Pest control and monitoring plan for Oakley Creek

Alicia Warren, amended and updated April 2010

1. MONITORING NATIVE SPECIES

Objective:

Control of major pests within Oakley Creek is intended to improve the native biodiversity within this Auckland City reserve and thereby enhance the natural environment experience for reserve users and local residents, and allow Oakley Creek to act more effectively as a wildlife corridor. To see whether the native component of the environment is enhanced we need to measure some of the key components that make up the native biodiversity. The key components where we hope to measure a change are:

- increased numbers of native birds and lizards
- more terrestrial macro invertebrates,

To distinguish changes over time caused by pest control, from co-incidental changes caused by other things we need to measure these key components before management starts as well as after, and in managed sites and unmanaged sites (BACI “before, after, control, impact” design).

1.a BIRD MONITORING

Monitoring question: Do the numbers of native species of birds and the number of birds per species increase with pest mammal control?

Precision required: Need to pick up moderate changes in numbers and change in species found over 3 years, with pest control commencing in the second year.

Indicators: Species diversity of native species, abundance of the following indicator species: grey warbler, fantail, tui, kereru. The presence of tui, kereru and morepork in the reserve will be a key milestone to success. Successful breeding of more vulnerable species such as tui, kereru or morepork will be the ultimate success.

Measurement methods: Participating in the Landcare Research National Garden Bird Survey. See http://www.landcareresearch.co.nz/research/biocons/gardenbird/index.asp

Design: BACI. Lower Oakley Creek will be divided into 2 sections for the first 3 years. Planting and weeding has commenced here, and rodent control will start here in 2009. The National Garden Bird Survey (Winter 2008) will occur prior to rodent control starting.

Marking: Bird survey positions will be marked so that the survey can be repeated from the same sites annually.

Sample size: There will be 2 transects along the creek each approximately 1 km long, one in the managed area and one in the unmanaged area. Bird survey positions will be spaced at 200 m along the transects. This will allow for 5 monitoring sites per transect.

Sample selection: Due to the long narrow nature of the management site and limited places with low background noise, Bird survey positions will be set up systematically on transects along the walkway.

Fieldwork: Will require 10 people following the National Garden Bird Survey as set out in the website (see above).

Timing: Two mornings during Saturday or Sunday in June or July for 2008, 2009, 2010, 2011.

Particular requirements: The weather needs to be fine with little wind. If wind or rain or flooding of the creek affect listening, the survey will need to be rescheduled for another day in within the National Garden Bird Survey timeframe. A weekend morning is preferable so that background traffic noise will be less.

Proposed storage: Paper records will be kept by Alicia. Electronic records will be provided to Landcare Research.

Resourcing: Equipment = flagging tape, vivid marker, field forms, hot drinks and biscuits

1. b LIZARD MONITORING

Native skinks are eaten by cats, mustelids, hedgehogs, rats, mice, magpies, kingfishers, and even blackbirds. Native skinks eat fruits and invertebrates. If pest control is effective, and consistently maintained, juvenile native skinks should increase in number. The introduced rainbow skink may also be found at Oakley Creek. The simplest monitoring technique for ground dwelling lizards is to provide permanent artificial cover objects (ACOs) made of 3 stacked Onduline tiles (with spacers between) on the ground and to check these on an annual basis.

Monitoring question: Do the numbers of native species of lizards and the number of lizards per species increase with pest mammal control?

Precision required: Need to pick up moderate changes in numbers and change in species found over 3 years, with rodent control commencing in the second year.

Indicators: Species diversity of native species, abundance of indicator species. The presence of juvenile lizards will be a key milestone to success.

Measurement methods: Numbers of lizards per artificial refuge.

Design: BACI. Lower Oakley Creek will be divided into 2 sections for the first 3 years. Pest control will start here in 2009. Monitoring will start in 2008 prior to rodent control.

Marking: ACOs will be labelled and mapped so that they can be found annually and re-established if vandalised or removed.

Sample size: There will be 2 lines along the creek each approximately 1 km long, one in the managed area and one in the unmanaged area. Twenty ACOs (4 groups of 5 ACOs) will be spaced along each transects.

Sample selection: Systematically on transects along the walkway, in places, above the floodplain, where they won't become inundated with surface water.

Fieldwork: Will require 2 or more people checking ACOs annually, photographing any lizards they find.

Timing: June or July every year, on a winter morning when lizards are slow.

Resources: 40 ACOs each made of 3 stacked Onduline tiles with spacers between.

Particular requirements: A cool morning in June or July is ideal because lizards will be sluggish when they are cold, making them easier to find and count.

Proposed storage: Paper records will be kept by Alicia.

Resourcing: Equipment = 40 onduline refuges = 120 onduline tiles, 400 x 10mm spacers, glue, silver marker pen, field forms

1.c WETA MONITORING

Large invertebrates are preyed upon by rodents, hedgehogs and other pest mammals. Weta make a good indicator species for large invertebrates and are easier to monitor than many other invertebrates. The use of artificial refuges is a useful way of detecting changes in weta abundance. See http://www.doc.govt.nz/upload/documents/science-and-technical/drds233.pdf

Monitoring question: Do the numbers of tree weta increase with pest mammal control?

Precision required: Need to pick up moderate changes in numbers and change in species found over 3 years, with pest control commencing in the second year.

Indicators: Numbers of tree weta occupying artificial refuges.

Measurement methods: Counts of the number of artificial refuges that are occupied abay weta.

Design: BACI. Lower Oakley Creek will be divided into 2 sections for the first 3 years. Pest control will start here in 2009.

Marking: Artificial refuges will be labelled and mapped so that they can be found annually and re-established if they are vandalised or go missing.

Sample size: There will be 80 artificial refuges with 40 (8 groups of 5) in the managed area and 40 (8 groups of 5) in the unmanaged area.

Fieldwork: Will require 2 or more people checking the artificial refuges once annually.

Timing: June or July each year.

Design of artificial refuges:
Forty weta refuges following guidelines in "*Design and Use of artificial refuges for monitoring adult tree weta Hemideina crassidens and H. thoracica*" by Bleakley and others 2006 (see website reference above). An entrance of 18 mm diameter or less excludes most adult mice, which prey on weta. Weta have a lower preference for pine compared to willow for the first few months, but once it is aged that preference disappears. The shape of the cavity can be a simple vertical tube with the entrance pointing downwards. The wood needs minimum dimensions of 50 mm x 50 mm x 300 mm, to accommodate a 18 mm diameter hole of at least 150 mm long, and space above the hole to nail it to a tree with 2 nails. Weta prefer cavities without a Perspex viewing pane. Additional refuges with viewing panes can be put up in Oakley Creek for public awareness but they should not be included in the monitoring programme.

Proposed storage: Paper records will be kept by Alicia.

Resources: Equipment and materials = 80 bamboo tubes with 100-150 mm internal length x 16-18 mm internal diameter cavities, Fencing staples and cable ties, or tyre inner tubing to secure to trees.
Hammer, Saw, Vivid markers, Compasses, Field forms

2. MONITORING AND CONTROLLING PEST SPECIES

Objective for rodents and possums: To control rodents and possums within the pest management area of Oakley Creek to achieve a result of less than 5% Bite Mark Index (BMI) for possums, or less than 5% tracking rate for rodents in order to allow for the increase in numbers of native birds, lizards and invertebrates, and to allow palatable native plant species to germinate and grow.

Objective for hedgehogs and mustelids: To control hedgehogs and mustelids within the pest management area of Oakley Creek to achieve a result of less than 5% tracking rate for hedgehogs and mustelids in order to increase the numbers of native birds, lizards and invertebrates.

In order to ensure that the minimum effort required to be effective is deployed, monitoring of pest species will be an integral part of the control programme.

2.a. RODENT MONITORING

Monitoring question: What is the abundance of rodents within Oakley Creek. Does the abundance of rodents decrease with rodent control? Is the rodent control effective? For how long after control does it remain effective? When should rodent control start and stop?

Precision required: Need to pick up moderate changes in abundance particularly over the bird breeding season, in order to determine when to start and stop rodent control.

Indicators: Species diversity of pest species, abundance of rodents

Measurement methods: Percentage of tracking tunnels with rodent tracks, or trapping rate per 100 trap nights (baited with peanut butter on a leaf and left out for 1 fine night). Tunnels set out at least one month prior to ensure that rodents do not treat them as novel objects, or to be put out and left in place.

Design: BACI. Lower Oakley Creek will be divided into 2 sections for the first 3 years. Rodent control started in the lower 1.3 km in July 2009. Tracking tunnel monitoring will occur from 2008 in the lower 2 km.

Marking: There will be three groups of 10 monitoring sites in the rodent control area and the same in the no rodent control area. The tracking tunnels will be 50 metres apart within a group and the groups will be 200 metres apart. There will be gap of at least 200 metres between the monitoring lines in the controlled and uncontrolled areas.

Sample size: Up to 3 sets of 10 monitoring sites in the pest control area and the same in the no pest control area.

Sample selection: Systematic – not enough area to select randomly.

Fieldwork: We will follow Gillies and Williams "Using tracking tunnels to monitor rats and mustelids" (unpublished DOC paper). We have a very small study site so the maximum number of lines 200m apart is 6, that is, 3 in each area.

Timing: A weekend in **Sept, Dec and March**.

Particular requirements: Training in distinguishing rodent, mustelid, hedgehog, weta, lizard tracks and other tracks

Proposed storage: Paper records will be kept by Alicia. Tracking cards will be kept for 2 years.

Resourcing
Equipment and materials = 60 tracking tunnels (Feetures), 120 wire pegs, 60 pre-inked tracking cards x 3
Peanut butter, Knives/Spatulas, Silver marker pens, Compasses, Field forms

2.b. RODENT CONTROL

Primary method - Poisoning: Rodents will primarily be controlled using hand laid poison bait in bait stations. The poisons which are suitable to use in an urban park are first generation anticoagulants (such as pindone, diphacinone, or coumatetralyl). Pindone and diphacinone are less persistent in the environment than other anticoagulants. Diphacinone is the preferred toxin for rodents. Multiple feeds over several days are required to reach a lethal dose, so it is important that supplies in bait stations don not run out.

Sodium fluoroacetate (1080) is not appropriate for an urban reserve. Second generation anticoagulants (such as brodifacoum, bromadiolone, difethialone, flocoumafen) are not appropriate for long term use.

Cholecalciferol is now registered for use on rodents in NZ and is an alternative choice, but is expensive. It currently doesn't come in a bait suitable for use on rods in Protecta Sidekick lockable bait stations.

As predicted our rat control in Oakley Creek has been effective and coupled with a dry summer, mice numbers became very high in autumn 2010. Since increased numbers of mice are likely to have detrimental effects on lizards and invertebrates as well as survival of seeds and seedlings, the decision was made to decrease spacing between bait stations in select areas from 50 m to 25 m to more effectively control mice. Friends of Oakley Creek now have 51 Protecta Sidekick bait stations in place.

Spacing and number of bait stations within a line: A line down each side of the creek with 50 m spacings. Consider adding extra bait stations in future where more than 25 metres from creek to edge of bush.

Type and Positioning of bait stations: Protect Sidekick bait station (require a key to open) on the ground with a crimped fine cable around the nearest tree or post. Baits held in bait station via rods so that rodents cannot cache baits. Entrance hole large enough for Norway rat, too small for possum, cat, and small dog. Too dark and enclosed for blackbirds.

Numbering of bait stations: All bait stations must be labelled and mapped.

Signs: Signs appropriate for the poison must be posted at all entries to the area where poison is used.

Frequency of delivery: Initially monthly from August to March, changed to quarterly from 2012, with bait in bait stations for 3 weeks, then removed, to reduce risk of rodents developing a resistance to the bait.

Target: Rodents
Pesticide Trade name: Ditrac blocks
Active Ingredient: Diphacinone
Toxic loading: 0.05g/kg
Type of Bait: Cereal bait
Method of delivery: rodent bait stations
Nontoxic pre-feed required: No

All poisons must be pellets or blocks or paste in bait stations. All poisons must be kept out of the weather.

Recording of bait consumed: Bait stations must be filled and refilled with known weights of fresh bait. All bait not consumed must be brought in and weighed so that the total quantity of bait consumed for each bait station is recorded.

Disposal: All poison bait brought in from a bait station must be disposed of appropriately, i.e. in a landfill or incinerator.

Risk control for poison:
Public notification: (1) warning signs on entrances to area where poison laid

It is important to have alternative techniques available so that if bait shyness or trap shyness develops alternative methods can be deployed.

Alternative method - Trapping: DOC 200 traps at 100 meters along each side of creek will also catch some rodents and this may be particularly useful for bait shy individuals. Protecta SideKick bait stations can also accommodate some types of rodent trap.

Resourcing
100 Protecta Sidekick baitstations
Approximately 8.2 kg of Ditrac per month, 12 months a year
100 m x 1 mm stainless steel cable
100 crimps
Crimping tool
Nitrile disposable gloves, Field form, Health and Safety information, Public warning signs at entrances to pest control area.

2.c. POSSUM MONITORING

Monitoring question: What is the abundance of possums within Oakley Creek. Is the possum control effective? For how long after control does it remain effective? When should possum control recommence?

Precision required: Need to pick up moderate changes in abundance seasonally particularly over the bird breeding season, in order to determine when to start and stop control.

Indicators: Abundance of possums

Measurement methods:
(1) Permanently marked WaxTag lines of 20 WaxTags at 10 m spacing (200m long lines) left out for 7 nights. 3 lines each in the pest control and non pest control areas. Lured with luminescent markers and flour and icing sugar (5:1) mix. All lines must be 200m apart.

Design: BACI. Lower Oakley Creek will be divided into 2 sections (approximately 1km each) for the first 3 years. Sustained possum control will start in the lowest 1 km in 2009. Sustained possum control can start in 2011 in next kilometre.

Marking: The start and finish of 200m long WaxTag lines will be permanently marked.

Sample size: 3 lines in each area (pest control and non-pest control). Distributed on both sides of creek. There is insufficient area to increase the number of lines while still keeping lines 200m apart.

Sample selection: Systematic – not enough area to be random.

Field trial of design: We will follow the April 2008 WaxTag method provided by NPCA. Lines need to be 200m apart, and this is especially important between the pest control area and uncontrolled area. http://www.npca.org.nz

Fieldwork: Volunteers on 2 days, 7 days apart (e.g. 2 Saturdays in a row).

Timing: Twice a year at beginning and end of breeding season: August and February.

Particular requirements: Volunteers will need training in how to tell the difference between possum bite marks and other species.

Proposed analysis: Analysis of trends**.**

Proposed storage: Used WaxTags should be stored until after the analysis of the data and for at least 2 years. Paper records will be kept by Alicia.

Resourcing
120 Waxtags x 2 times a year = 240
120 luminescent markers
3 Vivid markers, 3 hammers, nails, blocks of wood, 5 Flour: 1 icing sugar mix, field forms, range finders

2.d. POSSUM CONTROL

Primary method –Trapping: Timm's traps baited with carrot or apple and cooking oil with 2-3% aniseed flavour (winter) or orange flavour (summer), and lured with flour scented with the same aniseed or orange flavour.
Traps require checking at least once a week in cool months or twice a week in warm months in such a public place. More frequent checks increase the effectiveness of trapping (i.e. number of catches per trap night).
Trapping can utilise the same lines as poisoning, with spacing every 100 m (22 Timm's traps, 11 each side of the creek from 0.05 m to 1.05 metres).

Disposal of possum bodies: Carcass bin provided by Auckland City Parks and emptied by contractor.

Alternatives to trapping (not implemented todate – 2012)
Trapping is expensive in terms of labour, but cheap in terms of materials. If labour is taken into account it is not as cost-effective as poisoning and it may be difficult to bring possums down to the levels desired using only trapping. Trapping is however more acceptable than poisoning to urban reserve users and people supporting Friends of Oakley Creek as volunteers. Some possums may be trap shy but not bait shy (or vice versa). For these reasons it is important to have alternative methods available.

Secondary method: Hand laid poison bait in possum bait stations both sides of the lower 1.1 km of Oakley Creek from July 2009.

Sodium fluoroacetate (1080), and cyanide are not appropriate for an urban reserve.
Second generation anticoagulants (such as brodifacoum, bromadiolone, difethialone, flocoumafen) are not appropriate because they are highly persistant in living tissue, sublethal doses can accumulate in animals and secondary poisoning of birds or pets can occur. First generation anticoagulants (such as pindone, or diphacinone, or coumatetralyl) are not particularly effective against possums.

The poison which is most suited to use in an urban park is cholecalciferol. Cholecalciferol is also known as Vitamin D3. Small amounts are found naturally in the bodies of mammals but large doses are toxic. It is registered in other countries for use on rodents. It is an acute poison that only requires a single dose. It is considered low risk for secondary poisoning to dogs and cats. It is not persistent in the environment. It is insoluble in water. There is a low risk of poisoning birds. There is an antidote although treatment is complex. Cholecalciferol is more effective if pre-feeding with a non-toxic bait is done first, to increase uptake of toxic baits by possums. It does not require a license to store, handle or use.

The use of any poison requires public notification at all entry points, and care in bait delivery to ensure that children, pets, and non-target species do not gain access to the poison. Standards warning signs with standard cautions for each poison type are available on the ERMA website.

Target: Possums

Spacing and number of lines: 2 lines of 24 bait stations that exclude dogs either by position or design of bait station or both. 1 line either side of the creek for the lower 1 km. Lured with flour scented with aniseed or orange.

Spacing and number of bait stations within a line: Spaced at 50m along the line. 48 bait stations in total.

Positioning of bait stations: 1.7 to 2.0 m above the ground on the dry side of the tree.

Numbering of bait stations: Each bait station must have a unique identifying label, and its position should be shown on map.

Signs: Signs appropriate for the poison (from ERMA website) must be posted at all entries to the area where poison is used.

Frequency of delivery: In July make non-toxic bait available for 3 weeks to accustom possums to eating the bait. Check weekly, topping up as necessary to determine the quantity of toxic bait likely to be consumed. Use consumption of non-toxic bait to determine quantity of toxic bait to be delivered. Provide sufficient toxic bait that it is unlikely to be all consumed within a week. Make toxic bait available for at least 3 weeks and up to 8 weeks, checking weekly and topping up as required. Continue providing toxic bait until less than 5% of baits are showing signs of consumption. Allow for weekly checking of toxic bait until the end of September if necessary. Then stop and remove baits. Wait to resume trapping for 1 month after bait removal.

Pesticide Trade name: Feracol or Kiwicare No Possums
Active Ingredient: cholecalciferol
Toxic loading: 8g/kg
Type of Bait: FeraCol Paste in bait stations or Kiwicare No Possums gel in bait stations,
Method of delivery: In bait stations above the height that dogs can reach.
Nontoxic pre-feed required: Yes in bait stations

Recording of bait consumed: Bait stations must be filled and refilled with known weights of fresh bait. All bait not consumed must be brought in and weighed so that the total quantity of bait consumed for each bait station is recorded.

Disposal: All poison bait brought in from a bait station must be disposed of appropriately, i.e. in a landfill or incinerator.

Risk control for poison:
Public notification: (1) newspaper of flyer alerting local residents and explaining purpose, (2) warning signs on entrances to area where poison laid
Health and safety: Storage, Transport, Handling, Disposal.

Resourcing
Trapping –
22 Timms traps
Apples approx 5 a week ≡ 1.5 kg a fortnight
Oil flavoured with orange or aniseed oil
Flour and icing sugar lure.
Gloves, rubbish bags
Contractor emptying bin

Poisoning
Cholecalciferol paste or gel
Non toxic prefeed paste or gel
48 Bait stations
Spatula
Nitrile disposable gloves, Field form, Health and Safety information, Public warning signs at entrances to pest control area.

2e. MUSTELID AND HEDGEHOG MONITORING

Mustelids eat invertebrates, lizards, rodents and birds. Mustelids are relatively rare within urban parks, probably because of the high densities of cats and dogs in urban areas. However if they do occur they can kill a lot of animals in a short space of time so it is necessary to have a detection method and pest control plan.

Hedgehogs eat invertebrates, lizards, mice, and birds found on the ground. Being ground dwelling they do not affect tree dwelling animals, but they can have a big impact on small ground dwelling animals especially lizards and large invertebrates such as weta. Control of hedgehogs and mustelids is done in conjunction with possum trapping, with traps located at the same sites.

Monitoring question: Are mustelids present in Oakley Creek? What is the abundance of hedgehogs within Oakley Creek. Does the abundance of hedgehogs decrease with hedgehog control? Is the hedgehog control effective? For how long afterwards does control remain effective? When should control start and stop?

Precision required: Need to pick up moderate changes in abundance particularly over the bird breeding season, in order to determine when to start and stop control.

Indicators: Presence of mustelids, abundance of hedgehogs

Measurement methods: Percentage of tracking tunnels with mustelid tracks, Percentage of tracking tunnels with hedgehog tracks, or trapping rate per 100 trap nights.
Tunnels set out at least one month prior to ensure that animals do not treat them as novel objects.

Design and Sample selection: BACI. Systematic – not enough area to be random or have replicates of lines. Lower Oakley Creek will be divided into 2 sections for the first 3 years. Pest control will start in the lower 1 km in 2009. Tracking tunnel monitoring will occur from 2008 in the lower 2 km.

Marking: Sites will be permanently marked. Each tunnel must have a unique identifying label, and its position must be shown on a map. The site must be marked so that if the tunnel goes missing, a replacement can be located in the same site.

Sample size: One line in the treatment area and one line in the non-treatment area, with a gap of 500m between the treatment and non-treatment lines. 10 tunnels spaced at 100m along the each line.

Positioning of tunnels: on the ground, near or under cover, on natural run lines. Located out of sight of people on the walkway. The tunnels need to be in place at least 3 weeks before monitoring begins.

Timing and Frequency of monitoring: 3 times during the breeding season, the month after rodent monitoring: Oct, Jan, Apr. Tunnels in place 3 weeks prior to commencement of monitoring, or left in place.

Tunnel type: Connovation multi-use tunnel with pre-inked cards.

Bait: Previously Erayz #3 (rabbit) paste, now sardine cat food.

Number of monitoring nights: 3 fine nights.

Particular requirements: Training in distinguishing rodent, mustelid, hedgehog, weta, lizard tracks and other tracks

Proposed storage: Paper records will be kept by Alicia. Tracking cards will be kept for 2 years.

Resourcing
Equipment and materials = 20 tracking tunnels (Feetures), 40 wire pegs, 20 pre-inked tracking cards x 3
Sardines, Knives/Spatulas, Silver marker pens, Compasses, Field forms

2.f. MUSTELID AND HEDGEHOG CONTROL

Trapping is the only practicable method of mustelid and hedgehog control. DOC 200 traps are suitable for stoats, weasels, hedgehogs and rats, and they kill more humanely than some other traps. They are enclosed in a wooden box with mesh ends to keep out birds, pets. The lids are secured with a screw to keep out hands.

Spacing and number of lines and traps: 2 lines of 11 traps in the treatment area one each side of the creek, with traps spaced at 100m along the line, 22 traps in total.

Positioning of traps: on the ground, near or under cover, on natural run lines. Located out of sight of people on the walkway, wired to a tree or anchor in the ground. In place one month before trapping begins.

Numbering of traps: Each trap must have a unique identifying label, and its position must be shown on a map. The site must be marked so that if the trap goes missing, a replacement can be located in the same site.

Frequency of trapping: Weekly as part of possum control.

Trap type: DOC 200

Cover type: Haines Pallets single set box

Bait: Egg (to minimise attractiveness to cats as kittens might be able to enter trap box) , or rabbit paste.

Number of trapping nights: unknown, depends on monitoring levels, and trapping rates.

Recording: The history of each trap-site will be recorded (date set, date checked, condition of trap, bait present/bait gone, trap set/trap sprung, any kills)

Disposal: Disposal of bodies: carcass bin emptied by Auckland City Council contractor.

Risk control: Traps enclosed in wooden boxes with double mesh entrance to prevent non-target animals entering the box. Warning signs on all trap covers, to discourage tampering.

Trapping –
22 DOC200 traps
1mm stainless steel cable and crimps to secure traps to trees, crimping tool
Eggs (pref white for night-time visibility) 30 per quarter
Setting tool – one for each team
Square end #2 screwdriver – one for each team