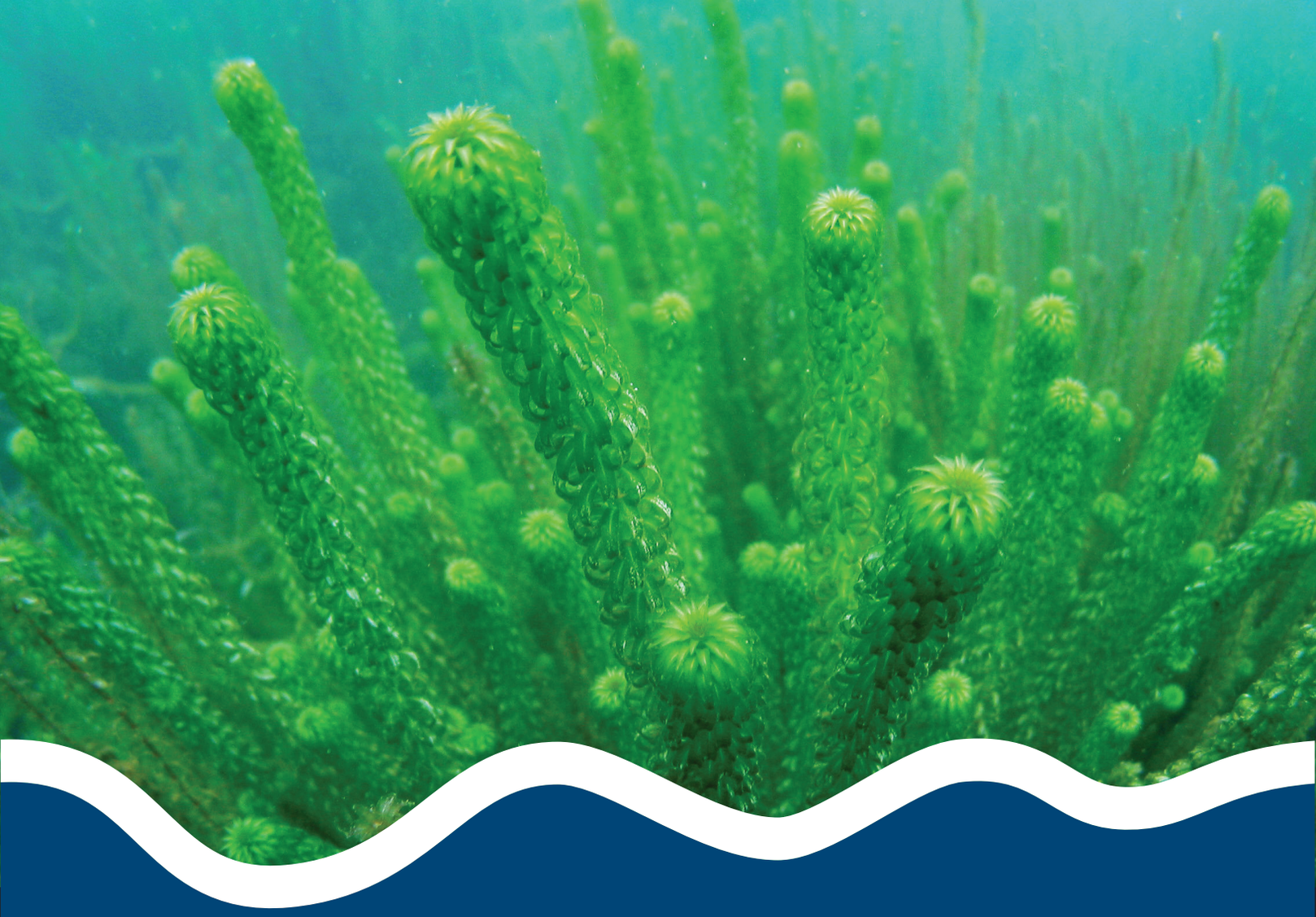

BAY OF PLENTY REGIONAL COUNCIL
TOI MOANA

Aquatic Pest Report 2019

Bay of Plenty Regional Council
Environmental Publication 2019/03
February 2019

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ISSN: 1175-9372 (Print)
ISSN: 1179-9471 (Online)

Cover photo: Rowan Wells (NIWA)

Acknowledgements

We would like to thank Hamish Lass, Biosecurity Officer for his support and guidance, and Lucas MacDonald, Biosecurity Officer for his assistance and advice across all advocacy work.

Our acknowledgements also go to Greg Corbett and the remainder of the Biosecurity Team at the Bay of Plenty Regional Council, we are grateful for the encouragement and support we received from all of you.

We would also like to show our gratitude to Geoff Ewert for his continued commitment to the Rotorua Lakes, in particular with fixing weed cordons and the running of the boat wash station. We are also immensely grateful to Sarah Van Der Boom from Freshwater Biosecurity Partnership Program for her help with data collection.

Lastly, we would like to thank Sam Beaumont and the remainder of the team at Ministry for Primary Industries, for the supplying of merchandise and collateral, signage and guidance.

Executive summary

Many of New Zealand's most well-known lakes and rivers can be found in the Bay of Plenty region and are therefore known to attract significant visitor numbers annually. The preservation and protection of these waterways are what attracts so many international and domestic tourists to them. Due to the close proximity of the Bay of Plenty lakes and rivers, and their popularity, they are extremely susceptible to invasive pest species.

Four main pest weeds have been identified in the Bay of Plenty waterways, these species are; Elodea canadensis (Canadian Pondweed), Egeria densa (Egeria), Lagarosiphon major (Lagarosiphon) and Ceratophyllum demersum (Hornwort). These species contribute greatly to water degradation and have adverse effects upon recreational activities. It is these recreational activities however which typically is the principle means by which weed fragments are spread between waterways in New Zealand's water bodies. Pest fish eggs could also possibly be hidden among weed fragments. There are specifically two pest fish of most concern in the Bay of Plenty region, these are Cyprinus carpo (Koi Carp) and Ameiurus nebulosus (Brown Bullhead Catfish). Similar to pest weed species pest fish have the ability to degrade water quality, affect recreational activities and threaten native species.

The Aquatic Pest Awareness Programme (APAP) aims to determine public levels of awareness whilst educating users about pests. The programme educates users on how they can prevent the spread of pest species, what those species look like and why they are a pest. Engagement within the awareness programme was implemented with surveys which were conducted at lakes and rivers across the Bay of Plenty. At the completion of a survey the APAP advocate would give the individual a pack including 'Check, Clean, Dry' (CCD), and 'Not in Our Lakes' merchandise and educational material. These were distributed at boat ramps, events, a number of retail outlets and accommodation. During the summer the Bay of Plenty's portable boat wash station was also used at busy boat ramps and events to decontaminate vessels entering or leaving the waterway.

During the 2018/2019 summer programme, a total of 673 surveys were completed on waterway users in the Bay of Plenty. A total of 95% of users were surveyed at lakes in the Bay of Plenty, with the remaining 5% being surveyed at rivers.

Of the users surveyed, 9% did not use a cleaning technique to prevent the spread of pests; however 70% of users did clean gear which had been in contact with water. Similarly 50.1% of waterway users indicated some level of awareness in regard to freshwater pest plants present in New Zealand. Of those surveyed 59% were from the Bay of Plenty region, followed by individuals from Auckland (17%).

The boat wash station surveyed a total of 197 vessel owners and of those, four vessels/trailers were found to have the invasive weed Hornwort attached. The majority of people who were surveyed at the boat wash station were from the Bay of Plenty (Rotorua 39%,Tauranga 28% and Whakatāne 11%). Of the users surveyed, 75% had previously visited another waterway, as opposed to the ocean.

Contents

Part 1:
Introduction

1.1 Background of Bay of Plenty waterways

The Bay of Plenty region is home to some of New Zealand's most popular lakes and rivers. One of the most distinct examples of this is the Rotorua Lakes district. Made up of 16 lakes and three major rivers, the Rotorua district is unique in New Zealand, well known for its geothermic activity. Home to the people of Te Arawa since the 14th century, Rotorua was made into a town in the 1880's to provide for visitors to the 'hot lakes' (NZ History, 2019). Today, Rotorua generates 3.3M visitors each year, including one third of all international visitors to New Zealand (Rotorua NZ, 2018).

All of the lakes in this district are of volcanic origin, originating up to 140,000 years ago when the Rotorua Caldera was formed (McLintock, 1966). The lakes are surrounded by various types of land, both undeveloped and highly developed forest and pastoral. Although the water quality of each lake is influenced by the surface flows in the surrounding catchment, groundwater springs within the catchment have been known to connect the lakes together (McBride, et al., 2015).

To the people of Te Arawa, these lakes are a tāonga, due to their cultural and historical significance, as well as their natural beauty and life-sustaining properties (Rotorua Lakes Strategy Group, 2007). The responsibility of the Bay of Plenty Regional Council is to protect Te Mana o te Wai (the intrinsic value of water). The lakes also hold recreational and economic value, with tourism in Rotorua contributing $820 million per annum (Rotorua NZ, 2018).

Figure 1 Mount Tarawera overlooking Lake Tarawera.

1.2 Invasive weed and algal species

Rivers, streams and lakes across the Bay of Plenty region are highly susceptible to invasion from exotic, non-native algae and pests. These pests and algae have the ability to out-compete the native flora and fauna, whilst simultaneously altering New Zealand's fragile ecosystems (Kelly & Hawes, 2005). Accidental and intentional transfers of pests and algae have caused substantial economic, recreational and biological impacts on New Zealand's freshwater systems (Champion & Clayton, 2000). Economically, the cost of managing these pests, particularly by the hydro-electricity industry is large and ongoing, therefore identifying the methods of spread and dispersal of these pests and algae is integral to managing their impacts (de Winton et al., 2009).

The Rotorua Lakes district in the Bay of Plenty has 16 lakes varying in size and depth, all of which are currently under protective management for four invasive macrophytes. These are; *Ceratophyllum dermersum* (Hornwort), *Elodea canadensis* (Canadian Pondweed), *Lagarosiphon major* (Oxygen Weed), and *Egeria densa* (Egeria) (Clayton, 1996). The distribution of these weeds across the 16 lakes varies (see Appendix 1) as shown on the Aquatic Pest Coordination Group (APCG) biosecurity signage posted at each of the lakes (see Appendix 2). Furthermore, the close proximity of the lakes and the volumes of lake users that visit them make them particularly susceptible to human assisted weed transfer.

Invasive weed species exhibit characteristics which allow them to out-compete native species; spread rapidly and form dense aggregations in New Zealand's waterways. One of the reasons why they out-compete native plants is that as they are exotic to New Zealand, lacking the presence of their natural predators or grazers (Francis, 2012). Due to their ability to asexually reproduce via vegetative fragmentation, weeds can be quickly distributed throughout recreationally used waterways as a result of human activity.

The Aquatic Weed Risk Assessment Model (AWRAM) is a useful tool that predicts the weed potential of a new species, by comparing the success of one aquatic species with another. The ecology, biology, invasiveness and management of the species (based on their behaviour in new habitats) are all compared. Each trait is ranked on a scale of 0–100 and combined to give a total score (Table 1).

Table 1 *Submerged aquatic plant species present in Rotorua lakes ranked according to weed risk. Higher score reflects greater impact (Champion & Clayton, Border Control for Potential Aquatic Weeds, 2000).*

Common name	Scientific name	AWRAM score
Hornwort	*Ceratophyllum demersum*	67
Egeria	*Egeria densa*	64
Oxygen weed	*Lagarosiphon major*	60
Canadian pondweed	*Elodea canadensis*	46

1.2.1 Hornwort

Ceratophyllum demersum, commonly referred to as Hornwort, is a submerged freshwater macrophyte, which can occupy both shallow and deep littoral habitats (Pelechaty, Pronin & Pukacz, 2014). Hornwort is a unique macrophyte as it has the ability to inhabit low light environments and can dominate in eutrophic and turbid habitats (Pelechaty et al., 2014) (Keskinkan, Goksu, Basibuyuk & Foster, 2004). Hornwort can be classified by filiform leaves in whorls of (6-)8-10(-12), which are dichotomously branched with minute teeth which causes the plant to feel rough to the touch (Wilmot-Dear, 1985). Hornwort has no root structure (Les, 1991) however; it has modified leaves which anchor the plant in sediment (Keskinkan et al., 2004). The base if its stem is buried in sandy or silty substrates, however it is often found floating in stagnant, slow moving water (Syed, Fatima, Mohammed, Siddiqui, 2018). In clear lakes Hornwort can be found in depths of up to 16 m, and in dense beds which can reach up to 10 m in height, causing the inhibition of light penetration to native species (Wells, de Winton & Clayton, 1997) (Champion, Clayton & Rowe, 2002).

Hornwort was first observed in the Bay of Plenty in 1975, in Lake Rotorua (Burton & Clayton, 2015) and has further established into Lakes, Rotoehu, Ōkataina, Rotoiti, Tarawera, Ōkāreka and Rotomahana. Lakes Ōkataina and Ōkāreka are under active control for Hornwort. Hornwort in Lake Ōkāreka is being controlled via an eradication program, which since August 2015 has yielded positive results, whereas Lake Ōkataina is being controlled by a weed cordon set across the arm of the lake, where Hornwort is commonly present. Hornwort is well established in the North Island, however it has been eradicated from the South Island of New Zealand. Due to the widespread establishment of Hornwort across the North Island it has caused detrimental effects on the environmental and recreational values within freshwater systems (Wells et al., 1997) (Champion et al., 2002). Due to Hornwort's ability to float in slow moving water it often causes blockages on hydro-electric systems, costing the hydro-electric power industry millions of dollars in maintenance which is undertaken to prevent Hornwort blocking turbines (Coffey & Clayton, 1988).

Hornwort has the ability to reproduce sexually and asexually, although the environmental requirements for sexual reproduction often limit seed production in many areas (Syed et al., 2018). Due to the rate and ease in which Hornwort can form a new plant via vegetative fragmentation it is considered a highly invasive weed species (Les, 1991) (Champion, Clayton & Rowe, 2002). Each fragment moving with the stem is capable of forming a new colony and are often dislodged from the parent plant as a result of wave action, currents, animals or propeller-driven boats (Coffey & Clayton, 1988) (Syed et al., 2018). As a result it is easily transported around the lake and can thrive in water of varying clarity, temperature, light and nutrient levels (Coffey & Clayton, 1988).

The AWRAM scale gives Hornwort a score of 67, meaning it is a very high risk aquatic species. Under the Bay of Plenty Regional Pest Management Plan (RPMP), it is a containment pest that must not be moved or interfered with (Bay of Plenty Regional Council, 2016). Hornwort is also an unwanted organism under the Biosecurity Act 1993 and is banned from sale, propagation and distribution under the National Plant Pest Accord (Ministry for Primary Industries, 2016). As the Rotorua Lakes are highly vulnerable and Hornwort has a high potential to thrive in a number of varying habitats, it possesses a high risk to aquatic biosecurity in the Bay of Plenty.

Figure 2 *A boat trailer heavily infested with Hornwort after exiting Lake Tarawera following a heavy storm.*

1.2.2 Lagarosiphon

Lagarosiphon major, (commonly known as oxygen weed), is a wholly submerged, vigorous freshwater perennial plant. Found to be present in all Rotorua lakes except lakes Rotomahana, Rotokakahi and Ōkaro, it is characterised by leaves that are strongly curved downward along the stem and arranged spirally (Champion, et al., 2013; Coffey & Clayton, 1988). Native to South Africa, the invasive weed has been present in New Zealand since the 1950s, presumably imported for use in the aquarium trade. It is now widely naturalised in the North Island, as well as the northern and eastern South Island.

Lagarosiphon is known to inhabit clear, shallow water bodies with slow to moderately fast flow of water. They prosper in up to 6.5 m depth but may grow to 1 m in murky water as well. As Lagarosiphon has sexes on different plants, only the female plant resides in New Zealand. Thus, it relies on human activity to facilitate its spread through fragmentation (Champion, et al., 2013; Coffey & Clayton, 1988).

Once widespread, Lagarosiphon is extremely difficult to control, as it has the ability to form vast meadows, which shade out native species and prevents their seedlings from establishing. This can result in rotting vegetation, causing stagnant water and killing plants and animals. It also has an impact on recreational activities, as large clumps may become dislodged, blocking waterways and hydro-electric systems, causing flooding (Weedbusters, 2018). As a containment pest plant in the Bay of Plenty Regional Council Pest Management Plan, Lagarosiphon follows the same guidelines as Hornwort (Bay of Plenty Regional Council, 2016).

1.2.3 Egeria

Egeria densa, commonly referred to as Egeria, is a freshwater perennial plant, native to South America. It is identified by short internodes and leaves which are approximately 10 mm-30 mm long, and 2 mm-5 mm wide (Champion & Hofstra, 2013). Egeria forms dense monospecific strands, restricting water movement in stream environments, trapping sediment and causing water quality fluctuations (Champion & Tanner, 2000).

Egeria thrives in turbid, slow-flowing waters (de Winton, Champion, Clayton & Wells, 2009), where its stems can grow to 5 m or until the plant reaches the water's surface. It then forms monospecific strands, reducing light penetration to other organisms (Invasive Species Specialist Group (ISSG), 2006).

Egeria was introduced to New Zealand's waterways via the aquarium trade (de Winton et al., 2009) and was first found in Lake Rotorua in 1977. It has since established in Lakes Ōkāreka, Rotoiti, Tarawera, Rerewhakaaitu and Rotomahana (Wells & Clayton, 1991). It is widely distributed across most of the North Island and is present in a small number of waterways in the South Island.

Egeria is difficult to properly manage and its dense growth creates anoxic conditions which smother benthic communities. Due to Egeria's dense growth it can cause major impacts on hydroelectric dams, and has the ability to impede irrigation flows and drainage within a catchment due to its growth habits (Chapman, 1970). Listed as a containment pest plant under the Bay of Plenty Regional Council Pest Management Plan, the Council would like to minimise its effects and prevent its further spread (Bay of Plenty Regional Council, 2016).

1.2.4 Elodea

Elodea Canadensis, (commonly referred to as Canadian Pondweed), is a submerged, bottom rooted, freshwater aquatic plant. Native to North America, it has the ability to grow and multiply rapidly in a diverse range of environments and conditions (Min et al., 2013). Elodea can be identified by its three leaves which are arranged in whorls around the stem, similar in appearance to other oxygen weeds (i.e. Lagarosiphon, Egeria). Elodea also flowers, in New Zealand this occurs in November, December and January (Popay, Champion & James, 2010). The flowers are carried to the surface by long, slender stalks for pollination via the wind and water (Hulme, Nentwig, Pysek & Vila, 2010). Elodea forms dense mats over substrate, often reaching heights of six metres (Popay et al., 2010), and thrives in moderately fast-flowing to still water bodies.

Elodea was the first invasive weed introduced to New Zealand in 1868 (Champion, Clayton & Rowe, 2002), presumably with the intention of oxygenating waters to support future introduced species of fish (Champion et al., 2002). It is currently present in all of the Rotorua lakes except for Lake Rotomahana. Dispersal and reproduction of Elodea occurs by vegetative fragmentation, where the stem breaks away from the parent plant and floats away. It then roots itself onto the substrate and begins growing a new plant (Hulme et al., 2010). Fragments of Elodea have a high survival rate, allowing for wide-spread dispersal, further increasing its invasion capabilities (Barrat-Segretain, 2004). Human recreation activities are believed to be one of the main dispersal methods for moving fragments, assisting in the dispersal of Elodea (Barrat-Segretain, 2004).

Large growths of Elodea are responsible for many adverse economic and ecological effects (Zehnsdorf, Hussner, Eismann, Ronicke & Melzer, 2015). Economically, similar to Hornwort it has the capability to block hydroelectric dams and restrict boat traffic (Zehnsdorf et al., 2015). Classed as a restricted pest plant under the Bay of Plenty Regional Council Pest Plan, the council would like to reduce the further spread of Elodea and support the community in doing so (Bay of Plenty Regional Council, 2016). Ecologically it poses a major threat to waterways due to its ability to modify the habitat it is present in, and the competitive ability for light and space against other plant species (Champion el al., 2002).

Figure 3 *Invasive weed species from left: Elodea canadensis, Ceratophyllum demersum, Lagarosiphon major and Egeria densa. Taken at Lake Aniwhenua.*

1.2.5 Didymo

Didymo (*Didymosphenia geminata*) is a major threat to rivers both within New Zealand and worldwide. A species of freshwater algae, didymo is a single celled diatom that is microscopic, only having a noticeable presence when it blooms. It is an aggressive invasive organism that is spread by humans, using as little as a single drop of water, and has the ability to stay living when kept moist for months at a time.

It is unusual for freshwater algae to dominate lotic water systems, even more so to grow in nutrient-poor environments. Algae blooms are typically associated with high concentrations in nutrients. Didymo however, appears to prefer water that is low in phosphorus. A distinct characteristic of waterways low in nutrients is the appearance of pristine, clean water. Therefore, didymo is a major threat to New Zealand's most beautiful waterways.

Didymo is able to form large mats when blooming, which consist of stalks that are strong and decay resistant (Kilroy, Larned & Biggs, 2009). These are used to attach to substrate such as rocks, forming thick colonies across large areas. The thick brown layer smothers habitat for native plants and animals and is distinctly recognised by its spongey texture, which appears slimy but rather feels gritty like cotton wool.

Didymo was first discovered in the South Island of New Zealand in 2004, in the Waiau River, Southland. It is believed that the algae had already been present there for 2-3 years, and was likely spread to New Zealand via human-related activities. Prior to this, didymo was widely distributed but uncommon across the Northern Hemisphere, but appeared to have more blooms in New Zealand, indicating that at some point the algae transformed into a more common, aggressive species (NIWA, 2014).

Although didymo is yet to be detected in North Island waterways, it is highly likely that it has been spread at some stage and not established successfully. Now present in 150 rivers in the South Island, it is one of the biggest threats of invasion to the Bay of Plenty region. The lack of didymo in the North Island may be a result of higher phosphorous levels; however didymo has been shown to grow successfully in North Island waters using lab-based trials.

Classified under the regional pest management plan as a pest of national significance, didymo is an unwanted organism under the Biosecurity Act (1993). In order to prevent the spread of didymo, it is essential that any gear used between waterways is cleaned and dried, especially as its presence is not visible to the naked eye. The 'Check, Clean, Dry' programme by Biosecurity New Zealand fundamentally targets the spread of didymo; however the guideline applies to all freshwater pests.

Figure 4 A mass of didymo from a heavily infested South Island riverbed.

1.2.6 Lindavia intermedia

Lindavia intermedia is a free-floating diatom and is currently understood to have arrived in New Zealand from North America, due to observations made in New Zealand and American lakes (Novis et al., 2017). Recent reports have recommended that no immediate action is to be taken to contain or eradicate Lindavia, and therefore it is highly likely that Lindavia will establish as an invasive organism in New Zealand's lakes (Novis et al., 2017).

Lindavia poses no known human health risk, however it can pose a serious threat to lake ecology and needs attention (Novis et al., 2017; Otago Regional Council, 2017). Commonly referred to as lake snow, colonies of Lindavia can produce a sticky biological material, for reasons unknown (Horizons Regional Council, 2018; Otago Regional Council, 2017). Further impacts of Lindavia on higher trophic levels of the food chain are unknown and therefore options for management and public awareness will need to be determined.

Lindavia is currently found in a number of Canterbury, Otago and North Island lakes, such as Wakatipu, Wanaka, Hawea, Hayes, Taupō, Waikeremoiana and Rotoaira (Horizons Regional Council, 2018). Water testing has shown Lindavia is yet to establish in the Rotorua Lakes. More comprehensive testing is required, as it is similar to didymo and is able to spread via a single drop of water. Once Lindavia forms lake snow it has been shown to require upgrades to urban water infrastructure, and has proven to be disruptive to recreational fishing on lakes (Williams, 2017).

1.3 Pest fish

Freshwater pest fish species are less common in the Bay of Plenty region but pose a serious threat to recreational waterways. Brown bullhead catfish, gambusia and the common goldfish are currently present in the Rotorua lakes, whereas koi carp, rudd, tench and perch have some presence in other areas of the Bay of Plenty or surrounding North Island regions (Bay of Plenty Regional Council, 2018).

Pest fish were originally introduced to New Zealand for a variety of reasons, including for biological controls, recreational fishing and ornamental purposes (Collier, 2015). These invasive fish establish quickly and out-compete native species for habitat and food. They are known to eat native fish and invertebrates, as well as destroy habitat by disturbing the sediment, damaging river banks and reducing water quality.

The presence of catfish in Lake Rotoiti is the most concerning invasion of pest fish in the Rotorua Lakes District. Catfish and many other invasive fish species are only spread to these areas via human activity. This may be accidental, such as catfish swimming into boat trailers that are left in the water, or purposefully, such as koi carp introduced to waterways as a food source.

1.3.1 Catfish

Brown Bullhead Catfish (*Ameiurus nebulosus*) are becoming an increasing biosecurity threat to the Bay of Plenty region. Generally found in slow or still waterways and the edge of lakes, they are highly adaptable to a variety of environments including poor water quality, low oxygen levels and high temperatures (Barnes & Hicks, 2003; Lakes Water Quality Society, 2017). Alongside this, they have been known to survive out of the water for up to 48 hours. They are recognized by four distinct pairs of barbels around their mouth, their dark brown to olive-green colour and their thick, flattened body (Barnes & Hicks, 2003).

Originally from North America, catfish were brought to New Zealand in 1877 as a food source and have since become abundant in various parts of the country, including the Waikato river system and Lake Taupō (Grayling, 2018; Blair & Hicks, 2009). Alongside their ability to tolerate a variety of environments, catfish are one of the few freshwater fish that exhibit parental care, defending juveniles in nests. (Eycleshymer, 1901) This significantly increases their chances of survival, facilitating their spread once introduced to a waterway. Catfish are generally spread between waterways through recreational activities, as they are known to hide inside boat trailers that are idle in the water for a period of time.

Once established, catfish cause detriment to natural lake environments in many ways. They decrease water quality through sedimentation, by stirring up substrate when feeding. Adults are omnivorous, feeding on fish, fish eggs, crustaceans, molluscs, invertebrate larvae, detritus and more. This has led adult catfish to both feed on koura (native freshwater crayfish) and compete with them for habitat (Barnes & Hicks, 2003). They are also likely to compete with native eels, disrupt macro invertebrate communities and alter ecosystem processes in our lakes (Lakes Water Quality Society, 2017).

Thought to have been introduced to the Bay of Plenty region from Lake Taupō or other Waikato waterways, catfish were initially found in 2016 at Lake Rotoiti, then in Lake Rotorua in late 2018. As a result of this, significant measures have been taken to prevent their spread to the remaining Rotorua lakes. Since their initial discovery in Te Weta Bay, an aquatic pest cordon has been put in place as an attempt to control the population. Although the majority of caught catfish have been found in Te Weta Bay in Rotoiti (78%), populations have spread to many areas around the lake, including Okere Inlet, Northern Shore and the Ōhau Channel (Grayling, 2018). The extent to which populations have spread in Lake Rotorua is yet to be determined. Classified as an exclusion or eradication pest in the Bay of Plenty Regional Pest Management Plan, the known spread or sale of catfish is prohibited under the Biosecurity Act (1993) and Freshwater Fisheries Regulations (1983).

Figure 5 *Catfish warning sign next to the boat ramp at Acacia Reserve, Lake Ōkāreka.*

1.3.2 Koi carp

Koi carp (*Cyprinus carpio)* are the most common pest fish in New Zealand (Lakes Water Quality Society, 2017). Identified by their orange colour, they are often mistaken with feral goldfish that can grow to similar sizes. Koi carp can grow to lengths of 750 mm and can weight up to 10 kg. They are distinctly different to goldfish, however, as they have two pairs of barbels on the side of the mouth. They also exhibit blotching of different colours, including orange, red, black, gold and white (Bay of Plenty Regional Council, 2018).

Introduced to New Zealand in the 1960's, it is not known whether koi carp arrived deliberately or by accident, but are thought to have been liberated from a pond to a waterway in Te Awamutu. Now they are widespread and common throughout the southern Waikato region and various ponds in the North Island. Like catfish, koi carp generally prefer slow-moving or still freshwater environments and are spread deliberately to waterways or private ponds, and can otherwise spread through flooding events and via water channels.

Koi carp are omnivores and eat a variety of food including plants, invertebrates, fish, larvae and detritus. They feed by vacuuming up benthic material and discarding unwanted sediment, causing an increase of sedimentation into the waterway, resulting in murky water and damaged riverbeds. In shallow lakes, they have the ability to increase turbidity as they are constantly disturbing the substrate. This causes unattractive waterways with poor water quality, and a reduction in native aquatic plants. (NIWA, 2018.) Koi carp are listed as an exclusion and eradication pest, indicating that the council is currently aimed at excluding them or eradicating them from the region (Bay of Plenty Regional Council, 2016).

1.3.3 Rudd

Scardinius erythrophthalmus, commonly known as Rudd belong to the cyprinid family (Hicks, 2003) and are native to Europe and Central Asia. Rudd typically prefer slow flowing water habitats and are able to tolerate a wide range of temperatures (Hicks, 2003). They prey on a variety of invertebrates and vegetation, due to their feeding habits they have the potential to alternative macrophyte communities, aiding in the invasion of aquatic pest weeds (Lake, Hicks & Dugdale, 2002) (Hicks 2003).

Rudd was illegally introduced into New Zealand in 1967, where a private consignment of juvenile Rudd were reared to adulthood and encouraged to breed (Department of Conservation, 2017). One adult, the fish were strategically released to a number of ponds in the Waikato region, however they have since spread to the Northland, Manawatu, Canterbury and Nelson Regions (Department of Conservation, 2017). Rudd are listed as a containment pest under the Bay of Plenty Regional Council Pest Management Plan. This specifies that the council would like to minimise the effects of and prevent their further spread. Land owners are required to destroy all rudd in any pond or waterway, excluding Lake McLaren (Bay of Plenty Regional Council, 2016).

1.3.4 Tench

Tinca commonly known as Tench belong to the cyprinid family (Rowe, 2004) and are native to the United Kingdom. Tench are limited to slow-moving shallow water habitats; however they are able to tolerate a wide variety of conditions. They have a fleshy, downturned mouth with small barbels either side (NIWA, 2016) which they use to prey on zooplankton and benthic invertebrates, and have been blamed for a reduction in benthic invertebrates overseas (Rowe, 2004). Typically they have bright red eyes and have an olive-green colour profile.

Tench were accidentally introduced into New Zealand in 1868, in addition to this accidental introduction; they are also spread illegally to new bodies of water by coarse fish angling enthusiasts (Carter, 2009). This illegal spreading of Tench is often performed as when Tench are in bodies of water which lack large predators, Tench have the ability to grow to unusually large sizes, making them attractive targets to anglers from overseas. Tench are currently found in Christchurch, Nelson, Oamaru, Northland and Tauranga (Dean, 2010), there have been unconfirmed sightings in Lake McLaren (Bay of Plenty Regional Council, 2011).

There is strong evidence that Tench, when in large numbers, are responsible for reducing lake clarity. They achieve this by disturbing the bottom sediments, and increasing nutrient recycling in shallow lakes (Bay of Plenty Regional Council, 2012). This can also cause indirect negative effects on native fish species via reduced food supply, reduction in water quality and reduced macrophyte cover. Like Rudd, Tench are listed as a containment pest under the Bay of Plenty Regional Council Pest Management Plan (Bay of Plenty Regional Council, 2016).

1.3.5 Gambusia

Gambusia affins, formally known as the mosquito fish, were supposedly introduced into New Zealand's waterways to control mosquitos (Ling, 2004), which unfortunately they do not. Gambusia are found most abundantly in shallow water, where they are protected from larger fish (Kuntz, 1913). They are also well adapted to living in hostile environments, are resilient to low oxygen concentrations and are able to survive in temperatures up to 42°C for short periods (GISD, 2010). Gambusia are aggressive and often attack native fish species by nipping at their fins and eyes, they also compete with native fish for food and have been observed eating native fish eggs.

Gambusia were first released in the Auckland Botanical Gardens pond in the 1930's (Department of Conservation, 2017). Further transfers into Northland, Taranaki and Wellington in the late 1930's are also documented (Department of Conservation, 2017). Since the 1930's, Gambusia have spread dramatically into the North Island's waterways due to natural spread, and by further illegal introductions. Following successful eradication operations, there are no known populations of Gambuisa in the South Island (NIWA, 2018).

1.3.6 Pest Management in the Bay of Plenty

The Bay of Plenty Regional Pest Management Plan (2011-2016) outlines what we as a Council are trying to achieve through our efforts to manage and prevent pest plants and animals. The plan also provides an outline of the statutory obligations surrounding various pests depending on their classification (Bay of Plenty Regional Council, 2011).

There are four classifications of pests in the Bay of Plenty, (Table 2). Each classification has its own specific objectives, rules and statutory obligations for the management of the pests. All freshwater pests, regardless, are protected under sections 52 and 53 of the Biosecurity Act 1993. This states that no person shall willingly sell, release or otherwise facilitate the spread of such species (Ministry of Agriculture and Forestry, 1993).

Table 2 *Definitions and examples of pest classifications as stated in the Bay of Plenty Regional Pest Management Plan (2011).*

Classification	Description	Examples
Agency Pests	Pests of national significance that are managed by or subject to programmes coordinated by the Crown.	*Didymo.*
Exclusion and Eradication Pests	Pests we want to prevent from entering the region, or eradicate from the region.	*Brown bullhead catfish, koi carp.*
Containment Pests	Pests that we want to minimise the effects of and prevent their further spread.	*Hornwort, lagarosiphon, egeria, rudd, tench.*
Restricted Pests	Pests we want to reduce the further spread of and will support community and occupier efforts to control, in places where they are a problem.	*Elodea, gambusia.*

The rules surrounding both containment pests and exclusion and eradication pests, also specify that, "No person shall move or allow to be moved, any machinery, vessel, organism, risk goods or other goods that is contaminated with any pest animal" (Bay of Plenty Regional Council, 2011). This is especially important due to the nature of these aquatic weed and fish pest species to be facilitated by the use of boats, boat trailers and other recreational equipment.

1.4 Awareness programme and survey background

The Bay of Plenty region's lakes and waterways are used by many residents, as well as domestic and international visitors. The waterways are used for a variety of recreational activities with a range of different equipment such as clothing, vessels and trailers entering the water. This equipment has been identified as the primary vectors capable of transferring invasive weed, fish and algae between water bodies around New Zealand.

Since the introduction of didymo to the South Island, several groups have been established to manage at-risk waterways and improve public awareness of freshwater pests. The Aquatic Pest Coordination Group (APCG) was established in 2004 and is made up of the Department of Conservation (DOC), Eastern Fish and Game, Bay of Plenty Regional Council (BOPRC), Te Arawa Lakes Trust, Land Information New Zealand (LINZ) and the Rotorua Lakes Council (RLC). These organisations work in partnership in regards to their role in preventing the dispersal of aquatic pests.

In July 2007, the didymo Long-Term Management Plan (LTM) was implemented across New Zealand, consisting of partnerships between MPI (Formerly MAF: the Ministry of Agriculture and Forestry), DOC, Fish and Game New Zealand, regional councils, impacted industry and iwi. The LTM outlined objectives, roles and responsibilities for didymo management. The Rotorua Te Arawa Lakes Programme was also established in 2015, and is comprised of the Te Arawa Lakes Trust, RLC and the BOPRC. The purpose of this programme is to 'work together to protect and restore water quality in 12 Rotorua lakes' (Te Arawa Lakes Programme, 2015).

More recently in 2016, MPI established the Freshwater Biosecurity Partnership Programme (FBPP). Formally the LTM programme, the FBPP is a long-term strategy extending through to 2021. It brings together the partners as listed above, as well as the addition of local iwi, Genesis Energy and Meridian Energy. The programme recognises the extension by the LTM to include all freshwater pests in 2011 and provides support and coordination for the APCG group.

Since the forming of the APCG in 2004, the Bay of Plenty Regional Council, with support from MPI, has employed two tertiary students over the busy summer period each year. The primary role for the students is to assist with the Aquatic Pest Advocacy Programme (APAP), a BOPRC initiative. Over previous years, a survey created for the APCG was conducted, in order determine pest awareness among the general public. Since 2017, a new MPI survey designed as a part of the National Science Challenge is being conducted nationwide (Appendix 3).

1.5 Aims and objectives

The aim of the Aquatic Pest Advocacy Programme is to raise awareness within the community and educate the public about preventing the spread of aquatic pests. This programme is specifically targeted at recreational users of Rotorua's waterways, both local and visiting. Emphasis is placed on ways in which the public can help minimise the spread of aquatic weed and fish species both within the Bay of Plenty region and beyond.

Data collected over the 2018/2019 summer period via electronic surveys will be used to determine the level of freshwater biosecurity knowledge by water users, as well as what they are currently doing to help prevent pests. This is important as it will allow for us to target future awareness programmes towards the types of users who appear to need it most. Various education material and merchandise supplied by the Ministry for Primary Industries and the Bay of Plenty Regional Council is also used to help capture public interest and spread knowledge throughout the community. This report will summarise the findings of the electronic survey, the efforts made through public interactions and what recommendations can be made as a result.

Part 2:
Methods

Between 20 December and 19 January, a total of 673 surveys were completed across the Bay of Plenty, with the vast majority conducted around the Rotorua Lakes. Lakes Rotomahana and Rotokakahi are privately owned, therefore were not visited.

The surveying schedule was conducted around aquatic events and during times when the water bodies would have peak volumes of users. Typically this was during public holidays and on weekends. Each survey period was eight hours long and occurred predominantly every weekend and three days a week, depending on weather conditions and user numbers.

Over the course of the summer, the BOPRC portable boat wash station was operational for nine days during public holidays and weekends. The aim was to clean vessels as they were entering or leaving the lake, and to engaging with vessel owners regarding the need to wash vessels between waterways. The boat wash provides a high pressured wash which removes loose weed fragments from boats and trailers.

Additionally to surveys, educational collateral material was distributed to; relevant retail outlets, information sites, tourism and accommodation providers. Aquatic event organisers were also contacted, and were provided with educational collateral material, information and decontamination equipment where required.

2.1 Waterway surveys

Boat ramps, lake and river side locations around the Bay of Plenty were visited multiple times during the busy period over summer. The Rotorua Lakes were divided into the Northern Lakes, Central Lakes, and Southern Lakes, each region was typically visited on alternating days, however if user population was low, multiple regions were visited a day.

Waterway users were observed and approached predominantly whilst they appeared to have a few minutes to spare, on boat ramps this was whilst they were in queue for the ramp. The waterway users were asked a series of questions in accordance with the National Science Challenge Survey, questions asked included:

- Waterway name.
- Location where the survey took place.
- User type.
- Country, region of residence and nearest town.
- Frequency of waterway visits.
- Freshwater pest plant and/or algae knowledge.
- Whether freshwater pest plants and/or algae had impacted waterway enjoyment.
- Methods for cleaning vessels and equipment used in freshwater.
- Water bodies visited in the last two weeks (prior to survey).
- Provide contact details for a follow up.

User knowledge of freshwater pest plants locally and nationally was gauged by asking users to identify aquatic pest plant species which are currently an issue in the Bay of Plenty and species which are outside of the region. The aquatic pest plants included in the survey included; Didymo, Hornwort, Egeria, Lagarosiphon, Lake Snow and Hydrilla.

Depending on the information collected, users were then informed on current aquatic pest issues, typically in the Bay of Plenty region and how to prevent the spread of aquatic pests. Education and information was tailored to the waterway user, i.e. boat/jetski owners were spoken to about weed transfer via trailer and fishermen about pest fish species.

Once a survey was completed a promotional pack containing further information was presented to the waterway user as a thank-you for participating, along with a practical use. The promotional packs were tailored for different waterway users, i.e. swimmers would be given a swim bag with a floatable keyring, bumper sticker, 'Check, Clean, Dry' material, and sunglasses strap, whereas a boat user/fisherman would be given a trout bag, floatable keyring, 'Check, Clean, Dry' material, sunglasses strap, fly holder and trout measuring ruler.

Surveys were conducted via iPad and mobile phone, all information gathered was uploaded to a central server (ArcGIS), which was collated and analysed.

Sites visited over the duration of the Summer Aquatic Pest Awareness Program are as follows; see Appendix 6 for map locations of these sites.

Table 3 Survey locations for the 2018/2019 summer period.

Northern sites	Central sites
Lake Rotorua • Awahou River • Hamurana • Hamurana Springs **Lake Rotoiti** • Otaramarae • Delta Ramp • Okawa Bay • Gisborne Point • Hinehopu Point **Lake Rotoehu** • Kennedy Bay • Ōtautū Bay **Lake Rotoma** • Merge Lodge • Matahī Spit **Lake Rotoma**	**Lake Rotorua** • Waitetī River • Sulphur Point • Hannahs Bay • Holdens Bay **Lake Okareka** • Boyes Beach • Acacia Point • DoC Campground **Lake Tarawera** • Bay View Road • Stoney Point • Boatshed Bay • The Landing **Lake Tikitapu**

Southern sites	River sites
Lake Ōkaro **Lake Rerewhakaaitu** • Guy Roe Reserve • Brett Road (DoC Campground) • Ash Pitt Road (DoC Campground)	**Rotorua** • Kaituna River • Hamarana • Ngongotahā River • Ngongotahā River Mouth **Tauranga** • Wairoa River **Whakatane** • Whakatāne River

2.2 Boat wash surveys

The Bay of Plenty Regional Council provided a portable boat wash station that was set up at five popular boat ramps during the 2018/2019 summer period. The wash uses water from the lake combined with simple green detergent to spray vessels from the sides and underneath, while they are driven over a ramp. The purpose of this is to ensure weed is removed from vessels and their trailers before they are taken to another waterway.

Boat wash users, as well as non-users who were interested, were asked to participate in a survey about freshwater aquatic pests. The survey included information about the vessel type, owner residence and previous water source, as well as the following yes/no questions:

- Do you know about aquatic pests/fish?
- Do you clean your vessel prior to changing water sources?
- Aquatic weeds found on vessel?

The sites where the boat wash was set up included Boat Shed Bay (Lake Tarawera), Matahī Spit (Lake Rotomā), Rotoiti Delta (Lake Rotoiti), Acacia Reserve (Lake Ōkāreka) and Lake Tikitapu. These sites were chosen due to spatial constraints, as the boat wash station was able to be set up without impeding on lake users accessibility. Weather was also a determining factor.

Figure 6 The boat wash in use at Lake Tikitapu for the 2018 FLOCHELLA event.

2.3 Retail and tourism awareness

Each year, millions of visitors are attracted to the Bay of Plenty region for its diverse range of freshwater activities. As a result of this, dozens of businesses are set up as retail and tourism outlets for outdoor/adventure based activities. These businesses are in turn tasked with helping to inform the public about their roles and responsibilities in regards to biosecurity. Between 19 November 2018 and 8 February 2019, 83 outlets were visited within the Bay of Plenty region, including Rotorua, Tauranga, Whakatāne and Ōpōtiki (Appendix 5).

In order to ensure that we were targeting waterway users, various accommodation sites including campgrounds, holiday parks and motor inns were visited, as well as stores that supplied boating and fishing gear. Tourist attractions were also visited alongside some popular cafes amongst lake users.

Various promotional materials were supplied to retail outlets depending on their target customers. Fishing and outdoor stores were supplied with Check, Clean, Dry brochures, spray bottles and detergent, as well as fish measuring stickers and fly fishing containers. Holiday parks, motor inns and campgrounds were given spray bottles and detergent, as well as brochures and keychains to distribute to guests. Tourism outlets were given information brochures, and cafes were given catfish coffee cups, t-shirts, brochures and various other small items such as lanyards. Where possible, managers and supervisors were spoken to, which ensured that the correct message was being spread to customers.

Merchandise was supplied by both the Ministry for Primary Industries and the Bay of Plenty Regional Council. The messages included were in relation to the 'Check, Clean, Dry' (CCD), campaign and 'Stop the Spread' of both aquatic weeds and catfish (Appendix 4). The CCD campaign messages focused on reducing the further spread of aquatic weeds as well as preventing didymo from entering the North Island. The catfish messages focused on 'Make our Lakes Great' and included steps on how to prevent the spread of catfish.

2.4 Event and school awareness

Water based events in the Bay of Plenty region provided the pest advocates an opportunity to engage with a wider audience, maximising aquatic pest awareness. Each event catered to groups with a diverse range of interests across the country. Events provided an opportunity for the aquatic pest advocates distributing information to organisers and collecting surveys from the event participants.

As with previous years, the focus was on event organisers to take the initiative and control of the decontamination process. As part of the lake closure consents for events, organisers and participants must read and abide by the biosecurity protocol (Appendix 7), in order to take part in the Bay of Plenty's waterway events.

Events held during the 2018/2019 summer period in the Bay of Plenty region were (events attended are labelled with an asterisk).

- Blue Lake Kayak Regatta, Lake Tikitapu.
- *New Zealand Water Ski Racing, Lake Rotomā.
- Jet Ski racing, Lake Rotorua.
- *Fish and Game Boat Fishing Seminar, Lake Tarawera.
- *Dewar Shield Blue Lake Regatta, Lake Tikitapu.
- Rotorua Half Iron Man, Lake Tikitapu.

Advocates also attended three outings with the Rotorua Duck Tours this summer period. Advocates went with school groups from Lynmore Primary School on the Duck to lakes Ōkāreka and Tikitapu, informing the students and their teachers the importance of freshwater biosecurity and the current pests we have in the Bay of Plenty. A game was played with the students where laminated pictures of pest fish and weeds in New Zealand were placed around the Duck and the students had to pick them off, simulating what needs to be done when exiting waterways.

Figure 7 *Advocates Thomas Bailey and Freya Ewing at the Dewar Shield Blue Lake Regatta.*

Part 3:
Results

3.1 Lake surveys

3.1.1 Distribution of surveys conducted at lakes

Nine of the Rotorua Lakes were surveyed over the summer period. The majority of users were surveyed at Lakes Tarawera, Tikitapu and Rotoiti (Figure 8). Of these locations, lakes Tarawera, Rotoiti, Rotomā, Ōkāreka, Rerewhakaaitu and Rotorua had multiple survey sites.

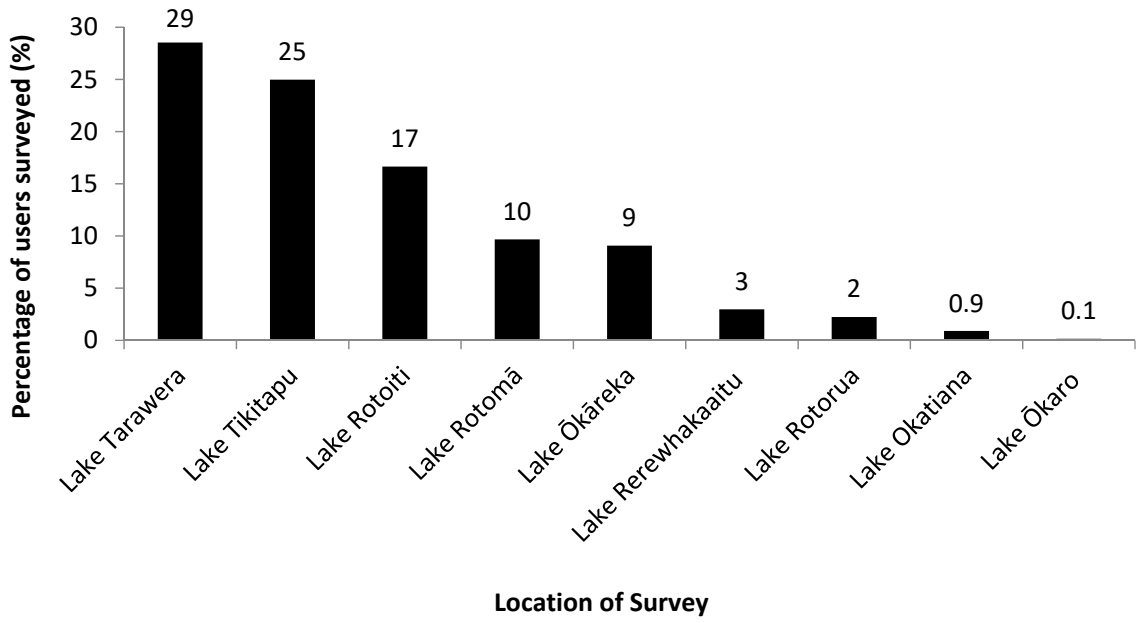

Figure 8 *Distribution of surveys conducted at different lakes within the Bay of Plenty region.*

3.1.2 Distribution of surveys conducted at rivers

Two river sites in the Bay of Plenty region were surveyed over the 2018/2019 summer period. Of those who were surveyed at a river, 67% were located at the Wairoa River and 33% at the Kaituna River (Figure 9).

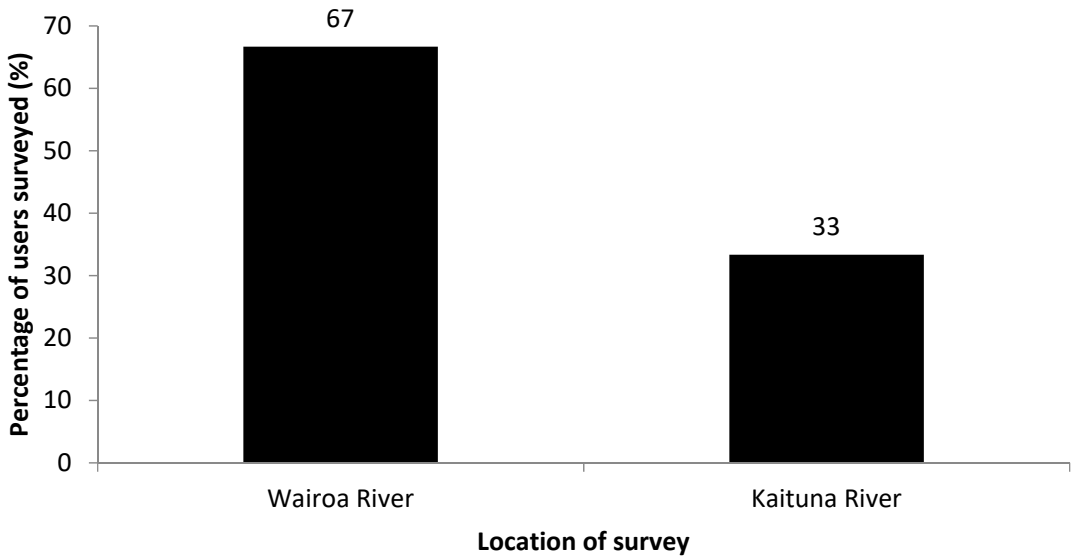

Figure 9 *Distribution of surveys conducted at different rivers within the Bay of Plenty region.*

3.1.3 Waterbody user type

A total of 12 different user types were recorded over the 2018/2019 summer period. Vessel users such as boat fishers, kayakers, rowers and water skiers comprised over half of those surveyed (Figure 10). Swimmers alone, however, comprised over a quarter (Figure 10).

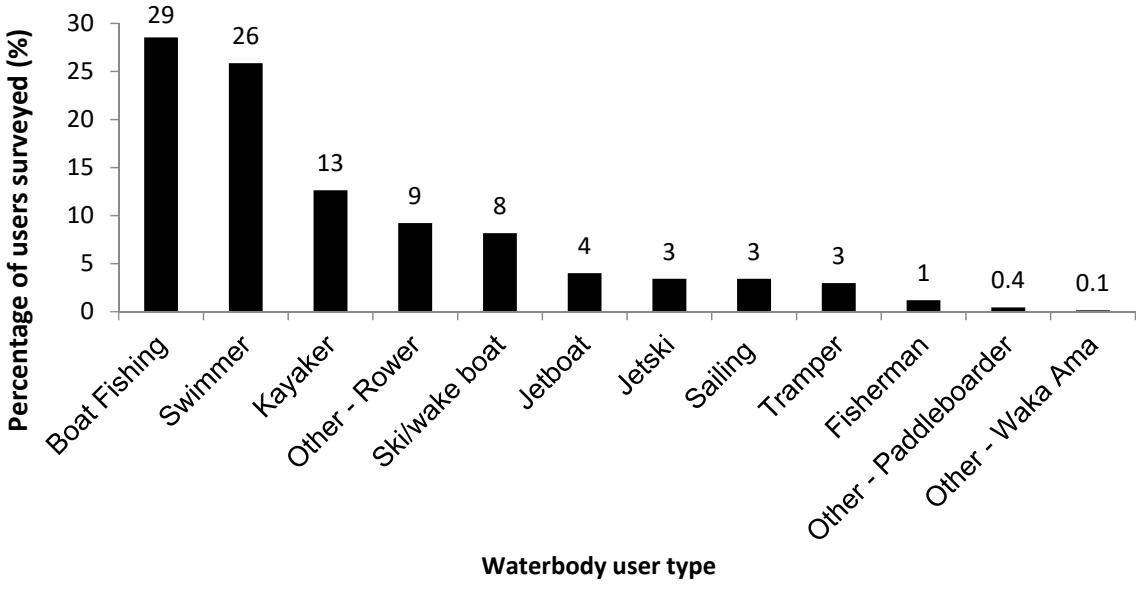

Figure 10 *Percentage of waterbody user types surveyed at different lakes and rivers within the Bay of Plenty region.*

3.1.4 Origin of users

A significantly high proportion of users surveyed originated from the Bay of Plenty region (Figure 11). Alongside this, over 95% of all users surveyed are from within the North Island (Figure 11).

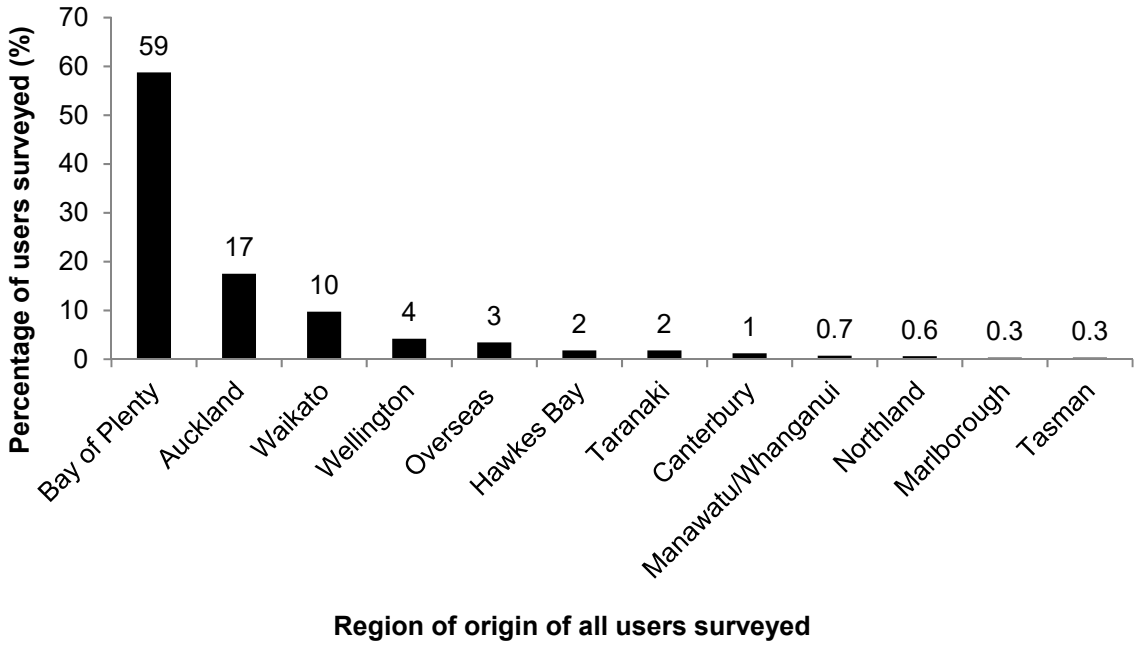

Figure 11 District/region of origin of all users surveyed.

3.1.5 Region/type of last water body used

Of the 672 users surveyed, 168 did not use any waterway in the last two weeks (Figure 12). 20% of users entered a marine waterway and the remaining users had entered a waterway in the Bay of Plenty or Waikato regions (Figure 12).

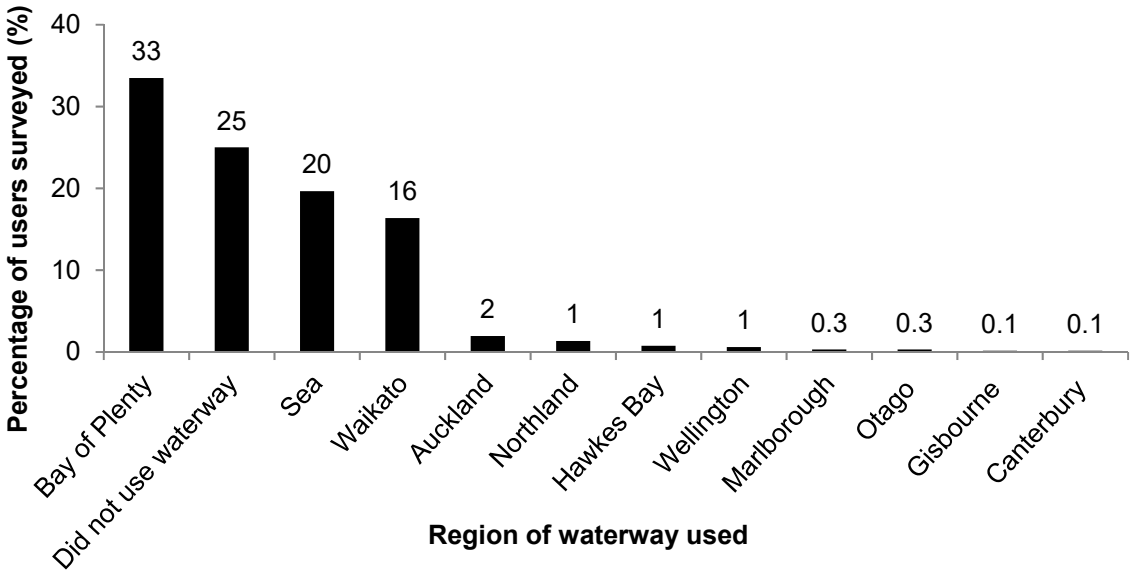

Figure 12 Region of last water body used by those surveyed.

3.1.6 Knowledge of freshwater pest plants

A relatively low number of waterway users had any knowledge of aquatic pest plants (49%), (Figure 13). The majority of users who were aware of pests however, knew of didymo/rock snot and nothing else (Figure 13).

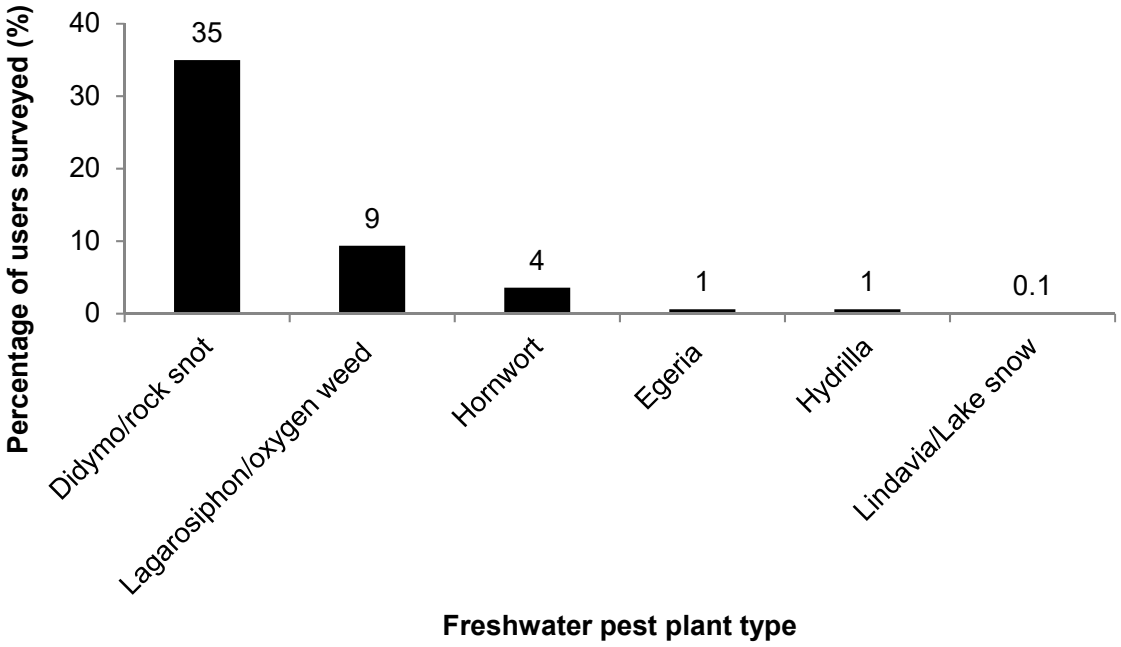

Figure 13 Knowledge of freshwater pest plants by all users surveyed.

3.1.7 Pest plant impact on enjoyment

Regardless of freshwater pest plant knowledge, the majority of users reported that pest plants do not impact on their enjoyment of waterways in New Zealand (Figure 14).

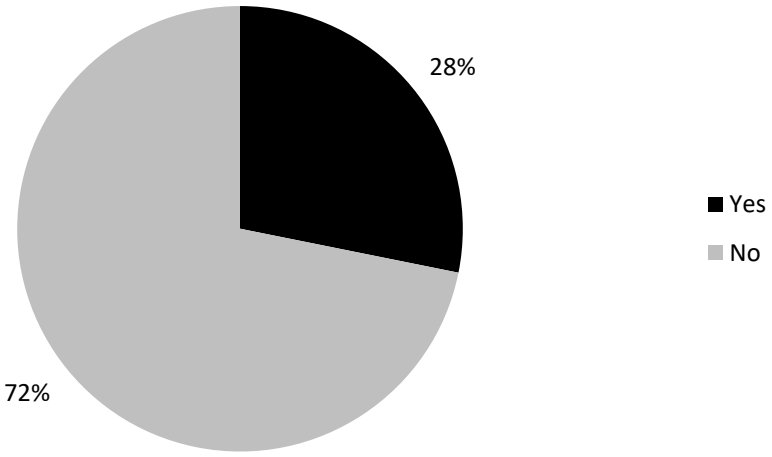

Figure 14 Percentage of all users who claim aquatic pest plants impact on their enjoyment of New Zealand waterways.

3.1.8 Users who Check, Clean, Dry vessels/equipment

Of the 672 users surveyed, 69% took action in the form of Check, Clean, Dry, to prevent the spread of freshwater pests (Figure 15). Of these users, the majority either cleaned their gear, or checked and cleaned it. Very few users followed the Check, Clean and Dry procedure correctly (Figure 15). Alongside this, 19% didn't take any action to prevent the spread, and 12% were not applicable as they did not move between waterways.

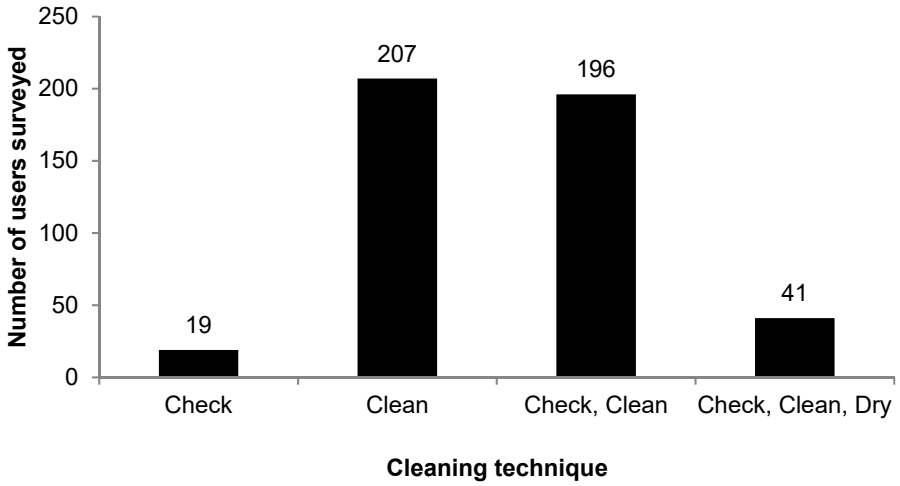

Figure 15 *Cleaning methods used by those surveyed to prevent the spread of pests.*

3.2 Boat wash survey

3.2.1 Distribution of surveys conducted at lake sites

Boat Shed Bay at Lake Tarawera and Matahī Spit at Lake Rotomā are both large boat ramps and were where the most boat wash surveys were conducted (Figure 16). Boat Shed Bay, Matahī Spit and Acacia Reserve were also all surveyed on more than one occasion.

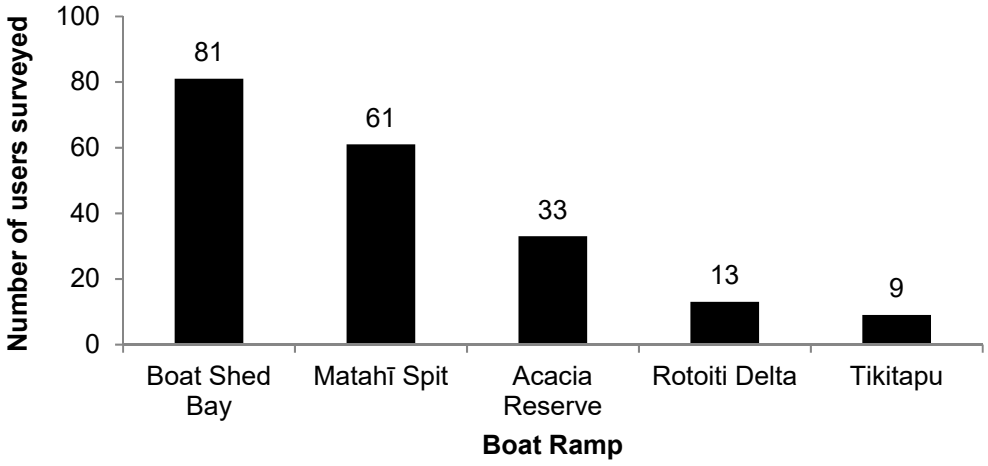

Figure 16 *Distribution of surveys conducted at Boat Shed Bay (Lake Tarawera), Matahī Spit (Lake Rotomā), Acacia Reserve (Lake Ōkāreka), Rotoiti Delta (Lake Rotoiti) and Lake Tikitapu.*

3.2.2 Origin of owners

The majority of vessel owners surveyed at the boat wash were originally from the Bay of Plenty region. Rotorua and Tauranga users were particularly common (Figure 17).

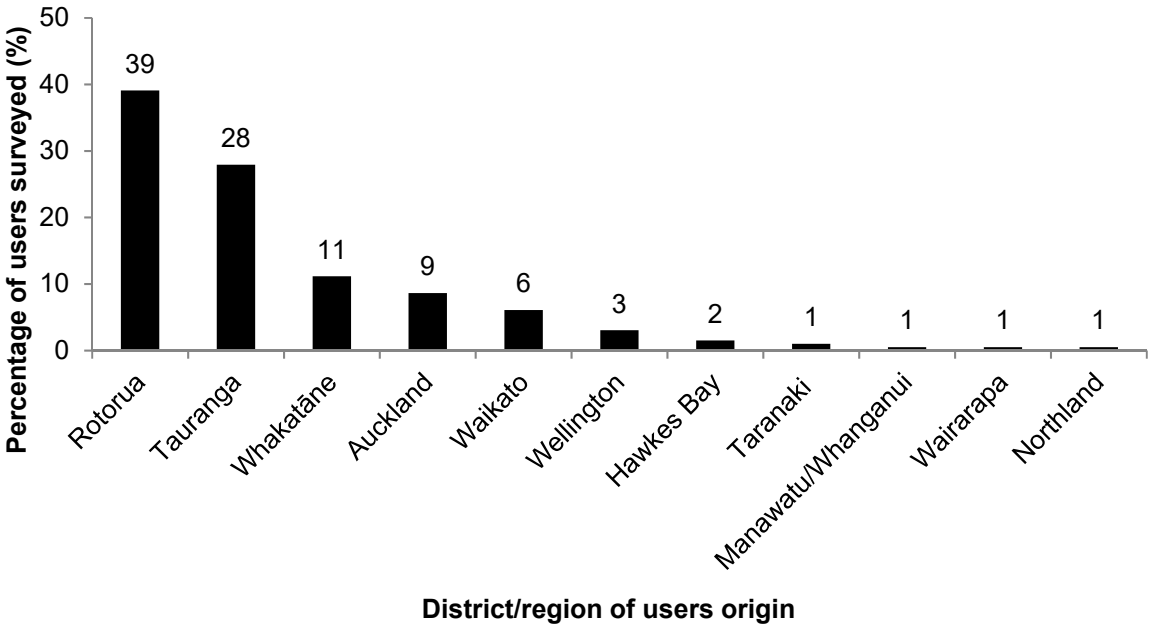

Figure 17 District/region of origin of users surveyed.

3.2.3 Vessel type

There were three vessel types surveyed at the boat wash over the 2018/2019 summer period. 75% of all users surveyed had a boat, however almost a quarter of users had a jet ski and a small proportion had a kayak (Figure 18).

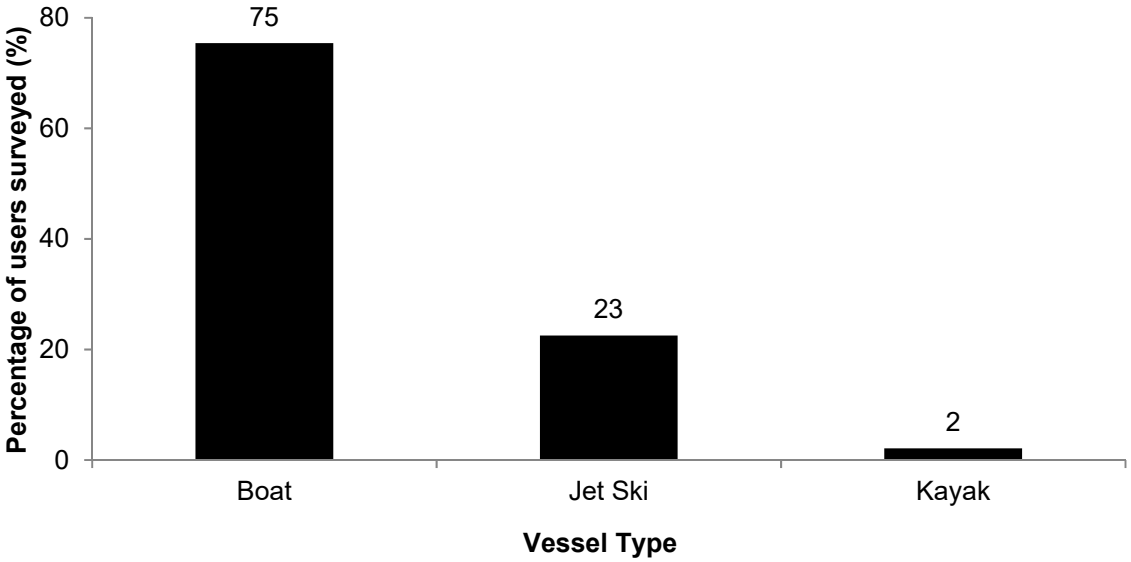

Figure 18 Percentage of different vessel types that were surveyed.

3.2.4 Last waterbody used

Previous water bodies used by those surveyed at the boat wash were all in the Bay of Plenty or Waikato regions (Figure 19). However, the majority of users had last entered the ocean as opposed to a waterway (Figure 19).

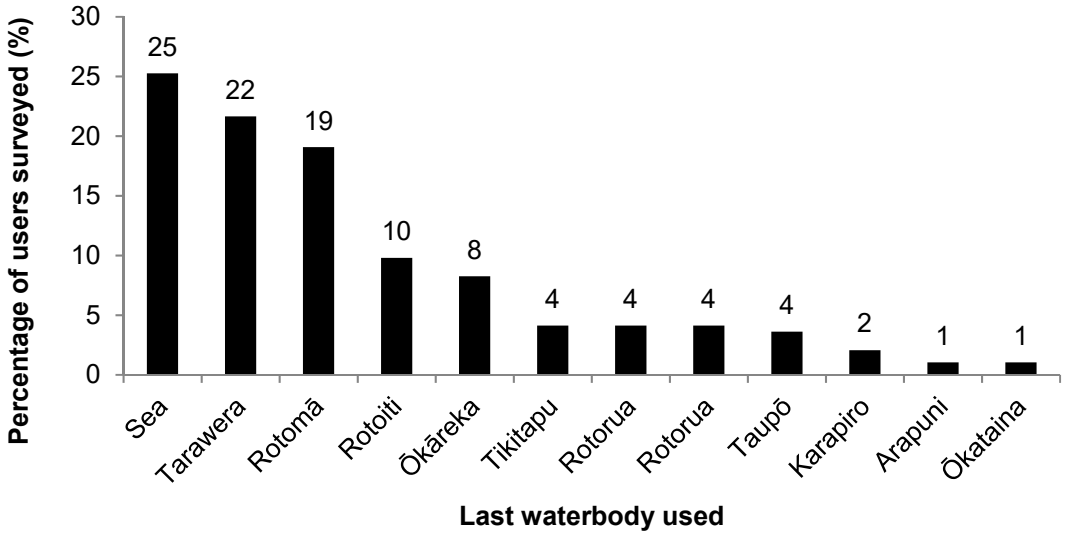

Figure 19 Most recent water source used by those surveyed.

3.2.5 Use of Boat Wash

Of the users surveyed at the boat wash, only 45% participated in using it to clean their vessel (Figure 20).

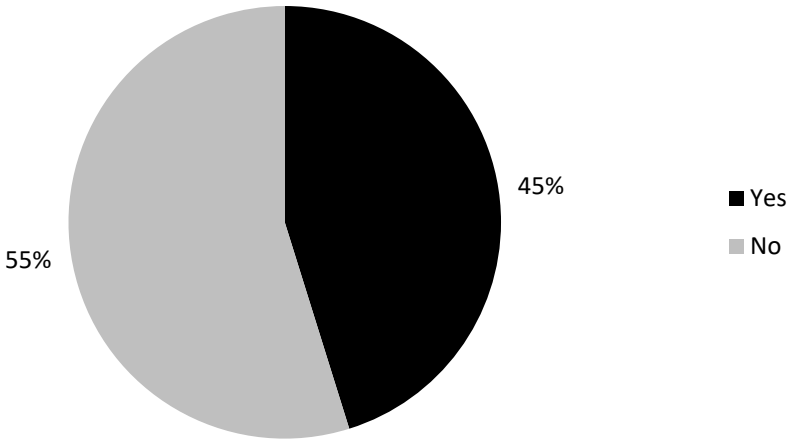

Figure 20 Percentage of users surveyed who used the boat wash.

3.2.6 Awareness of pest weeds/fish

85% of all users surveyed at the boat wash had knowledge of freshwater pest plants or fish (Figure 21).

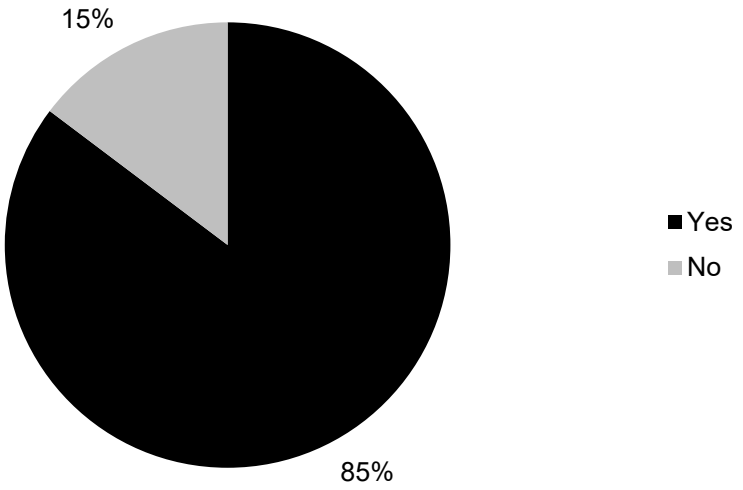

Figure 21 Percentage of users with knowledge of pest weeds and fish.

3.2.7 Do you clean your vessel between water bodies?

Regardless of freshwater pest knowledge, 91% of all users surveyed at the boat wash clean their vessel between waterways.

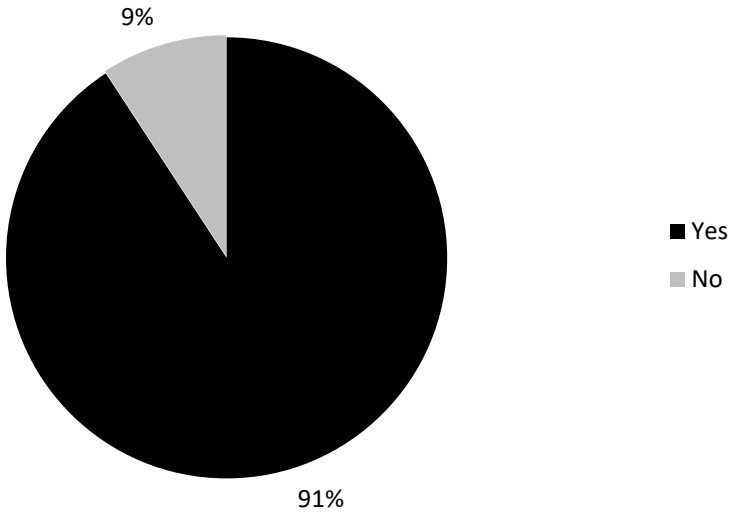

Figure 22 Percentage of users who clean their vessels when moving between water bodies.

Part 4:
Discussion

4.1 Waterway surveys

During the survey period of the 2018/2019 Aquatic Pest Awareness Programme, an emphasis was placed on visiting lakes and rivers with greater recreational use, ensuring a larger population of waterway users were engaged with. Previous years' recommendations and current knowledge of aquatic pest issues aided advocates in prioritising waterways with high popularity; waterways which were less popular were therefore visited frequently, due to a smaller user population. It is important to note that the number of surveys conducted at each lake does not reflect the actual number of lake users visiting the lakes, they are only indicative of the amount of time spent at each lake, which was not quantified.

Lake Rotomā is widely considered the most pristine lake in the Rotorua Lakes, due to its water quality and relative absence of aquatic weeds. It is also highly regarded for recreational activities and events, especially during the summer period. This high level of popularity and its close proximity to lakes Rotoiti and Rotoehu (both of which harbour a number of aquatic pests), led to Rotomā being a high priority site for collecting survey data and educating users.

Lake Rotoiti is the third largest lake in the Rotorua Lakes region at a surface area of 38.6 km² (McLintock, 1966) and is popular with users from Rotorua and Tauranga. Otaramarae ramp was visited frequently as it was the most popular with vessel users. An emphasis on checking trailers for catfish and catfish eggs was also made at all boat ramps on Rotoiti to prevent the potential spread.

Lakes Tikitapu and Ōkāreka were visited frequently over the summer period. Advocates attended events at Lake Tikitapu and conducted surveys on vessel users, along with swimmers and individuals walking around the lake. Surveys at Lake Ōkāreka were carried out at the DOC campsite, Boyes Beach and Acacia Bay boat ramp.

Lake Tarawera is one of the most popular lakes in the Bay of Plenty for fishing and other recreational activities, and therefore is highly susceptible to pest incursions. Lake Tarawera is also well known for its geothermal hot springs on its southern shore, attracting visitors year round. Due to limited parking at many of Tarawera's boat ramps effort was put into gathering surveys from Boatshed Bay and Stoney Point, both had large parking areas and turning circles for trailers.

Lakes Rerewhakaaitu and Ōkaro were visited twice during the summer period. This is due to the smaller population of users using the lakes. Of the individuals surveyed at these lakes it was found that the majority were locals or annual visitors. Due to fewer individual users at these lakes the advocates could allot more time to educating the individual.

4.1.1 Recreational purpose

The user type which was most commonly surveyed was boat fishing (29%) closely followed by swimmers (26%). Due to these two user types accounting for more than half of the surveys, the importance of 'Check, Clean, Dry' was highly stressed. Unlike previous years the number of Jet skiers surveyed was much lower (3%).

4.1.2 Origin of users and last waterbody used

The summer of 2018/2019 saw the majority of waterway users come from the Bay of Plenty region (59%), users from Rotorua accounted for 24% of total surveys, followed by Tauranga (23%) and Whakatāne (3%).

Users from regions which are deemed high risk for pest transfer also visited the waterways in the Bay of Plenty. Users from the Auckland and Waikato regions made up 17% and 10% of those surveyed respectively. These regions are renowned high risk regions due to the abundance of aquatic pest plants and fish. Many of waterway users not from the Bay of Plenty held a belief that the Bay of Plenty had little to no freshwater aquatic pests and were shocked once educated.

Overseas waterway users are also considered a potential risk due to their lack of knowledge around New Zealand biosecurity and how frequently they travel between different waterways. This summer however users from overseas made up 3% of users surveyed, with the majority surveyed at campgrounds, a significant decrease to last year's surveys.

The majority of users in the two weeks prior to the survey had used a waterway in the Bay of Plenty (33%), followed by 25% of users stating they had not visited another freshwater waterway. This was lower than the previous summer period where 74% of users stated they had not visited another freshwater way (Te Kurapa & Hippolite, 2018). A large portion of users stated they had been in the sea (26%) and/or the Waikato (22%).

4.1.3 Levels of pest plant and algae awareness

Waterway users were asked two questions to determine levels of Pest Plant awareness. Users were first asked whether they had any knowledge of freshwater pest plants in New Zealand, if users answered yes, they were then asked to name them. The most common pest plant users could name was Didymo with 35% of users having some knowledge on it. The least well known pest plant species were; Egeria (1%), Hydrilla (1%) and Lindavia (0.1%). Among all waterway users 50.1% were aware of at least one pest plant listed in the survey app without being prompted.

After asking whether they had knowledge of pest plants, users were then asked to give a yes or no answer whether or not pest plants impact on their enjoyment of the waterways (Appendix 3). Users gave varying results (not just yes or no) however the most common answers were that, 'it is not enjoyable to swim through' and 'it gets stuck on the anchor or prop and is a hassle to clean'.

Questions regarding pest fish were not included in this year's survey, so levels of awareness and interest were unable to be quantified. However due to the catfish incursions in Lakes Rotoiti and Rotorua most waterway users had some awareness to the issue due to the signage on and around the boat ramps. Many users the advocates spoke to were concerned with the presence of catfish in the Bay of Plenty; feedback consistent with previous survey results.

4.1.4 Users who Check, Clean, Dry

Cleaning gear which was in contact with the water was the most common cleaning technique, with 70% of users saying they cleaned. This was followed by 38% of users checking their gear for signs of pest plants. However of the 673 users surveyed, 60 individuals did not take any action to prevent the spread of freshwater pests. In previous years advocates spoke with lake users prior to them using the waterway, determining what waterways the user had previously been to. This allowed the advocates to educate the user if they had been to a notoriously pest infested waterbody.

This summer educational material was given to every user after they had completed the survey, allowing them to teach themselves and others. In addition to this cleaning equipment (spray bottles, detergent) were also given primarily to those who didn't realise they needed to clean, or those that had become complacent. A strong emphasis was also put on the ease by which aquatic pests can be transferred. This was done by educating waterway users how they potentially can spreads aquatic pests by not checking or cleaning gear. With the recent incursion of catfish in Lake Rotorua at the end of 2018, it was highlighted that weed fragments could also potentially be carrying pest fish eggs.

4.2 Boat wash surveys

The main purpose of the boat wash was to assist members of the public in cleaning their vessels by providing a convenient opportunity to do so. This set up served the additional purposes of educating the public about aquatic pest issues and ensuring that vessels bearing weed were washed off prior to entering the lake. Vessels were not required to go through the boat wash stations, and were surveyed regardless of whether they did or not. Users who did not use the wash were encouraged by summer advocates to do so. This resulted in only 45% of surveyed users going over the boat wash (Figure 20).

During the 2018/2019 summer period, the boat wash was used at five sites and surveyed a total of 197 users (Figure 16). This has improved since the 2017/2018 period, which surveyed four sites and 131 people. This may be due to better weather than the previous season, allowing the boat wash to be set up at more boat ramps and reach a larger range of people. Of the five sites, Boat Shed Bay (81%), Matahī Spit (61%) and Acacia Reserve (33%) had the highest numbers of surveys completed (Figure 16). These are generally popular boat ramps in the area as they boast a lot of room for loading and parking, compared to Rotoiti Delta and Tikitapu. However in the 2017/2018 period, Lake Tikitapu was a much more popular site with 39% of surveys completed there, compared to 9% this year (Figure 16).

Origin of users posed similar results to last year. The majority of owners lived in the Bay of Plenty (Rotorua, Tauranga and Whakatāne), followed by Auckland and Waikato (Figure 17). There was an increase in users from Whakatāne this year, with 11% as opposed to 6% during the previous season. This may be a result of the increase in surveys conducted at Matahī Spit in Lake Rotomā from 18% last year to 61% this year. Lake Rotomā attracts many users from Whakatāne as it is the closest to their town. This may also explain why the most popular 'previous waterbody' is the ocean, as many Tauranga and Whakatāne users visit the sea before or after entering a waterway (Figure 19).

Awareness of pest weeds/fish has decreased since 2017/2018, with only 85% of users saying yes compared to 92% previously (Figure 21). However, the number of people claiming to clean their vessel between waterways has increased from 82% to 91% over the same period (Figure 22). This appears to indicate that regardless of aquatic pest knowledge, users are getting the message to clean gear between waterways.

Feedback from the public in regards to the boat wash was generally very positive. Multiple people stated that they would prefer to use the boat wash if it were available permanently at popular ramps. In spite of this, it seemed that many users chose not to use the boast wash when it was available to them, as they were in a hurry to load/unload their vessel. There were a total of four vessels recorded as having weed present on their trailers either when launching or retrieving from Lake Tarawera. All four instances had hornwort present and occurred on the same day, as there was a strong south-westerly blowing weed onto the boat ramp. This is a decrease in the number recorded from last year, which saw 12 vessels, six of which were at a single event in Lake Tikitapu.

Figure 23 *Hornwort and Oxygen Weed washed up at Hinehopu boat ramp in Lake Rotoiti.*

4.3 Pest fish awareness

Educating waterway users on the various pest fish species that threaten the Bay of Plenty was a priority over the summer period. Although this region has few invasive pest fish, it was important to ensure users were aware of the risks if those species were to enter our lakes and rivers. Alongside this, the presence of catfish has grown substantially in the last 12 months, with 17,000 caught in Lake Rotoiti.

During the 2018/2019 summer period it was announced that catfish have also inhabited Lake Rotorua, resulting in hundreds of conversations with locals about the damage caused by these fish. Many of these conversations were initiated by concerned locals, wondering what to do if they catch one and how to stop them from spreading. Many lake users were also made aware by the signage put out at every boat ramp in the Rotorua Lakes area.

In order to ensure that waterway users were educated about pest fish, a large range of catfish collateral was provided to give to members of the public during surveys and at events (Appendix 4). Although the survey questions involved pest plants rather than fish, we ensured merchandise with catfish information was handed out among Check, Clean, Dry material.

Fewer conversations were had surrounding other pest fish such as koi carp, tench and rudd. This may be a result of lack of awareness, as mentioned previously in the 2017/2018 summer report. Although they are not a major threat to the Bay of Plenty at this stage, it is still crucial that the public are actively working to prevent them. The boat wash survey results indicate that 85% of users are aware of pest fish or weeds, however further questions would need to be asked to determine level of knowledge.

4.4 Retail and tourism awareness

The Bay of Plenty region and the Rotorua Lakes District are some of the most popular domestic and international tourist destinations in New Zealand. This poses a significant risk to the regional waterways, as visitors are likely to have travelled to various regions across New Zealand, before or after visiting the Bay of Plenty. In order to compensate for this, retail and tourism outlets were visited across the region to provide information regarding aquatic pest risks. Similar to previous years, focus was largely placed on fishing/hunting stores, backpackers, holiday parks, white water rafting operations and cafes (Appendix 5).

A variety of accommodation businesses were visited over the 2018/2019 summer period in Rotorua, Whakatāne and Tauranga to distribute Check, Clean, Dry brochures for guests. The management were very receptive of the information and happy to distribute material to help in educating their guests. Many holiday parks and motor inns were also happy to take spray bottles and detergent sachets for guests to clean their vessels with. A few requested for us to return again during the summer period to drop off more material when they had run out.

Outdoor retail stores such as fishing and boat stores were visited across the region including Rotorua, Tauranga, Whakatāne and Ōpōtiki. They were very interested in having brochures as well as keyrings, spray bottles, detergent, trout stickers and bumper stickers. These stores seemed particularly clued up on biosecurity risks in the Bay of Plenty and many already had information available to customers. Visiting the coastal areas such as Tauranga, Whakatāne and Ōpōtiki it appeared that many retail stores were aware of marine pests rather than freshwater. This allowed for advocates to discuss the various freshwater pest plants and fish that customers should be aware of when visiting waterways within the region.

Several cafes were visited across the Rotorua Lakes District to distribute compostable catfish coffee cups (Appendix 5). These opened a point of discussion between advocates and café owners, many of which were not aware of catfish being a problem. Due to delays, cups were not able to be distributed until the end of the summer period. Despite this, every café visited agreed to give out takeaway cups to customers, allowing locals and tourists to read the information on the cup and see what they can do to help prevent the spread.

The majority of tourism ventures visited took place in Rotorua, as they tend to have a high proportion of tourism activities, especially those related to waterways. White water rafting companies were very enthusiastic about Check, Clean, Dry and happy to spread the message. The Rotorua Duck Tours venture was also very interested in educating customers on this issue. The trips undertaken by advocates with Rotorua Duck Tours were filmed for the purpose of creating an informative video about preventing the spread of pests in the Rotorua District.

The overall response gathered from retail and tourism ventures in the Bay of Plenty was very positive and indicated a high level of awareness. This is likely a result of the work undertaken by previous advocates to visit these locations each and every summer. This reinforces the importance of advocacy work between the Council and local businesses, both in building positive relationships and ensuring that efforts to educate the public are regular and up-to-date.

4.5 Event and school awareness

Ensuring that event organisers and competitors are aware of their responsibilities regarding the prevention of aquatic pests is a crucial role. This involves speaking to event organisers, providing information and merchandise to raise awareness and being present at events where possible, to increase public conversations. Although the majority of events that took place over the 2018/2019 summer period were at the Rotorua Lakes, many participants were not locals and had travelled from across New Zealand. This poses a significant risk to waterways in the Bay of Plenty as hundreds of users may enter a lake or river during a single event.

Over this summer period event organisers were less receptive to assistance from advocates. Representatives from several events across the summer period were contacted, to determine if they would like for us to provide any merchandise for spot prizes, or to talk to participants upon registration about their responsibilities. Many organisers denied assistance as they had biosecurity rules and regulations in place ensuring participants' cleaned equipment as a condition of entry into the event. The Rotorua Rowing Club were happy to use both CCD and catfish collateral to give away to competitors, and allowed for us to set up a station where advocates were able to conduct surveys and raise awareness with participants and their families.

Across previous years, emphasis has been placed on the responsibility of event organisers to ensure biosecurity rules are adhered to. The response received this year indicates that this has been successful. Although many event participants were not regular users of the Bay of Plenty waterways, they are able to follow the same procedures in waterways across the country to achieve the same result. Several primary schools were also contacted across the summer period but with little success. Lynmore Primary School pupils participated in educational Duck Tours and were able to play a pest weed and fish game with advocates. Teachers and pupils were given merchandise to take home and were very enthusiastic about raising awareness with their families, with many children mentioning that their parents are regular lake users.

New Zealand Water Ski Racing, Lake Rotomā

Although event organisers did not require us to speak to the participants at the event, the relaxed nature of the programme meant that advocates were able to engage with participants when they weren't racing. Surveys were conducted with competitors and family members throughout the day. The overall understanding of Check, Clean, Dry from competitors and state of boats entering the water was very high, which was excellent to see considering that the event took place in Lake Rotomā.

Fish and Game Boat Fishing Seminar, Lake Tarawera

Similar to many other events over the 2018/2019 summer period, the Fish and Game Seminar had scheduled a moment to discuss Check, Clean, Dry with their participants. As advocates had spoken at the event in past years, Fish and Game were happy to talk about it themselves to ensure both new and experienced fisherman were educated on how to prevent the spread of aquatic pests. Advocates provided both catfish 'stop the spread' and CCD information booklets as well as trout measuring stickers, fly containers and a selection of small merchandise. This was laid out with Fish and Game information for participants to collect at the beginning of the seminar.

Dewar Shield Blue Lake Rowing Regatta, Lake Tikitapu

The Lake Tikitapu regatta was a great opportunity to engage with rowers as a different type of lake user. The majority of users surveyed were rowing for high school clubs and were well aware of the Check, Clean, Dry procedure. Having a stall set up at the regatta attracted the attention of many adults as well, including parents and other lake users there on the day. This meant that many conversations were initiated by the public approaching advocates, proving to be a successful set-up in capturing the public's attention and raising awareness.

4.6 Other issues for discussion

Generally users from the Bay of Plenty, especially Rotorua, were more knowledgeable on aquatic pests, due to them speaking to previous year's advocates. A portion of these users were also very grateful for the efforts in place to prevent the spread of aquatic pests, such as signage for both pest plants and catfish, weed cordons and the active trapping of the catfish in lakes Rotorua and Rotoiti.

Advocates were approached by numerous vessel owners over the course of the summer expressing the difficulty of thoroughly cleaning their boat between waterways. The vessel owners were told best practices to ensure their equipment was clean and given a spray bottle and detergent. They were also informed of the portable boat wash station which visits a lake a day and provides vessel owners a means to thoroughly clean their vessel. Some waterway users however highlighted the need for permanent boat wash stations at busy boat ramps.

Part 5:
Conclusion

The Rotorua lakes are a treasured asset to both locals and visitors to the region. As they hold cultural, recreational and economical significance to many New Zealanders, it is in their best interests to ensure the ecological health of these waterways is maintained. This involves protecting water quality and biodiversity, so that they lakes can still be used and appreciated for generations to come. All it takes is a single person to act carelessly for new pests to spread from one waterway to another, resulting in the degradation of native species and their unique habitats. Alongside this, aquatic pest plants and weeds have the potential to completely overrun waterways, block hydroelectric dams, eliminating potential for recreational activities and destroying entire ecosystems.

There are four pest weed species that are of a major concern to the Bay of Plenty waterways. These include hornwort, egeria, elodea and lagarosiphon. It is essential that efforts are maintained to inform lake users of their potential to spread weeds. This is especially important for lakes in close proximity of each other, such as Lakes Tikitapu and Ōkāreka, where one lake has less weed species present than the other. Although pest fish are uncommon in the Bay of Plenty, the recent introduction of catfish to two of the Rotorua lakes has sparked public interest and poses a significant danger to the remaining Bay of Plenty waterways.

The 2018/2019 Aquatic Pest Awareness Programme aimed to educate lake users and raise awareness of the risks involved in the spread of aquatic weed, pest fish and didymo. The overall feedback from waterway users was very positive. 673 lake users were surveyed in total, the majority of which originating from the Bay of Plenty region. Many members of the public, particularly those local to Rotorua, were already aware of the Check, Clean, Dry, process when spoken to over the summer. Although this may appear reassuring, it is still vital to reach out to users from within the region, especially in Tauranga and Whakatāne, as there is still confusion between marine and freshwater pests.

Freshwater users largely appreciated the work done by advocates over the summer and very seldom did people refuse to participate in the survey when asked. Data collected over the summer period indicated that many users are in the habit of checking and cleaning their equipment between waterways but do not know to dry it. Conversations with water users indicated that although many users cleaned their gear, not everyone was aware that 5% detergent was required. In the future, more emphasis placed around the addition of soap when cleaning gear would be beneficial.

Many local retail, tourism and accommodation businesses were enthusiastic about spreading the Check, Clean, Dry message and were happy to receive more information and resources in the future. Several events that took place over the summer such as the Lake Tikitapu rowing regatta and the Rotomā water ski racing competition were great opportunities to attract attention to the pressing issues across our region today. The decrease in number of vessels and trailers found with weed present over the summer indicates that lake users are making more of an effort to remove material from their equipment between waterways, reducing the risk of spreading hornwort among other weeds. Although not quantified in a survey, advocates found that many users were unaware of the ways in which catfish can be spread between waterways, often doubting common information such as catfish swimming inside boat trailers. This indicates that pest fish awareness is crucial, as lack of education between users continues to put our waterways at risk.

Part 6:
Recommendations

6.1 Biosecurity recommendations

1 Vessel trailers with carpet are much like felt waders and provide an easy means for pest species to transfer. It would be beneficial to explore this further and potentially restrict trailers which are carpeted from entering a waterbody.

2 A decontamination station at the Kaituna River drop-in at Ōkere Falls would aid the prevention of pest plants as Kayakers tend to frequently visit different waterways.

3 After a number of prevented weed incursions due to the boat wash facility, it may be beneficial to look into public wash down facilities at the busiest boat ramps.

4 Due to the Bay of Plenty being a highly popular destination for international and domestic tourists, it may be beneficial for roadside signage on biosecurity between waterways.

6.2 General recommendations

Survey and behaviours

1 Many people have the attitude of 'if I can't see it, why should I care?' which is highly detrimental to the prevention of pests. Perhaps allowing the users to have a hands on or eyes on approach.

2 The survey question 'How often do you visit this lake/river?' should allow a drop down menu to put the specific number of times, as the current options are vague.

3 Noticing a few individuals disregarding the notices for the toxic algae bloom, it would be beneficial for advocates to remind users of the health risks involved when using a waterway which has toxic algae.

4 Ordering collateral from the Ministry of Primary Industries should be done in the first few weeks of the programme, ensuring to order enough stock to last the summer period.

5 Very few waterway users do not wish to be spoken to, and may begin to become argumentative or berate the organisation. In these events it is simply best to thank them for their time and walk away.

6 When surveying at ramps with weed cordons, regular checks should be made on the cordon. This ensures the cordon is effective at preventing the weed from spreading. It should also be noted that whilst surveying at any ramp the advocates should check parked trailers for signs of pests.

7 As kayakers are capable of launching almost anywhere, more efforts are necessary around reaching these users.

8 Carry laminated photos of the aquatic pests in New Zealand to show waterway users what they should be looking out for if they are unaware or unsure how to identify the pests.

Retail and tourism

1 Start delivering educational material to accommodation and related retail businesses early in the summer. This ensures they are sufficiently stocked with information prior to the summer period.

2 Campgrounds and holiday parks are especially important as they often accommodate waterway users and are ideal places to distribute merchandise, gather surveys, and educate waterway users.

3 Encourage fishing and boat shops to distribute educational material when selling a boat/licence/rod.

Events

1 Summer students should view the lakes closure website when looking for events to attend. This provides a list of all lake closures for events, and has the event information and contact details.

2 Seek out events where other Regional Council staff, such as harbour patrol, will be working and arrange to collaborate. This can include material distribution and speaking with water users.

3 Attending the Wairoa Dam release multiple weekends in a row will see repeat users, therefore it is better to space out attendances.

4 The Blue Lake Rowing Regatta is an ideal time to collect surveys as there are many different regions in attendance. Parents and rowers alike are interested and happy to be educated on the risks of transferring aquatic pests and often share this information with their peers.

Additional

1 Justify travelling to remote waterways, such as the Wairoa River, lakes Rerewhakaaitu and Ōkaro by going at busy periods, such as public holidays, allowing a sizeable number of surveys to be collected.

2 The Wairoa River has a dam release every second Sunday of the month over summer. Kayakers are in abundance and are happy to participate in the survey. Typically river sites require fewer visits due to the same users being frequent visitors.

3 On days with bad/rough weather, weed fragments tend to gather on the shores of the heavily pest infested lakes, such as Lake Rotoiti. It is advisable to attend these lakes to ensure any users are checking and cleaning their trailers, it is also a good time to educate users as you can show what the plant looks like.

4 Signage could be put up at areas where vessel users spend time. The signage is at boat ramps is mostly ignored due to users rushing to get on or off the water. Signage at locations such as Hot Water Beach on Lake Tarawera would give vessel users time to read them thoroughly.

Part 7:
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Appendices

Appendix 1:

Known pest sites in Rotorua lakes

The current known distribution of four pest weed species between eleven of the Rotorua Lakes.

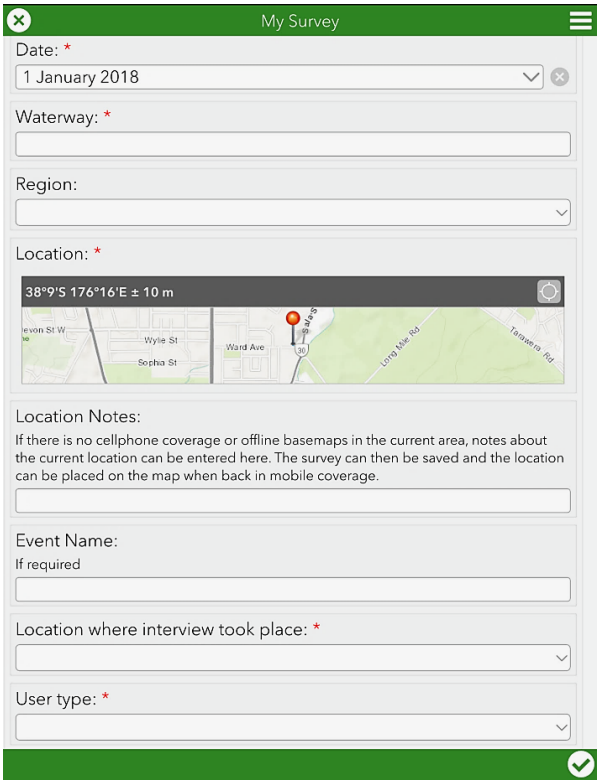
Appendix 2:

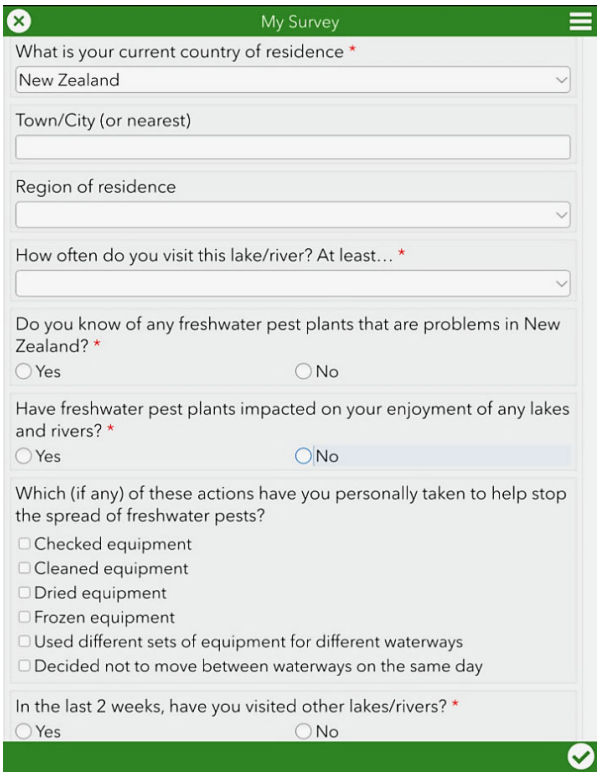
Biosecurity signage at Rotorua lakes

Aquatic Pest Coordination Group biosecurity signage at the Rotorua Lakes.

Appendix 3:

National Science Challenge Survey





Appendix 4:

Ministry for Primary Industries and Bay of Plenty Regional Council material distributed

From Ministry for Primary Industries

- CCD 250 mL spray bottle
- CCD 1L spray bottles
- CCD 20 mL biodegradable detergent sachets
- CCD Z-booklets “How to: Check, Clean, Dry”
- CCD posters
- CCD “Protect your Patch” pamphlets
- CCD temporary tattoos
- CCD bumper stickers
- CCD pens

From Bay of Plenty Regional Council

- CCD, Pest Patrol and Stop the Spread cooler bags
- CCD, Pest Patrol and Stop the Spread drawstring bags
- CCD, Pest Patrol and Stop the Spread floating key rings
- CCD, Pest Patrol and Stop the Spread hoodies
- CCD, Pest Patrol and Stop the Spread lanyards
- CCD, Pest Patrol and Stop the Spread T-shirts
- CCD, Pest Patrol and Stop the Spread trout bags
- CCD, Pest Patrol and Stop the Spread trout lures
- CCD, Pest Patrol and Stop the Spread waterproof phone case
- Pest Patrol and Clean your Boat drink bottles
- Pest Patrol and Clean your Boat ponchos
- Pest Patrol and Clean your Boat tie down
- Pest Patrol and Clean your Boat trailer and propeller fluorescent flag
- Keep Our Lakes Great bumper sticker
- Keep Our Lakes Great biodegradable coffee cups
- Keep Our Lakes Great coasters

- Keep Our Lakes Great cooler bags
- Keep Our Lakes Great fridge magnets
- Keep Our Lakes Great fly holder
- Keep Our Lakes Great hats
- Keep Our Lakes Great larger sticker
- Keep Our Lakes Great measuring sticker
- Keep Our Lakes Great pamphlets
- Keep Our Lakes Great small sticker
- Keep Our Lakes Great sunglasses strap

Appendix 5:

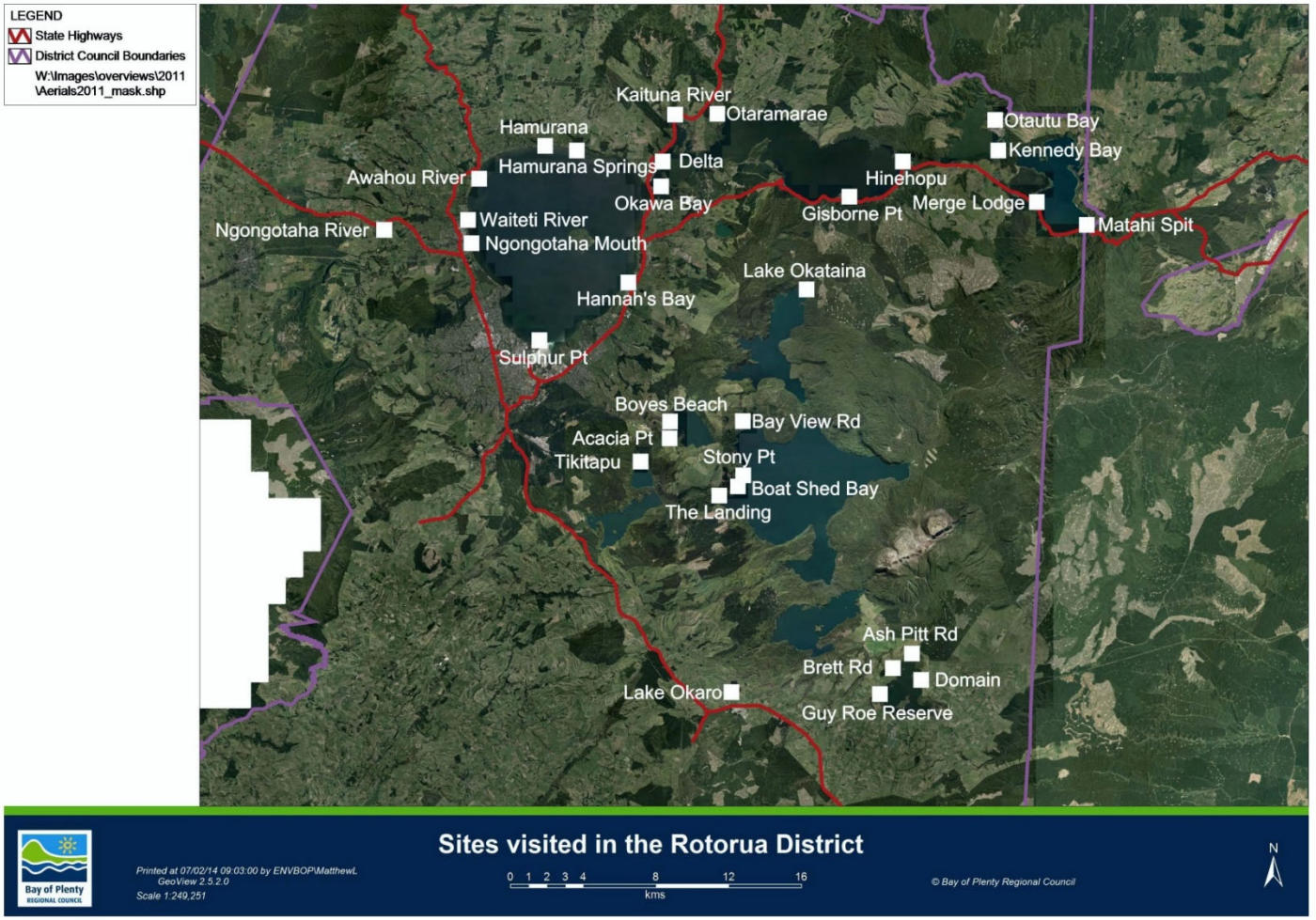
Retail and tourism outlets visited

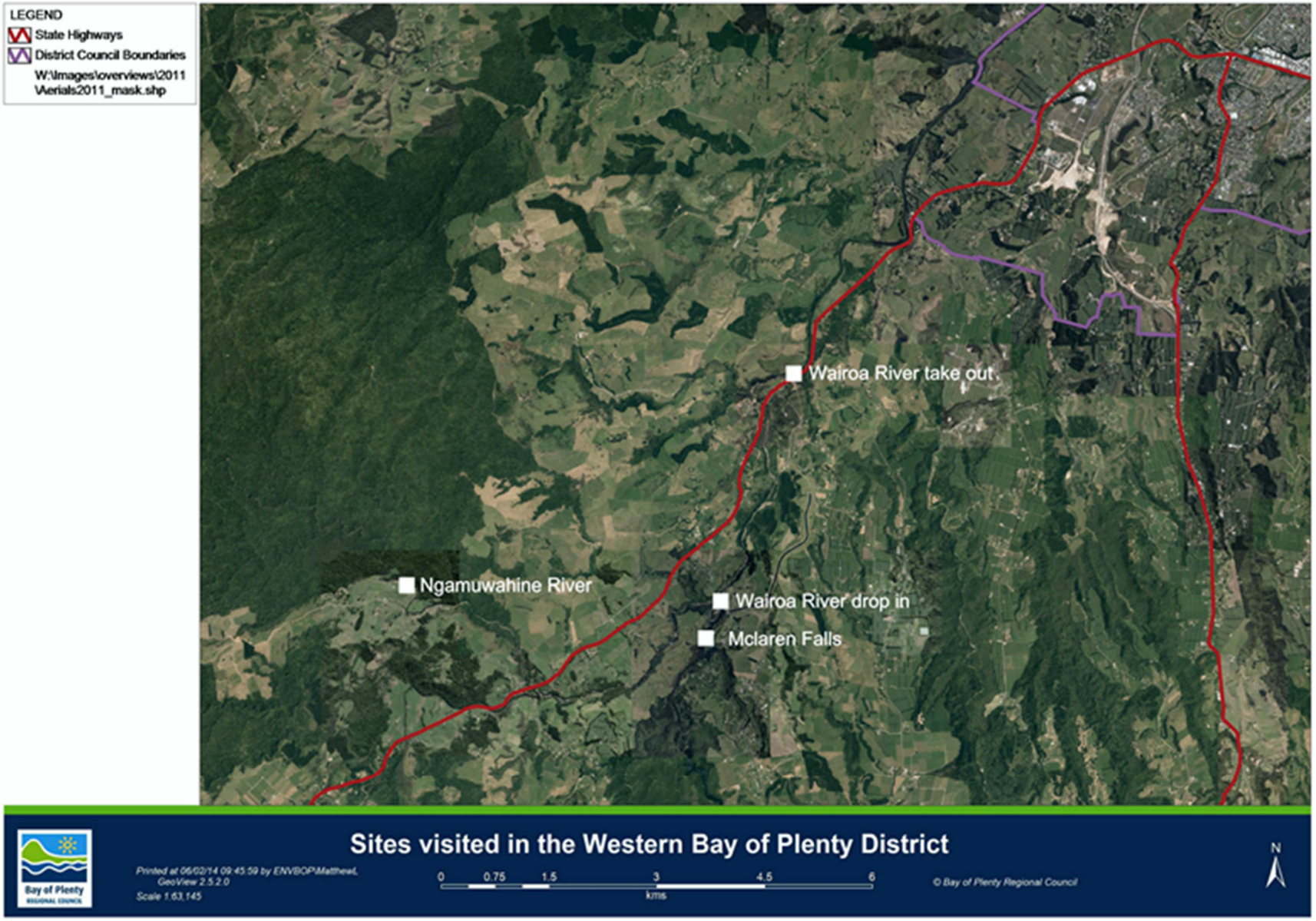
Rotorua sites	Name
Retail outlets	Hamills Hunting and Fishing Macpac O'Keefes Ōkere Falls Store Outdoorsman Headquarters Telfer Marine
Tourism outlets	Buried Village Fish & Game Hatchery Kaitiaki Rafting Kaituna Cascades Rainbow Springs River Rats Redwoods Information Centre
Accommodation	Aaryn Court Motel Ace Motor Lodge Ascot on Fenton Ashleigh Court Baden Lodge Blue Lake Top 10 Holiday Park Brylin Motel Capri Court Motel Coachman Comfort Inn Emerald Spa Resort Executive on Fenton Fenton Court Motel Four Canoes Hotel Gateway Motel Geneva Motor Lodge Golden Glow Motel Heywoods
	La Mirage Lakes Lodge Ōkataina Malones Motel

Rotorua sites	Name
	Midway Motel Palm Court Motor Inn Pineland Regal Palms Rob Roy Rose Court Rotoiti Holiday Park Rotorua Thermal Holiday Park Rydges Silver Fern Motor Inn Tuscany Villas VR Rotorua Lake Resort Wylie Court
Tauranga sites	**Name**
Retail outlets	Bay Marine Bivouac Outdoors Broncos Outdoors Decoro Fishing Hunting and Fishing Kathmandu Macpac Stirling Sports Tauranga Boat Sales Tauranga Marine Centre The Bait Shop The Boat Place Top Catch Sulphur Point
Accommodation	Bowentown Holiday Park Mount Backpackers Mount Beachside Holiday Park Top 10 Beachaven Top 10 Waihī Beach Pacific Coast Lodge Backpackers Pāpāmoa Beach Holiday Park

Appendix 6:

Sites visited in the Bay of Plenty region




LEGEND
State Highways
District Council Boundaries
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Wairoa River take out
Ngamuwahine River
Wairoa River drop in
Mclaren Falls
Sites visited in the Western Bay of Plenty District
Printed at 06/03/14 09:45:59 by ENVBOP\Matthewl, GeoView 2.5.2.0
Scale 1:63,145
0 0.75 1.5 3 4.5 6
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© Bay of Plenty Regional Council
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Appendix 7:

Biosecurity protocol letter for events

22/09/2015

Bay of Plenty Regional Council's biosecurity protocol for prevention of aquatic pest species incursions during events

Read and abide by this protocol in order to partake in events in Bay of Plenty waterways. Failing to properly clean and decontaminate vessels and equipment before entering any Bay of Plenty waterway is a significant risk. It is an offence under Section 52 of the Biosecurity Act to knowingly communicate a pest or unwanted organism e.g. transport it from one waterway to another. The penalty upon conviction, for an individual person, is imprisonment for a term not exceeding five years and/or a fine not exceeding $100,000.

Introduction

Bay of Plenty Regional Council (BOPRC) is responsible for managing pests named in the Regional Pest Management Plan for the Bay of Plenty region 2011-2016 (RPMP). Council use powers under the Biosecurity Act 1993 to ensure compliance with the RPMP and to protect the region's natural environment from pests.

The Bay of Plenty region contains a number of lakes and rivers which are popular places for people to recreate and provide habitat for native plant and animal species. Pests can degrade the quality of our waterways and impact on native species and people's enjoyment.

High risk activities and species

The Bay of Plenty is free of a number of pest species, and while some exist within the region, many lakes and rivers remain free of these problematic species. A number of pests are present in New Zealand, the goal of the RPMP is to prevent further pest establishment in the Bay of Plenty.

Particular attention needs to be given to those users who enter Bay of Plenty waterways soon after using Lake Taupō, the Waikato River and all its hydro lakes and many water bodies in the Auckland region where a number of aquatic pests reside.

Vessel cleaning and decontamination before entering Bay of Plenty waterways

All vessels and equipment used as part of any event in the Bay of Plenty region must:

1 Be thoroughly cleaned before entering and/or moving between water bodies, remove visible live and dead animal and plant material from trailers, anchor wells, nets, waders, fishing equipment or any other spaces or items potentially housing a pest species.

2 Decontaminate all equipment before entering any Bay of Plenty waterway, instructions for the correct decontamination procedure can be found at: http://www.biosecurity.govt.nz/files/pests/didymo/2010-freshwater-pests-leaflet.pdf or by contacting a member of BOPRC's Biosecurity Team.

3 Ensure all jet skis or jet boats have had their jet unit flushed prior to entering the lake. Jet units are particularly risky in terms of pest spread.

4 Ensure all boat trailers are clean, all cavities drained and free of any living or dead plant or animal material. Pest species, particularly pest fish can use these spaces and can be easily transported, particularly if trailers are left submerged in water bodies for extended periods.

Bay of Plenty Regional Council's RPMP rules regarding the transfer of aquatic pests

Rules apply in regard to aquatic pests within the Bay of Plenty region, BOPRC are authorised under the Biosecurity Act 1993 (the Act) to ensure compliance with these rules. Failing to properly clean and decontaminate your vessels and equipment prior to the event could amount to knowingly communicating a pest, a breach of RPMP rules. Those responsible will be prosecuted under the Act.

Offences

1 A breach of any RPMP rule is an offence under Section 154 of the Biosecurity Act 1993 with individuals liable on conviction of a fine up to $5,000.

Regional Pest Management Plan rules, statutory obligations regarding pest species

Rules specific to aquatic pest species are dependent on their classification. Below is a list of aquatic pest species managed under the RPMP and for whom the rules and statutory obligations apply.

RPMP classification	Aquatic pest species
Agency Pests	Didymo, Hydrilla, Salvinia, Water hyacinth.
Exclusion/Eradication Pests	Alligator weed, Marshwort, Senegal tea, Spartina, Water poppy, Brown bullhead catfish, Koi carp, Perch.
Containment Pests	Egeria densa (Brazilian waterweed), Hornwort, Lagarosiphon major (oxygen weed), Yellow flag iris, Rudd, Tench.
Restricted Pests	*Elodea canadensis* (Canadian pondweed), Mexican water lily, Parrots feather, *Gambusia.*

The intentional spread of any of the species listed above is an offence. Below is a summary of the plan rules and statutory obligations related to the RPMP.

RPMP rules	Rules
No person shall move or interfere with any article or substance left in place by an authorised person for the purpose of monitoring, controlling or eradicating any pest plant or pest animal.	Section A(1), B(1), C(1), D(1), E(1) F(1), G(1)
No person shall move, or allow to be moved, any machinery, vessel, organism, risk goods or other goods that are contaminated with any pest.	Section B(2), C(3), D(6), E(3)

Statutory obligations	
No person shall knowingly communicate, cause to be communicated, release, or cause to be released, or otherwise spread any Exclusion and Eradication pest plant or animal.	Section A(2),B(3), C(4), D(7), E(4), F(2), G(2)

For more information on Aquatic Pests visit http://www.boprc.govt.nz/environment/water/aquatic-pests/ or contact a Regional Council Biosecurity Officer on 0800 884 880.

Appendix 8:

Department of Conservation pest fish sighting signage

Appendix 9:

Boat wash survey

Date:		**Location:**			
Weather:		**Vessel:**	Boat	Jet Ski	Kayak
Place of residence:					
Purpose of voyage:	Fishing	Water sports		Other	
Water source previously come from:		Lake	Sea	River	
Location:					
Do you know about aquatic weeds/fish:		Yes/No			
Do you clean your vessel prior to changing water sources:		Yes/No			
Aquatic weed found on vessel:	Yes/No	**Type:**			