Theme one: Ecosystems

Level 3 & 4 Science

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Porirua Harbour and Catchment Community Trust

Living Waters
TIAKINA NGĀ TAONGA - PROTECT THE TREAS

Theme one: Ecosystems

Level 3 & 4 Science

Achievement Objectives:

- Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.
- Use their growing science knowledge when considering issues of concern to them.
- Explore various aspects of an issue and make decisions about possible actions.

Conceptual understandings:

- The living and non-living organisms in Porirua Harbour and Catchment are inter-dependent and affected by environmental changes.
- Human decisions, including our own decisions, can affect the environmental sustainability of Porirua Harbour and Catchment, both positively and negatively.

Learning framework

Links to social inquiry approach	Activities	What to look for
Establishing what we know		
Focus of learning topic Why are food chains important?	1. Simple food chain 2. Food chains in-depth (optional)	Building conceptual understandings by • Identifying the various organisms that make up a food chain • Predicting how changes in a food chain can affect an ecosystem.
Experiencing the Harbour		
Selecting a context What lives in our harbour?	3. Preparing for field trip 4. Field trip 5. Observations from field trip	Gaining first-hand knowledge by • Observing the many plants, animals and habitats within the harbour and catchment.
Building on knowledge		
Finding information What are the issues affecting our local waterways?	6. Ecosystems 7. Human impact 8. Scientific investigation	Deepening understanding by • Investigating the ecosystems in the Porirua Harbour and Catchment and the impact humans have had on the food chains within these. • Conducting scientific research into the impact of their chosen issue on these

Planning for action		
Exploring values and perspectives Why do people want different outcomes? Considering responses and decisions What is the right decision?	9. Rural & Urban Catchments 10. The future	Developing critical thinking by • Analysing different responses and decisions made regarding the Porirua Harbour and Catchment. • Evaluating the consequences of changes to rules concerning this resource. • Considering ways to ensure people have sustainable access to this resource now and in the future.
So what, now what		
Social action How can we bring about change?	11. Student directed social action 12. Presentation of action	Deepening sense of kaitiakitanga by • Positively impacting the Porirua Harbour and Catchment with social action.

Establishing what we know

Activity 1: Simple food chain

In an ecosystem, plants and animals all rely on each other to live. Scientists sometimes describe this interdependence using a food chain.

Explore with the class the topic of food chains.

- Discuss what a food chain is and why it is important.
- Talk about the different foods people eat and compare these with what other animals eat.
- As they come up with ideas, record them on the board under the categories herbivore, omnivore and carnivore. Can they think of other categories? (I.e. producers, decomposers)
- Ask if they know what things a plant needs to grow. Have they ever had plants at home or in the garden die? What did they need that they weren't getting? What happened to those plants when they died?

Working in groups, ask students to create a simple food chain starting with sunlight and using a plant, a herbivore and a carnivore that might be found within the Porirua Harbour and Catchment. Ask groups to predict what would happen if a plant or animal was taken out of the chain.

Diagnostic:

If you feel that your class has a strong understanding of how human decisions can affect food chains and ecosystems of the Porirua Harbour, you may choose to go straight to the selecting a context section. Otherwise, continue with this section.

Activity 2: Food chains in-depth

- Watch the Living Waters Documentary: September: Creatures Great and Small (10 min)
- Draw a simple food chain on the board using the organisms found in the documentary. For example: stream plants, small fish, larger fish and birds.
- Ask students what might happen if a particular plant or animal, or even a whole group was removed from the food chain; repeat this for each group.
- Discuss the possible reasons why an organism may disappear from, or appear in greater numbers in, the food chain of a particular ecosystem.
- Some teachers may like to explore the Chinese Great Sparrow campaign of 1957 as an example of human impact on a food chain.

- Online games to reinforce learning about food chains:

http://www.sheppardsoftware.com/content/animals/kidscorner/games/foodchaingame.htm

http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/play_chainreaction.cfm

Experiencing the Porirua Harbour & Catchment

Activity 3: Preparing for the fieldtrip

Explain to the class that they are going to investigate the plants and animals found in the Pauatahanui Inlet arm of the Porirua Harbour. Use the following two resources to create learning activities for your students that helps them build prior knowledge in preparation for their trip.

- *At the Beach* by Ned Barraud & Gillian Candler. Refer to the pages about mudflats to guide student's learning about the plants and animals that they could expect to find in the Pauatahanui Inlet.
- This title in the *Building Science Concepts* series is about the intertidal zone and contains activities to extend this aspect of the topic: http://scienceonline.tki.org.nz/What-do-my-students-need-to-learn/Building-Science-Concepts/Titles-and-concept-overviews/Tidal-Communities

Activity 4: Investigating plants and animals in Pauatahanui Inlet

The focus of this fieldtrip is to explore the natural ecosystem of the Inlet. The intertidal zone is easily accessed by students, and provides an excellent opportunity to learn about interdependence of living things, and the amazing diversity of life within the harbour ecosystem.

The easiest place to access the Inlet with students is the car park at Motukaraka Point. There are public toilets here as well as an information board. At the road end a boardwalk starts which has excellent interpretation boards that could be used as the basis of small group learning activities for your students.

To plan your field trip visit the Guardians of Pauatahanui Inlet website for suggested activities on site: http://www.gopi.org.nz/let-s-visit-the-inlet/

As with all field trips we strongly urge teachers to visit the site prior to taking students there. The Ministry of Education has excellent guides for safe outdoor experiences: http://eotc.tki.org.nz/EOTC-home/EOTC-Guidelines

Activity 5: Fieldtrip reflections

Back in the classroom encourage students to reflect on their experience. What did they see, hear, learn, enjoy? What questions do they have? This reflection could be part of a creative writing activity.

Following the reflection, explain to students that they are now going to look closer at the ways human activity has impacted on the natural ecology of the harbour and catchment. Begin by brainstorming all of the examples they can remember seeing where human activity might have had a negative impact e.g. stormwater drains, roads and buildings, farms, litter. Group these activities and write them at the top of large sheets of paper, leaving room for students to write below.

Spread these sheets around the room and ask students to move from sheet to sheet writing:

- What they noticed about this impact while on the field trip,
- The impact they think this would have on the local ecosystem, including the plants and animals they saw on the field trip.

Ask students to rank impacts using a ranking ladder from least serious to most serious. For example: Most serious – erosion, stormwater drains, litter, built structures – least serious.

Discuss why students think certain impacts are more serious than others. Which issues can be easily addressed? Which impacts cause the greatest harm? Who is responsible for addressing these impacts?

Building on knowledge

Activity 6: The ecosystems of Porirua Harbour and Catchment

Display a large map of the Porirua Harbour and Catchment, or as a class create one as a mural. Identify where the school is located, any nearby streams the students will be familiar with, and where the field trip took place. Discuss and locate the different habitats for example fresh water streams, intertidal zone, deep sea, swamp.

- Discuss with the students how streams flow into the harbour and; therefore, how the health of the harbour is affected by the health of the streams.
- In small groups, ask the students to draw pictures of each of the living things they can think of in the Porirua Harbour and Catchment. Encourage them to think of both plants and animals. They can then stick their pictures on to the map in the area they think that organism lives in relation to the habitats located earlier. (Note: use blutac or post-it notes as students will get the opportunity to move these later on as they refine their knowledge.)

Activity 7: Human impact on the food chain of the Porirua Harbour and Catchment.

- Revisit the food chain activity from the start of the topic. Build on knowledge gained so far to add layers of complexity to create a food web of plants and animals of Porirua Harbour and catchment, or just the Pauatahanui Inlet. Discuss the impacts seen and learnt about. Can they be introduced to the web? What are the impacts on living things?
- Watch the *Living Waters* episode: *Urban Catchment* 3:08-5:40. Ask students to note down changes to streams and

rivers in the Porirua and Harbour Catchment that have been caused by human activity. Ask students to predict what might happen to the food chains because of these changes.

- Hand out this booklet on whitebait to groups of students. Ask them to categorise human decisions or actions into positive or negative regarding the survival of whitebait. Students may wish to draw up a T chart to help them organise their ideas.
- Ask students to draw a picture of humans and add them to the food web. Discuss how humans change the food chain and what impact these changes would have for other species.

Activity 8: Scientific research investigation

Discuss with the class that they are going to investigate some of the different ways humans have impacted on the local ecosystem and food webs. Use the four stage research process suggested in Science Online to investigate the issues discussed in Activity 5 either as a whole class or in groups.

Stage 1: Focusing and planning. Questions relevant to the direction of the research are generated.

Stage 2: Sourcing information. Appropriate resources must be found. Using a range of different sources of information helps ensure the ideas are those commonly accepted.

Stage 3: Analysis. The information needs to be organised and then analysed to ensure that valid conclusions can be drawn.

Stage 4: Reporting. Finally the research must be reported. This can be done in various ways – for example a demonstration, a poster, a video or a report.

http://scienceonline.tki.org.nz/Teaching-science/Teaching-Strategies/Types-of-investigation

For example: if the class is looking at the impact of stormwater drains, water pollution may be identified as a problem. Questions might include where does stormwater come from? How can it be managed to minimise impact on the plants and animals? Where are the stormwater outlets? Are some worse than others? Why is that? Information sources could be council websites and staff, the library.

Planning for action

Activity 9: Rural & Urban Catchments

Watch the Living Waters Documentary: Rural Catchment from 5:26-9 minutes. View this section once then ask the students to answer the following questions while they watch the section again:

1. What organisms make up the ecosystem in the section of stream that is on Sam and Andre's property?
2. What changes have Sam and Andre made to their part of the stream?
3. How do these changes protect the ecosystem of the stream?
4. What impact would these changes have on the harbour where the stream comes out?
5. Why did Sam and Andre choose to make these changes?

Watch the Living Waters episode: Urban Catchment from 5:40-8:15. Watch this section once then ask the students to answer the following questions while they watch the section again.

1. What changes have Liam and Calvin made to their part of the stream?
2. How do these changes protect the eels in the stream?
3. How do these changes protect the ecosystem of the stream?
4. What impact would these changes have on the harbour where the stream comes out?
5. Why do Liam, Calvin, Mike and Joy think it's not okay to catch eels?

As a class, choose one of the two case studies above and brainstorm any stakeholders (people or groups with an interest or concern in an issue) who may be affected by these children's actions.

Sam and Andre's family (stakeholder)	Long term	Short term
Positives	• Have a nice place to swim and have picnics. • When the trees grow they will keep the bank from falling into the stream.	Feel good about themselves
Negatives	• Have to maintain the trees. • Have to redo the swimming hole when there are floods.	Takes a bit of time to build.

In groups, hand out A3 sheets of paper with a grid showing the long- and short-term positives and negatives for each of the stakeholders. Each group gets a different stakeholder to put in the top left corner. Allow four minutes for each group to fill out their sheet, then move the groups around so they have a different sheet. Give them two minutes to read what the previous group wrote then four minutes to add some more ideas of their own. Repeat until each group has seen each paper.

For example:
As a class, discuss how the positives and negatives differ between the stakeholders. How does this reflect the values of each group? How do these differing values and perspectives impact on decision making?

Considering responses and decisions

Activity 10: The future

Watch the Living Waters Documentary: The Future up to 6:10.

- Discuss what changes Carras Limited made and why they made them.
- Ask students to predict how these changes will help the health of the harbour.

Optional activity: In groups, have students complete the online game *Up the Creek*.

As a class decide on a problem that is affecting the ecology of the harbour and catchment. Use the POOChI model below to find a way to address this problem, and to ensure the ongoing sustainability of the food chains within the harbour.

1. Identify the Problem. This is informed by your scientific investigations and trip to the Inlet.
2. Generate Options to solve the problem. Encourage students to come up with a range of solutions that they will be able to carry out.
3. Predict Outcomes for each option, analysing both short- and long-term positive and negative outcomes.
4. Choose the best option
5. I – Ask students to consider: How am I affected by this?

Students can then repeat this activity for another issue but this time in groups. Once they have found a problem, they use the POOChI model to generate the best solution. Encourage the students to consider the outcomes for other people before they choose their solution.

So what, now what?

Activity 11: Student directed social action

Students can now try to implement their solution. Encourage students to come up with their own social action. Some ideas to help get them thinking include:

- Clean up an area of the stream
- Inform nearby businesses or homeowners how they can help the health of the stream
- Fence off stream banks
- Plant stream banks
- Build a fish ladder for grade control structures

Use the TKI action planner to help students plan and implement their action project.

Activity 12: Reflection, presentation & celebration

Ask students to discuss in pairs and then feedback to the class: what does this mean to me?

Have student's feedback findings from their social action:

- Invite guests to see presentations
- Slide show at assembly