



Coal Island (Te Puka-Hereka) restoration plan

Derek Brown – September 2013



Department of
Conservation
Te Papa Atawhai

Cover: Preservation Inlet showing Coal Island (centre back), Steep-To Island (centre right), Weka Island (front right) and Kisbee Bay (front left). *Photo: Johan Groters*

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Executive summary

Coal Island (Te Puka-Hereka) is situated in the Fiordland National Park and administered by the Department of Conservation (DOC) through its Te Anau office. The island has been the focus of a restoration programme by the South West New Zealand Endangered Species Charitable Trust since 2004.

At 1189 ha, Coal Island is large enough to provide habitat for self-sustaining or managed populations of a wide range of threatened species. The relatively unmodified forest, as well as freshwater and coastal habitats, offer a range of possibilities for recovery and translocation of various species.

The island has never had some pest species such as possums, goats or feral cats, and while rats may once have been present, they have not been recorded in the last century. Intensive pest control efforts have successfully eradicated mice, red deer and stoats, although on-going efforts will be required to prevent re-establishment of deer and stoats.

Coal island is relatively close to three neighbouring smaller islands (Steep-To, Weka and Round), which could potentially be used as 'stepping stones' for reinvasion of Coal Island by pest species, so these have been included in the management unit for continued pest prevention and, to a lesser extent, for restoration, in recognition of their intrinsic conservation values and potential. It is recommended they are also brought into formal management agreements between the Trust and DOC. Areas of the adjacent mainland will also need to be included in long-term pest management programmes, particularly for stoats.

The primary and overriding focus for restoration of the island will be implementing long-term regimes to prevent stoats, rodents and deer re-establishing populations on the island. The relative success of these measures will (to a large degree) dictate the extent of the recovery of flora and fauna currently present, and will also determine the range of species suitable for translocation to the island.

Further survey work is required to assess the suitability of Coal Island for many species, including bats, invertebrates and lizards. Subfossil or fossil surveys are also recommended to provide information on the former (pre-human) ecology of the island and, in particular, to assess whether colonial nesting seabirds had been present. Results from such surveys would influence subsequent restoration actions, including potential translocations.

A number of candidate species for translocation are discussed, one of which (Haast tokoeka) has already been established. Some potential translocations are dependent on further actions being completed, or should be deferred or discounted for a variety of reasons, but a number of relatively straightforward transfers could occur in the short-term future. The species in this later group include mohua, robin, several rare plants and invertebrates and, possibly, saddleback (tieke), orange-fronted parakeet and some lizards.

Outstanding progress has been made on restoration of Coal Island in the relatively short time period since restoration work started in 2005, and the Trust and its sponsors and supporters should be acknowledged and praised for this. Continued sponsorship of the Trust's activities appears critical to maintaining the protection of the island from stoat and deer incursions, and to aid in funding restoration and translocation work.

Coal Island provides a wonderful opportunity for collaboration between DOC and a charitable community trust and for meaningful contributions by volunteers, supporters and sponsors from the wider public towards achieving the restoration of natural flora and fauna of the region and for selected threatened species.

1. Introduction

Coal Island is part of the Fiordland National Park, and is situated in Preservation Inlet in the extreme southwest corner of the South Island.

The Māori name for Coal Island is Te Puka-Hereka, which translates as ‘the tied anchor’.

Ngāi Tahu is the iwi with mana whenua over Fiordland National Park.

Coal Island and the Fiordland National Park are administered and managed by the Department of Conservation (DOC) through its Fiordland District Office at Te Anau. DOC is responsible to the Minister of Conservation, and manages the park under the National Parks Act 1980, the General Policy for National Parks adopted by the New Zealand Conservation Authority, the Fiordland National Park management plan, and Fiordland National Park bylaws.

The Southland Conservation Board, appointed under the Conservation Act 1987, is responsible for formulating management policy specific to Fiordland National Park (by way of the Fiordland National Park Management Plan), and for advising on the implementation of this policy by the Department of Conservation.

Coal Island is identified as a ‘biodiversity hotspot’ in the Fiordland National Park Plan, and as part of the National Park is also part of the Te Wahipounamu Southwest New Zealand World Heritage Site. It is situated in the Fiord Ecological Region, and within the Preservation Ecological District.

In 2004, a trust—The South West New Zealand Endangered Species Charitable Trust (SWNZESCT, referred to in this document as ‘the Trust’)—was formed to provide the driving force and vehicle for a pest control and restoration project on Coal Island. The Trust has full project management and operational responsibility for the project, but works in collaboration with DOC, and can access technical advice and support from DOC’s experts. DOC’s role in the restoration is largely provision of this advice and issuing legal approval to operate in a National Park, rather than directly running the project or making operational decisions.

Coal Island was chosen for restoration because of several key features that will aid the effectiveness of the operation and the resultant conservation benefits:

- At 1189 ha in area, it is a large island in conservation terms and can support self-sustaining populations of many forest-inhabiting indigenous species
- It is relatively easily accessible, being on a route regularly flown by helicopters from local companies
- In comparison with the adjacent mainland areas, the island has had only a limited range of pest animal species present, meaning current ecological values are probably higher than for the adjacent mainland, and maintaining a total ‘pest-free’ status should be relatively straightforward

After the Trust was formed in 2004, the project got underway. Its initial goals included the removal of all introduced pest mammals from the island and, through on-going monitoring and maintenance programmes, preventing these and other pests from re-establishing. Once removal of pests was accomplished and maintained, a programme of recovery, introduction or reintroduction of threatened species could begin.

The close proximity of three smaller islands—Weka or Long Island (hereafter Weka Island) (106 ha), Steep-To (60 ha) and Round (c. 3 ha)—means they could potentially provide ‘stepping stones’ for pest animals to reach Coal Island. Pest management regimes are, of necessity, being implemented on these islands, and they have intrinsic conservation values

of their own. It is recommended that the informal management that has so far occurred on these islands is formalised within the Trust's management agreement with DOC to bring them into the restoration programme for Coal Island. Pest management work on these islands will be of appreciable conservation value in its own right, as well as bolstering the security of Coal Island.

The minimum distance between Coal Island and the mainland is only around 400 m, well within the swimming range of deer and stoats. Coal and Weka islands are also within the known maximum swimming distance for Norway rats and, possibly, ship rats (Russell et al. 2008). There has been no known rat invasion of Coal Island in the last 100 years and rats have never reached Weka Island. Maximum swimming distances are probably influenced by local factors such as water temperature, tides, currents and sea conditions and the cold southern New Zealand waters around Coal Island may make these islands just beyond the capabilities of rodents.

Therefore, for both deer and stoats, the focus has been on the removal of the existing population, and the implementation of systems to prevent, detect and respond to any re-invasions in the future. For mice, the focus has been on eradication of the existing population, to be followed by advocacy and quarantine measures to limit, as far as possible, the potential for humans to accidentally reintroduce mice aboard boats, helicopters, packs or personal supplies.

For all other pest species (e.g. rats, possums, pest plants) there will need to be on-going quarantine measures to limit the potential for these species to reach Coal Island, while the stoat trapping regime will also double as a detection system for any potential un-aided or aided rat invasion of the islands.

Support for the project has been received from many different quarters, including DOC, local and regional councils, and university scientists. Significant and generous sponsorship has been received from a variety of commercial and private sponsors, as well as contributions in kind that have facilitated the restoration work to date. The continuation of sponsorships from a variety of sources is essential for the on-going pest management work and to facilitate future survey and restoration work.

2. Description of Coal Island

2.1 Status

Coal Island is classified in the Mainland Southland / West Otago Conservation Management Strategy (DOC 2000) and in the Fiordland National Park Plan (DOC 2007) as an 'open sanctuary' island. This classification has the primary conservation function as *protection and interpretation to the public of indigenous species and habitats, including those threatened by extinction or destruction.*

According to this criterion, restorative actions allow for *restoration of island or mainland communities according to requirements of indigenous plant/animal species of interest*, and translocations of species not natural to the island are *permitted according to ecological appropriateness, educational and species conservation needs, and risk to other biota in the region.*

Use by visitors and for education and interpretation is a major function for this category of island, and they are usually 'open access', i.e. freely accessible by the public, though supervision can be applied in certain situations.

Round, Weka and Steep-To Islands are classified as ‘restoration’ islands, for which the primary conservation function is: *recovery of viable populations of threatened species of particular communities*. Restoration actions allow for *restoration of island communities formerly present and extension of some still existing*, and translocation of some species not native to the islands are permitted for selected species of nationally endangered animals and plants, but is generally excluded for other species, except in special circumstances. In short, ‘restoration’ islands can be interpreted as generally more focused on restoring the original flora and fauna, whereas ‘open sanctuary’ islands such as Coal Island have a wider scope to include threatened species from further afield.

Restoration islands are generally less-suited to visitors and for education than are open sanctuary islands, but do allow *low impact activities not possible in an open sanctuary and for volunteer help with restoration work on some islands*.

In 2004, the Trust was granted a concession by DOC to undertake its planned activities on Coal Island. In April 2012, this was superseded by a 10-year management agreement between DOC and the Trust to allow the Trust to undertake its activities. These are specifically outlined in the agreement and are:

- Pest and predator eradication
- Maintenance of the existing system of marked routes (including vegetation clearance, directional signage and track markers)
- Placement of signs regarding biosecurity information for visitors to the islands
- Helicopter access to the island for the purpose of undertaking ‘non-commercial’ management activities consistent with the Trust’s objectives and the Fiordland National Park Management Plan
- Maintenance of a temporary bivvy
- Maintenance of a helipad

2.2 Physiography

Coal Island has previously been recorded as 1163 ha in size, but accurate GIS estimates show it is nearer 1189 ha (G. Coulston pers. comm.). It rises to a maximum altitude of 251 m and is a four-sided, regularly-shaped island with a long southeast side and shorter southwest, northwest and northeast sides. It is 5.7 km long and 3.1 km wide (see map in Appendix 1). The ‘corners’ of the island are all named—Moonlight Point in the northeast, Sandfly Point in the north, Lee Point in the southwest and the southern commonly referred to as Surf Point.

The island has a flattish area on its northeast side (Moonlight Flat) that rises steeply to a ridge with the highpoint of 251 m. Southward of this, four permanent streams drain the land towards the southwest in roughly parallel valleys. The streams were unimaginatively but pragmatically called No.1, No.2, No.3 and No.4 Creeks by the gold-miners of the 19th century. The second-most easterly and longest stream (No.2) originates from a small un-named lake in the northeast corner of the island. Two much smaller and un-named streams run from the highpoints north to outlets at Fishing Bay and near Sandfly Point.

The west and southwest (ocean-facing) coasts of the island have been ‘planed’ by former glacial action. Large boulders can be found strewn in various locations on the island, left by glacier action as part of the moraine debris.

The shoreline is typically steep and rocky, with few beaches or suitable landing sites. One small bay is situated to the west of Moonlight Point and is used as a regular landing point by restoration workers. Another landing point is Tim’s Landing, at the southeast corner of the island in Otago Retreat. This probably served as the main former access point to the island by lighthouse keepers and other visitors from the nearby Puysegur Point Lighthouse.

The island is exposed to the full force of southerly ocean swells, particularly on its ocean-facing southwest coast, and rolling swells and salt-spray also impact the entire coastline of the island, even at its most sheltered spots.

Coal Island is located at the seaward entrance of Preservation Inlet, and is, at its nearest point, approximately 400 m from the mainland near Puysegur Point. It is separated from the mainland by a 400 m to 1 km wide channel of water known as Otago Retreat, which extends along the entire eastern side of the island.

Coal Island is approximately 75 km to the west of the nearest sealed roads and town at Tuatapere.

Steep-To Island is just 500 m to the northeast of Coal Island. It rises to 132 m above sea level and has small, possibly permanent, streams on its southwest side, southern-most point and northwest bay. A campsite is recorded at the northwest bay (Morrison 1980).

Weka Island, maximum altitude 88 m, is approximately 1.4 km east of Steep-To Island. It has small permanent or semi-permanent streams on the northwest and western sides. A campsite is recorded from the head of Weka Cove on the western side.

A further small island (Round Island, 54 m in height) is approximately 400 m from Weka and 800 m from Steep-To, potentially providing a stepping stone for travel between the two larger islands by deer or stoats.

2.3 Climate

Climate records are not available for Coal Island itself. However, the records collected from the nearby Puysegur Point lighthouse station are directly relevant, although anecdotal evidence suggests Coal Island's climate is slightly more benign than that of Puysegur Point. In general, the climate can be regarded as cool, wet and windy. Being low-lying, with the mainland ranges nearby also being of relatively low altitude, the orographic rainfall is lower than for more northern parts of Fiordland.

Based on data from the automatic weather station at Puysegur Point from 1992 to 2012, the annual mean daily temperature at Puysegur is approximately 11°C.

Rain falls on more than 200 days per year, with a mean annual rainfall of 2172 mm (range 2909–512 mm).

Winds are often strong and gusty, with average speeds of 28.9 km/hour (~15 knots), making it one of the windiest spots in New Zealand. Winds around Coal Island tend to be most commonly from the northwest and southwest quarters.

Snow, hail, fog and thunder all occur on average between 4 and 7 times per year, though this can range widely from year to year.

2.4 Soils and geology

The soils of Coal Island are described as southern and gley podzols, which are widespread in Fiordland on wet coastal hills under podocarp-broadleaf forest. They are classed as Tautuku soils, yellow-brown earths that are weakly to moderately podzolised. Podzols are formed in high-rainfall areas by the leaching of minerals into lower sections of the soil. The soils on Coal Island are low pH (highly acidic), strongly leached and often nutrient-deficient (e.g. lacking phosphates), and often have subsoil accumulations of iron and humus, which is characteristic of podzolisation. They are deep but poorly drained, and are clay-rich.

The following notes on geology owe much to a report by Jon Lindqvist who first visited the island as a University of Otago research student in 1973. He returned to re-examine the geology as a volunteer for the Trust in December 2007.

Coal Island comprises three geological parts:

Ordovician slate, sandstone, and quartz veins

The oldest rocks of Coal Island are slate and sandstone of the Ordovician age (488–444 million years ago (mya)) found along the shoreline south and northwest of Moonlight Point. Originally deposited as deep-sea mud, the dark grey to black slate contains rare fossil graptolites (small colonial planktonic animals) that are now extinct and have no known modern relatives. These fossil organisms are the oldest known fossil type found in New Zealand. Interlayered with the slate, sandstone layers were deposited as turbidity currents—dense, sediment-laden flows that today periodically carry sand and mud from the continental shelf to the deep ocean floor. The Ordovician rocks around Preservation Inlet have been weakly metamorphosed during deep burial and heating related to nearby granitic rock intrusions.

Associated with the Ordovician rocks, white quartz veins (up to 50 cm or more thick) cut across the original bedding at various angles. Although quartz veins have been mined for their gold content elsewhere around Preservation Inlet, none appear to have been mined on the island.

Mid-Cretaceous rift lake deposits

Most of the island is underlain by layered sandstone and mudstone that was deposited mid-way through the Cretaceous period (c. 100 to 90 mya). Softer than the Ordovician rocks, the Cretaceous sedimentary rocks formed during an episode of continental drift when segments of the earth's crust now occupied by New Zealand and Australia parted from Gondwanaland, the former continent that also included Africa, South America, Antarctica and India. The outcrop belt of Cretaceous sediments extends from Gulches Head at the north entrance of Preservation Inlet, to Coal Island, across Otago Retreat to Puysegur Point, and southeast to Gates Harbour. Also deposited largely from turbidity flows, but in a continental rift lake setting, individual 'turbidite' beds typically show an upwards gradation from coarse gritty sand at the base to silty mudstone at the top. Although deep-water lake sediments predominate, some of the rock succession on Coal Island and Gulches Head formed in swampy river deltas where peat accumulated. The resultant thin coal seams near Sandfly Point likely gave the island its English name. Related rocks are found along Pororari River and Buller Gorge in Westland, and in many offshore basins.

Quaternary deposits and landscape features

The third and youngest geological division is represented by gravel deposits and landforms that are related to successive glacial advances and recessions during the last few hundred thousand years. A layer of bouldery sand exposed about some 70 m above beach level along the western shore of the island was probably deposited during a time of global warmth and slightly higher sea-level about 125–80 thousand years ago commonly called the 'Last Interglacial Period'. This beach deposit provides a measure of the amount of uplift Fiordland is undergoing due to tectonic plate interactions. The western coast beaches and shallows around Moonlight Point are littered with granite boulders, some approaching truck-size. The boulders were transported tens of kilometres by glacial ice that probably never completely overrode the island. Formed during warm interglacial periods of high sea level, some remnants of higher terrace flats on the island are crisscrossed by the remains of water races that were hacked through heavy forest during the late 1800s to aid gold recovery. To get at gold in the stream beds, the miners had to toil long and hard to remove boulders, stacking them neatly in walls that survive today.

3. History of Coal Island

One of the earliest Māori settlements of the Fiordland area was made by the Waitaha people, who are believed by many to have settled directly in Te Wai Pounamu from Hawaiiki on the Uruao canoe. Later migrations of Ngāti Māmoe into the area from the east coast of the North Island slowly absorbed Waitaha, until no distinct separation of the more ancient group was possible. In a similar way, Ngāi Tahu later migrated from the North Island and absorbed Ngāti Māmoe. Today Ngāi Tahu therefore represents the three principal historical tribes of Te Wai Pounamu, Waitaha, Ngāti Māmoe and Ngāi Tahu.

Evidence of Māori use of the area has been widely recorded. Although no sites have been located on Coal Island, the relative lack of dry caves for preservation of materials and subsequent land disturbance by miners may well have meant evidence was obliterated by weather or subsequent activity before any historical investigations occurred. Coal Island was known as ‘Te Puka-Hereka’ to early Māori. The Beggs, in their 1973 book ‘Port Preservation’ (Begg & Begg 1973) report that another early name for Coal Island may have been ‘Kārehu a Tamatea’ (the spade of Tamatea). Tamatea was a legendary early Māori explorer.

A dry cave on Round Island was discovered in 1971 to hold beautiful examples of pre-European flax weaving (a basket and cordage). Such finds are extremely rare and provide an insight into material culture not usually available. The materials were removed from the site by the finder, and deposited in the Southland Museum and Art Gallery.

Steep-To Island was considered to have been a popular Māori camping site, with numerous caves for shelter.

In 1809, the American sealing captain Eber Bunker charted the south coast of Fiordland and gave the name of ‘Preservation Harbour’ to what is now known as Preservation Inlet. Coal Island was originally called ‘Preservation Island’ by the early European visitors.

Sealers and whalers were present in the area during the early decades of the 1800s. A whaling station—one of the first shore whaling stations in New Zealand—was established in nearby Cuttle Cove in Preservation Inlet in 1829, but although relatively successful, taking an average of 40 whales per year, it was abandoned by 1838. Evidence of former sealers’ presence on Steep-To Island was found by the Beggs in 1969, with various artefacts associated with sealing found, along with signs of former inhabitation.

Coal was discovered on Preservation [Coal] Island in 1851 by Dr Charles Forbes, the surgeon of HMS *Acheron*, a paddle steamer tasked by the British Admiralty with mapping the west coast of the South Island. Preservation Island was renamed by Captain J.L. Stokes of the *Acheron* in honour of Forbes’ find. Although coal-mining was carried out from 1867 to 1872 as a result of the discovery, the miners suffered various depredations and mishaps and eventually abandoned the work. The government geologist Dr James Hector visited the island in 1873 and deemed the coal seams on the island not to be of sufficient quantity or quality to sustain further development, and finds of coal elsewhere in Southland further reduced the economics of coal extraction on the island.

Gold was discovered in Preservation Inlet in 1868, with traces being found on Steep-To Island. Gold was subsequently found on Coal Island in 1887 by an assistant lighthouse keeper from Puysegur Point. (He subsequently lost his job as he was too busy mining the gold!) Over the following years a number of miners arrived on the island to mine the four streams, and at one time there may have been up to 70 men based on the island. In the first year of mining, over 400 ounces (c. 11 kg) of gold was recovered. One of the largest gold nuggets ever discovered in New Zealand was found on the beach at Moonlight Point, reportedly weighing-in at 16 ounces (c. 450 g).

Extensive archaeological and historical evidence still remains of the coal and gold workings and the associated dwelling areas. The known sites are recorded in the NZ Archaeological Association digital Site Recording Scheme, and by Petchey (2004), but it is quite feasible that other sites are yet to be discovered. The recorded sites are listed in Appendix 2 of this plan.

A cottage using hand-hewn wood slabs for cladding which was possibly built in 1907 by Percy Seymour, a gold prospector. It has also been suggested that it was built by Tim Smith (Hall-Jones 1982:10). This hut was used again in the 1940s by a former mental asylum patient, until his attack and arson attempt on the Puysegur Point lighthouse in 1942 forced his arrest and removal. The hut was still present in 1969, but in a semi-dilapidated state. No recent updates are available on its current status. Traces of its former garden with wild-growing thyme, daffodils and buddleia were evident in 1969.

The Moonlight Point gold-mining area, the coal mine and seams and the slab hut are all recorded archaeological sites. Petchey found four more sites—alluvial goldmine workings in No. 2 and 3 creeks, hut sites near No.2 Creek, and a small corrugated iron hut in advance state of decay at Tim's Landing, on the eastern coast approximately 1 km up from the southern point.

Thirteen archaeological sites are recorded on Weka Island, sixteen on Steep-To and one site exists on Round Island. Those on Weka Island are predominantly Māori occupation sites, but two relate to gold-mining or prospecting. The Steep-to Island sites are also mostly Māori occupation sites, but six include gold-mining or prospecting. Appendix 2 provides a complete listing of known sites.

As the recorded sites suggest, gold was also mined on Steep-To Island, and one claim there was deemed to be amongst the richest alluvial diggings in Preservation Inlet.

The Preservation Inlet area in general has many historic values, with various recorded Māori sites, along with temporary European settlements at Cromarty and Te Oneroa, and the Puysegur Point lighthouse, which was manned from 1874 to 1989, and which continues to operate automatically.

3.1 The ecological situation prior to pest control

As a large island in close proximity to the mainland, and almost certainly linked to the mainland at some stage in recent geological history, Coal Island could be expected to have held populations of most of the flora and fauna that originally inhabited lowland areas of Fiordland. However, while records are unfortunately scant from the island itself, there is a wealth of information from the general Preservation Inlet area.

According to an Otago Daily Times reporter in 1890 (Begg & Begg 1973), kiwi and weka were reported in large numbers on Coal Island. Robins were also common and described as very friendly. Kākāpō and mohua were also reportedly present, but original references have not been able to be verified by the author. The species of kiwi present was not recorded, but Atkinson & Taylor (1992) indicate it was the little spotted kiwi (the scientific names of all fauna mentioned in this report are listed in Appendix 3).

Rats were anecdotally noted as being present on Coal Island during the gold-mining era, and were described as *numerous...and nothing was safe from their marauding* (Begg & Begg 1973). Extensive checks in more recent times have failed to locate or record any sign of rats. It is possible (but in the author's view unlikely) that the early record mistakenly identified mouse damage as rat damage. More feasible is that the rats were eliminated by a subsequent invasion of stoats. Norway rats have been recorded as being eliminated by a subsequent invasion of stoats on D'Urville Island in the Marlborough Sounds, and

on Resolution Island in Fiordland, and it is feasible something similar occurred here, as Norway rats (the species most likely to have established during sealing, whaling or gold-mining activity) are highly sensitive to stoat predation. Extermination of the rats may not have been instant, but occasional irruptions (temporary surges in populations) of stoats in beech-mast years could well have seen the eventual end of the rats. Mice tend to be more resilient to stoat predation, as they can seek refuge in cavities inaccessible to larger-bodied animals such as stoats.

It is also likely that the pet dogs of the miners had a significant effect on ground-dwelling birds such as kiwi and weka (and possibly other species such as ducks and some seabirds) and may have contributed to their local demise, while also severely reducing populations of penguins and other species still present on the island.

It seems likely that fault does not entirely lie with the animals, though, as it can be surmised that the presence of up to 70 hungry, hard-working but poorly provisioned miners on the island for some years also had an impact. They no doubt contributed hugely to the local extermination of kākāpō, kiwi and weka. As an example in Begg & Begg (1973), G.V. Biggar, a miner walking on a return from the Inlet in 1896, stated that at nearby Grace Burn *we made our supper from some kakapo and kiwis which our dog had caught, cooking them in a Maori umu or oven. To those who have never tasted fowl cooked in this manner I must say they have missed a treat.*

Similarly, at Cromarty *kiwis and kakapo abounded* at the time the township was established in 1892, but they were *continually eaten and hunted and caught as an important part of the miners' diet.*

Several early visitors or residents noted the abundance of other birds in the area—native thrushes [piopio], crows [kōkako], and saddlebacks were described as very plentiful in Chalky and Preservation Inlet, while parakeets, kākā and pigeons were described as being in the *millions and millions.*

Given its location, it is surprising that no burrowing seabird colonies have been recorded from Coal Island. However, if they had been present they may well have been wiped out with the arrival of rats and/or stoats, and the range of species present may have been limited to larger species capable of tolerating the presence of weka. Several species of Procellariiformes (tube-nosed seabirds that include shearwaters, prions and petrels) are known to breed in the vicinity of Coal Island—sooty shearwaters, mottled petrels and broad-billed prions are still present and breeding in a few remnant island refuges within Fiordland and, possibly, within Preservation Inlet itself.

Gold extraction methods used on Coal Island were apparently very damaging to the environment. The gold often lay 1.5–6 m below the surface of the soil, on top of a layer of ancient sandstone. To access the 'pay-dirt', the trees had to be removed, along with upper layers of soil and boulders. Sluicing of the pay-dirt could only occur once this removal task was completed. The streams were probably dammed and modified in the course of this activity, and the lake was used to provide the water source for some sluicing. This damage was obviously temporary, as regeneration of the native vegetation has all-but repaired the effects, but it was probably locally severe, and the creeks may have been severely disturbed at times.

It is unclear when deer and mice arrived on Coal Island, but both species were probably present for many decades before this restoration project got underway.

Anecdotal information suggests that rodents were 'not found' on Weka, Round and Steep-To Islands in a c. 2006 survey, indicating that they may be rodent-free, but DOC records for this survey were not locatable. While it appears likely that the islands do not have rats, the information is contradictory on the possible presence of mice. The DOC Southland Island

Database had ‘unknown’ rodent status for these islands. The islands’ current rodent status is probably ‘nil’, but the situation is not totally clear, and requires further research. Lack of rodents could be an important factor in aiding the preservation of original invertebrate and lizard communities.

Atkinson and Taylor’s (1992) report ‘Distribution of alien mammals on New Zealand islands’ lists deer as present on Steep-To and suspected of being present on Weka, and goats having been eradicated from Steep-To. No details are provided of rodent status on either island, or any information on Round Island. Table 1 summarises the pest species situation on Coal Island and its neighbouring islands prior to 2005.

Goat droppings were reported as still being present in caves on Steep-To Island in 1978, but no live animals were seen (Morrison 1980) or have been reported since.

Deer had previously been removed from Weka Island (pre-DOC, but dates unknown) by the New Zealand Forest Service and/or the Department of Lands and Survey (A. Cox pers. comm.).

Rat ‘chews’ were seen on miro fruit on Weka Island on one or both of two visits to the island in 1978 (Morrison 1980). It is not clear how certainly this sign could be attributed to rats, nor how extensive the sign was. No live rats were recorded despite two nights being spent on the island by the two-person team. It is also conceivable that rats may have once been there and/or periodically swim to the island but have been eliminated by stoats.

Table 1. Summary of knowledge about mammalian pest species on Coal, Weka, Steep-To and Round Islands and the neighbouring mainland prior to 2005.

SPECIES	LOCATION				
	COAL ISLAND	WEKA ISLAND	STEEP-TO ISLAND	ROUND ISLAND	ADJACENT MAINLAND
Stoat	✓	✓	✓	? (Within swimming distance)	✓
Mice	✓	?	?	?	✓
Rat species	? Early records, unknown species	Within swimming distance? ‘Rat-chews’ previously recorded	o	o	✓
Deer	✓	E	Formerly present.	? (Within swimming distance)	✓
Goats	o	o	E	o	?
Possum	o	o	o	o	✓
Feral cat	o	o	o	o	✓
Feral pig	o	o	o	o	✓

[Key: ✓ = present, E = eradicated, ? = unknown status, o = not known to have ever been present.]

4. The current ecological situation on Coal Island

Until recently, there was limited information on the ecological values of Coal Island, and very few trips have been made to the island in recent years to intensively study the flora and fauna. This is being remedied as part of the overall restoration strategy, but there is still a dearth of information on some species.

However, in spite of the previous effect of miners, introduced predators and browsing animals, it is known that the island still harbours a wide range of indigenous species, including several threatened species (see Tables 2, 3 and 4). Its ecological value is no doubt enhanced by the relative intactness of its forest cover, and by some of New Zealand's pest species (such as possums, ferrets, feral cats, pigs and goats) never having been present.

4.1 Vegetation and flora

All plant species mentioned in this report are listed, with their scientific names, in Appendix 4.

Coal Island's principal habitat type is mixed podocarp-broadleaf forests, with a protective fringe of salt-tolerant coastal shrubs in places. Coal Island also provides a variety of other habitats, including a small (c. 3 ha) lake, at least four permanent streams and a variety of coastal types, meaning restoration efforts may not only benefit forest-inhabiting species, but a variety of coastal and freshwater species as well.

Coal Island is a relatively unmodified island, with a healthy cover of native forest, dominated by large specimens of podocarp species—rimu, Hall's tōtara, and miro. Also present are southern rātā, kāmahī, mountain beech and silver beech.

Five-finger, pigeonwood, and broadleaf/pāpāuma are also common components of the forest. Coastal forest of olearia (*O. angustifolia* or tētēaweke, and *O. colensoi*, leatherwood) occurs in more exposed sites. Relatively small modified areas exist (grassland and regenerating shrubland), possibly as a result of previous human occupation associated with gold-mining.

There was a botanical survey and vegetation monitoring trip to Coal Island in May 2005 (Rance 2005, Rogers & Rance 2005). Five broad habitat types were recorded by Geoff Rogers and Brian Rance in 2005, these being rimu forest, mountain beech forest, a mixed mountain beech-rimu association, a species-diverse coastal forest and coastal shrubland. A total of 168 species of native vascular plants have been recorded.

Deer have significantly altered the distribution and abundance of some plant species on the island, with 20 or more species having retreated to deer-inaccessible sites, including five-finger, raukawa, broadleaf/ pāpāuma, lancewood, māhoe, large-leaved *Coprosma* spp., hen and chicken fern and astelia lilies.

Six of the plant species recorded, including three species of mistletoe, are nationally threatened. The island is significant for having good populations of these mistletoes (Rogers & Rance 2005). Populations of all these species appear reasonably healthy, although at least one—the shore carrot *Anisotome* sp.—has suffered considerably from deer browsing. The mistletoes and orchid in particular have benefited from the island never having had possums present.

Also of note is the presence of the regionally rare green mistletoe *Ileostylus micranthus*, and of the possum- and deer-sensitive tree *Raukawa edgerleyii*. Both are likely to have declined as a consequence of deer browsing. It is probable that one rare species, punui *Stilbocarpa lyallii* ('At Risk—Recovering'; Townsend et al. 2008) has been browsed to local extinction by deer. Table 2 lists threatened plant species present on Coal Island.

Some 19 species of introduced plants are present on Coal Island. Only one (chickweed) is found in the island's forest interior while most are found on the more open coastlines of the island. Only two species—gorse and tutsan—are considered to be potential ecological problems.

Round Island has a canopy to 15 m of rātā, rimu, miro, kāmahī and Hall's tōtara forest. Weka Island has rātā-kāmahī, Hall's tōtara, rimu, miro and silver beech. Steep-To Island has rātā-kāmahī forest with Hall's tōtara, rimu and miro, (Morrison 1980), but no detailed vegetation reports are known for these islands.

Table 2. Threatened plant species present on Coal Island.

SPECIES	STATUS*	LOCATION/ABUNDANCE
<i>Drymoanthus adversus</i>	At Risk, Naturally Uncommon	A small epiphytic-growing orchid, recorded from only a few plants at one site on the western side of the island. It is likely to be more widespread but is difficult to observe.
Yellow-flowered beech mistletoe	At Risk, Declining	Yellow-flowered beech mistletoe is relatively common on its mountain beech host, which is scattered throughout the island's forests.
Scarlet flowered mistletoe	At Risk, Declining	Scarlet flowered mistletoe is relatively common in parts of the island where its host, silver beech, occurs. However silver beech is less common than mountain beech on the island.
Red flowered mistletoe	At Risk, Declining	Red flowered mistletoe is uncommon on the island. Its host is silver beech.
Native sow thistle	At Risk, Relict	This sow thistle was recorded from scattered sites on beaches and coastal rocks along the northern shore of the island, west of Moonlight Point.
Shore carrot	At Risk, Declining	Native shore carrot is locally common around the western coast. It is a palatable species and has been much reduced by deer browsing. Most plants observed were small in size and most restricted to inaccessible outcrops of coastal rock.

* In order of conservation priority, the rankings used in this document and in Tables 2, 3 and 4 follow the New Zealand Threat Classification System (Townsend et al. 2008) and are (from highest to lowest conservation priority): Nationally Critical, Nationally Endangered, Nationally Vulnerable, and At Risk (subcategorised into Declining, Recovering, Naturally Uncommon and Relict). More common species not in these classes are deemed Not Threatened].

4.2 Fauna

The arrival of stoats and mice on Coal Island almost certainly had a major effect on the wildlife formerly present on the island. The native fauna that remains are the species that could cope, at least to some degree, with predation from these species, although many populations may have been severely repressed and may only now (since pest control started after 2004) be recovering.

Little is known of the current ecological values of Steep-To, Weka and Round Islands. They probably also contain the rare mistletoes. Steep-To in particular is an island for which trapping records show so far that stoats are infrequent visitors. This and the other smaller islands may have very significant value for invertebrates and lizards as they may never have had rodents present.

Currently, 12 threatened species of fauna (10 bird species and two freshwater fish) are confirmed as being present (or recently present) on Coal Island. Several others may be present but have not been confirmed.

4.2.1 Marine mammals

Pinnipeds (fur seals, New Zealand sea-lion, elephant seal and leopard seal) almost certainly use Coal Island from time to time, and were probably much more prevalent prior to the sealing era in the late 1800s, but few records are known from Coal Island or Weka, Steep-To and Round Islands. There are reports in the Southland Island Database of seal haul-outs being present on Coal and Weka Islands.

4.2.2 Bats

Native bat species (all of which are threatened species) could feasibly be present, but this is unlikely due to the former presence of stoats and rodents, and is yet to be confirmed.

4.2.3 Birds

Several rare species are still present on Coal Island. The New Zealand falcon (the southern form, 'Nationally Endangered') has been regularly seen on the island. Similarly, kākā are regularly present in small numbers, but it is currently unclear whether any breeding pairs exist (kākā are cavity nesters and nesting females are particularly vulnerable to stoat predation, so remnant populations are often heavily skewed towards aged males).

Fiordland crested penguins utilise Coal Island for nesting. A total of 17 nests and 23 adult birds were noted in one cave during a survey in August 1992 (McLean et al. 1993). Steep-To Island also has a breeding population, with five birds seen in a partial survey of its coast in 1992, while Weka Island held 11 nests and 18 adult birds. McLean et al. suggested that, combined, the three islands provide the entire known breeding sites for Fiordland crested penguins in Preservation Inlet, and approximately 2% of the entire world breeding population for the species. However, they are also reportedly present in good numbers on the nearby Cording Islands (D. Goodhue pers. comm.).

A small number of Haast tokoeka are present on Coal Island (the result of translocations carried out since 2009).

Kingfishers, paradise shelducks, shining cuckoos (all 'Not Threatened'), pipits and southern little blue penguins (both At Risk, Declining) and brown skuas (At Risk, Naturally Uncommon) are amongst the species known to be present in the Preservation Inlet area and likely to be present at times on Coal Island but which have not yet been formally recorded as present.

Few introduced birds are established, with only blackbirds and chaffinches being recorded in baseline monitoring (Gansell 2006), but dunnoek, greenfinch and goldfinch have also been recorded (Morrison 1980), while other introduced species (e.g. yellowhammers, redpolls, thrushes) are probably also present at times, but have not been formally recorded.

Few bird records are available for the smaller islands, but Round Island has sooty shearwaters (a few burrows on higher slopes) and Fiordland crested penguins present, with bellbirds and pigeons also recorded (Morrison 1980).

Steep-To Island has the Fiordland crested penguins, bellbirds, pigeons, tomtits, fantails, silvereyes, grey warblers, blackbirds, little shags, variable oystercatchers and black-backed gulls. Table 3. lists bird species currently known to be present on Coal Island.

Weka Island has Fiordland crested penguins, pied shags, kākārīki, bellbirds, tomtits, fantails, grey warblers, moreporks, southern black-backed gulls and kererū. (Morrison 1980).

Table 3. Bird species currently known to be present on Coal Island.

SPECIES	STATUS*	COMMENTS
THREATENED SPECIES:		
NZ falcon (southern form)	Nationally Endangered	Present in low numbers, breeding unconfirmed
South Island kākā	Nationally Endangered	Present in low numbers, breeding unconfirmed
Fiordland crested penguin	Nationally Vulnerable	Breeding in small to moderate numbers
Pied shag	Nationally Vulnerable	Present. Unclear if breeding occurs on the island.
Rifleman	At Risk, Declining	Present and most probably breeding
White-fronted tern	At Risk, Declining	Present but breeding status unclear
Long-tailed cuckoo	At Risk, Naturally Uncommon	Present seasonally in low numbers, probably breeding
Little shag	At Risk, Naturally Uncommon	Present. Unclear if breeding occurs on the island.
Black shag	At Risk, Naturally Uncommon	Present. Unclear if breeding occurs on the island.
Variable oystercatcher	At Risk, Recovering	Present. Unclear if breeding occurs on the island.
NON-THREATENED SPECIES:		
White faced heron	Not Threatened	
Black-backed gull	Not Threatened	
Kākāriki (yellow-crowned parakeet)	Not Threatened	
Kererū	Not Threatened	
Tūī	Not Threatened	
Bellbird	Not Threatened	
Fantail	Not Threatened	
Brown creeper	Not Threatened	
Grey warbler	Not Threatened	
Tomtit	Not Threatened	
Morepork	Not Threatened	
Silvereye	Not Threatened	
Blackbird	Introduced, Not Threatened	
Chaffinch	Introduced, Not Threatened	
Goldfinch	Introduced, Not Threatened	
Greenfinch	Introduced, Not Threatened	
Dunnock	Introduced, Not Threatened	

4.2.4 Reptiles

No lizards have been seen on Coal Island (Don Goodhue pers. comm.). The lizard and invertebrate fauna have not been surveyed adequately, and the presence of any threatened species in this category is unknown.

4.2.5 Freshwater species

The relatively unmodified streams and lake on Coal Island may have significant value for indigenous fish and other freshwater species. As for the terrestrial flora and fauna, the freshwater ecosystems clearly warrant further survey. It is not likely that introduced fish such as trout are present on the island, and if it is free of such fish, the value of the island to native fish could be appreciable.

The habitat in the lake and stream ecosystems will have been locally modified by mining in the past, but it is likely that many freshwater values still occur in a near-natural state. A brief freshwater fish survey was undertaken in 1986 in the small stream near Sandfly Point, and it recorded kōaro, banded kōkopu and long-finned eel (Table 4), but the larger streams and lake do not appear to have been investigated at all. It is highly probable that other freshwater fish species occur.

Table 4. Freshwater fish of Coal Island.

SPECIES	STATUS	COMMENTS
Long-finned eel	At Risk, Declining	Present in one stream. Probably present in other streams and the lake.
Kōaro	At Risk, Declining	Recorded present in one stream. Probably present in other streams and the lake.
Banded kōkopu	Not Threatened	Recorded present in one stream. Probably present in other streams and the lake.

5. Coal Island restoration

5.1 Restoration goals

The Mission Statement Operational Aim and Objective of the Trust, as stated in its project profile and newsletters, is:

To fund and establish a world class sanctuary on Coal Island for rare and endangered native species of flora and fauna that will be jointly developed by private philanthropists, corporate and government participants.

Goals 3 and 5 of the Trust's project profile were the objectives of the 2005 pest management plan:

To clear Coal Island of introduced pests and predators;

and

To prevent the re-invasion of a permanent stoat and deer population

This will enable the attainment of another stated goal (Goal 4) of the project, which is largely the focus of this Restoration Plan:

To introduce a suitable range of rare and endangered native birds, plants and wildlife.

In the author's view, this last goal should be amended to incorporate the range of species currently present on the island and locally that may re-colonise the island without assistance. It would perhaps better reflect the overall restoration aim by saying:

To allow the natural recovery of the current flora and fauna, and the natural re-colonisation or assisted translocation of a suitable range of rare and endangered native birds, plants and wildlife.

5.2 Progress on restoration

Restoration of the island's ecological values was initiated in 2004, with the establishment and incorporation of the South West New Zealand Endangered Species Charitable Trust, which specifically 'adopted' Coal Island as the focus of its efforts. This prompted the following activities:

- An archaeological assessment of the island in 2004 (Petchey 2004).
- A pest management plan developed in 2005 to outline the proposed pest eradication methods and potential restoration goals for the island (Brown 2005).
- A botanical survey and baseline vegetation monitoring carried out by Brian Rance and Geoff Rogers in 2005 (Rance 2005; Rogers & Rance 2005), and re-measured by Geoff Rogers in 2009.
- Establishment of approximately 15 km of tracking on Coal Island by a team of 16 volunteers in 2005. This created a network of 3 tracks (Pratt's, Johan's and Otago Retreat) suited for the island-wide placement of stoat traps, and for general access for other necessary activities such as deer hunting and wildlife monitoring (see map in Appendix 1 for trap locations as of June 2013).
- Placement of approximately 132 stoat traps on the island (at a low density of approximately 1 per 9 ha) in early 2005. These were pre-baited four times with hens eggs and venison, with a bait take recorded as high as 95%. Traps were set in August 2005, and 21 stoats were caught on Coal Island in the first trapping session. Later trap checks in November 2005 and January 2006 caught a further 14 stoats, but no further animals were caught on the island from mid 2006 to the beginning of 2010. Ten stoats were caught on Coal Island in Feb/May 2010 following a beech-mast event, almost certainly all due to reinvasion. To February 2013, a total of at least 45 stoats had been caught on Coal Island alone, with unconfirmed reports of another 3 caught in 'informal checks' post 2006 by the Kisbee Lodge caretakers, and one in 2012 (unconfirmed, E. Loe pers. comm.), making a probable total of 49 stoats caught since 2004.
- Placement of stoat traps on Weka, Steep-To and Round Islands in 2005. These were also pre-baited and then set in 2005 (Weka: 8 traps, 4 stoats caught, Steep-To: 6 traps, 1 stoat caught and Round: 1 trap, no stoats caught). These traps have been permanently present and in operation since that time, with checks programmed for every four months. To May 2010, 10 stoats have been caught on Weka Island, but none on the other two islands. [No records occur after May 2010 for the small islands].
- Installation of stoat traps on the mainland adjacent to Coal Island. A trap-line of 35 traps (unknown spacing between traps) was installed on the mainland to the east of Coal Island (the Te Oneroa - Fuel Store trap-line) in 2005 in an attempt to reduce the densities there and the possibility of invasion of the island from that quarter (see map in Appendix 1). Seven additional traps were sited at the Lighthouse and four more at Docherty's North opposite Weka Island. The major mainland trap-lines were revised (to become accessible by land not just via boats) and added to in 2009, with a further 40 traps added on the Morning Star track and 31 on the Painted Trail. A total of 117 traps are now on the mainland, and to February 2013 they have caught 224 stoats (and 185 rats).
- Establishment of an emergency bivouac on Coal Island (at Moonlight Point) in 2006 for use, as necessary, by field parties.
- Initiation of targeted deer hunting (with the intent of eradicating the resident population) on the island in 2006. Professional hunters (Hunt South) in three short hunting trips killed 24 deer early in the year, another 21 in August 2006 and a further 17 in July/August 2007. Another 13 were shot (unknown by who or when), as Trust newsletters report 75 deer were shot by the professional hunters in total but

complete records are not available to the author. Recreational (volunteer) hunters shot numerous deer in the lead-up to the targeted campaign, including some aerially hunted, but numbers were not officially recorded (D. Goodhue pers. comm.). The aerial drop of bait for mice in 2008 may have killed any remaining deer, although it was likely that at that stage there were very few left. A 'bait-minding' team on the island immediately before the aerial bait drop shot one deer in July 2008, and this is the last reported sighting.

- Successful eradication of mice using two aerial drops of bait containing brodifacoum in July–August 2008 (Trust Newsletter #24, January 2011). At the time, Coal Island was the largest island in the world ever cleared of mice, but this has now been surpassed by Rangitoto/Motutapu and Macquarie Island.
- Introduction of Haast tokoeka from 2009.

5.2.1 The current pest situation

The pest situation on Coal Island prior to 2005 is summarised in Table 1. The current pest situation (April 2013) is as follows:

Mice—Eradicated from Coal Island, and not seen there since 2008. Presumably not present and never present on Weka, Round or Steep-To Islands

Deer—None seen on Coal Island since 2008. None reported from the smaller islands for many years.

Stoats—The last stoat caught in traps on Coal Island was in May 2010. None have been recorded since. The last stoat caught on Weka Island was in May 2010, and the only stoat caught on Steep-To was caught in 2005. No stoats have ever been caught on Round Island.

5.3 Management threats—control of pest species

5.3.1 Weeds

The removal of deer and mice from Coal Island could feasibly increase some weed issues there, as their range or abundance may have been limited by browsing or consumption of seeds by these animals, but this is considered unlikely because of the island's intact indigenous vegetation and the lack of nearby seed sources.

While there are 19 recorded exotic plants on Coal Island, only two are considered to be of concern. Gorse is present in low numbers of seedlings at two sites. These are being controlled annually by DOC Te Anau (R. Ewans pers. comm.). Tutsan is the only other exotic species of potential weed concern, but currently appears not to be widespread or abundant. Only two plants were found by botanists in 2005, and both plants were removed (Rance 2005).

Dense regrowth of native understorey plants and saplings is likely to shade out any weed infestations within the forest but not on the coastal margins or coasts.

Recommended management actions for weed species:

- Continue annual gorse control programme.
- Obtain tutsan locations from Brian Rance, and conduct surveys to locate these, obtain GPS references, and initiate monitoring and control
- Check places where weeds are most likely to occur, such as the old hut site, for any remaining exotic plants (e.g. buddleia was recorded there in 1969)
- As recommended by Rance (2005), check Moonlight Point (major landing and camping point on Coal Island) and track verges occasionally for weed establishment

5.3.2 Deer

Deer have been successfully removed from Coal and Weka Islands. It appears that deer swimming to islands is something of a learned behaviour, and the deer that do so are relatively mobile between islands, even those islands too small to sustain a permanent presence. When such individuals are removed, the instances of deer re-invasion substantially drop, and are lower than perhaps would be expected. The very low rate of recolonisation by deer noted so far on Coal Island is mirrored by the situation on Secretary Island (A. Cox pers. comm.).

Don Goodhue reports that due to the obvious and well-established trails, it was clear many deer were previously accessing Coal Island at Tim's Landing, opposite the nearest point of the mainland close to the Puysegur oil-store and landing. If deer incursions become a problem, this would be key site to monitor and even place detection or control devices.

Recommended management actions for deer control:

- All deer incursions or suspected deer sign on Coal, Weka, Steep-To or Round Islands are to be immediately reported to the DOC Te Anau office.
- All people working on Coal Island should look out for signs of deer and such observations or evidence should be responded to as soon as practical.
- Weka and Steep-To islands must also be checked periodically for any evidence of deer re-invasion there.
- If deer incursions become an issue, expert advice should be sought on methods for detecting and responding to these, e.g. use of surveillance cameras along suspected trails.
- Recreational hunting pressure on deer around the Kisbee Bay and Puysegur Point areas should be maintained and encouraged.
- A cost-benefit analysis of sustained long-term controlling of deer to low levels on the mainland adjacent to Coal Island, versus the likely cost of eradicating deer if they re-invade Coal Island should be conducted. The results of this may dictate what future actions are taken.

5.3.3 Stoats

TECHNOLOGY AND TRAP-LINE EFFICIENCIES

To maximise the long-term operational efficiencies and cost-effectiveness of the on-going pest control measures, all current measures need to be regularly reviewed. New technology and innovations, as well as learning derived from on-site activity, should be used wherever possible to streamline the operation. The Trust has already initiated several changes to improve the ability of the stoat-trapping teams. These include re-aligning some traps and tracks to be able to be accessed via land, and replacing older-style traps with new, less rust-prone stainless steel models.

The simple but ingenious 'flag' system installed on coastal traps means that it is easy to tell whether a trap has gone off or not from a boat, avoiding the necessity of landing.

The smaller islands had stoat traps installed at boat-accessed sites around the coastline, but maintenance and checking of these traps has apparently been somewhat erratic because of a miscommunication of responsibilities between DOC and the Trust; this will be resolved as a result of this plan.

The Trust and DOC need to continue to liaise regularly on any technological advances made in stoat trapping, baits, stoat ecology, etc. that may assist in refining trapping regimes to make them more effective at trapping stoats and/or more cost-effective.

REACTION TO BEECH-MAST YEARS AND STOAT PLAGUES

While it appears that Coal Island and the smaller islands can generally be kept free of stoats, incursions may occur from time to time, and the experiences of 2010 show that following a beech-mast event, the propensity of stoats to reach the islands increases significantly. The 2010 stoat incursions to Coal Island followed a beech-mast in 2009 and were mirrored by similar concurrent invasions on other Fiordland islands such as Pomona, Secretary, Resolution and an island in Lake Hauroko (D. Goodhue, Gerard Hill, A. Cox pers. comms.). If there are a range of stoat-vulnerable species present on the island, appreciable harm could be done before the stoats are trapped. If such incursion events continued periodically, and the stoats arriving on the island took time to catch, the island may not be able to be used for highly stoat-sensitive and endangered species such as kākāpō and saddlebacks.

Forewarning of beech-mast events can be obtained from local people familiar with the island or its surrounding area reporting on the abundance of beech flowers, which will provide a few months' notice of increased seedfall.

DOC's Fiordland District Office (Te Anau) currently monitors beech sites in Waitutu in western Southland. There are series of seed-trays at four sites. Seed rain is collected quarterly and the information is recorded in DOC's National Seed Fall Database. Stoat and rodent abundance is also monitored quarterly (C. Bishop pers. comm.). It is recommended that the Waitutu seed fall information be copied and emailed to the Coal Island Trust by DOC Te Anau each time it is collected.

Another source of information may be available from the DOC science staff who work with threatened species management, particularly kākāpō. They assess the size of impending beech masts by collecting seed in seed-fall trays or by shooting branches off a sample of trees and counting developing seed. This approach seems to work well and, if it's done in January, will give up to 6 months' notice of an impending rat plague and nearly a year's notice of an impending stoat plague. It is possible that DOC's kākāpō team will undertake this on a regular basis on Anchor Island, and results could be made available for other parties, such as the Trust (R. Moorhouse pers. comm.).

During beech mast years it is recommended that additional checks and re-baiting of traps with fresh baits occur with greater regularity (advice should be sought from DOC technical experts on this), and especially during the summer and early autumn months. Depending on results in the next few mast years, trapping systems either on the island or on the mainland may need to be enhanced or reviewed to maximise their effectiveness.

Recommendations for management actions for stoat control:

- All stoat incursions on Coal, Weka, Steep-To or Round Islands are to be immediately reported to the DOC Te Anau office. (See Appendix 5 for an initial response procedure).
- Consideration should be given to replacing some traps (particularly those on the smaller islands or difficult-to-access sites) with self-resetting (CO₂ canister type) traps or other labour-efficient traps, when and if these prove to be suitable for stoat control in the conditions found in the Coal Island area.

- DOC Te Anau and the Trust need to maintain regular (annual or more frequent) communication with respect to the potential for beech mast seeding events and subsequent stoat plagues.
- The Kisbee Lodge caretaker (or other nominated Trust person in future) will have the responsibility to hold:
 - multiple blank copies of a templated stoat trap record form, for each trap-checking team to fill out.
 - master maps (and field copies of these) showing the stoat trap locations, with trap numbers and an attached GPS reference list of locations.

This person will have the responsibility for collecting these forms from each trap-checking team and recording and storing stoat trapping records (including on a master spread-sheet).

- The Trust should seek advice from DOC technical experts on optimal trapping responses (increasing regularity of checks, bait options, potential increase in trap numbers, etc.) leading up to and during stoat plagues.

5.3.4 Rodents

Stoat trapping records on the mainland show that as the numbers of stoats have been reduced, the numbers of rats caught in mainland traps have appreciably increased. This may pose some increased risk of rats reaching Coal Island, especially if Norway rats are present on the adjacent mainland, as they are known to be better swimmers than the black or ship rats that occur more commonly in forested areas.

Based on evidence to date, the island may be out of the known swimming range for rats in cool southern waters, but there is no 'hard and fast' distance that can be applied, and rats have been known to travel greater distances in warmer waters or where possibly aided by currents or floating debris, so it is a realistic possibility that rats could reach the island.

Recommended management actions for rodent control:

- A person competent in identifying rat species should train key Trust personnel in basic rat species identification, and these key personnel should be provided with species identification information so that at least one person in any trap-checking trip can confidently identify any rat caught.
- Future rat captures in the Trust's trap-lines should be recorded by species.
- The range and extent of stoat and rat traps on the mainland opposite Coal Island, and on the island itself, should be maintained to help limit the extent and duration of any possible incursions.
- All rodent incursions on Coal, Weka, Steep-To or Round Islands are to be immediately reported to the DOC Te Anau office, and immediate steps must be taken to respond to the incursion (see Appendix 5 for an initial response procedure).

5.4 Recovery and reintroductions

5.4.1 Understanding what was present in the past on Coal Island

The records of what species were present on Coal Island prior to the arrival of humans are very incomplete. To 'restore' an island it is important to understand as much as possible about the original flora and fauna assemblages.

It is possible that a subfossil/fossil survey of bluff and crevice deposits on Coal and its neighbouring islands could yield considerable information about the islands' former bird, reptile, invertebrate and, possibly, plant composition (E. Edwards pers. comm.). There is considerable expertise available within New Zealand for this type of work, and a survey of this nature is likely to generate appreciable public interest. Finding the remains of any key species would help construct a better picture of the original Coal Island ecosystem, and thus refine restoration objectives, including giving added weight to the justification for translocations of particular species.

Coal Island may have once been used extensively by seabirds. It appears to be in a suitable location—a windy site facing open ocean in an area of high importance to seabirds, with known islands of high seabird value in reasonable proximity (Solanders, Codfish, etc.) and remnants of known seabird colonies still present elsewhere in Fiordland. The island was inhabited by weka, and it is within swimming distances known for this species. However, larger seabirds (e.g. sooty shearwaters, Fiordland crested penguins) are less vulnerable to weka predation than smaller species and could have been present in appreciable numbers. It would be valuable to understand to what extent the islands have been used by colonial-nesting seabirds (e.g. shearwaters, petrels, penguins) in the past. Colonial-nesting seabirds have a profound effect on the ecosystems of the places they inhabit. Their droppings create a major boon for invertebrate and lizard abundance, which flows through to greater food resources for the whole food chain. They increase soil fertility, providing habitat for the types of plants that require higher fertility sites. (Markwell & Daugherty 2002). Fossil or subfossil remains of seabirds may provide some indication of what species were formerly present and, if these are still locally available, they could be considered for reintroduction.

A process called stable isotope analysis can provide evidence of seabird influence on ecosystems, and the evidence can be detected for several centuries after the seabirds have disappeared (Mituzani et al. 1991). Islands with a high current or previous seabird influence have a higher proportion of 'marine-derived' isotopes of carbon and nitrogen in vegetation and soils than islands that do not have or have not had seabird colonies (Markwell & Daugherty 2003). The soils on Coal Island should be analysed to see if they provide evidence of former seabird colonies.

Knowing whether Coal Island formerly had large colonies of seabirds could influence management actions and directions. For example, considerably more focus could be placed on encouraging the return of certain species of seabirds to restore the original soil fertility and ecosystem processes. Such seabird restoration programmes are on-going elsewhere in New Zealand and best practice and success in this field are improving all the time. Restoration of burrow-nesting seabird species requires commitments well in excess of five years and up to ten years just to begin the process of establishing sustainable populations.

If researchers were confident that colonies numbering more than hundreds of pairs of prions, shearwaters or petrels had formerly existed on Coal Island, then, in addition to working towards re-establishing them on the island, it would also be possible to 'kick-start' the ecosystem flow-on effects that these birds will eventually supply by applying a fertiliser regime to their predicted nesting regions. In this way, vegetation response would not have to wait decades to start up and changes in invertebrate productivity and forest bird densities would be expected sooner. Also, aquatic communities would likely respond positively in this otherwise nutrient-poor environment.

Recommended management actions:

- A fossil and subfossil survey of Coal and its neighbouring islands should be carried out as soon as is realistically possible. Those undertaking such work should be informed of the locations of recorded archaeological sites, which they must avoid, and be advised of the accidental discovery protocols (Appendix 6).
- Research (using stable isotope analysis) into the former extent and influence of seabirds on the soils of the island is also desirable.
- The fossil survey and soil research may indicate former colonial seabird activity, in which case scoping of seabird enhancement processes and an interim fertiliser regime (for soil fauna, plants, streams and forest birds) would be recommended.

5.4.2 Recovery of existing values

FLORA

Now that deer have been removed, it is envisaged that the natural vegetation of Coal Island will recover and eventually return to close to its pre-deer condition. Browse-sensitive species will expand out from their deer-inaccessible retreats, and it is likely that groundcover and subcanopy vegetation will undergo considerable change in diversity and abundance over time.

All of the six threatened species of plants present are likely to benefit to some degree from deer removal, and will increase in both distribution and abundance on the island. The ground-growing shore carrot and native sow thistle will probably benefit most. The highly palatable epiphytic mistletoes and orchid were previously restricted to above deer-browse height and can now establish closer to the ground and in smaller trees.

Seedling Ratio Index vegetation monitoring transects have been established to monitor forest understorey changes that may take place. To measure long-term changes in forest structure and diversity would require the establishment of a network of 20 × 20 m permanent plots.

Mice may also have had a more subtle but nonetheless appreciable effect on vegetation through consumption of seeds and seedlings of various species. The eradication of mice will allow plant species with rodent-palatable seeds to potentially increase in abundance.

FAUNA

Many, if not most, fauna species already present on Coal Island are likely to be benefiting from the recent removal of pest species. Of particular interest are the threatened species currently resident on the island, such as South Island kākā, Fiordland crested penguins, and the southern form of the New Zealand falcon. Coal Island offers significant habitat for these species and it could become an increasingly important refuge for them.

It is possible that kākā on Coal Island, as in many other parts of New Zealand, have a very low proportion of females due to their cavity-nesting behaviour and resultant predation on the nest by stoats. The island should be monitored for any evidence of females, breeding attempts and/or juveniles. Assisted translocations of female breeding stock may be required if natural breeding does not appear to be occurring (see comments in Potential Introductions section below).

Other significant species are present in the general area of Coal Island, including southern little blue penguins and sooty shearwaters, and pinniped species, particularly NZ fur seals. Natural re-colonisation of these species may occur over time. Both seals and colonial nesting seabirds can have a profound effect on soil fertility through concentrated accumulation of wastes, and this can create valuable site-specific ecosystems different to the surrounding environment.

5.4.3 Potential introductions of species

The former species records for Coal Island and its outliers are scant and incomplete. It is therefore somewhat difficult in some instances to distinguish between species that may once have been present, and those that are not likely to have been present but for which the island may present a safe 'ark'. An assumption is made in this plan that Coal Island and its neighbouring islands formerly held a representative range of species that have been or are still present in other coastal forest or islands in Fiordland.

The restoration of the islands to as close as possible their natural (pre-human) state should be the primary objective. This will then guide the assessments of the appropriateness of introducing species that do not naturally occur in the area. The priority would be for critically endangered species.

It is important to ensure that any translocation does not degrade the existing ecological and conservation values of the islands (e.g. by competing or hybridising with existing species or formerly existing species that may be reintroduced). There are three criteria required for species reintroduction on these islands and these are listed below in order of their priority:

1. Species that currently or historically existed on the islands or in close proximity to them;
2. Species that would fill a gap in the ecosystem for a species once known on the islands or within close proximity to them but which is now extinct;
3. Species that are critically endangered and require a predator-free environment but are not known from the islands or within close proximity to them.

Balancing these criteria is a vital over-riding factor—the security of the islands in relation to the proven level of success of the on-going efforts towards preventing re-establishment of stoats in particular, but also of rodents and deer. Some native species are considerably more sensitive than others to such introduced animals. This factor will play a huge part over the long term in determining which species can be 'safely' placed on the island, and the relative priority of Coal Island in respect to other conservation or translocation options.

The establishment of many threatened species is heavily dependent on Coal Island and its smaller neighbours remaining free of populations of pest species. Incursions are likely to occur from time to time, and these must be detected and dealt with quickly and efficiently, before the pests can establish self-sustaining populations or do significant harm to native species on the island.

Previous Trust newsletters, promotional material and plans have suggested the following suite of species may be considered or desirable for establishment or re-establishment on the island:

Saddleback (tīeke), rock wren, yellowhead (mohua), robin (toutouwai), kiwi (brown or little spotted), kākāpō, tuatara, geckoes, the mistletoes *Peraxilla tetrapetala*, *P. colensoi* and *Alepis flavida*, orchid (*Drymoanthus flavis*), sand spurge (*Euphorbia glauca*), punui (*Stilbocarpa lyallii*) and water milfoil (*Myriophyllum robustum*).

Some of these (the mistletoes and orchid) have subsequently been discovered on the island and are likely to be present in near-natural abundances. The remainder, plus a range of other species, are discussed in more detail in the following text and listed in Table 5.

It should also be noted that the species listed are submitted for discussion and evaluation only, and inclusion of a species in this section does not automatically imply that translocation is recommended or will occur. For all species, a translocation proposal will have to be developed and then approved by DOC and, where applicable, will also have to conform to the goals and objectives of approved species recovery plans.

Table 5. List of potential species for translocation to Coal Island and/or Weka and Steep-To Islands.

NEW ZEALAND THREAT CLASSIFICATION	CRITERIA 1 Species that currently or historically existed on the island or in close proximity	CRITERIA 2 Species that would fill a gap in the ecosystem for a species once known on the island or in close proximity but now extinct	CRITERIA 3 Threatened species that require a predator-free environment but which are not known from the island
Nationally Critical			Haast tokoeka Te Kakahu (Chalky Island) skink
	Kākāpō Orange-fronted parakeet		
Nationally Endangered	Long-tailed bat (South Island) South Island kākā Southern short-tailed bat		
Nationally vulnerable	Southern Fiordland tokoeka Mohua	North Island kōkako Rock-wren	North Island kōkako
'At Risk' Declining	South Island fernbird Southern blue penguin <i>Euphorbia glauca</i> (sand spurge)		<i>Myriophyllum robustum</i> (water milfoil)
'At Risk' Recovering	South Island saddleback (tīeke) Brown teal <i>Stilbocarpa lyalli</i> (punui) Little spotted kiwi		
'At Risk' Naturally Uncommon		Snares snipe	Snares snipe
'At Risk' Relict	Tuatara—Cook Strait form Fiordland skink Knobbed weevil		
Not Threatened	South Island robin (kakaruai) Mottled petrel Broad-billed prion Sooty shearwater		
CONSIDERED BUT DEEMED UNSUITABLE	REASONS		
Western weka	Formerly present but not compatible in the short-term with some other species e.g. kākāpō, teal, seabirds. Likely to impact on lizards and large ground-dwelling invertebrates.		
Red-crowned parakeet	Potential competition and hybridisation with established and recovering population of yellow-crowned parakeets, and options for orange-fronted parakeets.		
Whio, takahē, shore plover and others.	Probably formerly present in general area, but it is assumed there is a lack of suitable habitat on the islands.		

FLORA

Three plant species have been specifically mentioned as having potential translocation to Coal Island (Brian Rance pers. comm.) These are discussed individually below.

Punui (*Stilbocarpa lyallii*)

Punui (*Stilbocarpa lyallii*) is a spectacular cool temperate or subantarctic megaherb. It was probably formerly present on Coal Island—the Coal Island record was described in the Flora of New Zealand (Allan 1982) as the plant identified *from the deck of a passing steamer* by Kirk. However, it is highly palatable to deer, which probably exterminated it very quickly from the island. The most likely source for the species would be Codfish Island (Whenuahou) (B. Rance pers. comm.). There are unconfirmed reports (Peat & Patrick 1996) that it persists on some islets within Preservation Inlet which, if this is correct, could provide a local source.

Recommended restoration action:

- Translocation of punui is recommended and could occur at any time. Advice should be sought from botanists for appropriate sites.

Sand spurge (*Euphorbia glauca*)

Sand spurge (*Euphorbia glauca*) is a strong candidate for introduction (B. Rance pers. comm.). It is unclear whether it was once present, but it is highly palatable to browsing animals such as deer, and if present may have been locally exterminated. The gravel beaches on the island are likely to be suitable for the spurge (B. Rance pers. comm.). Southern Fiordland is a stronghold for this species. It could be sourced from Sealers Beach (east of Puysegur Point).

Recommended restoration action:

- Translocation of sand spurge is recommended and could occur at any time

Water milfoil (*Myriophyllum robustum*)

Water milfoil (*Myriophyllum robustum*) is a species that is found in a few freshwater lake margins throughout Fiordland. The small lake on Coal Island would need to be inspected and its suitability assessed for this species.

Sites in Fiordland where this species currently occurs include Lake Forster, Pickersgill Harbour, Dusky Sound and Big Bay. Of these Lake Forster would be a potential source (an alternative source could be southern Westland (i.e. Ship Creek—kahikatea walk).

Recommended restoration action:

- A habitat assessment of the lake on Coal Island by a botanist familiar with the habitat requirements of water milfoil is required. Further action is dependent on the findings of that assessment; but if positive, a translocation of water milfoil could occur at any time.

BATS

Bats have not been recorded from Coal Island, but either or both short-tailed bats and long-tailed bats would probably have been present in the area before pest animals dramatically reduced their abundance and range. Long-tailed bats have been recorded in western Southland, and in parts of Fiordland National Park (e.g. Eglington Valley). Short-tailed bats are present on southern islands (Codfish Island (Whenuahou) is a stronghold), and they possibly occur on some of the Titi/Muttonbird Islands.

At a generalised level, habitat on Coal Island appears to be favourable for these species, but this would need to be assessed by bat experts.

The native bat recovery plan (Molloy 1995) has a goal *to ensure the perpetuation of all extant bat species and subspecies throughout their present ranges, and where feasible establish new populations within their historical ranges. An objective of the plan is to establish populations of short-tailed bats on suitable islands*

However, transfers of bats have proven difficult elsewhere, with failed translocations on Ulva and Kapiti islands (C. O'Donnell pers. comm.). New Zealand bat species have very strong homing instincts and are difficult to hold in captivity for any time, so further work is needed before successful translocations can reliably occur.

Recommended restoration actions:

- Bat detection devices should be installed on Coal Island and possibly also on Weka and Steep-To Islands as soon as practicable to determine if remnant populations are present.
- If no bats are found, a person with suitable expertise needs to assess the potential habitat for bat species.
- If it appears that suitable habitat is present, translocation proposals for bats could be prepared, but advances would be needed to be made in bat translocation techniques and/or husbandry prior to any translocations being planned.

BIRDS

Haast tokoeka

This Nationally Critical taxa numbers only in the low hundreds in its natural range of the Haast Ranges and, as with many kiwi species on the mainland, it suffers serious problems in recruitment to the population because of stoat predation of juvenile birds.

Haast tokoeka were the first species translocation to occur following the pest eradication programme on Coal Island. They have been introduced as part of the Taxon Plan for Haast Tokoeka (Freer 2010), based on a key Goal (1.3) of the plan, *to establish a meta-population of at least 65 pairs of Haast tokoeka in predator-free sites. A head-starting programme based at Franz Josef has raised captive-hatched juveniles which are released on predator-free islands or mainland islands. Coal Island is the largest of four chosen sites (Rarotoka Island, Coal Island, Pomona Island and Orokonui Ecosanctuary (a fenced mainland enclosure)) at which a collective 'insurance population' of c. 65 pairs can be established. These sites are known as 'kōhanga kiwi', where the establishing breeding population can be subsequently 'cropped', with the surplus young birds being transferred back to their natural range in the Haast Tokoeka Sanctuary. It is believed that there is enough habitat for up to 41 pairs of tokoeka on Coal Island.*

The goal was for 40 individual juvenile birds to be established by 2013, but this has not been achieved due to lower than hoped-for numbers of eggs/chicks available from the source population, with only 15 birds present by April 2013. Seven tokoeka were released on the island in December 2009, a further six in December 2010 and two in March 2013, but population recruitment through breeding will be slow, as only two of these are known to be females, with two of as yet unidentified sex and the rest males.

Recommended restoration action:

- Continue current efforts as per the current Haast tokoeka recovery plan.

Fiordland tokoeka and little spotted kiwi

It is not entirely clear which species of kiwi occurred naturally on Coal Island, though Atkinson & Taylor (1992) indicate that it was the little spotted kiwi, (although the author has not been able to ascertain the source reference). Richard Henry found the two species in Fiordland occupied different sites, and no island in Fiordland held populations of both

species. Either the little spotted kiwi or the southern Fiordland form of tokoeka could have been the species formerly present on Coal Island, and whichever it was would be the most appropriate kiwi taxa to establish on the island. However, it is not practical to introduce this taxa until (and if) Haast tokoeka are in a far more secure status in their natural home range, and Coal Island is no longer required as a sanctuary for that more 'At Risk' taxa. The two different forms of kiwi should not be mixed.

Resolution Island currently has the only recognised 'secure' population of southern Fiordland tokoeka, so it would be desirable to create further 'safe' populations, but the demands of the more critically threatened Haast tokoeka currently takes precedence.

The little spotted kiwi was formerly widespread in Fiordland, and Preservation Inlet probably represented the southernmost point of its range. While it is probably not suitable to have two different kiwi species on Coal Island because of the potential for competition, the smallest of the species—the little spotted kiwi—could be considered as a possibility for Weka and, possibly, Steep-To islands.

The criteria for suitability of islands for kiwi are: lack of predators; sufficient size (at least 100 ha), presence of suitable habitat, legal protection, absence of conflicting conservation values and, as far as possible, an island selected for translocation should lie within the natural geographical range of a species (Colbourne 2008). Weka Island, at 106 ha, probably fulfils all criteria, and Steep-To Island, at 60 ha, fulfils most. Separately or together these two islands may be of sufficient size to hold semi-managed little spotted kiwi populations if additional habitats are required for this species. However, these islands were not listed in the kiwi island strategy (Colbourne 2008).

Little spotted kiwi require smaller home ranges than the larger kiwi species, and survive in good numbers on a similar-sized (although with better habitat quality) island (Long Island) in the Marlborough Sounds. The peat soils on Fiordland Islands are typically less productive for invertebrates than the soils on many islands elsewhere, which may further restrict the suitability of islands such as Weka and Steep-To that are of 'marginal' size. The little spotted kiwi is the least threatened of all the kiwi species (classified as 'At Risk, Recovering') and does not have a critical need for additional habitat at present. There is some discussion and some variance of views on how kiwi might affect invertebrate, lizard and amphibian fauna, so release of kiwi on Weka or Steep-To islands would have to be considered carefully once further ecological surveys have been completed there (e.g. for lizards and invertebrates).

Recommended restoration actions:

- No translocation of little spotted kiwi or Fiordland tokoeka is possible to Coal Island in the foreseeable future. Review translocation of these species when and if Coal Island is no longer required for Haast tokoeka.
- Potential for little spotted kiwi translocation to Weka and/or Steep-To Island is a lower conservation priority and should be deferred at least until invertebrate and reptile assessments are completed on the smaller islands (>10 years), and any potential conflicts considered.

Kākāpō

Kākāpō were formerly widespread through Fiordland, and were present in Preservation Inlet. If once present on Coal Island, they would have been quickly extirpated by any combination of predation by stoats, or miners or their dogs.

While Coal Island was identified as one of only six islands currently suitable for kākāpō (Moorhouse 2010), kākāpō are potentially extremely sensitive to predation by stoats, and the security of Coal Island from incursion by stoats would need to be ensured and proven over time before any translocation could be considered. The higher risk of Coal Island

compared with islands further offshore from stoat sources probably means it is only a longer-term prospect for kākāpō, once the overall numbers of kākāpō have grown and the species' status becomes less critical.

The habitat on Coal Island appears very suitable for kākāpō, with a number of mature rimu trees. Recovery of groundcover and subcanopy plants will improve habitat quality.

Recommended restoration action:

- Translocation of kākāpō to Coal Island is a longer-term prospect only (>20 years). The island's security from stoats would need to be proven over an extended period, and kākāpō numbers would also need to improve before any translocation could be considered.

South Island kākā

Kākā are already present on Coal Island, but it is unclear if breeding occurs, and formerly stoat-predated populations are often heavily biased toward—even to the point of being entirely—male birds. It is probable that their population will recover naturally on the island, but observations need to be made to confirm breeding is occurring. If this does not appear to be the case within, say, 5 years, strong consideration should be given to translocation of female kākā to boost breeding stock.

Recommended restoration action:

- Monitor Coal Island kākā for evidence of breeding for at least 5 years. If successful breeding is confirmed, no further action is necessary. If not, translocation proposals should be developed for introduction of female birds into the population.

Orange-fronted parakeet

It is not known if the orange-fronted parakeet existed historically on these islands. There are museum specimens of orange-fronted parakeets labelled as being from nearby Chalky Sound and Dusky Sound, so it is presumed they were formerly widespread throughout Fiordland.

Breeding of captive birds has been the focus of recent recovery efforts, and progeny from these are to be used to establish at least three self-sustaining populations on predator-free islands.

Releases have already been made onto Chalky Island (Te Kakahu-o-Tamatea) (Fiordland) and Maud Island (Marlborough Sounds). Post-translocation monitoring on Chalky Island has indicated that the parakeets are breeding successfully.

Resolution, Secretary and Coal Islands have all been identified as islands suitable for future transfers of orange-fronted parakeets. Due to the size of the islands and the range of habitats available, the opportunities offered for the protection of many native species through the eradication of stoats, are great. The release of orange-fronted parakeets on Secretary and Coal Island will only be attempted if numbers of yellow-crowned parakeets are deemed low enough for orange-fronted parakeets to establish without interbreeding.

Recommended restoration action:

- Assess Coal Island with regard to potential habitat for orange-fronted parakeet, and especially with regard to the size and growth of the yellow-crowned parakeet population already present. No translocation should occur until the orange-fronted parakeet Recovery Group analyse these findings and conclude that the potential for interbreeding or competition is negligible. If the island is deemed suitable for orange-fronted parakeets, translocation could occur at any time after that.

Brown teal (pāteke)

Pāteke were formerly widespread and common in lowland habitats throughout New Zealand. Despite no historical records from Coal Island, pāteke were once widespread in Fiordland, and were recorded in nearby Chalky Inlet by Reischek in 1887.

While low numbers remain in the Fiordland area, the population is now considered effectively extinct, as these individuals have hybridised with either mallard or grey ducks (O'Connor et. al. 2007).

One of the goals in the Pāteke Recovery Plan has been to *begin pāteke releases at a fourth additional suitable site from 2008, with the aim of establishing a large breeding population of at least 200 birds*. Potential sites are assessed by the Pāteke Recovery Group.

An island the size of Coal Island, free of their main introduced predators (rats, stoats, cats, dogs and ferrets) could potentially sustain a moderate population of pāteke but habitat assessments would need to occur to determine if the island could hold 200 birds as per the Pāteke Recovery Plan goal.

The first South Island release of North Island pāteke took place in March 2009 with the release of birds into the lower Arthur Valley 10 km southwest of Milford Sound (Smart 2008). Some have survived and indications are that captive-reared pāteke were able to cope with the conditions in the Arthur Valley.

There is a risk that released North Island pāteke could hybridise with mallard and grey ducks. There appear to be no resident populations of mallard on Coal Island, but the status of grey duck is currently not clear. The presence of these species on Coal Island would need to be assessed as part of any translocation proposal. If their numbers are low and a sufficient number of pāteke are released, then this risk would be reduced (see Smart 2008).

Currently, the Pāteke Recovery Group is reviewing their national reintroductions plan, and this should be finished by the end of June 2013 (T. Browne pers. comm.). The Recovery Group is developing a site assessment form to aid in evaluations. The Pāteke Survival Guide (DOC 2011) includes six key criteria for establishment of pāteke sites. Coal Island easily meets the three criteria relating to predator control, absence of domestic pets and other causes of mortality (road-kills and fishing nets), and almost certainly would provide adequate nesting habitat, but the other two criteria relating to amount of suitable foraging habitat and a flock-mating area would need to be further assessed. The nature of the streams (the slower-flowing the better) and the extent of permanently marshy areas, muddy/damp margins and stream mouths as foraging habitat need to be better understood. Current indications based on relatively scant information suggest Coal Island does not have large areas of pāteke habitat, and possible dispersal to the mainland could be a compounding issue (Andrew Smart pers. comm.).

Recommended restoration action:

- Habitat suitability needs to be assessed by a person experienced in pāteke habitat, and the priority for Coal Island needs to be determined by DOC in relation to other Fiordland island restoration projects. Translocation should only occur if assessments are favourable for a self-sustaining population.

South Island saddleback (tīeke)

The South Island saddleback (tīeke) was once widely spread throughout Fiordland and the South Island. The main reason for their decline was predation by introduced rats, cats and mustelids. A translocation of tīeke to Coal Island and/or to Weka or Steep-To Islands would support the objective in the South Island Saddleback Recovery Plan (1994): *to translocate saddlebacks to rodent-free islands*.

Tieke are highly vulnerable to stoats. They were very quickly exterminated from Maud Island in the 1980s when stoats reached the island (Crouchley 1994), and the failed Bauza Island transfers may also have been the result of stoats (Wickes & Edge 2012). The security of Coal Island in relation to stoat incursions and the effectiveness of the system to capture any re-invading stoats needs to be proven over time (and especially over at least one and preferably several stoat-plague years) before this species is considered for translocation.

Tieke are attractive, noisy and sometimes gregarious birds for which a translocation could potentially garner a lot of public interest for the overall Coal Island restoration project. Habitat suitability would need to be assessed fully as part of a transfer proposal, but tieke have done well on most pest-free Fiordland islands and islands off Stewart Island/Rakiura that they have been transferred to.

Coal, Weka and Steep-To islands are all larger than many southern islands on which tieke have been successfully established or have survived. It would be recommended that if tieke were translocated, they should (because of their sensitivity to any stoat presence) be established on at least two of the islands as a 'security' measure in case stoats invade any one island. The dispersal of tieke over water is unknown but likely to be poor, so each population would probably have to be established by translocation. Steep-To Island is possibly the best protected of the islands from potential future stoat incursions, as stoats would first have to get to Weka or Coal Islands (with their trap networks) to be able to access Steep-To Island. However, tieke can attain relatively high densities and are effective foragers for larger invertebrates and possibly also smaller lizards. Therefore it may be advantageous to defer releases of tieke for some years to allow the prior recovery and/or establishment of key invertebrate and lizard populations.

Recent successful transfers within Fiordland have included Breaksea Island, and the Passage Islands (Chalky Inlet). Several source locations may be desirable to increase the genetic diversity of the founder population.

Recommended restoration action:

- Tieke are a suitable candidate for translocation to Coal Island and also to Weka and Steep-To islands, but translocation should be deferred (> 5-10 years) until key invertebrate and lizard surveys and/or transfers have been carried out.

Mohua (yellowhead)

Mohua were reportedly formerly present on Coal Island, and were widespread in the Preservation Inlet area, being seen there up until at least 1969 (Begg & Begg 1973) and, possibly, much later. As cavity nesters they are highly vulnerable to stoat and rat predation. It is likely that they disappeared due to irruptions of populations of these predators on the island.

Successful translocations of mohua have occurred in recent times in Fiordland to Breaksea, Chalky (Te Kakahu-o-Tamatea), Anchor, Pomona, Pigeon and Secretary Islands. The size of Coal Island offers significant habitat for a self-sustaining population, and the habitat appears generally suitable.

Timing and source of any translocation would be directed by the Mohua Recovery Group (MRG). They have stated that *while not contributing significantly to long term mohua recovery (potential population size) it [Coal Island] is very useful and a marketable community opportunity* (Mohua Recovery Group minutes, June 2012).

Currently, the MRG has proposed using Chalky Island as the source for stocking Coal Island. The MRG resolved that *if the Trust is keen and funding found it can happen anytime provided it does not interfere with a priority transfer*. Three translocation sites were named

(Resolution and Blumine Islands and Hawden Valley), none of which are identified as needing to draw upon the Chalky Island source.

Recommended restoration actions:

- A mohua translocation could occur at any time. The Mohua Recovery Group would determine the best genetic sources, but the closest and most practically located 'harvestable' population may be on Chalky Island.
- Mohua Recovery Group or individual members should be consulted as to 'best practice' for translocation of mohua, to maximise survival of transferred birds.
- Once mohua are established on Coal Island, it may then be possible to introduce them from Coal to Weka and Steep-To Islands as well, as back-up populations (it is unclear but presumed unlikely that they would self-introduce across water gaps of the distance between these islands).

Kōkako

South Island kōkako were present in Fiordland at the time of European settlement, but probably died out around the 1960s (Heather & Robertson, 1996). It is not known whether South Island kōkako were historically present on Coal Island; however, it is very likely that they were, and they certainly were present in abundance on the adjacent mainland. Being a large and formerly abundant frugivore and seed disperser, South Island kōkako would have been an important part of the forest community. As the South Island sub-species is considered extinct, the North Island sub-species can be considered as an 'analogue' and their establishment could be viewed as a step to restoring the biotic community, which would be less complete without such a species.

Kōkako are vulnerable to stoats and rats, so any prospective island should have a strong trapping regime to prevent stoat incursions as far as possible.

North Island kōkako were transferred to Secretary Island in 2008 and on subsequent occasions and while initially appearing to be establishing, their numbers in recent surveys have dropped and the translocation may have failed (Willans 2013). This has obvious negative implications for any further translocations to southern islands until the causes of the failure can be examined in detail and further research is conducted to boost the prospects for any future translocations.

Recommended restoration action:

- The Kōkako Recovery Group need to analyse the Secretary Island kōkako releases and the possible reasons for the apparent failure there before any consideration should be given to possible attempts to establish this species on Coal Island. If developments improve the prospects for such translocations, habitat could be assessed on Coal Island and planning could occur in the longer term (20+ years) for a kōkako translocation to the island.

South Island robin (kakaruai)

This species was formerly abundant on Coal Island, and was widespread through Fiordland but, until recently, the only island stronghold has been Breaksea Island. Robins are still present (but in low numbers) around Kisbee (D. Goodhue pers. comm.), but the birds are reluctant fliers over water so may not re-establish naturally. Robins can tolerate some stoat predation, but populations are severely reduced where stoats are present and to a lesser degree where rodents are present. Recent successful translocations to islands in Fiordland include to Pigeon, Pomona, Chalky and, most recently, to Indian Island. A translocation to Secretary Island has been less successful (Willans 2013), the reasons for which have yet to be established.

Recommended restoration actions:

- It is recommended that a translocation of robins to Coal Island should be carried out as soon as is practical.
- Re-colonisation of robins to Weka and Steep-To Islands may possibly occur naturally from Coal Island if they are established there, but this could be accelerated by transfers once the Coal Island population has securely established.

Fernbird (mātātā)

The South Island fernbird was once widespread in Fiordland. Fernbirds naturally re-established on Anchor Island soon after the stoats were removed (Willans, cited as a pers. comm. in Wickes & Edge 2012), as well as on Chalky Island and may also do so on Coal Island if there is a source population nearby. They are presumed to be reasonably tolerant of a low stoat population.

Recommended restoration action:

- Await possibility of natural establishment of fernbird over the next 10 years or so. This species is a long-term possibility for translocation if this does not occur.

Southern little blue penguin

This species is present within Preservation Inlet, and may have remnant populations on Coal, Weka, Steep-To or Round islands, and/or may recolonise the islands naturally. This species can tolerate rodents but is moderately vulnerable to stoats.

Recommended restoration action:

- Survey the coasts of all four islands for evidence of the presence or breeding of southern little blue penguin during appropriate times of year.

Mottled petrel (kōrure), sooty shearwater (tītī), broad-billed prion (pararā)

Mottled petrels are present on numerous islands in the Foveaux Strait – Stewart Island/Rakiura area, and on some Fiordland Islands (an island in Lake Hauroko, plus Shag and Front Islands in Dusky Sound and, possibly, on an islet in Isthmus Sound just a few kilometres north of Coal Island in Preservation Inlet). The Action Plan for Seabird Conservation in New Zealand (Taylor 2000) recommends *new colonies should be established in safe sites (restored islands now free of introduced mammals and weka) within the former breeding range.*

Broad-billed prions nest on islands in Fiordland, in Breaksea Sound, Dusky Sound and Chalky Inlet, and also on the Solander Islands. They may be present in the area but *distribution of this species is still incompletely known and priority sites for survey are islands and stacks off Stewart Island and coastal Fiordland* (Taylor 2000).

Sooty shearwaters are reported as still present currently or recently on the Cording Islands and Round Island in Preservation Inlet, but *surveys [are] still needed on coastal headlands and islands off ... Fiordland* in order to fully determine their current distribution and abundance within Fiordland (Taylor 2000).

All of the seabird species are vulnerable to stoats, and the smaller species (prions and petrels) are also highly sensitive to rats. Sooty shearwaters are less vulnerable to rats, but their productivity can be affected.

While these species are not threatened, their influence on island ecosystems can be major and, if they were once present, their return could be significantly beneficial to the entire Coal Island ecosystem.

Recommended restoration action:

- Seabird experts should examine Coal Island and its outliers for suitability (and possible former or remnant presence of seabirds) for seabird restoration. This could include marine isotope or fossil/subfossil survey work. Any further restoration work would depend on the outcome of that survey. Such restoration may well include a fertiliser regime as an interim step.

Weka

Weka were historically present on Coal Island but are now absent, and it is believed their absence is due either to hunting by dogs during the mining era, or as a result of predation by stoats, disease issues, or a combination of these factors. Western weka are present only on islands and the mainland to the north of Breaksea Sound and on islands to the south, including Entry Island (where stoats are very irregular visitors), the Seal Islands in Dusky Sound, and Passage Islands in Chalky Inlet (Henderson & Goodman, 2007). As weka prey on many native species (especially large invertebrates, lizards, and ground-nesting birds such as seabirds, penguins and kākāpō), it is advantageous that they are not present on Coal Island while other threatened species are re-establishing.

Recommended restoration actions:

- No translocation of this species be considered for the foreseeable future, at least until all translocated weka-sensitive species have become well established.
- Weka are capable of swimming from the mainland or neighbouring islands, so no releases in the area are recommended in the near future. Any natural recolonisation of the island is currently unlikely given their present distribution, but if it occurs, it may need to be managed (individuals trapped and removed).

Snipe

The extinct South Island snipe formerly inhabited Fiordland (Worthy et. al. 2002), though there are no records specific to Preservation Inlet. Snipe are very predator-naive and are unable to tolerate rats, stoats or cats. Four subspecies of New Zealand snipe remain today, with the closest geographically to Coal Island being the Snares Island snipe (Tutukiwi, *Coenocorypha aucklandica huegeli*).

Weka are natural predators of snipe, but as snipe and weka both inhabited Fiordland, it is presumed that they once coexisted.

The Snipe Recovery Plan (Roberts & Miskelly 2003) recommends the *trial capture, holding, transfer and establishment of Snares Island snipe/tutukiwi to one or more islands near the South or Stewart Islands*. The objective is to create a second population for the 'At Risk, Naturally Uncommon' Snares Island snipe, and to return snipe to the Stewart Island region. Snares Island snipe were transferred to Putauhinu Island, one of the Titi/Muttonbird Islands off Stewart Island, in 2005.

Snipe are highly sensitive to rat and stoat predation, and do not exist on any islands where these pests occur. Translocations could only be considered once the pest trapping regime on Coal, Weka, Round and Steep-To islands have been proven to be effective over time.

It is likely that priority will be given to further translocations of tutukiwi to other surrounding titi islands in the short term and that a release on Coal Island or other Fiordland islands could not happen for a number of years. Should a future translocation be planned for Coal Island the source population would most likely be the Snares Islands / Tini Heke to ensure a genetically robust founder population.

Recommended restoration action:

- Translocation of snipe (tutukiwi) is a long-term prospect (>20 years) only, but possible for Coal Island and/or Steep-To or Weka islands in the future.

Rock wren

The rock wren (pīwauwau) has been suggested as a possible introduction to Coal Island, as an analogue species for the now-extinct bush wren, which probably inhabited the area in the past. One of the last unconfirmed mainland records of bush wren was from Cape Providence in Chalky Inlet in 1969 (Begg & Begg 1973). However, this suggestion for a translocation was made at a time when translocations for this species were theoretical only, and since then some valuable practical knowledge has been gained.

Analysis of an unsuccessful transfer to Anchor Island in 2004/05 suggested timing of the translocation was at fault, as birds were translocated in family groups while the females were still light and juveniles had not matured to adult weight (Weston 2006). However, it may also have demonstrated that habitat requirements for this typically alpine species may not be fully met on some lowland islands. It is noted that there is a relative lack of open rocky habitat on Coal Island.

A more successful transfer to Secretary Island (with 'alpine' habitat) from 2008 onward has been carried out. Habitat assessments have been made for Secretary Island (Willans 2008) to compare this site with areas in the Murchison Mountains where rock wren are known to breed. The same could be done on Coal Island, but it does not have the same range of alpine or rocky habitats and, consequently, would be a higher-risk venture. It is feasible that rock wrens that establish on islands may adapt to lower-altitude habitats, so they, rather than wrens from alpine areas, could be considered as potential source populations.

The rock wren is vulnerable to stoats but may be able to resist individual incursions.

Recommended restoration actions:

- An expert in rock wren habitat should evaluate possible habitat on Coal Island and assess the 'risks' associated with transferring rock wrens to an island lacking alpine habitat.
- Species experts should discuss relative priorities for any future island translocations of rock wrens, and prioritise Coal Island within this. Future actions would be dictated by these findings.

Reptiles

The herpetofauna of Coal Island is poorly studied, and the range of species present is unknown. A number of species of geckos and skinks are known from within Fiordland, and there have been recent discoveries of 'new' species as well, but it is unlikely that they all occur (or previously occurred) in the Preservation Inlet area.

The recovery of gecko and skink populations after successful pest eradications is generally relatively slow, so it may be some time before remnant populations of any lizards are reliably detectable on Coal Island. The DOC Lizard Technical Advisory Group suggests a recovery period of at least 10 years (i.e. from 2018) and, perhaps, up to 15 years for skinks to be able to be **reliably** surveyed for, and perhaps even longer for geckos, although surveys (with a lower degree of confidence in any 'nil' results) could be carried out at any time. Until the current lizard fauna is known, it is not considered appropriate to introduce new species. The highest priority task for lizards is to conduct thorough surveys on Coal Island and, perhaps even more importantly, on Weka, Steep-To and Round islands (as, presumably, these have always been rodent-free and therefore may have more intact lizard faunas as a result).

Some of the rarer species of reptile are sensitive to stoat and rodent predation. The 'security' of the pest prevention regime on Coal Island and the 'stepping stone' islands needs to be demonstrated over time before highly threatened species should be considered for translocation.

However, if no lizards are found, or none that pose an issue with competition or hybridisation, some suitable candidates for future establishment might be the Fiordland skink, the Chalky Island skink, and a forest gecko species. Some further survey and distribution mapping and, possibly, taxonomic work may be required to determine which species of gecko is most appropriate.

Lizards could be searched for at any time, using a combination of monitoring methods, such as intensive ground-searching, spotlighting for eye-shine (geckos), and Gee's-minnow traps. Any lizards found incidentally during stoat trap checks or other activities on the islands should be photographed for later identification by experts.

Recommended restoration action:

- Comprehensive lizard surveys are required on Coal Island and, especially, on Steep-To, Round and Weka Islands. Findings will dictate subsequent actions. If no species are currently present, or species found are of a type that will not compete in terms of habitat requirements, the previously mentioned species could be considered for translocation.
- Permission should be sought from iwi to allow for the collection of tail tips (for DNA analysis and taxonomic identification) from any reptiles found on the islands.

Chalky Island skink

The Chalky Is skink is of the *O. inconspicuum* species complex and has been recently named *Oligosoma tekakahu*. It is classified as 'Critically Endangered', the highest conservation risk status, being found on the one island only. Chalky Island is not a particularly large island and, like Coal, it is not totally 'secure' from pest incursion, so a second population is desirable from a single species conservation action point of view, rather than a strictly 'restoration' option for Coal Island. The numbers of this skink appear good on Chalky Island and sufficient to permit harvest of a suitable number for translocation. The skink occurs in open scrubby habitat. Coal Island and its smaller neighbours are geographically close to Chalky, and may offer one of few pest-free habitat options for establishing a desirable second population of this threatened species. These facts give the Chalky Island skink the highest priority for any reptile translocations to Coal Island.

Recommended restoration action:

- If comprehensive surveys of Coal Island find no similar species already present, the island's habitat should be assessed and, if found suitable for Chalky Island skinks, translocations could occur within 5 years (i.e. >10 years post mouse eradication).

Fiordland skink

This species is vulnerable to rats. It occurs in littoral (shoreline) habitats, so would probably not compete for habitat with the Chalky Island skink. It is found on some rat-free islands in Fiordland, including Breaksea, Hāwea and Secretary, but is also found on Resolution Island in the presence of mice (Andrew Smart pers. comm.). Coal Island is 40 km south of the current known limit for this species (in Dusky Sound), though surveys of Preservation Inlet islands has not been comprehensive. An adequate 'wait' period is required to allow any skink species to recover to reliably detectable levels in proposed future surveys on Coal, Weka, Round and Steep-To Islands before translocation should be considered.

Recommended restoration action:

- If comprehensive surveys find no similar species already present, the habitat on Coal Island should be assessed for Fiordland skinks and, if found suitable, translocations could occur in the medium term (>15 years post mouse eradication).

Forest gecko

Coal Island is close to Puysegur Point, where an unidentified species of *Mokopirirakau* gecko has been reported (the Lizard TAG group of DOC speculate that this could be *M. cryptozoicus*, but further work is required). It is likely, therefore, that the same species is still present on Coal Island. This places even more importance on the need to survey and to wait before considering any translocation of members of this genus (note the Lizard TAG group think Puysegur Point would be the preferred source if translocations were considered).

Recommended restoration action:

- If comprehensive surveys of Coal Island find no similar gecko species already present, the island's habitat should be assessed and, if found suitable for forest geckoes, translocations could occur in the medium term (>15 years post mouse eradication).

Tuatara

Tuatara have been mentioned as a possible species for establishment, but Coal Island is well south of the current most southerly populations in Cook Strait, and conditions may not be ideal, even though tuatara were found throughout New Zealand including southern South Island in the past. However, the Tuatara Recovery Plan has an objective of *Further translocations are planned as part of the long-term objective of establishing wild populations of tuatara throughout their pre-human range.*

Tuatara may not be compatible, at least in the short term, with attempts to establish viable populations of invertebrates or smaller reptiles. Tuatara (especially eggs and juveniles) are vulnerable to rats, and may also be vulnerable to stoats.

Recommended restoration action:

- Tuatara are not a suitable candidate for translocation to Coal Island in the short to medium term. A habitat assessment would be desirable as a lower-priority task in the longer term. This species could be considered at a later stage (>20 years from now), once key invertebrate and lizard species have been securely established.

INVERTEBRATES

Invertebrates have not been the focus of much study on Coal Island. The presence of mice and stoats and, formerly, rats has probably led to the extirpation of many larger rodent-vulnerable species. A survey, focussing primarily on larger-bodied and possibly rodent-vulnerable species, such as weta, weevils and ground beetles, would be highly desirable on both Coal Island and its smaller neighbours, to determine the range of species currently present. A survey for fossil or subfossil invertebrate remains could also help to determine any locally extirpated species.

It is presumed that the range of rodent-vulnerable invertebrate species formerly present on Coal Island would have been very similar or identical to those on Weka, Steep-To and Round islands. Some species may have survived on these smaller islands (without rodents) while being eliminated from Coal Island. Consideration could be given to local inter-island transfers if (as suspected) Coal Island's large-bodied invertebrate range is diminished compared with the rodent-free neighbouring islands. Potential source islands could be the closest islands (Weka, Steep-To and Round), but could also extend to other nearby islands (such as the Cording group) within Preservation Inlet.

It is thought that the large stag beetles *Geodorcus helmsi* and, possibly, *G. philpotti* could be present, and there will certainly be other species such as weta, carabid beetles and moths that are unique to this part of Fiordland (B. Patrick pers. comm.). Other invertebrates that may have remnant populations include the teteaweke weevil, the Fiordland land snail *Powelliphanta fiordlandica* and the flax weevil *Anagotus fairburni*. Other large-bodied species

may also have persisted, including ground wētā (*Hemiandrus* spp.), ghost moths (*Aoraia* spp.), other Rhytid snails, and leaf vein slugs (E. Edwards pers. comm.).

It is desirable that existing invertebrate populations on Coal Island are able to recover before any potential predator species such as saddlebacks or kiwi are introduced (noting that Haast tokoeka are already present in low numbers). Many species will already be responding to the now 5+ years of absence of rodents and mustelids, although slower-breeding species such as larger snails may take many more years to fully recover. However, none of the invertebrate species discussed as possibilities for translocation are considered to have a 'high urgency tag' in conservation terms (E. Edwards pers. comm.), so are unlikely at present to influence overall restoration schedules on Coal Island.

Recommended restoration action:

- Surveys for invertebrates are highly desirable in the short term (as soon as possible) to determine the current range and status of invertebrates present, especially on the smaller islands which have probably never had rodents.

The stilbocarpa weevil or knobbed weevil

As it has been specifically mentioned in previous restoration debates for Coal Island, this species is specifically discussed here.

The large knobbed weevil *Hadrampus stilbocarpae* is one of the largest beetles in New Zealand. It occurs on Secretary Island and a number of smaller coastal islands in Fiordland, and was formerly recorded at Puysegur Point opposite Coal Island. This flightless nocturnal weevil is highly vulnerable to rat predation and, as a result, the remaining populations are very disjunct and confined to rodent-free islands. It eats *Stilbocarpa* sp. (punui) plants (currently absent on Coal Island but proposed for re-establishment), but has an alternative host plant—*Anisotome lyalli*—that grows along coastal margins and is present on Coal Island (where former deer-browsing has reduced its abundance). This plant is now recovering and extending its distribution on the island.

A form of this weevil was known to exist at Puysegur Point (Eric Edwards pers. comm) and there is a remote possibility it still remains there (although this is doubtful in the presence of rats). On Coal Island, surveys should target this weevil; but again, its presence is doubtful because of the previous presence of mice and a rat species.

Recommended restoration actions:

- Conduct a survey of *A. lyalli* plants on Coal, Weka, Steep-To and Round islands (and around Puysegur Point, if possible) for the continued presence of the knobbed weevil.
- A translocation of knobbed weevil could occur at any time, pending a 'nil' outcome of prior surveys on Coal Island, and selection of suitable sources.

FRESHWATER LIFE

The most important consideration in regard to freshwater fauna on Coal Island is to prevent the introduction of all freshwater pests (including the alga didymo *Didymosphenia geminata*) to the waterways on the island. Protocols should be put in place to minimise the risk of visitors to the island introducing didymo. Such protocols are part of the Island Biosecurity Plan for Southland Conservancy.

The freshwater values of Coal Island are not well known. The small lake and four streams appear to have suffered some disturbance during the mining era (the major activity for which ceased c. 120 years ago), but have probably fully recovered with little long-term modification.

It is possible that seals or shags utilise the small lake or its surrounds.

The streams and lake are most likely free of all introduced fish (such as trout or pest fish species), and this is a major ecological advantage.

A record of a very brief survey in 1986 showed three freshwater fish species present on Coal Island—kōaro, long-finned eel and banded kōkopu—but this was from just a single electric-fishing sweep of c. 100 m in one of the smaller north-flowing streams (Marty Bonnett pers. comm., and the NZ Freshwater Fisheries Database)

Fiordland in general is known to have at least 12 species of native fish. Streams in nearby Kisbee Bay in the same 1986 survey recorded giant kōkopu, a single short-jawed kōkopu juvenile (although this record is questionable), red-finned bully (all ‘At Risk, Declining’ species) and kōura and freshwater shrimps. Inanga, common smelt, and short-finned eels were recorded uncommonly elsewhere in Preservation Inlet. It is probable that Coal Island has at least some of these species present in addition to the three species already recorded.

Recommended management actions:

- A more comprehensive survey of freshwater values and species is highly desirable.
- No introductions of fish species should be considered.

6. Public use and involvement (including future opportunities)

As an ‘open sanctuary’ island, Coal Island is able to be visited by any member of the public at any time without special permit. The remoteness of the island does limit its accessibility, which is largely via helicopter (nearest base is Tuatapere) or via a lengthy boat trip from Doubtful Sound or further north, or from Bluff or Riverton to the east.

Current usage of the island by the general public is not able to be accurately gauged, but is considered to be very low.

A few charter tourist and ‘adventure’ vessels may be more attracted to visit the island once a range of threatened species becomes established.

The Trust has already proven its willingness to involve the wider public in its restoration activities. Volunteers have formed the core of work parties for track-making, some deer control, participation in the mouse eradication, and in on-going stoat trap maintenance. The income from paying volunteers is important in helping to fund the on-going trapping work and similar future activities. Currently, approximately 20 paying volunteers (4 trips of 5 volunteers) take part in stoat trap checks each year.

The Trust has relied heavily on sponsorship to undertake its restoration work on the island. The involvement of private, local business and corporate sponsors will continue to be essential in order for any future work of the Trust to occur.

Translocations of threatened species are a proven and effective way of engaging the public in conservation work.

An important aspect of the project is the inclusion of an iwi representative on the Trust, and this position is currently held by Stewart Bull, as a representative of Oraka Aparima. This will help ensure that iwi issues are addressed throughout the planning and implementation phases of the restoration programme. Iwi should be regularly updated on the project through this channel, or any other channel deemed appropriate by the iwi. Oraka Aparima will be an integral part of future restoration work on the island, including any potential translocations.

6.1 Potential conflict with archaeological sites and wāhi tapu

An assessment has been made of archaeological sites on Coal Island, and a register (ArchSite) is maintained for all known sites on Coal, Weka, Steep-To and Round islands.

Before tracks were placed on Coal Island, an archaeologist investigated routes to ensure the proposed tracks did not threaten any archaeological feature, particularly where earthworks may have been required.

It is not expected that there will be any further development of tracks, huts or other facilities on Coal Island. The current track situation appears to cater for all foreseeable requirements.

It is highly unlikely that any introduction of species listed in this plan, or the management typically required for them in such locations, would cause any significant modification or potential harm to archaeological or historic sites. Burrowing seabirds (if they re-establish) will only burrow into softer soils, and it is very unlikely they will affect mine tailings or other historic features incorporating earthen substrates.

It is possible that, in the course of fieldwork, staff or volunteers will discover further sites of archaeological importance, artefacts or even human remains. A policy on accidental discoveries (including artefacts) needs to be set in place as soon as possible, and this needs to be relayed in briefings to everyone engaged in the restoration work and visiting the islands.

Recommended management actions:

- Any possible further track development or other landscape alteration should be first proposed to and approved by the Trust board, with guidance and advice sought from iwi and a suitably qualified archaeologist before any actions are taken.
- All field workers must be made aware of the accidental discovery protocols for archaeological sites, artefacts and human remains. Any field worker on any of the islands who finds any potential or actual historic site or artefact should immediately notify DOC Te Anau, who will forward the findings on to relevant experts. Refer to the accidental discovery protocol (Appendix 6) for further details.
- Many of the alluvial gold tailings on Coal Island and the other islands are particularly well conserved due to a lack of foot traffic over the years. These features are vulnerable to damage and deterioration through such foot traffic, as each passage inevitably moves the stacked stones, gradually reducing their height and filling-in hollows. Staff or volunteers who will be working off the track networks should be informed of this problem and advised to go around the edge of areas of tailings wherever possible.

7. Biosecurity and quarantine

The relative inaccessibility and remoteness of Coal Island and its smaller neighbours means they are not often visited by tourists or other people not directly associated with the restoration programme. However, some charter and tourist vessels may use the area from time to time, and a few coastal fishing boats may shelter in the Inlet. Advocacy and education with regards to biosecurity would need to incorporate these and other key users of Preservation Inlet.

Volunteers and field staff involved in the restoration project would generally either need to pass through the Kisbee Lodge or access the islands via the DOC vessel *Southern Winds*. These limited access points create 'bottlenecks' where biosecurity and quarantine measures can be implemented and effectively policed by DOC staff or Trust members.

Clear biosecurity guidelines and recommendations that are used widely by DOC for its activities on southern islands can be found in the Southern Islands Biosecurity Plan (Agnew & Roberts 2008).

Higher-risk species, i.e. those more likely to be transported accidentally to the island by human means are likely to include mice, invertebrates, the didymo alga, and small-sized seeds of various plants.

Also of high risk are stoats and deer, as these species have the ability to recolonise naturally, but are very unlikely to be accidentally introduced through human actions.

Other species such as rats, possums, hedgehogs, cats, dogs, and large-seeded plant species are considered to be at lower risk of 'accidental' introduction, but will still need to be addressed by adequate biosecurity measures.

Rodent detection and control should occur as a matter of course on the *Southern Winds*, on any other vessel used to access the island for management purposes, and also at Kisbee Lodge, to reduce the chances of rodents and other pest species being inadvertently transported. All items (packs, supplies) being transported to the islands should be checked, and all foodstuffs and items attractive to rodents or invertebrate pests should be placed in sealed plastic containers.

On-going monitoring will need to occur on Coal Island in order to detect and respond to incursion of any pest species. Ideally, this will be in a form that will not only detect the incursion, but also control it at the same time, although this will not always be possible.

The current means by which any incursion of pest animals will be detected are:

- Permanent DOC 150 traps to monitor for and control stoats and rat species.
- Mouse traps (added within stoat tunnels since June 2010)
- Tracking tunnels (added outside stoat tunnels since June 2010)
- Sightings, browse sign, droppings, stag roaring for red deer
- Tracking tunnels and bait at the bivvy site for mice or rats

Further means of control (if required) are outlined in Appendix 5 (pest incursion responses) and in the Contingency plan for pest invasion of islands in Southland Conservancy DOCDM-29722.

Recommended management actions:

- Maintain the current suite of pest detection and control devices, but undertake periodic reviews to take into account any new technology or analysis of information from trapping results on Coal Island or elsewhere to help improve efficiency.

- Any incursion of pest species needs to be responded to immediately. An initial incursion response is set out in Appendix 5.
- Biosecurity measures (as set out in the DOC biosecurity plan) should include measures to prevent spread of didymo alga and all other aquatic pests to the islands streams.
- All trips involving DOC staff, Trust workers and volunteers to the island(s) should go through appropriate biosecurity measures, and the DOC biosecurity plan should be followed where practical.
- Wherever possible, DOC or the Trust will provide informal on-site advocacy on biosecurity measures for any member of the public not associated with management trips (e.g. fishermen, tourists).
- Some prepared advocacy material would be desirable to promote the work being undertaken by the Trust on Coal Island, and the need for biosecurity measures when visiting the islands. This could be made available to any visitors to the area. Copies of this material could be held at Kisbee Lodge, and perhaps also at the Oil Store near Puysegur Point and on the barge at Weka Island.

8. Monitoring

Baseline information, i.e. identifying and quantifying what is on Coal Island and the smaller islands prior to the restoration efforts, will be important for demonstrating the overall value of the project. The project's success will not be judged solely on what threatened species were able to be returned to the islands, but also on the response of the species that were already there.

- Baseline information on bird populations has been established using five-minute bird counts (Gansell 2006). This was undertaken by Otago University Wildlife Diploma students, and it is possible they can be involved in subsequent counts.
- Baseline information on vegetation has been assessed via 20 permanently marked transects established throughout the island to record the presence of understorey seedlings and saplings. Re-monitoring was carried out in 2009, and is intended to be repeated at intervals of about 7 years (Coal Is newsletter #2, 2005). This will be undertaken by DOC botanists.
- Monitoring of threatened species will be dictated by the specific requirements of the Technical Advisory Group / Recovery Group responsible for that species. For example, for Haast tokoeka, annual monitoring is deemed 'essential' and will be undertaken by DOC staff from Te Anau and the West Coast, with possible volunteer assistance.
- Monitoring of stoats and rodents will be via the kill traps and tracking tunnels established on Coal Island, on Weka, Steep-To and Round islands, and on the mainland trap-lines.
- Beech mast events that cause a significant increase in stoat numbers are monitored in Waitutu and, possibly, Anchor Island for conservation purposes, and Coal Island will need to be included in the information network so the Trust can be alerted to possible stoat, mouse and ship rat plagues.
- Any opportunity to gather further information on the flora and fauna present on Coal Island is desirable. This could be either formal surveys by relevant experts, or informal observations made by anyone involved in the restoration project, so long as these

observations are systematically reported and recorded. The Trust should facilitate a 'wildlife observations book' that can be used by volunteers and staff to report interesting observations of key wildlife species, such as falcons, penguins, kaka, and any 'unusual' sightings (see information management section).

9. Research opportunities

Coal Island provides one of the first opportunities to scientifically record the effect of deer removal on the vegetation of an island. Data from Coal Island could be interpreted alongside that from similar Secretary and Resolution Islands deer eradication programmes.

Similarly, the invertebrate fauna of Weka, Steep-To and Round islands could be compared with the faun on Coal Island to highlight the differences between islands that have (presumably) never had rodents and one that has.

The potential restoration of penguin and seabird colonies may create opportunities to study the influence of these species on local ecosystem ecology.

Involvement of the Otago University Post Graduate Wildlife Management Diploma unit has already occurred. Potential exists for a long-term collaboration with this or similar research agencies, and for student projects in long-term bird monitoring, studies of individual species, or more 'social' research such as the co-operative nature of the management between DOC, iwi, the public and a private Trust.

Paleontological surveys and stable isotope analyses are recommended, and although ideally carried out by experienced professional researchers, they could be undertaken by post-graduate research students under supervision.

Surveys for various species (e.g. freshwater fish, invertebrates, lizards) and of habitat suitability for a variety of potential translocations (e.g. brown teal, skinks, water milfoil) are still needed, and these could well be part of research activities by students.

Recommended management action for research opportunities:

- DOC and the Trust need to develop a prioritised 'wish list' of possible research projects that could occur on Coal, Weka, Steep-To or Round Islands, which could be provided to universities and other research agencies.

10. Administration

10.1 Day-to-day management

The restoration of Coal Island (Te Puka Hereka) should remain the responsibility of the South West NZ Endangered Species Charitable Trust, in accordance with the prescriptions of management of the National Park and the Southland Conservation Management Strategy.

The Trust should be responsible for maintenance and checking of the trapping system, on-going track maintenance and maintenance and upkeep of the bivvy.

It is recommended that a proposal be put to DOC and the Southland Conservation Board to formalise the management and restoration situation regarding Weka, Steep-To and Round Islands, and to include them within the Trust's management activities and restoration goals. This concept is acceptable to the Trust.

Weed control responsibilities will be shared between the Trust and DOC. Staff of DOC's Fiordland District Office (at Te Anau) will continue their annual coastal weed surveys and gorse control measures on Coal Island, while the Trust will monitor for any other weed issues and keep DOC informed of any sightings and control measures undertaken. Both parties should survey for and control tutsan and any other weeds that may present a significant ecological threat.

Staff from DOC's Fiordland District Office (at Te Anau) should be available to the Trust to be called upon when necessary to provide expert technical advice and to assist the project.

DOC species Technical Advisory Groups (formerly Recovery Groups) will have a role in outlining required management and monitoring for their respective species.

10.2 Information management

In the course of preparing this plan, it became obvious that information storage systems for the island could be improved. Some information is being well-recorded (e.g. the stoat trapping records), but even here it appears there are omissions and conflicts with other records—only 33 stoats are recorded as having been trapped on Coal Island, but it is possible that up to 49 have actually been caught). Some important details appear not to have been formally recorded, while others could not be located (e.g. deer hunting results, presence/absence of rodents and details on surveys for such on Weka, Steep-To and Round Islands). Staff turnover both within the Trust and within DOC appears to have compounded this issue.

Information from general observations needs to be recorded to better understand the pest species targeted, the islands, and the conditions in which the work occurs. For example, it had not been clear to the Trust that the servicing of traps on the smaller islands had been in a confused situation. This sort of information needs to be recorded and shared, so the problem can then be analysed and solved.

A central storage system is highly recommended where all trip reports, trapping records, anecdotal information and any other relevant material on the island(s) can be held (and backed-up) in a secure location. This could be at DOC or the Trust, or both. It should be readily accessible to all Trust users (i.e. not on internal DOC systems).

Recommended management actions for information management:

- Standard data recording sheets for trap checking trips, and for all other 'official' visits to the islands should be set up for Coal Island and its surrounding islands. These standard 'trip-recording' forms should be made available to all trip leaders who **must** complete it for **all** trips to the islands (or a pre-delegated person should fill it out on their behalf on completion of the trip). All trip leaders should be educated on the importance of collecting this information. This data sheet could include incidental sightings (e.g. unusual bird species recorded) or this could be held somewhere else. The data sheet should also clearly show trip leaders what triggers a pest incursion response.
- All pest incursions, unusual wildlife observations, new records of flora and fauna, etc. (with observer name and date), should be recorded and stored in a central 'logbook'.
- A central storage system must be created (and backed-up) to collate all information gathered on trips to Coal, Weka, Steep-To and Round Islands and this information must be able to be shared and updated by DOC and the Trust.

10.3 Management task list

Some of the tasks considered desirable or necessary for the Coal Island Restoration Project in the short- to medium-term future are summarised in the following tables:

Pest management required:

ACTIVITY	LOCATION					ACTION	RESPONSIBILITY	TIME FRAME
	COAL	WEKA	ROUND	STEEP-TO	MAIN LAND			
Stoat trap checks and maintenance	✓	✓		✓	✓	DOC150 trap-lines.	The Trust	Checked quarterly, more in plague years
Stoat trap-line revision		✓	✓	✓	✓	Remove or alter all boat-accessed traps, to be accessible from the land.	The Trust	One-off
Deer control	✓	✓				Specific deer sign survey.	The Trust	At least annually
Mouse detection	✓	✓				Snap-traps within stoat tunnels.	The Trust	Same schedule as stoat traps
Rodent detection	✓	✓		✓		The stoat traps will act as rat detection/control devices. Tracking tunnels maintained permanently.	The Trust	Same schedule as stoat traps
Biosecurity	✓	✓	✓	✓		Biosecurity protocols as per approved plan.	DOC and the Trust	All visits to all islands

Surveys and habitat assessments required:

ACTION	ISLAND				PERSONNEL REQUIRED	TIME FRAME	
	COAL	WEKA	ROUND	STEEP-TO			
Fossil and sub-fossil surveys	✓				?	Independent specialists.	As soon as possible
Reptiles	✓	✓	✓	✓	✓	Lizard Technical Advisory Group aided by Trust volunteers?	As soon as possible (summer surveys)
Invertebrates	✓	✓	✓	✓	✓	DOC or university specialists aided by volunteers. Brian Patrick has offered to identify any collections.	As soon as possible
Freshwater fish (informal spotlighting of waterways at night)		✓				Trust or DOC fieldworkers?	As soon as possible, Lower priority
Freshwater fish (comprehensive surveys)		✓				DOC or NIWA specialists.	Lower priority

Surveys and habitat assessments required continued

ACTION	ISLAND				PERSONNEL REQUIRED	TIME FRAME
	COAL	WEKA	ROUND	STEEP- TO		
Bats (Detectors and habitat assessment)	✓	?		?	DOC bat specialists aided by volunteers.	As soon as possible (summer months)
Penguins and seabirds (current and former presence, stable isotopes)	✓	✓	✓	✓	DOC seabird specialists or University researchers aided by volunteers.	As soon as possible
Didymo and aquatic weeds	✓				Trust member or DOC staff member familiar with didymo and aquatic weeds.	As soon as possible

Monitoring desirable:

SUBJECT	ISLAND				ACTION/PERSONNEL REQUIRED
	COAL	WEKA	ROUND	STEEP-TO	
Fiordland Crested Penguin	✓	✓	✓	✓	Summer breeding surveys. OSNZ, university researchers or DOC specialists aided by Trust volunteers?
Haast kiwi	✓				On-going programme. DOC and volunteers as determined by Kiwi Recovery Group.
Vegetation	✓				On-going programme. DOC botanists.

Translocations possible in the next 1–10 years:

All potential translocations require DOC transfer approval and support from the respective Species Recovery / Technical Advisory Group.

While it may be considered most appropriate for the Trust to develop transfer proposals, the experience of local DOC staff in preparing such documents should be drawn upon to streamline the process.

SPECIES	DEPENDENCIES	TIMEFRAMES
Mohua	Moderately stoat tolerant, but stoat numbers need to be under control.	Could occur any time.
South Island robin	Moderately stoat tolerant, but stoat numbers need to be under control.	Could occur any time.
Orange-fronted parakeet	Assessment needs to be done in relation to yellow-fronted parakeet population status and habitat suitability.	Any time after assessment, if island is deemed suitable.
Brown teal	Stoat vulnerable, numbers and incursions need to be under control. Needs prior assessment of habitat, sources, risks, etc.	Stoat control needs to be proven effective over time before any translocations. Likely timeframe 10+ years.

Continued on next page

SPECIES	DEPENDENCIES	TIMEFRAMES
Tieke (South Island saddleback)	Highly sensitive to stoats. Stoat numbers and incursions need to be under control. Best if transferred to at least two islands (Coal and Steep-To) for 'security'.	Best if delayed until several years after reptile and invertebrate transfers. Stoat control also needs to be proven effective over time before translocation should occur. Likely timeframe 10+ years.
Knobbed weevil	Prior invertebrate survey required. Recovery of host plant <i>Anisotome</i> sp. underway. Alternative host <i>Stilbocarpa</i> sp. introduction required.	Could occur any time after dependencies completed.
Sand spurge	None—establishment sites (gravel beaches) suggested by Rance.	Could occur any time.
Punui/stilbocarpa	Establishment sites to be selected by botanist.	Could occur any time.
Water milfoil	Needs prior habitat assessment.	Could occur any time after assessment if habitat deemed suitable.

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<http://www.tepukahereka.org.nz>

<http://www.niwa.co.nz/freshwater-and-estuaries/nzffd>



ARCIS Life
 Internal DOC use only
 Crown Copyright Reserved
 NZGD 2000 New Zealand Transverse Mercator
 User: Imarahalli
 Date: 22/08/2013

Appendix 1.

Map of Coal Island and surrounds, showing locations of traps June 2013.

Project Location: E. Bilsborough, New Zealand. Scale: 1:50,000. Date: 22/08/2013.



Appendix 2

Recorded Archeological sites

SITE NUMBER	DESCRIPTION	ISLAND	EASTING	NORTHING*
B46/14	Slab Hut	Coal	1106435	4872145
B46/46	Coal mine	Coal	1106238	4870441
B46/77	Gold working	Coal	1109236	4874758
B46/92	Hut sites	Coal	1106600	4871577
B46/93	Alluvial gold workings	Coal	1106664	4871719
B46/94	Ground-sluice pit	Coal	1106776	4872727
B46/95	Hut site	Coal	1107663	4871293
B46/27	Rockshelter	Steep-To	1109937	4875361
B46/28	Prospecting holes	Steep-To	1109836	4875461
B46/29	Cave with mining pit	Steep-To	1109937	4875261
B46/30	Occupation cave	Steep-To	1109937	4875261
B46/31	Pits	Steep-To	1110238	4875161
B46/56	Pit and midden	Steep-To	1109937	4875361
B46/57	Pits	Steep-To	1109937	4875261
B46/68	Midden	Steep-To	1110439	4875061
B46/69	Goldworkings	Steep-To	1110439	4875061
B46/70	Midden	Steep-To	1110439	4875061
B46/71	Pits	Steep-To	1110537	4875964
B46/72	Hut site	Steep-To	1110537	4875964
B46/73	Pits and trenches	Steep-To	1110337	4875863
B46/74	Hut site	Steep-To	1110536	4876265
B46/75	Cave and midden	Steep-To	1110336	4876264
B46/76	Cave and midden	Steep-To	1110336	4876264
B46/1	Occupied Cave	Round	1111538	4876668
B46/33	Occupation cave	Weka	1112240	4876769
B46/34	Occupation cave	Weka	1112240	4876669
B46/35	Trench	Weka	1112240	4876769
B46/58	Cave with midden	Weka	1112442	4875667
B46/59	Cave with midden	Weka	1112140	4876468
B46/60	Cave with midden	Weka	1112342	4875968
B46/61	Rockshelter	Weka	1112442	4875667
B46/62	Cave	Weka	1112442	4875667
B46/63	Cave	Weka	1112443	4875467
B46/64	Rockshelter	Weka	1112544	4875166
B46/65	Rockshelter	Weka	1112544	4875066
B46/66	Cave	Weka	1112645	4874865
B46/67	Gold workings	Weka	1112842	4876470

* Grid references are shown in NZTM. A grid reference gives the location of a site, but it does not delimit its extent. The location of sites is usually only recorded to within about the nearest 100 m. Please refer to the notes that follow for further details on the limitations of site data.



Interpretation of data from the New Zealand Archaeological Association's Archaeological Site Recording Scheme

ArchSite is an online database that contains information about recorded archaeological sites in New Zealand. ArchSite uses GIS (Geographic Information System) technology to manage and display information on maps. It is the national inventory of archaeological sites in New Zealand. The information is used for research, site management and protection. There are currently over 60,000 sites in ArchSite.

ArchSite incorporates information from the NZ Archaeological Association's Site Recording Scheme. The Site Recording Scheme began over fifty years ago as a paper-based recording system for information about archaeological sites. Information has been provided by many different individuals and organisations over the years.

All information is provided on the strict understanding that the New Zealand Archaeological Association and any person or organisation associated with the Site Recording Scheme shall not be held liable in respect of any omissions from, or errors in, the data provided.

The following features of the data should be noted:

- A grid reference gives the location of a site, but it does not delimit its extent. The location of sites is usually only recorded to within about the nearest 100 metres. A more precise location may be given if a handheld GPS was used, but all such measurements have a standard error.
- The absence of data for any particular area should not be taken to mean that it contains no archaeological sites. It may mean that no archaeological survey has been carried out, or that sites were obscured at the time the survey was done. In any given area there may be any number of undiscovered or unrecorded sites.
- Some recorded sites may no longer exist. (They may, for example, have been destroyed since they were recorded.)
- Historical (post-European contact period) archaeological sites, in particular, are currently under-represented in ArchSite.
- Not all sites recorded in ArchSite are archaeological sites in terms of the Historic Places Act 1993. They may, for example, post-date 1900 or no longer be able, through investigation by archaeological methods, to provide evidence relating to the history of New Zealand.
- The formal evaluation of site significance is not a function of the Archaeological Site Recording Scheme.
- While some archaeological sites may also be considered wahi tapu, the Archaeological Site Recording Scheme is not specifically concerned with such places. If information about wahi tapu is required, it should be obtained from the relevant iwi.
- Information about vulnerable burial sites will, in some circumstances, be withheld.

For many purposes, an inspection by a qualified archaeologist will be required. Information from the Archaeological Site Recording Scheme is not a substitute for this.

Appendix 3

Scientific names of fauna mentioned in the text

BIRDS (indigenous and introduced)

Little spotted kiwi (pukupuku)	<i>Apteryx owenii</i>
Northern tokoeka / brown kiwi	<i>Apteryx australis</i> 'North Fiordland'
Southern tokoeka / brown kiwi	<i>Apteryx australis</i>
Broad-billed prion / parara	<i>Pachyptila vittata</i>
Mottled petrel / korure	<i>Pterodroma inexpectata</i>
Sooty shearwater / titi	<i>Puffinus griseus</i>
Southern little blue penguin / korora	<i>Eudyptula minor minor</i>
Fiordland crested penguin / tawaki	<i>Eudyptes pachyrhynchus</i>
Pied shag / karuhiruhi	<i>Phalacrocorax varius</i>
Black shag / kawau	<i>Phalacrocorax carbo</i>
Little shag / kawaupaka	<i>Phalacrocorax melanoleucos</i>
Reef heron	<i>Egretta sacra sacra</i>
White faced heron	<i>Ardea novaehollandiae novaehollandiae</i>
Mallard	<i>Anas platyrhynchos</i>
Grey duck / parera	<i>Anas superciliosa</i>
Pateke / South Island brown teal	<i>Anas chlorotis</i> 'South Island'
Pateke / North Island brown teal	<i>Anas chlorotis</i> 'North Island'
Paradise shelduck / putangitangi	<i>Tadorna variegata</i>
Whio / blue duck	<i>Hymenolaimus malacorhynchos</i>
Australasian harrier / kahu	<i>Circus approximans</i>
NZ falcon / karearea	<i>Falco novaeseelandiae</i> 'southern'
Takahe	<i>Porphyrio hochstetteri</i>
Western weka	<i>Gallirallus australis australis</i>
Variable oystercatcher / torea	<i>Haematopus unicolor</i>
NZ snipe / hakawai	<i>Coenocorypha aucklandica</i>
Brown skua	<i>Catharacta antarctica lonnbergi</i>
Black-backed gull / karoro	<i>Larus dominicus</i>
White-fronted tern / tara	<i>Sterna striata</i>
Kereru / NZ pigeon	<i>Hemiphaga novaeseelandiae</i>
South Island kaka	<i>Nestor meridionalis meridionalis</i>
Kākāpō	<i>Strigops habroptilus</i>
Kakariki / red-crowned parakeet	<i>Cyanoramphus novaeseelandiae novaeseelandiae</i>
Kakariki / yellow-crowned parakeet	<i>Cyanoramphus auriceps</i>
Kea	<i>Nestor notabilis</i>
Shining cuckoo / pipiharauroa	<i>Chrysococcyx lucidus</i>
Long-tailed cuckoo / koekoea	<i>Eudynamus taitensis</i>
Ruru / morepork	<i>Ninox novaeseelandiae</i>
Kingfisher / kotare	<i>Halcyon sancta</i>
Rock wren	<i>Xenicus gilviventris</i>
South Island bush wren	<i>Xenicus longipes longipes</i>
Rifleman / titipounamu	<i>Acanthisitta chloris chloris</i>
NZ pipit / pihoihoi	<i>Anthus novaeseelandia</i>
Dunnock / hedge sparrow	<i>Prunella modularis</i>
Black bird	<i>Turdus merula</i>
Song thrush	<i>Turdus philomelos</i>
South Island fernbird / matata	<i>Bowdleria punctata punctata</i>

BIRDS (indigenous and introduced)

Mohua / yellowhead	<i>Mohoua ochrocephala</i>
Brown creeper / pipipi	<i>Mohoua novaeseelandiae</i>
Grey warbler / riroriro	<i>Gerygone igata</i>
Fantail / piwakawaka	<i>Rhipidura fuliginosa</i>
South Island tomtit / miromiro	<i>Petroica macrocephala macrocephala</i>
South Island robin / kakaruai	<i>Petroica australis australis</i>
Silvereye / tauhou	<i>Zosterops lateralis</i>
Bellbird / korimako	<i>Anthornis melanura</i>
Tui	<i>Prothemadera novaeseelandiae</i>
Chaffinch	<i>Fringilla coelebs</i>
Green finch	<i>Carduelis chloris</i>
Redpoll	<i>Carduelis flammea</i>
South Island piopio	<i>Turnagra capensis capensis</i>
South Island kokako	<i>Callaeas cinerea</i>
North Island kokako	<i>Callaeas wilsoni</i>
Tieke / South Island saddleback	<i>Philesturnus carunculatus</i>

REPTILES

Fiordland skink	<i>Oligosoma acrinasum</i>
Chalky Island skink	<i>Oligosoma tekakahu</i>
Tuatara	<i>Sphenodon punctatus</i>

FRESHWATER FISH

Banded kokopu	<i>Galaxias fasciatus</i>
Giant kokopu	<i>Galaxias argenteus</i>
Short-jawed kokopu	<i>Galaxias postvectis</i>
Koaro	<i>Galaxias brevipinnis</i>
Longfinned eel / tuna	<i>Anguilla dieffenbachii</i>
Bully species	<i>Gobiomorphus</i> spp.
Inanga	<i>Galaxias maculatus</i>

INTRODUCED MAMMALS

Norway rat	<i>Rattus norvegicus</i>
Ship rat	<i>Rattus rattus</i>
Mouse	<i>Mus musculus</i>
Cat	<i>Felis catus</i>
Dog	<i>Canis lupus familiaris</i>
Possum	<i>Trichosurus vulpecula</i>
Deer	<i>Cervus elaphus</i>
Pigs	<i>Sus scrofa domesticus</i>
Goats	<i>Capra aegagrus hircus</i>
Ferrets	<i>Mustela putorius furo</i>
Stoats	<i>Mustela erminea</i>

Appendix 4

Coal Island vascular plant list

Prepared by Brian Rance and Geoff Rogers 25–28 May 2005

	Abundance	Habitat
* Adventive species	a Abundant	f Forest interior
# Rare species	f Frequent	cf Coastal forest
	c Common	c Open coastal communities
	o Occasional	r Rock faces
	u Uncommon	

SPECIES	COMMON NAME	ABUNDANCE	HABITAT
Ferns			
<i>Asplenium bulbiferum</i>	hen & chicken fern	u	f
<i>Asplenium flaccidum</i>	hanging spleenwort	o	f,cf
<i>Asplenium obtusatum</i>	coastal spleenwort	o	cf
<i>Asplenium polyodon</i>	a fern	u	cf
<i>Blechnum banksii/durum</i>	a fern	o	cf
<i>Blechnum colensoi</i>	a fern	o	f
<i>Blechnum chambersii</i>	a fern	o	f
<i>Blechnum discolor</i>	crown fern	f	f
<i>Blechnum novae-zelandiae</i>	kiokio	c	f,cf
<i>Blechnum fluviatile</i>	a fern	o	f,cf
<i>Blechnum penna-marina</i>	little hard fern	o	cf
<i>Blechnum procerum</i>	hard fern	a	f
<i>Ctenopteris heterophylla</i>	a fern	c	f
<i>Cyathea medularis</i>	mamaku	o	cf
<i>Cyathea smithii</i>	soft treefern	c	f,cf
<i>Dicksonia squarrosa</i>	hard treefern	o	f,cf
<i>Grammitis billardierii</i>	a fern	c	f,cf
<i>Histiopteris incisa</i>	water fern	o	f,cf
<i>Hymenophyllum bivalve</i>	a filmy fern	o	f
<i>Hymenophyllum demissum</i>	a filmy fern	c	f
<i>Hymenophyllum dilatatum</i>	a filmy fern	f	f,cf
<i>Hymenophyllum ferrugineum</i>	a filmy fern	o	f
<i>Hymenophyllum flabellifolium</i>	a filmy fern	c	f
<i>Hymenophyllum flexuosum</i>	a filmy fern	c	cf
<i>Hymenophyllum minimum</i>	a filmy fern	o	cf
<i>Hymenophyllum multifidum</i>	a filmy fern	o	f
<i>Hymenophyllum rarum</i>	a filmy fern	c	f
<i>Hymenophyllum revolutum</i>	a filmy fern	c	f
<i>Hymenophyllum sanguinolentum</i>	a filmy fern	a	f
<i>Lastreopsis glabella</i>	a fern	lf(o)	cf
<i>Lastreopsis hispida</i>	a fern	f	cf
<i>Leptopteris hymenophylloides</i>	crape fern	o	cf
<i>Lindsaea trichomanoides</i>	a fern	o	f
<i>Lycopodium varium</i>	a clubrush	o	f
<i>Lycopodium voluble</i>	a creeping clubrush	o	cf
<i>Phymatosorus diversifolius</i>	hounds tongue fern	o	cf
<i>Pnmatopteris pennigera</i>	a fern	o	cf
<i>Polystichum vestitum</i>	prickly shield fern	o	cf
<i>Pyrosia serpens</i>	leather-leaved fern	f	cf

SPECIES	COMMON NAME	ABUNDANCE	HABITAT
Ferns continued			
<i>Rumorha adiantiformis</i>	a fern	c	cf
<i>Tmispteris tannensis/elongata</i>	a chain fern	o	f
<i>Trichomanes reniforme</i>	kidney fern	f	f,cf
<i>Trichomanes strictum</i>	a fern	o	f
<i>Trichomanes venosum</i>	a filmy fern	o	cf
Podocarps			
<i>Dacrydium cupressinum</i>	rimu	a	f,cf
<i>Lepidothamnus intermedius</i>	yellow-silver fern	lc	f
<i>Podocarpus hallii</i>	Halls totara	f	f,cf
<i>Prumnopitys feruginea</i>	miro	f	f
Trees and shrubs			
<i>Archeria traversii</i>	a shrub	c	
<i>Arisotelia serrata</i>	wineberry	o	cf
<i>Ascarinia lucida</i>	hutu	f	cf,f
<i>Brachyglottis rotundifolia</i>	muttonbird shrub	f	cf
<i>Carpodetus serratus</i>	marble leaf	o	cf,f
<i>Coprosma ciliata</i>	a shrub	o	f,cf
<i>Coprosma colensoi</i>	a shrub	c	f
<i>Coprosma foetidissima</i>	stinkwood	f	f,cf
<i>Coprosma lucida</i>	glossy karamu	o	f,cf
<i>Coprosma propinqua</i>	mingimingi	c	cf
<i>Coprosma rhamnoides</i>	a shrub	c	f
<i>Coprosma rotundifolia</i>	a shrub	c	cf
<i>Coriaria arborea</i>	tree tutu	c	cf
<i>Cyathodes juniperina</i>	prickly mingimingi	o	f,cf
<i>Dracophyllum longifolium</i>	inaka/turpentine shrub	lc(o)	f,cf
<i>Elaeocarpus hookerianus</i>	pokaka	o	f
<i>Fuchsia excorticata</i>	tree fuchsia	lc(o)	cf
<i>Gaultheria rupestris</i>	a shrub	u	cf
<i>Griselinia littoralis</i>	broadleaf	o	f,cf
<i>Haloragis erectus</i>	a shrub	u	c
<i>Hebe elliptica</i>	coastal hebe	c	cf
<i>Hebe salicifolia</i>	koromiko	o	cf
<i>Hedycaria arborea</i>	pigeonwood	f	cf
* <i>Hypericum androsaemum</i>	tutsan	o	c
<i>Leptospermum scoparium</i>	manuka	lf(o)	cf,f
<i>Meliccytus ramiflorus</i>	mahoe	o	cf
<i>Metrosideros umbellata</i>	southern rata	f	f,cf
<i>Myrsine australis</i>	red mapou	c	cf
<i>Myrsine divaricata</i>	weeping mapou	o	f
<i>Neomyrtia pedunculata</i>	rohutu	f	f
<i>Nothofagus menziesii</i>	silver beech	c	f
<i>Nothofagus solandri</i> var. <i>cliffortioides</i>	mountain beech	f	f,cf
<i>Olearia arborescens</i>	a shrub daisy	o	cf
<i>Olearia avicennaefolia</i>	a tree daisy	o	cf
<i>Olearia colensoi</i>	leatherwood	o	cf
<i>Olearia oporina</i>	tete-a-weta	c	cf
<i>Pittosporum rigidum/crassicaule</i>	a shrub	o	f
<i>Pittosporum tenuifolium</i>	black mapou	o	cf
<i>Psuedopanax colensoi</i> var. <i>fiordense</i>	southern five finger	o	cf
<i>Psuedopanax colensoi</i> var. <i>ternatus</i>	three finger	o	f,cf

SPECIES	COMMON NAME	ABUNDANCE	HABITAT
Trees and shrubs continued			
<i>Pseudopanax crassifolius</i>	lancewood	o	f
<i>Pseudowintera colorata</i>	peppertree	o	f
<i>Raukaua edgerleyii</i>	a tree	o	f
<i>Raukaua simplex</i>	a tree	c	f
<i>Scheffera digitata</i>	seven finger	o	cf
* <i>Ulex europaeus</i>	gorse	o	c
<i>Weinmania racemosa</i>	kamahi	f	f
Mistletoes			
# <i>Alepis flavida</i>	yellow-flowered mistletoe	c	f
<i>Ileostylus micranthus</i>	a mistletoe	lc(o)	cf,f
# <i>Peraxilla colensoi</i>	scarlet mistletoe	c	f
# <i>Peraxilla tetrapetala</i>	red mistletoe	o	f
Climbers and vines			
<i>Metrosideros diffusa</i>	climbing rata	f	cf,f
<i>Muehlenbeckia australis</i>	pohuehue	o	cf
<i>Rubus australis</i>	a lawyer vine	o	f,cf
<i>Rubus cissiodes</i>	a lawyer vine	o	f,cf
Herbs			
<i>Acaena anserinifolia</i>	a biddibid	o	c
<i>Anisotome lyallii</i>	native coastal carrot	c	c
<i>Apium prostratum</i>	native celery	u	c
<i>Cardamine debilis</i> agg	a bitter cress	o	cf
<i>Centella uniflora</i>	a herb	lc	c
* <i>Cerastium fontanum</i>	mouse-ear chickweed	c	c
* <i>Cerastium glomeratum</i>	annual mouse-ear chickweed	o	c
* <i>Cirsium arvense</i>	Californian thistle	lo	c
* <i>Cirsium vulgare</i>	Scotch thistle	c	c
<i>Crassula moschata</i>	a coastal herb	o	c
* <i>Digitalis purpurea</i>	foxglove	o	cf
<i>Epilobium brunnescens</i>	a willowherb	o	c
<i>Epilobium pedunculare</i>	a willowherb	o	cf
<i>Guaphalium ruahinicum</i>	a daisy	o	c
<i>Gunnera monoica</i>	a creeping herb	o	c
<i>Hydrocotyle heteromeria</i>	a pennywort	o	c
<i>Hydrocotyle moschata</i>	a pennywort	o	c
<i>Hydrocotyle novae-zelandiae</i> var. <i>montana</i>	a pennywort	o	c
<i>Lagenifera pumila</i>	a daisy	lc	c
<i>Liliopsis novae-zelandiae</i>	a herb	o	c
<i>Lobelia anceps</i>	a coastal herb	o	c
<i>Nertera depressa</i>	a creeping herb	c	cf,f
<i>Nertera villosa</i>	a creeping herb	o	f
* <i>Plantago australis</i>	hairy plantain	lc	c
<i>Plantago triandra</i>	a native plantain	o	c
<i>Pseudognaphalium luteo-album</i>	Jersey cudweed	o	c
<i>Ranunculus acaulis</i>	a coastal buttercup	c	c
* <i>Rumex crispus</i>	curled dock	o	c
<i>Rumex neglectus</i>	a native dock	o	c
* <i>Sagina procumbens</i>	pearlwort	c	c
<i>Selliera radicans</i>	a coastal herb	o	c
<i>Senecio biserratus</i>	a groundsel	lc	c
<i>Senecio minimus</i>	fireweed	o	c

SPECIES	COMMON NAME	ABUNDANCE	HABITAT
Herbs continued			
# <i>Sonchus kirkii</i>	a native sow thistle	o	c
* <i>Sonchus oleraceus</i>	sow thistle	o	c
* <i>Stelleria media</i>	prickly sow thistle	o	f
<i>Stellaria parviflora</i>	a native chick weed	o	f
* <i>Taraxicum officinale</i>	dandelion	o	c
<i>Tetragonia tetragonioides</i>	native spinach	o	c
<i>Urtica incisa</i>	a native nettle	o	cf
* <i>Veronica serpyllifolia</i>	turf speedwell	o	c
Grasses			
* <i>Agrostis capillaris</i>	browntop	lc	c
<i>Cortaderia richardii</i>	toetoe	o	c
* <i>Dactylus glomerata</i>	cocksfoot	lo	c
<i>Dichelachne crinita</i>	plume grass	lc(o)	c
<i>Hierochloa redolens</i>	holy grass	u	c
* <i>Holcus lanatus</i>	Yorkshire fog	o	c
<i>Lachnagrostis pilosa</i> ssp. <i>pilosa</i>	a grass	o	cf
<i>Microlaena avenacea</i>	bush rice grass	o	f
* <i>Poa annua</i>	annual poa	o	c
<i>Rytidosperme gracile?</i>	a native grass	o	c
<i>Rytidosperme setifolium?</i>	a native grass	o	c
Sedges			
<i>Carex appressa</i>	a sedge	f	c
<i>Carex pleiostachys</i>	a sedge	o	c
<i>Carex</i> sp.	a sedge	o	c
<i>Gahnia procera</i>	a sedge	o	f
<i>Isolepis cernuus</i>	a sedge	o	c
<i>Isolepis habrus</i>	a sedge	o	c
<i>Isolepis nodosus</i>	club rush	o	c
<i>Schoenus concinnus</i>	a sedge	o	c
<i>Uncinia aucklandica?</i>	a hook grass	c	cf
<i>Uncinia filiformis?</i>	a hook grass	o	f
<i>Uncinia uncinata?</i>	a hook grass	o	f
Orchids			
<i>Acianthus sinclairii</i>	an orchid	u	cf
<i>Bulbophyllum pygmaeum</i>	an epiphytic orchid	o	f,cf
<i>Caladenia</i> sp.	an orchid	u	f
<i>Corybas trilobus</i>	a spider orchid	o	f
<i>Dendrobium cunninghamii</i>	an epiphytic orchid	c	f,cf
# <i>Drymoanthus flavus</i>	an epiphytic orchid	u	cf
<i>Earina autumnalis</i>	an epiphytic orchid	o	f,cf
<i>Earina mucronata</i>	an epiphytic orchid	o	f,cf
<i>Thelymitra</i> sp.	a sun orchid	o	cf
Other monocots			
<i>Astelia fragrans</i>	bush lily	o	f,cf
<i>Astelia nervosa</i>	a lily	u	b
* <i>Juncus bufonius</i>	toad rush	o	c
<i>Juncus gregiflorus</i>	a native rush	o	c
<i>Juncus planifolius</i>	flat-leaved rush	o	c
<i>Libertia pulchella</i>	an native iris	c	f
<i>Luzuriaga parviflora</i>	lantern berry	o	f
<i>Phormium cookianum</i>	mountain flax	c	c
<i>Rhipogonum scandens</i>	supplejack	c	cf

Appendix 5

Pest incursion response

(Adapted from DOCDM-475494 Incursion response plan information for Fiordland Islands (August 2010).

An ‘incursion’ for a stoat or rodent on Coal, Weka, Steep-To or Round islands is defined as a single individual caught, or seen, or suspected evidence of such an individual being seen on the island. This should trigger an immediate notification to DOC Te Anau, and implementation of the initial response as indicated below:

Coal Island (1163 ha)

Rodent Status: None

Key native birds: Bush birds

Current trapping system:

- 130 DOC 150 tunnels

- 1) If a mouse incursion, see **Plan C)**
- 2) If a rat incursion, see **Plan C)**
- 3) If a stoat incursion, see **Plan D*)**

Weka Island (108 ha)

Rodent Status: None

Key native birds: Bush birds

Current trapping system:

- 8 DOC 150 tunnels

- 1) If a mouse incursion, see **Plan C)**
- 2) If a rat incursion, see **Plan C)**
- 3) If a stoat incursion, see **Plan D*)**

Steep-to-Island (61 ha)

Rodent Status: None

Key native birds: Bush birds

Current trapping system:

- 6 DOC 150 tunnels

- 1) If a mouse incursion, see **Plan C)**
- 2) If a rat incursion, see **Plan C)**
- 3) If a stoat incursion, see **Plan D*)**

Round Island (4 ha)

Rodent Status: None

Key native birds: Bush birds

Current trapping system:

- 1 DOC 150 trap

- 1) If a mouse incursion, see **Plan C)**
- 2) If a rat incursion, see **Plan C)**
- 3) If a stoat incursion, see **Plan D*)**

*[NB. Response to stoat incursion may change in the future to Plan E if highly stoat-sensitive species are translocated and established on the islands]

Planned ‘initial’ responses

These plans are not detailed and are only suggestions. Each incursion will need to be assessed on a case-by-case basis. As a general rule, the initial grid should be put in place within 48 hours of an incursion being detected. The grid should stay in place for 1 year or as otherwise advised by DOC Te Anau; however, this may be extended if further signs and/or sightings are reported. Depending on the island, detection dogs may be used where needed.

Note: if bait stations are to be used, the appropriate pesticide procedures will to be adhered to. DOC Te Anau can advise on these procedures.

Plan C—Rodent incursion on an island without weka

Rodent trapping / bait stations

- Need to ensure entrances to tunnels are small to prevent small bird captures. However, they do not need to be robust—wire mesh or corflute trapping tunnels are sufficient.

Pest response for mouse incursion

A trap/bait station grid should be established directly around the sighting/sign/capture—50–100 traps in a 25 m × 25 m grid. Place traps close to cover (e.g. alongside rocks, at the base of trees, under logs or overhanging vegetation). Each trap should be numbered and GPS coordinates recorded for data collection.

Notes:

- Mice are more prone than rats to investigate new objects.
- Victor professional traps or Snap E plastic traps are to be used.
- Bait stations—use Pestoff 20R or rodent block (Brodifacoum). Ensure the station is stable and secure.

Follow part IV contingency plan for pest invasion of islands in Southland Conservancy DOCDM-29722.

Pest response for rat incursion

A trap / bait station grid should be established directly around the sighting/sign/capture—50–100 traps in a 100 m × 50 m grid. Place traps close to cover (e.g. alongside rocks, at the base of trees, under logs or overhanging vegetation).

Notes:

- Norway rats use tracks and tend to be coastal foragers
- Ship rats may not use tracks and prefer forest interiors
- DOC 150/200 or Victor professional traps or Snap E traps should be used—bait with peanut butter / rolled oats, or white chocolate. A peanut butter wax tag is also useful for detecting rat presence. Protein-based bait may be better for Norway rats.
- Bait stations—use Pestoff 20R pellets or rodent block. Ensure the station is stable and secure. Norway rats prefer wooden stations to plastic versions.

Follow part IV contingency plan for pest invasion of islands in Southland Conservancy DOCDM-29722.

Plan D—Stoat incursion on island—minimum response

It is expected that stoats will arrive at these islands from time to time and no additional trapping will be required. However, this will have to be monitored (perhaps with additional checks) to ensure that a stoat population does not establish.

Follow part IV contingency plan for pest invasion of islands in Southland Conservancy DOCDM-29722.

Plan E—Stoat incursion on an island where vulnerable native bird species are present.

The installation of additional traps will depend on whether a stoat is caught or stoat sign is found.

Follow part IV contingency plan for pest invasion of islands in Southland Conservancy DOCDM-29722.

Incursion kits are available at:

DOC Te Anau Area Office

DOC Eye St Store, Invercargill

Anchor Island (50 ‘Snap E’ rat snap traps, 50 ‘Snap E’ mouse snap traps, 50 wire cage snap trap covers and pegs).

Appendix 6

Accidental discovery protocols

Why do we need to be careful and what should we look for?

Human remains

The appearance of human remains in the form of bones could occur unexpectedly in many locations, through erosion or natural processes. Such remains are of considerable spiritual significance, and may also reveal valuable information about the past. There is also always the possibility that they could be the result of homicide. For these reasons such discoveries must be handled with care. Such remains must not be disturbed in any way.

Artefacts

All artefacts are protected under the Protected Objects Act and/or the National Parks Act. Artefacts (i.e. moveable objects) provide vital clues for understanding the human past, and often are great treasures/taonga for present and future generations. Considerable understanding and knowledge of artefacts can be lost if their origin is unknown and if their original location within a site is not adequately recorded. It is important that artefacts be handled in a manner befitting their importance, and ensuring they are not damaged.

In addition, artefacts often constitute an integral part of an historic site and it may be more appropriate that they remain at the site. For these reasons it is generally desirable for them to remain in their original location either indefinitely, or until their context has been appropriately recorded.

However, there are exceptions to this. Some artefacts that come to light are extremely vulnerable to the effects of decay, and in other cases may be uplifted by members of the public or collectors if they are left in high use areas.

Archaeological sites

Many unrecorded historic heritage sites will only be found by chance so it is essential that staff are alert to signs that may indicate their presence, and that they gather adequate information on the spot. The evidence of human activity within a natural environment is often subtle, and the effects of natural deterioration and re-vegetation further disguise physical remains. However, in most cases observant staff familiar with the natural environment will be able to recognise features that are out of context or indicate human activity.

It is important that such finds are recorded so that these sites can be given adequate protection, or active management if required.

All staff should be alert and report:

- **any unnatural ground formations:** (ex. holes; pits; straight and squared off water-courses; flat areas; cleared pathways; formed steps.
- **any natural features out of their usual context** such as: stones in stacks, circles, or other unnatural formation; dead vegetation stacked or shaped; introduced plant species that may have been part of gardens, farming, or could be spread by livestock; native species that have been marked in any way (such as de-barked sections or drawings); artefacts of pre-European or European origin; shells of seafood species in piles, or layers in eroding banks; layers of charcoal.
- **any items of human manufacture** such as metals, plastics, concrete, worked timber, glass, brick

Protocol

In the event that any discovery is made by staff in the field, **All work in the vicinity that could impact the discovery should cease immediately.**

Step one: Information gathering

The following information will be required:

- Grid reference from GPS in NZTM or with map number and edition
- Date of the discovery
- Name of person making the discovery, and contact details
- Aids to relocation of the site—a precise description
- Description of exactly what was seen
- If what is seen appears to be part of a site / larger site, provide a description of the site
- A site or location sketch including a north point and reference to some fixed landmark or feature
- Photographs showing details and context. These are particularly important for potential human remains and artefacts where decisions may need to be made without a site visit.

DO NOT TOUCH OR MOVE ANYTHING

Step two: First contacts

The following people should be contacted immediately or as soon as possible:

- Project manager or supervisor in DOC's Te Anau Area Office

Step three: Subsequent contacts

This person will then advise and seek advice from a Technical Advisor for heritage from DOC's Science and Technical Unit.

The relevant people from the following list will be notified or become involved as appropriate:

- Local Police (if the find is human remains)
- The appropriate Runanga representative (for human remains or if the find potentially relates to Māori occupation or activity)
- New Zealand Historic Places Trust (NZHPT) Regional Archaeologist (for human remains, or if the find is potentially pre-1900 and a site has been damaged).
- New Zealand Archaeological Association (NZAA) District Filekeeper (to add information to site recording scheme)
- Ministry for Culture and Heritage (for artefacts, within 28 days of the find)

Step four: Decision-making for human remains

The contact people identified above will then manage the situation. An archaeologist from or approved by the NZHPT will establish if the remains are archaeological or not, and record them. An archaeological authority will be required for disinterment and/or re-interment of human remains. If the human remains are still in the place of burial when they are found a licence may be required from the Health Department to re-inter them. Ko Iwi Tangata will be handled in accordance with Iwi wishes and protocols.

Step five: Management of artefacts

- It is preferable to leave most items in the location where they are found, especially if specialist staff can revisit them within a short period of time.
- In some circumstances it may be advisable to collect the object and bring it back to the office. The criteria for uplifting the item are as follows:

- Threat as a result of high visitation
- Located in unstable land, i.e. eroding banks, sand dunes, land slips etc.
- Of a delicate nature and obviously susceptible to damage or deterioration if they are left (i.e. timber, textile, or bone).
- Rare or unusual items in locations where staff are unlikely to visit again for some time, or where items are vulnerable to being taken by visitors.

Advice should be sought by radio if possible, before any action is taken.

All items retrieved must be lodged with an appropriate repository (such as a museum) where they will be secure and receive the appropriate conservation treatment, they will be adequately recorded, and their custody determined by the Ministry of Culture and Heritage, in consultation with Iwi where relevant.