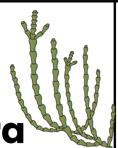
SALTMARSH SUPER SAVERS SURVEY

Saltmarsh Subjective Assessment Of Ecosystem Values and Risks

earthwatch AUSTRALIA

MangroveWatch

WHAT IS A SALTMARSH?

Description 	• Saltmarsh is a marine plant ecosystem. • Saltmarsh edges are 'fuzzy', with gradual change from mangrove to saltmarsh or saltmarsh to adjacent coastal habitats like Casuarina and Melaleuca spp. • Ecotone zones are still considered saltmarsh if >50% of the groundcover is saltmarsh. • mangroves and saltmarsh share the tidal zone. Saltmarsh plants thrive where mangroves are absent due to increased salinity and variable soil moisture further up the tidal zone. • Local factors such as groundwater upwelling, terrestrial and urban runoff can allow mangroves to establish higher up the tidal profile in some areas. Sea level rise is causing mangroves to expand into saltmarsh in some locations.
Location 	• This complex ecosystem occupy protected coastlines such as embayment's, along banks of tidal creeks/rivers, or within dune swales. • Saltmarsh's occupy the upper tidal zone above mean sea level but below the highest astronomical tide (HAT) mark. • Saltmarsh areas occur where <30% of tides inundate the tidal zone (Mackenzie, 2005).
 **Flora** 	• The saltmarsh ecosystem consists of salt tolerant (halophyte), plant communities (small shrubs and grasses), algal mat and claypan/ saltpan complexes with less than 50% tree cover.

HOW TO COMPLETE THE SURVEY?

Define the area of interest	• Visually define the saltmarsh area you're assessing. You can use online maps (eg. Google Maps) to assist. • Look for features that define a distinct saltmarsh area. • If you're in a large saltmarsh area, divide the area into subsections (North & South). • You can help with accurate mapping!!!!! If you have a GPS or tracking app on your phone (eg. Strava). Take a walk around the site and send the track to us at **mangrovewatch@gmail.com** or put it on Google Earth and send us the .kmz file.
Site information	• Fill in the top section of both datasheets • Location: The shoreline or estuary (eg. Boyne River) • Site Name: A descriptive name of the area being assessed (eg. Salty Swamp Reserve or Canoe Point Saltmarsh) • Site Description: Notes on the location of the saltmarsh area. (Eg. Mixed samphire/saltpan southern bank near creek St, opposite cricket ground). • Latitude & Longitude: Use you GPS, camera or smart-phone to get a lat/ long coordinate. On a smart-phone lat/long position can be found by using your map
Species observations	• Take a photo of each different plant type present at your site • To assist with identification of both plant and animal species you can download the app **'iNaturalist'**. Tag @MangroveWatch in the comments section of your post and we can assist confirm your ID. • • The "Field Guide to Common Saltmarsh Plants of Queensland" (Johns, 2006), should also assist you in species ID

THINGS TO NOTE

Data Sheet: Can be found on the last page of this document

= Saltmarsh Values

= Saltmarsh Threats

= The question with the grading system that is used to complete the data sheet is highlighted in the corresponding threats or values colour with a boarder

*Most of the questions will have correlating visual aids that will help you to complete the survey

HELPFUL LINKS

- Protected Matters Search Tool: https://www.dcceew.gov.au/environment/epbc/protected-matters-search-tool

- Queensland Globe: used to help identify saltmarsh areas https://qldglobe.information.qld.gov.au/

NOTES

• There is no right or wrong answer.

• Make sure you have the visual aids provided with you to help complete the survey.

• Score every box!

• For values: only use 0 in rare circumstances.

• Try and take photos of features that relate to your answers.

HAVE FUN!!!! :)

RATE YOUR KNOWLEDGE

The following 2 questions are to be used to help fill out the top section of the data sheet.

How familiar are you with the site?

1 = Never been there before
3 = I know this area
5 = You know the site very well

How familiar are you with saltmarsh habitats?

1 = What's a saltmarsh
3 = I know a bit about saltmarsh
5 = I could give a 1-hour presentation on saltmarsh

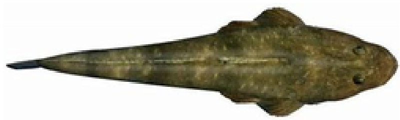
METHODS: FISH HABITAT

The following section is all about Fish Habitats.

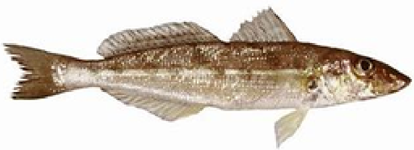
- For this section you are going to need to think like a fish.
- Remember that we assume that you are completing this survey with the knowledge that you are provided with in this booklet.

COMMON SALTMARSH FISH

Snapper & Perch (Lutjanus sp.)



Flathead (Platycephalus sp.)



Whiting (Silago sp.)

Bream (Acanthopagrus sp.)

Perchlet (Ambassis sp.)

Mullet (Mugil sp.)

Silverbiddy (Gerres sp.)

Ponyfish (Leiognathus sp.)

FISH HABITAT

ACCESSIBILITY

- Fish use saltmarsh's as a nursery and feeding ground at high tide. Assess how accessible the site is for fish at high tide.
- Bund wall = manmade retaining wall

Deep water channel

Shallow water channel

How easily can fish access the saltmarsh site at high tide?

0. Fish unlikely to access site

1. Bund walls/barriers present blocking tidal flow

2. Tidal connectivity through adjacent mangroves

3. Shallow tidal channels present

4. Fish can access site at high tide only

5. Saltmarsh is directly adjacent to deep water channel

FISH HABITAT

PROXIMITY
(TO HABITATS OTHER THAN SALTMARSH)

- Assess the number of habitats fish can access at high and low tide.
- Saltmarsh proximity to other habitats (seagrass, coral, rocky shoals, sand banks, deep-water channels etc.) has been known to have higher fish habitat value.


Dep water channel


Rocky shoals


sand banks


Seagrass


Rockwall


Mangrove


Coral Reef

How many other habitats can fish access other than the saltmarsh?

0.Fish unlikely to access site

1.Fish can access 1 habitat type at high and low tide

2.Fish can access 2 habitat types at high and low tide.

3.Fish can access 3 habitat types at high and low tide.

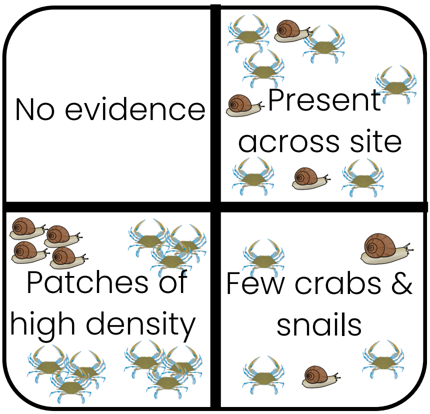
4.Fish can access 4 habitat types at high and low tide.

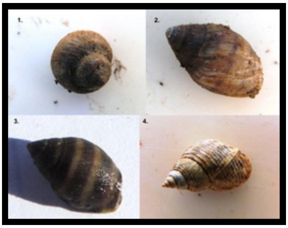
5.Fish can easily access 5 or more habitat types at high and low tide

FISH HABITAT

SNAIL & CRAB DENSITY

- Fish feed on crabs, snails, algae & detritus (organic matter i.e. leaves on the ground).
- Look for burrows, shells and snails around plant basses and in pools.





Snail Shells

Crab shells & Burrows

Crab

What is the density and distribution of crabs and snails across the site?

0.Fish unlikely to access site - no tidal connectivity

1.No evidence of crabs or snails

2.Few crabs and snails present

3.Snails and crabs present across site

4.Patches of high density snails and crabs on site

5.Lots of fish food - high density of snails and crabs across the whole site

FISH HABITAT

SALT COUCH

- Salt couch (*Sporobolus virginicus*)Is a salt-tolerant grass that can grow to 30cm tall. Salt couch is important as food and carbon for many fisheries species.

Salt couch

>90% cover (nearly all)

What is the salt couch percent cover of the site?

0.0% Cover (none)
1.<10% cover (a little bit)
2.10-30% cover (a bit)
3.30-60% cover (some)
4.60-90% cover (most)
5.>90% cover (nearly all)

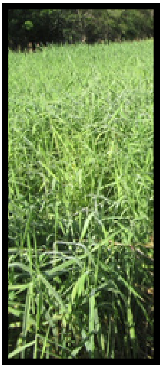
FISH HABITAT

HABITAT DIVERISTY

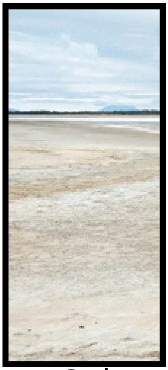
- Different habitat types include: salt flat, algal mat, samphire, saline grassland, sedges, shallow pools, saltpan, rocks/stones.
- Higher habitat diversity = higher diversity of fish species.

Salt Couch

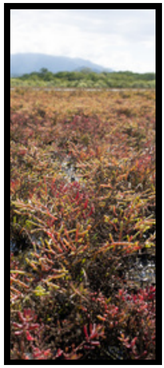
Pools/ Channels



Reeds



Salt Flat



Samphire

Sedge/ Rushes

How many other habitat types are present that fish can access?

0.fish unlikely to access the site, hence the habitat diversity isn't relevant

1.1 habitat type present

2.2 habitat type present

3.3 habitat type present

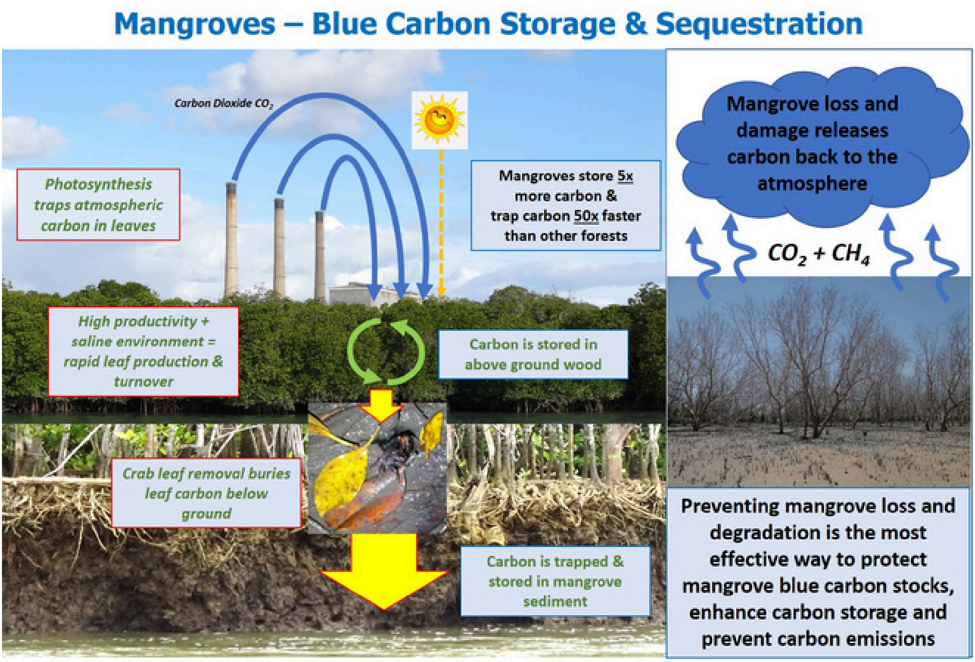
4.4 habitat type present

5.5 or more different habitat types present

METHODS: CARBON STORAGE & SEQUESTRATION VALUES

The following section is all about Carbon Stores.

Saltmarsh are an important blue-carbon resource. Blue carbon refers to carbon stored in marine habitats. Carbon trapped by plant photosynthesis is stored in leaves, roots and algae. The salty environment causes high leaf and root turnover. The carbon is then buried in the sediment, exported on the tide, or consumed by fauna, trapping it in the marine environment. Saltmarsh soils remain mostly wet, and do not emit large quantities of methane, like freshwater wetlands. When disturbed, these habitats emit greenhouse gases.



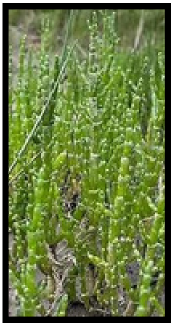
CARBON STORAGE & SEQUESTRATION VALUES

VEGETATION TYPE

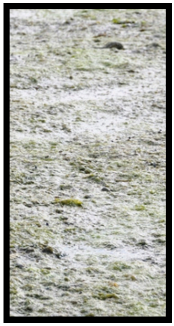
- Different vegetation types are more productive than others and provides an indication of sediment water content. (Reeds/Sedges > Salt couch > Samphire > algal mat > bare).

Sedges

Salt Couch



Samphire



Algal mat

What vegetation type does the site mostly consist of?

0.No vegetation cover (100% saltpan without plants or algal mat)
1.Vegetation and algal mat cover < 25%
2.Saltmarsh mostly algal mat OR has patches of samphire (25%-50%) with other vegetation types OR has patches of salt couch (10%-25%)
3.Saltmarsh mostly samphire OR has patches of salt couch (25%-50%) with other vegetation types OR some swampy areas (10-25%).
4.Saltmarsh mostly salt couch OR has swampy areas (25%-50%) + other vegetation
5.Saltmarsh mostly dense reeds and/or sedges (> 50% swampy)

CARBON STORAGE & SEQUESTRATION VALUES

SEDIMENT TYPE

- It's important to note the sediment type because substrate (sediment) high in organic matter stores more carbon than substrate with low organic matter.

SAND

Coarse texture and visible sand grains. Can easily be brushed off the trowel/ fingers.

MUDDY SAND

Coarse texture, with some smoothness, visible small sand grains. Leaves a small amount of muddy residue on the trowel/ fingers

SANDY MUD

Smooth texture, with some coarseness, some visible sand grains. Leaves muddy residue on trowel/ fingers.

MUD / SILT

Mud/ Silt: Smooth texture with no coarseness. No visible sand grains. Leaves a smear on the trowel/ fingers.

CLAY

Smooth sticky texture, sediment strongly bound, some visible sand grains, mottled grey colour. Sticks to fingers. Difficult to remove from

ORGANIC

Sediment is black/ dark brown and contains large amounts of partially broken down organic matter (it's like compacted compost). The sediment

What sediment type does the site mostly consist of?

0.Dry Beach Sandy (very rare)

1.Muddy Sand

2.Sandy Mud

3.Dense Clay

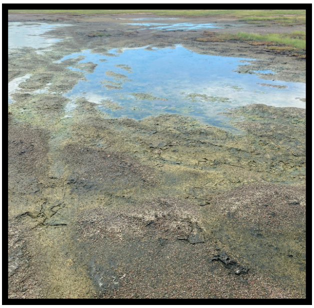
4. Organic Muds (darker brown)

5.Mostly moist peat (spongy, light brown with high organic matter)

CARBON STORAGE & SEQUESTRATION VALUES

VEGETATION COVER

- Plant biomass (amount of plant material) is a good indicator of saltmarsh carbon sequestration potential.
- *Include algal mat cover.



10-30%
(mostly algal mat)

30-60%

60-90%

What is the vegetation % cover?

0. 0% (none)
1. < 10% (a little bit)
2. 10-30% (a bit)
3. 30-60% (some)
4. 60-90% (most)
5. > 90% (nearly all)

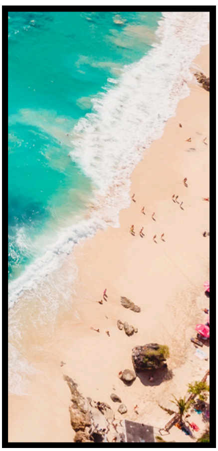
METHODS: WATER QUALITY IMPROVEMENT

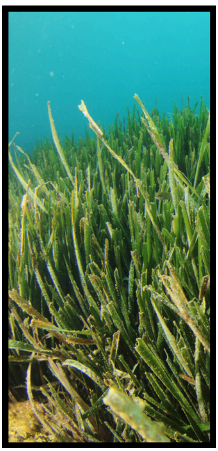
This next section is about Water Quality.

- Saltmarsh's can clean water in 2 ways; 1) from land-based runoff like urban stormwater and 2) cleaning tidal water during a flooding tide

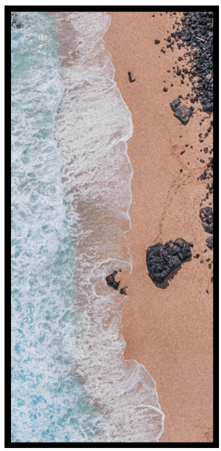
- The capacity of saltmarsh's to trap and retain nutrients and sediment is related to the following:

- Vegetation density, algal mat cover, direct runoff (stormwater), proximity to point source, indirect runoff, tidal connectivity.


Beach


Seagrass


Reef


Beach

WATER QUALITY IMPROVEMENT

VEGETATION DENSITY

- The capacity of a saltmarsh to trap and retain nutrients and sediment is related to:
- The presence of vegetation structure (density) that slows water currents, allowing sediment to floc out of the water column.

Patches of dense vegetation

Very dense vegetation

What is the vegetation density at the site?

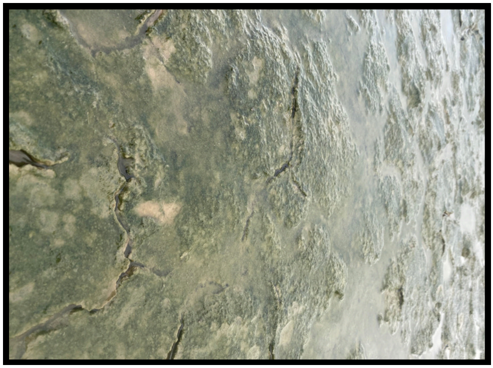
0.No vegetation present
1.Very low density vegetation
2.Low density vegetation
3.Moderately dense vegetation
4. Patches of dense vegetation
5.Very dense vegetation to intercept water

WATER QUALITY IMPROVEMENT

ALGAL MAT COVER

- The capacity of a saltmarsh to trap and retain nutrients and sediment is related to:
- Plant and algal mat growth that binds sediment in roots and uses trapped nutrients.

30-60%



>90%

What is the algal mat % cover?

0. 0% (none)
1. < 10% (a little bit)
2. 10-30% (a bit)
3. 30-60% (some)
4. 60-90% (most)
5. > 90% (nearly all)

WATER QUALITY IMPROVEMENT

PROXIMITY TO DIRECT STORMWATER RUNOFF

- Looking at the proximity of the saltmarsh to direct storm water runoff. This assesses the amount of sediment and nutrients available to be trapped.

Drain present on site

Drains in areas adjacent to site

Drain outlet into saltmarsh

What is the proximity of the site to direct stormwater runoff?

0.No direct runoff
1.Drains flowing into estuary or tidal wetland complex
2.Drains in tidal wetland area, but not nearby
3. Drain in areas adjacent to site
4.Drain nearby (< 100m)
5.Drain present directly flowing into site

WATER QUALITY IMPROVEMENT

PROXIMITY TO POINT SOURCE

- Proximity to direct source of nutrients or pollution such as a sewage outlet, aquaculture, factory.

What is the proximity of the site to direct sources of nutrients/pollution?

0.No source present
1.Point source flowing into estuary or tidal wetland complex
2.Point source in tidal wetland area, but not nearby (> 1km)
3.Point source in close proximity downstream (< 1km)
4. Point source in close proximity upstream (< 1km)
5.Adjacent to point source

WATER QUALITY IMPROVEMENT

INDIRECT RUNOFF
(OVERLAND FLOW - TERRESTRIAL CONNECTIVITY)

- Tidal wetlands (such as saltmarsh's) can trap between 50-80% of sediment in tidal waters and runoff.
- Harmful nutrients and chemicals are attached to sediment runoff which can damage nearby reef and seagrasses habitats.

Adjacent to urban landuse

Pristine, natural catchment

Assess how connected the site is to other landuses, which may contribute to indirect runoff on the site.

0.Pristine, natural catchment
1.Some urban/agricultural land use in catchment
2.Most of the catchment area is agricultural or urban land
3.Urban or agricultural landuse surrounding tidal wetland but not nearby (> 1km)
4. Nearby areas adjacent to urban or agricultural landuse
5.Adjacent to urban or agricultural landuse

WATER QUALITY IMPROVEMENT

TIDAL CONNECTIVITY
(PROXIMITY TO MAIN WATER CHANNEL)

- Looking at how close the saltmarsh is to a main water channel.

Shallow tidal channel present

Tidal connecitvity limited by barrier

How connected is the site to tidal channels?

0.No tidal connectivity
1.Tidal connectivity limited by bund walls or barriers to tidal flow
2.No direct connectivity with tidal channels, but tidal connectivity maintained through adjacent mangrove
3.Shallow tidal channels present
4. Direct connectivity through large tidal channels
5.Saltmarsh is directly adjacent to deep water channel

METHODS:
HABITAT VALUES

The following section is about habitat values of saltmarsh's.

- Saltmarsh's provide habitats for many species. These may be locally iconic important for tourism or have cultural significance.

- Saltmarsh's are also home to threatened species and internationally threatened migratory wader bird species.

HABITAT VALUES

MIGRATORY WADER BIRDS

- Species that are shorebirds or waders. They hunt around saltmarsh's in search for food.
- Keep in mind that we assume that this is based on the knowledge you have gained from this method. If you are unsure try your best to make a calculated guess.

Asian Dowicher

Eastern Curlew

Common Greenshank

Presence of migratory wader birds?

0.Site is unsuitable for wader birds
1.Low potential (high food resource + open spaces)
2.High potential (high food resource + open spaces)
3.Site is listed RAMSAR Wetland
4. Site is adjacent to known shorebird roosts or feeding grounds
5.Site is known as shorebird roost or feeding ground

HABITAT VALUES

THREATENED SPECIES

- This includes any species that are vulnerable to extinction in the near future.
- You could use the “Protected Matters Search Tool” to assist with your knowledge

Water mouse nest

Presence of threatened species (that you know of)?

0.Unlikely that threatened species do or will utilize this site.
1.Possible potential as threatened species habitat
2.High potential as threatened species habitat
3.Threatened species are present in the area, may use this site
4. Threatened species use saltmarsh habitats nearby
5.Threatened species are known to use this site

LOCALLY ICONIC SPECIES

- Animals that are of importance to the local community.

Presence of locally iconic species?

0.Unlikely that locally iconic species do or will utilize this site.
1.Possible potential as locally iconic species habitat
2.High potential as locally iconic species habitat
3.Locally iconic species are present in the area, may use this site
4.Locally iconic species use saltmarsh habitats nearby
5.Locally iconic species are known to use this site

HABITAT VALUES

GENERAL HABITAT VALUES

- This relates to terrestrial connectivity and non-marine species.
- Some valuable attributes = Nature reserve, high connectivity between marine and terrestrial environments.

Assess the general habitat values this site has?

0.Site has very low terrestrial biodiversity - no connectivity (very rare)
1.Site has limited potential as habitat - little connectivity
2.Site has some potential as habitat
3.Site is important as a natural landscape in an otherwise impacted environment
4.Site has attributes that make it valuable
5.Many species observed at the site

METHODS: RECREATION VALUES

This next section is about the recreational values of the site.

- Saltmarsh's provide open spaces that provide opportunities for recreational activities such as fishing, walking and bird watching.

- They are also used to gain access to larger waterways for recreational uses.

RECREATION VALUES

RECREATION ACCESS

- Assess the frequency of the site being used for recreational activities.
- This section is largely based on your knowledge of the site. It is ok if you are unsure of the recreational activities that occur at your site. Try and make the best assessment with what you know.




Assess the general habitat values this site has.

0.The site has no recreational value
1.The site has low recreational value
2.The site could have recreational value with increased accessibility
3.Site is highly accessibile for recreational use but is rarely used for such activities
4.The site is occasionally used for recreational activities
5.The site is frequently used for recreational activities

RECREATION VALUES

VISUAL APPEAL

Assess the general habitat values this site has.

0.An eyesore
1.Not very nice
2.Alright
3.Average
4.Pretty
5.Beautiful

METHODS: OTHER VALUES

This next section is about the other values the site provides.

- This section is based on two other values being buffer zone values and cultural values

- Buffer zone values:
  - LOW VALUE = Degraded land
  - MEDIUM VALUE = Farm land used for stock, roads, parks
  - HIGH VALUE = Suburbia, agricultural land with high productivity

- We assume that you are answering the following questions based on the knowledge that is provided in this booklet. We don't expect you to have any prior knowledge about the site.

OTHER VALUES

BUFFER ZONE

- Saltmarshes protect adjacent terrestrial habitat, landuse and infrastructure from coastal hazards like storm surge and floods, providing an important natural buffer between land and sea.

1. Site has LOW-VALUE but is part of a large tidal wetland

3. Site protects adjacent HIGH-VALUE landuse as part of tidal wetland

Does the site protect adjacent habitat, landuse of infrastructure?

0.The site is isolated within a small tidal wetland area
1.The site has LOW-VALUE but is part of a large tidal wetland
2.The site protects adjacent MEDIUM-VALUE landuse as part of a tidal wetland
3.The site protects adjacent HIGH-VALUE landuse as part of a tidal wetland
4.Site is the only habitat b/w coastline and adjacent MEDIUM-value habitat/landuse
5.Site is the only habitat b/w coastline and adjacent HIGH-value habitat/landuse

OTHER VALUES

CULTURAL VALUE

- Saltmarsh's form part of land and sea country for coastal Traditional Owners and may contain sites of cultural significance to First nations people.
- Even if there are no specific sites of cultural significance within a saltmarsh, the area may be important to different communities for reasons including; fishing, play, art and landscape.

What is the cultural value of the site to the people in the community?

0. None
1.Very Low cultural value
2.Low cultural value
3.Moderate cultural value
4.High cultural value
5.Very High cultural value

METHODS: DIRECT DAMAGE

We are now starting to survey the threats that are faced by the saltmarsh site. This next section looks at the direct damages that is occurring at your site.

- Direct damages can result from: vehicles, cattle, pigs, mowing, fire and foot traffic (human trampling).
- These impacts damage saltmarsh vegetation, cause sediment erosion, compact sediment and alter saltmarsh hydrology and can take many years to rehabilitate.
- Additionally, it can result in loss of vegetation cover, decreases habitat diversity, reduces faunal diversity and reduces carbon sequestration capacity.
- Vehicle ruts, cattle tracks and pig diggings can result in pools providing additional mosquito habitat posing a threat to public health.

DIRECT DAMAGE

VEHICLE DAMAGE

- Assess the damage from vehicle ruts and tyre tracks including those form bikes.



Vehicle tracks

What percent of the site is damaged by TYRE TRACKS (car, truck, bike)?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

DIRECT DAMAGE

CATTLE DAMAGE

- Stock damage can come in the form of cattle tracks or grazing on the saltmarsh vegetation.

Grazing

Cattle Tracks

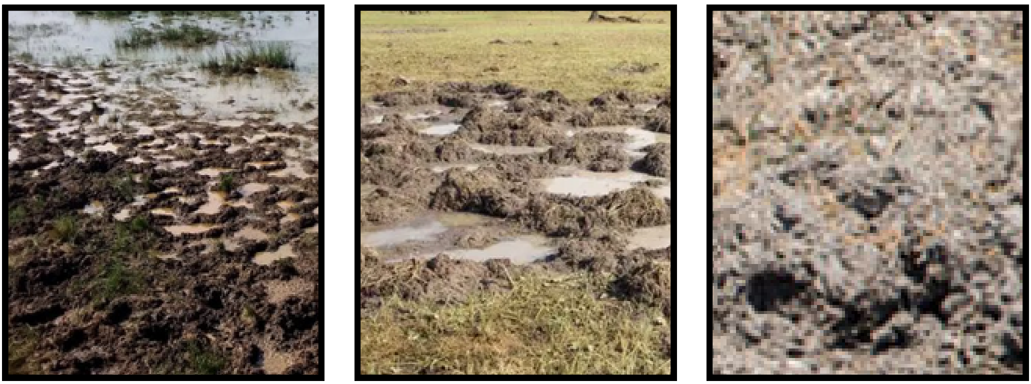
What percent of the site is damaged by CATTLE (cattle tracks & grazed vegetation)?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

DIRECT DAMAGE

FERAL ANIMAL DAMAGE

- Feral animal damage largely relates to wild boars in our wetland environments.
- Keep an eye out for any pig tracks and diggings on your site.



Wild boar markings

What percent of the site is damaged by FERAL ANIMALS (pig tracks & diggings)?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

DIRECT DAMAGE

MOWING

- Mowing of the vegetation on site can result in added nutrient loads, also loss of vegetation cover and general loss of habitat values and biodiversity.

25-50% of saltmarsh mowed

>75% of saltmarsh mowed

What percent of the site is damaged by MOWING?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

DIRECT DAMAGE

BURNING
(FIRE DAMAGE)

- Fire damage can affect the health of the vegetation in your saltmarsh, ultimately it could lead to a loss of vegetation cover.


Burnt Saltmarsh Vegetation


Burnt leaves & new growth in response to fire


Burnt Saltmarsh Vegetation

What percent of the site is damaged by FIRE?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

DIRECT DAMAGE

HUMAN TRAMPLING

- Human trampling can aid in sediment erosion, and compact sediment. Also it can create pools that provides additional mosquito habitat, posing a threat to public health.


Human tracks

What percent of the site is damaged by HUMAN TRAMPLING?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

METHODS: PHYSICAL PROCESSES

This next section of the survey addresses the physical processes that are affecting the saltmarsh site.

- The focus will be on surface erosion, sediment burial and shoreline erosion.

PHYSICAL PROCESSES

SURFACE EROSION

- Look for any channels caused by erosion, bare areas and small erosion cliffs a the terrestrial margin.

10-25% (channels caused by erosion)

50-75% of the site is impacted by surface erosion

What percent of the site is affected by surface erosion?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

PHYSICAL PROCESSES

SEDIMENT BURIAL

- Look for any areas that the saltmarsh is smothered by soil deposited from floods or runoff.

<10%

10-25%

What percent of the site is affected by sediment burial?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

PHYSICAL PROCESSES

SHORELINE EROSION

- This section is only relevant if the saltmarsh is near a creek/river bank.
- You are only going to assess the shoreline interface of your site.


Shoreline erosion on saltmarsh margin

What percent of the shoreline interface is affected by shoreline erosion?

0. 0%
1. < 10%
2.10-25%
3.25-50%
4.50-75%
5. > 75%

METHODS: LITTER & TRASH

This next section evaluates the amount of litter and trash is at the site and the potential it could have to leach into the saltmarsh site.

- Litter in saltmarsh's impacts fauna and flora by leaching toxic chemicals into the environment, which can work its way up in the food chain and be part of human consumption.
- Rubbish such as plastics can hold water which acts as a habitat for mosquitos increase public health risks.
- The dumping of green waste can increase the sites vulnerability to weeds.

LITTER & TRASH

LITTER & TRASH
(LITTER & DUMPING)

- This section is only relevant if the saltmarsh is near a creek/river bank.
- You are only going to assess the shoreline interface of your site.

25-50% of litter cover or large items

<10%

What is the litter percent cover?

0. 0%
1. < 10%
2.10-25%
3.25-50% of litter cover OR large items (car bodies, tyres)
4. > 50% litter across most of the site OR evidence of historical dumping
5.Recent dumping of large quantities OR high potential of toxic chemical leaching

METHODS: DIRECT HABITAT REPLACEMENT

This next section evaluates the percent of the site that has been altered for other landuses.

- This is identified by the presence of hard engineering structures and raised land that follows straight lines.
- Saltmarsh areas have been viewed as wastelands and converted to alternative landuses. This continues today with urban, industrial and agricultural encroachment into saltmarsh regions. *Refer to note.
- Note: Old aerial photos can help with complete this question

DIRECT HABITAT REPLACEMENT

HABITAT REPLACEMENT
(INFILLING & LANDFILL)

- Look for any noticeable hard engineering in the site.
- Or use old aerial imagery to assist.

Road through saltmarsh ~ <10%

What percent of habitat replacement is observed?

0. 0%
1.0-5%, infilling/landfill present at saltmarsh terrestrial margin (no terrestrial buffer)
2.5-10%
3.10-25%
4.25-50%
5. > 50%

METHODS: INDIRECT POLLUTION

This next section assess the indirect pollution that may be affecting the site.

- Runoff from adjacent agricultural and urban areas increase nutrient loads and increases toxic pollution risks to the saltmarsh site.

INDIRECT POLLUTION

AGRICULTURAL RUNOFF

- Is there any farm or agricultural land within a close proximity to the site.

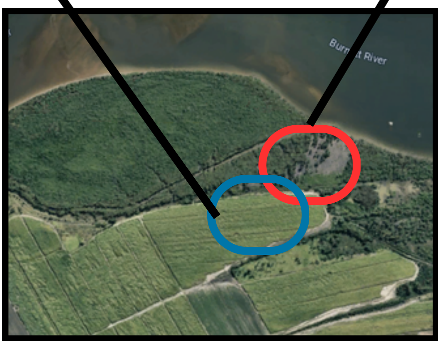
What's the likelihood of agricultural runoff impacts?

0. Unlikely
1.Possible (via overland flows, through buffer zone)
2.Low intensity agricultural landuse within 100m of site

3.Low intensity agricultural landuse (cattle grazing) adjacent to site
4.High intensity agricultural landuse 100m within site
5.High intensity agricultural landuse (application of fertiliser & pesticides) adjacent to site

Agriculture production

Saltmarsh Habitat



High intensity agricultural landuse (application of fertiliser & pesticides) adjacent to site

Unlikely to have agricultural runoff impacts

INDIRECT POLLUTION

URBAN RUNOFF

- Is there housing or buildings that may contain chemicals within close proximity to the site.

What's the likelihood of urban runoff impacts?

0. Unlikely
1.Possible (via overland flows, through buffer zone)
2.Low intensity urban landuse within 100m of site
3.Low intensity urban landuse (parks, low density housing) adjacent to site
4.High intensity urban landuse 100m within site
5.High intensity urban, industrial or recreational landuse

Saltmarsh Habitat

Urban Areas

Possible urban runoff (via overland flows, through buffer zone)

Low intensity urban landuse (parks, low density housing) adjacent to site

METHODS: DIRECT POLLUTION

This next section assess the direct pollution that may be affecting the site.

- Marine plants and animals are highly sensitive to pesticides.
- Hydrocarbon pollution from oil/fuel spills also toxic to saltmarsh fauna and can smother saltmarsh plants.
- Pollution may occur directly from spills, leachate from adjacent dump sites and industrial areas and chemical spray drift from weed control in land adjacent to saltmarsh.

DIRECT POLLUTION

CHEMICAL SPRAY DRIFT

- This refers to herbicide damage. Assess whether there is a likelihood of the site being at risk of herbicide damage in the future OR if it is already impacted by herbicide on along the saltmarsh margin.

Terrestrial margin dead due to herbicides

Percent of saltmarsh margin dead due to herbicide?

0.0%
1.Herbicide damage likely in the future
2. < 10%
3.10-25%
4.25-50%
5. > 50%

CHEMICAL POLLUTION

- This refers to spills, leaching from dump sites and industrial areas that may be close by.

Assess the potential and current affects of chemical pollution.

0.Unlikely
1.Low risk of chemical pollution from adjacent landuse
2.Moderate risk of chemical pollution from adjacent landuse
3.High risk of chemicals leaching from adjacent landuse (dump)
4.Chemical leaching from nearby sites or on-site debris
5.Chemical spill directly impacting saltmarsh (oil spill)

METHODS: ALTERED FLOWS

This section assess the altered flows of the saltmarsh site.

- Changes to tidal flows in saltmarsh habitat via tidal flow restriction (bund walls) or increased tidal flow via channels alters saltmarsh vegetation communities and alters tidal connectivity important for fish.

- Reduced freshwater inputs to saltmarsh can reduce ecosystem resilience to drought and cause loss of vegetation cover. Increased freshwater flows to saltmarsh alter habitat values and increase the risk of mangrove encroachment.

ALTERED FLOWS

ALTERED TIDAL FLOWS

- This refers to the way the tide flows across the area has been changed by humans.

Bund wall changing tidal flow to saltmarsh and surrounding habitats

Has the way the tide flows been changed by humans?

0. No altered tidal hydrology
1. Minor modifications to tidal flow
2. Tidal flow modified but mostly natural
3. Tidal flow moderately modified
4. Tidal flow of main tidal channel connected to saltmarsh significantly altered
5. Tidal flows severely restricted (bund wall) OR large channels constructed at site

ALTERED FLOWS

ALTERED FRESHWATER INPUTS

- This refers to the way freshwater flows onto the area and if its been altered by humans.

Rock wall adjacent to site

Road adjacent to site

Dam: Freshwater impoundment affecting flow into wetland

Has the way the freshwater flows onto the site been changed by humans?

0.No altered freshwater hydrology
1.Freshwater impoundments catchment restricting freshwater flow to tidal wetland area
2.Large-Scale water extraction (groundwater and surface water) in surrounding area
3.Hard surfaces (road, urban landscapes) adjacent to site
4.Irrigated land use adjacent to site OR significant groundwater extraction
5.Significant barrier (dam) preventing direct overland flow of freshwater to site OR unnatural direct flows of freshwater to the site

METHODS: CLIMATE CHANGE & SEALEVEL RISE

- Sea levels are rising. To survive saltmarsh habitats will need to migrate landward. Natural topographic barriers and human infrastructure and landuse can prevent landward migration.

- **BUFFER ZONE** = Healthy buffer zones will also assist saltmarsh move landward. A healthy buffer zone is considered a large vegetated area that saltmarsh habitat can migrate int

- **COASTAL SQUEEZE** = Tidal wetlands retreat and erode along shorelines, but cannot migrate landward, squeezing the available tidal wetland habitat area.

- **TERRESTRIAL RETREAT** = This refers to the expansion of saltmarsh vegetation into more terrestrial vegetation due to sea level rise and saltwater incursion. Terrestrial vegetation will retreat at this margin.

- **MANGROVE ENCROACHMENT** = Mangroves will also move landward with sea level rise and as such colonise saltmarsh habitat. Increasing long-term rainfall also enables mangroves to colonise saltmarsh. This is a natural process but can result in loss of saltmarsh habitat area.

- **WEEDS** = Weeds directly colonising saltmarsh areas can smother and outcompete these regions, reducing the functional value of the habitat. Weeds in the buffer zone (landward edge) area a major threat, as they prevent natural landward migration of tidal wetlands.

CLIMATE CHANGE & SEA LEVEL RISE

LANDWARD BUFFER ZONE CONDITIOIN

- The buffer zone is the area that saltmarsh's can migrate into when moving inland, a healthy buffer zone will consist of extensive natural land with no modified landuse.

0. Healthy extensive natural vegetated buffer zone

5. No natural vegetated buffer between saltmarsh and adjacent landuse

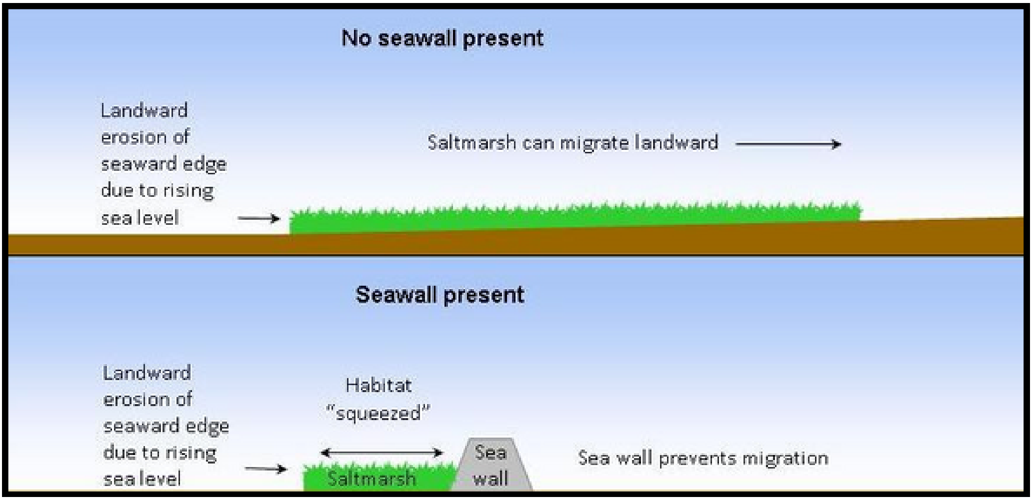
Assess the condition of the buffer zone.

0.Healthy extensive natural vegetated buffer zone / no modified adjacent landuse
1.Large vegetated buffer zone in degraded state
2.Vegetated buffer zone < 100m wide
3.Vegetated buffer zone < 50m wide
4.Vegetated buffer zone < 50m wide and highly degraded
5.No natural vegetation buffer between saltmarsh and adjacent landuse

CLIMATE CHANGE & SEA LEVEL RISE

COASTAL SQUEEZE

- Refers to the inability of the natural environment to move landward as a natural response to sea-level rise, due to man made structures or actions. Look for any structures that are acting as barriers prevent landward migration of habitats.



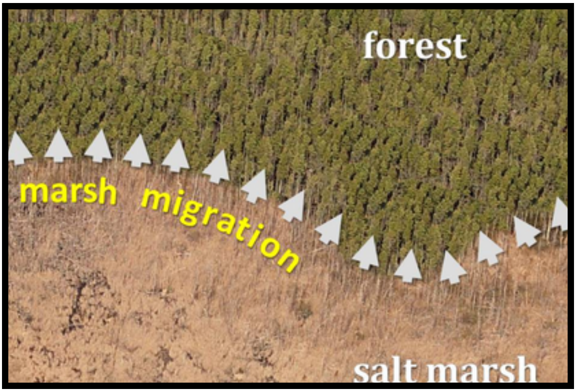
Assess whether there is coastal squeeze in affect.

0.Natural landward migration unrestricted
1.Natural barrier within 50m of the high tide mark
2.Natural barrier present at or below the high tide mark
3.Modified landuse within 50m of saltmarsh likely to restrict landward migration
4.Man-made barrier within 50m of the high tide mark
5.Man-made barrier present at or below the high tide mark

CLIMATE CHANGE & SEA LEVEL RISE

TERRESTRIAL RETREAT

- Look for dead/unhealthy terrestrial trees at the landward margin. The expansion of saltmarsh vegetation and retreat of terrestrial vegetation at landward margins due to sea level rise and saltwater incursion.



Assess whether there is terrestrial retreat present.

0.No terrestrial retreat present

1.Few dead terrestrial trees and plants, landward expansion of saltmarsh evident

2.10-25% of terrestrial margin dead or erosion along 10-25% of margin

3.25-50% of terrestrial margin dead or erosion along 25-50% of margin

4.50-75% of terrestrial margin dead or erosion along 50-75% of margin

5. > 75% of the terrestrial margin dead or erosion along 75% of the margin

CLIMATE CHANGE & SEA LEVEL RISE

MANGROVE ENCROACHMENT

- To assess mangrove encroachment look for young mangrove saplings and seedlings colonizing saltmarsh areas. Periods of high rainfall, La-Nina weather patterns and sea-level rise can result in landward migration of mangroves.

10-25%

25-50%

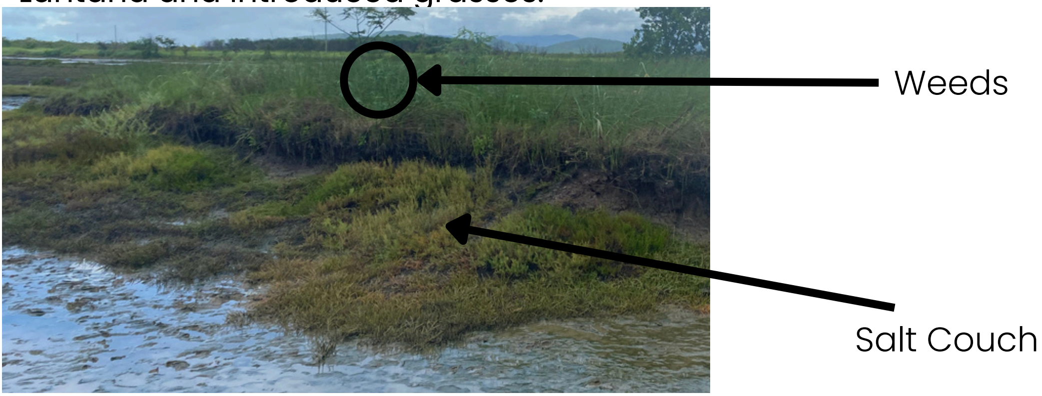
Assess the extent of mangrove encroachment on the saltmarsh.

0.No mangrove saplings/seedlings evident
1.A few mangrove sapling/seedlings present in saltmarsh
2.1-10% saltmarsh covered with mangrove saplings/seedlings
3.10-25% of saltmarsh covered with mangrove saplings/seedlings
4.25-50% of saltmarsh covered with mangrove saplings/seedlings
5. > 50% of saltmarsh covered with mangrove saplings/seedlings

CLIMATE CHANGE & SEA LEVEL RISE

WEEDS

- Look for weeds present in the buffer zone (landward edge) of the saltmarsh area. Look for weeds within the saltmarsh area too. Weed species include but are not limited to: Rubber Vine, Caltrope and Prickly Acacia, Groundsel, Singapore Daisy, Lantana and introduced grasses.



What is the percent of weeds colonizing the saltmarsh?

0. No weeds present in saltmarsh buffer zone
1. Weeds present in very low numbers
2. Weeds present in 10-50% of the buffer zone
3. Weeds present in > 50% of the adjacent buffer zone
4. Weeds colonizing directly in tidal zone across < 50% of the site
5. Weeds colonizing directly in the tidal zone across > 50% of the site

CLIMATE CHANGE & SEA LEVEL RISE

DROUGHT

- Assess the dead vegetation and look for moisture stress (dead leaves, dry, dead plants, bare spots).
- ECOTONE = An ecotone is an area that acts as a boundary or a transition between two ecosystems.

Dried out Salt Couch

Dried out mangrove

Determine if there is any drought/water stress affecting the vegetation on site.

0. No drought effect evident
1. Few dead mangroves, moisture stress evident in vegetation
2. Small areas of mangrove dead ecotone OR < 25% of vegetation dead
3. 25-50% of vegetation dead due to moisture stress
4. Large areas of mangrove dead at saltmarsh-mangrove ecotone
5. > 50% of vegetation dead due to moisture stress

END OF SURVEY

Thanks for being a Super Saltmarsh SAVER!!!

To complete your survey upload your data that you have collected into this google form via the link below.

https://forms.gle/WCEstYBLy2NZATzf9

MangroveWatch

Super Saltmarsh Savers

earthwatch AUSTRALIA

Location/ Site Name:	Latitude:	Longitude:

Your Name:	Rate Your Saltmarsh Knowledge: (1-5) *5 = Expert*
Date:	Your Knowledge of the Site: (1-5) *5 = Very Familiar*

Saltmarsh Values		
Fish Habitat	**Accessibility**	
	Proximity	
	Fish Food (Crabs/Snails)	
	Salt Couch (grass)	
	Habitat Diversity	
Carbon Stores	**Vegetation Type**	
	Sediment Type	
	Vegetation % Cover	
Water Quality	**Stem Density**	
	Algal Mat Cover	
	Direct Runoff (Stormwater)	
	Proximity to Point Source	
	Indirect Runoff	
	Tidal Connectivity	
Habitat	**Migratory Wader Birds**	
	Threatened Species	
	Locally Iconic Species	
	General Habitat Value	
Recreation	**Access**	
	Visual Appeal	
Other	**Buffer Zone Value**	
	Cultural Value	
Value Score:		

Saltmarsh Threats		
Direct Damage	**Vehicle Damage**	
	Cattle Damage	
	Pig Damage	
	Mowing	
	Burning	
	Human Trampling	
Physical Processes	**Surface Erosion & Scouring**	
	Sediment Smother	
	Shoreline Erosion	
Litter/Rubbish		
Infilling/Landfill		
Altered Direct Indirect Flows Pollution Pollution	**Agricultural Runoff**	
	Urban Runoff	
	Chemical Spray Drift	
	Chemical Pollution	
	Altered Flows (Tidal)	
	Altered Flows (Freshwater)	
Climate change & Sea Level Rise	**Buffer Zone Condition**	
	Coastal Squeeze	
	Terrestrial Retreat	
	Mangrove Encroachment	
	Weeds	
	Drought/Water Stress	
Threat Score:		