Practical Handbook

Instructions

Read through the following practical handbook. Think about the form in which you would like to present your Depth Study (listed under 'Ideas for Depth Study' in the Biology Stage 6 Syllabus, 2017). Ensure to record all resources used as you progress through the practical component in the table at the conclusion of this practical handbook.

Depth Study Practical Component

Site Details

Use search engine tools to complete the table below.

Name of study site:	
Type of aquatic system:	
Location (include a map image):	
Satellite aerial image of site:	
Latitude:	
Longitude:	
Site description:	
Site area coverage:	
Site volume:	
Site depth:	
Surrounding land use:	
Abiotic factors of the site:	

Protected Area Factors

1. Was the site once accessed by Traditional Owners? If so, explain the relationship Traditional Owners had with the site.
2. What is the current relationship between the site and Traditional Owners?
3. Is the site a protected area (government managed land)?

Risk Assessment

1. Complete the SLS NSW Education Values worksheet.
2. Refer to the SLS NSW Education Values worksheet and the risk assessment matrix below to construct a risk assessment for your study site before commencing your field investigation.

Risk Assessment Matrix

How serious could the injury be?	***How likely is it to be that serious?***			
	Very Likely	Likely	Unlikely	Very Unlikely
Death or permanent injury	1	1	2	3
Long term illness or injury	1	2	3	4
Medical attention & several days off	2	3	4	5
First aid needed	3	5	5	6

Severity – is how seriously a person could be harmed

Likelihood – is an estimate of how probable it is for the hazard to cause harm.

Legend (as a guide only)

1	Extreme risk; action to rectify the hazard should commence immediately
2	High risk; action to rectify the hazard should occur within 48 hours
3	Medium risk, action to rectify hazard should occur within 7 days
4	Low risk; action to rectify hazard should occur within 14 days
5 & 6	Minimal risk, action to rectify hazard should occur within 21 days

Complete the following risk assessment table prior to conducting fieldwork at your site. The first risk has been done for you.

Identified risk	Risk Matrix Assessment	Control measures
Bite/sting from insect (anaphylaxis)	3	• Students disclose allergies/anaphylaxis in permission note. • All staff are in possession of epipen and are trained in emergency first aid procedures.

Ethical Considerations

Ethically, what procedures must be in place to ensure the protection of the aquatic ecosystem and animals encountered at the study site during the field investigation?

Biotic Factors

List all the biotic factors of the site in the table below. List the animals by:

1. Observing and recording any bird life of your study site before disturbing the area.
2. Observing any fish or reptiles of your study site. (They may be a means by which materials and energy enter or leave the pond.)

Note: Educated guesswork will be needed to establish some trophic links. Remember that species with adaptations for catching, killing or holding prey are unlikely to eat plants. Size also determines what a carnivorous organism can eat (eg. A fish will eat anything it can fit into its mouth except for very small organisms).

Optional sampling techniques:

1. Using a screw-top container, take a sample of any sediment at your study site. For accuracy, 3 samples should be taken. Observe the samples organically with your eye in a petri dish or under a microscope and determine any organisms you can see. Record the biotic factors in the table below.
2. Again, using a screw-top container, take a sample of the water at your study site. For accuracy, 3 samples should be taken. Observe the samples organically with your eye in a petri dish or under a microscope and determine any organisms you can see. Record the biotic factors in the table below.
3. Using a dip-net, sample some larger organisms of your study site. Record the specie in the table below and then release it back to the site unharmed. Ensure that the samples are taken in an ethical manner and to do this under the supervision of your teacher.

Image	Organism Common Name	Scientific Name	Phylum	Community	Trophic Role	Characteristics	Location at site

Site Food Web

Using the table above, construct a food web of your study site. After completing your food web, answer the following questions:

1. How many species are in your food web?
2. How many linkages are there in your ecosystem?

Abiotic Factors

Using your knowledge and search engine tools, complete the table below.

Abiotic factors influencing communities at the site:	
Selection pressures of the site:	
Possible connections and interactions with neighbouring ecosystems:	
Effects of rainfall and temperature:	
Tidal flow movement and effects:	
Site saline conditions:	
Annual water temperature variation:	
Animal sampling techniques for diversity and abundance:	

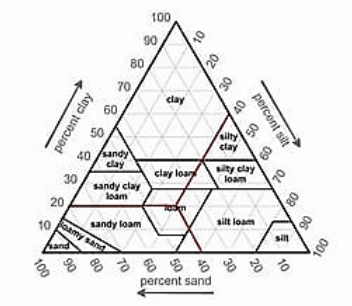
Referencing data by the Bureau of Meteorology and using the appropriate fieldwork equipment, complete the below two tables and question on rainfall.

Air temperature (degrees C)	
Soil temperature – metal thermometer 3 to 4 inches deep (degrees C)	
Soil pH – source below	
Soil moisture % - Tensiometer	

How to test soil pH:

[How to measure the ph of soil]

How to Measure the pH of Soil



- Step #1: Dig a hole deep enough for the pH electrode, and place the soil in a bucket or bowl.
- Step #2: Add water to the soil and remove any large rocks or sticks.
- Step #3: Place the calibrated pH probe into the newly dug hole.
- Step #4: Pour the mud back into the hole, around the probe, and wait 25 minutes to achieve the most accurate pH reading. ...

Reference: atlas-scientific.com/blog/how-to-measure-the-ph-of-soil/

Most recent rainfall event (date, hours the rainfall event took place and mm's of recorded rainfall):

Tidal tests	Low Tide	High Tide
Time		
Weather conditions		
Temperature		
Dissolved oxygen		
pH		
Salinity		
Conductivity µS/cm		
Turbidity (suspended material in water)		
Light availability		
Tidal movements		

How does the conductivity of your sites water effect the aquatic ecosystem?

Species Distribution

Make a transect by running a measuring tape starting from the lower edge of your study site uphill. Locate 5 sample points along the tape/transect. Ensure that the 5 points are even distance apart. Starting from the lower edge, at each sample point, record the species that are found horizontally to the tape. Record the species found at each sample point in the table below. Repeat this at least 3 more times in different locations along your study site's aquatic ecosystem. This can be done in groups. Resource your supervising Teacher or an identification guide to name any unknown species. If the species remains unknown, write some notes about the species' characteristics for later identification.

Population Abundance Estimate Key:

- Abundant (clearly visible)
- Common (easily found)
- Frequent (found with minimal searching)
- Rare (found with careful searching)

Sample 1:

Point	Distance	Species	Population estimate of abundance	Estimated % of coverage at the sample point
1				
2				
3				
4				
5				

Sample 2:

Point	Distance	Species	Population estimate of abundance	Estimated % of coverage at the sample point
1				
2				
3				
4				
5				

Sample 3:

Point	Distance	Species	Population estimate of abundance	Estimated % of coverage at the sample point
1				
2				
3				
4				
5				

Sample 4:

Point	Distance	Species	Population estimate of abundance	Estimated % of coverage at the sample point
1				
2				
3				
4				
5				

Use the quadrat technique (Biology in Focus, Page 210-211) to discuss the distribution and abundance of plant species from your sample points above.

Abiotic Changes and Pressures

Assess the suitability of the plants in your study area in relation to their existing environment in terms of adapting to salinity and oxygen in the table below.

Plant Community	Featured plant species	Rank the plant's ability to tolerate high salinity: 1= poor 2= moderate 3= high	Rank the plant's ability to overcome lack of oxygen due to water inundation: 1= poor 2= moderate 3= high	Total adaptability score of the plant to high salt and low oxygen

Use your rankings above to predict the most important limitation to survival of your study area's aquatic ecosystem.

Further Understanding

Using your knowledge, search engine tools and/or available testing equipment, complete the table below.

Global change impacts:
Aquatic ecosystem bacteria:
Fossil relevancy of organisms:
Genetic evolutionary changes:
Optional: explain the lifecycle of an organism at your site:

Reflection

Describe the limitations of the scientific methods used during fieldwork investigation and suggest how these concerns could be improved.

Resources

List the resources used during the theory component in the box below: