THE HOW AND WHY OF

POSSUM CONTROL Teachers' Booklet

Introduction

Each and every night throughout New Zealand an estimated 50 million possums are chewing their way through approximately 20,000 tonnes of native plants. It's a staggering statistic.

These materials are designed to be used either in conjunction with visits to schools by staff of pest control agencies or by teachers as stand alone materials to study possums across the curricula. Department of Conservation, Regional Council staff and Contractors involved with pest control may visit schools as part of the public consultation required for up-coming control operations. For contact details of pest control agencies in your area and the possibility of visits to your school, visit our website: www.npca.org.nz

Teachers' Booklet

The material presented in this booklet provides teachers with a range of activities and opportunities to assist with planning a unit of work based on possums and associated issues. It contains background information on possums and possum control, relevant curriculum links and activity suggestions.

The suggested activities can be used across a wide level of ability. However, it is important that you adapt appropriate activities to meet the specific needs of your students or ensure they have a clear understanding of the purpose of the activity.

SCIENCE					
STRAND	DESCRIPTION	LEVELS & ACHIEVEMENT OBJECTIVES			
A	Making Sense of the Living World	1.2	2.4	3.3, 3.4	4.2, 4.3, 4.4
TECHNOLOGY					
A	Technological Knowledge and Understanding	1.3	2.3	3.3, 3.4	4.2a, 4.3, 4.4
B	Technological Capability	1.5, 1.6a, 1.6b, 1.6c, 1.6d	2.5, 2.6a, 2.6b, 2.6c, 2.6d	3.5, 3.6a, 3.6b, 3.6c, 3.6d	4.5, 4.6a, 4.6b, 4.6c, 4.6d
C	Technology and Society	1.8	2.7, 2.8	3.7, 3.8	4.7, 4.8
SOCIAL STUDIES					
C	Place and Environment		2.2	3.1	4.1, 4.2
E	Resources and Economic Activities		2.2	3.1	4.2
HEALTH AND PHYSICAL EDUCATION					
A	Personal Health and Physical Development	1.3	2.3	3.3	4.3
D	Healthy Communities and Environments	1.4	2.3	3.3	4.3, 4.4
MATHEMATICS					
D	Algebra		2.2	3.4	4.3
E	Statistics	1.1	2.1, 2.3	3.1, 3.2, 3.4	4.1, 4.2, 4.3, 4.4

ENGLISH – Oral Language		
STRAND	DESCRIPTION	LEVELS & ACHIEVEMENT OBJECTIVES
Listening Functions	Interpersonal Listening	1 - 4
	Listening to Texts	3 - 4
Speaking Functions	Interpersonal Speaking	3 - 4
	Using Texts	1 - 4
Listening and Speaking Processes	Exploring Language	3 - 4
	Thinking Critically	1 - 4
	Processing Information	1 - 4
ENGLISH – Written Language		
Reading Functions	Personal Reading	1 - 4
	Close Reading	1 - 4
Writing Functions	Expressive Writing	3 - 4
	Transactional Writing	1 - 4
Reading and Writing Processes	Exploring Language	3 - 4
	Thinking Critically	1 - 4
	Processing Information	1 - 4

Curriculumn Links

The activities and information provided in this resource, offer opportunities to develop some of the Essential Skills in the New Zealand Curriculum Framework, across many of the essential learning areas.

The table of curriculum links alongside is intended to assist you in the planning and preparing for your study of possums. However, the curriculum links we have included within this resource are by no means exhaustive and we encourage you, as teachers, to work beyond them, as only you know best the specific strengths of your students.

For further information visit our website:
www.npca.org.nz

Student Booklet

The student booklet is designed to compliment and reinforce the information presented to the students during the presentations by DoC or regional council staff, or pest control contractors. It contains a possum quiz, facts & figures, a word search, information on 1080, and much more.

BACKGROUND INFORMATION – BRUSHTAIL POSSUMS

This information will be useful for teachers in planning a unit of work based on possums with young students. Students of upper primary and secondary levels could probably use this information directly.

Why introduce possums?

Because New Zealand was so far from other countries, it was very difficult for animals or plants to get here by accident and nearly all our flora and fauna was native. However, the first Maori and European explorers brought numerous plants and animals to New Zealand for a variety of reasons.

Early settlers often missed the familiar animals and plants of 'home' so Acclimatisation Societies introduced many exotic species. Deer and rabbits, for instance, were introduced as game animals, while possums were introduced to establish a fur trade. They also worked hard to establish populations of animals such as blackbirds, hedgehogs and sparrows etc.

Animals such as horses, donkeys, oxen, cows, goats, sheep and pigs were deliberately introduced to provide transport, meat, milk and wool. Plants such as kumara, wheat, oats, barley, vegetables and fruit trees were introduced as food. Pasture grasses were also introduced to provide food for domestic animals. Bees were introduced to provide honey and to pollinate the food crops (native bees were not always efficient in pollinating new plants because they didn't recognise them!)

Other animals arrived by accident, for instance, the first ships to arrive in New Zealand probably brought insects and seeds in furniture stuffing, the padding of saddles, stuck on clothing or hidden in soil etc. Other animals could have stowed away in cargo and then transported ashore in belongings. Also shipboard pets, such as cats and pests, such as rats and mice could have used gangplanks or mooring ropes to escape ashore.

People didn't really understand the devastating effect new organisms could have when introduced to a new environment. So there was very little control on what could or couldn't come into the country.

No one would have predicted the devastating effect the deliberate introduction of possums would have on New Zealand's native flora and fauna.

What are possums?

Brushtail possums are marsupials and about the size of a cat. They have a long bushy tail, big dark eyes, and big ears. They are very active solitary nocturnal animals covered in thick dense fur, which ranges in colour from grey to black. Like alpacas, a possums fur has microscopic air pockets, giving it a thermal capacity that makes it approximately 7% warmer than wool. Possums are omnivores, feeding on a wide range of plants and insects, as well as birds eggs and chicks. The life expectancy for a male is 9 years and 12 years for a female.

Reproduction

Females can breed from the age of one and usually only breed once a year, producing a single baby. However, when food is abundant possums will often breed twice a year. Like kangaroo's a baby possum is called a joey. Once the joey is born it crawls up and into its mother's pouch where it continues suckling and growing for the next five months. The joey is dependent on its mother for approximately eight months.

Where did they come from?

Most of the Brushtail possums introduced to New Zealand originally came from Tasmania between 1837 and 1922 and they were released at nearly 500 different sites around the country. Until 1861 private individuals organised the release of the possums. After this date the introductions were made by Acclimatisation Societies. In 1922 it became illegal to release possums, however, this didn't stop trappers and possums continued to be released right up until the 1980s.

Why are possums such a problem?

Possums are very adaptable feeders and they will eat a wide variety of foods, from fruit, seeds, bark, buds, flowers, leaves and nectar to weta, snails, eggs and chicks. They not only compete with native animals for food sources, but they also eat some of our native animals! By eating native plants, possums decrease seed production by damaging or eating the flowers. This reduces regeneration of the plant and potentially removes a crucial food source for native species.

Possums often have favourite food sources and will return to a tree night after night systematically stripping it before moving on to another. This exclusivity of feeding often causes local extinction of plants. Possums also have a taste for pasture crops and will travel considerable distances to feed on clover, herbs, vegetables and other arable crops. They also do considerable damage within young pine plantations, eating the main shoots and stripping bark.

Possums are also known to be carriers of bovine Tb (tuberculosis). This disease can be transferred to humans and is one of farming's main animal health problems. Possums with advanced Tb are often lethargic, found out in the open and have weeping sores that contain Tb bacteria. It is believed that Tb is spread when cattle sniff or lick these possums.

The spread of Tb threatens our multi-million dollar exports of beef, dairy products and venison as some of our trading partners are Tb free eg Australia. Tb can affect non-trade tariff barriers and New Zealand needs to ensure that we meet the official world accepted target of less than 0.2% of herds infected with Tb by 2013. This adaptability to food sources and the fact that they are transmitters of Tb places them as a direct threat to native plants, animals and agriculture.

POSSUM CONTROL

What level of possum control should we aim for?

Much as we might like to eradicate possums, it is unlikely to be possible, so it is necessary to decide what level of control is reasonable.

- No control – this is usually only considered if numbers of the pest are low, it is only affecting a very small area, there is no satisfactory method of control or control is too expensive.
- Management only when a crisis occurs eg devastation of rare plants.
- Management to keep numbers within reasonable limits with short-term programmes, sustained efforts or targeting certain areas when needed.
- Management by commercial hunting eg collection of fur for possum fur products.

What control methods could be used?

Control programmes are most effective if a variety of methods are used together. There are three main groups of possum control methods as well as a few methods suitable only in certain situations.

Killing or removing by:

Poisoning

This method must be used carefully so that non-target species are not affected eg, using a type of bait only possums find attractive. Testing with harmless baits to see whether other species are taking them or using a bait station only accessible to the target animal.

Currently five different poisons are available for both public and commercial possum control. Brodifacoum, Pindone, Cyanide, Encapsulated cyanide and Cholecalciferol. Sodium monofluoroacetate, or 1080 as it is commonly called, is also widely used for possum control. Both 1080 and cyanide have extra controls on their use, including the requirement to have a special licence. This resource material uses 1080 as an example of one of the poisons used in possum control.

Agencies responsible for possum control carefully study an area, before choosing the most appropriate and effective form of poison. Most poisons are incorporated into pollard baits and 1080 can be added to carrot bait. Pollard and carrot baits are always dyed green in colour, as this is the colour least detectable by birds. Frequently baits have a mask, such as cinnamon, which is attractive to possums, but at the same time hides the smell of the toxin.

Shooting or Dogging

This method usually works best when possum numbers are already low.

Trapping

Cage traps are also acceptable from an animal welfare point of view, so long as they are checked often enough to avoid undue distress to trapped animals. Cages can only remove very small numbers of animals.

Exclusion

This is most often done by fencing, however, fencing is expensive. One example of successful fencing is the fence around the Karori Wildlife Sanctuary in Wellington. (However, poisoning and trapping were used to initially rid the area of possums).

New Zealand is lucky in that we have a number of off shore islands that we can make possum free through eradication programmes. This has been successfully done on Kapiti, Rangitoto and Codfish islands.

Biological Management

Diseases aimed at specific species can offer very effective management eg, the Calicivirus for rabbits. However, if a disease was used here to control possums, we would have to take extreme care to ensure that it didn't inadvertently spread to Australia where it could affect possums or even other native marsupials, which are not pests.

The issue with biological management is the need to be certain that they will only affect the target species and remain harmless to domestic and native animals, as well as humans.

Alternatively, preventing animals from breeding can be a way of reducing numbers, but it is difficult to manage and often expensive. Work is continuing to find an effective method of controlling possum breeding.

Habitat Manipulation

This can be done either by making the habitat less favourable for the pest or more favourable for the native creature under threat. For example, establishing populations of threatened species on islands where possums do not live or cannot get to. Or captive breeding programmes can keep endangered animals from becoming extinct until a pest predator problem can be solved. Landholders can also assist in this area by removing possum nesting sites such as windrows or pampas. Or by not grazing stock in areas known to have high possum populations as a precaution against Tb.

Why is controlling pests, such as possums, so difficult?

- People can have different views about the same animal.
- Many different groups have conflicting interests in pest control - farmers, animal welfare, conservationists, councils, government, industry, hunters etc. Because of this it is sometimes difficult to agree on a solution to a pest problem that is acceptable to everyone.
- Pest control can be very expensive and only limited funds can be devoted to it.
- Pests typically have few natural enemies and spread to new areas quickly.
- Some methods of control are not humane. Others could contaminate the soil, water or crops with poisons.
- Some control methods may harm native species, livestock or game animals.
- Changes in land use can encourage the survival of pests.
- Some people encourage pests unintentionally eg, by dumping garden rubbish on roadsides or in the bush, thinking it is OK because it's biodegradable.
- Harvesting a pest commercially may have little effect in reducing numbers.

ACTIVITIES

Science

As a class discuss the answers to the following questions. Write the answers on large sheets of paper and display them around the classroom.

- What are introduced animals? *Animals that have been brought into a country where they are not normally found.*
- List as many introduced animals as you can under the headings: *Deliberately Introduced* and *Accidentally Introduced.*
- In what environments do you find introduced animals?
- How do native and introduced animals compete in these environments?
- Which New Zealand native animals are at threat because of introduced species?
- What is a pest? *Any animal or plant that is introduced to New Zealand and has a negative impact on our native plants and animals.*
- Why should we control pest species?
- Why is it important to know what a pest animal or plant is capable of?

In their native Australia, possums are not considered pests at all – they are even protected! Why do students think possums are regarded as pests here in New Zealand?

New Zealand spends millions of dollars each year controlling possums. But do they have any uses or unique features that could be utilized to benefit society or help fund their control? For instance possum fur products are becoming increasingly popular.

It is not just possums that have become pests in New Zealand. A number of other animal and plant species are also considered pests, eg, rats, stoats, varroa mite in bees, painted apple moth, wild ginger, old mans beard, gorse, or cathedral bells. Why do students think these and other species have become a problem in New Zealand when they are not a problem in their country of origin?

Ask students to research an introduced species. Students should include: A description (size, colour, differences between male and female, life cycle, diet etc.) Preferred habitat; Where it originally came from; When and why was it introduced; How it got here; What effect it has had on the environment; What areas of New Zealand are affected by it; What attempts have been made to control it? Could it be effectively eradicated and/or controlled? Publish the information as a book for the school library.

When it comes to pest management, poisoning is just one option that can be considered. Explore some of the other ways pests could be managed and/or controlled, eg, culling, trapping, building a barrier, using other animals eg, stoats to control rabbit populations. What are the pros and cons for each of these options?

Find out how scientists target possums specifically to take bait and not species they want to protect? Why is the poison 1080 so effective?

Control V Eradication: Ask students to find out what the consequences of either of these management techniques for the handling of possums would be. What would be the positive and negative aspects of each?
Control means managing a species, through trapping, poisoning etc. to limit numbers, and therefore limit impact to other species and/or a habitat. Eradication means the complete removal of the target species from a given area, permanently.

ACTIVITIES

English

'Shake Away', 'Possum Chase' and 'Gone Possum' are the names of real products used to control possums in Australia and the USA. Ask students to devise an advertising campaign for one of these products. Depending on the age of the students ask them to come up with either a print ad, radio ad or TV commercial – or all three!

The introduction of pest species either deliberately or accidentally has been in the news a lot recently. Use newspaper articles to stimulate discussion, creative writing etc.

Write a story in the day of a life of a possum. What did you eat? What dangers did you face? What environment did you live in? Perhaps you were the first possum to arrive in New Zealand. What did you think when you got here? What was the journey like?

Pose the following question to your class: If the school suddenly became totally overrun with possums, what would you do to get rid of them?

Eradication of pest species has been carried out on a number of islands around New Zealand. Imagine you are going to eradicate all the possums from a particular area. What do students think they would need to consider before this could be done?

Over a number of days or weeks ask students to find examples of pest introductions or the damage that pests are doing in New Zealand in newspapers etc. At the end of this time ask students to suggest reasons for the introduction of pests and ways in which human activity contributes to the problem of pest species in New Zealand.

Debate the 1080 issue. Students could take the positions of various groups wishing to use or oppose the use of 1080.

For 1080

- It is cheaper to use than employing people to hunt and trap possums.
- It is easy to use in rough country.
- Other chemicals have been less effective and others more dangerous.
- It kills quite quickly and humanely.
- It dissolves in water and dissipates relatively quickly.

Against 1080

- It is very poisonous to other animals such as dogs and cats.
- It is poisonous to some of our native animals.
- Farm animals have died when it has been dropped accidentally on farmland.
- It is thought that human health might be affected.
- Not enough research has been done into the effects on the ecosystem.

Social Studies

It has been suggested that all the possums in New Zealand should be caught and shipped back to their native Australia! Ask students to design, draw and describe a special machine that can humanely trap possums. Tell students they can be as inventive as they like!

The following animals are all considered pest species in some situations in New Zealand: cats, deer, dogs, ferrets, goats, hares, hedgehogs, mice, possums, rabbits, rats, stoats and weasels. In some countries and cultures some of these animals are not considered pests at all. Ask students to find New Zealand examples of where, when and why some of these animals are not considered pests?

Find out when and how the following animals were introduced to New Zealand: bell frog, carp, cat, chamois, ferret, goat, German wasp, hare, hedgehog, magpie, mice, pig, possum, rabbit, red deer, sparrow, stoat, thar, trout, weasel, varoa bee mite, zebra or any others they can think of. Ask students to research the effects these animals have had on New Zealand's natural environment. Most species introduced by early settlers were for food, sport, the fur trade, controlling other pests or simply to remind them of home.

Repeat the previous activity this time looking at plants that have been introduced to New Zealand that have caused problems, eg, gorse, wild ginger, old mans beard etc.

Invite a MAF inspection officer to come and talk to your class about the work they do and the importance of the Biosecurity Act.

Early settlers to New Zealand established Acclimatisation Societies to bring animals and plants from 'home' to New Zealand. In the 1850's how long was the average journey from England to New Zealand? How do you think they managed to keep the animals and plants they bought with them alive on board ship? What problems might they have had to face? How would they water the plants? Why do you think it was important for them to bring plants with them?

Mathematics

Create a graph showing the various ways animals have been introduced to New Zealand.

Create a variety of graphs showing the spread of various pest species in New Zealand.

Create a pest awareness game that teaches people about the importance of pest control in countries like New Zealand.

Each of New Zealand's 50 million possums eat about 400g of food each night. Find something that weighs the same amount so you can see how much that is. Multiply 400g by 365 (the number of days in the year) to find out how much a single possum eats in a year. Multiply that by 50 million to find out how much is eaten by all of New Zealand's possums in a year.

The Arts

Construct 3D models of possums.

Ask students to design a pamphlet or poster for younger students, explaining the dangers of 1080 poison and how to recognise it ie, if it is green it is toxic, and if it is toxic DON'T TOUCH IT.

Many classroom computers have programs on them that allow students to create calendars. Produce a class calendar where each month the illustration is produced by a student and warns people about the dangers of possum control poisons, such as 1080 or about why we should control possums. Each student could have a copy or one could be presented to each class in the school.

Acknowledgments

This material along with the student booklet, 'The How and Why of Possum Control' has been produced by the NPCA as a resource for use in primary schools. They have been linked to the curricular with the aim of developing a greater awareness of the possum as a serious pest for conservation and farming.

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