Tin Can Bay School wetland

The Tin Can Bay School wetland is located in Tin Can Bay on the east coast of Queensland, in the Gympie Regional Council area.

The tidal and intertidal areas of Tin Can Bay are part of the Great Sandy Strait Ramsar (List of Wetlands of International Importance) site and the Great Sandy Marine Park. To the south is the Great Sandy National Park (Cooloola), to the north-east is the World Heritage listed Fraser Island and to the west is the Department of Defence Wide Bay Training Area, which is listed on the National Heritage Register.

The Tin Can Bay School wetland is made up of a range of different, connected wetland types including:

- Coastal non-floodplain wet heath swamp
- Coastal non-floodplain tree swamp–*Melaleuca*
- Coastal saline swamp
- Estuarine wetlands–saltmarsh and mangroves

These well-connected wetlands are a haven for threatened species of plants, frogs and other wildlife.

Photo: M. Prior

Photo: M. Prior

The endangered Christmas bells, ***Blandfordia grandiflora*** (top) and the vulnerable wallum sedge frog ***Littoria olongburensis*** are found in the wetland heath community of the Tin Can Bay School Wetland.

Photo: www.mangrovewatch.org.au

Tin Can Bay School wetland includes a range of habitat types.

Image:Wetland Maps

The estuarine habitats in the Tin Can Bay School wetland are located within the Great Sandy Strait Ramsar site.

About this case study:

This case study was created by the Department of Environment and Resource Management (DERM) Aquatic Ecosystem Health Science Integration and Capacity Building Team as part of the Queensland Wetlands Program. The purpose of this conceptual modelling case study is to synthesise and present information on the values of the Tin Can Bay School wetland site as an intact, well-connected wetland complex with high diversity and habitat for endangered and vulnerable plant and animal species.

Tin Can Bay wetlands are well connected

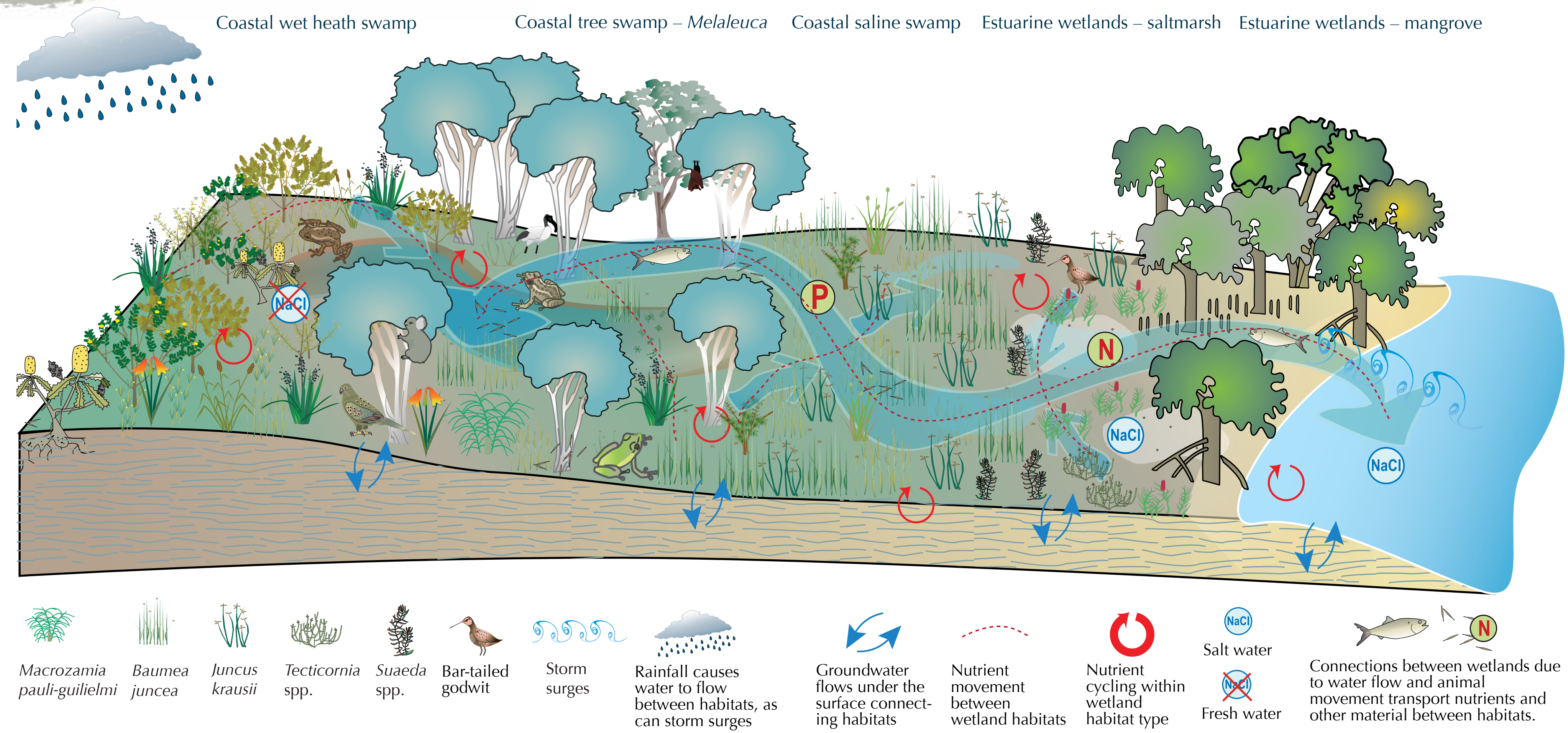
Ecosystems in their undisturbed state rarely occur as separate entities; they tend to flow into each other, sharing nutrients and water across their borders.

Wetland ecosystems are often connected during times of flood. Water flow connectivity provides drier wetlands with water and allows the movement and restocking of aquatic animals such as fish.

Some fish species need to access different wetland habitat types (including lakes, brackish or freshwater swamps, rivers, estuaries and the sea) at different stages of their lifecycles, making connectivity between these wetland types very important for their survival.

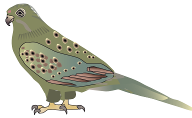
The movement of animals such as birds also connects wetlands, as they transport nutrients, seeds and sometimes even fish eggs between wetlands.

Tin Can Bay is a good example of a connected coastal wetland – from freshwater paperbark and wet heath swamps, to saltmarsh and mangrove estuarine habitats – this connected spectrum of wetlands makes it very special!



Protected plants and animals live here

Ground parrot (vulnerable)



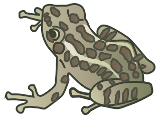
Bright green with yellow and black markings, the shy ground parrot is rarely seen unless flushed from cover. Confined to pockets of heath and sedgelands along the coast of South East Queensland, it eats the seeds of grasses, sedges and herbs. Its nest is a shallow bowl of fine sticks and grass, hidden under low shrubs. Survival is threatened by loss of habitat, altered fire regimes and hunting by introduced predators.

Koala (vulnerable)

Koalas are seen and heard in the Tin Can Bay School wetland, which falls within the South East Queensland Bioregion. Here koalas are listed as vulnerable. The school wetland and surrounding protected areas help ensure that Queensland's much loved fauna emblem has a future in this part of the state.

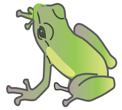
Acid frogs (vulnerable)

The wallum rocket frog, wallum froglet and wallum sedge frog are 'acid' frogs, adapted to survive in the acidic water (pH 3.0–5.2) of undisturbed coastal heathlands. Clearing and draining alters the water pH and increases nutrient levels, making the habitat less suitable for acid frogs and encouraging competitor frog species and cane toads to invade.



The wallum rocket frog is pale grey–brown with darker brown blotches and is about 30 mm long. Powerful back legs make it an agile jumper. In the spring and summer, it lays its eggs in any available water, including temporary puddles that may dry up. The tadpoles develop very quickly and can survive high water temperatures.

The wallum froglet is small (20 mm), patterned in grey to brown with a distinctive white stripe on the underside from chin to belly. These frogs breed in autumn and winter. The small tadpoles have long wide tails and take six months to mature.



Coloured light brown to green, the 25 mm wallum sedge frog has a distinctive pointy snout. Wallum sedge frogs breed in spring and summer after good rains. The tadpoles are small, dark and mottled and have a bluish sheen.

Protected plants

Protected plants of the Tin Can Bay School wetland include the vulnerable *Acacia baueri* and the endangered *Macrozamia pauli-guilielmi* and *Blandfordia grandiflora*. The latter, also known as Christmas bells is illustrated here.

Freshwater wetlands including coastal wet heath swamps and coastal ***Melaleuca*** swamps are connected in Tin Can Bay School wetland.

Freshwater wetlands meet coastal saline swamps and estuarine wetlands including saltmarsh and mangroves.

Birds, fish, frogs, insects, crabs and other wildlife, play an important role in connecting the zones of wetland vegetation by moving between the vegetation types and transporting nutrients, eggs, seeds and plant matter from one zone to another.

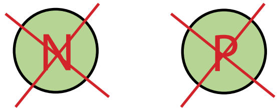
Left to right: Honeyeater, wallum rocket frog, dragonfly, sacred kingfisher, fiddler crab

Coastal non-floodplain wet heath swamp

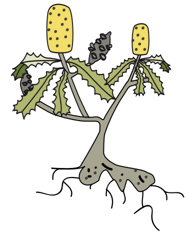
Coastal wet heaths occur in swampy areas on sand plains, on poorly drained coastal dunes and where water collects in dune swales from both overland flow and infiltration.

These wetland habitat types can form over coffee rock in the dune systems or over hard pan and groundwater discharge systems where organic matter can accumulate.

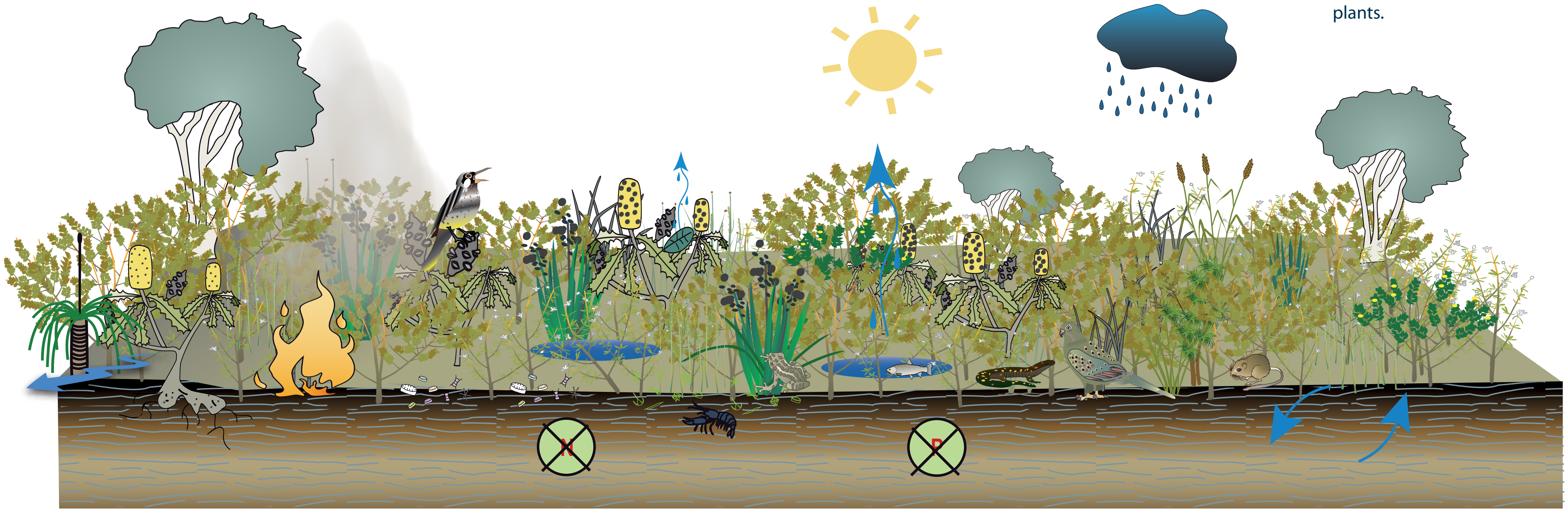
The soils of wet heath habitats are characterised by low fertility. Yet these soils support a great diversity of shrubby plants.



Wet heath swamps are typically very low in nutrients like nitrogen (N) and phosphorus (P).



Banksias, along with other members of the Protea family have special roots that help maximise the amount of soil nutrient available, both to themselves and to other plants.



Water inputs

Surface water inflow from local watershed

Groundwater discharge

Rainfall

Water outputs

Groundwater recharge

Surface water outflow

Evaporation

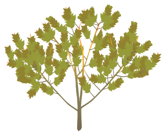
Evapo-transpiration

Conceptual models from www.wetlandinfo.ehp.qld.gov.au

Wet heath plants

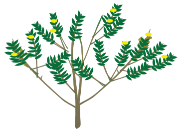
Myrtaceae

Melaleuca spp.



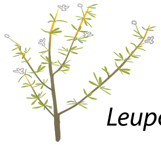
Leptospermum spp.

Fabaceae



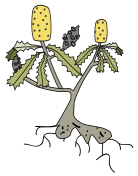
Pultanea spp.

Ericaceae



Leupogon spp.

Proteaceae



Banksia spp.

Cyperaceae

Gahnia spp.

Plant families that thrive in the wet heaths are adapted for life in acidic, low nutrient soils.

Photo: M. Prior

The wet heath ecosystem of the Tin Can Bay School wetland supports a rich diversity of shrubs and herbs on soil very low in nutrients. This diversity can best be appreciated in spring when the heaths are resplendent with wildflowers.

Photo: J. Tilden

Photo: M. Prior

The purple fringe lily is found in moist areas, among grasses.

Photo: J. Tilden

Leptospermum (top left), ***Banksia*** (top right) and many other nectar-rich plants thrive in wet heath, providing food for nectar-loving insects, birds and mammals.

Photo: J. Tilden

Many heath plants are specially adapted to life in low nutrient soils. Members of the pea family (Fabaceae) such as ***Pultenaea*** (right) have bacteria in their roots that fix nitrogen. Sundews (above) supplement their nutrient intake with insects caught in their sticky leaf hairs.

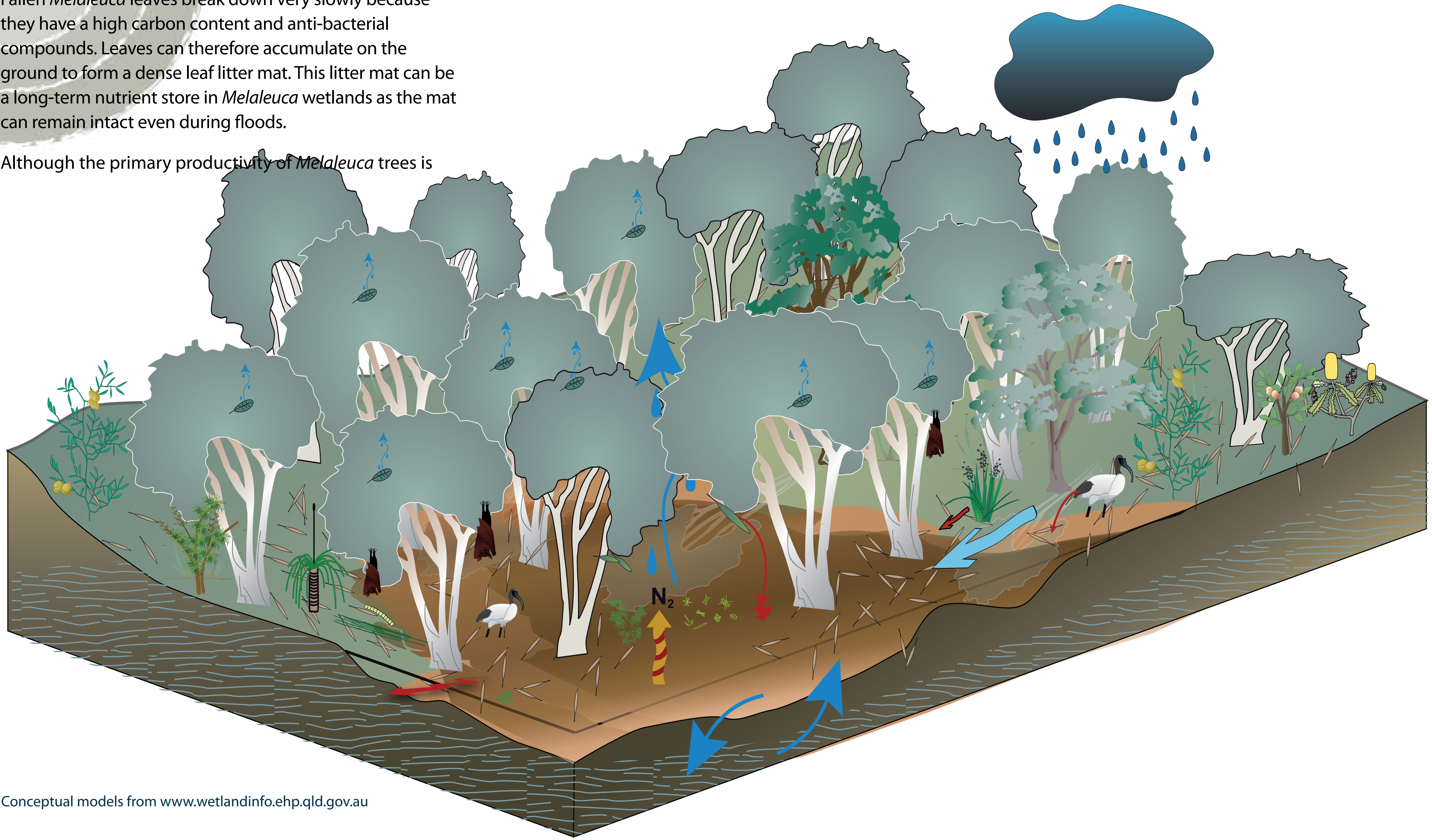
Photo: J. Tilden

Coastal non-floodplain tree swamp – *Melaleuca*

This wetland habitat type is dominated by *Melaleuca* trees that can be inundated with water for three to six months of the year.

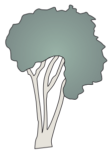
Fallen *Melaleuca* leaves break down very slowly because they have a high carbon content and anti-bacterial compounds. Leaves can therefore accumulate on the ground to form a dense leaf litter mat. This litter mat can be a long-term nutrient store in *Melaleuca* wetlands as the mat can remain intact even during floods.

Although the primary productivity of *Melaleuca* trees is relatively high, algae (in the shallows), phytoplankton (in deeper waters) and sedges can be even more productive within *Melaleuca* wetlands because they have faster growth and recycling rates.



Conceptual models from www.wetlandinfo.ehp.qld.gov.au

Melaleuca swamp plants



Melaleuca spp.

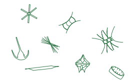
Eucalypt spp.

Banksia spp.

Baloskion tetraphyllum

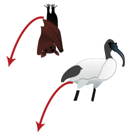
Gahnia sieberiana

Other grasses and sedges



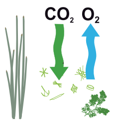
Algae

Plants of Melaleuca swamps are aquatic, semi-aquatic or adapted to withstand having their roots submerged seasonally.

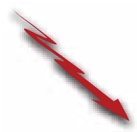


Droppings from nesting birds and bat colonies can be a significant nutrient input to the wetland.

Leaf fall accumulates into a dense leaf litter mat.



Algae, phytoplankton and macrophyte production can be very high in coastal non-floodplain tree swamps.



Nutrients (including nitrogen and phosphorus) can enter coastal non-floodplain tree swamps attached to particles and suspended or dissolved in catchment run-off water. Nutrients can leave the wetlands when they are connected by water to the land and to other water bodies or through biological processes such as denitrification.

Denitrification occurs when bacteria convert the nutrient nitrogen into a gas which passes out of the wetland sediment and water and into the atmosphere.

Migratory and mobile animals like fish and birds can transfer nutrients (as well as pollen, seeds and the small eggs of many species) between wetlands and into terrestrial areas.

Photo: DERM

Photo: Jenny Miners (Brisbane)

Melaleucas or 'tea trees' produce the tannin-stained, waters that support acid frogs such as the Wallum rocket frog (right). In turn, frogs and fish adapted to these acid brown waters attract predatory waders such as white-faced herons (below).

Photo: M. Prior

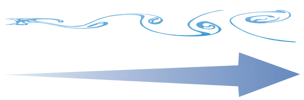
Photo: Joe Heaphey

Coastal saline swamp

Coastal saline swamps are found between coastal freshwater wetlands and salty estuarine wetlands like saltmarsh and mangroves.

A variety of grasses, sedges and some salt-tolerant succulents grow in this habitat.

In connected, intact areas like Tin Can School wetland the borders between this wetland habitat fluctuate with neighbouring wetland habitat types depending on rainfall patterns and flooding by storms and extraordinary high tides.



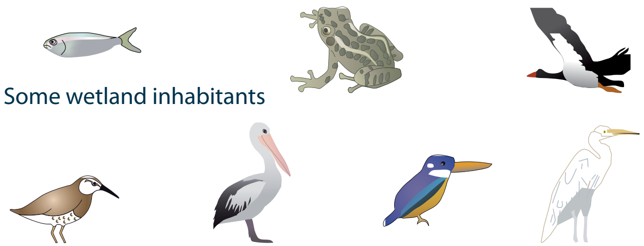
Though these wetlands are above Highest Astronomical Tide (HAT) and therefore are not estuarine, they still receive some ocean-derived salt from their close proximity to marine and estuarine systems – from wind action, unusually high tides, from storm surges and/or as a result of their position on old marine plains. This salinity typically decreases with distance from marine and estuarine areas.

Saline swamps are seasonally inundated with fresh water but become more saline as they dry, due to the concentration of salt by evaporation. These habitats can be seasonally flooded with water and dry out completely before the next season's rain.

Conceptual models from www.wetlandinfo.ehp.qld.gov.au

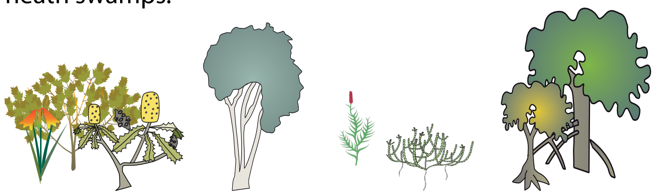
Wet heath (to the left) bordering coastal saline swamp (right)

Coastal saline swamps are important habitat, breeding and feeding areas for a range of animals including fish, birds and frogs.



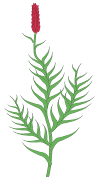
Some wetland inhabitants

In Tin Can Bay School wetland, coastal saline swamps are found near, and often interspersed with, mangroves, saltmarsh, coastal *Melaleuca* swamps and coastal wet heath swamps.



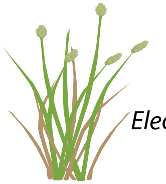
Wet heath **_Melaleucas_** Saltmarsh Mangroves

Saline swamp plants



Sporobolus virginicus

Juncus kraussi (at its northern limit)



Eleocharis sp.

Baumea rubiginosa

Photo: www.mangrovewatch.org.au

Saline swamp bordering **_Melaleuca_** (in the distance)

Invertebrates such as dragonflies are important in saline swamp food webs.

Photo: edenink

Photo: J. Tilden

When saline swamps are part of a connected system of wetlands, they provide habitat for fish species that move between fresh and salt water during their life cycle, such as Australian bass (below), sea mullet and barramundi. These fish are a food source for kingfishers (above) and other fish-eating birds.

Photo: Vin Lam

Estuarine wetlands – saltmarsh and mangroves

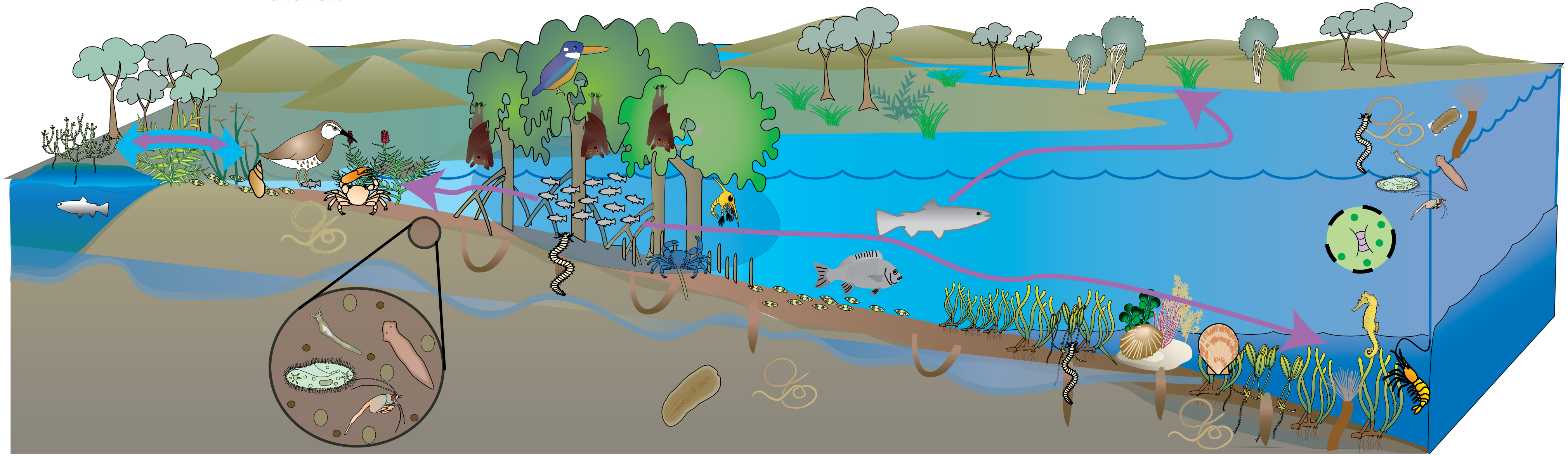
Saltmarsh

Saltmarshes are intertidal plant communities adjoining coastal saline swamps and mangroves in the Tin Can Bay School wetland. They form a mosaic of succulents, grasses, low shrubs and salt flats. The ground in which these plants grow can fluctuate between very salty and quite fresh depending on rainfall and tides. The plants have a range of special adaptations to cope. For example some have hard waxy surfaces which help retain water.

Saltmarshes are an important feeding ground for birds and fish.

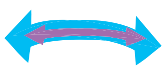
Mangroves

Mangroves are trees, shrubs, palms and ferns, generally exceeding 1.5 m in height, that grow above mean sea level in the intertidal zone of coastal environments and estuarine margins. The large mangroves provide nursery habitat for a range of commercial fish and prawn species and are also involved in shoreline protection. A large colony of flying foxes roosts in the Tin Can Bay School wetland.



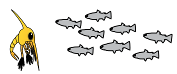
Conceptual models from www.wetlandinfo.ehp.qld.gov.au

Small fish move with the tides to access mangrove areas, where they find protection, and to the salt marsh, where some feed.



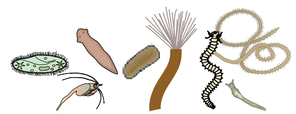
Water flow between wetland pools and estuaries during very high tides or run-off events allows fish to move.

At different stages of their life cycle, some fish move up- and down-stream, to fresh and marine water to breed and spawn.



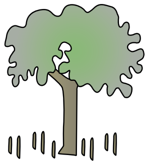
Mangroves are important nursery areas for some juvenile fish and crustacean larvae, as well as birds and bats.

Mangrove provide shade, buffering temperature and blocking UV radiation, so providing suitable living places for other life forms.

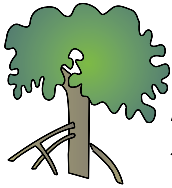


Many estuarine organisms, including worms and microbes, live in burrows or on the sediment.

Mangrove plants

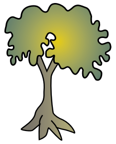


Avicennia marina



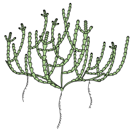
Rhizophora stylosa

Aegiceras corniculatum

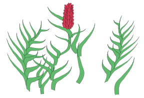


Ceriops australis

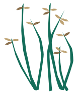
Saltmarsh plants



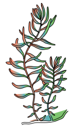
Halosarcia sp.



Sporobolus virginicus



Other grasses



Suaeda sp.

Photo: M. Prior

Plants in saltmarsh (right) and mangrove communities (below) are adapted to varying levels of innundation by salt water, determined by daily and seasonal variations in the tide cycle.

Photo: www.mangrovewatch.org.au

Photo: M. Prior

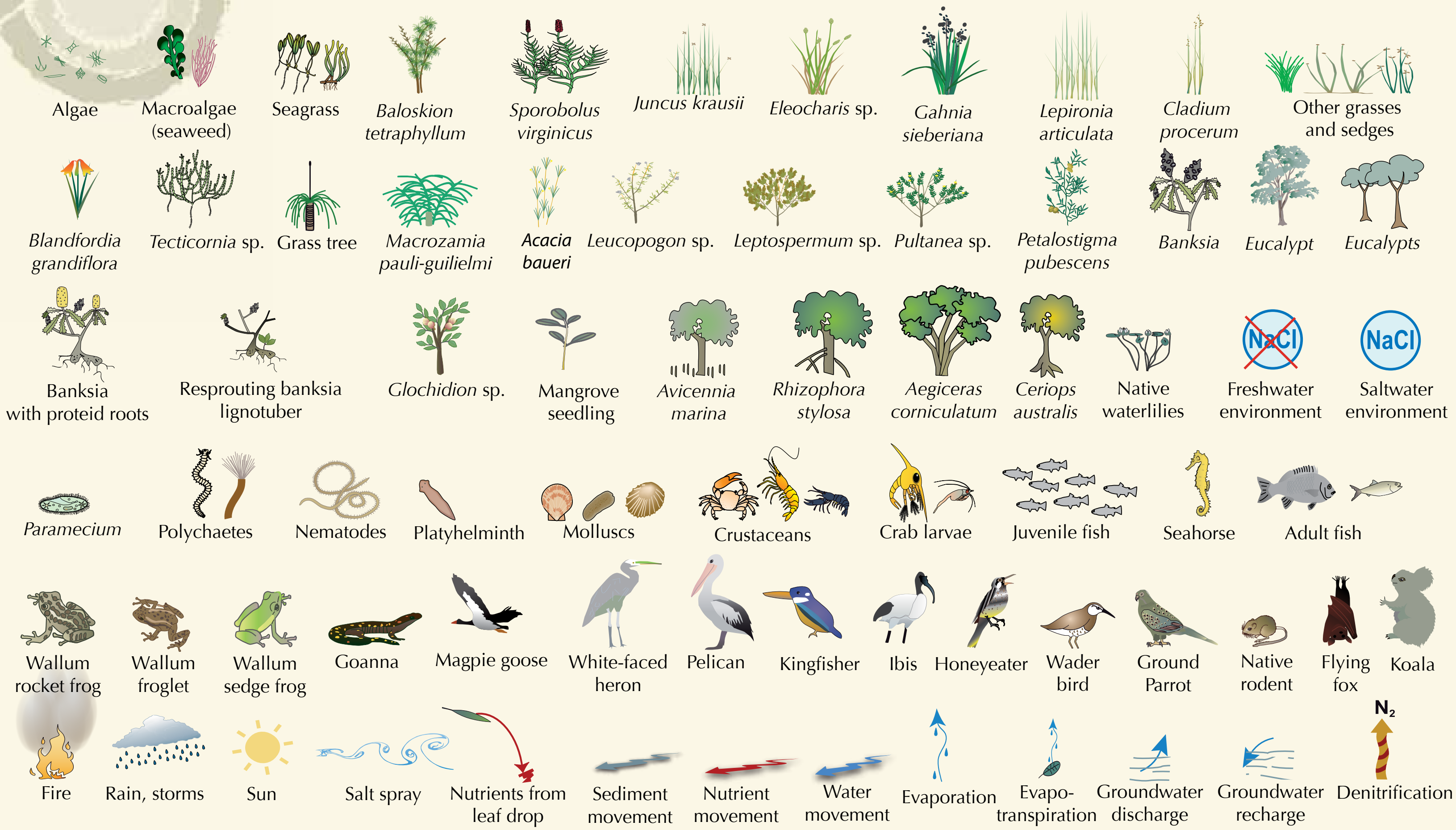
Saltmarshes are important feeding grounds for birds including these bar-tailed godwits (in flight) and pied oyster catchers.

Photo: N. Duke

Photo: J. Tilden

Crabs play an important role in mangrove food webs, keeping nutrients in the forest by burying and consuming fallen leaves (above). Crab larvae are also important food for young fish in adjacent waterways. Their burrows help aerate the mangrove soil, preventing buildup of toxic products such as ammonia and sulfur compounds.

Tin Can Bay School wetland conceptual model legend



Banksia robur is a prominent species in the Tin Can Bay School wetland

The Queensland Wetlands Program is a joint initiative of the Australian and Queensland governments.

Australian Government

Queensland Government

Queensland Wetlands Program

Burnett Mary REGIONAL GROUP

wetlandcare australia

Find all your wetland management resources at: www.wetlandinfo.ehp.qld.gov.au