats within a regional context. Includes Little Liverpool Range Corridor, Flinders Karawatha Corridor and D'Aguilar Range Terrestrial Corridor (*Ipswich Nature Conservation Strategy 2015: ICC*).

Regional ecosystem: a state government classification and mapping system of vegetation communities for bioregions associated with native species composition, geology, landform and soil.

Remnant vegetation: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy is greater than 70 per cent of the height and greater than 50 per cent of the cover relative to the undisturbed height and cover of that stratum and is dominant by species characteristics of the vegetation's undisturbed canopy (*Ipswich Nature Conservation Strategy – Background Report 2015: ICC*). The species present are those normally expected in that vegetation community.

Scenic amenity (natural): landscape scale areas containing important natural beauty and features such as the city's ranges, bushland, waterways and wetlands.

Significant species: plants (flora) and animals (fauna) listed as: threatened under the Commonwealth Government's *Environmental Protection and Biodiversity Act 1999*; endangered, vulnerable, near threatened, special concern or least concern through the state government's *Nature Conservation Act 1992*; iconic species in the *Nature Conservation Strategy 2015*; or significant local species (including priority species) by council (**Ipswich.qld.gov.au/about_council/initiatives/environment/wildlife/significant-flora-and-fauna**).

Steppingstone: patches of smaller scale and isolated vegetation scattered through the landscape that provide habitat or refuge.

Steppingstone corridors: patchwork or series of isolated vegetation providing some potential connection for the movement of wildlife species to larger nodes or core habitat areas i.e. birds. For the purpose of landscape planning, they are typically 100m wide.

Strategic remnant (vegetation): patches of remnant vegetation or high-value regrowth strategically located within the habitat network to facilitate the movement of biodiversity across the landscape by providing steppingstones within identified corridors. These steppingstones are located close enough to each other for some species to be able to move from one patch to the next (*Ipswich Nature Conservation Strategy 2015: ICC*).

Sustainability/sustainable: means balancing economic, social, cultural and environmental factors to support a desired quality of life for current and future generations (*City of Ipswich Sustainability Strategy: ICC*).

Threatened species: flora and fauna species listed under the state government's *Nature Conservation Act 1992* or Commonwealth Government's *Environmental Protection and Biodiversity Act 1999.*

Urban biodiversity: refers to the variety and variability among living organisms found in the city's highly developed areas and the ecological systems in which they are found (*Natural Environment Policy: ICC*).

Urban (biodiversity) corridors: natural or semi-natural links through urban areas. For the purpose of this strategy these urban areas are defined by the urban footprint.

Urban footprint: land designated to meet the urban land requirements for population and employment growth in Ipswich as defined by the SEQ Regional Plan 2017.

Urban greening: the network of natural and semi-natural areas that deliver a range of environmental, economic and social values and benefits to urban places, including protection from flooding or excessive heat, or improving air and water quality, whilst also protecting biodiversity. Examples of urban greening include urban tree canopies, parks and sports fields, nature reserves and wildlife corridors, waterways and wetlands, stormwater harvesting systems, green roofs and walls, and tree-lined streets and pathways (*City of Ipswich Sustainability Strategy: ICC*).

Urban nodes: patches of remnant vegetation providing important wildlife habitat within the urban footprint (*Ipswich Nature Conservation Strategy 2015: ICC*).

Waterway: river, creek, stream or watercourse defined, mapped or referenced within the Waterway Health Strategy 2020. May be both permanent or ephemeral and includes drainage features.

Waterways and wetlands (system): the extensive system of drainage features across the city such as its rivers, creeks, streams, watercourses, lagoons, swamps and low-lying areas. The features may be permanent or periodic/intermittent. Encompasses the floodplain, adjacent vegetation and in-stream habitats for native flora and fauna (drafted for the *Natural Environment Strategy 2023*).

Wetland: areas of permanent or periodic/intermittent inundation defined, mapped or referenced within the *Waterways Health Strategy 2020*.

Wildlife Corridors: a link of vegetation that joins two or more areas of habitat (**Lfwseq.org.au**). Comprises values or attributes for the functional movement of native wildlife species. Mapped in the *Nature Conservation Strategy 2015* or species-specific recovery plans as 'corridors'.

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ATTACHMENT 1 – LEGISLATIVE FRAMEWORK

Table A1: List of relevant environmental management legislation, strategies and plans.

LEGISLATION, STRATEGIES AND PLANS	SUMMARY
INTERNATIONAL	
United Nations Sustainable Development Goals	Goals to improve quality of life through social, environmental and economic determinants that were endorsed by the Commonwealth Government.
Bilateral migratory bird agreements	International agreements for specific species reflected in Commonwealth legislation and regulation i.e. *Environmental Protection and Biodiversity Conservation Act 1999.*
The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 1999	The Charter can be applied to all types of places of cultural significance including natural, indigenous and historical places with cultural values.
UN Declaration on the Rights of Indigenous Peoples	Articles relating to the Rights to Country, resources and knowledge – i.e. Articles 25–32.
NATIONAL	
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	Protection of areas and objects that are of significance to Aboriginal and Torres Strait Islander people.
Australia's Strategy for Nature 2019–30	Overarching framework for all national, state and territory and local strategies, legislation, policies and actions that target nature.
Environmental Protection and Biodiversity Conservation Act 1999	Legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places.
Native Title Act 1993	Provides a legislative framework for recognising and protecting native title rights and interests, particularly around management.

LEGISLATION, STRATEGIES AND PLANS	SUMMARY
STATE	
Biosecurity Act 2014	Legal framework to manage impacts of animal and plant diseases and pests in a timely and effective way.
Environment Protection Act 1994	An act about the protection of Queensland's environment.
Fisheries Act 1994	An act for the management, use, development and protection of fisheries resources and fish habitats.
Flinders Karawatha Corridor Management Strategy 2014–19	Contains a range of management actions to achieve a shared vision for the area.
Local Government Act 2009	An act to provide a system of local government that includes sustainable principles.
Nature Conservation Act 1992	Legal framework to protect and maintain aspects of nature, while allowing for its ecologically sustainable use.
Planning Act 2016	Provides a framework for land-use planning and development assessment to support ecological sustainability.
SEQ Regional Plan 2017	Statutory strategic land-use planning framework to manage growth, change, land-use and development.
SEQ NRM Plan 2009–31	Non-statutory environment and natural resource management plan.
State Planning Policy	A policy of state interests (i.e. environment) that local governments use when making or amending their local planning instruments.
Vegetation Management Act 1999	Regulates the clearing of vegetation in Queensland.
Water Act 2000	Provides a framework for the planning, allocation and use of surface water and groundwater in Queensland.
Aboriginal Cultural Heritage Act, 2003	Provides effective recognition, protection and conservation of Aboriginal and Torres Strait Islander cultural heritage.
Human Rights Act, 2019	28. Cultural Rights – Aboriginal peoples and Torres Strait Islander peoples.
LOCAL	
iFuture: Corporate Plan 2021–2026	'Natural and Sustainable' is one of the themes for which council is committed to. The plan contains a vision: *"In 2041 We are proud of and enjoy our waterways, our bushland, our flora and fauna and our cultural landscapes. We are continuing our work towards a sustainable future that mitigates environmental impacts and adapts to a changing climate. We are known nationally for being clean, green and a city with a circular economy."* Additional, four outcomes by 2026 are sought: (1) Ipswich is celebrated as a clean, green, circular economy city (2) Our natural environment is interconnected across the city. It is managed to balance positive conservation and nature-based recreation outcomes including wildlife habitat protection. (3) Our waterway health is improved (4) Our natural environment is managed to support the continuation of traditional cultural practices.

LEGISLATION, STRATEGIES AND PLANS	SUMMARY
Ipswich Planning Scheme *(under review)*	Natural environment matters featured extensively in the Statement of Proposals including draft Strategic Framework. It is identified as one of the city's unique and valuable features.
Natural Environment Policy	Detail's commitments and positions on natural environment matters. Covers seven focus areas: (1) Biodiversity and Threatened Species (2) Wetlands and Waterways Improvement (3) Urban Biodiversity Enhancement (4) Natural Area Restoration and Protection (5) Experiencing Nature (6) Community Awareness and Support (7) Governance, Measuring and Reporting
Ipswich Enviroplan Program and Levy Policy	Specifies how levy funds are managed through the programs four funding themes: (1) Acquisition of significant nature conservation land (2) Community nature conservation partnerships and support (3) Nature conservation planning (4) Embellishment, capital and operational management investment within the Natural Area Estate
Environmental Offsets Policy	Outlines management of environmental offsets for matters of local, state and national significance.
Sustainability Policy	Includes a commitment to conserve and protect the natural environment.
Sustainability Strategy *(under development)*	Sets out a plan for the natural environment and healthy waterways, as a contributing factor to the liveability of the city.
ACCORD 2020–2025	This Accord is Ipswich City Council's strategic framework for reconciliation and community governance with Aboriginal and Torres Strait Islander peoples and their communities.
Local Law 49. (Protection of Important Vegetation)	Details the administration associated with nominating, assessing and protecting vegetation of importance.

City of Ipswich

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