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Wood Badge Project
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Environment

Special Interest Area (Scout Section)

In Scouting we spend a lot of time outdoors in the natural world, however, it is important that we do more than just enjoy it. Understanding the natural environment helps young people grow a deeper respect and find their place in the world. This can be done by looking into natural processes and interactions in the environment, to then better understand human impacts and the flow on effects to management and sustainability.

This project has been put together to be used as a resource for the Scout section, to grow a deeper understanding for the environment and to support ideas towards SIA Environment Projects in the Scout section.

For more information and support please contact Kathy Jones.
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I would like to acknowledge Country and the traditional custodians, the Guringai people, on whose land we spend time on at Camp Kariong. We acknowledge the ways in which they cared for and sustainably managed the land, water and living things. We pay respect to Aboriginal Elders past, present and emerging.

Special Interest Area - Environment

As part of one of the six Special Interest Areas, the Environment award encourages Scouts to come up with their own project or activity ideas, and to develop them into a meaningful project or activity for the individual or group of Scouts. These resources have been put together to spark new ideas which can be further developed by an individual, Patrol or Unit. The SIA Environment award cannot be achieved by completing one or all of these stand-alone investigations, rather, they are a collection of ideas to start with. Scouts will be involved in the Plan/Do/Review process for a project or activity and this will involve setting personal or group goals with support from others. To achieve a SIA award a scout needs to complete a project with a total of 8 hrs.

Information on SIAs and the planning tool can be found from page 62 in the Scout Record Book or here:
https://pr.scouts.com.au/mdocs-posts/sia-planning-tool/

Project Ideas

Several investigation ideas have been developed for Camp Kariong, depending on the area of interest for the Scout, which can be incorporated into a SIA Environment Project. Some of the activities need to take place prior to fieldwork and usually involves internet based research.

A. Identifying potential sources of pollution at Camp Kariong;
B. Investigate human impacts on a creek using chemical characteristics (pH testing);
C. Investigating the biological health of a creek;
D. Fire in the Australian landscape and bushfire management at Camp Kariong;
E. Investigating biophysical interactions at two different natural locations at Camp Kariong; and
F. Design an environmental sustainability plan for Camp Kariong based around the Australian Scout Environment Charter. The focus could be on environmental issues such as protecting the surrounding environment, waste minimisation and disposal, the impact of high numbers of campers at one time, environmental education of campers.

By choosing to investigate one of these options or developing their own similar investigation, Scouts will learn through their experiences, develop greater knowledge and understanding of the natural world around them, their impact upon it and ultimately their place in it.

A. Potential sources of pollution at Camp Kariong

Pre-fieldwork: Internet based research and discussion. Read through investigation below.
Fieldwork equipment: white A4 paper, clip board, pencil

There are many processes occurring in the natural world which exist in a delicate balance. When humans interfere with the natural environment these processes can be disrupted and cause harm to ecosystems. Some of these activities include:

- clearing land of vegetation
- building houses
- introducing exotic plants
- Damming a river to interrupt its natural flow
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Explore by researching more human impacts and add them to the list as you observe them.
Reflect on how and where these human alterations might be occurring at Camp Kariong.

Action: Create a site map.

1. Spend time walking around the whole area of the campsite to build a site sketch plan.
2. Create a key for your map using symbols to represent human impacts on the land, such as, roads, buildings, dams etc.
3. Draw in areas or use symbols to indicate negative human impacts on the natural environment. E.g. soil erosion from dirt roads or the place where the creek has been dammed preventing its natural flow.
4. Suggest some possible management strategies that could be used at the Camp to minimise environmental damage.

B. Investigate human impacts on a creek using chemical characteristics.

Pre-fieldwork: Internet based research and discussion. Read through investigation below.
Fieldwork equipment: print out of these pages, clip board, pencil, a **soil pH** testing kit and a **water pH** testing kit, both available at Bunnings.

When it rains, water flows across the surface of the land, we call this run-off. When run-off flows over urban areas, like suburbs, it can pick up pollutants which then enter the creek. There are many small aquatic organisms that live in fresh water creeks and they can be harmed by these pollutants.

Explore by researching potential pollutants that can come from an urban environment. Then spend some time walking around the campsite to **observe** human impacts to the land. In the table below **list** the land uses that you see and **reflect** on potential pollutants that could enter the creek.

Urban land use	Potential pollutant	Impact on creek health
Grass camping area	Fertiliser Excess water Pesticides Grass cuttings	Algal bloom Increased runoff and flow Chemicals kill creek animals Grass seeds, weed infestation
Toilet block/ septic tank		

Explore by researching pH to learn about what it is, the pH scale and the difference between an acid and a base/alkali.
Action: Investigate the pH of the natural soil (sandstone) and water in the creek to determine if human land uses are changing the acidity of the creek water.

Soil pH test: Using a soil pH testing kit

1. Collect a sample of soil from the surrounding weathered natural bedrock (the sample should be about the size of a 50c piece);
2. Add 5 drops of universal indicator, allow indicator so soak into sample;
3. Sprinkle white powder (barium sulfate) onto sample, allow to soak up colour change;
4. Use colour chart to determine pH and record this on your data sheet.

Water pH test: Using a water pH testing kit

1. At the creek, collect a sample of creek water in small container;
2. Add 5 drops of universal indicator, cap container and shake sample;
3. Use colour chart to determine pH and record this on your data sheet.

pH test results

	Soil	Water
pH		

Write up a report based around the answers to the questions below:

1. How would you describe the pH of the soil and the water? (acid or base?)

2. Was there a difference in the pH of the soil and the creek water?

3. pH is water soluble, meaning that the pH of the natural soil should be reflected in the creek water. If the result is different what could be affecting the change? Hint: research the pH of concrete as well as nutrients such as fertilisers.

4. How could changing the pH of the creek impact the organisms living in the creek?

C. Investigate the biological health of a creek.

Pre-fieldwork: Internet based research and discussion. Read through investigation below. Fieldwork equipment: print out of these pages including waterbug sheets, clip board, pencil, see list in **Action** section.

Many insects in the bush start their life in water such as freshwater creeks and rivers. **Explore** by researching organisms that can be found in freshwater creeks in the Sydney area and list them below:

Creeks which are healthy can support many different species of aquatic animals, however, some of these organisms are not very tolerant to pollution. The most sensitive animals disappear from a creek first if the creek becomes slightly polluted. If the creek becomes more polluted more animals will disappear. **Reflect** on what this could mean for the creek at Camp Kariong.

Action: Investigate the aquatic animals in the creek.
You will need:

- a dip net of kitchen sieve;
- an empty ice cream or take away container;
- Water Bug Detective Guide sheet (at back of this document);
- You could also design and create a yabby trap from a 2L plastic bottle.

Spend some time dip netting in the creek. If you find an animal in your net tip it into the container with some water. Then **identify** the animal from the ID sheet and **record** it on your data table. Make sure you release the animal to the exact location where you caught it.

Animals identified in the creek

The animals on your list can be categorised into their pollution sensitivity levels. Compare your list to the sensitivity table below and circle what you found. The most sensitive animal, the Stonefly nymph, can only exist in an unpolluted creek. The animals in the next category can also survive in an unpolluted creek but not in the categories below it. The most tolerant animals can survive in all categories.

Pollution Level	Animal
Very sensitive (unpolluted)	Stonefly nymph, Mayfly nymph
Sensitive (very slightly polluted)	Alderfly larva, Caddisfly larva, Riffle beetle and larva, water mite
Tolerant (slightly polluted)	Beetle larva, Dragonfly nymph, water strider, whirligig beetle, freshwater crayfish, damselfly nymph, fly larva and pupa, midge lava and pupa, freshwater mussel, nematode, freshwater sandhopper, freshwater shrimp, water scorpion,
Very tolerant (polluted)	Diving beetle, flatworm, hydra, water treader, freshwater worm, freshwater slater, water boatman, backswimmer, bloodworm, leech, mosquito larva, freshwater snail.

Write up a report from this investigation. Discuss your results compared against the pollution level categories. And give possible reasons for your findings linked to human impacts and land use at Camp Kariong. Make recommendations to improve the water quality of the creek.

D. Fire in the Australian landscape and bushfire management at Camp Kariong.

Pre-fieldwork: Internet based research and discussion. Read through investigation below. Fieldwork equipment: print out of these pages, clip board, pencil.

Fire has been a part of the Australian landscape for many thousands of years.

Explore and reflect on the ways that indigenous people used fire to manage the landscape.
Who were the indigenous people who lived in this area and how would they have used fire to manage their environment?
Visit Bulgandry Aboriginal Art Site, close to Camp Kariong and reflect on Aboriginal people once lived in this area and how they might have used fire.
https://www.icentralcoast.com/bulgandry.html

Ask the camp warden if a fire safety plan exists and ask if you can take a look.
When was the campsite last threatened by bushfire?
Was the fire safety plan put into action?

Action: Walk around the campsite, draw a site plan, identify areas that:

- Could be most prone to bushfire because of thick vegetation
- Could act as fire breaks
- Store water to fight fires
- Have had fire management strategies put in place such as sprinkler systems, water tanks and metal building materials
- Could act as an emergency evacuation point

Write a report or present your findings as a presentation to your Unit.

E. Investigating biophysical interactions at two different natural locations at Camp Kariong

Pre-fieldwork: Internet based research and discussion. Read through investigation below.
Fieldwork equipment: print out of these pages, clip board, pencil, 30cm long tent peg, 30cm ruler, 3m rope.

Ecosystems exist as a result of interactions between living and non-living parts of the environment. **Explore** by researching interactions within ecosystems to do with plant growth, soil depth and water availability. **Reflect** on how these interactions could form different environments within the Australian bush.

Action: Undertake an investigation at two bushland locations to determine if the position of the location affects tree growth. One location needs to be located near the ridge (or top of the hill) and one location needs to be located downhill (in a gully). Take measurements of soil depth and tree size at each location to determine if there is a relationship between the two.

Soil Depth:

1. Using the soil depth spike push it into the soil with the force of your hand;
2. slide the cable tie down to the soil level, then remove the spike;
3. measure from the tip of the spike to the cable tie with a ruler: This is your soil depth.
4. Record this on your data sheet;
5. Repeat this 5 times in your location and then calculate the average.

Tree Girth:

1. In your location measure the 5 trees with the biggest trunks;
2. Use the piece of string to wrap around the tree at shoulder height. If the tree has more than one trunk, measure the bigger trunk.
3. Remove the piece of string, holding your hand at the marking point;
4. Measure the length with the ruler from the end to your hand marker.
5. Record this on your data sheet;
6. Repeat this 5 times in your location and then calculate the average.

Location 1 – Ridge

	1	2	3	4	5	Average
Soil depth (cm)						
Tree girth (cm)						

Location 2 – Gully

	1	2	3	4	5	Average
Soil depth (cm)						
Tree girth (cm)						

Use the following questions to write a report of give a presentation to your Unit on the findings of your investigation:

- Was the soil deeper or shallower on the ridge?
- If the soil was deeper in the gully why might this be?
- What might be moving the soil downhill?
- Did the trees grow bigger in the gully? Why?
- Explain the relationship between soil depth and tree size.
- Could there be another biophysical factor apart from soil depth affecting tree height?

F. Environmental Sustainability Plan

Pre-fieldwork: Internet based research and discussion. Read through investigation below. Fieldwork equipment: print out of these pages, clip board, pencil.

Explore by researching Environmental Sustainability Action Plans and **reflect** on how this could be applied for Camp Kariong. Use the Australian Scout Environment Charter and consider the five dot points:

- Protecting and improving biodiversity
- Learning about the environment and inspiring others
- Enjoying and connecting
- Living sustainable lives by taking action to reduce negative impacts
- Thinking global, acting local.

The focus could be on one or several environmental issues at Camp Kariong such as protecting the surrounding environment, waste minimisation and disposal, the impact of high numbers of campers at one time, environmental education of campers etc., future joint management with traditional owners.

Action: Spend time walking around the camp site to identify areas which might be impacted by human activity and possible action which could be taken to minimise negative impacts. Compile a report or give a presentation to your Unit on your findings.

WATER BUG DETECTIVE GUIDE

Waterwatch NEW SOUTH WALES
Communities Caring for Catchments

Macroinvertebrate sampling and waterway health

Sampling will reveal information about the abundance and diversity of macroinvertebrates and their tolerance to pollution: This will provide an indication of the health of the waterway.

ABUNDANCE = the total number of macroinvertebrates present

DIVERSITY = the number of different types of bugs present. Healthy streams usually have a greater diversity of bug types

POLLUTION TOLERANCE = the ability of macroinvertebrates to withstand pollution. This is reflected by its SIGNAL 2 score based on their sensitivity to pollution.

STREAM POLLUTION INDEX = calculation based on the abundance and diversity of bugs and their SIGNAL 2 score.

HEALTHY WATERWAYS = a high SIGNAL score and a large number of bug types

Very Sensitive Bugs - 10,9

Stonefly nymph 10
Order: Plecoptera
Description: Two thin tails and gills extending from their abdomen.
Habitat: Found among stones or plants, in fast-moving waters.
Maximum size: 7-12 mm

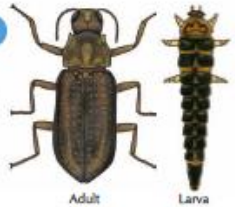
Mayfly nymph 9
Order: Ephemeroptera
Description: Three long thin tails and gills along the sides of their bodies.
Habitat: Found on or under rocks or among plants and leaf litter in standing water and fast flowing streams.
Maximum size: Up to 15 mm

Sensitive Bugs - 8,7,6

Alderfly larva 8
Order: Megaloptera
Description: Their bodies are fleshy with a a hard-shelled head.
Habitat: Found among rocks, in a variety of flow conditions.
Maximum size: Up to 20 mm

Caddisfly larva 8
Order: Trichoptera
Description: They are often enclosed within a case of twigs and plant material or silk.
Habitat: Found among sediment and rocks in streams, ponds and lakes.
Maximum size: Up to 20 mm

Riffle beetle and larva 7
Order: Coleoptera
Description: Beetle-like, tiny and usually black. Larvae have circular stripes or rings.
Habitat: Fast moving water.
Maximum size: Up to 4 mm



Water mite 6
Order: Acarina
Description: Mites usually have simple rounded bodies with eight legs.
Habitat: Found among plants or stones on the stream bed in standing or slow-moving waters.
Maximum size: Up to 5 mm

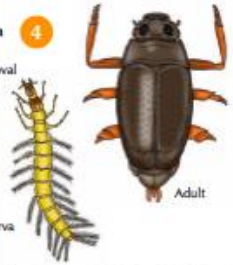
Tolerant Bugs - 5,4,3

Beetle larvae 5
Order: Coleoptera
Description: Larvae are usually elongated with well-developed legs and a large head.
Habitat: A variety of habitats including still waters or quiet areas of flowing water.
Maximum size: Up to 35 mm

Dragonfly nymph 4
Order: Odonata
Description: Stout bodies, no external gills and extendable mouth parts.
Habitat: Found within the substrate of rivers and streams.
Maximum size: 12-50 mm

Water strider 4
Order: Hemiptera
Description: Flat spider appearance with long pairs of middle and hind legs.
Habitat: Found on the surface of slow moving rivers and streams.
Maximum size: 8-12 mm

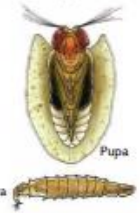
Whirligig beetle and larva 4
Order: Coleoptera
Description: A streamlined oval beetle that swim in circles.
Habitat: Found on the surface around the edges of ponds an streams.
Maximum size: 5-25 mm



Freshwater yabby/crayfish 4
Order: Decapoda
Description: Fan tailed with well developed claws and prominent front end.
Habitat: Slow flowing and still waters and burrow into sediment.
Maximum size: Up to 400 mm

Damselfly nymph 3
Order: Odonata
Description: Nymphs have three gill structures extending from the tail.
Habitat: Found on plants, among rocks and leaf litter or burrowing into the sediments.
Maximum size: 16-33 mm

Fly larva and pupa 3
Order: Diptera
Description: Larva usually have an elongated body with a small head. They do not have true legs.
Habitat: Found in shallow regions of ponds and stream amongst mud and detritus.
Maximum size: Up to 30 mm



Midge larva and pupa 3
Order: Diptera
Description: Often small and C shaped.
Habitat: Attached to debris by their tiny legs and can be found anywhere that water collects.
Maximum size: Up to 50 mm

Freshwater mussel 3
Class: Bivalvia
Description: Freshwater mussels have paired hard shells (valves) with a fleshy body between them.
Habitat: Found in or on sandy or muddy stream beds.
Maximum size: Up to 150 mm

Illustrations: Christine Rockley

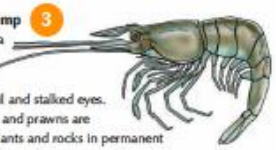
NSW GOVERNMENT Environment, Climate Change & Water

Tolerant Bugs - 5,4,3

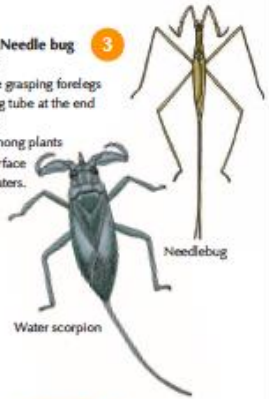
Nematode 3
Order: Nematoda
Description: Thin elongated worms without segments and can look translucent.
Habitat: Burrow into the substrate.
Maximum size: Up to 12 mm

Freshwater sandhopper 3
Order: Amphipoda
Description: Slightly curled and flattened sideways and have hard segments each with a pair of legs for swimming or walking.
Habitat: The edges of slow moving water amongst plants and stones.
Maximum size: 6-20 mm

Freshwater shrimp 3
Order: Decapoda
Description: Covered by a shell, fanned tail and stalked eyes.
Habitat: Shrimps and prawns are found amongst plants and rocks in permanent slow-moving waters.
Maximum size: Up to 35 mm



Water scorpion/Needle bug 3
Order: Hemiptera
Description: Large grasping forelegs and short breathing tube at the end of their abdomen.
Habitat: Found among plants or on the water surface of slow-moving waters.
Maximum size: Up to 50 mm

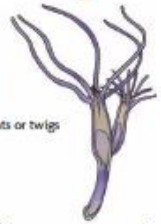


Very Tolerant Bugs - 2,1

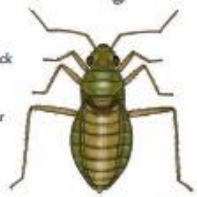
Diving beetle 2
Order: Coleoptera
Description: Sleek, shiny beetles with hard-shelled body and hairy paddle-shaped hind legs.
Habitat: A variety of habitats including still waters or quiet areas of flowing water.
Maximum size: Up to 40 mm

Flatworm 2
Class: Turbellaria
Description: Flat, thin, slow-moving worms with two simple eye spots.
Habitat: Found gliding over rocks and plants in a variety of flow conditions.
Maximum size: Up to 20 mm

Hydra 2
Class: Hydrozoa
Description: Hydras have a simple sack-like body with a mouth encircled by tentacles.
Habitat: Found attached to rocks, plants or twigs in fast flowing water.
Maximum size: Up to 30 mm



Water treader 2
Order: Hemiptera
Description: Long middle and back legs, and thick body
Habitat: Found on the water's surface of slow flowing pools near banks and plants.
Maximum size: Up to 5 mm



Freshwater worm 2
Class: Oligochaeta
Description: Segmented worms with rounded ends with no suckers or legs and usually coloured red or flesh coloured.
Habitat: Found in soft sediment rich in organic matter.
Maximum size: Up to 30 mm

Freshwater slater 2
Order: Isopoda
Description: Flattened from top to bottom with no body carapace or shield.
Habitat: Found in still to slow-moving waters.
Maximum size: Up to 20 mm

Waterboatman 2
Order: Hemiptera
Description: Boat-shaped with piercing mouth parts and boat shape appearance.
Habitat: Found among plants on the water surface or swimming freely in still to slow-moving waters.
Maximum size: Up to 10 mm

Backswimmer 2
Order: Hemiptera
Description: Curved back, large eyes, long hairy hind legs and swim on their backs.
Habitat: Found in standing water or slow flowing ponds.
Maximum size: Up to 11 mm

Bloodworm 1
Order: Diptera
Description: Worm-like and C shaped. Only the red ones are called Bloodworms.
Habitat: Found in soft sediment rich in organic matter.
Maximum size: Up to 20 mm

Leech 1
Class: Hirudinea
Description: Leeches are soft-bodied animals made up of 32 segments with a sucker on one or both ends.
Habitat: Found in standing or slow moving water.
Maximum size: 7-80 mm

Mosquito larva and pupa 1
Order: Diptera
Description: Thorax wider than the head and breathes through a long siphon at the end of the abdomen.
Habitat: Still water.
Maximum size: Up to 25 mm

Freshwater snails 1
Class: Gastropoda
Description: Snails are soft-bodied animals enclosed in a hard, protective, coiled shell.
Habitat: Found on plants and rocks in slow flowing or standing water.
Maximum size: Up to 25 mm

WATER BUG DETECTIVE GUIDE

waterwatch NEW SOUTH WALES Community Caring for Catchments
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Environment, Climate Change & Water