Appendix

This field guide is also available in electronic format from the author.

Non-destructive rapid assessment methodology for saltmarsh in urban areas

Rationale and implementation in Sydney Harbour Catchment

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Contents

INTRODUCTION

Saltmarsh is an intertidal ecosystem composed of a variety salt tolerant species. Saltmarsh occurs in areas that are periodically flooded by tides usually between the highest astronomical tide and the mean high water mark. In the Sydney region it is most common to find saltmarsh on the landward side of a band of mangroves (Adam 1990).

Depending on the amount of freshwater input and the extent to which marshes are inundated by seawater, saltmarshes range in salinity from brackish to hypersaline. Vegetation consists of grasses, herbs or low shrubs which in NSW are dominated by Saltcouch (*Sporobolus virginicus*) or Samphire (*Sarcocornia quinqueflora*) (Laegdsgaard 2002).

Saltmarsh is considered particularly susceptible to the impacts of human action due to its location at the fringe of the terrestrial environment and that fact that much of it is in private ownership (Evans & Williams 1999). Threats to saltmarsh include increased sedimentation, increased nutrification, increased freshwater input, development pressures, mangrove invasion and, increasingly, climate change and the effects of sea level rise.

THE NEED FOR RAPID ASSESSMENT

Tidal saltmarsh systems are considered to be amongst the most threatened ecological systems globally (Bridgewater & Cresswell 1999), a fact which has been recognised by the listing of saltmarsh from NSW North Coast, Sydney Basin and South East Corner bioregions as an Endangered Ecological Community.

A limited number of saltmarsh sites, such as those at Sydney Olympic Park, have been studied extensively. However, many other sites have received little attention. If we are to ensure saltmarsh survival in Sydney Harbour and other highly urbanised catchments there needs to be a way of undertaking a quantitative and qualitative assessment of changes to individual sites. These assessments must be simple enough to allow them to be used widely but provide enough information to allow management priorities to be set.

A non-destructive methodology is important to ensure we are not making significant changes to these threatened ecosystems while attempting to assess them.

BACKGROUND TO THIS METHODOLOGY

This non-destructive rapid assessment methodology was tested within the Sydney Harbour catchment, thus some of the measures are particular to this region. However, with minor modifications the methodology should be appropriate for any regional assessment of urban saltmarsh areas.

This work builds on earlier rapid assessment saltmarsh methodologies developed by Sainty and Jacobs (1997) and riparian and wetland rapid appraisal work by Jansen *et al.* (2004). It has attempted to identify key indicators for identifying saltmarsh management priorities from a large body of research on saltmarsh both in Australia and overseas.

The methodology consists of a quantitative assessment to allow comparisons between sites and at the same site over time and a qualitative assessment to allow key management priorities to be identified (see Table A1).

Table A1: Saltmarsh rapid assessment indicators.

Indicator	Quantitative Measure	Scoring	Qualitative Information
Physical site characteristics (6/26)			
Area of site	Site area (ha)	0 = <1ha 1 = 1-2ha 2 = >2ha	GPS reading and location
Tidal flushing	Area of saltmarsh undergoing most regular tidal flushing	0 = Debris line located line in the vegetation community closest to the marine environment 1 = Debris line located between vegetation communities 2 = Debris line located in the vegetation community further from the marine environment	
Evidence of edge erosion	% boundary length affected	0 = >20% of boundary length affected by erosion 1 = 5-20% of boundary length affected by erosion 2 = <5% of boundary length affected by erosion	Location of boundary erosion and information on possible mitigation actions
Anthropogenic impacts (6/26)			
Limits to site expansion	% boundary length with barriers to expansion	0 = >20% of boundary length unable to expand 1 = 5-20% of boundary length unable to expand 2 = <5% of boundary length unable to expand	Anthropogenic vs natural barriers and possible mitigation actions
Anthropogenic structures	% site covered by anthropogenic structures	0 = >10% covered with anthropogenic structures 1 = 5-10% covered with anthropogenic structures 2 = <5% of site covered with anthropogenic structures	Nature of structures and possible mitigation actions
Presence of rubbish	% site covered by anthropogenic rubbish	0 = >10% covered with anthropogenic rubbish 1 = 5-10% covered with anthropogenic rubbish 2 = <5% of site covered with anthropogenic rubbish	Nature of rubbish
Fauna characteristics (2/26)			
Evidence of crab populations	% area covered by crab burrows	0 = <20% covered by crab burrows 1 = 20-60% covered by crab burrows 2 = >60% covered by crab burrows	Information on birds sighted in the area

Table A1: Saltmarsh rapid assessment indicators, continued.

Indicator	Quantitative Measure	Scoring	Qualitative Information
Vegetation Characteristics (12/26)			
Community distribution	Number of vegetation communities	0 = <3 vegetation communities present 1 = 3 – 4 vegetation communities present 2 = >4 vegetation communities present	List of dominant species in each community
Species composition	Number of vascular plant species present	0 = <3 species present 1 = 3-7 species present 2 = >7 species present	List any identifiable species
Vegetation cover, including algae	% site with vegetation cover	0 = <30% covered by vegetation 1 = 30-60% covered by vegetation 2 = >60% covered by vegetation	
Threatened species present	Presence or absence of species	0 = No 2 = Yes	List of threatened species present
Evidence of mangrove intrusion	% site affected	0 = >10% covered by mangroves 1 = 5-10% covered by mangroves 2 = <5% covered by mangroves	Height of mangroves and their location. Any evidence of phragmites intrusion
Evidence of introduced species	% site affected	0 = >10% covered by introduced species 1 = 5-10% covered by introduced species 2 = <5% covered by introduced species	List of weed species present with a particular focus on significant weeds
Management Recommendations			
Suggestions based on scoring and other relevant information			Description of surrounding environment Presence of wading birds and other seasonal information Other site specific information
Mapping			
Items to be mapped			All qualitative information able to be mapped

ASSESSMENT METHODOLOGY

This section of the document describes how to record the quantitative and qualitative features of each saltmarsh site. Information should be recorded on individual fieldwork templates for each site. The key to the successful use of this methodology is to accurately record the factors that may trigger management changes in a way that allows comparison over time. Quantitative measures should be determined numerically and then scored appropriately. A list of qualitative measures is provided for each relevant section.

Physical site characteristics
Location and boundaries
- Before beginning the assessment, become familiar with the layout and physical characteristics of the site. This will assist in taking specific measurements.
- Include a description of location, including nearest street and directions to the site from relevant landmarks.
- Identify appropriate photopoints and take a photographic record of the site. See National Parks and Wildlife Service Conservation Note 9 (2003) for further information on establishing appropriate photopoints.
- Record the site name, the date and time of the assessment and which Council area the site is located within.

Area of site
- Measure the boundaries of the wetland including compass readings to allow the area of the site in hectares to be calculated.
- Take a GPS reading from a fixed landmark on the site. Ensure the landmark is unlikely to change over time to allow future comparisons.

Tidal Flushing
- A debris line of either natural or rubbish material will indicate the area that is most commonly influenced by the highest astronomical tide. Indicate where this debris line is located with reference to the proximity of vegetation communities to the marine environment.

Evidence of erosion
- Record the percentage of the boundary length currently undergoing erosion. Measure the length of erosion sites and compare this to the total boundary length.
- Provide information on the type of erosion, possible causes and possible mitigation measures.

Anthropogenic impacts
Limits to site expansion
- Record the percentage of the boundary length that is made up of structures that would prevent the expansion of the saltmarsh site if required. Measure the length of these structures and compare this to the total boundary length.
- Record whether the barriers are natural or anthropogenic. If anthropogenic, detail whether it is possible and recommended to remove them.

Anthropogenic structures found within the site
- Indicate the percentage of site covered by anthropogenic structures. Use the area diagrams supplied overleaf to assist in this assessment.
- Describe the type of anthropogenic structures found on the site. Factors to measure include both hard structures such as stormwater drains or transmission towers, and damage to the site from recreational activities, including rutting or trampling.
- Provide a description of the type of structures present and whether it is possible and recommended to remove them. Detail any likely implications of such removal.

Presence of rubbish
- Indicate the percentage of the site covered by anthropogenic rubbish. Natural wrack is not considered rubbish.
- Describe the type of rubbish found on the site and whether it is small items such as plastic items or larger items such as car bodies.

Fauna characteristics
Evidence of crab populations
- Walk transects of the site to ensure the entire area has been inspected and record the percentage of the site covered by crab burrows.
- If any crabs are found while on site, record their species if possible or provide a brief description if the species is unknown.
- Record information on any birds sighted including observations on their distribution within the area and key features such as long stilt legs or short stilt legs to assist later identification.

Vegetation Characteristics
Visual assessment of species distribution
- Saltmarsh typically exhibits a number of vegetation communities within each site which are dominated by an individual species. Record the number of these communities present.
- Where possible, list the dominant species identified in each vegetation community.

Detailed species composition
- Using the transect method, identify the number of saltmarsh species on site.
- Where possible, list the species present.

Vegetation cover on site, including algae
- Algae are an important component of saltmarsh vegetation but is often difficult to identify in the field. For this reason algae is not required as part of the 'detailed species composition' but should be considered in overall vegetation cover.
- Record the percentage of the site covered by vegetation including leaves, branches and stems (see Figure 1).
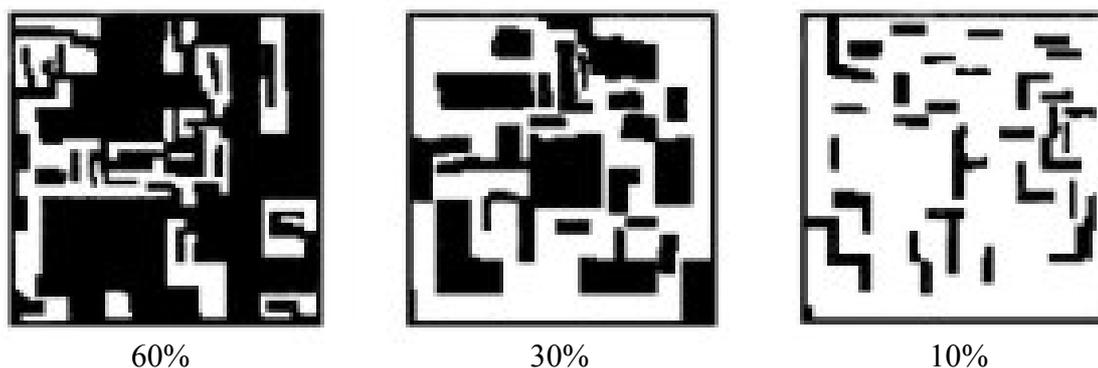
| 60% | 30% | 10% |

Figure 1: Sample area diagrams.

Threatened species present on site
- Check the *Threatened Species Conservation Act Schedules* list at http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Schedules+of+the+Threatened+Species+Conservation+Act
- Record if any threatened plant or bird species are located on or use the site.
- List the threatened species present.

Evidence of mangrove intrusion
- Indicate the percentage of the site covered by mangroves.
- Provide information on whether these mangroves are located close to surrounding mangrove vegetation or are spread across the site. Provide information on the height of mangrove shoots (this will allow establish and grow of mangroves to be assessed in the future).
- Also record the presence of *Phragmites* (reeds) if it overlaps with saltmarsh species to allow for future assessment of whether the area of *Phragmites* is increasing.

Evidence of introduced species
- Indicate the percentage of the site covered by weed species (include both introduced species and native species that are not naturally found on saltmarsh sites).
- If possible, provide a list of weed species present and what proportion of the total flora they are. Focus on noxious or particularly invasive weeds, such as *Juncus acutus*.

MANAGEMENT RECOMMENDATIONS

- Based on the outcomes of the site assessment, identify any management actions required on the site. These might be short-term issues such as the need to remove a car body or some other debris or longer-term issues such as the need to redirect a stormwater drain from within the site. Provide an indication of the relevant issues and the urgency of the mitigation actions required.
- Record information on the condition of the surrounding environment.
- Record seasonal information such as the presence of internationally important migratory wading birds.
- Describe any unusual patterns that occurred in the weeks or months before the survey, e.g. prolonged drought.
- Record any site specific information.

MAPPING

- Draw a map of the site and mark the location of the GPS and photopoints.
- Use the site map to provide information on the location of each of the measures outlined above.

RECOMMENDED FIELD EQUIPMENT

The following equipment will help you to complete the assessment:
- Tide charts
- Wet weather gear
- Sun protection and mosquito repellent
- Clipboard, pencils, pens, ruler, eraser
- Copies of the Field Guide Templates
- Copies of the appropriate documentation to aid with species identification
- NPWS Conservation Note 9 - Photopoints
- Camera
- Binoculars
- GPS
- Tape measure or laser measure
- Compass

Saltmarsh Field Assessment

Physical site characteristics

Site Name: _____   Date and Time: _____

Location: _____

_____

Latitude: _____   Longitude: _____

GPS Landmark: _____

Size of site (ha) (0 = <1ha, 1 = 1-2ha, 2 = >2ha): _____

Tidal Flushing (0 = 1st veg com, 1 = Between veg com, 2 = Furthest veg com): _____

Erosion (0 = >20% of boundary length, 1 = 5-20%, 2 = <5%): _____

Description of erosion: _____

_____

Anthropogenic impacts

Limits to site expansion (0 = >20% of boundary length, 1 = 5-20%, 2 = <5%): _____

Description of limits: _____

_____

Anthropogenic structures (0 = >10% of site covered, 1 = 5-10%, 2 = <5%): _____

Description of structures and impacts: _____

_____

Presence of rubbish (0 = >10% covered, 1 = 5-10%, 2 = <5%): _____

Description of rubbish: _____

_____

Fauna characteristics

Evidence of crab populations (0 = <20% covered, 1 = 20-60%, 2 = >60%): _____

Crab and bird species present: _____

_____

_____

Site Name: _____

Vegetation Characteristics

Community distribution (0 = <3 vegetation communities, 1 = 3 – 4, 2 = >4):   _____

Dominant species: _____

_____

Species composition (0 = <3 species present, 1 = 3-7, 2 = >7):   _____

Saltmarsh species present: _____

_____

Vegetation cover on site (0 = <30% covered, 1 = 30-60%, 2 = >60%):   _____

Threatened species present on site (0 = No, 2 = Yes)   _____:

Threatened species present: _____

_____

Mangrove intrusion (0 = >10% covered, 1 = 5-10%, 2 = <5%):   _____
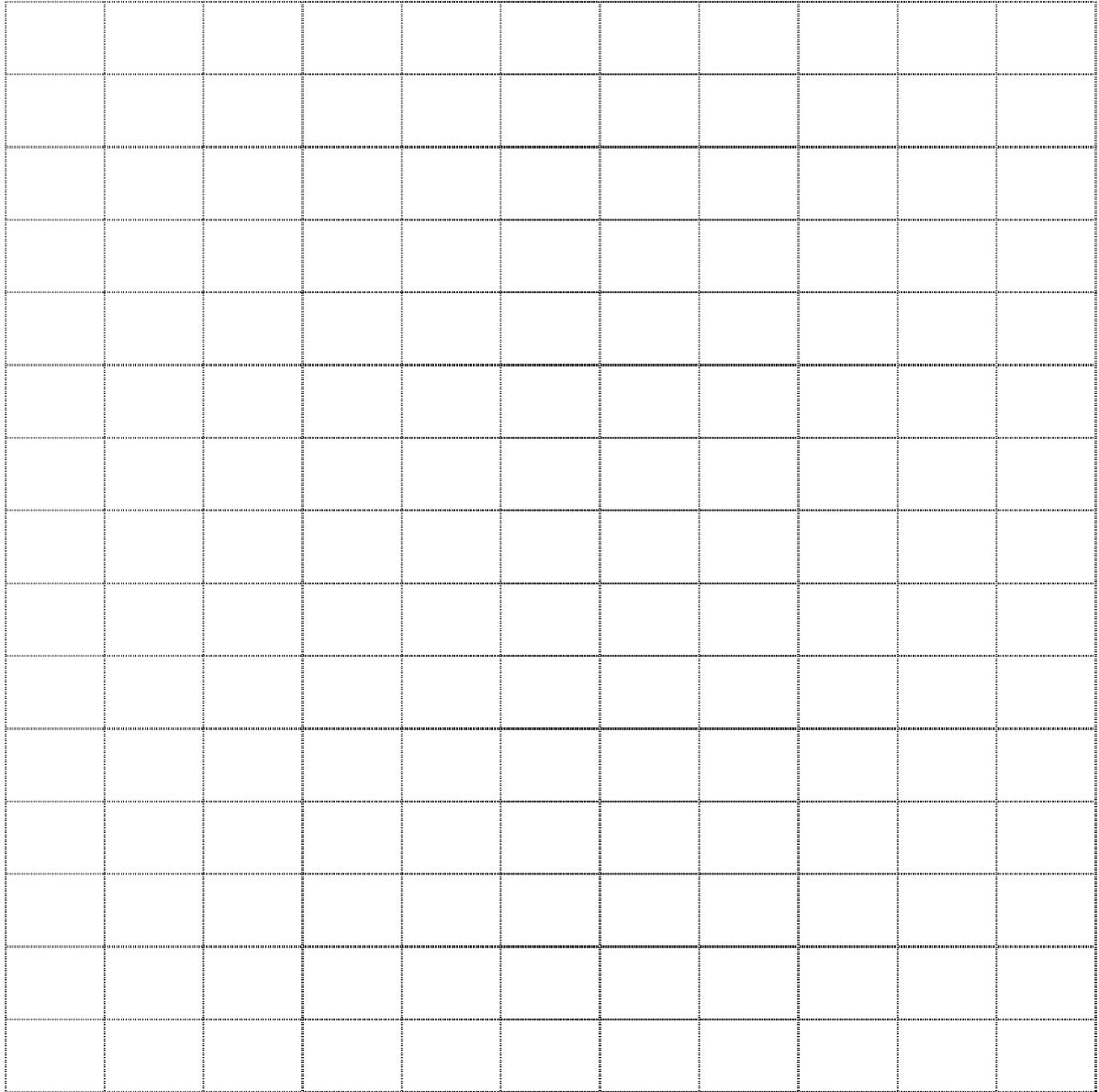
Description of mangrove and phragmites location: __

_____

Introduced species (0 = >10% covered, 1 = 5-10%, 2 = <5%):   _____

Weed species present: _____

_____

Management recommendations

_____

_____

_____

_____

_____

_____

_____

Site Name: _____

Site Map

North point   GPS location

Scale   Photopoints

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