Swan Canning River System Inquiry

Integrated Science Workbook
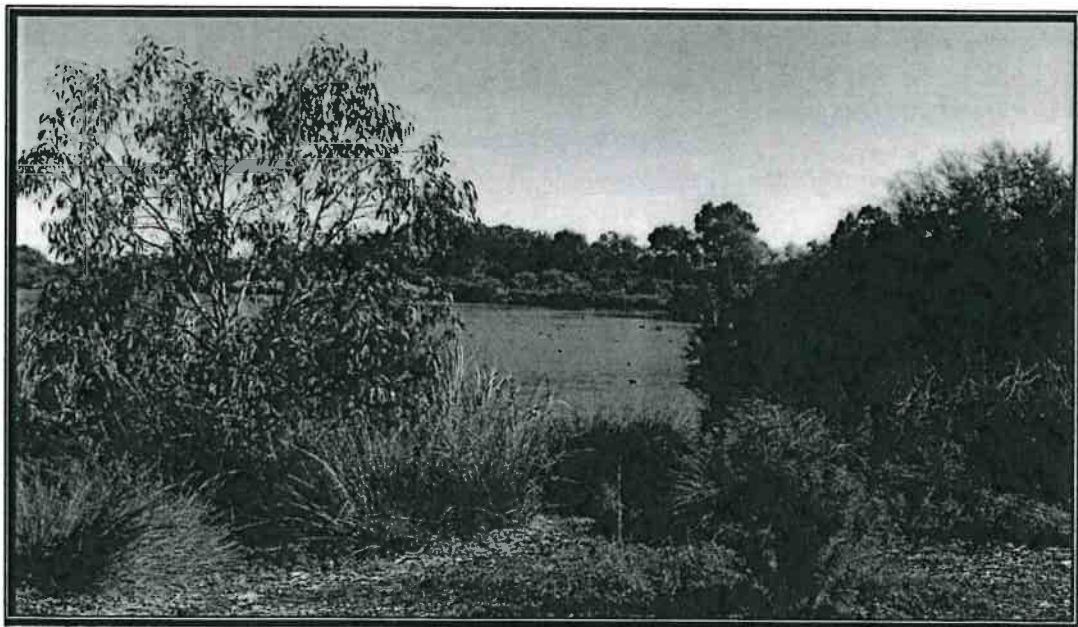
Name: Miss Bellini

Site survey

Group: _____ Date: __/__/____

Site: _____ Final score:____ / 50

1. Walk around your site using this table to record your observations. The questions in the table can give you important clues on how healthy the ecosystem is.
2. Write (and/or draw) your observations for each category in the column provided.
3. Then, using the scoring column, circle the number on the scale which best describes your site's condition.
4. When all the categories are completed, add up the scores to give you a total out of 50.
5. Use this score to give your wetland an overall rating.
6. If you can, photograph the site so that you have a permanent record and can see changes over time.
7. This is your groups' assessment of your site, and different groups may record different results, therefore, keep the photo/s with a copy of the site check.

Category	Observations	Score
1. Vegetation Look at the banks and the land near the waterbody. Can you see: • rushes or reeds in the water and along the banks • trees and shrubs surrounding the water and/or overhanging the water • large areas of lawn along the banks? Are the plants natural/native or introduced/weeds? (Use the plant ID charts.)	reeds → Water reeds. small bushes. large areas of lawn – dog area (cleared areas). Race course across the river. (Ascot). Many trees along area. Introduced trees – Eucalyptus. Dead trees.	**0.** Lots of introduced plants/weeds, much clearing and/or lawn. **1.** **(2.)** Mixed native and introduced plants, some **3.** **4.** Mainly native plants. Little sign of **5.** human changes. Note: a common weed is the bulrush. A tall reed with flat leaves. Native reeds usually have
2. Water Record what the water in the waterbody looks like. • What colour is the water? • Does the water look frothy or scummy? • Is the water clear or cloudy (turbid)?	Brown water. Turbid – looks cloudy Sticks, particles. Muddy, sandy water. No detergents or foam.	**0.** Milky brown or green colour with particles, scum or froth. **1.** **(2.)** **3.** Some colour and particles. **4.** Clear (can be colourless or **5.** stained brown).

Category	Observations	Score
3. Smell Sit by the waters edge and record any surrounding smells. If it does have a smell: • is it a natural (earth or plant-like smell) or • unnatural/chemical smell?	→ Natural smell - Water smell. - slight - Bins of dog poo → (smell).	**0.** Very strong, unnatural chemical smell. **1.** **2.** Strong natural decaying (rotting) smell or slight unnatural smell. **3.** ~~4.~~ **5.** No smell/ natural smell.
4. Banks Look at the banks of your waterbody. • Are they covered by plants and stable or are there patches of bare ground with loose soil? • Are there any man made structures such as walls, concrete, or wooden boards? • Can you see any erosion or undercutting of the bank? If the water is flowing is it: • in a straight channel (like a drain), or • in a natural 'winding' stream with rocks, logs or sticks?	trees. reeds. oo o oo trees. rocks exposed. Sand (concrete) - Rock cages. washed away - Rock wall - across river (near Ascot). - Clearing for dog swimming. - Erosion → banks washed away. → Boats, waves → - concrete in banks erosion → sand washes	**0.** Bare, eroded (washed away) banks, or concrete walls. Water flows in a straight channel (drain). **1.** (2.) ~~3.~~ Moderately vegetated, some erosion. Creek channel 'winds'. Some rocks and sticks in the water. **4.** **5.** Well vegetated, stable banks. Winding creek channel with rocks and logs.
5. Animal Life As you walk around or sit by your waterbody what do you notice about animal life? Can you see/hear any: • insects buzzing around such as dragonflies or damselflies • fish, tortoises or bugs swimming in the water • birds or frogs? Do you notice any 'droppings' on the ground? (They could be from ducks, kangaroos, dogs etc).	Dogs → scare away - Ducks. natural bird - Jellyfish (dead). life - Pelican - Willy wag tail. - Not many bush birds - Not many ducks - or native birds.	away No animal life **0.** visible at all, or dead animals visible in water. **1.** (2.) ~~3.~~ Only a few different types of animals found. **4.** **5.** Many different types of animals found.

Category	Observations	Score
6. Litter Record any litter floating on or in the water, or on the surrounding land (this could include dog poo). • Look carefully at any reeds or plants in the water, litter often gets trapped there. • If you see any litter, are there any rubbish/recycling bins (with dog bags) nearby?	– concrete. – Minimal to none – well cared for. – tyres, bricks	**0.** Lots of litter, such as tyres, cans, glass, plastics and domestic animal droppings. **1.** **2.** **③.** Some litter. **4̶.** **5.** No litter at all.
7. Pipes and drains Look for pipes or drains leading into your waterbody. • Look at what is coming out of them (by smell and sight: don't touch or taste). • Record how many pipes or drains there are and what you think they are there for. – Fertiliser, pesticides, Car wash (nitrates & phosphates) → increase in algae.	– storm water drains. (one giant one) ⟶ no smell. → for entire city of Bayswater. book main drain. Water from roads etc → pollution from oil, petrol from cars / tyres	**0.** Lots of pipes and drains. **1.** **2.** **③.** Some pipes and drains. **4̶.** **5.** No pipes or drains.
8. Land Use Look at the bigger area surrounding your waterbody. • How is the land being used that you can see? • What land uses are you aware of in the local area? (Google Earth can help with this, or look carefully as you travel to/from the site).	– Ascot race course (fertiliser, horse poo) – Dog area. – River system for boats & kayaking. – Jetty, picnics. – Few houses (around) – Roads, highways, airport – Used to be land fill → cleared & made into a park. (→ rubbish washed into water.	**0.** Industry, agriculture and/or transport. **1.** **②.** **3̶.** Housing, commercial, and /or recreational. **4.** **5.** Low human use, in its natural state.

Plants in bird sanctuary use # tonnes of phosphate & #lb nitrates per year removed.

could cause algal bloom.

Category	Observations	Score
9. Human Use What do people often do at this place? Record: • any activities that people are doing in, on and around the waterbody now or • any that you know happen at other times • what people are doing to care for this site (e.g. bins, boardwalks, tree planting)	- Dog park - Walking - recreational activities - Kayaking. Tree planting → next to path Picnicing Site seeing boat (captin cook cruises) ↳ waves cause erosion Exercise stations.	0. Motorised water sports, humans feeding birdlife. Or 1. no evidence of people caring for it. (2) (3.) Fishing, swimming, exercising domestic animals, picnicking. Some actions to 4. care for it. 5. Walking, rowing, bird watching, low human use. Or well cared for and managed place.
10. How do you feel? After having a good look around your waterbody, describe how it makes you feel. Do you feel that it is: • polluted or unpolluted • pleasant or unpleasant • interesting or boring • lively or dead • happy or sad • natural or degraded?	- Natural, pleasant - Cared for - by human Intervention.	0. This place is a dump! 1. 2. (3.) I do not feel really good about this site, but we could make it better. (4.) 5. A great place to be!
TOTAL SCORE		24

The greater the total score, the better the condition of your site. To see what this means, look up your score on the waterbody rating table below.

Score	0-9	10-19	20-29	30-39	40-50
Rating	Very Bad	Bad	Medium	Good	Excellent
Action	This place needs people to get involved and help improve the condition of the waterbody or start an action project.		Further investigation of this place is required and may include a water monitoring program.		We need to make sure this site is looked after for its long-term health.

This survey provides a good start to investigating a wetland or river ecosystem. To gain a more detailed knowledge of your wetland you could conduct studies of water quality, macroinvertebrates and other animals or plants over a longer period.

Ocean (salt)
rainfall (fresh)
stormwater
groundwater.
} where the water in this system comes from.

Water quality testing data sheet

56 ms/cm (Ocean - salty).
0.8 ms/cm (fresh water)

Date: 09/03/20   Time: 11:10am

Location: Riverside Gardens - Bayswater.

Observations

Weather conditions (circle the most appropriate):

cold   (warm) ⟷ (hot)

(sunny)   partly cloudy   cloudy   very stormy

still   gentle breeze   (Moderately windy) Very windy

Environmental conditions:
Make some notes about the environment. Are there lots of trees and plants? What does the water look like? If it is a creek or river, is the water flowing? Is there much litter around?

- River - murky, brown, sticks & leaves.
- Eucalyptus trees, reeds near water. many grass/lawn areas.
- Fresh & salt water mix.

Results   Yellow coloured water

Algae grows better & less oxygen in hotter water.

(saltiest around summer - less rainfall)

TEST	UNITS	SAMPLE A	SAMPLE B
Temperature	°C	27.5°C	27.1°C
pH		7.82	7.83
Salt	mS/cm	45.3	
Turbidity	NTUs	<40 (high)	
Dissolved Oxygen	% (0-200)	101.7	
Phosphates	ppm / mg/L	0.2 × 3.07 = 0.614	
Nitrates	ppm / mg/L	0.8 × 4.43 3.544	

CONVERSION 1mS = 1000μ

Amount of oxygen entering & leaving is the same (cool.)

slightly higher - more entering than leaving.

Interpretation

Look at the ANZECC trigger values and describe how your results compare to those.

	ANZECC trigger value for this site*	How our result compares (OK, higher, lower?)	Other information on ranges and status
pH	7.5 – 8.5[1]	OK 7.52	• 6.5 – 8.5[1] = normal • 4 – 6.5 and 8.5 – 9 = may be polluted • ≤ 4 or ≥ 9 = pollution likely
Salt (Electrical conductivity) mS/cm	Not applicable to estuarine environment	saline 45.3 ms/cm	• <0.9 = fresh • 0.9 – 2.7 = marginal • 2.7 – 9.1 = brackish • >9.1 = saline
Turbidity - NTU's	1 - 2	Hugely high. <40	< 15 = very clear > 30 = high turbidity; light penetration into water column affected
Dissolved Oxygen % saturation	90 – 110 % saturation	OK 101.7 %	When water is %100 saturated there is equilibrium between amount of oxygen entering and leaving the water
Phosphates ppm mg/L	0.005	Hugely High. 0.614 ppm mg/L	WA wetlands are naturally low in nutrients, so small quantities can have large impacts on ecosystems.
Nitrates ppm / mg/L	0.045	Hugely High. 3.544 ppm/mg/L	WA wetlands are naturally low in nutrients, so small quantities can have large impacts on ecosystems

*ANZECC Trigger Values are set by the Australian Government as a basis to establish ecosystem health
1 – pH of 8.5 is acceptable where there is limestone present

There are no guidelines for **temperature**. It is best to compare your measurements to previous data at this site and consider how the time of day or season may affect your reading. A change of 2°C in a 24 hour period can cause stress to aquatic organisms.

If you get a result that is **higher than the trigger value** it doesn't automatically mean there is a problem. It may mean that further investigation is needed to decide if there really is a problem or that some management is needed to avoid a future problem.

↳ rains lately ∴ a lot of phosphates & nitrates transfered into the water.

Conclusions

Write two – three sentences describing the water quality of this waterway.

_____

_____

_____

_____

_____

_____

_____

The data you have collected is a "snapshot" of the water quality at this site. How might the results differ with time of day, time of year and presence of algae? Any other factors you think we would need to consider when interpreting our data?

_____

_____

_____

_____

_____

_____

What impacts would high nutrient levels have on the ecosystem at this site? Are there any strategies in place to reduce these impacts?

_____

_____

_____

_____

_____

_____

_____

Estuarine Macroinvertebrate Sampling — Activity 4

(handwritten top margin) water quality quite good — due to we have many fauna & at the time of year.

(handwritten left margin) Most tolerant species · Vertebrate (fish) · Invertebrate (including macroinvertebrates) · G-abundant

Estuaries are home to many small animals without a backbone, called invertebrates. They include crustaceans, molluscs and worms. The presence and abundance of species adapted to different saltwater habitats provides an indication of the health of the ecosystem.

Abundance is the number of organisms represented in a particular ecosystem. The following rating has been developed to record species abundance:

- **1 = uncommon (<5 individuals)**
- **2 = common (5–20 individuals)**
- **3 = abundant (>20 individuals)**

Diversity refers to the variety of different species found at a particular location. High diversity and species number indicates a healthy site. Low numbers and few species may indicate a problem with the ecosystem.

(handwritten) Gambusia → introduced to eat mosquito larvae (from South America or Mexico).

Name	Classification	Number present	Abundance Rating	Preferred Habitat
Melita matilda	Crustacea Amphipoda	} 9	(2)	Intertidal mud, sand, rocky shores, seaweed - Prefer seaweed
Grandidjierella sp.	Crustacea Amphipoda			Intertidal mud, sand & rocky shores
Corophium minor	Crustacea Amphipoda			Intertidal mud, sand & seaweed- Prefers sand.
Capitella capitata	Annelida	1	uncommon (1)	Soft sediment.
Nassarius burcharodi	Mollusca Gastropoda	5	(2)	
Dragonfly nymph	Insectia	1	(1)	
water Scorpion	Arachnida	1	(1)	

How many species did the class find in total? _____

Is this an area high in biodiversity or low in biodiversity? Explain your answer

Low biodiversity → Summer (hot & time in life-cycle)
Flowing water moves macroinvertebrates around.
→ Scooped up water from sand (not much vegetation).

What are some things that may have affected which macros you found and how many there were? Consider time of year (season); habitat; flow (or lack of flow) in a river; water level; land use in the surrounding catchment.

(handwritten) low tide today (less water).

_____

_____

_____

(handwritten) If we were near reeds → should of found more.

Macroinvertebrate data interpretation

Macro diversity		
How healthy is your site? These are very general guidelines and the factors listed at the bottom of the page should be considered when interpreting your data.		
Number of different types of macroinvertebrates		Site health
0–5		This site is a very poor environment for aquatic macroinvertebrates.
6–10		This site provides an environment that only a few types of macroinvertebrates can live in.
11–15		This site provides a moderately healthy environment for many aquatic macroinvertebrates.
15–23		This site provides a fairly healthy environment for many aquatic macroinvertebrates to live in.

Factors to consider

When interpreting data it is important to consider why you have the result you obtained. Consider the factors which may have influenced what types of macroinvertebrates live at the site, this could include:

- life cycles (some insect species may be in their terrestrial adult form, rather than aquatic larva),
- season (often invertebrates are less active in colder months; or water temperatures may be too high in summer),
- water flow (there may be low numbers in a stream after heavy rain as rapid flow may wash them downstream),
- vegetation (is there enough vegetation, in or near the stream to provide food and or habitat?)
- water quality
- the catchment (are there any possible sources of pollution surrounding the waterbody).

One of the best ways to interpret your data is to compare to:

- data from the same time in previous years
- data from the same site at different times of the year
- data from similar waterbodies in your area (i.e. different sites on the same stream, or nearby wetlands), or
- data from different waterbodies.

Interpretation should always consider which animals are (or are not) found at the site, how many, and try to explain why. Certain types of macroinvertebrates can indicate nutrient rich waters in WA, typically they are water fleas, snails, ostracods (seed shrimps), midge larvae and water boatmen.

Bird sanctuary.
@ 3 million
removes.

• Sedimentation Basin (let everything settle)
• U shape → 150000 plants
   to absorb Nitrogen
   & phosphates.

1·3 tonnes nitrates. 200-300 kg
                                phosphates.

Birds of our wetlands and waterways

Type of bird		Species identified (common names)
	Large water birds	~~Pelican.~~ —Black swans.
	Large wading birds	—Pelican
	Ducks and Grebes	—Ducks (wood + pacific black).
	Water hens	
	Cormorants and darters	
	Small wading birds	
	Gulls / terns	
	Birds of prey	
	Bush birds	—Singing ~~Humming Bird~~. Honey Eater —Magpie Lark (Mudlark) —Wattle bird Red! —Willy wag tails. —Swallow —Kookaburra.

(left margin) • Cut grass → in my "field" this would
○ Add artificial hollows to allow
birds to rest.

BirdLife WA, sercul → bird species.

Bringing it all together....

Our focus question: Was this wetland healthy? ⟶

Flowing water, boats/minimal water birds. ∴ less/minimal water birds.

Flowing water → human activity

A summary of our findings

Investigation	**Findings** briefly describe what you found out in your research; your conclusions for each investigation.
Site survey	Medium score → relatively healthy but could be improved.
Water quality testing	High turbidity & high phosphate & nitrate → washed in nutrients & pollution heavy rainfall.
Macroinvertebrate sampling	Low biodiversity due to time of year but fairly healthy
Bird survey	Low amount - more bush birds than water birds → not enough trees for nests. Low biodiversity consdering $5-10 different types of specie
Overall findings What general conclusion can you reach about this site; what is the answer to your focus question?	Fairly healthy → but could be better with improvements.

Reflection and planning

Positives: what are some of the good things about this place?	→ Some human intervention → bird sanctuary that was added. → few macroinvertebrates considering the species. → clean - rubbish minimal.		
Threats: what are some things that are happening in and around this place that may affect it negatively in future?	→ Pollution - race course (horse poo/fertilisers). → Storm water pipe - changes in lots of phosphates & nitrates.		
Goal: ten years from now...how would you like this place to be in ten years time?	→ More trees & bushes. → More nesting places for birds. → less/no dog areas → allow nature to thrive.		
Action: what needs to happen to reach this goal?	What can people do as individuals (at home / work etc)?	What can be done by communities (as volunteers etc)?	What can local or state governments do (and how can individuals get them to act)?
	Pick up dog poo & rubbish	Pick up rubbish bird boxes for nests Plant trees & bushes.	Closed areas for natural land/cluster birds for development.
Priorities: what are the best things our school (or class) can do to help?	1. Pick up rubbish 2. Plant more trees / seedlings 3. Make bird boxes → add to trees for nest sites.		

Background Information

The Swan River System Inquiry excursion is run by the Department of Parks and Wildlife – Nearer to Nature program. On the day, students will explore topics such as water quality, land cover change, biodiversity loss and sustainability.

Riverside Gardens is located adjacent to the Eric Singleton Bird Sanctuary restoration project. This location provides a great opportunity for the students to see the connection between the drains, wetlands and the river, with an overall focus on land cover change. It offers a unique opportunity to view and learn about the City's largest environmental wetland restoration project.

Task

You are tasked with completing a field report from your observation and analysis of the Riverside Gardens location (an example field report is provided on Seqta to assist with your layout).

Key Dates

Excursion: Mon 9th March 2020

Class Time: Fri 6th March – Excursion Preparation
               3 lessons in-class (Tues 10th – Fri 13th March) to work on Field Report

DUE DATE: Monday 16th March 2020 (at the start of the lesson)

Task Weighting

10% of the year mark.

Total marks available

Part 1 - Excursion Workbook: 33 Marks
Part 2 – Field Report: 69 Marks

Total Marks: 102 Marks

Submission Requirements

Excursion booklet – paper
Field report – electronic submission via seqta assessment (word or PDF only)

Part 1: Excursion Workbook   [33 marks]

You are required to complete the Excursion Workbook while on site at Riverside Gardens. This workbook is to be submitted as an appendix to your field report.

Marking Guide – Excursion workbook

Site Survey • Completes all sections, clearly describing observations.	/10
Water Quality Testing Data sheet/Interpretations • Record all results accurately, using correct units • Complete interpretation sheet, comparing your results to ANZECC trigger values	/9
Water Quality Conclusions • Clearly describe what has been determined from your data collection	/6
Macroinvertebrate Sampling • Identify species present • Characterise biodiversity of site • Describe the factors affecting biodiversity	/6
Birds of our Wetlands • Identify species present	/2

Part 2: Field Report   [69 marks]

Your field report will detail all information from the excursion, including background information, photographs, data collected, conclusions and evaluations.

Marking Guide – field report

Cover Page *Table of Contents/List of Figures*	/3
Field Trip Summary • Provide a summary of the different components of the field trip	/3
Site Location • Provide a summary of the location, including a clear map that outlines the areas that were observed/analysed	/5
Site Survey • Introduction/Background information • Outline all observation categories, incorporating annotated photographs and diagrams (cross-section through the bank) to assist in your description of the site • Site Rating (use the rating matrix to identify the health of the site	/12

Water Quality Testing
 • Introduction/Background information
 • Water quality table (includes all test results and ANZECC trigger values, identifying area in need to remediation.
 • Water Quality Conclusions
    o Describe the water quality of the wetland
    o Discuss what factors need to be considered when using this data
    o Describe strategies that could be used to deal with high nutrient level
	/3
	 /4
	 /7

Macroinvertebrate sampling • Introduction/Background Information	/3

• Species identified table	/4
• Biodiversity	/4
o Describe what biodiversity is.	
o Describe the biodiversity in the area	
o Describe factors that have or may have affected the biodiversity	
Birds of our Wetlands	
• Introduction/Background Information	/3
• Species Identified	/5
o Provide detailed information about the different types of birds that have been identified in this wetland. List the status of the bird (endangered etc). Describe the habitat of this bird and what it eats. Include photographs.	
• Environmental Impacts	/3
o Describe the environmental factors that are impacting upon the bird population within this wetland.	
o Discuss at least one mitigation strategy that could be put in place to deal with the adverse environmental factors	
Evaluation	
• Identify any difficulties that you had with obtaining data whilst on the excursion	/4
• Make suggestions for how you could improve the quality of the data collected, or make the data more reliable	
Conclusion	
• Provide a conclusion that details the health of the wetland, based on the data that you have collected.	/3
References	/3

Part 1: Excursion Workbook	/33	Teacher Comment:
Part 2: Field Report	/69	
Total Mark:	/102	
	%	

Ross Mitchell → nothing completed.