Wetland Assessment Techniques Manual – Field Sheets

These field sheets have been compiled to compliment V3.6 of WetlandCare Australia's Wetland Assessment Techniques Manual. They are to be used in conjunction with the manual until at such time you feel comfortable with the techniques being used. To conserve paper, only print out those health indicators which you are likely to assess.

Transect Details

Wetland Name:		
Transect Identifier (for more than 1 transect per wetland):		
Landowner Name		
Landowner Address		
Date assessed:		
	Transect 1	Transect 2 (for more than 1 per wetland)
Easting Start:		
Northing Start:		
Easting Finish:		
Northing Finish:		
Bearing:		

Wetland Description

1. Assessed Wetland Area (ha)	**6. Brief Wetland Description** (ie. swamp forest with understory of ferns)
2. Catchment Name	
3. Subcatchment Name	
4. CMA or NRM Region	
5. LGA Name and Zoning	

Site Characteristics

Water sources into the wetland - estimate the type of water sources entering the wetland and rank (number) them in order of significance.

Floodplain waters		Ephemeral creek		Runoff – from rainfall (e.g. stormwater)	
Groundwater		Pumping		Runoff – from irrigation	
Estuary / Marine					

Other - specify

Current Weather (tick one below)
Dry Period
Average Period
Wet period
Very wet period

Water Level (tick one below)
Lower than average / Low tide
Average / Mid tide
Higher than average / High tide

Land Situation

Who owns the wetland, and what is the land classification. The wetland is:

- ☐ Located on private land
- ☐ Located in a State forest
- ☐ Located on Crown land
- ☐ Located in a National Park
- ☐ Located within a flora or fauna nature reserve
- ☐ Protected under JAMBA/CAMBA/ ROKAMBA
- ☐ Located in an area containing a site of aboriginal significance
- ☐ Protected by SEPP14 or SEPP 26 Legislation (NSW)
- ☐ Listed on a directory of wetlands of national or international significance
- ☐ Covered Ramsar Treaties
- ☐ Located within or adjacent to a key habitat corridor (regional or state)

Connectivity

Proximity

Step 1: Estimate how far your study wetland is from the next nearest wetland that is at least 1 hectare in size.

Distance to Nearest Wetland	Score
more than 10 km	0
5 to 10 km	1
1 to 5 km	2
200 m to 1 km	3
less than 200 m	4

Step 2: Estimate what portion of the wetland boundary merges with adjacent natural ecosystems.

Proximity to Adjacent Ecosystems	Score
No natural ecosystem merges with the wetland boundary	0
Adjacent natural ecosystem/s merges with up to 25% of the wetland boundary	1
Adjacent natural ecosystem/s merges with up to 50% of the wetland boundary	2
Adjacent natural ecosystem/s merges with up to 80% of the wetland boundary	3
Adjacent natural ecosystem/s merges with more than 80% of the wetland boundary	4

Step 3: Add up the two scores and enter the total here → **Proximity Score** [ ]

Step 4: Transfer proximity score to connectivity index table on page 17

Roads

Step 1: Estimate the area of your wetland (A (hectares)), and write the value in the road information table.

Step 2: Estimate the length of major roads (Lmajor (metres)) that are either within your study wetland, or within 50 metres from the wetland boundary

Step 3: Estimate the length of minor roads (Lminor (metres)) within your study wetland, or within 50 metres from the wetland boundary.

Step 4: Calculate the road value using the equation:

$$\text{Road value} = \frac{(2 \times \text{Lmajor}) + \text{Lminor}}{A}$$

Step 5: Enter the relevant details in the table below.

Road Information	Value
Area of wetland (A) in hectares	ha.
Length of major roads (Lmajor) in metres	m.
Length of minor roads or walking tracks (Lminor) in metres	m.
Road value= $\frac{(2x\ \text{Lmajor}) + \text{Lminor}}{A}$	=

Step 6: Calculate the road score using the road conversion table.

Road Conversion Table					
Road Value	>200	>90 - 200	>30 - 90	>10 - 30	0 – 10
Road Score	0	1	2	3	4

Step 7: Enter your road score into the Connectivity Index table.

Area

Step 1: Circle the number in the box that corresponds with the area of your study wetland

Area (ha)	< 2	2 - 5	> 5 - 20	> 20 – 50	>50– 200	>200–500	>500–1000	>1000– 2000	>2000
Score	0	1	2	3	4	5	6	7	8

Step 2: Write this number in the area score box in the Connectivity Index table on pg 17.

Adjacent Land Use

Step 1: Tick each box in the adjacent land use table that describes the land use in the area surrounding your study wetland, tally up the ticks, and write this number in the adjacent land use value box.

Adjacent Land Use	Tick ✓
Within 200 metres from the wetland boundary :- there is an urban/agricultural structure (eg house, farm shed)	
there is more than one urban/agricultural structure	
some of the land supports high-density urban development (if so, also tick the option above).	
more than 10% of the land supports agriculture	
more than 50% of the land supports agriculture (if so, also tick the option above)	
some of the land supports intensive agriculture	
some of the land supports industrial activity	
Within 500 metres of the wetland boundary there is :- an effluent treatment works or similar	
a municipal waste disposal depot (dump)	
In the surrounding land within 1 km of the wetland:- more than 50% of the land supports intensive human activity. List type(s) of intense human activity:	
there is an airport	
Within the wetland there are:- powerlines	
telephone cables	
natural drainage channels out of the wetland have been modified.	
natural drainage channels into the wetland have been modified	
a levee bank separates the wetland from the floodplain.	
Other (define)	
Adjacent Landuse Value (number of ticks)	

Step 2: Use the adjacent land use conversion table below to obtain the adjacent land use score.

Adjacent land use value	>12	10 - 12	8 - 9	6 - 7	5	4	3	2	1 or 0
Score	0	1	2	3	4	5	6	7	8

Step 3: Calculate the connectivity index. To do this calculate the proximity, area, road and adjacent land use scores, and write this number in the score value box.

CONNECTIVITY INDEX TABLE						
Proximity Score +	**Roads Score +**	**Area Score +**	**Adjacent Landuse Score**	**Score Value**	**Calculation**	**Connectivity Index**
			=	**(**	**÷28) x 100**	**%**

Human-Induced Disturbance

Step 1: Circle the appropriate level of impact of each disturbance using the above explanations as a guide, and add the total value in the below table.

Human-Induced Disturbance Data Table				
	Level of Impact on Wetland			
Disturbance	Not Affected	Low	Medium	High
Grazing	0	1	3	5
Fire	0	1	2	5
Weeds	0	1	2	5
Rubbish	0	1	2	3
Recent clearing	0	1	2	3
Siltation	0	1	2	3
Polluted Water	0	1	2	3
Dead Trees	0	1	2	3
Drains from wetland	0	1	2	3
Drains into wetland	0	1	2	3
Domestic animals	0	1	2	3
Evidence of Feral animals	0	1	2	3
Dead, wounded or diseased native animals	0	1	2	3
Plant or bark removal	0	1	2	3
Boat Wash	0	1	2	3
Vehicular Damage	0	1	2	3
Other define	0	1	2	3
Human Disturbance Value (Add scores to find value – to be used in next table)				

Step 2: Use the Human Disturbance Value figure and convert it into a score using the below table.

Human Disturbance Value	>=20	18-19	16-17	14-15	12-13	10-11	8-9	6-7	4-5	2-3	0-1
Score	0	1	2	3	4	5	6	7	8	9	10

Step 3: Complete the below calculation to arrive at your Human Disturbance Index.

HUMAN DISTURBANCE INDEX TABLE		
Score Value	**Calculation**	**Human Disturbance Index**
	x10	**%**

Acid Sulfate Soils

Field / Desktop Observations	Score	Comment
Mapped PASS (Potential Acid Sulfate Soil) Score: 2-High 1-Low 0-None		
Drainage intensity (Score value) Score: 0 = 0 m3 /ha 1 = 0 < 100 m3 /ha 2 = 100 < 500 m3 /ha 3 = > 500 m3 /ha **NB: drainage intensity is approximate length x width x depth of drains per ha.**		
Presence of iron stain/ MSO in bottom of constructed drains (Use shovel to bring up bottom sediment) Score: 0 = Not present 1 = Slight < 1% 2 = Moderate 1 < 5% 3 = Heavy 5 < 20% 4 = Very Heavy > 20% **NB: MSO = black monosulfidic ooze, which has a distinctive sulfidic odour**		
Presence of iron stain / MSO across the low lying parts of the landscape (Use shovel to examine top 100 mm of surface soil profile. Look for MSO and/or iron deposits Score: 0 = Not present 1 = Slight < 1% 2 = Moderate 1 < 5% 3 = Heavy 5 < 20% 4 = Very Heavy > 20%		
Presence of scald (% transect polygon) Score: 0 = Not present 1 = Slight < 1% 2 = Moderate 1 < 5% 3 = Heavy 5 < 20% 4 = Very Heavy >20%		
ASS Total Value: **(add all scores above)**		

Step 1: Complete the Field / Desktop Observations table above.

Step 2: Use the table below to convert the acid sulfate soil value to a score out of four.

Acid Sulfate Value	>10	6-10	4-5	1-3	0
Score	0	1	2	3	4

Step 3: Calculate your Acid Sulfate Index by using the formula below.

ACID SULFATE INDEX		
Score	Calculation	Acid Sulfate Index
(	**÷ 4) x 100 =**	**%**

Vegetation

Freshwater Wetlands

SHEET A: Freshwater Associated Vegetation List all species within appropriate vegetation types eg. tall trees, medium trees etc	D= dominant A= abundant F= frequent O= occasional R= rare X= absent Quadrat No.																			
Tall Trees	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Eucalypt or Swamp Box trees																				
Figs																				
Medium Trees	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Paperbarks																				
Casuarinas																				
Acacia *sp.*																				
Small Trees (<3m)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Vines & Climbers (native species)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Common Silkpod																				
Scrambling Lily																				

SHEET B: Freshwater Associated Vegetation List all species within appropriate vegetation types eg. tall trees, medium trees etc	D= dominant A= abundant F= frequent O= occasional R= rare X= absent Quadrat No.																			
Shrubs (< 3 m)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Palm Trees	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ferns & Orchids in Trees (eg staghorns)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Birdsnest Ferns																				
Ferns & Orchids on Ground	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Bracken Fern																				
Blechnum sp.																				
Grasses	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

SHEET C: Freshwater Associated Vegetation

List all species within appropriate vegetation types eg. tall trees, medium trees etc

D= dominant A= abundant F= frequent O= occasional R= rare X= absent

Quadrat No.

Herbs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Moss/ Lichen	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Cunjevoi (Elephant Ears)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Water Plants (incl reeds, rushes, sedges)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

TOTAL NUMBER OF DIFFERENT VEGETATION TYPES (Vegetation Type Value) Veg Types eg tall trees=1, shrubs=1 etc Tally from sheets A, B & C (to be used in the ‘vegetation type conversion table’ on pg. 32)	**=**
TOTAL NUMBER OF SPECIES = **(Species Number Value)** Tally from sheets A, B & C (excluding Weeds) (to be used in the ‘species number conversion table’ on pg. 32)	**=**

SHEET D: Weeds

Immediately after field work include Weed Type (ie minor, moderate, major) and Weed Infiltration = L,M,H (ie low-med-high)

Quadrats 1 to 20

NB mark every box D-A-F-O-R or X

D= dominant A= abundant F= frequent

O= occasional R= rare X= absent

Weed Species Name	Type Min, Mod, Maj	Weed Infiltration Low Med High	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Photo			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Record with a tick when 4 photos taken for quadrat.																						

Step 2: On completion of the transect, count the number of different **vegetation types** (Vegetation Type Value) using the headings provided in Sheets A – D (ie. Tall Trees, Small Trees, Water Plants etc). Also count the number of different **species** recorded (Species Number Value). Record these totals at the bottom of Sheet C

Step 3: Enter the Values into the tables and calculations provided below. DO NOT enter WEED data until Step 6.

Step 4: Use the table below to convert the Vegetation Type Value (from Sheet C) to a score out of five.

VEGETATION TYPE CONVERSION TABLE						
Vegetation Type Value	0-1	2-3	4-5	6-7	8-9	>=10
Vegetation Type Score	0	1	2	3	4	5

Step 5: Use the table below to convert the Species Number Value (from Sheet C) to a score out of five.

SPECIES NUMBER CONVERSION TABLE						
Species Number Value	< 8	8 - 15	15 - 25	25 - 35	35 - 50	>50
Species Number Score	0	1	2	3	4	5

Step 6: Use the table below to calculate the weed value, taking into account the number of weeds, their type and infiltration into the wetland.

WETLAND WEED TABLE	Sub Total
No. of Minor Weeds x 1 =	
No. of Moderate Weeds x 2 =	
No. of Major Weeds x 3 =	
No. of Low Infiltration Weeds x 1=	
No. of Medium Infiltration Weeds x 2 =	
No. of High Infiltration Weeds x 3 =	
Total Weed Value:	

Step 7: Use the table below to convert the Total Weed Value (from Step 6) to a score out of five. Use the score below, along with the Vegetation Type and Species Scores to calculate the Wetland Vegetation Index.

Wetland weed conversion table						
Weed Value	>42	31 - 42	21 - 30	13 - 20	6 - 12	<6
Weed Score	0	1	2	3	4	5

Step 8: Use the calculation below to add the scores above and determine the Wetland Vegetation Index.

WETLAND VEGETATION INDEX					
Vegetation Type Score +	Species Number Score +	Weed Score	Score Value	Calculation	Wetland Vegetation Index
		=	(	÷ 15) x 100	%

Vegetation
Estuarine Wetlands

SHEET A: Estuarine Associated Vegetation List all species within appropriate vegetation types eg. tall trees, medium trees etc	D= dominant A= abundant F= frequent O= occasional R= rare X= absent																			
Trees	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Grey Mangrove (*Avicennia marina*)																				
Orange Mangrove (*Brugiera gymnorhiza*)																				
Stilted Mangrove (*Rhizophora stylosa*)																				
River Mangrove (*Aegiceras corniculatum*)																				
Milky Mangrove (*Excoecaria agallocha*)																				
Yellow Mangrove (*Ceriops australis*)																				
Hibiscus (*Hibiscus tiliaceus*)																				
Swamp Oak (*Casuarina glauca*)																				
Paperbarks																				
Tuckeroo																				
Small Trees & Shrubs (< 3m)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

SHEET B: Estuarine Associated Vegetation

List all species within appropriate vegetation types eg. tall trees, medium trees etc

D= dominant A= abundant F= frequent O= occasional R= rare X= absent

Quadrat No.

Reeds & Rushes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Common Reed (*Phragmites australis*)																				
Vines & Climbers (native species)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ferns	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Mangrove fern (*Acrostichum speciosum*)																				
Grasses	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Salt Couch (*Sporobolus virginicus*)																				

SHEET C: Estuarine Associated Vegetation List all species within appropriate vegetation types eg. tall trees, medium trees etc	D= dominant A= abundant F= frequent O= occasional R= rare X= absent Quadrat No.																			
Herbs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Samphire/Glasswort (*Sarcocornia quinqueflora*)																				
Seablite (*Sueda australis*)																				
Other (fungi, lichens, mistletoe, orchids etc)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Water Plants	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Eelgrass or Ribbonweed (*Zostera capricorni*)																				

TOTAL NUMBER OF DIFFERENT VEGETATION TYPES =

Veg Types eg tall trees=1, shrubs=1 etc

Tally from sheets A, B & C (Number to be used in the 'vegetation type table' on pg. 38) **=**

TOTAL NUMBER OF SPECIES =

(*ie. species diversity)*

Tally from sheets A, B & C (excluding all Weeds) **=**

(Number to be used in the 'species number table' on pg. 38)

SHEET D: WEEDS

Immediately after Field Work– include Weed Type (ie minor, moderate or major) and Weed Infiltration = L,M,H (ie low-med-high) by referring to the weed list attached, Addendum Section 5 and the Addendum's weed table

Quadrats 1 to 20

NB mark every box D-A-F-O-R or X

D= dominant A= abundant F= frequent

O= occasional R= rare X= absent

Weed Species Name	Type Min, Mod, Maj	Weed Infiltration Low Med High	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Photo			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Record with a tick when 4 photos taken for quadrat.																						

Step 2: On completion of the transect, count the number of different **vegetation types** (Vegetation Type Value) using the headings provided in Sheets A – D (ie. Tall Trees, Small Trees, Water Plants etc). Also count the number of different **species** recorded (Species Number Value). Record these totals at the bottom of Sheet C

Step 3: Enter the Values into the tables and calculations provided below. DO NOT enter WEED species recorded until Step 6.
Step 4: Use the table below to convert the Vegetation Type Value (from Sheet C) to a score out of five.

VEGETATION TYPE CONVERSION TABLE						
Vegetation Type Value	0-2	3	4	5	6-7	8+
Vegetation Type Score	0	1	2	3	4	5

Step 5: Use the table below to convert the Species Number Value (from Sheet C) to a score out of five.

SPECIES NUMBER CONVERSION TABLE						
Species number value	0 – 4	5 – 9	10 - 14	15 – 19	20 – 24	25+
Species number score	0	1	2	3	4	5

Step 6: Use the table below to calculate the weed value, taking into account the number of weeds, their type and infiltration into the wetland.

WETLAND WEED TABLE	**Sub Total**
No. of Minor Weeds x 1 =	
No. of Moderate Weeds x 2 =	
No. of Major Weeds x 3 =	
No. of Low Infiltration Weeds x 1=	
No. of Medium Infiltration Weeds x 2 =	
No. of High Infiltration Weeds x 3 =	
Total Weed Value:	

Step 7: Use the table below to convert the weed value (from Step 6) to a score out of five. Use the score below, along with the vegetation type and species number scores to calculate the Wetland Vegetation Index.

WETLAND WEED CONVERSION TABLE						
Weed Value	>42	31 - 42	21 - 30	13 - 20	6 - 12	<6
Weed score	0	1	2	3	4	5

Step 8: Use the calculation below to add the scores above and determine the Wetland Vegetation Index.

WETLAND VEGETATION INDEX					
Diversity Score +	Species Number Score +	Weed Score =	Score Value	Calculation	Wetland Veg Index
			(	**÷ 15) x 100**	**%**

Habitat

Step 1: For the following habitat indicators, determine if the wetland has any of the following core habitat types or bonus indicators.

Scoring options are: assign a score of 3 if the indicator is present and covers an area of at least a 10m x 10m (100m^2) quadrat in one complete parcel;

assign a score of 2 if the indicator is present and small patches add up to a total of at least approx. 100m^2;

assign a score of 1 if the indicator is present, but only in very isolated patches of less than approx. 100m^2.

Table B **Core Habitat Types**	✓ when present	Score
Open Water		
Forest		
Sedge or Saltmarsh		
Sand or MudFlats		
Island		
Standing Water		
Bonus Indicators		
Fauna Activity – burrows, scats, insects, tracks etc **		
Tidal Influence or evidence		
	TOTAL (β) =	

** For fauna activity – Score occurrence for your wetland as 0 = Absent, 1 = Low (indicator present 1-2 times), 2 = Medium (2-5 times), 3 = High (>5 times)

Step 2: Complete the table below during field work/transects

Step 3: Score occurrence for each indicator for each quadrat as 0 = Absent, 1 = Low (indicator present 1-2 times), 2 = Medium (2-5 times), 3 = High (>5 times).
** For Forest Structure/Layers score occurrence as 0 = Absent, 1 = one layer, 2 = two layers present, 3 = three to four layers present.

Step 4: On completion of transect, add total of all scores for each indicator in the 'Overall' and divide by number of quadrats for the average. Then add up your averages to determine your total averages score (α).

Table A	Quadrat number																					
Habitat indicator	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Overall**	**Av.**
Physical Indicators																						
Forest Structure/layers**																						
Fallen branches/ trees																						
Standing dead trees																						
Large Hollows (trunk)																						
Small Hollows (branches)																						
Decorticating Bark																						
Snags/ Rocks (aquatic habitat)																						
Nectar Bearing Plants																						
Estuarine vegetation parameters below should be recorded using % cover– Low (<5%) = 1, Medium (>5% or <75%) = 2, High (>75%) = 3 (record species in vegetation section)																						
Est. Veg. (aquatic habitat)																						
Est. Veg. (aquatic shade)																						
Use a $1m^2$ quadrat when recording for leaf litter, numbers of burrows and shells present.																						
Leaf Litter or debris																						
Shells																						
Burrows																						
Freshwater Wetland parameters below should be scored using % cover– Absent =1, Low (<5%) = 2, Medium (>5% or <75%) = 3, High (>75%) = 0																						
Floating Aquatic Plants																						
Submergent Aquatic Plants																						
Emergent Aquatic Plants																						
																					Total of Averages(α) =	

Step 5: Add your total average score from table A (**α**) and the total score from Table B (**β**) together to determine your habitat score.

HABITAT SCORE		
Total Average from Table A (α)	**Total Score from Table B (β)**	**Habitat Score**
	+	**=**

Step 6: Convert the Habitat Score to a Value using the Habitat Conversion Table below, then complete the Habitat Index equation to find your Habitat Potential Index.

HABITAT CONVERSION TABLE	
Habitat Score	Value
0-1	0
2-3	1
4-5	2
6-7	3
8-9	4
10-11	5
12-13	6
14-15	7
16-17	8
18-19	9
20-21	10
22-23	11
24-25	12
26-27	13
28-29	14
30-31	15
32-33	16
34-35	17
36-37	18
38-39	19
40-41	20
42-43	21
44-45	22
46-47	23
48-49	24
50+	25

HABITAT POTENTIAL INDEX		
Value	Calculation	Habitat Potential Index
(	**÷ 25) x 100**	**%**

Hydrological Change or Tidal Restriction

OBSERVATION	SCORE	COMMENT
Mapped Human Induced Changes & Structures **Score** **2** – None visible **1** – Moderate **0** – High		
Presence of Structures Affecting Hydrological Regime **Score** **5** – Not Present **4** – Small structures with little hydrological or tidal restriction **3** – Structures with low degree of hydrological or tidal restriction **2** – Structures with moderate degree of hydrological or tidal restriction **1** – Structures with high degree of hydrological or tidal restriction **0** – Complete hydrological or tidal restriction		
Vegetation Indicators **Score** **3** – No obvious changes to vegetation community health, type or structure as a result of hydrological change or tidal restriction **2** – Some indications of changes to vegetation community health, type or structure as a result of hydrological change or tidal restriction **1** – Significant indications of changes to vegetation community health, type or structure as a result of hydrological change or tidal restriction **0** – Complete vegetation community change or very high mortality of original vegetation species due to hydrological change or tidal restriction		
HYDROLOGICAL CHANGE INDEX = TOTAL (add all scores from above)	**X 10**	**=**

Bank Condition

Step 1: At each of your quadrats, circle the number which best represents the degree of erosion at that site. Use the 'erosion classification table' on page 46 as a guide.

Step 2: Convert the Erosion Value to a 'Score' using the table below. This score will be used to calculate the Bank Condition Index on pg. 48.

Erosion Table – circle one number per site				
	Stable	Good	Moderate	Unstable
Site 1	3	2	1	0
Site 2	3	2	1	0
Site 3	3	2	1	0
Site 4	3	2	1	0
Erosion Value(avg of circled numbers):				=

Erosion Value	<1	>=1 & <2	>=2 & <3	3
Score	0	1	2	3

Step 3: At each of your selected bank condition sites, randomly select three 1m^2 quadrats and count the pug marks within. Calculate and record the pugging average

Pugging	**Site 1**			**Site 2**			**Site 3**			**Site 4**			**Total Average**
Quadrat	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3	
Value													

Step 4: Use your pugging average to determine your 'score' which is to be used in the Bank Condition Index on pg. 48.

Pugging Average	**>18**	**>16- 18**	**>14 -16**	**>11-14**	**>8 -11**	**>5 - 8**	**>2 - 5**	**>0 - 2**	**0**
Score	0	1	2	3	4	5	6	7	8

Step 5: At each site, compare the gradient of the bank to the gradient diagrams on pg. 46, and circle the number in the box that best describes the bank gradient. Once you have completed your assessment, calculate the bank gradient score by taking the average of circled values.

Step 6: Use the gradient conversion table to calculate the gradient score for your study wetland. Use the example below for guidance.

Gradient Conversion Table				
Gradient value	4	>=3 & <4	>=2 & <3	>=1 & <2
Gradient score	1	2	3	4

Bank Gradient				
	shallow	moderate	steep	very steep
Site 1	1	2	3	4
Site 2	1	2	3	4
Site 3	1	2	3	4
Site 4	1	2	3	4
Bank Gradient Value (avg of circled numbers):				=

Step 7: Calculate the Bank Condition Index by adding your erosion, pugging and gradient scores.

BANK CONDITION INDEX Erosion Score +	Pugging Score +	Gradient Score =	Score Value	Calculation	Bank Condition Index
			(	**÷ 15) x 100**	**%**

SECTION 3: Assessments for Specific Wetland Types

Paperbark Wetlands

Step 1: Use a quadrat sampling system to quantitatively assess paperbark condition. Suggested quadrat size is 10m x 10m.
Step 2: Assess each parameter within that area and record whether it is absent (X), low (L), medium (M), or high (H).
Step 3: At the completion of the transect summarise the measures recorded for each quadrat into an 'Overall' measure (X, L, M or H) for the wetland.

PAPERBARK CONDITION	Quadrats 1 to 20 NB mark every box in the shaded rows as either X - L - M or H X = ABSENT/ Not affected L = LOW M = MEDIUM H = HIGH																			
PAPER BARK CONDITION INDICATORS NB record data for every quadrat:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Overall**
Standing dead or dying trees																					
Clusters of fallen trees																					
Vine Growth (incl. native & non native)																					
Necrotic Spots on Paperbark leaves																					
Galls on small branches																					
Other:																					

Step 4: Use the 'Overall' value (X, L, M, H) for each of the criteria above and circle the corresponding numbers in the table below.

Paperbark Condition Data Table				
	Overall Impact on Wetland			
Condition indicator	Not affected	Low	Medium	High
Standing dead or dying trees	0	2	4	6
Clusters of fallen trees	0	1	2	3
Vine growth reducing paperbark vigour	0	1	2	3
Necrotic spots on leaves caused by sap sucking insects	0	1	2	3
Galls on branches	0	1	2	3
Other (define):	0	1	2	3
Other (define):	0	1	2	3
			Paperbark Condition Value (total of circled scores)	

Step 5: Use the table below to convert the paperbark condition value to a score out of ten. Use the score in the calculation below to determine the Paperbark Condition Index.

Paperbark condition value	>9	9	8	7	6	5	4	3	2	1	0
Score	0	1	2	3	4	5	6	7	8	9	10

PAPERBARK CONDITION INDEX		
Score	Calculation	Paperbark Condition Index
	x10	**%**

Along the transect, measure tree girths and dig to discover peat depths as outlined above. Record the measurements in the field sheet below. On completion of the transect, average both measures and use them in the tables and calculation below to determine the wetland's establishment **(Step 1 – 3 & Step 5 - 6)**.

WETLAND ESTABLISHMENT INDICATORS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Avg
Girth Circumference (cms) NB measure one average Paperbark per quadrat at chest height																					
Peat Depth (in cms) NB check & record at least 4 per transect																					

Use the tables below to convert the average tree girth circumference and peat depth to scores out of five **(Step 4 & 7)**.

Girth Circumference Conversion Table

Average Girth Circumference (cm)	<20	20 – 40	40 – 80	80 – 140	140 –180	>180
Girth circumference score	0	1	2	3	4	5

Peat Depth Conversion Table

Average Peat Depth (cm)	0 – 5	6 – 15	15 – 50	51– 100	101 –200	> 200
Peat depth score	0	1	2	3	4	5

Step 8: Add these scores and complete the calculation below to determine the Wetland Establishment Index.

WETLAND ESTABLISHMENT INDEX

Girth Score +	Peat Depth Score =	Total Score	Calculation	Wetland Establishment Index
			x10	%

Open Freshwater Wetlands

Step 1: At the four sampling sites, use a 50-metre tape to measure the width of the fringing vegetation, and record these values (m) in the width table. Measure from the water's edge to the outer edge of the fringing vegetation. The boundary is defined when the fringing vegetation stops, or when it extends beyond 50 m from the high water mark. If the fringing vegetation continues beyond 50 metres in width (generally the case with undisturbed wetlands), then the wetland is considered to merge with an adjacent ecosystem.

Fringing Vegetation	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4
Width of Fringing Vegetation (m)				

Step 2: When you have measured the width of fringing vegetation at each of the four sample sites, calculate the average width, and record below.

Average Width =	

Step 3: Use the width conversion table below to determine your Width Score.

Width Conversion Table	
Average Width	Width Score
0-2 m	0
>2-5 m	1
>5-15 m	2
>15-30 m	3
>30-48 m	4
>48 m	5

FRINGING VEGETATION INDEX						
Width Score +	Vegetation Type Score +	Species Number Score +	Weed Score =	Total Score	Calculation	Fringing Veg Index
				(	÷ 20) x 100	%

Water Quality

pH, Electrical Conductivity, Turbidity

Step 1: Measure pH at each of the four sampling sites using a pH meter or broad-spectrum litmus paper. The water in which you undertake your measurements should ideally be 50 cm deep or more. Position the probe midway between the water surface and the wetland floor – make sure the probe does not contact the sediment! Record the pH values in the 'water quality table'.

Step 2: Measure electrical conductivity at each of the four sampling sites using an electrical conductivity meter. The water in which you undertake your measurements should ideally be 50 cm deep or more. Position the probe midway between the water surface and the wetland floor – make sure the probe does not contact the sediment! Record the values in the 'water quality table'.

Step 3: Use a turbidity tube, a secci disk or an electronic turbidity meter to measure turbidity at your four sampling sites. Be very careful not to stir up sediment when you are collecting your sample, or you may obtain a higher-than-actual value. Record the values in the 'water quality table'.

Water Quality	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4
pH				
Electrical Conductivity				
Turbidity				
Water Quality Sample taken (tick) **				

Step 4: Use the 'pH conversion table' to convert the pH to the pH score.

pH Conversion Table				
Average pH	**< 4**	**<5 – 4**	**5 – 6or > 8**	**6 – 8**
pH score	0	1	**2**	**3**

Step 5: Use the 'EC conversion table' to convert the electrical conductivity to the EC score.

EC Conversion Table				
Average EC	> 3 000 µS / cm	1000 –2999 µS / cm	200 – 999 µS / cm	**<200 µS / cm**
EC score	0	1	2	3

Step 6:, then use the 'turbidity conversion table' to obtain the turbidity score for your wetland.

Turbidity Conversion Table				
Average Turbidity	>100 NTU	50 - 100	20 - 50	<20
Turbidity Score	**0**	**1**	**2**	**3**

Step 1: Use the water sample taken at your sites to determine the levels of nitrate, ammonium and phosphate at your wetland.

Step 2: Use the conversion tables to work out nitrate and ammonium scores.

Nitrate Conversion Table				
Average Nitrate	> 4 mgN/L	1 - 4 mgN/L	0.4 - 1 mgN/L	<0.4 mgN/L
Nitrate score	0	1	2	3

Ammonium Conversion Table				
Average Ammonium	> 4 mgN/L	1 - 4 mgN/L	0.4 – 1 mgN/L	<0.4 – 1 mgN/L
Ammonium score	0	1	2	3

Step 3: Use the ‘phosphorus conversion table’ to work out the phosphate score.

Average phosphate	> 2 mgP/L	0.5 - 2 mgP/L	0.2 – 0.5 mgP/L	<0.2 mgP/L
Phosphate score	0	1	2	3

Step 4: Use your ‘scores’ to calculate your Water Quality Index. If you have only tested for pH, EC and turbidity, divide your score value by 9 instead of 18.

WATER QUALITY INDEX								
pH Score	EC Score	Turbidity Score	Nitrate Score +	Ammonium Score +	Phosphate Score =	Total Score	Calculation	Water Quality Index
						(	**÷ 18) x 100**	**%**

Estuarine Wetlands

Step 1: Collect the following data, using 10 x 10 m quadrats, sampling up to 10 quadrats (minimum of 4) and record in the table below.

Step 2: Measure and record the diameter of each tree over 2.5cm within the quadrat at chest height. This is referred to as Diameter at Breast Height (DBH). This height is approximately 1.3 meters from ground level.

Step 3: Calculate mean tree height by measuring a number of trees within the plot and calculating the mean, in metres.

Step 4: Count the number of trees within each quadrat to calculate your tree density. Only count those mangroves with a DBH>2.5cm

	Community Structure Data Quadrats 1 - 10									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Diameter at Breast Height (DBH) (cm)										
Mean Height (m)										
Tree Density										

Step 5: Calculate the Basal Area by applying the **Basal Area formula** - to do this, square (multiply by itself) all the individual tree diameters (DBH) and then sum (add) these figures.

$$\textbf{a (Basal Area)} = 0.000785 \times \sum(DBH^2)$$

Where: $\sum$ = Sum

DBH^2 = Diameter Breast Height in cm squared (dbh x dbh)

Total of all DBH^2 collected in above table =		**BASAL AREA**
Sum of (DBH^2) =	**X 0.000785**	**=** **m^2**

Step 6: Calculate the area assessed

AREA ASSESSED	
No. Quadrats x 100 m^2 =	m^2

Step 7: These parameters are then used to calculate the complexity in the following equation:

$$\textbf{C (Complexity)} = \frac{(\mathbf{a} \times \mathbf{d} \times \mathbf{n} \times \mathbf{h})}{\mathbf{A}}$$

Where:

C = Complexity index
a = basal Area in m^2
d = average tree density per quadrat (with DBH >2.5cm)
n = number of different mangrove species along transect
h = mean tree height in m
A = Area assessed in m^2 (no. of quadrats x 100)

Apply the Complexity formula by transferring the totals and averages from the data collection tables, to the calculation table below to give the Complexity Index**.** Use this number in Step 8 to convert to a 'score'.

Basal Area (a)		**Mean Tree Density (d)**		**No. of mangrove species (from veg section) (n)**		**Mean tree height (h)**		**Area Assessed (A)**	**Complexity Index**
m^2	**X**		**X**		**X**	**m**	/	**m^2**	**=**

Step 8: Circle the corresponding score in the table below, this will be used to calculate the Mangrove Condition Index below.

Complexity Score Conversion Table					
Complexity Index	0-3	4 -9	10-19	20 - 39	40 +
Score	0	1	2	3	4

Step 9: Use quadrat sampling system to quantitatively assess mangrove foliage condition, quadrats should be located at the same locations where data is recorded for the complexity index. Suggested quadrat size is 1x1 m for foliage cover. Within the area assess each parameter and record the appropriate figure. At the completion of the transect calculate the average (SUM quadrats ÷ no. quadrats) measure for the wetland.

Mangrove Condition	**Quadrats 1 - 10** Record each as a percentage for each quadrat										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Avg**
Foliage Cover (%)											
Foliage Health (%)											

Step 10: Circle the corresponding scores in the table below.

Mangrove Condition Conversion Table				
Avg Foliage Cover	<10%	10 – 30 %	31-60 %	> 60 %
Score	0	1	2	3
Avg Foliage Health	<10%	10 – 25 %	26-75 %	> 75 %
Score	0	1	2	3

Step 11: Add your Avg Foliage Cover Score and Avg Foliage Health Score to give you a 'Mangrove Condition Score' and record in the table in Step 12.

Step 12: Add up the scores from the Complexity and Mangrove Condition conversion tables to give the total score.

Complexity Score	+ Mangrove Condition Score	= TOTAL

Step 13: Use the formula below to calculate the Mangrove Condition Index

MANGROVE CONDITION INDEX		
TOTAL Score	Calculation	Mangrove Condition Index
	/10 x 100	= %

Saltmarsh Condition

Step 1: Usinq a quadrat sampling system with 10 x 10 m quadrats, sample up to 20 locations along the transect to assess saltmarsh condition. Quadrats should be placed every 100 m or at every change in vegetation type. In each quadrat the percentage covered by vegetation should be recorded, along with the number of species present.

GROUND COVER	1	2	3	4	5	6	7	8	9	10	Avg
Area of 10 m quadrat covered by veg (%)											
Area of 10m quad. with signs of necrosis (%)											
Number of crab burrows in 1 x 1 m quadrat											
Snail density (30 cm quadrat)											

Step 2: Use the average determined in the ground cover table to convert the percentage to a score. Circle the appropriate score

Cover Percentage Conversion Table				
% Cover	< 25	25– 50	50 – 75	> 75
Score	1	2	4	5

Step 3: Use the average necrosis level to convert to a score which is used to calculate the Saltmarsh Condition Index.

Necrosis Conversion Table				
Average Necrosis	>50%	>25 – 50%	5 - 25	<5%
Score	0	1	3	4

Step 4: Use the average crab burrow count from above to convert the number to a score. Circle the appropriate score.

Crab Burrow Conversion Table				
Average Crab Burrows	0	0 - 2	2 – 4	> 4
Score	0	1	2	3

Step 5: Use the average snail count from above to convert the number to a score. Circle the appropriate score.

Snail Density Conversion Table				
Average Snail Density	0	0 - 5	>5 – 20	> 20
Score	0	1	2	3

Step 6: At 4 points along the terrestrial edge of the saltmarsh, and four points along the estuarine edge of the saltmarsh determine the level of encroachment on the saltmarsh. This is done by determining whether encroachment is:

Definite - definite impacts might include introduced grass species or weed species occurring into the terrestrial edge of the saltmarsh, or large numbers of mangroves seedlings established in the estuarine edge
Suspected - you cannot determine that the above is definitely happening score the impact as suspected
Not occurring - If there is no impact or no obvious encroachment on the saltmarsh, score the impact as not occurring

PLANT ENCROACHMENT	Impact Level	SPECIES PRESENT AND COMMENTS
Mangrove Encroachment		
Terrestrial, Freshwater, Weed Species Encroachment		
OVERALL		

Step 7: Use your overall impact level of encroachment to convert to a score in the table below.

Encroachment Conversion Table			
Level	Definite	Suspected	Not Occurring
Score	0	2	3

Step 8: Transfer the scores from the percentage cover, Species, and encroachment conversion tables, to calculate the Saltmarsh Condition Index.

SALTMARSH CONDITION INDEX	
Cover Score	
Necrosis Score	
Crab Burrow Score	
Snail Density Score	
Encroachment Score	
TOTAL	**/18 x 100 = %**

Seagrass Condition

Step 1: Usinq a quadrat sampling system with 1 x 1 m quadrats, sample 10 locations along the transect to assess seagrass condition. In each quadrat the percentage covered by vegetation should be recorded.

COVER	1	2	3	4	5	6	7	8	9	10	Avg % Cover
Area (%) of 1 m^2 quadrat covered by vegetation											

Step 2: The Average percentage cover from above can then is translated into a score using this table. Use this score to calculate the Seagrass Condition Index in Step 8.

Cover Score	SCORE
High - >60% cover	6
Mod – 30 – 60% cover	4
Low - <30% cover	2

Step 3: Estimate the average seagrass depth and circle the corresponding score. Use this score to calculate the Seagrass Condition Index in Step 8.

SEAGRASS DEPTH	SCORE	OBSERVATIONS & COMMENTS
DEEP Deepest edge of seagrass bed is > 2m OR Water is < 2m deep at deepest point, with seagrass growing to deepest points of estuary, lake or lagoon	3	
MODERATE Deepest edge of seagrass bed is between 0.3 – 2 m OR Water is < 0.3 m deep at deepest point with seagrass growing to deepest point estuary, lake or lagoon	2	
SHALLOW Deepest edge of seagrass bed is < 0.3 m	1	

Seagrass depth ranges adapted from: CSIRO, 2002, 2005.

Step 4: Selecting a number of individual seagrass blades within the quadrat (approx. 10), and estimate the cover on each of the blades (approx. 50%). Then look at the whole quadrat and estimate the overall coverage of epiphytes on the seagrass (approx. 50 %).

Epiphyte Cover	Quadrats 1 -10										
	1	2	3	4	5	6	7	8	9	10	Avg.
Individual Leaf Cover (%)											
Overall Quadrat Cover (%)											

Step 5: The calculation for overall coverage is determined as follows: 50 % (individual leaf cover) x 50 % (overall quadrat cover) = 2500 / 100 = 25 % true seagrass epiphyte cover (Koss et al. 2005).Use the following table should be used to simplify the calculation

True Epiphyte Density Calculation Table			
Individual leaf cover	**Overall quadrat cover**	**Calculation ÷ 100 =**	**True Epiphyte Cover**
X		**/ 100**	**%**

Step 6: Use the table below to convert the true epiphyte cover percentage to a score. Use this score to calculate the Seagrass Condition Index in Step 8.

Epiphyte Density Score					
True Epiphyte Density	**< 20 %**	**20 – 40 %**	**40 – 60 %**	**60 – 80 %**	**> 80 %**
Score	**3**	**5**	**4**	**2**	**1**

Step 7: Take the cover score, seagrass depth, and epiphyte cover score and enter them into the table below.

Step 8: Add the scores together and perform the calculation to get the final Seagrass Condition Index.

SEAGRASS CONDITION INDEX	
Cover Score	
Depth Score	
Epiphyte Score	
TOTAL	**/14 x 100 = %**