

**Annual Report on
the aerial use of 1080**
For the year ended
31 December 2017

1080



**Environmental
Protection Authority**
Te Mana Rauhi Taiao



“Without it (1080),
we would lose the
battle and, with it,
many of our native
species.”

Former Parliamentary Commissioner
for the Environment, Dr Jan Wright

Contents

Executive summary	03
Background	06
Aerial pest control operations	07
Application information	08
Organisations that use aerial application of 1080 for pest control	09
Findings from post-operational reports	10
Operation management	10
Safe application rates	10
Location of operations	10
Size of operations	11
Communication	13
Consultation with iwi/Māori	13
Consultation with hunting groups	14
Communications guidelines	14
Monitoring	15
Water monitoring	15
Species monitoring	16
Research	18
References	22
Appendix 1	23

Executive summary

This is the Environmental Protection Authority's (EPA) eleventh annual report on the aerial use of sodium fluoroacetate (1080) in New Zealand.

This is an important document for three reasons. They are:

- **Accountability.** As a government entity, the EPA is ultimately accountable to the New Zealand public. This report and its 10 predecessors play an important role in that accountability process.
- **Reassurance.** Some members of the public are concerned about the use of 1080 and its impact on the environment. While we may not agree with those views, we respect the right of people to hold them. This report is designed to provide the public with the reassurance that, regardless of concerns about the nature of 1080 itself, the EPA is rigorous in meeting its obligations under the Hazardous Substances and New Organisms Act 1996 (HSNO) to protect the health and safety of the New Zealand public. 1080 is one of the most closely monitored and controlled hazardous substances in New Zealand.
- **Balance.** The EPA expects all its decisions, including its decision to allow the use of 1080, to be open to rigorous public debate. However,

that debate needs to be informed, balanced and based on all the available scientific evidence. Unsubstantiated and sometimes inflammatory statements and actions are unhelpful, and do little to promote considered discussion. This report is designed to provide information to inform a balanced public debate on an important issue. EPA has been publishing the report on 1080 aerial operations since 2008 based on information from the operation reports provided by the operators.

The New Zealand public is entitled to know that the EPA's fundamental position about 1080 remains unchanged. 1080 is critical in the ongoing fight to protect our native birds from the onslaught of introduced predators – possums, rodents (rats and mice) and stoats – and to ensure our dairy, beef and deer herds are not ravaged by bovine tuberculosis carried by possums. Simply, the positive benefits of the use of 1080 outweigh any negative aspects and, when applied under the provisions of HSNO, its use will not compromise public safety or the environment.

This is a view shared by the New Zealand Government, other government and environmental agencies and New Zealand's scientific community. For example, in 2017 in a major report to Parliament, the then Parliamentary Commissioner for the Environment, Dr Jan Wright, noted that the aerial application of 1080 "remains essential for the foreseeable future."¹

In a radio interview in August 2018, Dr Wright said without 1080 we would lose many of our native species.²

The application of 1080

Our mandate is to require all aerial operators to send us post-operational reports for all of their activity, with details of every aerial 1080 operation. Our reports are compiled from the information provided by those operators.

This eleventh report highlights the important factors applicants must meet for their applications to be successful. In particular, applicants must demonstrate that they will consult and communicate widely and be prepared to amend their operational plans in response to any concerns or other issues identified in the consultation process.

In 2017, consultation with iwi/Māori resulted in changes to 28 of the aerial operation plans. Changes to operational plans following consultation included boundary changes, changes in timing, changes to flight paths and changes from aerial to ground application.

Monitoring of water quality and any impact on plant and animal species is an important part of the aerial programme.

Following a major reassessment of 1080 in 2007, major changes were made to operating practices. The management of incidents, public concerns and complaints continues to be an important part of the process.

This report contains a summary of incidents and complaints and the action taken as a result. In 2017, 12 incidents and three complaints were reported to the EPA. These came mostly from operators or funding agencies rather than from members of the public or other government agencies. All the reported incidents alleged non-compliance with HSNO. They were investigated and no significant evidence of adverse effects on the public's and operators' health, waterways or land were identified.

This report also details the aerial operations and land area covered in 2017. The operations focused on the protection of significant ecosystems, indigenous species and their habitats. These included at-risk populations of birds such as the yellowhead (mohua), blue duck (whio), kea, kaka, rock wren, south island robin, morepork (ruru), grey warbler, NZ falcon (karearea) and kiwi (several species including north island brown kiwi and great spotted kiwi), at-risk populations of long-tailed bats, and vulnerable plant species such as fuchsia, hall's totara, and kamahi.

The targeted species were possums, rodents and wallabies. Stoat populations were also anticipated to be impacted because of the suppression of rodents and/or the consumption of poisoned rodents. In 2017, the EPA received 50 final operation reports relating to a total of 875,106

1 The Parliamentary Commissioner for the Environment, Taonga of an island nation: Saving New Zealand's birds, (Office of Parliamentary Commissioner for the Environment, May 2017) p 49

2 <https://www.newshub.co.nz/home/rural/2018/09/nz-lucky-to-have-1080-in-the-fight-against-predators-former-parliamentary-commissioner-for-the-environment-jan-wright.html>

hectares. DOC covered 511,379 hectares, TBfree covered 362,147 hectares, and Timberlands Ltd covered 1580 hectares. In 2016, reports of 36 operations covering 1,051,204 hectares were received.

About 60 percent of the 2017 treatment programme was due to the DOC initiative 'Battle for our Birds' being undertaken to control an expected rise in rodent and stoat populations. This was driven by a significant beech forest masting (flowering and seeding event) during the 2016/2017 summer. Masting occurs when climatic conditions encourage abundant flower production followed by heavy seeding, feeding both rodents and native species alike. Abundant prey leads to a large increase in stoats and other mustelids the following summer. Mast events are not restricted to beech forests, rimu trees in lowland forests also show mast seeding. As predicted, the 2016/2017 masting event affected many of New Zealand's beech forests. Operations to target rodents and suppress stoats were carried out across large areas of forest in both the North Island and South Island. The aerial operations planned were evenly spread across both islands.

Research

This report summarises almost 30 ongoing research projects on 1080 and on alternative pest control methods. While the search for a cost-effective alternative to 1080 continues, the New Zealand public can be confident the EPA will continue to exercise its legislative responsibilities in respect of the aerial use of 1080 competently and in the best interests of New Zealanders, the New Zealand environment and the New Zealand economy.

However, the EPA acknowledges that there are limitations to current predator eradication methods, including the use of 1080. For example, 1080 has reduced the numbers of predators in New Zealand, but it is not target specific. It may result in undesired effects on untargeted species. Continued research must look at alternative strategies to achieve sustainable pest eradication.

In this regard, in her 2017 report, the Parliamentary Commissioner also recommended that the Minister for the Environment, the Minister of Conservation and the then Minister of Science and Innovation, direct officials to begin developing a programme of staged engagement with New Zealanders on the potential uses of genetic techniques to control predators.

The EPA supports all research efforts to find alternative methods as potential replacements for 1080.



Matthew Dean
Manager, Hazardous Substances
Compliance

Background

The Environmental Risk Management Authority (ERMA – now EPA) reassessed 1080 for pest control use in 2007

1080 is a brand name given to the manufactured form of **sodium fluoroacetate**. The main use of 1080 is in baits that are designed to be eaten by possums and rats and other invasive species. Most baits used in aerial application in public conservation forests are cereal baits dyed green to discourage birds from eating them.

The 2007 reassessment process found that the benefits of using 1080 outweighed the adverse effects. A decision was made to continue using 1080 with tightened additional controls.

As a result, and to ensure good practice and a consistent approach nationwide, ERMA outlined a management regime for 1080 operations, which required operators to report on all aerial 1080 operations. The EPA has reported on the outcome of those operations since 2008.

Aerial pest control operations

Control of pests such as possums, wallabies, rabbits, rats, and stoats is done using ground-based and aerial application of poisons. Ground-based operations may include trapping, shooting, or placing various toxins in bait stations. These toxins, or vertebrate toxic agents, may include 1080.

Aerial application is more efficient than the ground based operations, and effective, particularly over remote or rugged land. The organisations that applied 1080 aerially in 2017 are:

- Department of Conservation
- TBfree
- Timberlands Limited.

Additional controls for 1080 require operational managers to submit information to the EPA after aerial 1080 operations. The information must include:

- who undertook the operation and reasons for conducting the operation
- the 1080 formulations used and the application rates
- the location and size of the area covered during the operation

- monitoring information, including any water or species monitoring, if carried out in conjunction with the operation
- an assessment of the operation's outcomes
- an overview of the communication activities (consultation and notification) and outcomes
- an overview of any incidents and complaints related to the operation, and actions resulting from those
- a map of the operational area.

Individual post-operational reports are available on the EPA website: www.epa.govt.nz/resources-and-publications/1080-aerial-operators-reports/

Application information

Individual pest management operations are usually singular events that are the annual component of a pest management programme. The programme is designed to deliver or sustain a desired management outcome over time, for a particular place.

The areas included in the programme are described as being “under sustained management”. The pest management interventions occur as required. The period between treatments is designed to minimise the number of operations while

still achieving the desired outcomes. It is dictated by the population ecology and dynamics of the target pests.

In some cases, large areas may be divided into smaller units and pests managed over time by rotating operations around those smaller units.

Table 1 shows treatment areas for different land managers from 2008 to 2017. Apart from 2014, 2016 and 2017, when DOC intervened to address risks of predator populations, it shows that the area of land treated with aerial application of 1080 has been relatively consistent since 2008, when monitoring began.

Table 1: History of treatment areas (thousands of hectares) for 1080 aerial applications

Year	No. of Operations	TBfree (000 ha)	DOC (000 ha)	Regional councils (000 ha)	Private land (000 ha)	Total area (000 ha)
2008	75	425	107	5	27	564
2009	64	314	167	17	17	515
2010	45	254	171	5	9	439
2011	49	344 ⁴	127	5	15	491
2012	48	279 ⁵	136	5 ⁶	12	432
2013	57	298	126	16	7	447
2014	58	307	645 ⁷	12	2	966
2015	45	239 ⁸	104	28 ⁹	3 ¹⁰	374
2016	36	427	619	–	5	1051
2017	50	362	511.5	–	1.5	875

A dash (–) indicates that no operations were reported. Figures are rounded to the nearest thousand hectares.

4 Includes combined TBfree and DOC operations of 31,500 hectares.

5 Includes combined TBfree and regional council operations of 27,084 hectares.

6 Includes combined council-led and DOC co-funded operations of 2,428 hectares.

7 Includes a joint TBfree and DOC operation of 5,629 hectares.

8 Includes TBfree and DOC co-funded operation of 5,617 hectares.

9 Includes public and private land for combined operations by Auckland Council, Waikato Regional Council and DOC.

10 Operation designed to control populations of wallabies, possums, mustelids and rats.

Organisations that use aerial application of 1080 for pest control

Department of Conservation

DOC manages approximately 8.6 million hectares of conservation land and uses a combination of ground-based methods and aerial application of 1080 to:

- improve the health of ecosystems by reducing the impact of browsing, competition, and predation by possums, rats, and other introduced pests
- protect threatened species from predators through direct control and secondary poisoning¹¹
- control rabbits to meet Regional Pest Management Commitments.

TBfree New Zealand

TBfree New Zealand (a wholly-owned subsidiary of OSPRI New Zealand) is responsible for managing and implementing the National Pest Management Plan for Bovine Tuberculosis (TB Plan) in New Zealand, under the Biosecurity Act 1993.

The TB Plan was approved by the Government in 1998, then amended in 2004 and again in 2011. It provides for measures to control and eradicate TB in cattle and deer herds, and in wildlife populations that act as vectors and reservoirs for the disease. The plan operates in two ways:

- disease control – aiming to control and contain the spread of the disease within and between cattle and deer herds, leading to eradication of TB from herds
- vector control – aiming to control and contain the wild animal species (in most cases possums) responsible for spreading the disease to cattle and deer, with the aim of eradicating TB from wildlife.

TBfree uses a combination of ground-based methods and aerially applied 1080 in its strategy for containing and controlling possums.

Timberlands Limited

Timberlands Limited is a forest management company that acts on behalf of the Kaingaroa Timberlands Partnership, owner of New Zealand's largest plantation forest. The 189,000 ha estate is situated in the centre of the North Island, New Zealand.

¹¹ Scavenging pests such as stoats are controlled by secondary poisoning when they feed on the dead or dying primary targets of 1080 operations (rodents and possums).

Findings from post-operational reports

Operation management

The 875,106 hectares covered by aerial operations during 2017 were treated by DOC (58.4 percent) and TBfree (41.4 percent) and Timberland (0.2 percent). The reported operations were:

- 22 funded by TBfree
- 27 funded by DOC
- 1 funded by Timberland.

Safe application rates

In 2017 the average application rate was approximately 2.5 grams (about half a teaspoon) of 1080 per hectare for possum control. (A hectare is roughly the size of a rugby field). This application rate is significantly below the maximum allowable rate of 30 grams of 1080 per hectare set by 2007 reassessment conditions.

Forty-eight of the aerial operations to control possums, rats, mice, or stoats, used 1080-laced cereal baits with 1080 concentration of 1.5 to 2.0 grams (just over ¼ teaspoon) per kilogram of bait. Two of the aerial operations used carrot baits.

Cereal baits coated with deer repellent were used in 16 of the 48 operations.

Bait application rates for possum and rodent control operations varied between 0.15 and 6 grams of toxin per hectare.

Location of operations

The number of aerial 1080 operations in each region and the sectors using 1080 vary according to the purpose of the operation, topography and land cover. The number of operations in 2017 also reflects the distribution of beech forest, the distribution of birds and snails at risk of local or national extinction, and the current distribution of farms infected with bovine TB.

The regions with the largest number of aerial 1080 operations were Waikato with 13 operations; Otago and West Coast with six operations each; and Canterbury with four operations.

The nature of the area treated also differs by location. For example, the Waikato is highly pastoral with most operations being for TB control. The West Coast has 37 percent coverage with indigenous forest. Aerial application of 1080 on the West Coast is considered a key tool in possum and rodent control programmes.

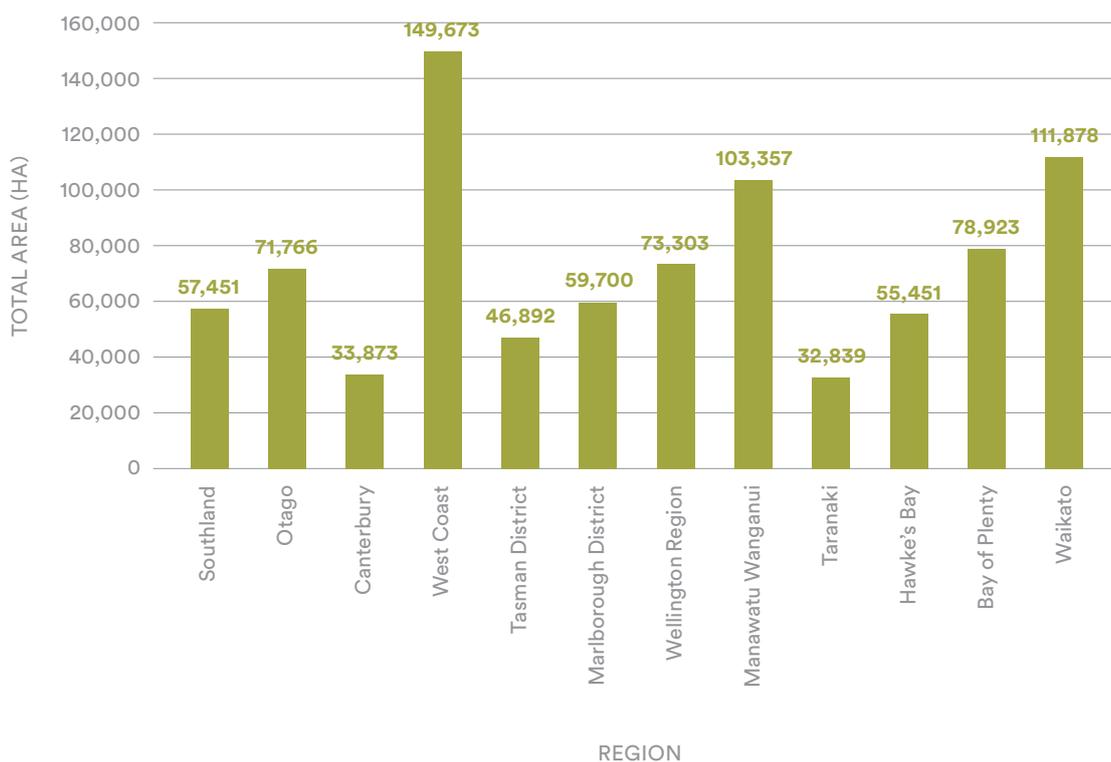
Size of operations

DOC and TBfree carry out operations to control possums and other predators over larger areas where aerial application of 1080 is more significantly efficient and effective than using ground-based methods.

Larger operational areas can delay the recovery of pest numbers in core areas, as it takes longer for pests to migrate into the heart of treated areas.

The following graph shows the total number of hectares per region treated aerially with 1080 in 2017. The largest area of application was the West Coast region, followed by the Waikato region and the Manawatu Wanganui region.

Figure 1: Total area (in hectares) per region, for aerial use of 1080 in 2017



In 2017, the total land area to which 1080 was applied aerially was 875,106 hectares. The average size of the area of aerial application was 17,500 hectares, with the largest application covering just under 60,000 hectares and the smallest covering 600 hectares.

DOC treated 511,379 hectares for possums or rats using aerial application of 1080, which is about 58.4 percent of the total area covered in 2017. Beech mast events occurred in 2015/2016 and in 2016/2017 and DOC's "Battle for our Birds" programme was carried out to control expected rodent and stoat plagues driven by those beech masts¹². The 2016/2017 event was less widespread than the 2015/2016 event although many areas of the country were affected. Operations to target rodents and suppress stoats were carried out across large areas of forest in both the North Island and South Island. The aerial operations planned were evenly spread across both islands and covered an area about 20 percent less than that covered in 2016.

TBfree uses a combination of ground-based methods and aerially applied 1080 in its strategy for containing and controlling possums. In 2017, TBfree treated 362,147 hectares of land using aerial application of 1080. This is about 41.4 percent of the total area covered in 2017.

The average size of the area of aerial 1080 applications was about 19,000 hectares for DOC and about 16,000 hectares for TBfree.

Timberlands completed one 1080 aerial operation during 2017, covering 1,580 hectares. This is about 0.2 percent of the total area covered in 2017. This controlled work provides the necessary protection to newly established tree crops from the browsing effects of possums, rabbits and hares. The use of carrot baits enables the targeting of all three of these pest species in a single operation.

¹² Beech Mast: high levels of seed production (mast) in our beech forests causing an increase in rodent and stoat populations which pose a serious threat to our endangered native wildlife

Communication

All aerial operations must be publicly notified in newspapers whose readership covers those areas where 1080 is to be applied.

Operation reports on aerial 1080 submitted to EPA must include information on the pre-operation notification and consultation process.

The EPA expects operators to consult with and notify affected Māori groups, neighbours, affected recreational and commercial hunting groups, and communities, to an extent that is appropriate for each operation.

Consultation with iwi/Māori

It is important that operators engage with Māori groups as early as possible in the planning process when an aerial 1080 operation may be carried out on public land, or in an area where the public may be affected. Ongoing discussions with Māori are essential to establishing good relationships with relevant hapū and iwi and benefit from the knowledge and expertise Māori have to offer.

This process is described in the Communications Guideline for Aerial 1080 Operations (2009) published by EPA's predecessor organisation, ERMA: www.epa.govt.nz/assets/Uploads/Documents/Hazardous-Substances/Guidance/1080-Communications-Guidelines.pdf

In 2017, Māori stakeholders were consulted and notified for all 50 aerial operations on public land. Changes as a result of consultation with Māori occurred in 28 operations, as listed below:

- boundary changes were reported for 14 operations
- five operations had boundary changes due to the exclusion of sensitive sites (which can include areas such as water supply, huts, and stock that may be at risk from accessing baits)
- the timing was changed for four operations due to school holidays and lambing

- fifteen operations changed from aerial to ground application of 1080 for parts of the treatment area
- two operations added deer repellent
- the loading site was changed for one operation.

Consultation with iwi/Māori in 22 cases did not result in changes to aerial operations. This indicates that iwi/Māori participation in the early stages of 1080 operations is valuable, and operators are consulting with iwi/Māori.

Consultation with hunting groups

Hunting groups are generally consulted and notified when an aerial 1080 operation is to be carried out on public land where hunting is likely. Hunting groups were consulted in 49 out of 50 of the operations on public land in 2017 via letters, emails, meetings, and public notices.

Communications guidelines

Ministry of Health

Before granting permission for an aerial 1080 operation, HSNO enforcement officers employed by the District Health Unit (Public Health-HSNO enforcement officers) assess the consultation against the Communications Guideline for Aerial 1080 Operations. The Ministry of Health (MoH) reports the results of these assessments to the EPA.

MoH reported that Public Health-HSNO enforcement officers received and assessed 79 applications for aerial 1080 operations against the communications guideline in 2017. All these applications met the requirements of this Guideline. Fourteen of these permissions were revoked due to changes in operational details and replacement permissions issued.

Not all of the 79 applications for 1080 operations resulted in completed operations due to weather and other site-specific conditions (four operations were cancelled, and others deferred or merged).

Department of Conservation

When treating land managed by the Department of Conservation (DOC) via a 1080 operation, the operator must obtain DOC's permission and permission from the District Health Unit.

The process and requirements to obtain DOC permission can be found at: www.doc.govt.nz/get-involved/apply-for-permits/business-or-activity/animal-pest-control-operations/

In 2017 DOC issued 57 permissions for aerial 1080 operations on its lands. Eight of those permissions were not acted on because pest densities did not meet anticipated operational trigger levels, or operational objectives changed, or weather conditions prevented the operation. Of the 49 DOC permissions for aerial operations, 47 were undertaken in 2017, two further operations were undertaken in 2017 but had permissions granted in 2016. Two permissions issued in 2017 that were acted on in 2018 operations will therefore be covered under next year's report.

Monitoring

Monitoring is required to ensure public health is protected and to provide an indication of the success of aerial 1080 operations, and how they benefit New Zealand's ecosystem.

Water monitoring

If an aerial 1080 operation is within the catchment of a drinking water supply, as a result of their risk assessment to public health, the Public Health-HSNO enforcement officers may require water monitoring before intakes are reconnected. This ensures drinking water does not contain 1080 residues that exceed the tolerable exposure limit of 3.5 micrograms (0.0035mg) of 1080 per litre of water. The tolerable exposure limit is set at a level that protects human health and is based on the Provisional Maximum Acceptable Value (PMAV) in drinking water (Drinking Water Standards for New Zealand, 2005, revised 2008) MoH set the maximum acceptable value at 0.0035 mg 1080/ litre water.

Water monitoring may also be required in other water catchments as part of environmental monitoring for resource consents or for research purposes. It may also be used to provide evidence where

a Public Health-HSNO Enforcement Officer is investigating concerns about alleged water contamination. Water testing can detect levels above 0.1 micrograms (0.1 parts per billion) of 1080 per litre of water, i.e. 35 times lower than the maximum acceptable value.

Post-operational water monitoring was carried out for 19 of the aerial 1080 operations in 2017, with 63 samples taken. None of the 63 samples contained 1080 above the level of detection. Hence the tolerable exposure limit (0.0035 mg) was not exceeded in any of the sampled operations.

Since the reassessment in 2007, more than 1298 water samples from drinking water catchments and other water bodies have been analysed for 1080 (including the 2017 water samples). Operators and regulatory bodies are likely to continue to test water to verify that specific operations pose no risk to water supplies.

Species monitoring

A conclusion from the Department of Conservation quoted: “Species monitoring continues to show the benefits of timely and effective large scale interventions against pest populations. Typically, immediate positive responses in nesting success and chick survival for vulnerable bird species are recorded. Long-term studies are showing significant population increases for species such as mohua, robins, bats and whio, and reversal of population decline for species such as kiwi, fuchsia and kaka. The past decade has seen a significant improvement in the Department’s understanding of and ability to intervene to protect vulnerable species across their range.”

Pre-operational monitoring of pest species was carried out for 28 of the aerial 1080 operations undertaken in 2017.

In 26 operations, species that benefit from 1080 applications were monitored for the effects of 1080. These species included yellowhead (mohua), blue duck (whio), kea, kaka, rock wren, south island robin, morepork (ruru), grey warbler, NZ falcon (karearea) and kiwi (several species including north island brown kiwi and great spotted kiwi), at-risk populations of long-tailed bats, and vulnerable plant species such as fuchsia, hall’s totara, and kamahi and domestic cattle and deer stock. The results of some of those studies can be found at: www.doc.govt.nz/nature/pests-and-threats/methods-of-control/1080/proof-that-1080-is-saving-our-species/

Plant and animal species are monitored to determine the need for pest control operations and the success of the operations. Species monitoring is not a mandatory requirement for 1080

operations, but where monitoring is carried out, operators must report the results to the EPA.

Monitoring for species and/or ecosystem benefit and for TB presence/absence requires a long-term approach. Because operators must submit reports within six months of completing the application of bait, monitoring in most cases may not have been completed and reported on by the time the operation reports are submitted to the EPA.

Industry practices

Industry practices, as well as available enforcement methods, have largely improved since 2008.

- Operators are subject to greater accountability when conducting aerial 1080 operations.
- Permissions are granted with clearer conditions.
- Industry has developed standard operating procedures and better mapping of boundaries and exclusion zones.
- Enforcement and funding agencies have more resources for responding to public concerns.
- The majority of complaints and incidents are now reported to the EPA by operators.

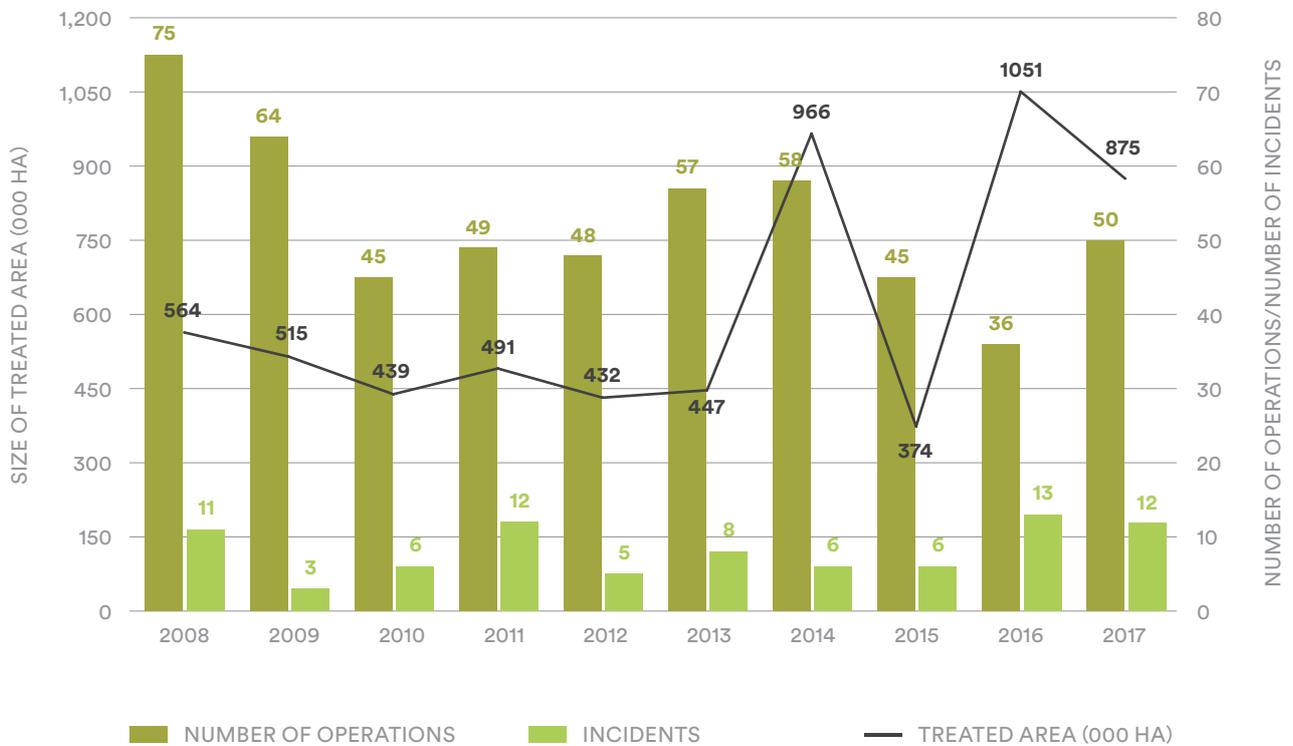
Incidents related to specific operations are described in post-operational reports. The reports for operations undertaken in 2017 are available on the EPA website: www.epa.govt.nz/resources-and-publications/1080-aerial-operators-reports/

Overview of incidents and complaints

Incidents involving 1080 are defined as any non-compliance¹³ with controls imposed on the hazardous substances under the HSNO Act; any event resulting in an increased risk to public, operator, and environmental safety; and any event that causes significant public risk. A complaint could be reported on matters not relevant to the HSNO controls.

There were 12 non-compliance incidents reported to the EPA in 2017. Figure 2 shows a comparison between total number of operations per year and total reported incidents for the past 11 reporting years.

Figure 2: History of breaches reported to EPA



All the 12 reported non-compliances in 2017 were responded to by DOC officers and/or investigated by Public Health-HSNO enforcement officers in a timely manner. None of the 12 reported incidents posed significant risk to public health or the environment. The EPA receives incident reports from operators or members

of the public on different incidents including compliance issues, public protesting and complaints. See Appendix 1, page 24 for a brief description of incidents reported to the EPA in 2017 that are considered compliance issues (listed by region, north to south).

¹³ in 2017 incidents, excluding complaints, reported on included misapplication, accidental release and overflight

Research

The reassessment in 2007 identified the need for more research on 1080 and on alternative predator-control methods.

The 1080 research that has been undertaken in the past year can be broadly categorized into that undertaken by the Department of Conservation and TBFree, the product manufacturers (Orillion and Pest Control Research), or into the categories of optimising the use of 1080, investigating alternatives to 1080 and other related research.

There are three distinct areas of research: alternatives to the use of 1080, improvements in the use of 1080, and other research related to 1080 use. Research has been funded or carried out by DOC, OSPRI (TBFree), Landcare Research, and the Ministry for Business Innovation and Employment.

This section summarises research that has occurred or concluded during the past year. It represents the latest information available at the time of publication.

A summary of the research projects reported are listed in Table 2, on page 21. A number of previously reported research projects are ongoing as collection of data over an extended period is needed to draw informed conclusions. Some of these projects have been completed, with reports and papers submitted and/or published.

The product manufacturers, Orillion and Pest Control Research, are also undertaking 1080 research and their work is summarised in the manufacturers' section.

Alternatives to the use of 1080

New projects include the development of other types of palatable bait for stoats that are suitable for aerial delivery.

The development of new control and surveillance methods are also being investigated, with the aim of achieving TB freedom in remote iwi land.

Improvements to the use of 1080

This research can be grouped into three areas: improving the targeting of pest species; monitoring the recovery of pest species; and impacts on non-target species.

Research to improve the targeting of pests and impacts on pest species continues. New projects include testing the palatability and efficacy of cereal baits with deer repellent against possums and ship rats. Work has continued with monitoring stoats above the tree line and determining if 1080 control over large areas slows re-population.

A number of projects reported are researching the impacts on non-target species. One new project is assessing the impact of bait with deer repellent on deer and tahr populations.

Ongoing projects are focused on the benefit of control operations on valued species such as nesting successes and population outcomes of rock wrens, whio, kea, mohua, long-tailed bats, and great spotted kiwi chicks.

Other related research

Other research related to 1080 use has looked at estimating the red deer population at Molesworth Station to establish a baseline population estimate for measurement of future efforts to mitigate deer by-kill if 1080 baiting was to be repeated.

Table 2: Summary of Research Projects

Alternatives to the use of 1080		
Status	Project	Organisation(s)
New	Development of aerial bait for stoats	OSPRI/Landcare Research
New	Development of alternative methods for reaching TB freedom in remote iwi land without aerial 1080	OSPRI/Landcare Research
Improvements to the use of 1080		
Status	Project	Organisation(s)
Improving the targeting of pest species		
New	Testing PCR and Orillion cereal bait with deer repellent for palatability and efficacy against possums and ship rats	OSPRI/Landcare Research
New	Testing efficiency of PCR 1080 baits on possums	OSPRI/Landcare Research
Ongoing	Strategy for 100 percent possum kill (Nugent, 2018)	OSPRI/Landcare Research/MBIE
Fieldwork completed	Operation Ark	DOC
Completed	Achieving multi-pest control by pre-feeding with non-toxic baits	DOC
Monitoring the recovery of pest species		
Ongoing	Mast at control – does aerial 1080 control stoats above the treeline?	DOC/TBFree
Ongoing	Mast large 1080 block – does aerial 1080 control over large areas slow re-population by predators?	DOC
Impacts on non-target species		
New	Impact of aerial 1080 baiting with and without EPRO deer repellent on a red deer and tahr population in Otago	OSPRI/Landcare Research
Ongoing	Safety use of pre-feed in aerial 1080 possum control for tomtit populations	DOC
Ongoing	Ecological outcomes for birds of aerial 1080 baiting for pest control	DOC
Ongoing	Does rock wren nesting success improve as a result of mast-driven predator control above the tree-line?	DOC
Ongoing	Does productivity and survival of whio through a breeding season differ before and after aerial 1080 predator control?	DOC
Ongoing	Do mast-driven 1080 operations increase great spotted kiwi chick survival enough that kiwi populations increase?	DOC
Fieldwork completed	Mast kea – is nesting success and survival improved by aerial 1080 pest control? (Kemp, Mosen, Elliott, & Hunter, 2018)	DOC
Fieldwork completed	Does mast-driven predator control maintain mohua populations at treated sites?	DOC
Fieldwork completed	Mast bats – outcome for long-tailed bats with and without aerial 1080 pest control (Edmonds, Pryde & O'Donnell, 2017)	DOC
Completed	Impact of aerially applied 1080 bait including EPRO deer repellent on sika deer population (Morris, 2018)	OSPRI/Landcare Research
Ongoing	Long-term bird population trend monitoring using Automatic Bird Recorders in Hokonui Forest 2013-2022	OSPRI
Other		
Status	Project	Organisation(s)
Completed	Estimating the deer density in Molesworth Station	OSPRI/Landcare Research
Ongoing	A scoping study has been undertaken to determine whether or not dust drift could be detected.	Ministry of Health / Environmental Science and Research

Manufacturers

1 Orillion has undertaken a number of research projects. These are associated with non-target repellents, improved bait acceptance by target animals and alternative toxins to potentially replace 1080 for some of the broad-scale aerial operations, while also substantially eliminating non-target risk. Specific research projects which are well advanced include repellents for aerial baits. Research in the earlier refinement stages include bait palatability, lures, new toxins and coatings.

Additional studies have been commissioned by Orillion to investigate the type and level of hazard associated with the storage of 1080 baits in bait stores, alternative and safer methods for mixing 1080, more precise and uniform bait production equipment and worker exposure risk.

2 Pest Control Research continues to work on projects that have previously been reported. This includes in-house research to improve the quality of its product, work on repellents, and methods to initiate and promote contact with community groups who undertake vertebrate pest control.

Published research

Three research papers were identified relating to the impacts on non-target species from 1080. The research included:

- an investigation of the mortality and survival of adult falcons with an emphasis on assessing the possible role of 1080 poisoning in annual mortality. No adult falcon death was attributable to 1080 poisoning in the study, and the risk was considered to be low. The mortality of juvenile falcons requires further study (Horikoshi, Minot, & Battley, 2018).

- a benefit study on the effects of aerial 1080 on the reproductive success of kea in a lowland rimu forest on the West Coast of New Zealand's South Island. The study found a positive effect of aerial 1080 application on kea reproductive success (Kemp, Mosen, Elliott, & Hunter, 2018).
- a benefit study over four years which monitored two South Island forest sites following aerially applied 1080 and found some conservation benefits for common forest birds (Vianen, Burge, MacFarlane, & Kelly, 2018).

One research paper identified investigates the impact of sodium nitrate, a 1080 alternative, on non-target species:

- trials were undertaken to investigate the potential secondary poisoning risks associated with encapsulated sodium nitrite (NaNO₂). It was concluded that the secondary poisoning risk from NaNO₂ appears to be minimal and the registration of NaNO₂ baits for possum and pig control should be pursued (Shapiro, Blackie, Arthur, Ross & Eason, 2018).

Papers were also identified in relation to gene drive technology for predator control. The research concerns both the development of the technology, as well as ethical issues and wider implications of the technology and its potential use (Dearden, Gemmell, Mercier, Lester, Scott, Newcomb, Buckley, Jacobs, Goldson, & Penman, 2017 and Esvelt & Gemmell, 2017).

References

- 1 Dearden, P.K., Gemmell, N.J., Mercier, O.R., Lester, P.J., Scott, M.J., Newcomb, R.D., Buckley, T.R., Jacobs, J.M.E., Goldson, S.G. & Penman, D.R. (2017) The potential for the use of gene drives for pest control in New Zealand: a perspective. *Journal of the Royal Society of New Zealand*, 48(4), 225-244, doi: doi.org/10.1080/03036758.2017.1385030
- 2 Edmonds, H., Pryde, M. & O'Donnell, C.F.J.(2017) Survival of PIT-tagged lesser short-tailed bats (*Mystacina tuberculata*) through an aerial 1080 pest control operation. *New Zealand Journal of Ecology*, 42(2), 186-192, doi: [10.20417/nzj ecol.41.20](https://doi.org/10.20417/nzj ecol.41.20)
- 3 Esvelt, K.M. & Gemmell, N.J. (2017) Conservation demands safe gene drive. *PloS Biol*, 15(11): e2003850. doi: [10.1371/journal.pbio.2003850](https://doi.org/10.1371/journal.pbio.2003850)
- 4 Horikoshi, C., Minot, E. O., & Battley, P. F. (2018). Annual survival estimates and risk of fluoroacetate (1080) secondary poisoning for New Zealand falcons (*Falco novaeseelandiae*) in a managed exotic forest. *Wildlife Research*, 45(2), 155-163. doi: [10.1071/WR17144](https://doi.org/10.1071/WR17144)
- 5 Kemp, J.R., Mosen, C.C., Elliott, G.P. & Hunter, C.M. (2018). Effects of the aerial application of 1080 to control pest mammals on kea reproductive success. *New Zealand Ecology Journal*, 42(2) In press. doi: [10.20417/nzj ecol.42.28](https://doi.org/10.20417/nzj ecol.42.28)
- 6 Morris, G. (2018). Monitoring a sika deer population with trail cameras to assess survival following 1080 baiting, Kararehe Kino Issue 31. Retrieved from the Landcare Research website: www.landcareresearch.co.nz/
- 7 Nugent, G. (2018). Rapid-repeat 'dual' 1080: Can 1080 survivors be killed with a second sowing of 1080? Kararehe Kino Issue 31. Retrieved from the Landcare Research website: www.landcareresearch.co.nz/
- 8 Shapiro, L., Blackie, H., Arthur, D., Ross, J. & Eason, C. (2018). Secondary poisoning risk for encapsulated sodium nitrite, a new tool for possum control. *New Zealand Ecology Journal*, 42(1), 65-73, doi: [10.20417/nzj ecol.42.6](https://doi.org/10.20417/nzj ecol.42.6)
- 9 Vianen, J.V., Burge, O.R., MacFarlane, A.T. & Kelly, D. (2018) The effects of single aerial 1080 possum-control operations on common forest birds in the South Island, New Zealand, *New Zealand Journal of Ecology*, 42(2) doi: [10.20417/nzj ecol.42.17](https://doi.org/10.20417/nzj ecol.42.17)
- 10 Wickham, L. and Baynham, P.(2016). A scoping study characterising dust drift from aerial application of 1080: Waimea Kawhaka, Nov 2015. Prepared by Emission Impossible Ltd and Air Quality Ltd. Insitute of Environmental Science and Research Ltd.

For more information about the research projects summarised in Table 2, see:

OSPRI TBF free programme:
www.ospri.co.nz

Department of Conservation:
www.doc.govt.nz

Landcare Research:
www.landcareresearch.co.nz

Appendix 1

Incident summaries Waikato region

The EPA received reports from operators or members of the public on different incidents including compliance issues, public protesting and complaints. This section outlines a brief description of incidents reported to the EPA in 2017 that are considered compliance issues (listed by region, north to south).

The EPA received reports on other incidents that are not considered non-compliance with HSNO controls, therefore they are not listed in this section. Details of the incidents below are as reported to the EPA by operators.

Operation: Whareorino

Type: Misapplication

Date: 29/7/2017

Bait was misapplied over a boundary and into an excluded area. The land is surrounded by the treatment area and does not differ from it in terms of habitat (native forest) or accessibility and use (remote, low use). The incident occurred because a buffer zone had not been applied to the area in question. This did not allow any leeway when flying around the boundary. The misapplication was reported to the Public Health official who considered that it did not pose any risk to public safety.

Type: Misapplication

Date: 30/7/2017

On three occasions, while using a transit point between two aerial application blocks of the treatment area, the pilot crossed out of the designated transit. Two of the occasions occurred while on return flights with empty buckets. One was on a trip with a full bucket. This incident was reported to the Public Health official, who agreed that these areas did not need to be checked, as they are remote and there is no risk to public.

Type: Spill

Date: 30/7/2017

An underslung helicopter bucket containing approximately 1000 kg of (0.15 percent 1080) cereal pellet baits was jettisoned from a helicopter. The incident occurred within the treatment area on the morning

of the second day of the operation. Sensing some mechanical failure in the helicopter, the pilot released the bucket into the bush shortly after take-off from the loading zone. The bucket loaded with baits was dropped and the resulting bait spill zone was small and in a discrete location.

The bucket location and bait spill site was accessed and secured within six hours of the incident occurring. All the spilt quantity was recovered from the site on Tuesday 1 August and transported to a secure storage area to await appropriate disposal. The nature and location of the incident was reported to the Public Health official on Sunday 30 July, who considered that there was no resulting risk to public health.

Follow up work:

The above three incidents were discussed at a DOC debrief attended by the helicopter company and the regional council. The briefing notes summarised the reasons for the deviation outside the flight corridor and the misapplication of bait into an exclusion. Both were due to GIS errors (not having a buffer on an exclusion and the flight corridor being too narrow).

These briefing notes have been shared with DOC officers and have led to the development of an aerial baiting training course for internal support staff for future operations.

Taranaki region

Operation: Waitaanga

Type: Overflight

Date: 18/10/2017

One small potential overfly of the Public Health Permission (PHP) boundary was identified by the DOC onsite GIS team member. The GPS data obtained from the helicopter showed a six-metre overfly of the PHP boundary. The area where the overflight was identified is beside SH43 through Tangarakau Gorge, on to DOC land. Two DOC staff searched through the area and did not find any bait. This was consistent with the information from the helicopter pilot.

Manawatu/ Wanganui region

Operation: Kia Wharite

Type: Misapplication

Date: 18/10/2017

The pilot was flying from the Taunoka loading site. On one run, the pilot flew too close to the treatment boundary, which may have resulted in some baits being applied outside the boundary. The calculated area that may have received baits was nine metres wide and approximately 30 metres long. This area was still within the 500 metre buffer zone between the treatment area and operational boundary.

The area where baits may have landed is remote and not easily accessible to the public. MOH advised that there are neither walking tracks through the area nor any water supplies/sources. The risk to public health was considered minimal, if any.

Wellington region

Operation: Project Kaka

Type: Misapplication

Date: 16/3/2017

Overfly of Jumbo Hut exclusion zone. DOC response team were dispatched and checked the roof, gutters, the tracks to the hut and its immediate surrounds and collected 16 baits found within the 50 metre exclusion zone.

One bait was dropped into a stream feeding into the Waiohine River. Six water samples were collected at three main public water supply intakes and tested twice. All of the six water samples were less than the method detection limit of 0.0001ug/mL for 1080.

Type: Misapplication

Date: 17/3/2017

Overfly of Neill Fork Hut exclusion zone. A DOC response team was dispatched to check the roof, gutters, the tracks to the hut and immediate surrounds. They collected six baits found within the exclusion zone.

Type: Overflight discovered after the operation

Overfly of Dorset Ridge, Powell and Totara Flats hut exclusion zones. Discovered around 21/3/2017 when reviewing GPS data. These overflies were notified late to Regional Public Health and no site checks were made of the exclusion zones. DOC estimates the number of baits applied in the exclusion zones was four, three and two respectively

Follow up work:

The regional Medical Officer of Health met with DOC staff to investigate the incidents which occurred during the Project Kaka operation. The investigation outcome was:

- 1 The Medical Officer of Health is now more closely involved in assessing applications and issuing permits, specifically for aerial operations.
- 2 Regional Public Health is tightening up its internal processes and procedures relating to the receipt, conduct of the investigation, and formal follow-up with pest control operations.
- 3 No warning letter or verbal warning was issued to DOC at the meeting, as it was clear that DOC has already updated its procedures.

Operation: Aorangi

Type: Complaint

Date: 16/6/2017

A farmer complained when he found baits in paddocks, and on tracks. During consultation, there was no mention of paddocks on DOC land where the farmer grazes stock. Contractor completed inspection of area, removed the baits found. Farmer agreed to monitor area. There was no reported stock deaths, all baits found were within consented and treatment boundaries.

Tasman district

Operation: Kahurangi West and North

Type: Potential misapplication

Date: 17/11/2017

A report was received that a recreational user of the Heaphy Track had detected 1080 bait near the track. The contractor initiated a search of the identified area and a full track inspection was carried out the following day. While no bait was located at the initial response, subsequent searches of the entire Heaphy Track exclusion corridor over the following week resulted in 1080 bait being found within the Public Health permit condition track exclusion.

The Health Protection Officer concluded that no immediate risk to public health had occurred as the result of this incident. Based on information provided by both the operator and the complainant, it was difficult to conclude definitively that a non-compliance of the permission had occurred. Evidence showed that it is very unlikely that the toxic bait found at Murray Creek was deposited due to a strong gust of wind. It was more likely that the bait was removed from the controlled area and relocated to the Murray Creek area by persons unknown.

Type: Complaint

Date: 16/6/2017

Complaint of over sowing of pre-feed bait of grounded helicopter at Heathy River edge. Complainant used helicopter to land on LINZ riverbed to go white baiting. Although aware of the operation (public notifications and air radio channels), complainant assumed that the riverbed was outside the treatment area.

West Coast region

Operation: Aryabhata

Type: Misapplication

Date: 5/7/2017

DOC reported that one 1080 pellet was sown beyond the operation area, which landed in Jackson River close to the left edge, but within the Public Health permission boundary. Water samples were tested and results were negative for 1080. As a result of this incident, DOC decided that maps used for public notification will show the full extent of the area covered by the permission rather than the proposed application area, so that the expectation is that baits be present anywhere within the permitted area.

Operation: Papago North

Type: Complaint

Date: 20/10/2017

The complainant was concerned that Punakaiki's drinking water might be contaminated by 1080. He wanted reassurance that the water source supplying the Punakaiki Rocks Café was safe to drink.

An investigation by Community and Public Health-West Coast found an aerial exclusion was in place for the supply. Flight lines for the operation showed that the exclusion was complied with. Two water samples were collected on the first day of the operation when the area close to the water supply exclusion was treated. Neither water samples contained detectable 1080.

The complainant also told the DOC officer that he had walked up Bullock Creek Road and there were 1080 pellets all over the road. As a result, he was concerned for his dogs which were on a leash.

Investigation by Community and Public Health-West Coast found that baits would have been present on Friday 27 October and were permitted to be there as most of the road was subject to a sow and clear condition. A field audit was also carried out for this operation on Friday 27 October. The audit included sign checks. Bullock Creek Road was closed by a gate and warning sign in the roadway. All 1080 warning signs were in place. The gate on the roadway was not locked but was observed to be closed at times by Health Protection, DOC officers and operators. It is, however, possible that it was opened at other times by a person or persons unknown.

Otago region

Operation: Matukituki Valley

Type: Overflight

Date: 27/10/2017

Overfly of a no-fly exclusion zone upstream of the Aspiring Hut water intake. Wind conditions at the time combined with the terrain meant the helicopter was unable to safely turn within the treatment area and was forced to fly into the Aspiring Hut water intake exclusion zone. The area was immediately checked for bait. It was confirmed that no bait entered the exclusion zone.

Type: Misapplication

Date: 27/10/2017

Bait sown outside the aerial application area in the Upper Rob Roy Valley. While sowing a boundary with a sharp turn, a helicopter sowed bait in 0.1 hectares outside the aerial application area. One bait was found and removed from outside the treatment area, (unconsented area). Further searching from within the unconsented area did not reveal any more baits.

