

# CURIOUS MINDS

HE HIHIRI I TE MAHARA



## PARTICIPATORY SCIENCE PLATFORM TARANAKI UPDATE 2020

**venture**  
TARANAKI  
Tē Puna Umanga

CURIOUS MINDS IS A GOVERNMENT INITIATIVE JOINTLY LED BY THE MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT AND THE MINISTRY OF EDUCATION AND THE OFFICE OF THE PRIME MINISTER'S CHIEF SCIENCE ADVISOR

New Zealand Government

# CURIOUS MINDS

## PARTICIPATORY SCIENCE PLATFORM AT A GLANCE

COMMUNITY GROUPS HAVE  
COLLABORATED WITH

**>100**

DIFFERENT SCIENCE &  
TECHNOLOGY EXPERTS



PROJECTS FUNDED



SCHOOLS INVOLVED  
IN LOCAL RESEARCH



**>2800**

PEOPLE ENGAGED IN  
SCIENCE & TECHNOLOGY

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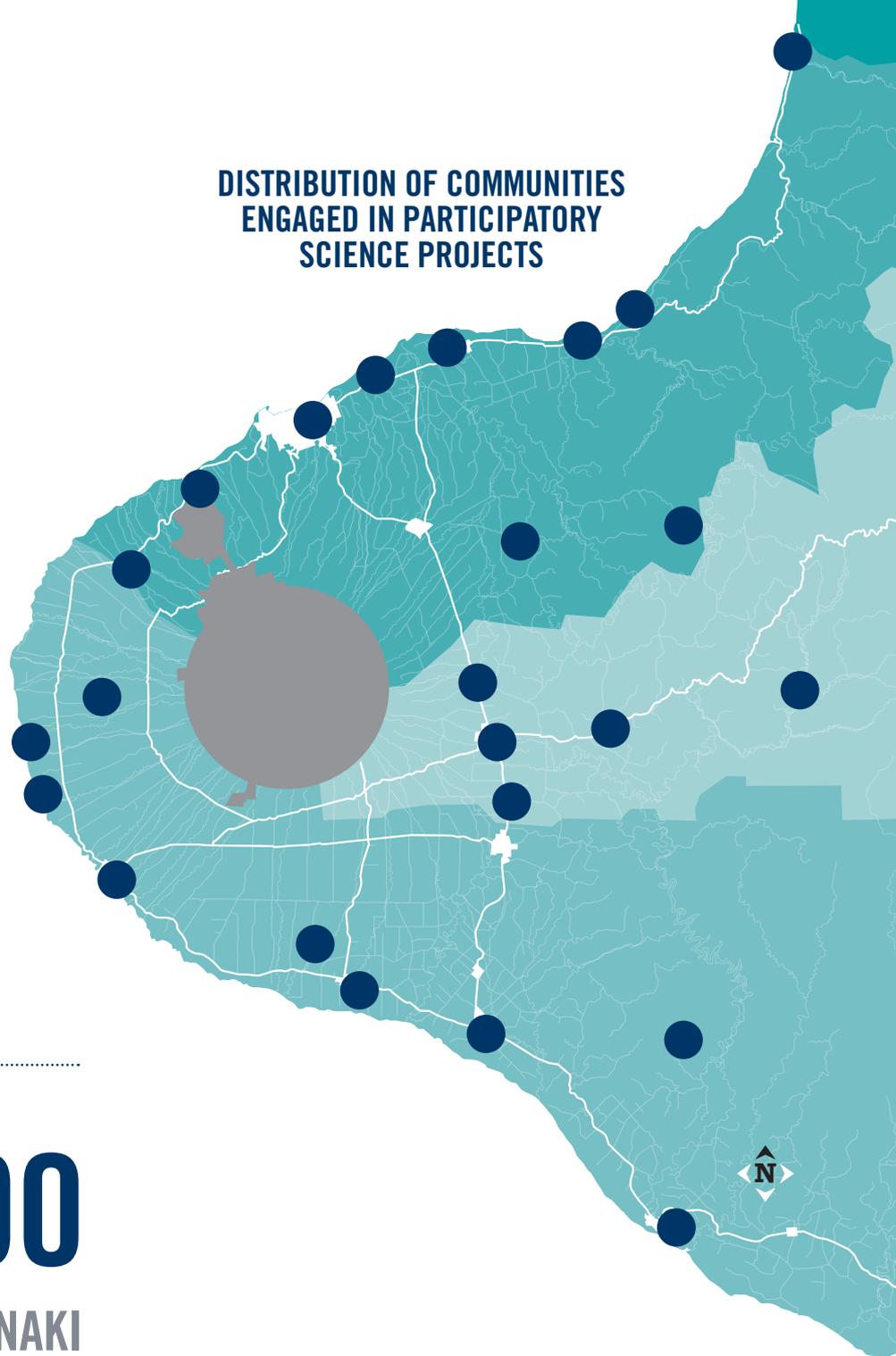
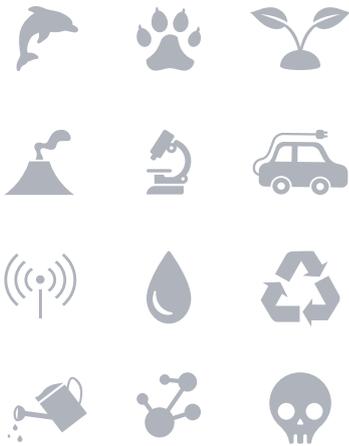
Sustainable energy generation for use in  
electric vehicles

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# 22

## DISTRIBUTION OF COMMUNITIES ENGAGED IN PARTICIPATORY SCIENCE PROJECTS

### SCIENCE & TECHNOLOGY DISCIPLINES UNDER INVESTIGATION



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# \$815,000

DISTRIBUTED IN TARANAKI

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# INTRODUCTION

**S**cience and technology are critical for enhancing living standards through economic growth and improving social and environmental outcomes. Today, science is embedded in the many decisions policy makers, business, individuals and societies must make. Societies with strong ‘science capital’ sustain more innovative economies and have a greater awareness of both the opportunities and limits of science in development and wellbeing. Science is central to the many global challenges we face (from environmental challenges to an aging and increasingly urban population, for instance).

The Curious Minds Participatory Science Platform (PSP) is designed to encourage communities, particularly young people, educators and scientists to work together on collaborative science projects so that people become more enthused and informed about the role science plays in their lives.

The emphasis on collaboration provides educational opportunity for both sides of the project partnership. Community groups benefit from the expertise and experience of their science and technology sector partners, while the science and technology experts benefit from the local knowledge and cultural understanding of the community groups.

Venture Taranaki is leading the Participatory Science Platform in Taranaki, funded by the Ministry of Business, Innovation and Employment. Either a community group or science sector based partner may apply to Venture Taranaki for funding to support their research project. Any type of community group is able to apply – these may include students, schools, kura, community-based organisations, businesses or Māori organisations and collectives.

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***“The Participatory Science Platform (PSP) offers Taranaki communities the opportunity to explore ideas and carry out investigations that are relevant to them.***

***As Taranaki and New Zealand transition to a low-emissions future, the role of science and technology becomes crucial. Building our community’s capability through collaborative research creates the opportunity for ground-up innovation, inspiring new scientists of all ages, as well as developing and retaining talented people.***

***Whether it be diversifying and strengthening our food and fibre industry, supporting the development of Māori economy, supporting our health and wellbeing, or reimagining our energy industry, the projects supported by the Curious Minds PSP are actively contributing to the action pathways found in the Taranaki 2050 Roadmap, and the collective vision the Roadmap sets out.***

***The PSP encourages curiosity within our community, supports connectivity between science, technology, community and education sectors, and empowers people to undertake research that is important to them, providing in-context learning for young and old.”***

**– Justine Gilliland, CE Venture Taranaki**

# CRITERIA

## PARTICIPATORY SCIENCE PROJECTS MUST BE:



### EDUCATIONALLY VALUABLE

Offer enduring educational value and two-way learning opportunities for those involved.



### LOCALLY RELEVANT

Will involve community members in research that is engaging and locally relevant and at least in part be driven by community-based champions.



### SCIENTIFICALLY ROBUST

The project will tackle a substantive scientific question in active partnership with a scientist or technology expert.

Nine projects were funded by the Curious Minds Participatory Science Platform in 2019. From investigating rivers and estuaries through to experimenting with renewable energy, our 2019 projects covered a range of disciplines and engaged communities right across the region. Their stories feature on the following pages.

# 2019 PROJECTS



2019

## TE ĀHUA O NGĀ KŪREI

In 2019 Te Rūnanga o Ngāti Mutunga undertook a comprehensive study of the Urenui and Mimitangiatua estuaries supported by the Taranaki Regional Council. Working with Urenui, Uruti, and Mimi Schools the project investigated shellfish abundance and diversity, sediment deposition across time, surface sediment chemistry, storm water testing and estuary water quality analysis, not to mention wider biodiversity surveying and pest species presence.

One of the key findings of the project was confirmation that human sewage was entering the estuary. Possible sewage runoff from Urenui Township has been a concern of the local community and Ngāti Mutunga for over 50 years. These concerns have increased recently when the population of Urenui and usage of the campground increased along with the aging of the septic tank systems in the township.

This contamination by human sewage has serious cultural, environmental and possible health implications for the awa, estuary and the local community. The testing undertaken during this project was carried out by TRC Staff (alongside Ngāti Mutunga whānau) and confirmed without doubt that contamination was taking place. This has led to the District and Regional Council taking action to find a solution.

Urenui and Mimitangiatua estuaries are incredibly important to their associated communities for their cultural, historical, recreational, and environmental qualities. Te Āhua o Ngā Kūrei will continue to build on the results from the 2019 study and work to preserve and enhance the estuarine environments in the Ngāti Mutunga rohe.



2019

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## NGAMATAPOURI SCHOOL WAITOTARA RIVER MONITORING PROJECT

**N**estled an hour drive up the Waitotara Valley, Ngamatapouri School have begun what they hope will be a long-term monitoring project on their local awa.

The school worked with the Taranaki Regional Council and Drone Technologies NZ to undertake regular water quality monitoring and aerial photography of the Waitotara River. The students found that apart from the very hottest and coldest times of the year the water temperature was consistently in the 10-15°C range that native fish prefer. Water clarity (turbidity) was highly variable due to the mud river bed. Clarity was particularly low after a rain event, with highest clarity recorded during February. The students also collected data on conductivity, pH, and MCI. Using the drone the students have collected a visual record of how the river changes over time.

The students showcased their results to neighbouring schools and their wider community during a science fair that Ngamatapouri School hosted. The school even went on to win a TRC environmental award for 'Environmental Action in Education' in 2019.

Project lead and school principal Heather Dallas has reported that students have become very aware of how the river can change across a year. They have a greater appreciation for what the features of a healthy river are and the importance of the data types collected on river health.

Flooding events in the Waitotara Valley are a regular hazard, and major floods can be devastating to the local community. In the future the project plans to work with Ōpunake engineer Andrew Hornblow to create flood warning devices that can provide advanced warning to local residents.



## I WHIO THAT I COULD LIVE HERE

**Who that I could live here is a collaboration between Te Korowai o Ngāruahine Trust, Manaia and Auroa Primary Schools, Ngāti Tū and Ngāti Haua hapū, Taranaki Mounga, Taranaki Regional Council, Fish and Game, and the Department of Conservation.**

6 The project aims to explore ways to restore the Kaupokonui Awa to a state that is fit for our native taonga, the whio.

Supported by the wider project team, students from the two partner schools undertook an investigation of the hauora (health, vigour) and wairua (spirit, soul) of the Kaupokonui. This was achieved through an interweaving of mātauranga Māori and pūtaiao (science) with measurements taken at three locations along the awa.

The three locations represented different zones along the river, an upper section found along Opunake Rd, a middle section accessed through Skeet Rd, and a lower section at the beach. The results showed that of the three locations, only the upper section at Ōpunake Rd had the appropriate climatic conditions to support the invertebrate food supply necessary for whio habitation.

The project then started an investigation in to why there aren't any whio already present at the Ōpunake Rd site. This involved assessing potential threats including presence of predators. Camera traps showed the presence of rats, a cat, and a stoat.

There is considerable scope to expand this project, including setting up ongoing water quality and cultural health monitoring programmes, introducing and maintaining trap lines, and contributing to whio monitoring.



2019

## HEALTHY LIVING SOIL

**Organic Farm NZ led a collaborative initiative that worked with local small-scale growers and Landbased Training horticulture students to better understand the soil chemistry and biology our producers are farming in.**

The project took soil samples from small-scale growers' properties and analysed them for biological composition and soil chemistry. Participants were supported by Cherryle Prew from Soil Food Web to better understand soil structure, texture, composition, bacteria, fungi, and protozoa. Results varied between locations, but together with expertise from the project team and Integrity Soils the project was able to work through suggested methods for enhancing the soil quality and growing potential.

The long term aims of this project are to build the capability of our growers, and to encourage more people in our small-scale farming community to utilise science in their growing journey.

Taranaki with its nutrient rich soils and reliable rainfall has the potential to greatly increase its food production. The Healthy Living Soil project is an excellent example of our community learning and working together in pursuit of our Taranaki food futures.



## FISH FOOD AND FRINGES: PARTICIPATORY INVERTEBRATE MONITORING FOR RIPARIAN MARGINS

**M**AIN Trust NZ worked with local biologist Dr Josephine Fitness, Rotokare Scenic Reserve, Hāwera High and Rawhitiroa Schools on their project titled Fish Food and Fringes.

This project aims to better understand invertebrate abundance and diversity in riparian zones (fringes). Water quality monitoring forms a big part of how we assess riparian regeneration and its impact on the environment. But invertebrate monitoring is also important. Although we know the importance of invertebrates in ecosystems and functioning such as pollination, soil formation, productivity, decomposition and population regulation as well as a vital food source for many native species, we don't tend to monitor invertebrate biodiversity.

The project worked with students to compare invertebrate diversity between two riparian zones. One site was at Rotokare which represents a well restored, predator-free environment. The other site was at Nowell's Lake which is currently undergoing restoration work and is still under pest and predator pressures.

Students installed pitfall traps to measure invertebrate diversity, and environmental monitoring devices to compare changes in temperature between the two sites. Results showed that there was a similar number of different species observed at both sites, but the exact species varied.

Beetles were the most common group across the two sites which is to be expected as they are often the most abundant and have the most varied ecological guilds.

The data from this study suggests it could be possible to use certain invertebrate species as indicators of environmental health. It is hoped that this project can be used as a model for future monitoring of our riparian ecosystems.



## SUSTAINABLE ENERGY GENERATION FOR USE IN ELECTRIC VEHICLES

**N**ew Plymouth Girls' High School students investigated the most efficient form of renewable energy generation on their school campus. The idea came from a desire to charge the electric vehicles the students were engineering as part of the EVelocity competition.

Supported by the wider community the school installed solar panels and two types of wind turbines (a vertical axis 3 phase turbine and a horizontal axis turbine). The students then investigated the efficiency of the three renewable energy generators in relation to weather conditions.

Each of the three methods were monitored by a separate meter which recorded the instantaneous voltage, current, power, and accumulative energy. The generators were connected to two 120 ampere hour batteries. To prevent the batteries from overcharging there were two large diversion resistors installed to release any excess energy in the form of heat.

Energy data was collected at the same time each day from 21 May to 3 July. Results from the project showed that the accumulative energy production of the solar panel was by far the most efficient method. One result that surprised the project team was that solar panel efficiency had an inverse relationship with temperature. That is, as temperature increased, energy production decreased.

The vertical axis turbine proved to be the most efficient of the two turbines. This was expected as the vertical axis turbine can catch the wind from any direction and has a lower minimum wind speed to start turning.

Two of the New Plymouth Girls' High School students entered their data and project report into the Taranaki Science Fair and were awarded the top prize. The report includes economic viability and considerations for those thinking about running renewable energy generation on their own properties.



## OUR MOUNTAIN OUR VOLCANO

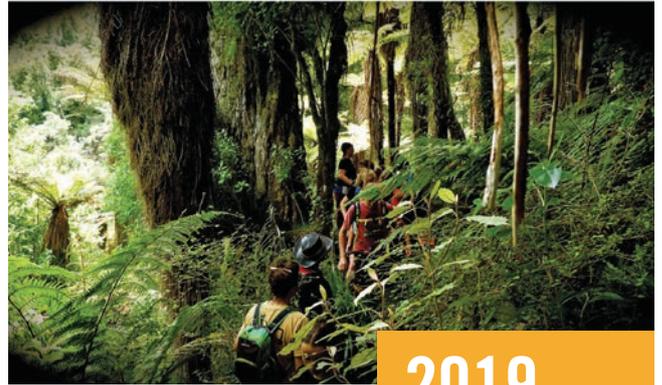
**L**ocal Volcanologist Cynthia Werner has been working with Te Kotahitanga o Te Atiawa Trust to carry out spring water and gas sampling analysis of one of the Kōkōwai Springs on the northern part of Taranaki Maunga. This is the first time that this work has been done since the 1980s.

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There is hope that this spring, and others on the Maunga, hold vital clues to the state of activity of the volcano. The study aims to collect baseline information about the amount of volcanic carbon band sulfur being emitted and relate these data to the amount of magma residing beneath the volcano.

The Kōkōwai Springs are of great significance to Māori. Alongside the geochemical analysis of spring water this project aims to provide scientists and community with a greater understanding of these sensitive environments from a Te Ao Māori and Mātauranga Māori perspective.

In the future the project hopes that geochemical analysis can become part of regular volcanic monitoring. The findings from the project will be important for risk assessments and planning by the Civil Defence, the Taranaki Regional and District Councils, the Department of Conservation, and for all people living in the Taranaki region.



2019

## PURANGI PEKAPEKA

**I**n 2019 Experience Pūrangi studied the critically endangered long-tail bat to define the home territory it occupies within Pūrangi, East Taranaki.

The study expanded on previous research undertaken in collaboration with Kaimata School in 2016. The 2019 study worked with Inglewood High School students to collect information about the presence and location of Pekapeka in the Pouiatoa Conservation Estate. Alongside using spectral bat detectors and motion sense cameras to monitor bat presence, students utilised temperature and humidity devices, and insect traps to assess habitat suitability.

The project team identified that long-tail bats had a broad distribution across the Pouiatoa Conservation Estate. Across the two weeks that the monitoring took place, over 500 long-tail bat passes were detected. While there is no way of knowing how many bats this represents, the fact that nearly all 6 sampling sites returned results every night there was recording equipment installed suggests there is a widespread population.

The Experience Purangi team aim to continue monitoring their bats and broaden their area of investigation in the hope of finding even more bats.



2019

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## SEACHANGE SURVEYS

**R**esidents of the coastal region between Fort St George and Ahu Ahu road have expressed a need for a scientific survey of the local paua reefs.

In response, the Seachange Surveys project was set up to create a community survey method, in conjunction with local schools and with input from residents, to monitor the health and distribution of pāua and other kaimoana species.

The project aimed to assess the current state of pāua on Ahu Ahu and Tapuae Reefs. The project looked at the average pāua size, their habitat and food source and the effect of the 'no take' rules at Tapuae Marine Reserve.

Results from the surveys showed that there was adult and juvenile pāua present on both reefs. Tapuae Reef had a more extensive pāua population which may be a result of its protected status.

The project team found that the initial survey design did not accurately represent the resident pāua populations found at either survey site. Often the survey effort, dictated by randomly placed quadrats, was focussed in unfavourable habitat. This led to a modified methodology that includes a habitat grading step prior to quadrat placement.

This unique project is a collaboration between residents, Ngā Māhanga a Tairi Hapū, scientists, community groups and education partners and will lead to the creation of a methodology and resources which can be widely used by schools and communities throughout Taranaki.

Seachange Surveys will continue in 2020.

# LOOKING AHEAD TO 2020

## AUROA SCHOOL SOUND LURES

Auroa School are investigating the way sound can be used to increase the efficiency of pest traps. Students have been working with their teacher Myles Webb and local engineer Andrew Hornblow to develop weather tight, solar powered devices capable of emitting any pre-recorded sound. The first step will be to work with local landowners to see if sound lures help attract possums to traps. Following this further refinement of the device will take place, and conservation groups will be invited to trial the lures and provide feedback on their utility.

## GROUND BREAKING MUSHROOMS

Mushrooms and coffee. For many people this will sound like a match made in heaven. For The Bishop's Action Foundation and Spotswood College, this partnership of bean and fungi is the focus of research. Spent coffee grounds collected from cafes are an ideal substrate ingredient for growing oyster mushrooms. The grounds are full of unspent energy and, through the process of coffee making, are pasteurised. Students will work with local mushroom growing expert Matthew Williams and their school science department to experiment with how different substrate mixes and environmental variables effect mushroom growth. Results from this study will help the development of a social enterprise dedicated to utilising spent coffee grounds from cafes around Taranaki.

## HE WHENUA, HE TANGATA, HE ORANGA: A FASHIONABLE FIGHT

In an industry where environmental and social impacts are catastrophic, the fashion sectors' public image remains largely unscathed. Referred to by the United Nations as "an environmental and social emergency", the \$2.75 trillion fashion industry produces almost 20% of the world's wastewater and contributes to 10% of global greenhouse gas. Led by Whiri Design, A Fashionable Fight: He Tangata, He Whenua, He Oranga sets out to explore how indigenous textile development and pedagogies intersects with 21st century commercial design and production methods within the fashion industry. Supported by Dr Steve McNeil of AgResearch and local Mātauranga Māori experts and Māori Art Practitioners, students from Te Wharekura o Te Pihipihinga Kākano Mai i Rangiatea will lead an exploration of how traditional Māori knowledge and indigenous dying methodologies can innovate current textile manufacturing processes and systems.

## HAURAPA KIWI

Haurapa Kiwi is a project which aims to change the way kiwi are monitored in Taranaki. All kiwi translocations to new areas require monitoring of birds for 1-2 years after they are released. The current method for tracking kiwi involves using telemetry equipment from the ground. To track non-territorial sub-adult kiwi, a fixed wing plane is often used as young birds on Mt Taranaki have been known to move up to 12km after they are released. This combination of methods is both time consuming and expensive. The Taranaki Kiwi Trust is working with Drone Technologies NZ and Oakura School to research whether telemetry equipment can be attached to a drone, and then test its efficiency in locating kiwi. If successful, this could allow a more economical and more accurate method of kiwi detection and monitoring.

## OUR GREEN ŌPUNAKE JOURNEY

Does timely, relevant information at point of purchase drive better recycling and do personal or social commitments drive more or longer lasting change? Ōpunake Kindergarten and Sustainable Taranaki are working together to try and answer this question. The project team will work with the wider Kindergarten community to collect a baseline of what people say they are doing versus what they actually do when it comes to recycling. Following this shoppers will be presented with recycling information, and a smaller group will be asked to make a commitment to better recycling. The initial surveying and bin audits will be repeated and compared to the baseline results to see if people changed their behaviour.

## EXPLORING A PLACE FOR VIRTUAL REALITY IN DEMENTIA

Alzheimers Taranaki is proactive in seeking ways to support its clients, and is collaborating with Dr Linda Jones, a health researcher and volunteer for Alzheimers Taranaki in, "Exploring a place for virtual reality (VR) in dementia." In the project Alzheimers Taranaki volunteers will train in an existing arts-for-dementia program and become researchers in assessing local clients' interests and deficits during visits to local museums; then the museum study findings will be used to create an original VR program that includes activities or games specifically written with New Zealand content. There are many potential benefits if VR is shown to be an effective way to support cognitive skills and/or social relationships, but it is essential to first scientifically assess the VR program itself, and VR headset use, for both positive or negative effects. Outcomes will include a template for future museum guided visits; and the VR programme.

## PAPA POKEPOKE

Papa Pokepoke explores the unique features and properties of papa/clay found within the Ngāti Mutunga rohe. The project will work with scientists from GNS and Verum Group to understand the physical make-up of papa and how it originated in Taranaki. The project aims to gain a clearer understanding of how this abundant resource could provide a valuable, sustainable and environmentally friendly material for building, pottery, and rongoa (Traditional medicinal uses). The project also offers the opportunity for Ngāti Mutunga and their community to further know and understand the whenua they whakapapa to and to strengthen that relationship.

## SEACHANGE SURVEYS

Seachange Surveys is a citizen science project that aims to support local communities in the monitoring of coastal species, primarily kaimoana (seafood), in their rohe moana (coastal area). The project is led by Wild for Taranaki and supported by a wide range of community organisations and business, including Ngā Mahanga a Tairi, Taranaki Iwi, Ngā Motu Marine Reserve Society, Highlands Intermediate, Taranaki Green School, Omata School, Coastal Taranaki School, and Drone Technologies NZ. Seachange Surveys will provide suitable methods to monitor changes of interest over time and allow communities to effectively manage their kaimoana species. The project aims for these methods to be simple, time efficient and adaptable to survey a range of coastal species and sites, and to suit different participant groups including school groups and local Iwi/Hapu.

# PREVIOUS PROJECTS



## 2015

Kiwi Presence in Egmont National Park – Taranaki Kiwi Trust  
 Project Ultra – Pekapeka in Purangi – Experience Purangi  
 Project Hotspot – Ngā Motu Marine Reserve Society  
 Waitara Kaimoana Survey – Otaraua Hapū & Waitara Alive  
 Project Reef Life – South Taranaki Underwater Club  
 Te Moeone – Growing for the Future – Ngāti Tawhirikura Hapū

## 2016

Maru Wai Matara – Te Whenua Tomuri Trust  
 Project Hotspot 2 – Ngā Motu Marine Reserve Society  
 Project Reef Life 2 – South Taranaki Underwater Club  
 CAPOW! – Stratford & Matapu Primary Schools  
 Full STEaM Ahead! – Opuake Primary School  
 REV IT – New Plymouth Boys’ High School  
 Stone v.s. Metal – The Motunui Panels Revealed – Puke Ariki

## 2017

Toko School Distillation Investigation – Toko School  
 A Pesky Problem – Te Namu Hakirara – Woodleigh Primary School  
 South Taranaki Project Earth – Hawera High School

Pest Trapping in the Makahu Valley – Makahu School  
 Dotterel Defenders – Taranaki Conservationists  
 Tracking Fur Babies in Taranaki – Wild for Taranaki  
 Ko Nga Kowhitiwhiti – BTW Company & Otaraua Hapū  
 Inanga Ora Ki Te Awa O Waitara – Otaraua Hapū & Waitara Alive  
 Bug ALERT! – Experience Purangi  
 Project Wi-Finding – Massey University  
 Schoolyard Blues – Massey University

## 2018

Soil Fertility and Health Trials – Midhirst School  
 CatMap – MAIN Trust NZ  
 Finding Little Blue – Ngā Motu Marine Reserve Society  
 Project Litter – Highlands Intermediate  
 Nga Kaitiaki o Nga Motu – Te Atiawa Iwi Charitable Trust  
 Bug ALERT! 2 – Experience Purangi  
 Kimihia Kermit – Te Rūnanga o Ngāti Mutunga  
 Trashformers – Upcycle Taranaki  
 Wi-DemystiFied – Massey University

# FOR MORE INFORMATION



Do you have a great idea for a science or technology research project? If so, you may be eligible for Curious Minds funding. For more information about Curious Minds and Science in Society in Taranaki contact Josh Richardson at Venture Taranaki.

**E:** [josh@venture.org.nz](mailto:josh@venture.org.nz) | **P:** 06 759 5158 (DDI)



**Venture Taranaki Trust is Taranaki's Regional Development Agency. We help Taranaki grow.**

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