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Finally, thanks go out to our friends and families for sacrificing time spent together over the holiday period, so we could carry out the Aquatic Pest Program to its full potential.
Executive summary

The Bay of Plenty region is home to many of New Zealand’s most well-known lakes and rivers. They attract a large number of visitors every year and their health and wellbeing are vital to the success of the region’s economy and are therefore worth protecting. The number, popularity and close proximity of the lakes to each other and the Waikato fresh-waterways make them extremely susceptible to invasive species.

Invasive aquatic weeds such as hornwort, egeria, lagarosiphon and elodea have been identified as the main invasive species that have established in the lakes and contribute to water degradation. Human recreational activities are the principal means through which weed fragments spread between lakes, with vessels, trailers and equipment identified as the main vectors. Eggs of pest fish species such as brown bullhead catfish and koi carp ‘hitchhike’ on weed fragments and are a concern, as is the invasive freshwater alga didymo. First identified in a South Island river catchment in 2004, didymo has now spread to over 150 rivers, though as of recent sampling, is not yet known to be present in the North Island.

The Aquatic Pest Summer Awareness Programme aims to identify levels of public awareness, whilst educating recreational users of the threats posed by pest weeds, fish and didymo. Ultimately the programme educates users on how they can prevent spreading the weeds. The awareness programme was conducted via surveys at boat ramps, popular lake spots and on the region’s rivers, during which, a promotional pack containing merchandise and educational information were offered for free. Awareness and decontamination stations were established at sporting events and educational material was distributed to retail outlets, information centres and tourist accommodation complementing the surveys. A portable boat wash was set up at various boat ramps and events over the busy summer period to decontaminate boats either entering or leaving waterways.

A total of 1,248 individuals were surveyed on lake boat ramps and rivers throughout the Bay of Plenty region during the 2015/2016 programme. Of those users surveyed at lakes, 81% checked and cleaned vessels between waterways. It was found that 80% of lake users are aware of the requirement to clean between waterways and knew how to correct complete this. A greater proportion of river users (88%) checked and cleaned their vessels/equipment between waterways.

In addition, 14 people were seen to have weed fragments attached to vessels, trailers or equipment, three of which were identified when entering hornwort free-lakes. A small amount of hornwort and egeria was found floating in the water at Lake Tikitapu. Such incidents pose a significant risk to many of the lakes, specifically the ones that are currently hornwort free such as Rotomā and Tikitapu.

Most lake users were from Rotorua (43%) or Tauranga (24%) and the majority of river users were from the Bay of Plenty region (14%) or Auckland (10%). The majority of lake users (83%) used vessels with outboard motors and most people took part in leisure based activities (48%). However, on rivers, kayaks (84%) were most heavily used due to the popularity of the Wairoa River dam release. The majority of river users had last come from waterways listed as ‘other’, making up 13%. In total, 53% of vessels at lakes had last been used on the Bay of Plenty region’s waterways, 34% of which came from lakes which contain hornwort.

Due to consistent survey methods over the last four years, data is comparable when analysing aquatic pest awareness. It was found that 41% of lake users had a high aquatic pest awareness a 9% increase since the 2014/15 survey period. 77% of river users showed a high level of didymo awareness; a 13% decrease from last year.
Contents

Acknowledgements i

Executive summary iii

Part 1: Introduction 1
1.1 Background on Bay of Plenty fresh waterways 1
1.2 Invasive weed species 2
1.3 Pest fish 7
1.4 Didymo 11
1.5 Awareness programme and survey background 12
1.6 Aims and objectives 13

Part 2: Methods 15
2.1 Boat ramp surveys 15
2.2 River site surveys 18
2.3 Retail and tourism awareness 20
2.4 Event awareness and decontamination stations 20

Part 3: Results 23
3.1 Boat ramp surveys 23
3.2 Rotomā Surveys 30
3.3 River site surveys 31
3.4 Boat wash surveys 36

Part 4: Discussion 39
4.1 Boat ramp surveys 39
4.2 Pest fish awareness 45
4.3 Boat wash 45
4.4 Other issues for discussion 46
4.5 Rotomā surveys 47
4.6 River site surveys 48
4.7 Retail and tourism awareness 50
4.8 Event and decontamination awareness 51

Part 5: Conclusion and recommendations 53
5.1 General recommendations 54
5.2 Biosecurity recommendations 57

Part 6: References 59

Appendix 1 – Sites visited to promote aquatic pest and didymo awareness 67

Appendix 2 – Survey form used 2015/20169 69

Appendix 3 – Boat wash survey form 71

Appendix 4 – Regional grouping for the origin of lake/river users 73

Appendix 5 – List of Ministry for Primary Industries and Bay of Plenty Regional Council products distributed 75

Appendix 6 – Boat function and recommendations 77

Appendix 7 – Letter to events for biosecurity protocol 79

Appendix 8 – Stop the Spread game instructions 81

Appendix 9 – Wanted pest fish flyer 83

Appendix 10 – Keeping our lakes pest free flyer 85

Appendix 11 – Sites visited in the Rotorua district 87
Appendix 12 – Sites visited in the Western Bay of Plenty district 89

Appendix 13 – Sites visited in the Ōpōtiki district 91
Part 1: Introduction

1.1 Background on Bay of Plenty fresh waterways

The Bay of Plenty region is home to many of New Zealand’s most well-known lakes and rivers. Contained within the regions boundary is the North Island lakes district which includes 16 lakes of varying sizes and depths. The high level of volcanic activity created the collection of lakes over 140,000 years ago (RotoruaNZ, n.d). Whilst these lakes are in close proximity to each other, many have no surface outlets and as a result, it is thought that the lakes within the district are interconnected via groundwater and subsurface flows (Lake Ecosystem Restoration New Zealand, 2014).

The Rotorua lakes area is considered by the people of Te Arawa and New Zealand as taonga, and is treasured as a natural asset of beauty (Bay of Plenty Regional Council, n.d). The protection and restoration of the Rotorua lakes is a high priority for locals due to the large source of economic, recreational and cultural benefit to not only the region, but also to the country. However the number, popularity and close proximity of the lakes within the region makes them extremely susceptible to invasions of pest species such as hornwort and pest fish (see 1.2.1 and 1.3). One of the biggest mediums in which weeds spread throughout freshwater ecosystems is through human activity such as fishing, water tourism and recreational activities (Department of Conservation, 2014).

In addition to the lakes, there are a number of rivers in the Bay of Plenty region which are known worldwide for activities such as white water rafting and kayaking. The Kaituna and the Wairoa River are two rivers which are well known as they are both classified as Grade 5 rivers (New Zealand Tourism Guide n.d).

The Bay of Plenty region is within a three hour drive of New Zealand’s largest city Auckland, and is home to an international airport. Rotorua districts tourism for 2015, including both domestic and international tourists, contributed $593 million dollars to the economy (Ministry of Business and Employment 2015). Rivers and lakes throughout the region contribute greatly to this tourism output. Therefore lakes and rivers are a vital asset to the region’s growth and development.

![Figure 1 Lake Tarawera. Photo credit Melissa van den Heuvel.](image)
1.2 Invasive weed species

The Bay of Plenty freshwater rivers, lakes and streams are extremely vulnerable to invasion of non-native aquatic weeds and algae. These pests have the ability to out-compete native flora and fauna and alter fragile ecosystems within New Zealand (Kelly & Hawes, 2005). Accidental transfers of both invasive weeds and algae have the ability to form large beds and platforms potentially smothering native plant and fish habitat and detracting from aesthetic and recreational values (Compton, De Winton, Leathwick & Wadhawa, 2012).

The Rotorua lakes are under particular threat from four invasive macrophytes; hornwort (*Ceratophyllum demersum*), Canadian pondweed (*Elodea canadensis*), lagarosiphon (*Lagarosiphon major*), and egeria (*Egeria densa*) (Clayton, 1996). Invasive non-native species are one of the biggest drivers of biodiversity loss (Anderson, Dunn, Roccliffe and Stebbing, 2014). It is important to note that although all four species are present in the Rotorua lakes when grouped together, individual lakes contain different combinations of each species (de Winton, Champion, Clayton & Wells, 2009). This is why it is important to ensure weeds are not transferred from one lake to another.

Invasive weed species possess characteristics which enable them to spread rapidly, survive and thrive in New Zealand’s aquatic environments. This is mostly due to a lack of naturally limiting factors such as grazers and predators as these weed species have not evolved alongside New Zealand fish and invertebrates (Francis, 2012). They also reproduce rapidly, often asexually through means of fragmentation allowing fast distribution throughout waterways. In addition, they can grow in thick blankets, altering habitats for native species (Bickel & Closs, 2008), smothering native aquatic plants (Kovalenko & Dibble, 2014), clogging intakes on jet boats, fouling propellers and inhibiting recreational activities (Department of Conservation, 2012). In most cases only one sex of the species has been introduced, meaning they are constrained by lack of natural dispersal methods (Department of Conservation, 2012). These aquatic weeds are therefore mainly reliant on human activities for distribution, either accidental or deliberate (Champion & Clayton, 2000).

An Aquatic Weed Risk Assessment Model (AWRAM) is a useful tool that compares the success of one aquatic species with another (Champion, Clayton, Petroeschevsky & Newfield, 2010). Attributes of the ecology, biology, weediness and management of each of the above four species is assessed below based on their behaviour in new habitats. Each trait is ranked on a scale of 0-100 and combined to give a total score.

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>AWRAM score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hornwort</td>
<td><em>Ceratophyllum demersum</em></td>
<td>67</td>
</tr>
<tr>
<td>Egeria</td>
<td><em>Egeria densa</em></td>
<td>64</td>
</tr>
<tr>
<td>Lagarosiphon</td>
<td><em>Lagarosiphon major</em></td>
<td>60</td>
</tr>
<tr>
<td>Canadian pondweed</td>
<td><em>Elodea canadensis</em></td>
<td>46</td>
</tr>
</tbody>
</table>

*Table 1 Submerged aquatic plant species present in Rotorua lakes ranked according to weed risk. Higher score reflects greater impact (Champion & Clayton, 2000).*
The Bay of Plenty Pest Management Plan (the Plan) outlines the statutory management for these species. The objective for pest plant management, as outlined in Section D (Containment pest plant rules) of the Plan, is to reduce the distribution and density of known populations. Target species include; egeria, hornwort and lagarosiphon. To meet the containment objective, rules and methods are included in the Plan. Most notably, landowners and occupiers are responsible for destroying these three plant pests in specified areas (see Figure 3 of the plan). In addition, the summer awareness programme promotes Rule 6 of Section D that; “no person shall move, or allow to be moved, any machinery, vessel, organism, risk goods, or other goods that are contaminated with any containment pest plant, and that any persons seen to be moving these goods be subject to prosecution”.

Although the aquatic pest awareness summer students do not have enforcement authority, if person(s) are seen to be offending in accordance with Rule 6, students will record number plates of offending vehicles and provide this information along with other relevant details to a Land Management/Biosecurity Officer with the correct authority (Bay of Plenty Regional Council, 2011).

1.2.1 Hornwort

*Ceratophyllum demersum*, hereby referred to as hornwort, is a fresh water macrophyte which, is mainly submerged and can occupy both shallow and deep littoral habitats (Pełechaty, Pronin, & Pukacz, 2014). Unlike many other macrophytes, hornwort has the ability to inhabit low light environments and can dominate in eutrophic and turbid habitats (Pełechaty et al., 2014), (Keskinkan, Goksu, Basibuyuk, & Forster, 2004).

Hornwort can be classified by filiform leaves in whorls of (6-)8-10(-12), dichotomously branched with minute teeth which make the plant feel rough to the touch (Wilmot-Dear, 1985). It lacks roots (Les, 1991) but has modified leaves that anchor the plant in bottom sediments (Keskinkan et al., 2004). In clear lakes hornwort can be found to depths of 16 metres and has dense beds which can reach up to 10 metres in height, inhibiting light penetration to native species (Wells, de Winton, & Clayton, 1997), (Champion, Clayton, & Rowe, 2002).

Hornwort has become well established in the North Island of New Zealand causing detrimental effects on environmental and recreational values within freshwater systems (Champion et al., 2002) (Wells et al., 1997). Hornwort has also cost the hydro-electric power industry millions of dollars (Coffey & Clayton, 1988) due to the regular maintenance that must be undertaken in order to keep hornwort from blocking hydro systems.

Hornwort is considered a highly invasive weed due to the rate and ease in which it can form a new plant via vegetative fragmentation (Les, 1991), (Champion et al., 2002) which, are readily snapped and dislodged by waves, currents or boats (Coffey & Clayton, 1988). As a result, hornwort is easily transported around the lakes via human activity and can thrive in water of varying clarity, temperature, light and nutrient levels. Hornwort is one of the very high risk aquatic weeds according to the AWRAM scale. The Bay of Plenty freshwater rivers, lakes and streams are extremely vulnerable to invasion of non-native aquatic weeds and algae. These pests have the ability to out-compete native flora and fauna and alter fragile ecosystems within New Zealand (Kelly & Hawes, 2005). Accidental transfers of both invasive weeds and algae have the ability to form large beds and platforms potentially smothering native plant and fish habitat and detracting from aesthetic and recreational values (Compton, De Winton, Leathwick & Wadhawa, 2012).
The Rotorua lakes are under particular threat from four invasive macrophytes; hornwort (*Ceratophyllum demersum*), Canadian pondweed (*Elodea Canadensis*), *lagarosiphon* (*Lagarosiphon major*), and *Egeria* (*Egeria densa*) (Clayton, 1996). Invasive non-native species are one of the biggest drivers of biodiversity loss (Anderson, Dunn, Roccliffe and Stebbing, 2014). It is important to note that although all four species are present in the Rotorua lakes when grouped together, individual lakes contain different combinations of each species (De Winton, Champion, Clayton & Wells, 2009). This is why it is important to ensure weeds are not transferred from one lake to another.

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Table 1 (Champion & Clayton, 2000), (Champion et al., 2002), and is banned from sale, propagation, and distribution under the Biosecurity Act 1993 National Plant Pest Accord (Ministry for Primary Industries, 2013).

Hornwort was first found in the Bay of Plenty region in Lake Rotorua in 1975 (Burton & Clayton 2015), and has since established in Lakes Rotorua, Rotomahana and more recently, Ōkataina and Ōkāreka. Note that the latter two are both under active control for hornwort. In Lake Ōkataina a cordon across the arm of the lake where it is present contains the weed, and on Lake Ōkāreka, an eradication programme has presented positive results as of August 2015.
1.2.2 Lagarosiphon

*Lagarosiphon major* or more commonly known as curly oxygen weed, originated from South Africa, and has been present in New Zealand since the 1950s (Martin & Coetzee, 2014). It was first introduced as an ornamental pond plant and since has widely naturalised in the New Zealand waterways (Coffey & Clayton, 1988). It is present in all Rotorua lakes except for Rotomahana, Ōkaro and Rotokakahi (Department of Conservation, 2014).

Lagarosiphon is a submerged freshwater perennial that is characterised by alternating leaves that curve downwards; they are between 6-20 mm long (Champion & Rowe 2012). Due to the species being dioecious (sexes on different plants), and having only female plants present in New Zealand, the spread around New Zealand lakes is facilitated by fragmentation due to human by human activities and through the disturbance by storms (Champion & Rowe, 2012).

This invasive oxygen weed prospers in clear, shallow water of depths up to 6.5 meters and may only grow up to 1 meter in murky water. It prefers cooler waters of the temperate zone with optimum temperature of 20-23°C and a maximum temperature of 25°C. It survives in both high and low nutrient levels and grows best under high light intensity with a moderately fast to slow flowing water (Global Invasive Species Database, 2006).

Similar to hornwort, lagarosiphon can and has previously blocked intakes of hydro-electric systems. It also forms dense floating mats in deep water reservoirs which block light penetration, eliminating growth of native plants and smothering benthic invertebrate populations. Once widespread, controlling the growth of Lagarosiphon is extremely difficult as is with any submerged plant body (Csurhes & Edwards, 1998).
1.2.3 **Egeria**

Egeria is a submersed, freshwater perennial herb that forms dense monospecific strands that restrict water movement in streams, trap sediment, and cause fluctuations in water quality (Champion and Tanner, 2000). Native to South America, the species was introduced via the aquarium trade and thrives in turbid, slow-flowing waters (de Winton et al, 2009). Egeria is very difficult to manage and its dense growth creates anoxic conditions (Ribaudo, Bertrin & Dutartre, 2014) that smother benthic communities and restrict light to surrounding native plants. It is a major weed in hydroelectric dams, also impeding irrigation, drainage and other water uses (Chapman, 1970).

The leaves and stems of egeria are generally bright green, with short internodes, giving the plant a leafy appearance. The stems can grow up to five meters in length. Individual leaves are minutely serrated, linear and arranged in whorls of four to eight (Invasive Species Specialist Group, 2006). Only male plants of egeria have been observed in New Zealand and therefore reproduction occurs entirely by vegetative methods. The fragile character of the plant makes it relatively easy to break up and spread through water bodies (Haramato & Ikusima, 1988).

Egeria was first found in Lake Rotorua in 1977 and since then has established in Rotoiti, Ōkāreka, Tarawera, Rotomahana and Rerewhakaaitu (Wells & Clayton, 1991).

1.2.4 **Elodea**

*Elodea canadensis* or Canadian pondweed was the first invasive weed introduced into New Zealand in 1868 (Champion, Clayton, & Rowe, 2002). It was presumably brought in with the intention of oxygenating waters to support future introduced species of fish (Champion et al., 2002). It is currently found in all but one of the Rotorua lakes, Lake Rotomahana.
Elodea is a submerged, bottom rooted, aquatic plant, native to North America that has the ability to grow and multiply rapidly in a diverse range of environments and conditions (Min et al., 2013). This species forms dense mats over substrate, often reaching heights of up to six metres (Popay, Champion, & James, 2010), (Champion et al., 2002). Massive growths of elodea have many economic and ecological effects (Zehnsdorf, Hussner, Eismann, Rönicke, & Melzer, 2015). Ecologically, it is a major threat to waterways because of its habitat modification and competitive ability against other plant species for light and space (Champion et al., 2002). Economically, alike hornwort, it can block hydro dams and hamper boat traffic and recreational activities (Zehnsdorf et al., 2015).

Elodea is similar in appearance to the other oxygen weeds, egeria and lagarosiphon, however, it can be identified as having three leaves arranged in whorls around the stem. This species also has flowers which are carried to the surface by long, slender stalks for pollination via the wind and water (Hulme, Nentwig, Pysêk, & Vila, 2010).

Reproduction and dispersal are primarily vegetative by fragmentation of stems that float away, root, and start new plants (Hulme et al., 2010). Fragments of this species have high survival rates which allow them to be dispersed over long distances, therefore increasing elodea’s invasion capabilities (Barrat-Segretain, Elger, Sagnes, & Puijalon, 2002). Alike the other main aquatic weeds, humans recreational activities are believed to be a main dispersal method for moving these fragments around and assisting the spread of this invasive weed (Barrat-Segretain, 2004).

Elodea is thought to have established in New Zealand over a century ago via the aquarium trade (Bowmer, Jacobs, & Sainty, 1995). It is present in all the Rotorua lakes except Lake Rotomahana.

1.3 Pest fish

The Rotorua lakes are largely free of invasive pest fish species, however, the introduction of further pest species poses a serious threat to the quality and health of these lakes. Currently the only pest fish that are present in the Rotorua Lakes are mosquito fish (Gambusia affinis) introduced for mosquito control (Turoa, 2009) and the common gold fish which are suspected to be introduced as part of the naturalisation of New Zealand (Thomson, 1922) (Champion et al., 2002). Both are aggressive species of fish that compete with native fish species.

Because pest fish species such as koi carp (Cyprinus carpio) and brown bull-head catfish (Ameriurus nebulosus) are distributed around the North Island in various locations, the containment of these species proves difficult. Koi carp and catfish are present in high abundances in the Waikato regions’ lakes, rivers and streams (Dean, 2001). Note that bull-head catfish are present in high abundances in Lake Taupō which is only a 45 minute drive from Rotorua. The introduction of these pest fish to the Rotorua lakes would reduce the water quality and significantly degrade habitat for native flora and fauna (Champion et al., 2002). Fertile eggs of pest fish species can attach to aquatic weed and then transfer from lake to lake (Clements, 2006).

This highlights the importance of checking trailers and equipment for aquatic weeds in order to reduce the spread of pest fish.
1.3.1 **Koi carp**

Koi carp are an invasive pest fish in New Zealand which originated from Asia before being introduced to Europe as a food source (Clements, 2006). Koi carp are now found on every continent besides Antarctica (NIWA, 2015). Koi carp are thought to have been introduced accidentally to New Zealand in the 1960s as part of the goldfish consignment (Department of Conservation, n.d). The release of koi carp into the wild from private ponds and flooding began the spread of carp to other regions in New Zealand. Koi carp were first noticed in the Waikato region in 1983 when a breeding population had already been well established (NIWA, 2015).

Koi carp can grow up to 120 cm and weigh up to 60 kg (Allen, Chandrasena, Pera, Hawkins, Eccles & Sim, 2005), however, in New Zealand they have not been recorded to reach such sizes. Koi carp are often mistaken for goldfish as they have a striking resemblance to them, however, unlike goldfish, koi carp have two barbels at each corner of the mouth (NSW Department of Primary Industries, 2014). The colour of carp varies greatly; in the wild, they are usually olive green to bronze or silvery in colour with a pale yellow underside (NSW Department of Primary Industries, 2014). The ornamental strain are brightly coloured with orange yellow and white markings; if this strain escapes into the wild, koi carp will soon revert to the wild colouring. Koi carp and goldfish can interbreed; first generation hybrids have drab coloration and one pair of barbels but subsequent generations of hybrids maybe highly variable (Collier & Grainger, 2015).

Koi carp feed by sucking up bottom sediments and blowing out what is not wanted, in doing so they stir up sediments and leave the water murky and discoloured. During this process, aquatic plants are dislodged and unlikely to re-establish causing habitat loss and food loss for native fish, waterfowl and invertebrates (Bellrichard, 1996), (Laird & Page 1996). Koi carp pose a serious risk to the Rotorua Lakes district and there is a prohibition on the movement and sale of live koi carp (Bio Security New Zealand, n.d).
1.3.2 **Catfish**

Similar to koi carp, the brown bullhead catfish (*Ameiurus nebulosus*) is also a serious threat to Rotorua’s waterways. This catfish species was introduced to New Zealand in the 1870’s as a food source for settlers and is native to North America (Barnes & Hicks, 2001). They are now widespread in the Waikato River system including Lake Taupō, where they are highly abundant. Brown bullhead catfish are dark brown to an olive green colour with paler sides and bellies. In addition to eight distinctive barbels around their mouth, catfish also have smooth, scale-less skin and possess a sharp spine on the leading edge of their dorsal fin. Catfish are an extremely robust fish and can establish in a wide range of habitats. They can also survive for long periods of time out of water. They commonly grow to 200-300 mm in length (Champion et al., 2002). Catfish are a major threat to not only the Rotorua lakes but also to the New Zealand fresh waterways as they stir up sediment causing a decline in water clarity. They also prey on fish eggs, small native fish and are known to eat and compete with koura (native freshwater crayfish) (Department of Conservation, n.d). Catfish are known to prey on juvenile rainbow trout in Lake Taupo and compete with them for prey fish such as smelt (Cryer & New Zealand. Dept. of Conservation, 1991). Their main vector for distribution is through eggs stuck on weed fragments on boating equipment such as trailers and anchor warps. Eggs can stay viable for long periods provided they stay moist. This makes places such as anchor wells on boats a high priority for cleaning after anchoring in contaminated waterways.
1.3.3 Tench and Rudd

Tench (*Tinca tinca*) were accidently introduced to New Zealand in 1868. They are a cyprinid fish belonging to the same family as goldfish, rudd, and koi carp (Rowe, 2004). In addition to the accidental introduction, tench are often spread illegally to new water bodies by coarse fish angling enthusiasts (Carter, 2009). When present in waters that lack large predating fish, tench may grow to unusually large sizes making them attractive to anglers from overseas. Tench are generally limited to slow-moving shallow water but have a wide tolerance to environmental conditions. They have fleshy, downturned mouths with a small barbell on each side along with bright red eyes and are typically olive green in colour (NIWA, 2016).

Little is known about their ecology; however, they are blamed for reduction in benthic invertebrate densities in overseas lakes (Rowe, 2004). There is strong evidence that high-density populations can reduce lake water clarity by disturbing sediments and increasing nutrient recycling in shallow lakes (Bay of Plenty Regional Council, 2012). Indirect negative effects on native fish are also possible through reduced food supply, changes in water quality and reduced macrophyte cover. Tench are now found in Oamaru, Christchurch, Nelson, Northland and Tauranga (Dean, 2001). There have also been unconfirmed sightings in Lake McLaren (Bay of Plenty Regional Council, 2012).

Rudd (*Scardinius erythrophthalmus*) are native to Europe and Central Asia and were illegally introduced into New Zealand in 1967 (Bay of Plenty Regional Council, 2012) via a private consignment of juvenile rudd that were reared to adulthood and encouraged to breed. Rudd since have progressively spread illegally around lakes, ponds and rivers throughout the North Island as well as Canterbury and Nelson. In the Bay of Plenty, Rudd has been noted but unconfirmed in Lake McLaren (Bay of Plenty Regional Council, 2012). Rudd feed primarily on native macrophytes species (Lake, Higgs, Wells and Dugdale, 2002).
1.4 Didymo

Didymo (*Didymosphenia geminata*), or 'rock snot' as it is known colloquially due to its unpleasant manifestation, is an aquatic organism posing a significant biosecurity threat to the Bay of Plenty's freshwater ecosystems. A species of freshwater diatom, didymo is a single celled algal micro-organism that can be spread in just a single drop of water through vegetative cell division and can remain undetected in rivers due to it being invisible to the naked eye and only detectable when it blooms (Biosecurity New Zealand, 2012). Didymo thrives in clear, shallow, cold and nutrient-poor water, and is influenced annually by weather and rainfall patterns (Bhatt, Bhaskar & Pandit, 2008). High light and stable flow conditions are also favourable for didymo and is most likely required for initial attachment to the substrate (Kuhajek, Lemoine, Kilroy, Cary, Gerbeaux & Wood, 2014). Although didymo is microscopic, it can attach itself to stream, river and lake beds by stalks, and can form a thick brown layer that smothers rocks, submerged plants and other materials (Biosecurity New Zealand, 2012). Didymo can be distinguished from other species of algae on the basis of its colour; beige/brown/white and despite the slimy appearance its texture is more spongy and scratchy like cotton wool (Aboal, Marco, Chaves, Mulero & García-Ayala, 2012).

Didymo is believed to have come to New Zealand in 2004 via human-assisted means, for example on footwear, fishing equipment and/or boats (Global Invasive Species Database, 2010). Branson (2006) indicates that didymo is affecting New Zealand’s commercial eel fisheries, municipal, industrial and agricultural water intakes, community, domestic drinking water, local recreation values, international and domestic tourism expenditure, local and national existence values and existence values associated with extinction of native species. Other studies however suggest that there is not enough evidence to support claims that didymo is harmful to native fish populations and more research is needed into the subject (Whitton, Ellwood & Kawecka, 2009).

Many rivers in the North Island that are used for recreational activities such as fishing or kayaking have ideal conditions for didymo growth, hence why these activities have been identified as the most likely cause of didymo proliferation throughout different rivers and waterways.
Studies show that didymo has the ability to establish in North Island without any restrictions (Wood, 2014) and therefore the lack of didymo to date in the North Island can be put down to having good management and biosecurity techniques and measures in place. Because the eradication of an established microscopic organism in a natural freshwater environment is practically impossible and not a viable option, a ‘check, clean, dry’ campaign has been developed by Ministry for Primary Industries. This campaign is a proactive approach to stopping the spread and containing didymo. Preventing didymo spreading to the North Island is of the upmost importance. This awareness campaign is directed towards the public and educates users of the best methods to clean vessels, clothing and equipment when moving between bodies of freshwater.

![Didymo bloom. Photo Credit: Carole-Anne Gillis and Mark S. Hoddle.](image)

### 1.5 Awareness programme and survey background

The Bay of Plenty region’s fresh waterways are used by people living locally as well as both domestic and international travellers undertaking a wide variety of recreational activities. Equipment, clothing, vessels and trailers associated with these activities have been identified as the primary items capable of transferring invasive weed and pest fish species, as well as live didymo cells, between waterways within the region and New Zealand.

In August 2004 representatives from Department of Conservation (DOC), Eastern Fish and Game, Bay of Plenty Regional Council (BOPRC), Te Arawa Lakes Trust, Land Information New Zealand (LINZ) and Rotorua District Council (RDC) formed the Aquatic Pest Coordination Group (APCG). These organisations work in partnership to determine and improve public awareness in regards to their role in the dispersal of aquatic pests.

Since 2004, BOPRC has employed two tertiary students to assist with their Aquatic Pest Advocacy Programme. In addition Department of Conservation employs one student to assist with the Aquatic Pest Advocacy Programme. These students engage with the public over the busy summer period and strive to educate and create awareness of aquatic pest issues within the region and throughout New Zealand. Whilst engaging with the public the students conduct a survey created by the APCG (Appendix 2). Educational material and merchandise provided by the Ministry for Primary Industries (MPI) and Bay of Plenty Regional Council are distributed free of charge to participants of these surveys.
Data collected from the surveys is analysed and made available to members of APCG and MPI in this present report.

1.6 Aims and objectives

The annual Aquatic Pest Advocacy Programme’s major aim is to determine awareness of aquatic pests by recreational and commercial users of lakes and rivers in the region, while, simultaneously educating these users about how pest fish, weeds and didymo are dispersed between waterways. In addition it educates water users on how to best minimise the risk of these pests spreading. The distribution of educational material to retail outlets, i-SITE locations and tourist accommodation provides an additional approach to promoting awareness. This method also ensures the target audience can access information throughout the year, not just during the three months of the programme.

Data collected while carrying out this aim is to be presented and analysed in this report. General and specific recommendations will also be made so that correct action can be carried out by the respective organisation if required.
Part 2: Methods

Between 20 November 2015 and 2 February 2016, a total of 1,248 surveys were conducted at fresh waterways throughout the Bay of Plenty region. Surveys were undertaken every weekend and for three days during the week. Survey days lasted for eight hours with varying start times based around the audience targeted and the weather.

During this summer, the Bay of Plenty Regional Council had a portable boat wash station in use for 24 days over busy weekends and public holidays. The aim was to clean boats as they were entering and/or leaving lakes depending on the specific needs of each lake. Although the boat wash does not use any solution, the water pressure is enough to remove any loose fragments on the boat/trailer.

In addition to carrying out surveys; relevant retail outlets, information sites, tourist accommodation and tourism activities were visited during the programme dates and were provided with educational material and merchandise. This ensured information relating to aquatic pest issues was available all year round. Organisers of aquatic events were also contacted and provided with information, merchandise and decontamination gear/services if required. In addition to this the surveyors also attended a “Hands on water” children’s activity day which focussed on awareness of fresh waterways health issues such as invasive species and pollution.

2.1 Boat ramp surveys

Boat ramps on Bay of Plenty lakes were visited multiple times during the summer period. The lakes were broken down into two regions (northern and southern) with Bay of Plenty Regional Council and Department of Conservation aquatic pest advocates working each region on alternating weeks.

Once at the ramp, the surveyor’s vehicle was parked out of the way of turning trailers and vehicles but close enough to the ramp to see vessels launching and being retrieved. Ramp users were observed and only approached while waiting for the ramp or fixing their vessel up to leave.

Once engaged with, ramp users were asked a series of questions in accordance with the APCG survey being conducted (Appendix 2). Information gathered included, lake name, ramp name, origin of owner, if the owner had been previously spoken to about aquatic pests, last water body used, vessel type, recreational purpose, level of interest in aquatic pest issues, level of awareness of aquatic pest issues and level of awareness of didymo. Lake users were also asked if any pest fish had been observed and of what species/description. To eliminate bias when assessing the user’s level of awareness for aquatic pest issue and didymo, three questions were asked for each topic. If the user was able to answer all three questions correctly they were assessed as having high awareness. If the user could answer two questions correctly they were assessed as having medium awareness. If the user was able to answer one question correctly they were assessed as having low awareness. If the user was not able to answer any questions they were assessed as having no awareness. Based on the information collected, users were then educated with current aquatic pest issues and provided with instructions on ways to help stop the spread of aquatic pests. Education was tailored to the specific recreational purposes of the craft and the interests of the users e.g. fishermen were informed about specific pest fish in Rotorua lakes and jet-ski and jet-boat users were informed about the issues around using carpet on trailers. Fishermen and other lake users were also encouraged to preserve any suspicious looking fish and hand them in to either DOC or BOPRC.
Upon the completion of the survey and once the user had been educated, a promotional pack containing more information and merchandise was provided to the ramp user, for future reference.

This year surveyors used an iPad to enter data into a survey app which was then uploaded to the Cloud and could later be collated and analysed.

Figure 9 Aquatic pest advocate Gordon Tieman educating a jet ski user at Otaramarae, Lake Rotoiti.

The following list comprises all the boat ramps visited over the summer period, the locations of which are displayed on maps in Appendices 11, 12 and 13.

Northern region

Lake Ōkataina

Lake Rotoehu
- Kennedy Bay
- Ōtaitū Bay

Lake Rotoiti
- Otaramarae
- Delta Ramp
- Gisborne Point
- Hinehopu
- Okawa Bay

Lake Rotoma
- Merge Lodge
- Matahī Spit

Lake Rotorua
- Hannah’s Bay
- Ngongotahā Mouth
- Hamurana
Hamurana Springs Mouth
- Sulphur Point
- Lake Front

Southern region

Lake Aniwhenua
- Camp ground and ramp

Lake Matahina

Lake Okareka
- Boyes Beach
- Acacia Point Reserve

Lake Rerewhakaaitu
- Guy Roe Reserve
- Domain
- Brett Road DOC Campground
- Ash Pitt Road DOC Campground

Lake Tarawera
- The Landing
- Boatshed Bay
- Stony Point
- Bay View Road

Lake Tikitapu (Blue Lake)

Waikato region
- Whakamaru

Upon the completion of the reporting period, data collected from the surveys was accessed from the Survey123 database, collated and then analysed. In order to be consistent with previous years, origin of owner was expanded into regional categories. Within the Bay of Plenty region, the origin of owner was expanded into local districts as displayed in Appendix 4. Lake Whakamaru was included in the surveys despite being located in the Waikato district. This inclusion was due to the high volume of people travelling from the lake to a number of the Rotorua lakes. Whakamaru is heavily infested with hornwort and pest fish and because the Waikato Regional Council does not actively promote freshwater pest awareness it was deemed appropriate to educate people at the site.
2.2 River site surveys

While the Rotorua Lakes were the main focus of the awareness programme this year, rivers throughout Bay of Plenty were visited a number of times.

The following list comprises all the rivers visited over the summer period:

**Western Bay of Plenty District**
- Wairoa River

**Opotiki District**
- Waioeka River

**Rotorua District**
- Ngongotaha River
- Awahou River
- Kaituna River
- Waiteti River
- Hamurana River

The Wairoa River located in the Western Bay of Plenty District was visited on three occasions over the survey period. This river is utilised heavily on Sundays over summer by kayakers and rafters taking advantage of the Wairoa release, which is carried out to generate hydro-electric power. The release happens from 10 am till 2 pm and users come and go a number of times within this timeframe.

The Waioeka, in Opotiki, was visited on one occasion due to its remoteness. The Waioeka is a pristine river that attracts fisherman and travellers from all over the country and world.

Rotorua river access sites where visited for short periods of time. If present, river users were approached and educated.
River users were asked a series of questions in accordance with the APCG survey (Appendix 2). Information gathered included, river name, weather conditions, origin of owner, last water body used, vessel type, recreational purpose, level of interest in aquatic pest issues, level of awareness of aquatic pest issues and level of awareness of didymo. To eliminate bias when assessing the user's level of awareness for both aquatic pests and didymo, three questions are asked for each topic. If the user could answer all three questions correctly they were assessed as having high awareness. If the user could only answer two questions correctly they were assessed as having medium awareness. If the user could only answer one question correctly they were assessed as having a low awareness. If the user could not answer any questions then they were assessed as having no awareness.

Based on the information collected, users were then educated with current aquatic pest issues and provided with instructions on how to help stop the spread of aquatic pests. More time was spent on didymo education as this has a more direct impact on river users.

Once the information had been collected and the user had been educated, a promotional pack containing more information and merchandise was provided to the river user for future use.

Once the engagement with the river user had ceased and all information had been collected, the survey was completed on the iPad in the vehicle.

At the completion of the reporting period the data collected from the surveys was entered into a database, collated and then analysed. In order to be consistent with previous years, origin of owner was expanded into regional categories. Within the Bay of Plenty region users origins was placed into local districts as displayed in Appendix 4.

Figure 11  White water rafters at the Wairoa River dam release.  
Photo Credit: Xia Stevens.
2.3 Retail and tourism awareness

Prior to the busy Christmas holiday period, a number of retail outlets, campgrounds and local businesses were visited in the Bay of Plenty region to distribute material, educate and provide updated information about the invasive pest species that threaten the lakes and rivers in New Zealand. Organisations targeted were ones which frequently used the waterways as part of their business, had customers who would be often using the waterways, or who had customers that lack understanding on the biosecurity issues in or around our waterways. In particular, businesses such as; rafting companies, boat and kayak shops, and retail outlets selling fishing and tramping gear were targeted. Campgrounds were targeted as they were identified as the main area where most people with recreational boats and fishermen were staying.

Retail outlets and campgrounds visited (Appendix 1):

- Retail outlets selling boating and fishing gear.
- Retail outlets selling fishing licences.
- Local businesses frequently using the water i.e. white water rafting, River Rats and The Duck.
- Information centres and libraries.
- Stores and petrol stations that were frequented by water users. i.e. Rotomā Trading Post.
- Fish and Game.

At each of the businesses targeted, the owners were educated about the risks associated with water users and why it is so important that their customers understand and are aware of the risks at hand. The threat of didymo was emphasised to relevant businesses in order to assure that travellers from the South Island are being careful and understand how to clean their equipment as to stop the spread of didymo. The majority of businesses were interested and were willing to take an active role in our campaign which is a very good sign.

Merchandise supplied from the Ministry for Primary Industries and Bay of Plenty Regional Council included A4 and A3 Posters, brochures (“Protect your Patch”) and z-booklets. The businesses that were more actively using the waterways or had more customers who did, were provided with key-rings, “stop the spread” branded clothing, bumper stickers and occasionally 20 L containers of Simple Green decontamination detergent.

2.4 Event awareness and decontamination stations

Attendance at water based events in the Bay of Plenty region were vital as they provided an opportunity to talk to a wider audience and increase aquatic pest awareness to a different section of the society. These events catered to groups with a diverse range of interests from all over New Zealand, some of who had not spent much time in this regions many waterways. In addition, events offered the chance to distribute information to organisers, friends and family of competitors and other spectators.

During November 2015 relevant aquatic events in the region were identified and the information provided by organisers was assessed to determine their risk to the lakes/rivers health. Correspondence with organisers helped determine whether it was possible and/or necessary to speak at briefings, if decontamination stations were needed and what merchandise would be most appropriate for distribution.
Once again this year’s focus was to make the event organisers understand that taking initiative and control of the decontamination process was their responsibility and should be practiced.

Below are the following events that the summer students attended or were a part of during the programme:

- Blue Lake Canoe Regatta.
- Eves Blue Lake Multisport Festival.
- Jet Skiing Lake Rotomā.
- Rotorua Half Iron Man.
- Rowing Regatta Tikitapu.
- Ski Racing Lake Rotomā.
- Lake Rotoiti Wooden Boat Parade.
- New Zealand Extreme White water Event, Wairoa.
- Legend of the Lake Open Water Swim.
- Hands on Water Kids Day.

During the ‘2015/2016 Summer Aquatic Pest Awareness Programme’ the Rotorua Half Iron Man, Eves Blue Lake Multisport festival, Legend of the Lake and The New Zealand Extreme White water Rafting event on the Wairoa River were provided with decontamination stations. This was done with a 10% ‘Simple Green’ detergent solution to dip the wetsuits in order to reduce the risk of spreading aquatic pests which may have come from other waterways. These events were also provided with promotional material to be given away as spot prizes as well as information on aquatic pests. Ski Racing and Jet Ski Racing Lake Rotomā and Lake Tikitapu were manned by Xia Stevens, Geoff Ewert and Gordon Tieman of the Regional Council whereby jet boats and trailers were decontaminated upon their arrival using the boat wash station and also spray packs with a 10% ‘Simple Green’ detergent solution.

The Blue Lake Canoe Regatta and the Blue Lake Rowing Regatta made it a requirement as terms and conditions of their race entry to have their gear/equipment decontaminated. These events were also provided with informational and promotional material.

Several other smaller events such as local fishing competitions also received promotional material such as hoodies, t-shirts, key-chains, caps and information brochures to be given away as spot prizes.

2.4.1 Hands on water kid’s day event.

2015 was the first year that BOPRC and DOC summer students supervised one of the games at the Hands on water kids’ day. This was an event that aimed to educate primary school students from around the Bay of Plenty about the importance of fresh water health and the effects people have on freshwater biota. This was done by organising a series of interactive games which in a playful manner helped them identify the main issues we have with freshwater health and how they can help improve these ecosystems. Instructions to both the game run by the Bay of Plenty Regional Council Students and Department of Conservation can be found in Appendix 8.
Part 3: Results

3.1 Boat ramp surveys

Over the summer period a total of 1,248 surveys were conducted in the Bay of Plenty region at boat ramps and camp sites.

3.1.1 Distribution of surveys conducted at Lakes

![Bar chart showing number of people surveyed at each lake]

Figure 12  Number of individuals surveyed at each lake 2015/2016.

The largest amount of surveys was conducted at Lake Tarawera (440). A significant amount of surveys were also taken at Lake Rotomā (361) and Lake Rotoiti (207). The remaining lakes had 70 or less surveys conducted at them.
3.1.2 Distribution of surveys conducted at boat ramps

Figure 13 Number of individuals surveyed at boat ramps summer 2015/2016.

Boat Shed Bay had the highest amounts of surveys conducted (352) closely followed by Merge Lodge (325). Another notable boat ramps was Otaramarae (148). The remaining ramps had between one and 69 surveys conducted at them.

3.1.3 Was vessel checked/cleaned prior to launching?

Figure 14 Percentage of vessels checked/cleaned prior to launching (%).

Of all ramp users it was found that 81% had checked and or cleaned their vessels before entering the water body. Of the remaining 19% ramp users, only 8% had not checked or cleaned their equipment before entering a water way. 11% of ramp users were N/A (non-applicable) due to the boat either being new or it had been out of the water for six months or longer.
3.1.4 **Do you know how to check/clean before launching?**

![Pie chart showing 80% Yes and 20% No]

*Figure 15*  **Percentage of individuals that know how to checked/cleaned prior to launching (%).**

Of the 1,248 boat ramp users surveyed 80% knew how to Check, Clean & Dry, whilst 20% did not know the correct procedure.

3.1.5 **Vessel type**

![Bar chart showing percentage of people surveyed by vessel type for 2013, 2014, 2015, and 2016]

*Figure 16*  **Vessel types surveyed at boat ramps (%).**

Figure 15 shows a decrease in the use of outboard powered boats (83%) down 17% from last year. However, it must be noted that Jet Skis were no longer classified in outboard power boats. Kayak remained steady with a 1% increase while ‘Other’ dropped 2%.
3.1.6 **Recreational purpose**

![Graph showing recreational purposes of lake users (%).

Figure 17  Recreational purposes of lake users (%).

‘Other’ dropped from 58% (2015) to 2% (2016), a fourth category of Leisure was added this year which had 48% of ramp users. Fishing and water sports remained steady and both increased.

3.1.7 **Origins of owners**

![Graph showing percentage of people surveyed from each district/region (%).

Figure 18  Percentage of ramp users surveyed from each district/region (%).
The Rotorua district had the highest percentage of users with 43%. Tauranga followed closely with 24%. The remaining districts varied from 0.5% to 8% of people surveyed.

### 3.1.8 Last waterway used

![Last waterway used](image)

Of all individuals surveyed, 34% had last used their vessels in Bay of Plenty waterways that contain hornwort and 19% had last used their vessels in Bay of Plenty waterways that do not contain hornwort. Vessels having last used the ocean accounted for 24%. Vessels that had last used in the South Island, Taupō or were on their Maiden Voyage also were accounted for.

### 3.1.9 Levels of aquatic pest awareness

![Levels of aquatic pest awareness](image)

Of all individuals surveyed, 34% had last used their vessels in Bay of Plenty waterways that contain hornwort and 19% had last used their vessels in Bay of Plenty waterways that do not contain hornwort. Vessels having last used the ocean accounted for 24%. Vessels that had last used in the South Island, Taupō or were on their Maiden Voyage also were accounted for.
Those showing a high level of aquatic pest awareness (41%) increased from last year by 9%. Individuals with no aquatic pest awareness decreased by 7% this year, whilst users with a ‘medium’ and ‘low’ level of awareness remained similar to previous years.

3.1.10 Level of didymo awareness amongst ramp users

![Bar chart showing didymo awareness levels amongst lake users (2013-2016).](chart)

*Figure 21 Didymo awareness levels amongst lake users (%).*

Those showing a high level of didymo awareness (42%) increased from the 2015 season by 13%. Ramp users with medium and low didymo awareness make the majority of didymo awareness with 32% and 22% respectively. No awareness decreased to 4% this season.
3.1.11 Perceived levels of interest

Figure 22 Perceived levels of interest in aquatic pest issues amongst lake users (%).

Perceived levels of interest in aquatic pest issues are high with 77% exhibiting “good” interest, 20% showing ‘moderate’ interest and 3% receiving ‘poor’ interest.

3.1.12 Do you know what to do if you see a pest fish?

Figure 23 Percentage of people surveyed who knew the procedure to undertake if a pest fish is spotted.

47% of users knew the correct procedure when they spotted a potential pest fish, 53% did not.
3.2 Rotomā Surveys

3.2.1 Was Vessel check/cleaned prior to launching?

![Pie chart showing 79% of vessels checked/cleaned, 14% N/A, 7% No, and 1% Yes.]

*Figure 24  Percentage of vessels surveyed at Lake Rotomā who checked/cleaned prior to launching (%).*

Of all the water users surveyed at Lake Rotomā, it was found that 79% had checked/cleaned their vessels and equipment before entering the water body. Therefore, 21% of ramp users had not either not checked or cleaned their vessels since using their last water body or their vessel had been out of water for over six months.

3.2.2 Do you know how to check/clean before launching?

![Pie chart showing 81% of vessels know how to check/clean, 19% do not know, and 0% N/A.]

*Figure 25  Percentage of vessels surveyed at Lake Rotomā that know how to check/clean prior to launching (%).*

Of all the water users surveyed at Lake Rotomā, it was found that 81% of them knew how to check and or clean their vessel in order to stop the spread of aquatic pests. Therefore of the 21% of users that did not check or clean their vessel since last use (Figure 19) 2% of them actually knew how to and did not.
3.3 **River site surveys**

Forty three surveys were conducted this summer period at Bay of Plenty river sites. Tauranga rivers sites were the most heavily surveyed with 41 surveys being conducted on the Wairoa River and surrounding catchment. Rotorua Rivers accounted for two surveys.

3.3.1 **Distribution of surveys conducted at river sites**

![Bar chart showing number of individuals surveyed at river sites.](image)

*Figure 26 Number of individuals surveyed at river sites summer 2015/16.*

41 surveys were conducted on the Wairoa River and seven at Mclarens Falls. The Kaituna drop in was the only river location surveyed in the Rotorua area.
3.3.2 **Was the vessel/equipment checked/cleaned prior to use on this river?**

![Percentage of vessel/equipment cleaned/checked prior to use on this river (>).](image)

Of all the Bay of Plenty river users surveyed this season 77% stated that they had cleaned their equipment/vessel before entering the current water body. 7% of those surveyed had not cleaned or checked before entering the water body.

3.3.3 **Types of vessel/equipment and recreational purpose**

![Type of vessel/equipment used on rivers and its recreational purpose (%).](image)
Kayaks and kayaking made up the highest percentage (84%) of equipment used and subsequently the most popular recreational activity on Bay of Plenty Rivers. The final 16% was made up of fishing and fishing gear.

3.3.4 **Origin of owners**

![Bar chart showing the percentage of river users surveyed from each district/region.]

Figure 29  **Percentage of river users surveyed from each district/region (%).**

A combined total of 77% of Bay of Plenty river users come from outside of the region to enjoy our pristine waterways. The other 23% was made up of users from the Bay of Plenty region.

3.3.5 **Last waterway used**

![Bar chart showing the percentage of people surveyed by last waterway used.]

Figure 30  **River users’ last water body used (%).**

Of the river users’ surveyed, 30% had last used Bay of Plenty waterways and 35% had last used other North Island waterways. Those last using the ocean accounted for 5%. 

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*Operations Publication 2016/01 - Aquatic pest advocacy report*
3.3.6 Level of didymo awareness amongst river users

Figure 31  Didymo awareness levels amongst river users (%).

Awareness of didymo has dropped to 77% percent of users having a high awareness level. This is a 23% drop from the 2015 survey period. 7% of those surveyed had a low awareness of didymo and 14% had a medium awareness. 2% of users had never heard of didymo.
3.3.7 Perceived levels of interest in aquatic pest issues amongst river users

Figure 32 Perceived levels of interest in aquatic pest issues amongst river users (%).

Of those surveyed 86% were deemed to have a good level of interest in aquatic pest issues; a decrease of 14% compared to last year. Moderate interest made up 12% and poor interest made up 2%.

3.3.8 Of those talked to in previous years how many knew how to check/clean/dry?

Figure 33 Percentage of people who had been talked to previously who knew how to check/clean.

Of the people who had been spoken to before 91% knew how to check/clean/dry and 9% did not (%).
3.3.9 Of those talked to in previous years how many people check/cleaned?

![Percentage of people who had been talked to previously who check/cleaned (%).](image)

Of the people who had been spoken to before 88% of people followed the check/clean/dry procedure, 8% had no requirement to and 4% did not follow the procedure.

3.4 Boat wash surveys

3.4.1 Number of surveys at each boat ramp

![Number of people who used the boat wash at each boat ramp.](image)

Boat Shed Bay was the most popular boat ramp (176) followed by Matahī spit (54) and Ōkāreka (47).
3.4.2 **Origin of owners**

Figure 36 Percentage of boat wash users from each region (%).

The majority of boat wash users originated from Rotorua (49%), Tauranga (16%) and Auckland (12%).

3.4.3 **Vessel type**

Figure 37 Vessel types using the boat wash (%).

Boats were the most popular vessel using the boat wash this summer (86%).
3.4.4 **Weed incursions at each boat ramp**

![Bar chart showing weed incursions at each boat ramp](image)

*Figure 38 Number of weed incursions spotted by the boat wash operator.*

Boat Shed Bay was where the largest amount of weed was found on vessels (56) followed by Okawa Bay (9).
Part 4: Discussion

4.1 Boat ramp surveys

4.1.1 Distribution of surveys conducted at boat ramps

This summer emphasis was placed on conducting surveys at bigger lakes. This is because of the larger audience of people that these lakes receive. Results from previous year’s surveys and knowledge of biodiversity, specifically pest species in the lakes, allowed us to determine where to allocate most of our efforts. For example, some lakes have not established as many weeds as others and therefore strenuous sampling and education efforts at these lakes were justified. It is important to note that the number of surveys conducted at each location should not be confused with the actual number of people visiting the boat ramp. Our efforts are only indicative of the amount of time spent at each location.

Lake Rotomā is the most pristine lake in the Rotorua district in terms of water quality and amount of aquatic pests. This, along with reported incursions in previous years and close proximity to other lakes, made it high priority for surveying and educating users. Its location makes it easily accessible to local users as well as people from Whakatāne and Tauranga. In previous years the Merge Lodge boat ramp on Lake Rotomā was identified as having many users who had previously been in different freshwater waterways (56.4%). This is another reason why a lot of time was spent specifically at this ramp. Unfortunately, this year there were three cases of weeds found on trailers at Lake Rotomā prior to launching, all of which involved hornwort, a weed not currently present in the lake. These were documented and handed onto a Biosecurity Officer for further action.

The Otaramarae Ramp on Lake Rotoiti is popular with those from both Rotorua and Tauranga and was visited frequently throughout the summer. Other boat ramps such as Delta and Gisborne Point were visited less frequently as these are less busy and are less frequently visited by out of town users. The Hinehopu Beach provided a good opportunity to reach a large number of people in a short amount of time as people tend to beach their boats and relax on the beach making them easy to approach and have a conversation with. Both Okawa Bay and Hinehopu boat ramps have large amounts of weed meaning many boats are covered in weed when exiting the lake. It is therefore very important to spend time at these ramps, especially on windy days, to ensure people are aware of aware of this increased weed transferral risk.

Lake Tarawera was frequently visited by surveyors due to its popularity with lake users and the high probability of spreading weeds to other waterways. Boatshed Bay was visited most frequently by surveyors along with the boat wash station. In windy conditions, large amounts of hornwort blew into Boat Shed Bay attaching to trailers and equipment. Sometimes when Lake Tarawera was too rough, users would move to Lake Tikitapu, transferring any weed attached on trailers. One user was caught under these circumstances and their information was passed onto a Biosecurity Officer and dealt with accordingly. The Landing, Stoney Point and Bay View Road are smaller boat ramps on Lake Tarawera which yield less numbers than Boat Shed Bay. They are more frequently visited by locals and therefore are usually less risk; however we still found it very important to visit these boat ramps as to target an audience which may usually be overlooked. Finally, because Lake Tarawera is frequently used for trout fishing, fisherman and general lake users were instructed to report any suspicious looking fish to either the Bay of Plenty Regional Council or the Department of Conservation.
Rerewhaakaitu is an important lake to be frequenting over summer as it does not contain hornwort and gets a lot of camp users with boats and equipment from other areas. It is recommended to visit these camp sites around 3-4 times a year.

Ramps at Lake Aniwhenua and Lake Matahina yield less data because they are a substantial distance from major towns and are also visited by summer students less often. They pose a significant risk as many of the lake users from Aniwhenua also use Rerewhaakaitu and Waikaremoana which at present contain different weeds. We did not manage to visit Aniwhenua more than twice during the summer period. It is recommended to visit them at least twice over the summer periods especially during long weekends when it can become quite busy.

Smaller boat ramps and lakes were visited as frequently as deemed appropriate. It was taken into account that although uncommon, some lake users that prefer to avoid contact with Harbourmasters or Biosecurity staff might actively seek to use less visited boat ramps and/or lakes. These users may be considered as high risk, therefore smaller boat ramps still require a certain degree of attention.

There is significant numbers of users that stay at campgrounds such as; Lake Aniwhenua, Lake Rerewhakaitu and Lake Whakamaru. Some of these lakes not only possess various pest weed species but also koi carp or even catfish. Although these users may only use the one lake they still require appropriate attention in terms of education. These locations were visited at least twice during the summer period as users still have the potential to spread invasive organisms to other lakes in the Bay of Plenty region.

**Figure 39** Jetty at Gisborne Point, Lake Rotoiti. Photo credit Matthew Liddicoat.

### 4.1.2 Was the vessel checked/cleaned before launching?

Ramp users were first asked which waterway that they had last used and when. This established whether they posed a significant risk to the current waterway. In situations where they were identified as being at high risk they were asked if they had checked/cleaned and were then educated accordingly depending on their answer. If they answered that the boat/equipment had been out of water for longer than six months or was on its maiden journey it was entered into the survey as N/A (11%) (Figure 18). This year’s data showed a decrease in people who had not been checking or cleaning from 28% (2015) to 8% (2016) (Figure 13). 81% of users had checked and cleaned their vessel or equipment before entering the waterway (Figure 13).
Users were also asked if they had been spoken to in previous years about aquatic pests. Of the 1,248 people surveyed, 724 (58%) had been talked to previously. Of the people who had been previously spoken to at Lake Rotoma, 91% knew the correct cleaning process (Figure 31). This is an encouraging result, as it shows that the message is getting across to users via advocates work.

Disappointingly, the advocates this year found 14 boat/trailers carrying weeds a 90% increase from the previous 5 boats/trailers from 2015. The boats that had been identified as carrying weeds included 10 that were carrying hornwort. Of the boats carrying hornwort three were entering waterways that did not currently possess hornwort at Lake Rotomā and Lake Tikitapu. The remaining boats carrying hornwort were identified at Lake Tarawera. It was often a misconception of lake users that if you only use a certain lake such as Lake Tarawera it did not matter if you did not complete checking or cleaning. This is not the case as despite the fact that the lake already has the weed in it, reintroducing it due to a lack of cleaning may hinder eradication processes that are being undertaken.

On three occasions boats were intercepted before entering a clean waterway with weeds. The first occasion occurred at Lake Rotomā, Matahi Spit during the Water Ski competition whereby a boat from Taupō had a large clump of hornwort located on his trailer. This boat went through the boat wash down station removing the large clump along with any other fragments of hornwort. As a result of this possible incursion, the water ski event organiser was sent a formal warning and made well aware of the problem this could have caused. The organisers have another event at Lake Tikitapu in February, whereby should another incursion occur it may result in the inability to book further lakes for any of their events. A second instance of weed transferral also occurred at Lake Rotomā when a jet ski user was launching whilst hornwort fragments were present on his trailer and jet ski. This user had come from Okawa Bay on Lake Rotoiti which is well known for its high levels of weed. Information from this incident was referred to a Biosecurity Officer and was followed up with a warning letter. They were educated by the advocacy student on the risks and consequences the introduction of hornwort could have to the lake. The third incursion took place as a jet ski covered in hornwort tried to enter Lake Tikitapu. The user had come from Lake Tarawera where conditions were rough and many users were picking up and moving to a more sheltered lake (Tikitapu and Okareka). Because so much weed had been washing up at Boat Shed Bay Lake Tarawera, many boats and trailers were getting covered in weed and increasing the risk of incursion. The details from this offender were once again passed onto the Biosecurity Officer for further action.

Finally, although not within the survey period it should be noted that hornwort was also unfortunately found at the Jet Ski Lake Rotomā event later on in the season (late February). Three separate jet skis possessed hornwort upon arrival. This is absolutely unacceptable and is the second time this event in particular has been affiliated with weed transferral, a breach of their lake closure concession. This matter was handed on to both the Biosecurity and Maritime Officers who will decide on the appropriate consequence.

Throughout the period users were educated strictly on the importance of cleaning and drying their anchor wells as these are main vectors for weed transfer because of their ability to remain wet for long periods of time. Users were also educated on the importance of cleaning and drying trailer carpets as carpet has the ability to firmly hold weed fragments and fish eggs.
4.1.3 Types of vessel and recreational purpose

This year ‘jet ski’ was added as a category option to the vessel type survey question, in previous year’s jet skis have been added to the ‘others’ category. Jet skis accounted for 8% of users surveyed in 2016 (Figure 15). Jet skis in particular have a faster tie down times than boats and because of this the window in which these users could be talked to be considerably smaller than that of boats. For this reason many jet skiers were unable to be approached. Talking to jet skiers while they are parked up on the beach is the best way to approach these users.

Boats with outboard motors made up 83% of users surveyed (Figure 15) a 7% decrease from 2015. Boats, jet skis and trailers present the greatest risk in regards to the transportation of aquatic pests. Trailers are entered almost completely into the water and have many areas in which weeds can attach. Boats also contain many areas in which weed can be transported including: carpet, anchor wells and outboard/engine (see Appendix 10).

Kayaks accounted for 6% of the surveyed vessels used in lakes or rivers over the summer period (Figure 15). Due to kayaker’s ability to launch anywhere, a small number of kayak users were actually able to be surveyed despite it being such a popular vector. It is advised to put more effort in to reaching and educating this high risk medium.

The ‘other’ category accounted for 3% of the vessels surveyed (Figure 15). These ‘other’ vessels included paddle boards and people approached who had no vessel. Paddle boarders are a good group to talk to due to their ease of moving between water bodies.

This year a ‘leisure’ category was introduced to the 2016 survey to explain users’ recreational purpose on the lakes. This is due to the increase of the other category in 2015 and includes pleasure boaters who were not fishing or water skiing. The new category ‘leisure’ received 48% of users surveyed, while water sports and fishing both increased; water sports increasing 7% to 34% and fishing increasing 1% to 16% (Figure 16).

4.1.4 Origin of owners and last water body used

In keeping with previous years, the largest proportion of people surveyed at the Rotorua lakes this summer were from Rotorua (43%) and Tauranga (24%) (Figure 17). The 2016 summer season saw an increase of Rotorua users by 10% and a decrease of users from Tauranga by 1%.

In regards to users who originated from areas that are considered high risk because of pest fish incursions, both users from Waikato (8%) and Taupō (2%) increased (Figure 17). Despite these low percentages, users combined from Waikato, Auckland and Taupō made up a sizeable fraction of 16% and present a sizeable risk (Figure 17). These three areas all pose a risk to the Rotorua waterways due to their alarming and prolific presence of pest fish species such as bull-head catfish and koi carp in their freshwater waterways. Waterways in both Auckland and Waikato contain high numbers of invasive weeds which are not present in the Rotorua lakes region. Grave concern goes to many of the Waikato region users who were not aware pest fish could travel by weed fragments. Similarly to previous years, users from Auckland and Waikato regions revealed that they visit the Rotorua lakes because of their superior water quality and lack of pest species compared to lakes and water bodies in their own regions.
South Island users increased by 2% this year and are classified as a high risk group due to the potential threat of spreading didymo cells. Although it should be noted that many South Island users have experienced didymo first-hand, they are often better informed and take better precautions than many in the North Island.

Overseas tourists (1%) increased by 0.9% from 2015. These users are at serious risk of transferring didymo between catchments and to the North Island due to the number of activities they undertake. Their short time frames and lack of awareness about didymo further increases their risk.

53% of vessels had previously been used in a Bay of Plenty freshwater way (Figure 18). This is a drop from the 60% of vessels in 2015. This suggests once again that more vessels are coming from waterways in regions that may have completely different pests to the ones found in Bay of Plenty. An example of this is Willow Weed and Parrot Feather which is found both in the Waikato and Northland.

Of those surveyed from the Bay of Plenty, 64% came from waterways which contain hornwort. This is of particular interest as it helps determine where users are potentially transferring pest weeds from. It was also noted that a number of people surveyed did not realise that all lakes did not have the same pest weeds and were not aware of the variety and number of pest weeds.

24% last used their vessel in saltwater (Figure 18), a number of these users were well aware that saltwater kills aquatic pests and stated that they always use the saltwater in between fresh water bodies as a means to eliminate the chance that they are spreading pest weeds.

This year saw an increase of users last in Waikato waterways by 1.4% rising to 7% (Figure 18). An alarming amount of these users were not aware about the risk of transferring eggs of koi carp and brown bull-head catfish to the Rotorua lakes despite the vast majority of users having some sort of knowledge about those pest fish. Users from Lake Taupō also increased to 4%, however due to very proactive advocates in the Taupō region, a number of them had already been talked to about pest fish and were well aware of the correct preventative procedure.

4.1.5 Perceived level of interest in aquatic pest issues and rated levels of awareness

Of the users surveyed this year 77% were perceived to have a good level of interest compared to the 64% in 2015 (Figure 21). Users displaying a moderate level of interest made up 20%, resulting in a drop of 10% from last year (Figure 21). A further 3% of people were perceived to have a poor level of interest which is another good drop from the 6% in the previous year (Figure 21). Users who were placed in the moderate and poor category were those who appeared to not be interested, claimed to know everything (and did not) or were unsupportive of our programme. These changes may be a result of the surveyor’s different perceptions, for this reason it is hard to fairly compare these results to last years. However a general consensus between surveyors found that on the most part users spoken too were genuinely interested in the messages relayed and were supportive of the programme and job being undertaken.

One of the biggest means of raising public awareness was the portable boat wash down station set up around the different lakes this summer. The boat wash down station was often a good starting point of conversation as many members of the public were interested in its purpose and how it works. As a result of this, it indicates that having the boat wash station in place over the summer months is worthwhile.
When asking users questions in order to gain an insight into their aquatic pest awareness, the last four years’ surveys and methodologies have been very similar which allows comparisons to be drawn. However surveys from years prior to 2012 had a different methodology which disables being able to accurately compare results. As levels of aquatic pest interest are now based on a method which allows for statistical comparisons. This enables future surveys to accurately compare results.

This year 41% of users were identified of having high levels of aquatic pest awareness (Figure 19), meaning that these users answered all three questions correctly. This is an increase from 33% in 2014 and 32% in 2015 (Figure 19). Users with no aquatic pest awareness dropped from 17% in 2015 to 10% this year (Figure 19). These users were not able to answer any of the three questions correctly; these users are the people who pose a very high risk of spreading aquatic pests, so it is a very good result to have this group drop by 7%. Knowledge of hornwort rose to 48%, up from the 36% of users last year. This increase is most likely due to focus and attention being placed on directly upon this particular weed.

96% of users surveyed this year had heard of didymo which is an increase from 2015 results of 87% (Figure 20). This is very encouraging and suggests that didymo is becoming a topic of general knowledge. Although, after asking users if they had heard of didymo, they were then asked further questions in order to gage their levels of awareness. Users were asked if they knew where didymo was located and of the 96% of users 83% correctly answered that didymo was located in the South Island or in rivers. Only 52% of those knew that didymo was located in rivers and in the South Island (Figure 20). These results indicate that although people had heard of didymo many were not able to correctly identify where it was located therefore do not fully understand the risks associated.

It is of high importance to place emphasis on the lakes which have the least amount of aquatic pests in them. Data collected at these lakes can determine whether lake users’ knowledge is greater at these lakes or whether further education is required. Lake Rotomā, Lake Tikitapu, Lake Okareka, Lake Okataina and Lake Rerewhikaaitu are lakes which are either hornwort free or under active management. Lake Rotomā has only lagarosiphon and elodea. Because of its lack of pest weeds and its close proximity to both Lake Rotoehu and Rotoiti (which both have well established hornwort colonies), it is very important users of Rotomā know the correct procedure to check and clean their boats and equipment. 81% of users at Lake Rotomā knew how to check/clean their boats and equipment (Figure 24) whilst 79% checked/cleaned before launching (Figure 23). These results suggest that 2% of those surveyed at Lake Rotomā did not check or clean their boat prior to launching despite knowing the correct process. Whilst this is a low percentage, seven boats entered the lake without checking or cleaning. The four other lakes showed that 76% of people knew the correct procedure to check clean dry which is an increase from 2015 results of only 58%.

Comments throughout the summer were made in regards to the lakes quality. People often would approach advocates with concerns in regard to the large volume of weeds at Rotoiti’s Okawa Bay and Lake Tarawera’s Boat Shed Bay. Concerns were also raised in regards to the algal blooms in Lake Tarawera.
4.2 **Pest fish awareness**

Due to the lack or pest fish in the Rotorua lakes a particular emphasis was placed on educating users about pest fish especially koi carp and bullhead catfish. Of the users surveyed this year 70% had heard of a pest fish such as koi carp and bullhead catfish. Furthermore 47% of users knew what to do if they saw a pest fish in any of the Rotorua lakes (Figure 22). This is a disappointing result as users were also asked if they had seen any pest fish and seven people replied that they had but did not know what to do. It is very important to report any pest fish sightings as populations can establish and rapidly grow.

Many people did not realise that fish eggs could survive out of the water as long as they remain wet. As 11% of users surveyed had last used Waikato or Taupō waterways (Figure 18), both of which are easily accessible to the Rotorua Lakes, a concern arises due to the abundance of pest fish in both waterways.

Users are still unsure what to do if they spot a pest fish while out on a lake. A common response from users is that they were “pretty sure they caught a pest fish, but they did not know what to do with it so they threw it back”. Due to this response, advocates focused strongly on advising lake users on the correct procedure if they see a pest fish.

It is clear that future emphases must still be placed on pest fish and educating users on the risks of these fish entering the Rotorua Lakes. If an incursion occurs in a Rotorua lake a number of other lakes would be at risk due to the close proximity of waterways in the region.

4.3 **Boat wash**

Over the duration of 2015/2016 summer period the boat wash down station was in operation at four lakes in the Rotorua region. The aim of the operation is to reduce the spread of aquatic pests by cleaning vessels, educating and creating awareness amongst lake users and the general public of the serious threat that aquatic pests pose. Vessel operators were encouraged to use the wash-down station to remove any weed fragments that may be attached to their vessels and trailers, prior to entering (clean) or exiting (dirty) lakes. Lake users were given information packs promoting the “check, clean, dry” policy. Survey forms were completed for users of the boat wash (Appendix 3). BOPRC and DOC students worked closely with the boat wash operation, further reinforcing the “check, clean, dry” message.

Due to space constraints at local boat ramps, it was only possible to setup and operate at four lakes, Tarawera, Okareka, Rotoiti and Rotoma. Boat users responded very positively to the boat wash at all four lakes. People showed curiosity and interest in the functioning and process of the boat wash. Local residents were positive in their comments and were happy to see active management was being undertaken.

Weekends, statutory and recognised public holiday periods were targeted as boat wash operation days because this is when there was the largest number of users present at the lakes. Events organised by the summer students were also a perfect medium to reach a large audience and decontaminate many vessels effectively.

The boat wash was operated for 24 days over the survey period. The average daily usage of the boat wash was 14 vessels and the busiest day saw 25 vessels cleaned. In total, over 300 vessels used the boat wash in the survey period.
Boat Shed Bay proved to be the busiest boat ramp with 176 surveys conducted at this ramp (Figure 34). The Matahi Spit boat ramp was the second busiest with 54 surveys conducted and Acacia Bay (Okareka) boat ramp also had many users (47) (Figure 34). People using the boat wash facility came from all over New Zealand with the majority of people coming from Rotorua (49%), Tauranga (16%) and Auckland (12%) (Figure 35).

The boat-wash identified weed on boats and trailers on 73 occasions during the survey period. This is an outstanding number and stresses the vitality of having the boat wash station out and in use summer. On eight occasions the boat wash intercepted hornwort being transported into hornwort free lakes (Figure 37). Three of these occasions were at a jet ski racing event; details were taken and passed onto a Biosecurity Officer for further action. The remaining 65 vessels with weed were as vessels were leaving both boat shed bay (Lake Tarawera) and Okawa Bay (Lake Rotorei) (Figure 37). These boat ramps in particular wash up a lot of weed and therefore many trailers were covered in weed before entering the boat wash on their way home or to other water bodies.

It is important to note that not all boat users used the facility; many people had no requirement to do so as they were headed straight home to wash their boat down or they were headed straight to the ocean. Also, many lake users are hasty to “get out there” and often overlook the need to check and clean their vessels and gear. Having the station physically set up is an effective reminder to them.

In terms of the overall running of the boat wash station, it is effective in cleaning most weed from vessels and trailers, however large strands of weed draped over trailer framework was occasionally not removed, and had to be physically pulled off by hand.

In conclusion, the wash-down station is a very successful education tool that people enjoyed using. It raises awareness about eliminating the spread of aquatic pests to not only boat users but also the general public and successfully helps prevents aquatic pest incursions around the lakes ensuring the preservation of our lakes for future generations.

Technical information and recommendation on set-ups and running of the operation can be found in Appendix 6.

4.4 Other issues for discussion

In general, regular users of the lake tended to be better informed about aquatic pests as they had been spoken to on previous occasions and/or received numerous information packs. Although many people stated they had already been talked to, it is quite common that they may have forgotten some, if not all of the information previously presented to them, for this reason it is worth quizzing them on what they do or do not remember. Another comment regularly made by boat users is “we mainly use this lake” in this occasion it is worth asking them to clarify if they have used others or not, because in many situations they would have. For example this year someone, when made to clarify, admitted they had been in Waikato just the previous day, which is of great concern due to the threat posed by the Waikato River pest species.
During the course of the awareness programme this year, a significant number of “Stop the Spread” merchandise was handed out to genuinely interested members of the public, event organisers and advocates of the programme. This included, T-shirts, hoodies, fishing lures, caps and propeller flags. On many occasions people were spotted wearing this merchandise around boat ramps and camp grounds. This is a great outcome as it then makes more people aware of the slogans which may help remind them to “Check, Clean, Dry” in the future.

Of major concern this year was the amount of people stating that they had seen pest fish or caught pest fish, killed it and then thrown it back. This is of concern because most people spoken to had no idea of the correct procedures (take photos, freeze fish, call Fish and Game or DOC), therefore extensive action cannot be undertaken to search the lakes for such pests as they may have incorrectly identified them, or mistaken them for goldfish, which are currently present in the lakes. It is a good idea to place emphasis on this in the future, then if an incursion were to occur it would be properly noted and could be dealt with as early as possible.

4.5 Rotomā surveys

One of the most pristine lakes in Rotorua is considered to be Lake Rotomā. Its absence of the pest weed hornwort results in a high amount of users choosing Lake Rotomā as a place to launch. Due to this reason a large volume of surveys were once again completed at the lake. Over 28% of all surveys were completed at Lake Rotomā (361). Alike last year, advocates collected sufficient data to analyse results in further detail to compare results to previous seasons.

81% (292 people) of users surveyed answered that they knew how to check/clean prior to launching (Figure 24). Another 7% (25 people) had had their vessels out of the water for over six months or were on their maiden voyage. Of the 292 users who had identified that they knew the correct process to check clean dry, seven users did not check/clean before entering the waterway (Figure 23). Whilst this is a drop from previous years it is still of a concern considering that Lake Rotomā is relatively free of invasive pest species.

Users who were last in the ocean were not required to clean or check their gear due to the fact that there was no ability to spread pests to Lake Rotomā. However, 80 (22%) users had come from waterways that required them to check/clean before entering the lake. 13 users had not checked their vessels/gear and of those 13 users, two of them were identified to have weeds on their gear.

Lake Rotomā plays host to two weed cordons at both Merge Lodge and Matahī Spit. The boat ramps and surrounding areas are well sign posted and the beach is regularly checked for invasive weeds. As a result, the lack of motivation to clean equipment by some of the lake users is even more concerning.

Lake Okareka, Okataina, Rerewhaakitū and Tikitapu are also hornwort-free or managed lakes. These lakes also had emphasis put on them by advocates due to this. 168 users were surveyed at these lakes, 81% had cleaned before entering the waters while only 76% knew the correct procedure to check, clean dry. The 5% difference includes people who had cleaned their trailers/boats but did not know that the anchor well was also required to be cleaned and that pest fish eggs needed to be removed through the use of bio-degradable detergent.
The lack of motivation by users to check clean dry before entering any of the five hornwort free waterways is alarming. Many of these users were aware of the correct procedures despite their knowledge of the requirement to Check/Clean. Continuing to place emphasis on these lakes is required along with marketing the process of an easy, cost effective and non-time consuming way to clean vessels and gear. This would hopefully reduce the breaches of aquatic pest in these lakes. If not, stricter enforcement measures may be required in order to reinforce the necessity check/cleaning.

4.6 River site surveys

4.6.1 Distribution of surveys conducted at rivers

This season Bay of Plenty Rivers were visited less frequently due to the emphasis being placed on the Rotorua lakes. The Waioeka River was visited once at the very start of summer due to its remote location and time needed to travel there. This summer unfortunately there were no users surveyed at that site.

The Wairoa River was visited three times on a Sunday to coincide with the hydro-dam release. The Wairoa River is a popular spot for kayakers and rafters and people could be targeted before and after entering the water. Information given to these kayakers was adjusted accordingly to focus more on didymo rather than aquatic pests in lakes. All kayakers were very receptive to the information given to them and knew the importance of Check, Clean, and Drying.

It is important to note that due to the low amount of surveys conducted (43) this summer at river sites, results may be skewed (Figure 25).
4.6.2 **Was the vessel checked/cleaned before launching?**

Users were directly asked if they had cleaned their vessel before entering the waterway. A decrease from 100% of users in 2015 to 82% of users this year had cleaned their vessels before entering the waterway (Figure 26). However, this year an additional category N/A was added to the surveys which applied to users who were on their maiden voyage or users whose gear/equipment had been out of the water for over six months. 16% of users fell into this N/A category whilst 7% of users (three users) had not cleaned their vessel before entering the water (Figure 26). Of the users who had no checked/cleaned, one had originated from the South Island however the last body of water their vessel had been in was the Kaituna drop-in. At this stage it is unsure if they had checked/cleaned prior to entering the Kaituna River. Ongoing didymo sampling undertaken by the Department of Conservation every three months will determine the outcome of this breach.

4.6.3 **Type of vessel and its recreational purpose**

Kayaks and kayakers made up the majority of users surveyed this year (84%) and is subsequently the most popular activity for the Bay of Plenty Rivers (Figure 27). The other 16% of users surveyed were fishermen with their fishing equipment (Figure 27). Unlike boats and trailers, kayaks and fishing gear does not have as many areas where visible clumps of weeds can accumulate. However, through being used in river systems, they still present a high risk in transferring didymo. River users were and continue to be reminded of the threat that didymo possesses. They are also reminded that although you might not see it on your equipment it is still possible that it could be on their gear.

White water kayakers have a close and well connected community, for this reason they are encouraged to share their good cleaning habits with those new to the sport.
4.6.4 Origin of owner, last water body used and perceived levels of interest

The vast majority of rivers users surveyed this summer originated from the Bay of Plenty region (33%) and from Auckland (22%) closely followed by Overseas (16%) and the Waikato (12%) (Figure 28). Due to the majority of surveys being taken at the Wairoa dam release, data is highly affected by bias and because of this it is hard to compare it to previous years. 23% of users surveyed originated from either the South Island or Overseas (Figure 27). These users pose significant threat because they could transfer didymo which is present in the South Island rivers. For example, the one user who had not checked or cleaned before they entered originated from overseas and did not know the about the threat of didymo.

86% of users had a high perceived level of interest, 12% had moderate and 2% had low perceived levels of interest (Figure 31).

4.7 Retail and tourism awareness

Due to the popularity of the Bay of Plenty, the regions retail and tourism sector services a wide variety of people including holiday makers and tourists. These sectors are often sort after to gather information about the range of freshwater recreational locations and activities. Providing information to this medium is seen as a perfect way to give year round access to aquatic pest information to public. During this season, advocates visited 45 retail, tourism and accommodation sites thorough out the entire Bay of Plenty region (Appendix 1). Due to demands and restraints (weather and temperature) of the summer advocacy position, sites were visited in the first month before holiday makers and tourists had descended on the region.

A highly level of focus is put onto holiday parks, outdoor retail shops, backpackers and high risk tourism operations. This is in place to target main groups of people using the Bay of Plenty waterways. Backpackers accommodation is very important to visit as people staying there often travel widely into remote areas of wilderness which have pristine waterways. They therefore have the potential to become vectors of didymo cell dispersal. Motels and hotels were not visited due to their lack of boat parking and as a result of negative feedback from previous years.

Holiday Parks and outdoor chains (e.g. hunting and fishing) were very receptive to the information and a vast majority of them are proactive in carrying out pest education to their guests. A majority of holiday parks have boat wash down stations available to their guests. Many of them also host annual trout fishing competitions, merchandise was therefore given out for use as spot prizes and owners were asked to talk about aquatic pests at such events.

High risk tourism operators were once again visited this season. They were again reminded of the importance of cleaning gear and vessels between waterways along with being updated with new information. Brochures and posters were given for their operating locations and simple green bio-degradable detergent was supplied to assist in their personal wash down stations. Operators were asked to talk about aquatic pests in their safety briefings.
4.8 **Event and decontamination awareness**

Speaking to event organisers and to competitors at briefings offered the chance to not only raise awareness of aquatic pest risks to lake health, but also to provide information on decontaminating vessels and equipment. All of the event organisers were willing to promote didymo and aquatic pest awareness and cooperated well with requests to decontaminate vessels and equipment, especially those coming from foreign waterways. Events can bring large captive audiences to a single location, so being granted permission to speak to a crowd of people in a relaxed manner offers the opportunity to spread awareness that would otherwise have taken a considerable amount of time and effort. Many of the competitors taking part in events over the summer may not usually use the Rotorua lakes and may thus arrive with very little knowledge of our specific freshwater biosecurity issues and requirements.

Alike 2014/2015 all event organisers were receptive to the messages provided by the Bay of Plenty Regional Council and the Department of Conservation to ensure they did not breach any of the biosecurity risks. All of the event organisers this summer knew the procedures they must follow in order to reduce the risk of any incursions.

Organisers of the Canoe Regatta Lake Tikitapu and the Blue Lake Rowing Regatta made it compulsory for competitors to check/clean before entering the competition. They did this by either making competitors sign off that they had done so, or put a sticker on their equipment indicating it had been decontaminated. This is a fantastic idea, as it helps event coordinators ensure that they are eliminating the risk of causing an incursion.

The event organisers of the Blue Lake Multisport Festival, The Half Iron Man Rotorua, Legends of the Lake and The New Zealand Whitewater Committee were again very proactive in organising decontamination gear from the Bay of Plenty Regional Council (half barrels and 20 L Simple Green) and provided their own volunteers to oversee the station. They were also given some merchandise for their participants' race bags and for spot prizes (brochures, bumper stickers, “stop the spread” T-shirts, hats and key rings).

At the Jet Ski Lake Rotomā event, the Ski Racing Lake Rotomā and the Ski Racing Lake Tikitapu event, the portable boat wash was present and decontaminated vessels upon entry. This is of high importance as many of these users come from waterways outside the region in areas that have high abundance of hornwort, pest fish, or other weeds not present in the Bay of Plenty region. Unfortunately, at both the Ski Racing Lake Rotomā event and the Jet Ski Racing Lake Rotomā event, large amounts of hornwort were found on competitor’s trailers and jet skis. This is a breach of Biosecurity, Clause 12 (Figure 41) and these incidences were therefore passed onto the Biosecurity Officer and dealt with accordingly.

It should be noted that all event organisers are made aware of the risks and procedures needing to be undertaken as it is one of the conditions they agree to when applying for the lake/partial lake closure (Figure 41). They are also provided with a Bay of Plenty aquatic pest event decontamination protocol (Appendix 7).
Lake users should be aware of the biosecurity risks of spreading aquatic pests such as Hornwort, (an invasive aquatic weed), Koi Carp and the invasive algae Didymo between waterways. Care must be taken to ensure that all equipment moved between waterways is decontaminated prior to use. For events where weed cordons are located at the lake all vessels involved in the event that are launched via trailer immersion will enter the lake via the weed cordon. Kayaks, canoes and other vessels that do not involve the immersion of a trailer may be launched outside of weed cordon areas providing they have been appropriately decontaminated prior to use. Information detailing appropriate decontamination methods and aquatic pest threats to the Rotorua Lakes is enclosed.

Figure 42 Clause number 12 on lake/partial lake closure conditions.

The majority of event organisers and competitors were friendly and supportive of what we were doing. Numerous people have participated in Rotorua events for many years and are passionate about keeping water quality and lake health high.

The Hands on Water day organised by several agencies was also attended by both the BOPRC students and DOC this year. The BOPRC students set up games and activities educating students about the weeds and the risks they can pose to recreation and fishing. The DOC student set up a memory game in order to educate the students about both native and pest fish species in New Zealand. Instructions to both activities can be found in appendix 8.

Figure 43 Hands on water day 2015, Gordon educating children about the effects didymo has on fishing with an interactive game.
Part 5: Conclusion and recommendations

Rotorua lakes are a significant asset to both the Bay of Plenty Region and the country. The health of the lakes, their water quality and biodiversity are therefore worth protecting for the enjoyment of today as well as for the enjoyment of future generations. Due to the number, close proximity and popularity of the Rotorua Lakes, they are extremely susceptible to the invasion of aquatic pests by lake users.

Hornwort, egeria, lagarosiphon and elodea are the main aquatic pest weeds which have established in the Rotorua lakes. These weeds contribute to water degradation and inhibit native community systems which can lead to a loss of native species. The activities undertaken by recreational users have been identified as the primary means through which weeds spread between lakes. The main means of which these pests spread is through trailers, vessels and equipment associated with recreational activities. Pest fish eggs from the likes of the koi carp or the bullhead catfish are able to ‘hitch-hike’ and can remain viable on damp weed fragments. This results in the capacity to spread from one water body to another. In 2004 a freshwater algae called didymo was identified in the South Island and has since spread throughout freshwater river systems over the South Island. Although it is not currently present in the North Island, it has the capability to spread via the microscopic cells that are often undetected by the human eye. Didymo has negative impacts upon river ecology and aesthetics; it also negatively impacts the interests of commercial endeavours and recreational users.

The 2015/2016 Aquatic Pest Summer Awareness Programme aimed to identify levels of public awareness and educate recreational users about didymo, invasive weeds (especially hornwort) and pest fish species. A total of 1,248 users were surveyed at lake boat ramps and river access points throughout the Bay of Plenty region this summer.

This year 80% of users surveyed said that they knew the correct procedure to check clean, however 81% said that they had cleaned before launching their vessels. This one percent difference can be put down to people who checked for weed fragments but did not realise that they needed to check their anchor wells or clean their gear with the bio-degradable detergent to eliminate the chance of spreading pest fish eggs. From these statistics, it can be shown that in the future, emphasis needs to be placed on actively encouraging people to undertake the cleaning process. The additional category of ‘not applicable (N/A)’ was once again included in this years’ survey. This category included users who were on their maiden voyage or users that had been out of the water for over six months, these users were not required to check or clean their vessels before launching.

Summer advocacy students found aquatic weed species attached to trailers on 14 different instances. The majority of these cases involved either hornwort or lagarosiphon. Of the 14 cases, four of these were a serious concern as they involved hornwort free lakes. Two were at Lake Rotomā which is known for its pristine water, one at Lake Okareka and one at Lake Tikitapu.

The majority of recreational users originated from Rotorua and Tauranga. The combined percentage of users from Waikato, Taupō and Auckland equalled 16%. These areas have a range of different aquatic pests including the pest fish which are detrimental to the Rotorua lakes. Vessels last used in the Waikato (8%) increased from last season which causes concern considering a significant number of those surveyed did not realise that Rotorua lakes were largely free of pest fish species. Fortunately, good perceived levels of interest by users increased to 77% compared to the previous year’s 64%. However, as with previous years this data is based on the surveyor’s judgement and for this reason is affected by bias.
The method used by surveyors this season is consistent to the 2014/2015 method which allows for comparisons to be drawn about lakes users’ aquatic pest and didymo awareness. A positive comparison can be drawn from users’ awareness of aquatic pest with users of high levels increasing by 9% this season. A decrease of users with no aquatic pest awareness by 7% was recorded this season which is a pleasing result. A 13% increase of users with a high level of Didymo awareness occurred along with a decrease by 9% of users with no knowledge of didymo. Overall these results show that aquatic pest awareness and didymo awareness is increasing and becoming a more well-known issue. A factor which may have helped the increase in didymo awareness is the large amount of emphasis placed on educating people in the South Island and on the Interisland Ferry. Educating people at the source of the problem is key in reducing the likelihood of an incursion elsewhere.

Three river users out of the total 43 had not checked or cleaned before entering the river survey sites. Of these three, a particular concern is towards one user who originated from the South Island. It is impossible to establish whether they had cleaned before entering a water body in the North Island. Although highly unlikely, ongoing didymo sampling undertaken by the Department of Conservation at the Kaituna River will establish if any didymo cells are present. Many of the people spoken to at river sites had experienced didymo first-hand and had seen the detrimental effects that it has had on the South Island rivers, as a result of this they were very receptive and acknowledging of the advocates work.

The Aquatic Pest Awareness Programme is reaching many of those most at risk of causing incursions of invasive species to the Bay of Plenty region. Users of the waterways appreciate the work conducted by the Regional Council and the Department of Conservation around the lakes and rivers. Users frequently make positive remarks about the work being undertaken. A mind-set among recreational users to “Check, Clean and Dry” vessels and equipment will prevent didymo incursions in the North Island. Similarly, “Stop the Spread” reminds users that procedures must be undertaken to prevent aquatic pests moving between waterways. This is important to New Zealand not only ecologically but also aesthetically and economically.

5.1 General recommendations

1. Work closely with the Department of Conservation student. This way you can share tips and bounce ideas and concerns off each other. Also this increases the number of surveys and reaches a larger audience.

2. Summer students should contact the Water Administration Officer at the Rotorua office when looking for events to attend. They are responsible for lake closures and have event information and contact details.

3. Make contact with event organisers as early as possible. This ensures they have had plenty of notice and sufficient time to contact participants if necessary.

4. Provide event organisers with a didymo information file, “Stop the Spread” DVD and some free merchandise (T-shirts, caps, key rings etc.) to either use as spot prizes for competitors or to use themselves. Organisers are often responsible for several events each year and when they wear or use merchandise the slogans or messages are seen by a large number of people.

5. Arrange with organisers the opportunity to speak about aquatic pests and cleaning vessels at event briefings and try to encourage them to be more proactive by carrying out decontamination themselves. Ask about putting aquatic pest information and didymo brochures in event packs.
If event registration is the day prior to the event itself, ask that a decontamination station be set up (e.g. if it involves wetsuits) and supervised by members from their organisation. This provides enough time for wetsuits to dry out. Decontamination could be a pre-requisite for participation in the event. A visit could be scheduled if there are doubts about compliance.

Large amounts of merchandise are required for survey packs, event organisers, retail outlets, tourist accommodation and other contacts. Conducting regular stock counts and ordering in stock that is running low ensures enough is available for the weeks ahead. This is especially vital leading up to Christmas and New Year which is the busiest survey period.

Ordering collateral from Ministry for Primary Industries should be done as soon as you start for the summer, this year they ran out of merchandise which made it very hard for us to distribute the materials to places needed.

Distribute brochures to retail outlets and tourist accommodation early in the programme. This ensures they are stocked prior to the busiest time of year.

Camp grounds/holiday parks are especially important places to distribute brochures and posters to as they are the places people often choose to stay at with their boats. It is also recommended to have the holiday park owners educated so if someone does arrive with a boat etc. they can help educate them on the cleaning process.

Backpackers often tramp in the South Island and then the North Island with the possibility of having contact with a large number of waterways in a short period of time. They are therefore a potentially high risk vector for didymo dispersal. Ask backpacker hostel owners for permission to put posters on noticeboards and to take a pile of the didymo brochures directed at those that tramp.

Encourage motel owners to put posters in communal areas (e.g. laundry/games room).

Ask owners of fishing outlets or boat showrooms to hand out a brochure with every fishing licence/fishing rod/boat sold.

Many people we spoke to had questions about the boating rules and where the ski lanes were. It is a good idea to put the Rotorua lakes map brochure into the packs; they also include the basic boating rules.

Occasionally members of the public do not wish to be spoken to and may become negative, argumentative or berate the organisation. You will not be criticised for simply thanking them for their time and walking away rather than getting enticed into an argument, although this happens very rarely if ever.

If people you approach say they have had packs in previous years, still attempt to engage them if they are receptive. You could ask them if they mind being updated regarding biosecurity issues in the region. These people often have very poor awareness or have forgotten information from previous years despite having the merchandise.

When conducting river surveys try not to attend the Wairoa River on too many occasions as you will find many repeat users. One visit at the beginning, once in the middle and again towards the end of the survey period would be ideal.

Different packs should be made for river users, without information on the weeds but more focused on didymo itself. This is because many of them only use rivers so it is better for them to have the didymo knowledge more strongly reinforced.
Choose busy periods such as weekends to visit more remote rivers (e.g. Waioeka) and lakes (e.g. Aniwhenua and Matahina). This will increase the chance of meeting people rather than travelling long distances for few surveys. Although you only need to visit these places once or twice throughout the summer.

Murray Redpath has a farm (Appendix 12) that the Waioeka River runs through. He has good didymo awareness and has a decontamination station set up for fishermen using the river. We would recommend you visiting him, providing him with ‘Simple Green’ if necessary and offering him some free merchandise.

Previous years advocates have suggested meeting with either Kelley Korau or John Merito at Te Waiairiki Purea Trust. They regularly use the lakes for activities with their youth groups. John Merito has also suggested the possibility of spreading awareness and educating people about cleaning procedures over the Māori radio station that they use.

Have the RDC phone number handy, because many people ask RDC related questions mistakenly to you when you are surveying. Especially questions about dogs and rubbish.

Encourage organisers to be more proactive with regards to invasive pest awareness at events. The aim is for organisers to contact us about wetsuit decontamination and for them to run the stations, as the Blue Lake Multi Sport organisers have in recent years. We can supply the equipment for this purpose. Some organisers have already included decontamination as a condition for entering their event which is promising.

Those living in properties with private boat ramps are often not surveyed so a significant number of people are not spoken to about aquatic pest awareness. Future summer students could communicate with the Regional Council’s consents officers to get addresses of these properties. The four information sheets used in survey packs could then be sent to these addresses with a covering letter explaining the awareness programme.

Awareness of pest weed, fish and didymo awareness issues need to be more strongly advocated at the lakes without hornwort (Rotomā, Ōkataina, Ōkāreka, Tikitapu). Particular attention needs to be paid to users of these lakes to ensure they are made aware of the pristine nature of these lakes and the importance of checking equipment, especially if they were last in the Waikato region.

When surveying at ramps with weed cordons, regular checking along the beach within the cordon should be carried out. This will ensure that unwanted pests are detected as early as possible. Regular checking of parked trailers is also recommended.

Lake Rotomā should be focused on more than the other lakes due to the lack of hornwort and Egeria densa. Especially after an on-going westerly as a lot of people travel from Hinehopu, Otaramarae and Okawa Bay boat ramps where lots of weed washes up, to Merge Lodge covered in weed.

A good idea to log hours at each boat ramp/lake, this way it is easy to establish why the data may be skewed to one conclusion and why some sites have more surveys than others.

When it suddenly becomes a windy day at Lake Tarawera, it is a good idea to sit at Lake Tikitapu and Lake Okareka to ensure users from Boat Shed Bay aren’t picking up and moving lakes with weed on their equipment and trailers.
5.2 Biosecurity recommendations

1. It is recommended to put a weed cordon in at Hinehopu boat ramp on Lake Rotoiti and Boat Shed Bay on Lake Tarawera in order to stop boats coming out of the water covered in weed and therefore becoming a high risk group for spreading aquatic pests around the area.

2. “Stop the Spread” or “Check, Clean, Dry” road signage between major pest free waterways. For example between Lakes Rotoiti and Rotomā.

3. A decontamination station at Kaituna river drop-in at Okere Falls would be ideal, if space and cost requirements allow.

4. Carpet on trailer is one of the major vectors of weed transferal. Trailer manufacturers should be approached and discouraged from using carpet when possible.

5. Waikato Regional council should be approached and encouraged to establish a similar awareness advocacy programme in the Waikato as well as have up to date signage informing people of pest fish transferal from the area.

6. DOC should update and maintain the great check/clean/dry signs on the Waioeka as they are overgrown and faded.

Figure 44 Department of Conservation signage at the Waioeka Gorge. Photo credit: Xia Stevens.
Part 6: References


Appendices
### Appendix 1 – Sites visited to promote aquatic pest and didymo awareness

<table>
<thead>
<tr>
<th>Rotorua sites</th>
<th>Name</th>
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<tbody>
<tr>
<td><strong>Camping grounds</strong></td>
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<tr>
<td>Blue Lake Holiday Park</td>
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<td>Cosy Cottage Holiday Park</td>
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<tr>
<td>Holdens Bay Holiday Park</td>
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<tr>
<td>Malfroy Motor Lodge</td>
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<td>Marama Resort</td>
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<td>Ōkataina Lodge</td>
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<tr>
<td>Rotorua Family Holiday Park</td>
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<td>Rotorua Top 10 Holiday Park</td>
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<td>Rotorua Thermal Holiday Park</td>
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<td>VR Holiday Park</td>
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<td>Waiteti Trout Stream Holiday Park</td>
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<td>Willow Haven</td>
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<td>Bill Davies Outdoor Sports World</td>
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<td>Dive HQ</td>
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<td>Hamill’s</td>
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<td>Hunting and Fishing</td>
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<tr>
<td>i-Site Rotorua</td>
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<tr>
<td>Kaitiaki Adventures</td>
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<tr>
<td>Kathmandu</td>
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<td>Lake Tarawera Water Taxi</td>
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<td>Macpac</td>
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<td>O’Keefes</td>
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<td>Outdoorsman Headquarters</td>
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<td>Redwoods info centre</td>
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<td>River Rats</td>
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<tr>
<td>Rotoma’s Trading Post</td>
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<tr>
<td>The Duck</td>
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<td><strong>Tauranga sites</strong></td>
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<td><strong>Tourism</strong></td>
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<td>Tauranga i-Site</td>
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<td>Te Puke i-Site</td>
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<td>Bivouac Outdoors</td>
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<td><strong>Retail outlets</strong></td>
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<td>Hamills</td>
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<td>Hunting and Fishing</td>
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<td>Te Puke Rod and Line</td>
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<td>Top Catch</td>
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<td>Whakatāne sites</td>
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<td>Hunting and Fishing Whakatane</td>
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<td>Ōpōtiki sites</td>
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<td>i-Site Ōpōtiki</td>
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<tr>
<td>Retail outlets</td>
<td>Name</td>
</tr>
<tr>
<td></td>
<td>Ōpōtiki Bait &amp; Tackle</td>
</tr>
<tr>
<td></td>
<td>Hickeys Sports</td>
</tr>
</tbody>
</table>
Appendix 2 – Survey form used 2015/20169

(Note survey form was conducted through an App designed by Simon Allard of BOPRC on the iPad)

Lake/river: .............................. Boat ramp: ............................. Date: ......................

Weather: .............................. Wind: ........................................

Talked to before about aquatic pests?  □ Yes  □ No

Checked/cleaned prior to launching today: □ Yes  □ No  □ N/A

Weed on boat/equipment: □ Yes  □ No

If yes, species and where? ........................................................................................................

Vessel/equipment type:  □ Boat  □ Kayak  □ Other

Recreational purpose?  □ Fishing  □ Skiing  □ Other

Level of interest in aquatic pest issues?  □ Poor  □ Medium  □ Good

Origin of vessel/equipment (last water body where used):

Origin of owners? (where vessel users are from/live):

1  Do you know what hornwort is? □ Yes □ No
2  Do you know if there are any koi carp/catfish in these lakes? □ Yes □ No
3  Do you know how aquatic weeds are spread around the lakes? □ Yes □ No

Level of awareness of aquatic pest issues? □ None □ (1) Low □ (2) Medium □ (3) High

Have you seen any pest fish? □ Yes □ No

Do you know what to do if you see any pest fish? □ Yes □ No

1 Have you heard of Didymo? □ Yes □ No
2 Do you know where is it found? □ (2) Yes- South Island □ (3) Yes- Mainly in rivers □ No

Level of awareness of Didymo? □ None □ (1) Low □ (2) Medium □ (3) High

Do you know how to reduce the risk of spreading aquatic pests? □ Yes □ No

Comments: ......................................................................................................................
## Appendix 3 – Boat wash survey form

<table>
<thead>
<tr>
<th>Date:</th>
<th>Location:</th>
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<table>
<thead>
<tr>
<th>Weather:</th>
<th>Vessel: Boat / Jet ski / Kayak</th>
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<table>
<thead>
<tr>
<th>Place of residence:</th>
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<table>
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<tr>
<th>Purpose of voyage:</th>
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<table>
<thead>
<tr>
<th>Water source previously come from? Lake / Sea / River</th>
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<table>
<thead>
<tr>
<th>Location:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Do you know about aquatic weeds/fish? Yes / No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Do you clean your vessel prior to changing? Yes / No</th>
</tr>
</thead>
</table>

| water sources:                                       |

<table>
<thead>
<tr>
<th>Aquatic weed found on vessel: Yes / No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type:</th>
</tr>
</thead>
</table>


Appendix 4 – Regional grouping for the origin of lake/river users

Rotorua region

Rotorua
Tarawera
Ngongotahā
Rotomā
Tarawera
Rerewhakaaitu
Rotoiti

Whakatāne region

Whakatāne
Kawerau
Matatā
Galatea
Edgecumbe
Ohope
Ōpōtiki

Tauranga region

Tauranga
Te Puke
Pukehina
Papamoa
Maketu
Katikati
Mount Maunganui

Waikato region

Tokoroa
Hamilton
Matamata
Te Awamutu
Reporoa
Morrinsville
Taupo
Waihi
Thames

Wellington region

Wellington
Hutt Valley
Kapiti

Hawke’s Bay region

Hastings
Napier
Gisborne

Northland region

Whangarei

Taranaki region

Taupo

Auckland region

Whanganui region

South Island

Overseas

UK
Australia
USA
Appendix 5 – List of Ministry for Primary Industries and Bay of Plenty Regional Council products distributed

From Bay of Plenty Regional Council:

- “Stop the Spread” fluorescent propeller flag.
- “Stop the Spread” floating key rings.
- “Stop the Spread” t-shirts.
- “Stop the Spread” hoodies.
- “Stop the Spread” caps.
- “Stop the Spread” green and blue string swimmers bags.
- “Stop the Spread” drink bottles.
- “Stop the Spread” ponchos.
- “Stop the Spread” chiller bags.
- Lakes information sheets showing aquatic plant pests and fish species.
- Department of Conservation “Wanted” pest fish sheets.
- Boat information sheets showing where to check for aquatic hitchhikers.
- Department of Conservation ‘Help protect the Rotorua Lakes from aquatic pests” brochure.

From Ministry for Primary Industries:

- 250 ml and 1 L spray bottles used for cleaning vessels and equipment.
- 20 ml sachets of detergent for decontamination purposes.
- Z-booklets (pocket brochures).
- Didymo posters- Various designs in A3 and A4 sizes.
- Trout bags with “Check, Clean, Dry” message.
- “Protect your Patch” brochures.
- Check, Clean, Dry temporary tattoos.
- Check, Clean, Dry bumper stickers.
- Check, Clean, Dry corflute signs.
- Check, Clean, Dry pens.
- Check, Clean, Dry key rings.
- Protect our waterways posters.
Appendix 6 – Boat function and recommendations

Operational weekends/days

- The holiday period (23 December – 10 January) was the busiest with the most people out and about on the lakes.
- Start operating one or two weekends prior to Christmas, only doing weekend, then full-time from Boxing Day throughout the holiday period.
- After the holiday period, it is recommended operating just Fridays, Saturdays, Sundays statutory holidays and events.
- When at lakes where targeting boats exiting the water is important, adjust times to be at the lake until at least 6 pm - this is when most of the boats are coming off the water.
- When at lakes where decontamination prior to entry is essential, aim to be set up by 8:30 - 9:00 am.

General

- The water blaster does not function with adequate pressure. With Increased pressure it would be very helpful for spraying down kayaks, boat bows/anchors and hatches. Having a spray bottle or knapsack with detergent in it is very useful to spray areas where the boat wash cannot.
- The ramp width requires adjusting to allow jet ski trailers to pass over. If not adjusted correctly there is potential for them to fall off the ramps and drop onto the tray.
- The water recycle unit is not operational in most locations due to a correct fall not being available for the spent water to run towards the outlet fitting.
- A separate 80 mm high volume/low pressure pump was used to fill the water tank.
- An emphasis on the alignment of ramps and cones is required when setting up. Vehicles and trailers are required to approach the ramps in a straight line, or potential risks for boat, trailer or wash tray damage could occur. Recommend having a measuring tool or a length of rope at the comfortable maximum distance of 2.5 m with the unit.
- The entire set-up can be done with one person however two are required to remove/replace tray from trailer. Possible assistance by general public.
- Syphoning occurs when pump-tray hose is connected. The (red) hose connecting the main pump and wash tray connection requires a shut off valve or anti-syphon (one way) valve.
- The remote is very handy to use. It allows you to stand in front of the vehicle, guiding the vehicle while operating the wash unit. It also allows the operator to remain dry.
- Having the giveaway packs was very useful. It works as an identifier for you while approaching lake users. They are a useful introduction tool and appreciated by all.
- On quiet days a greater percentage of boats used the wash, as there is more time to talk to users and gain their interest.
- On busier days don’t hinder people while they are loading or offloading vessels at ramps. They can become annoyed because you are holding things up. Approach people upon arrival, while at jetties or following departure from ramps.
Appendix 7 – Letter to events for biosecurity protocol

Biosecurity protocol BOPRC
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 were 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.
BOPRC’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.

RPMP 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.

<table>
<thead>
<tr>
<th>RPMP classification</th>
<th>Aquatic pest species</th>
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<tbody>
<tr>
<td>Agency Pests</td>
<td>Didymo, Hydrilla, Salvinia, Water Hyacinth</td>
</tr>
<tr>
<td>Exclusion/Eradication</td>
<td>Alligator weed, Marshwort, Senegal tea, Spartina, Water</td>
</tr>
<tr>
<td>Pests</td>
<td>poppy, Brown bullhead catfish, Koi carp, Perch</td>
</tr>
<tr>
<td>Containment Pests</td>
<td>Egeria Densa (Brazilian waterweed), Hornwort, Lagarosiphon</td>
</tr>
<tr>
<td></td>
<td>major (Oxygen weed), Yellow flag iris, Rudd, Tench</td>
</tr>
<tr>
<td>Restricted Pests</td>
<td>Elodea canadensis (Canadian pondweed), Mexican water</td>
</tr>
<tr>
<td></td>
<td>lily, Parrots feather, Gambusia</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>RPMP Rules:</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>No person shall move or interfere with</td>
<td>Section A(1), B(1), C(1), D(1), E(1) F(1),</td>
</tr>
<tr>
<td>any article or substance left in place</td>
<td>G(1)</td>
</tr>
<tr>
<td>by an Authorised Person for the purpose</td>
<td></td>
</tr>
<tr>
<td>of monitoring, controlling or eradicating</td>
<td></td>
</tr>
<tr>
<td>any pest plant or pest animal.</td>
<td></td>
</tr>
<tr>
<td>No person shall move, or allow to be</td>
<td>Section B(2), C(3), D(6), E(3)</td>
</tr>
<tr>
<td>moved, any machinery, vessel, organism,</td>
<td></td>
</tr>
<tr>
<td>risk goods or other goods that is</td>
<td></td>
</tr>
<tr>
<td>contaminated with any pest.</td>
<td></td>
</tr>
</tbody>
</table>

Statutory obligations:

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

Appendix 8 – Stop the Spread game instructions

Hands on water - Stop the Spread games:

Invasive weeds and fish tag:

Kids play tag in 15x15m plot using a spray bottle to symbolise the cleaning of boat and trailer. One child is the tagger and wears a stop the spread t-shirt and uses the spray bottle to tag the others. All other kids carry a lanyard with an image of an invasive weed or fish. When tagged the child hands over the lanyard to the tagger and sits outside the plot until all other children have been tagged. The last one standing is the next tagger.

Required items; lanyards with images of fish and weeds, spray bottle with water, stop the spread t-shirts, traffic cones or flags to mark the boundaries of the plot.

Didymo fishing:

A large bucket is filled with warm/hot water in which to soak tea bags and cotton wool mixed with dishwashing liquid. This gives the cotton wool a slimey texture and yellow-brown colour to give the appearance of didymo. This is then emptied into a large clear container with water containing plastic fish with little magnets attached. Children will try to catch the fish with plastic rods which is made difficult by the “didymo”. This is to illustrate the negative effects didymo has on streams in terms of human use.

Required items; 3 bags of cotton wool, 8 tea bags, dishwashing liquid, bucket, large clear container and plastic fish and rods.
Appendix 9 – Wanted pest fish flyer
Catfish and carp are not known to be present in the Rotorua lakes or streams.

If you catch or see these or any other unusual fish:

- Record where you saw or caught it / them, time, size, how many, colour etc.
- Place in a plastic bag and freeze (if caught)
- Call Dept of Conservation: (07) 349 7400 (office hours) or DOC Hotline: 0800 362 468 (after hours)
Appendix 10 – Keeping our lakes pest free flyer

Keep our lakes pest free this season

The Rotorua Lakes are popular for many forms of recreation and are treasured natural assets of great beauty. We need to look after them so that they remain as beautiful and enjoyable for generations to come.

You can help to stop the spread of pests

When entering the Rotorua Lakes (especially from the Waikato River system including Lake Taupo and the hydro-lakes) and when moving between the Rotorua Lakes, it is important that you:

• Inspect trailers, engine wells, anchors, propellers, fishing gear and other wet equipment such as waders to ensure they are not carrying either weed fragments or pest fish species BEFORE you leave one waterway.

• Ensure you thoroughly clean your boat and all equipment that has been in contact with water before using again.

Threats to our lakes

Threats to the lakes include aquatic weeds, algae, and pest fish.

Aquatic weeds and algae can invade and seriously degrade our lakes, displace native aquatic plants, and reduce suitable habitat for aquatic organisms.

Pest fish can cause many problems, such as causing extensive damage to native plant, fish and waterfowl habitats. They also eat and compete with native fish. Once pest fish have become established in a lake it is practically impossible to eradicate them.

It is your responsibility as a lake user to ensure that you are not contributing to the introduction or spread of aquatic pests.
New rules around pest management

The Bay of Plenty Regional Council 2011-2016 Pest Management Plan has rules regarding spreading pests including Section D(6):

No Person shall move or allow to be moved any machinery, vessel, organism, risk good, or other goods that is contaminated with any containment pest plant.

Under these new rules it is an offence to move or allow to be moved, any machinery, vessel, organism, risk good or others goods contaminated with any contaminant pest plant.

STOP THE SPREAD
Protect our waters from aquatic hitchhikers
Check, clean and dry
all boats and recreational equipment between waterways

Inspect trailers, engine wells, anchors, propellers, fishing gear and other wet equipment such as waders to ensure they are not carrying either weed fragments or pest fish species BEFORE you leave one waterway.

For more information contact a Biosecurity officer at Bay of Plenty Regional Council 0800 884 880 or visit www.boprc.govt.nz
Appendix 11 – Sites visited in the Rotorua district
Appendix 12 – Sites visited in the Western Bay of Plenty district
Appendix 13 – Sites visited in the Ōpōtiki district