Aquatic Plant Survey Report 2010/2011

Prepared by Lauren Bennett and Nathan Burkepile

Bay of Plenty Regional Council
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Bay of Plenty REGIONAL COUNCIL

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Cover Photo:
Invasive weeds washed up on Rotorua lake front after northerly storm.
Photographer: Lauren Bennett

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Executive summary

The Bay of Plenty region is renowned for its natural resources such as the Rotorua lakes, which provide significant environmental, economic and social benefits to the local community. These natural resources are currently under threat from invasive aquatic pest species in the form of Hornwort (*Ceratophyllum demersum*), Didymo *(Didymosphenia geminata)* and pest fish. Humans have been indentified as primary candidates for inter-lake transferral through objects such as boats, trailers and other recreational accessories or equipment. Also due to the large number of local and non-local water users and the close proximity of the lakes to each other increases the likelihood of infestation from invasive species.

Recreational activities such as boating, fishing and water sports have the potential to assist in the spread of invasive pest weeds through vegetative fragmentation. In August 2004 representatives from Department of Conservation (DOC), Eastern Fish and Game, Bay of Plenty Regional Council (formally Environment Bay of Plenty), Te Arawa Lakes Trust, Land Information New Zealand, Rotorua District Council and Landward Management formed the Aquatic Pest Technical Advisory Group (APTAG) with the aim of determining and enhancing public awareness and their role in the dispersal of aquatic pest plants.

A survey was created by APTAG with questions directed at those that utilise boat ramps and waterways within the Bay of Plenty region. Since 2005, two students have been employed each summer by Bay of Plenty Regional Council to conduct these surveys and distribute Biosecurity New Zealand (BNZ) promotional packs including key-rings, prop flags, pens, lollipops, stickers and information packs on aquatic pest plants and Didymo.

Over the 2010/2011 survey period 793 people were surveyed with the majority of the vessel owners utilising the Rotorua lakes coming from Rotorua and Tauranga. It was found that 64% of recreational fresh waterway users checked their vessels/equipment for weeds prior to launching. Overall it was discovered that 63% of users surveyed had a medium awareness of aquatic pest issues. River access sites were also visited throughout the Bay of Plenty region and these results were analysed along with boat ramp surveys.

A retail and tourism awareness campaign was also conducted to aid in advocating aquatic pest issues within the Bay of Plenty region. Sporting events were also seen as a successful platform and educational tool to promote aquatic pest weeds, fish and Didymo issues and awareness within the wider sporting communities. Overall the responsive that was received from retail outlets, tourism operators and event organisers was positive and many were receptive when receiving information regarding aquatic pest issues.

Contents

Part 1: Introduction

1.1 Bay of Plenty lakes and rivers background

The lakes and rivers within the Bay of Plenty region are natural resources which provide significant environmental, economic and social benefits. The Rotorua lakes in particular provide numerous recreational opportunities and are a taonga to the people of Te Arawa.

Twenty lakes are located within 32 km of Rotorua, some are small and receive little use and others are larger providing tourism and recreation attractions for the region. The Rotorua lakes were formed through volcanic activity occurring over the past 150,000 years.

Regional tourism for the period 2004 – 2009, including domestic and international, contributed $31.3 billion to Rotorua's economy (Ministry of Tourism, 2010). Therefore it is vital that a proactive approach to biosecurity and lake health be undertaken, in order to ensure economic stability and growth is maintained.

The large number of lakes and ease of accessibility makes this region an important centre for water based activities. Due to large number of local and non-local water users and the close proximity of the lakes to each other increases the likelihood of infestation from invasive weed species.

1.2 Invasive aquatic pest species

The main threats to the Bay of Plenty region are four invasive aquatic pest species, which have established themselves throughout the 12 Rotorua lakes. These weeds include; Canadian pondweed (*Elodea canadensis*), Lagarosiphon (*Lagarosiphon major*), Egeria (*Egeria densa*) and Hornwort (*Ceratophyllum demersum*).

The Aquatic Weed Assessment Model (AWRAM) is an important decision making tool and scores the above four plants on five weed risk assessments (Champion and Clayton 2000). These include:

- Invasiveness – habitat versatility, competitive ability
- Impact – economic, environmental, recreational
- Dispersal – propagate output, natural vs. human (deliberate/accidental)
- Potential distribution – current vs. un-colonised habitat
- Resistance to management – scope of methods, effectiveness

Table 1: Submerged aquatic pest plant species present in the Rotorua lakes; ranked according to weed risk with a higher score reflecting greater weed impact (Champion and Clayton 2000).

Common Name	Scientific Name	AWRAM Score
Hornwort	*Ceratophyllum demersum*	67
Oxygen weed	*Egeria densa*	64
Oxygen weed	*Lagarosiphon major*	60
Canadian Pondweed	*Elodea canadensis*	46

Hornwort is a species which does not form root systems and is easily dislodged by wind, waves and boating action, making it a prime candidate for inter-lake transferral. Elodea, Lagarosiphon and Egeria, grow thick weed beds which can be an inconvenience for swimmers and boaters, where the weed can wrap around their propellers and clog engines (Environment Waikato, 2010).

These four invasive species are present in lakes Tarawera, Rotorua and Rotoiti (Appendix 5). A recent incursion of Hornwort in Lake Ōkataina has increased this lakes invasive species total to three pest species. Since this incursion of Hornwort to the lake an incursion response plan has been developed (Lass 2010) that proposes management options for this species. This incursion response plan could be used as a model for future aquatic pest weed incursions in other lakes. Currently lakes Rotomā, Rotokakahi, Tikitapu, Rotomahana and Ōkaro all have two or less invasive species present. The close proximity of all the Rotorua lakes to one another increases the possibility of transferral between lakes.

Currently the lakes within the Bay of Plenty region have one known invasive pest fish species, Mosquito fish (*Gambusia affinis*) but there is always the impending threat of other pest fish being introduced. Introduced pest fish species negatively impact the native fauna and flora in freshwater ecosystems. Koi Carp impact plants, insects, and fish through competition for resources and by reducing water quality. Koi carp and mosquito fish are classified as unwanted organisms.

One of the key regions where harmful aquatic pest species can transfer from is Waikato freshwater ways, including Lake Taupō, Waikato River and Lake Karapiro. The Waikato fresh waterways host two freshwater aquatic pest fish species which are not currently present within Bay of Plenty lakes and rivers. These include Koi Carp (*Cyprinus carpio*) and Bullhead Catfish (*Amieurus nebulous*). Also Hawke's Bay fresh waterways contain Hydrilla (*Hydrilla verticillata*), which is not currently present within Bay of Plenty lakes and rivers. Hydrilla could have a negative impact on native species by outcompeting and excluding native vegetation due to the dense canopies formed by this plant. Hydrilla would also impact recreational users as this weed can restrict navigation and could cause accidental drowning to swimmers who become tangled in the dense weed beds this species produces.

Figure 1 : Thick beds of Elodea, Lagarosiphon, Egeria and Hornwort washed up on Rotorua lake front after a northerly storm.

1.3 The threat of Didymo (*Didymosphenia geminata*)

While pest plants pose a serious threat to the environmental, recreational and aesthetic values of our lakes and rives, other unwanted organisms such as the invasive freshwater microscopic alga, Didymo *(Didymosphenia geminata)* encompass the same threat to Bay of Plenty freshwater systems. Didymo, also known as 'rock snot', is a native species of northern Europe and North America and was first reported in New Zealand in 2004, in the Waiau and Mararoa Rivers in Southland. Didymo is currently found in a number of South Island rivers, with the whole of the South Island declared as a controlled area for Didymo, while the North Island is considered to be Didymo free (BNZ, 2008).

The establishment of Didymo depends significantly on a range of abiotic and biotic factors within the environment, such as temperate to cool water temperatures, high-light availability, suitable substrate, moderate flow velocity and either neutral or slightly alkaline pH levels. This microscopic pest can spread by a single drop of water, even if you can't see it, you could be spreading it. The problem with this species is that it is single-cell diatom which is not visible to the human eye, it is not until this species 'blooms' and forms dense mats does it become visible to humans and by this time it is too late, the species has established. No approved treatment methods to control or remove Didymo are currently available. The current control strategy is to stop the spread of this invasive species between fresh waterways.

A campaign designed by Biosecurity New Zealand (BNZ) to create awareness of this extremely invasive species, focuses on three main ways to minimise the transfer risk of Didymo through the slogan 'Check, Clean, Dry'. This message provides the general public and waterway user the responsibility of, checking their gear for any obvious unwanted material from items that have been in contact with water, cleaning all equipment with a 5% detergent solution ensuring surface contact for at least one minute and drying the item for at least 48 hours which will kill Didymo. The fight against Didymo has become so serious that it has a legal status of an unwanted

organism (under the Biosecurity Act 1993) and it is an offence to knowingly spread an unwanted organism with penalties of up to five years imprisonment, and/ or a fine of up to $100,000 (BNZ, 2008).

The principal impact from Didymo is likely to be upon the aesthetic and recreational values, due to the dense mats this diatom produces are unsightly and can obstruct recreational activities. An economic impact assessment was conducted by the New Zealand Institute for Economic Research estimates potential present value impacts of Didymo on New Zealand to be between $58 million and $285 million over an eight year period from 2004/05 to 2011/12.

1.4 Awareness programme and survey background

Recreational activities such as boating, fishing and water sports have the potential to assist in the spread of invasive pest weeds through vegetative fragmentation. Once aquatic pest plants have established they can form dense beds of vegetation which obstruct drainage, encourage stagnation, increase the effects of flooding and degrade surrounding water quality. Aquatic pest plants have the potential to out compete native plants, which can lead to native plants becoming displaced from freshwater ecosystems. Interlake dispersal of aquatic pest plants is thought to be highly influenced or achieved via human activities.

The aquatic pest advocacy summer programme has a clear objective to inform recreational users of the possible inter-lake transferral of pest weeds when using Bay of Plenty fresh waterways and also provides information on how to reduce the risk of spreading aquatic pests between waterways and how this can be achieved.

In August 2004 representatives from Department of Conservation (DOC), Eastern Fish and Game, Bay of Plenty Regional Council (formally Environment Bay of Plenty), Te Arawa Lakes Trust, Land Information New Zealand, Rotorua District Council and Landward Management formed the Aquatic Pest Technical Advisory Group (APTAG) with the aim of determining and enhancing public awareness and their role in the dispersal of aquatic pest plants.

A survey was created by APTAG with questions directed at those who utilise boat ramps and waterways within the Bay of Plenty region (Appendix 1). Since 2005, two students have been employed each summer by Bay of Plenty Regional Council to conduct these surveys and distribute Biosecurity New Zealand (BNZ) promotional packs including key-rings, prop flags, pens, lollipops, stickers and information packs on aquatic pest plants and Didymo.

The questionnaire which was produced focuses on what waterway the vessel was last used, the origin of the owner of the vessel and if they regularly clean their vessel between using waterways. The activities in which the vessel is participating in and type of vessel are also recorded. A perceived awareness of aquatic pests and interest in the problems are also determined by the surveyors. It is important to promote lake health so that the public understand what it is that they are protecting and also to understand the importance of checking their boats, trailers and equipment for weed fragments.

1.5 Aims and objectives

The awareness programme aims to target key fresh waterway users both indirectly and directly. The retail and tourism sector is targeted to increase the likelihood of distributing information to a wider demographic than what can be targeted in the field.

The distribution of promotional information and products at boat ramps, river sites and events within the Bay of Plenty region aims to create awareness on pressing aquatic pest weeds, fish and also Didymo issues. The data collected from these locations will be collated and analysed to provide broad conclusions and recommendations to assist with any aquatic pest and Didymo awareness programmes which maybe carried out in the future.

Part 2: Methods

As part of the aquatic pest summer advocacy programme conducted by the Bay of Plenty Regional Council, contact was established with the public in a variety of ways either directly or indirectly within the Bay of Plenty region during the period 16 November 2010 to 31 January 2011. Retail outlets which sold fishing gear, accommodation facilities, information centres, water sport events, boat ramps and river sites were all visited on a regular basis throughout the summer period in order to target a large number of contacts and ensure that the information was spread appropriately.

2.1 Boat ramp surveys

During the active summer period 16 November 2010 – 31 January 2011 boat ramps and river sites were visited and surveyed within the Bay of Plenty region. This was conducted by Bay of Plenty Regional Council employees Nathan Burkepile and Lauren Bennett. Amy Greaves, a DOC representative, also attended events, boat ramps, and river sites within both the Bay of Plenty and Waikato regions.

The surveys conducted by Nathan Burkepile and Lauren Bennett involved working both weekdays and weekends. Normal hours of work tended to be 8 am – 5 pm with the exception of events and some later starts during the busy Christmas period to catch recreational users as they were returning to the boat ramp or embarking for evening activities.

Once at the ramp or river site the vehicle would be parked and users of the ramps/access points were approached. Before approaching the person/people to be surveyed a minute was taken to observe and assess the person's body language to ensure that they were not rushed or stressed, also this minute was to observe the cleaning practices of the particular user.

Waterway users were approached and given information relating to the importance of checking their boat, trailer and equipment for aquatic weeds, when entering and leaving a waterway. Didymo information was distributed also but not pushed unless the user was seen as a direct risk of Didymo transfer e.g. kayakers, fishermen and trampers. Information relating to the survey was gathered within the time of distributing information. Information gathered included, whether the user had cleaned/checked their equipment, origin of vessel and owner, vessel/equipment type, recreational purpose and perceived risk was recorded on aquatic pest and Didymo issues. Promotional packs were also provided for the user which contained information brochures on both Didymo and aquatic pest weeds and fish, floating key ring, pens, lollipops and prop flag if required. The promotional packs were partly funded by BNZ and partly by Bay of Plenty Regional Council.

Once all the necessary information was acquired from the user the survey sheets were filled out in the vehicle away from the people just surveyed. Any bias towards surveys was aimed to be removed in order to gain accurate results.

Figure 2 Boat ramp surveys at Otaramarae, Lake Rotoiti

The following lists the boat ramps or lake accesses where surveys took place and can be found as labelled GPS waypoints in Appendix 6 Rotorua District Map:

- **Lake Rotorua**
  - Hannah's Bay
  - Ngongotaha
  - Beaumont Rd
  - Hamurana
  - Hamurana Springs
  - Sulphur Point
  - Lake Front
- **Lake Rotoehu**
  - Kennedy Bay
  - Otautu Bay
- **Lake Okareka**
  - Boyes Beach
  - Ōkāreka Ramp
  - Steep Street Reserve
- **Lake Rotoma**
  - Merge Lodge
  - Matahi Spit
- **Lake Okataina**

- **Lake Rotoiti**
  - Otaramarae
  - Ohau Channel
  - Gisborne Point
  - Hinehopu
- **Lake Tikitapu (Blue Lake)**
- **Lake Tarawera**
  - The Landing
  - Boatshed Bay
  - Stony Point
  - Otumutu Bay
- **Lake Rerewhakaaitu**
  - Guy Roe Reserve
  - Domain Ramp
  - Brett Road DOC campground
  - Ash Pitt Road DOC campground
- **Lake Rotokakahi (Green Lake)**

All of the above lakes and boat ramps were visited on a weekly basis except Lake Ōkaro, Rotokakahi, Aniwhenua, and Matahina. Lake Ōkaro was not surveyed until mid January due to a full lake closure which was caused by blue and green algae blooms. Lake Rotokakahi was visited less frequently as it is a privately owned lake with no public access. Lake Aniwhenua was visited twice during the survey period. Lake Matahina was only visited once due to time constraints and low number of users.

At completion of the survey period the data from the two Bay of Plenty Regional Council students was entered into a database and collated. To enable comparisons to be made between the data, some previously separated categories were combined in order to produce results that were legible. The origins of lake users were expanded to regional categories with the local districts incorporated as follows:

- **Rotorua Region**
  - Ngongotaha
  - Rotoiti
  - Rotoma
  - Rotorua
  - Okareka
  - Tarawera
  - Okataina
  - Rotoehu
  - Hamurana
  - Rerewhakaaitu
  - Kaiangaroa
- **Whakatane Region**
  - Whakatane
  - Te Teko
  - Opotiki
  - Ohope

- Kawerau
- Murupara
- Aniwhenua
- Matahina
- Paengaroa
- Waimana
- Wairata

- **Tauranga Region**
  - Tauranga
  - Omokoroa
  - Papamoa
  - Te Puke
  - Maketu
  - Katikati
  - Pukehina
  - Mount Maunganui
  - Tauriko
  - McLaren Falls
  - Wairoa
  - Pongakawa

- **Waikato Region**
  - Hamilton
  - Cambridge
  - Te Awamutu
  - Morrinsville
  - Te Aroha
  - Tokoroa
  - Paeroa
  - Tirau
  - Ngatea
  - Huntly
  - Ngaruawahia
  - Whanganui
  - Raglan
  - Putaruru
  - Taupō
  - Reporoa

- **Coromandel Region**
  - Whangamata
  - Whitianga
  - Thames
  - Pauanui
  - Waihi

- **Wellington Region**
  - Wellington and surrounding suburbs (e.g. Marton, Wairarapa)
  - Paraparaumu
  - Levin
- **Taranaki Region**
  - New Plymouth
  - Hawera
  - Stratford
- **Hawke's Bay Region**
  - Napier
  - Hastings
- **Horizons Region**
  - Manawatu
  - Taumarunui
- **Auckland**
- **Gisborne**
- **Northland Region**
  - Kerikeri
- **Overseas**
  - (France, Sweden, Germany, South Africa, Australia, America, Canada and Scotland).

2.2 River user surveys

- In addition to boat ramp surveys, nomadic surveys were undertaken along popular river locations in the Bay of Plenty District. The Rotorua District rivers and streams were visited on a weekly basis, up to two or three times a week. The Whakatāne, Western Bay of Plenty and Ōpōtiki District rivers and streams were visited only twice over the survey period, due to the low number of people that use these rivers and steams and also due to time constraints.
  Rotorua District (Appendix 6)
  - Ngongotaha River Mouth and Access Points
  - Hamurana Springs Mouth
  - Waiteiti River Mouth
  - Awahou River Mouth
  - Ohau Channel

- **Whakatane District (Appendix 7 and 8)**
  - Whakatane River
  - Tarawera River
  - Rangitaiki River
  - Waimana River
  - Whirinaki River

- **Opotiki District (Appendix 9)**
  - Waioeka River

- **Western Bay of Plenty District (Appendix 10)**
  - Wairoa River
  - McLaren Falls
  - Ruahihi Power Station
  -

Access points to rivers previously identified by Neilson and Jeffries (2010) were used to find river users, along with the blue and white Fish & Game angler access signs which indicated known and popular fishing spots. Without the presence of the white and blue Fish and Game signs along the Waioeka River, it would be extremely hard to navigate and find all the popular fishing sites.

River users were approached in the same manner as those at boat ramps. Where appropriate, river users were greeted and then invited into a conversation where questions relating to the survey were included. Promotional information for Didymo, aquatic pest weeds and fish was distributed to those that were surveyed and the survey sheets filled out in the vehicle away from those that were just surveyed. At times, an unaccompanied vehicle would be found at an angler access point, if no-one could be sighted or access to the site was restricted, promotional items (key ring, trout bag, Didymo spray bottle, and information) would be left on the windshield of the vehicle for the occupier to read once they return.

Due to accessibility, time constraints and low number of users, rivers within the Upper and Lower Whakatane and Opotiki districts were surveyed less frequently compared to rivers within the Rotorua district. Day trips to the further afield rivers were organised during the busier time of the summer period in order to ensure there would be people to survey. Several sites within the Rotorua district could be surveyed on a daily to weekly basis therefore allowing for flexibility should boat ramps be empty or lakes closed.

Due to the low number of people surveyed at the river access points it could not be justified to have an exclusive results section. Therefore, data from both the river and lake user surveys were categorised the same way and analysed together.

2.3 Retail education

During the period 15 November 2010 to 23 December 2010, campgrounds, hotel, motels, and retail outlets were provided with BNZ collateral to supply to their customers. Promotional items provided to these businesses included, posters, brochures, key rings, and DVDs. Businesses which had a good response and interest to requests, were given “Stop the Spread” hats. Providing informational material to businesses, aim’s to increase public knowledge on how to prevent the spread of aquatic pest species. Businesses were prioritised to increase the potential of water users receiving information. Campgrounds in the Rotorua lakes region were highest priority due to the large number of non-local boat fisherman using these

facilities. Secondly, priority was retail outlets that sold outdoor recreational equipment. Thirdly, information was distributed to local petrol stations around the lakes. Lastly, hotels/motels and other accommodation facilities within the Rotorua region were supplied with collateral.

At each outlet employees were informed about aquatic pest issues in their locality and the Rotorua lakes region in particular. Further, the impending threat of Didymo to the region was highlighted focusing on the South Island river systems, which are now a controlled area, and the threat this poses to North Island waterways. Any queries which were raised by businesses or employees were followed up with further information. In some cases businesses such as motor camps within the Rotorua region were revisited on a regular basis to provide further resources and information.

Collateral provided to these businesses include; information packs (brochure, pen, sticker), brochures (Korean, Chinese, Japanese, Maori, English, German, Hebrew, French, Dutch), Simple Green in spray bottles and A3 and A4 posters for common areas (Appendix 3).

2.4 Event education

Sporting events were seen as an ideal way of educating water users on aquatic pest issues and also an opportunity to distribute information to a large number of local and non-local potential freshwater users at a single focal point. Events were researched at the beginning of November 2010 in order to create a calendar and prioritise events accordingly, which occurred in or near Bay of Plenty freshwater ways. Meetings were scheduled with event organisers to establish what promotional items would be best suited to distribute to their contestants and also to answer any questions regarding lake health and recently installed weed cordons.

Events attended and supplied with promotional resources were as follows:

- Annual International Trout Fishing Tournament
- Blue Lake Sprint Regatta
- Fish and Game Boat Fishing Seminar
- Waka Ama Regatta, Te Puku o Te Ika Outrigger Canoe Association
- North Island PWC Summer Tour, Hawkes Bay Jet Sport Club Inc
- Water Ski Racing, New Zealand Water Ski Racing Association Inc
- NZ Slalom kayaking events (Kawerau)
- Blue Lake Multisport Festival

Depending on the nature of the event and the organisers, lollipops and floating key rings were distributed to the crowd, creating a platform for discussions with competitors, supporters and spectators at the event. Some events attended allowed for a short time within the briefing to be dedicated to one of the two Bay of Plenty Regional Council workers, speaking about the aquatic pest issues and also use of the weed cordons and their effectiveness in reducing the spread of aquatic weeds. When time was not allocated to specifically talk directly about aquatic pest issues, it was asked that our presence and purpose be mentioned to the crowd over loud speaker during announcements.

At the Blue Lake Multisport Festival wetsuit decontamination stations were set-up as a requirement of race entry. Before competitors could register for the event, their wetsuits had to be decontaminated in a 5% detergent solution in order to reduce the

risk of spreading aquatic pests such as Didymo. The station at this event was manned by two Bay of Plenty Regional Council employees using DOC decontamination stations. Key rings were given to competitors to indicate their equipment had been decontaminated prior to registration.

Part 3: Results and Discussion

3.1 Boat ramp and river surveys

From the period 16 November 2010 to 31 January 2011, 793 surveys were completed at various Bay of Plenty boat ramps and rivers. Results from boat ramp and river surveys are as follows:

3.1.1 Was the vessel checked before launching?

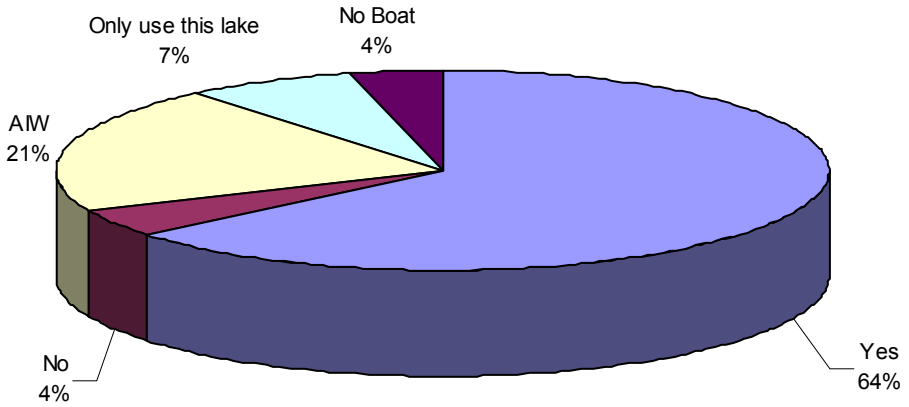

Figure 3 Percentages of vessels checked for weed fragments prior to launching

This question was not directly asked to the water user as this survey is intended to be indirect with the aim to avoid any bias towards answers given. Many users when surveyed were exiting the water which allocated 21% of users already in the water (AIW) (Figure 3). Due to this question only being an observation and limited time to approach the user before they left the boat ramp it posed a problem in effectively assessing whether or not people had checked their vessels prior to launching. Of the users surveyed only 4% answered negatively to checking their vessels or equipment prior to launching. This was a 2% increase from the previous year which only had 2% of users not check their vessels prior to launching. Of the users surveyed it was found that 7% claim to only use one particular lake (Figure 3). These users who only use one lake would be considered low risk candidates for aquatic pest transferral. Of the 793 people surveyed 64% were observed and answered yes to checking their vessels prior to launching. This number is an increase from the 38% which answered yes last year. The large number of people checking their vessels prior to launching could be an indication of the effectiveness of the summer awareness programme.

This year the category ‘no boat’ was added to the survey when analysing the data. This allowed for users who do not have a vessel to be included in the results. This category included fishermen, swimmers, campers and campervans which were surveyed. It was difficult to determine whether these particular users had cleaned their equipment prior to entering the lake, as primarily this would be done at home not at the boat ramp. This category amounted to 4% of the total survey number.

3.1.2 **Was weed present on the vessel or equipment?**

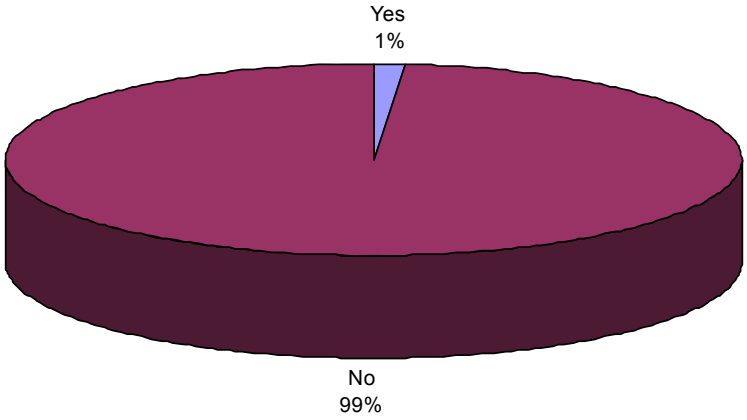

Figure 4 *Percentage of vessels observed to have weed present on their vessel/equipment*

Of the users surveyed only 1% were found to have some form of visible aquatic weed on either their vessel or equipment. People who were found to have weed were advised of the risks of leaving it on the vessel and inter-lake transfer, many were responsive in discarding the weed at the ramp. One of the people surveyed said that he would remove the weed when he returned home and cleaned his boat and trailer down. A few users were encountered who refused to clean their vessels due to the lack of wash down facilities available at boat ramps. It was explained to these users the cost effectiveness of installing these kind of facilities and also the maintenance, power supply and vandalism issues.

3.1.3 **Water body the vessel last visited**

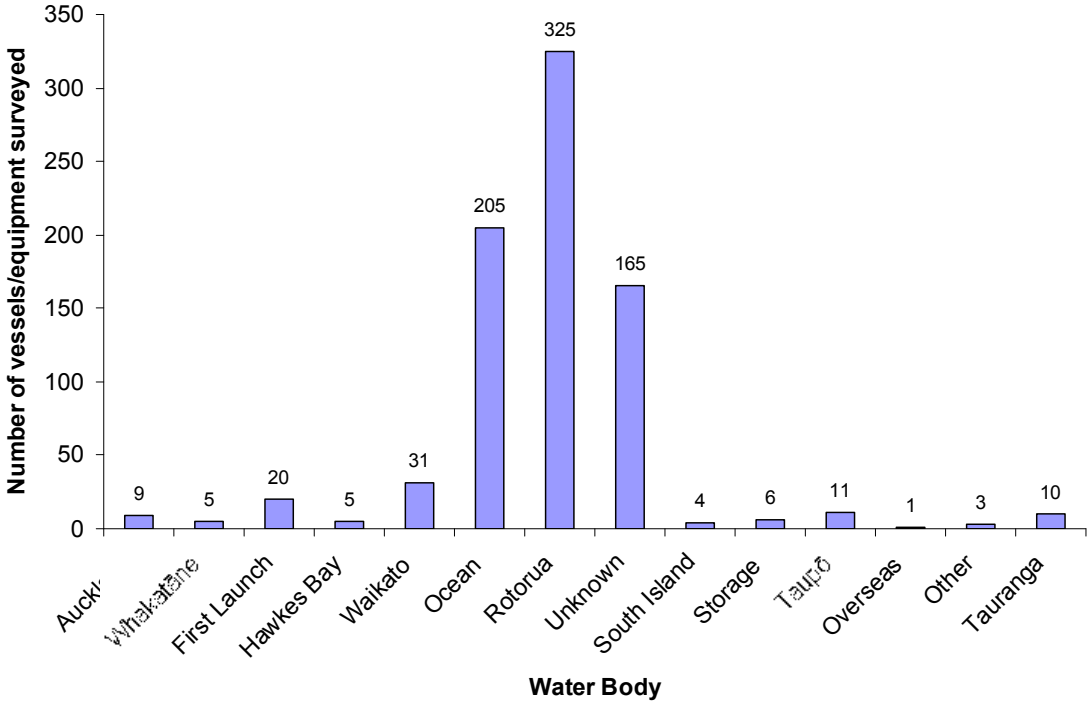

Figure 5 Region of water body the vessel last visited

Of the 793 vessels surveyed 325, approximately 40% had last used a Rotorua freshwater way (Figure 5). This is nearly a 20% decline from the previous year. This decline could be due to an increase in unknown origins of vessels. Neilson and Jeffries, 2010, reported 1.3% of vessels had unknown origins compared to this years 20.63%, which may be a reflection of between the two years surveyors ability to situate this question into causal conversation without this becoming an invasive direct survey. The number of vessels which last visited the sea remained stable with last years results, which could be due to the short distance which people, have to travel in order to access the lakes if the sea is unsettled.

3.1.4 **Origin of vessel owner**

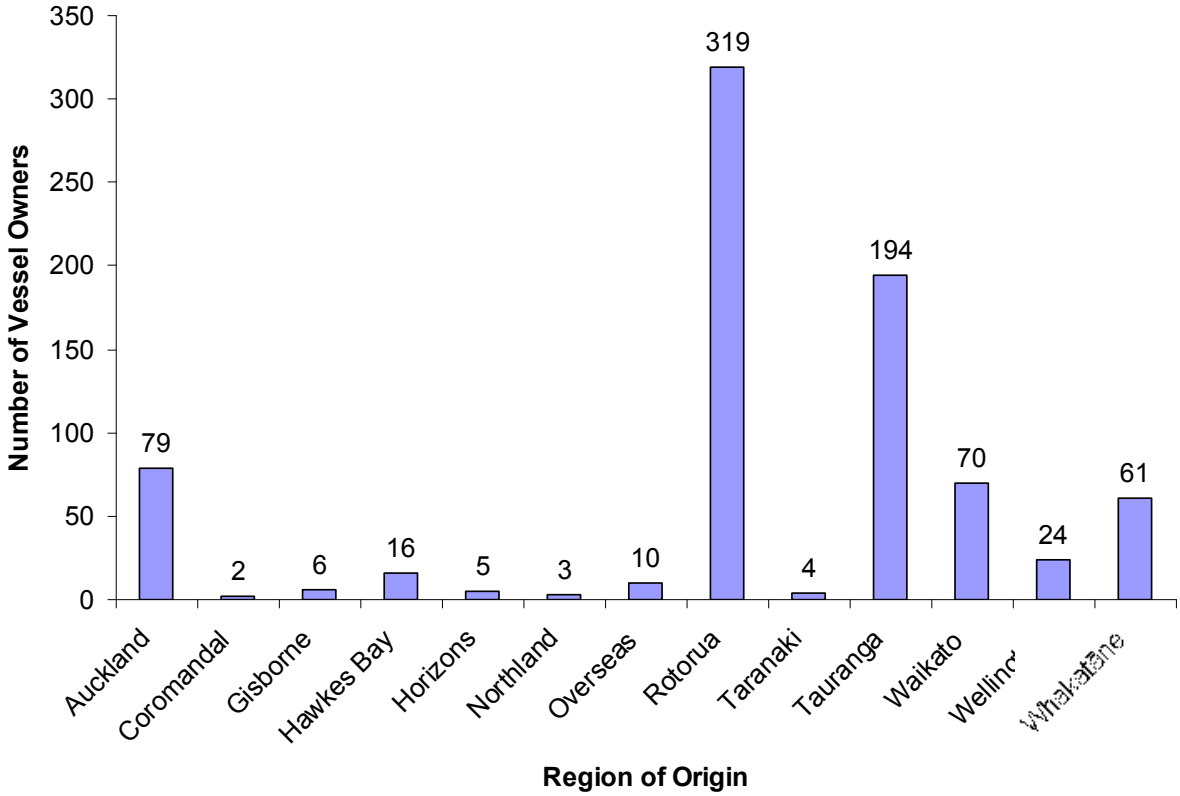

Figure 6 Number of vessel owners from each region

Rotorua, Tauranga, Auckland and Waikato were the four main regions of origin for vessels using Bay of Plenty freshwater ways (Figure 6). Users from Waikato have increased by around 3% from previous years, which could be due to the poor state of Waikato freshwater ways or an increased number of holiday makers from this region. The number of people surveyed from Tauranga remained consistent with last years results with no increase apparent. Auckland vessel owners declined this year by 3% from previous years, which could be a result of increased petrol prices just before the peak holiday period. It is suspected this has made many people reluctant to make a long journey to the Rotorua lakes and then also pay for petrol to run their vessels. A decrease in petrol prices next summer may see an increase in further afield regions.

3.1.5 Types of vessels/equipment

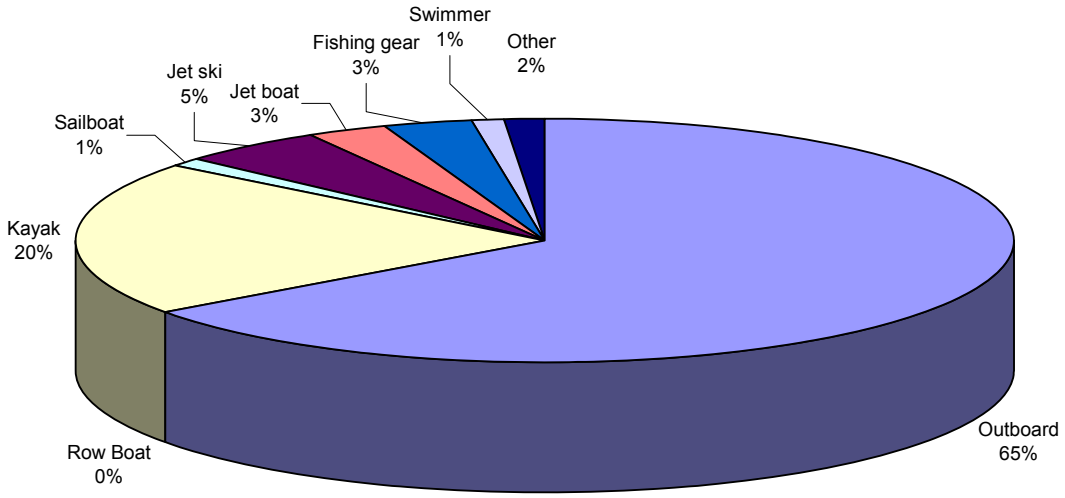

Figure 7 Vessel types surveyed

This years results followed trends of recent years with the outboard powered vessel being the most common type used. 65% of users surveyed were aboard one of these vessels (Figure 7), an increase from last years results with only 57% recorded. This increase could be influenced by the larger number of surveys which were conducted this summer compared to previous years. A 2% decrease in kayakers surveyed this year could be a result of less frequent visits to popular kayaking spots such as the Wairoa release and Kawerau slalom course. The remaining vessels and equipment results remained consistent with previous years with no apparent increase or decline recorded.

3.1.6 Recreational purpose of vessel

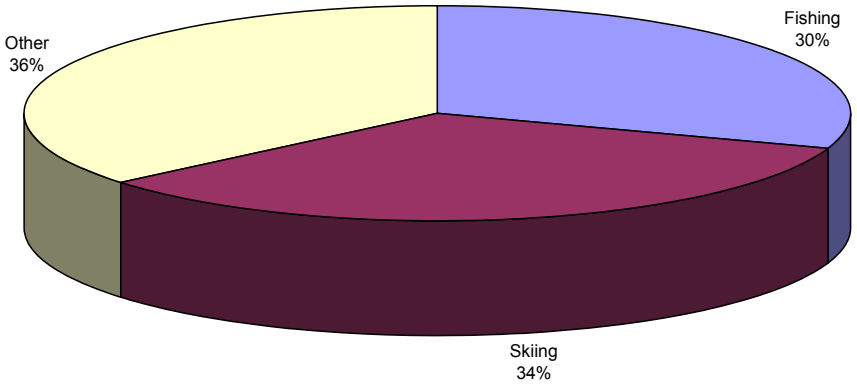

Figure 8 Recreational purposes of vessels surveyed

The recreational purposes of users surveyed were categorised within fishing, skiing (includes jet skiing, waterskiing, biscuiting, wakeboarding etc) and other. Other includes all other recreational activities such as kayaking, swimming, camping and boating. As with previous years, many of the people surveyed this summer were participating in multiple recreational activities whilst using a waterway. This makes the task of defining their recreational purpose increasingly difficult to categorise the individual being surveyed.

This year all three categories produced relatively even results with no major variation between activities evident. The category 'other' was most popular with 36% of users conducting a recreational activity in this category (Figure 8). Due to this category being so broad and including all activities which are not included under fishing or skiing, could contribute to the higher percentage represented. Users participating within the recreational category of fishing have decreased by 7% compared to pervious years, which could be a result of few late starts and late finishes by the surveyors. This did not allow time to survey fishermen who embark and disembark early in the morning or late at night. Fishermen are also the most unpredictable category as many will stay out in less favourable conditions then users in the other categories.

3.1.7 Perceived levels of interest and awareness in aquatic pest and Didymo issues

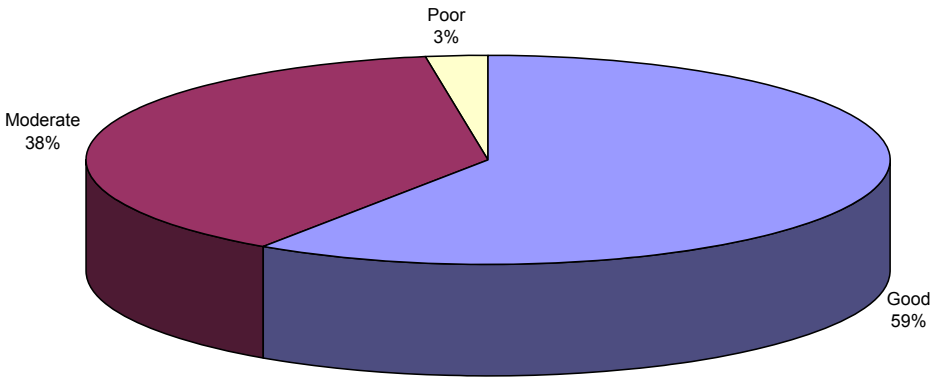

Figure 9 Perceived level of interest in aquatic pest issues

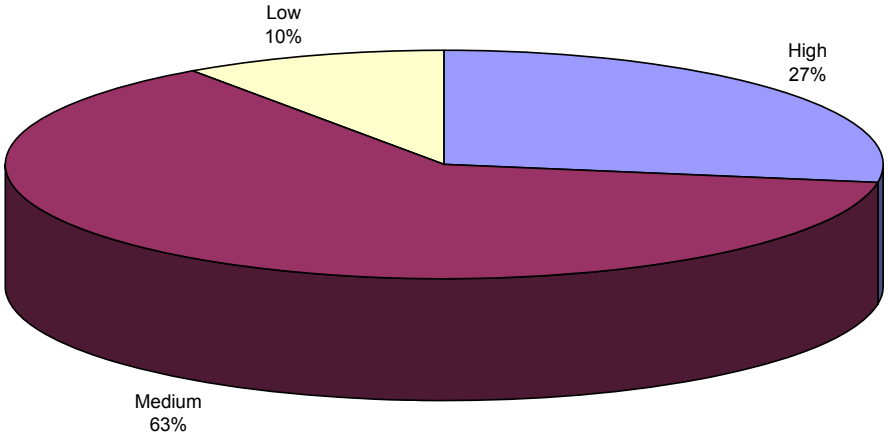

Figure 10 Perceived level of awareness of aquatic pest issues

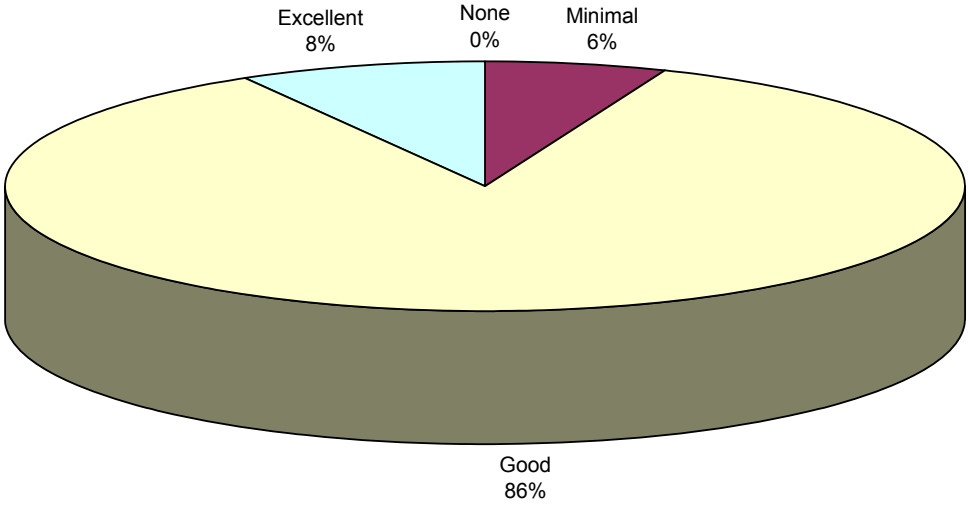

Figure 11 Perceived level of awareness of Didymo

The level of interest that was perceived by this year's surveyors was good (59%) (Figure 9). People were gauged on their interest by how many questions they asked and the amount of time that they were prepared to spend listening and learning about aquatic pest issues. 3% of people surveyed showed a poor interest on aquatic pest issues, this could be due to a number of factors including time limits over the busy period or already knowing about issues from previous years.

The level of aquatic pest awareness of those surveyed this year was overall a medium result (63%) (Figure 10). People's awareness was determined via the user's knowledge which they could pass on to the surveyor. Many people knew what aquatic pest species were of concern within Bay of Plenty freshwater ways but did not know why they were of concern and did not know what the weed cordons purpose was; these people would be rated medium. People who did not have any awareness of the issues being conveyed and the 'check, clean and dry' slogan were considered to be of low awareness. These people tended to be from overseas or from other regions where they only utilise the ocean. 10% of people surveyed demonstrated low awareness of aquatic pest issues which is decrease from last years 14%. The number of people that displayed a high level of awareness towards aquatic pest issues this year was 27% (Figure 10), this is a decrease from last year

which was 40%, this decrease can only be put down to the difference in surveyors opinions and not the effectiveness of the advocacy programme.

The perceived level of awareness this summer had 86% of fresh waterway users having a good level of awareness of Didymo issues (Figure 11). People were placed in this category if they displayed knowledge of what Didymo is and whether or not it was in the North Island. If they could answer these then they were placed in the good category. 8% of users were perceived to have an excellent knowledge of Didymo, many of these people had lived or travelled down the South Island and had experienced issues firsthand. Users which had minimal (6%) awareness of Didymo mainly consisted of overseas tourists which were approached at rest stops and campgrounds.

The perceived level of interest and awareness of an individual is gauged by the surveyor, which can create room for possible bias between surveyors. The level of interest and awareness will change from year to year and surveyor to surveyor, this highly influenced by the surveyor's capability to interact with the public. These perceived levels of interest and awareness can become an issue when collating and reporting the data as the results do not allow for inclusive conclusions to be drawn from the data but does allow for broad conclusions and recommendations to be made. This poses a problem when management decisions have to be made as inconclusive results allow for inconclusive decisions. It also makes it difficult to determine the effectiveness of the advocacy programme and justify the amount of funding which is allocated towards programmes such as this one. If a majority of the users have a high awareness of aquatic pest issues then the question could be asked what the point of the advocacy programme is but these conclusions could only be made if the perceived aspect was eliminated.

3.1.8 Origin of vessels using Lake Rotomā and Lake Okataina

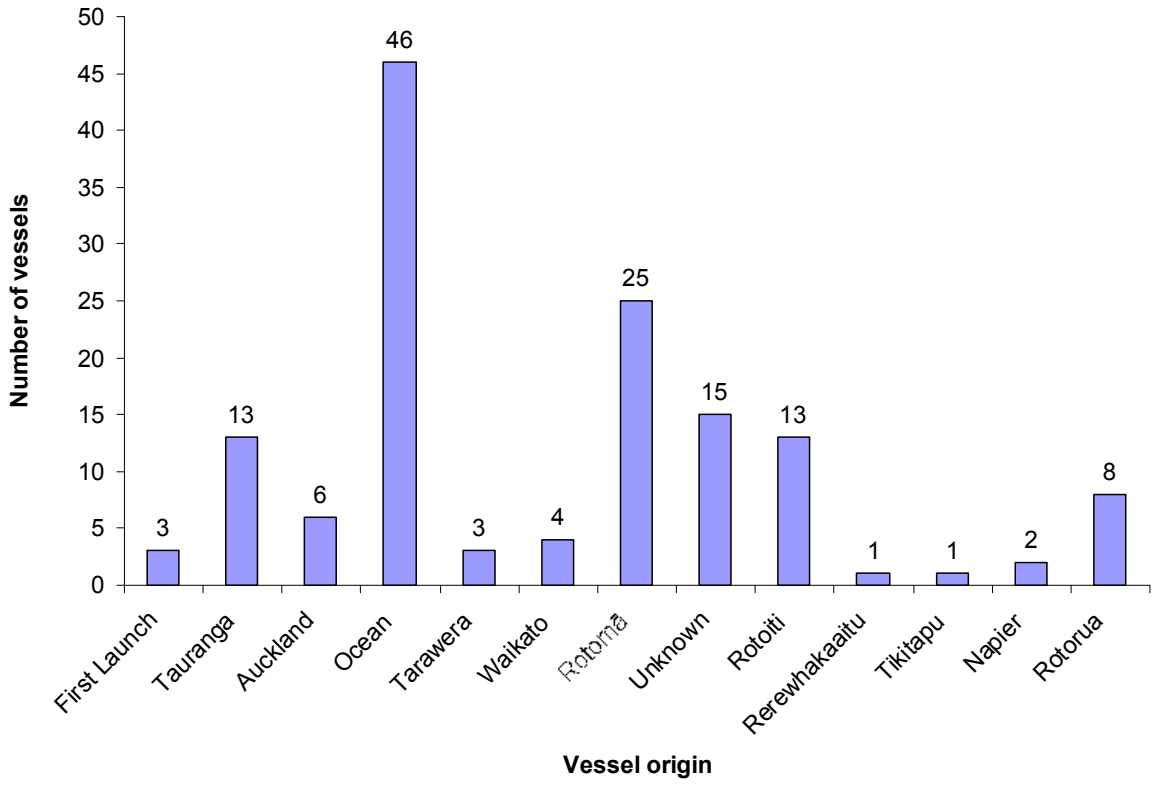

Figure 12 Origins of vessels utilising Lake Rotomā

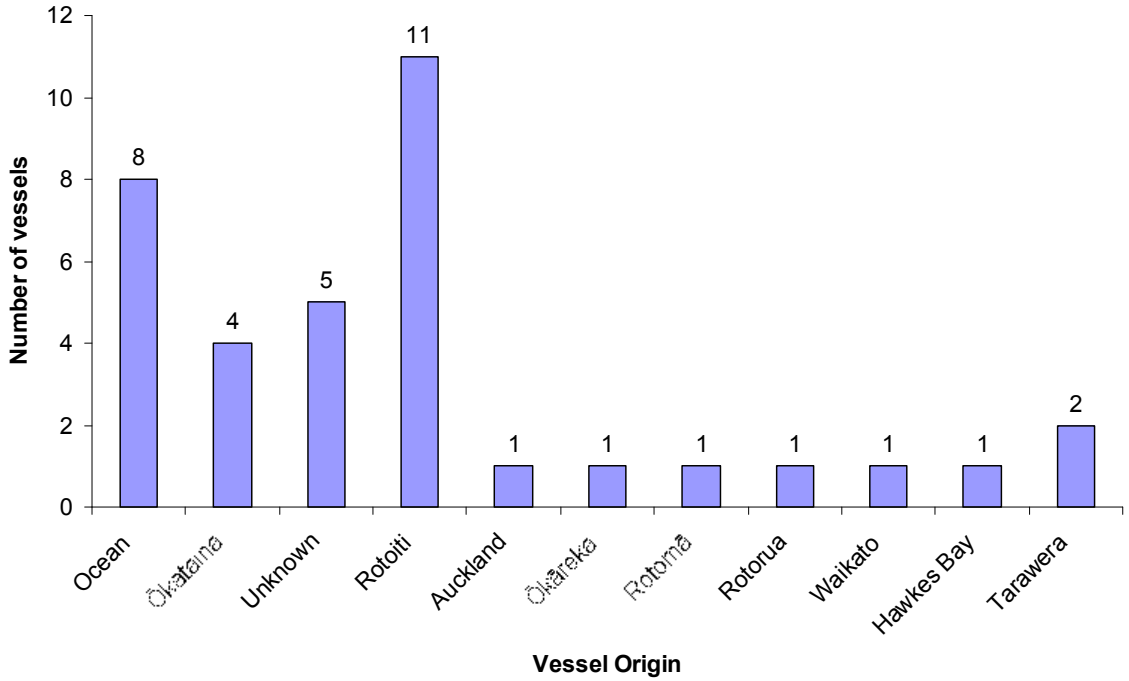

Figure 13 Origin of vessels utilising Lake Ōkataina

A majority of the vessels using Lake Rotomā last utilised the ocean and Lake Rotomā which does not pose a high risk of inter-lake transferral of aquatic pest plants. The 36 vessels (Figure 12) whose origins were from Lakes Rotoiti and Rotorua and unknown origins pose a greater threat to transferring aquatic pest weeds. Lakes Rotoiti and Rotorua both have an established population of all four aquatic pest weed species which are of concern in the Bay of Plenty region. Users who utilise multiple freshwater way systems increase the risk of transferral.

Twenty four of the vessels surveyed at Lake Ōkataina had last visited the ocean, Lake Rotoiti or unknown waterways (Figure 12). The same issues of inter-lake transferral at Lake Rotomā are of concern also in Lake Ōkataina. The fact that many of the users did not specify the vessels origins causes concern of where the vessel has come from.

The origin of vessels using both Lake Rotomā and Lake Ōkataina is important as these two lakes have high recreational use and also have low numbers of invasive aquatic pest plant species. A recent incursion of Hornwort in Lake Ōkataina has highlighted the need for incursion response plans and the use of weed cordons to reduce the risk of transfer into these lakes.

3.1.9 Distribution of surveys conducted at boat ramps

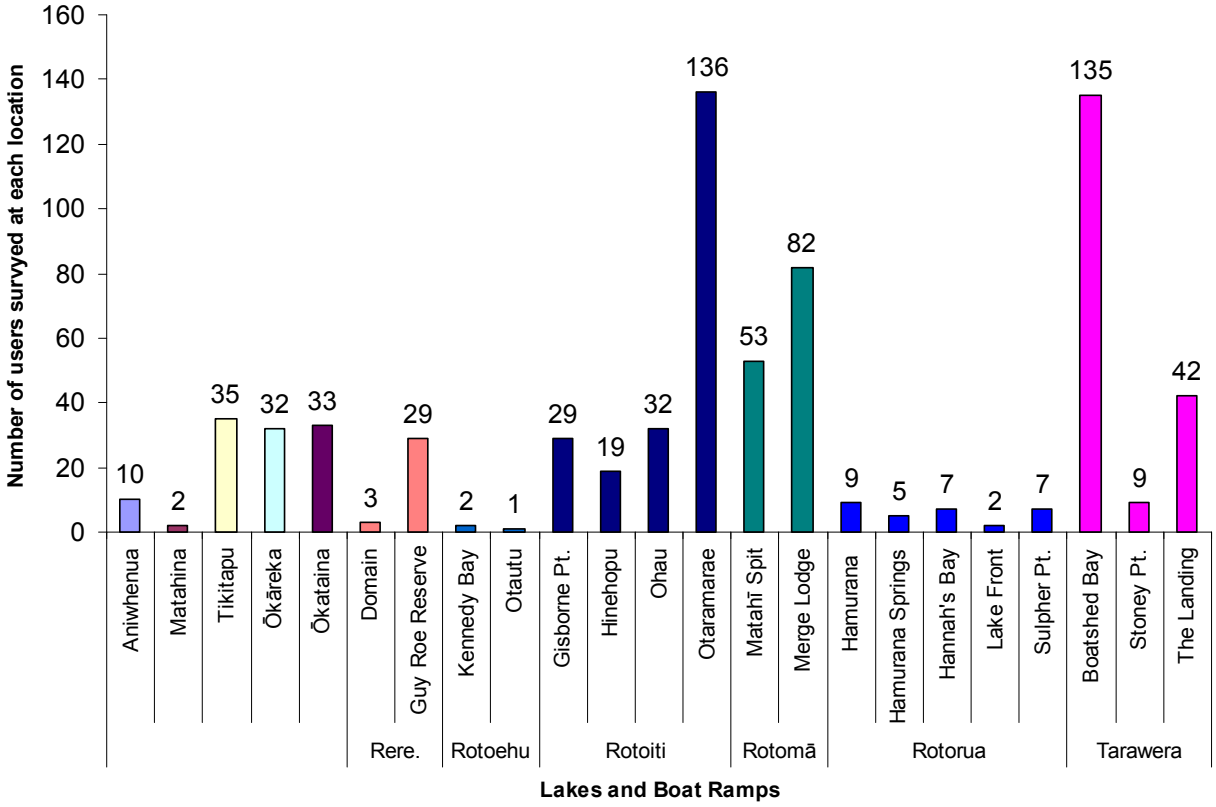

Figure 14 Number of users surveyed at each Rotorua lakes boat ramps

The number of users surveyed at each lake and boat ramp was recorded and analysed in order to identify key lakes and boat ramps to target over the summer period in order to allocate resources appropriately and prioritise ramp visits. The two most popular and highly utilised ramps were Otaramarae, Lake Rotoiti and Boatshed Bay, Lake Tarawera (Figure 13). The accessibility and amount of space to park boat trailers at these two ramps contributed to these being the most popular. Otaramarae, Lake Rotoiti, is also the first boat ramp for users travelling from Tauranga region, which could also contribute to its popularity. This graph also highlights which boat ramps should visited on a less frequent basis due to lack of users.

3.1.10 River user surveys

When surveying river access sites it is difficult to predict when and where users will be utilising waterways. This lack in knowledge and distance to travel to some of the river access sites such as the Waioeka (Appendix 9) contributes to the low number of users surveyed each year at river sites.

The low number of users surveyed at river access sites this summer, did not warrant these results be analysed separately, instead they were included in the lake user survey figures to provide a larger sample for more inclusive outcomes.

The majority of river users surveyed were white water kayakers; this was due to events such as the Wairoa release being attended. Fishermen were a category who was difficult to target. Their unpredictable fishing schedules made it difficult to prioritise when regions and rivers would be visited to survey fisherman. On one of the trips to survey the Waioeka sites, no river users were sighted or conversed with.

The rivers and streams around the Rotorua region were a lot more popular then far field sites. Many of the fishermen surveyed in the Rotorua region used multiple streams and rivers on a weekly basis and were interacted with on a number of occasions over the summer period. It was found that fishermen and white water kayakers have a sound knowledge of aquatic pest and Didymo issues and had a positive attitude towards surveyors.

3.2 Retail education

A total of 38 hotels, motels and camping grounds along with 30 retail and tourism outlets were visited throughout the Bay of Plenty region during the summer period of 2010/2011 (Appendix 2). Due to informational brochure shortages it proved difficult to supply the same number of motels and hotels of previous years. The support displayed while distributing information relating to Didymo and other aquatic pests was over-whelming and the overall response was positive towards these issues. Some businesses seemed weary about handing out promotional items and information, if this attitude was encountered a brief explanation was given to highlight the negative effects the spread of the aquatic pests could have on the tourism industry and the importance of their support in aid of reducing the spread. Once the business fully understood the message and information which they were displaying and supporting, the response became much more positive.

Many of the businesses visited still had information brochures from prior years displayed and many people that were spoken to remembered the students from previous years.

The majority of hotels and motels visited preferred the brochures only for display within the reception area while a few asked for extra items such as posters and stickers. Of the camping grounds that were visited 90% were happy to display posters within their laundry areas/common areas and to hand out spray bottles filled with 5% simple green solution to guests that had boats. Others would only take brochures, as they felt that the space used by a Didymo poster could be more appropriately used for an item that brings them revenue.

Campgrounds appeared to be the most responsive to taking the information that was provided. Most campgrounds took both posters and brochures and a few took other promotional materials. The All Seasons Holiday Park at Hannah's Bay was given 10 spray bottles to give boaters at the beginning of December, and when visited again the week before Christmas, they were down to a couple. They were provided them with an additional 24 bottles to get them through the holiday season. This campground was also supplied with "Stop the Spread" hats which they distributed to their staff to wear while working within the campground. This campground holds a popular annual trout fishing contest which sees the return of guests from around New Zealand and Australia. Due to this competition and to ensure the future success of it, the camp ground owners were extremely enthusiastic to do all they could to stop the spread of aquatic pest plants and to inform their guests of the importance of Didymo awareness. The Waiteti Trout Stream Holiday Park also appeared passionate towards the issues that were being conveyed and took brochures, posters, key chains and spray bottles to give to clientele.

Generally hotels/motels were willing to put brochures out for their customers to take, however most stated that they receive very few boaters and fishermen. It was pointed out that this is an issue for all users of the natural resources and just not boaters and fishermen. Some hotels/motels still had brochures from previous years. At one of the motels being visited a Jason's Travel Guide representative expressed their concern towards displaying the brochures in their display cases. Due to

brochures being in short supply during the period of distributing information which decreased the number of hotels and motels visited compared to previous years, it is thought that the impact of getting information to the target audience was not hindered in anyway, due to the main clientele of hotels and motels being overnight tourists visiting the city.

Retail outlets preferred brochures which could be placed on the counter along with other free information brochures. Retail outlets were also supplied with 'Stop the Spread' hats for employees to wear, which increases the publicity of this campaign. The canoe and kayak retailers which were supplied with floating key chains and brochures to distribute to customers who brought a canoe or kayak from them seemed to be interested and supported the work that was being carried out.

Retail outlets have been supplied with information brochures and Didymo spray bottles on a yearly basis. It became apparent this year that some of the retail outlets still had some items left over from previous years which could indicate that they are not readily distributing them to their customers. The 'Stop the Spread' hats became a 'big hit' with local businesses and accommodation facilities, which provided extra advocacy towards aquatic pest issues.

3.3 Event education

Organising to speak at sport event meetings has become a successful platform and educational tool to promote aquatic pest weeds, fish and Didymo issues and awareness within the wider sporting communities. The range of sporting events attended over the 2010/2011 summer period allowed for a wide demographic of people to be targeted and information distributed in a short amount of time. Although not all people who attended these events were regular users of freshwater ways it was still useful to distribute the information to them as they could pass it on to someone who does regularly utilise freshwater ways.

The following provides a brief outline of the events attended by Nathan Burkepile and Lauren Bennett and the activities undertaken and/or the resources provided for each:

3.3.1 Annual Trout Fishing Tournament

- Hamish Lass attended an evening meeting held by the club for the entrants
- Nathan Burkepile and Lauren Bennett set up stall within the clubhouse with posters, brochures and information.
- Tournament organisers were provided with promotion items to use as spot prizes and bag fillers such as propeller flags and beanies.

3.3.2 Fish & Game Boat Fishing Seminar

- Nathan Burkepile spoke to audience that was predominantly trout fishers about the risks and transfer of aquatic pest species.
- Provided information packs to individuals containing aquatic pest plant/fish and Didymo information along with boat float key rings, stickers, pens and prop flags.

3.3.3 Waka Ama Regatta, Te Puku o Te Ika Outrigger Canoe Association

- Coordinators made announcement about cleaning equipment and also the purpose of the presence of the two Bay of Plenty Regional Council students to the event

- Spent time talking to the crowd and distributing “Stop the Spread” key rings.

3.3.4 NZ Slalom Kayaking Selections (Kawerau)

- Nathan Burkepile spoke at the race briefing which was predominantly competitors
- Information packs were provided

3.3.5 Water Ski Racing, New Zealand Water Ski Racing Association Inc

- Lauren Bennett spoke to race participants at their race briefing about the importance of cleaning their trailers, boats and equipment before entering another waterway, especially for this association as they use South Island freshwater ways also.
- Information and promotional products such as beanies prop flags, lollipops, floating key rings and brochures were distributed to participants and spectators.

3.3.6 North Island PWC Summer Tour, Hawke’s Bay Jet Sport Club Inc

- Met with organisers and discussed use of weed cordon and beach launching risks.
- Talked with both participants and observers about cleaning equipment and ways they can reduce the spread of aquatic pests
- Distributed “Stop the Spread” key rings and lollipops to participants and observers.
- Received multiple bottles and information packs from the organiser as they do not need them anymore

3.3.7 Blue Lake Sprint Regatta

- Promotional items were distributed throughout the crowd to include both spectators and competitors

3.3.8 Blue Lake Multisport Festival

- Decontamination stations were set up in order to ‘dunk’ wetsuits prior to race registration
- Out of approximately 300 Sprint Triathlon competitors an estimated 50 had their wetsuits decontaminated prior to registration.

Overall the response that was received from event organisers, participants and spectators was positive. Everybody that was talked to seem grateful to be getting something for nothing and were more than happy dedicate a minute to listen to the issues surrounding aquatic pests.

Many of the organisers, participants and spectators had a sound knowledge of Didymo and the ‘Check, Clean and Dry’ message. Many commented on ‘Didymo Dave’ attending their events in the past and distributing information. The risks of aquatic weeds spreading between the Rotorua Lakes were not as well known as Didymo issues, which allowed for conversation to be started and questions asked and answered. Also the recent instalment of the weed cordons at Lake Rotomā and the recent hornwort incursion in Lake Ōkataina become topics of conversion.

The use of the BNZ lollipops was useful as a tool to get users interested in the message and issues being conveyed by the two Bay of Plenty Regional Council students. Once lollipops were distributed it was much easier to enter into conversation with people. Using events to target a broad target audience and a range of sporting participants allows for efficient delegation of resources and time. Due to the short period of time that the awareness programme is run it is important that all resources are utilised to their full potential and time used efficiently.

The value of decontamination stations at events such as the Blue Lake Multisport Festival can be questioned as to what the effectiveness of this practice is. An event such as the one mentioned above attracted a large number of entrants from throughout New Zealand and abroad. Many competitors arrived earlier then the registration dates so that they could run through the course before the actual race event. Competitors who used the lake prior to registration would not have had their wetsuits decontaminated before entering the water, unless this was preformed by the individual. This poses the risk of transferring unwanted aquatic pest species such as Didymo to the Bay of Plenty region. Many of the competitors spoken had been decontaminated at previous events and had a strong knowledge of Didymo and aquatic pest issues.

The issue with decontamination stations at large events is that the policing of all vessels and equipment. A sticker could be placed on equipment to indicate that it has been decontaminated but this is not suitable for all equipment types.

The use of key chains at the Blue Lake Multisport Festival proved to be an appropriate method of monitoring decontamination before registration. The organisers at this event did not support the decontamination of equipment with the same enthusiasm that Bay of Plenty Regional Council employees did. This lack of support made it extremely hard to push the issue of Didymo decontamination for competitors. Event organisers decided to make their own judgments as to who should and shouldn't be decontaminated and were very lenient with competitors registering without a keychain to say that they had been decontaminated. It became apparent that without the support of event organisers the presence of a decontamination station at such an event almost becomes redundant. Also with no announcements made at the registration briefing many people were not aware that their wetsuits brought with them to registration to be decontaminated.

Sporting events such as the Blue Lake Multisport Festival need to be prioritised in order to assess the risk of Didymo and other aquatic pests transfer from one waterway to another. This event appeared to be of low risk of Didymo transfer due the only equipment being used was wetsuits and also the lack of flowing water within Lake Tikitapu for Didymo to establish itself in.

Part 4: Conclusions and recommendations

4.1 Boat ramp surveys

A large number of the river and lake users surveyed over the summer period were aware of aquatic pest issues and the need to' check, clean, dry' when leaving one waterway to the next. This results in the perceived awareness overall being medium and the perceived interest overall being good. The majority of vessels and transport equipment was observed to have no aquatic weed present at the time of surveying, with only 1% of vessels exhibiting weed.

This campaign has been running for five years now and the number of Bay of Plenty fresh waterway users who have received information over the five years is relatively high. It is important that this campaign is carried on in order to effectively advocate aquatic pest issues within the region.

4.2 River user surveys

Of the river users kayakers were the most accessible and predictable. Common events such as the Wairoa release should be attended in order to make contact with a large number of river users in a short period of time. The unpredictability of fishermen makes it difficult to make contact with these river users and contributes to the low number of river users surveyed.

4.3 Retail education

Visiting retail outlets that promote and sell equipment used in fresh waterways provides an extra avenue to spreading information regarding invasive aquatic pest species. Campgrounds appeared to be the most receptive and supportive towards the issues being conveyed. Many campgrounds and retail outlets are aware of the negative impacts invasive aquatic pests impose and were willing to aid in anyway to protect the tourism industry.

4.4 Event education

Positive feedback was received from all events that were attended by the Bay of Plenty Regional Council workers over the summer period, although some events were more supportive and receptive then others. Many competitors and event organisers were more than happy to dedicate a minute to aquatic pest issues. Events also become a large part of the campaign due to the large number of active and potential fresh waterway users which could be targeted.

4.5 Recommendations

Targeting boat ramp and river users does not target all the holiday freshwater users. Many holiday goers own or rent properties which have direct access to the lake. Due to the access being restricted to only residents, there is a great difficulty in directly distributing information to these lake users. It is suggested in order to target these lake users, mail drops could be carried out prior to the busy summer period. Although many properties have multiple groups occupying them, this would allow for the information to be received by a portion of these lake users that could not be targeted at boat ramp surveys.

There are a significant number of people which utilise Lake Tikitapu throughout the summer period. Due to this influx of people there is usually little or no place to park, which restricts the number of people which can be targeted at this lake. It is recommended that future surveyors arrive earlier in the day in order to gain a vantage point for contact with the lake users.

Although it is hard to accurately assess the impact of distributing promotional information and products to tourism, retail outlets and accommodation facilities, it became apparent that some campgrounds and retail outlets are important advocates towards aquatic pests and have a vested interest in the issues being conveyed. Future work could include rewards and benefits for campgrounds and retail outlets which provide support and advocacy towards aquatic pest issues. Time could be taken at the start of each summer to develop tailored information and promotional packs for campgrounds and retailers to provide to clientele.

Changes to the survey questionnaire can also be recommended. When interviewing users a perceived transfer risk for the individual could be determined. A user who uses multiple lakes on a regular basis would be considered a high risk and people who use only one lake would be considered low risk. The attitude, lakes used and awareness of the user would also be factors in determining the transfer risk for the individual.

Another change to the survey could be that instead of the question origin of vessel, which is hard to slip into a casual conversation without it seeming like a survey is being conducted, it could just be a question of what other lakes do you use and record these down to determine the transfer risk of the individual.

To ensure the information gathered from the survey is non-bias it is recommended that any perceived awareness and subjective judgments be removed from the questionnaire. The questionnaire could be improved by creating five questions which river users such as fishermen and kayakers can answer regarding Didymo. Boat ramp surveys could include both the river survey questions and an additional five questions relating to Bay of Plenty lakes and invasive species. The survey would only require a yes or no answer on the questionnaire, from this it would be possible to gauge user's actual awareness of aquatic pest issues rather then just a perceived awareness. This questionnaire can be tailored to the individual being surveyed. A draft questionnaire containing suitable questions can be found in Appendix 4.

To improve the effectiveness of event decontamination it would be recommended that decontamination stations be set up at the event venue, a week prior to the event beginning. This allows for competitors who have travelled from other regions to familiarise themselves with the course, the tools to effectively decontaminate their own equipment prior to entering the waterway. By doing this it places the responsibility of decontamination on the individual user and also the organisers to ensure that all competitors have fulfilled registration and event requirements.

It is also recommended that if a large number of entrants at sporting events are from a high risk area such as the South Island, a separate briefing could be held for these entrants in order to decontaminate their equipment separately prior to the race to reduce the risk of Didymo contamination. This practice would eliminate the unnecessary time and resources being consumed on low risk water users such as local novice entrants who only use Rotorua lakes to train in.

Events should be prioritised by both DOC and Bay of Plenty Regional Council to ensure that resources are allocated appropriately. Sporting events could be prioritised from highest risk of Didymo contamination and transfer to lowest risk.

Events which use rivers and streams are going to be of higher risk then those events which utilise lakes, due to Didymo needing a moderate flow of water velocity to successfully establish and flourish. Events such as river kayaking, fishing, and rafting all pose a higher risk then multisport events and triathlons which occur in lakes. The likelihood of a tri-athlete using a South Island waterway on a Saturday and using a North Island waterway on a Sunday is highly unlikely and if this was to occur then the chances are this individual is an experienced athlete with sound knowledge of Didymo decontamination and issues. A meeting with event organisers needs to be scheduled before the event date in order to gauge the interest and support of the organisers. Without the backing of the event organisers there is no point even attending an event to decontaminant equipment. It is worthless only decontaminating half the competitors, all competitors must be treated the same and decontaminated prior to race registration. The responsibility of decontamination should be placed on event organisers and not left up to DOC or Bay of Plenty Regional Council staff to police. If decontamination was a clause within event organisers consent for a lake closure then maybe more enthusiasm and support would be present from event organisers.

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Appendices

Appendix 1 – Boat ramp survey form

Lake/River___________________ **Boat Ramp**___________________ **Date**________ **Surveyor**_________

Cleaned/checked boat prior to launching today?	Yes	No	?(already in water)	Only use this la
Weed on boat/equipment?	Yes	No		
If Yes–Species & where on boat (anchor, trailer,??)				
Vessel/Equipment type? eg boat (separate jet boats), jetski, waders etc				
Origin of Vessel/equipment? (last waterbody where used)				
Origin of Owners? (where vessel users are from/live)				
Recreational purpose?	Fishing	Skiing	Other__________	
Level of Interest in aquatic pest issues?	Good	Moderate	Poor	
Level of Awareness of aquatic pest issues?	High	Medium	Low	
Level of Awareness of Didymo?	1(none)	2(minimal)	3 (good)	4(excellent)
Comments(on anything: e.g.didymo, signs, banners etc):				

Cleaned/checked boat prior to launching today?	Yes	No	?(already in water)	Only use this la
Weed on boat/equipment?	Yes	No		
If Yes–Species & where on boat (anchor, trailer,??)				
Vessel/Equipment type? eg boat (separate jet boats), jetski, waders etc				
Origin of Vessel/equipment? (last waterbody where used)				
Origin of Owners? (where vessel users are from/live)				
Recreational purpose?	Fishing	Skiing	Other__________	
Level of Interest in aquatic pest issues?	Good	Moderate	Poor	
Level of Awareness of aquatic pest issues?	High	Medium	Low	
Level of Awareness of Didymo?	1(none)	2(minimal)	3 (good)	4(excellent)
Comments(on anything: e.g.didymo, signs, banners etc):				

Cleaned/checked boat prior to launching today?	Yes	No	?(already in water)	Only use this la
Weed on boat/equipment?	Yes	No		
If Yes–Species & where on boat (anchor, trailer,??)				
Vessel/Equipment type? eg boat (separate jet boats), jetski, waders etc				
Origin of Vessel/equipment? (last waterbody where used)				
Origin of Owners? (where vessel users are from/live)				
Recreational purpose?	Fishing	Skiing	Other__________	
Level of Interest in aquatic pest issues?	Good	Moderate	Poor	
Level of Awareness of aquatic pest issues?	High	Medium	Low	
Level of Awareness of Didymo?	1(none)	2(minimal)	3 (good)	4(excellent)
Comments(on anything: e.g.didymo, signs, banners etc):				

Appendix 2 – Sites visited to promote aquatic pests and Didymo awareness

1. Rotorua sites

	Name	BNZ Products Distributed
Hotels/Motels		
	Acapulco Motel	Brochures
	Alpine Conference and Hotel Centre	Brochures
	Ambassador Thermal Motel	Brochures
	Aywon Motel	Brochures
	Bel Aire Motel	Brochures
	Birchwood Spa Motel	Brochures
	Boulevard	Brochures
	Capri Court	Brochures
	Cedar Lodge Motel	Brochures
	Emerald Spa Resort	Brochures
	Executive On Fenton	Brochures
	Fenton Court Motel	Brochures
	Four Canoes	Brochures
	Gateway Motel	Brochures
	Geneva Motor Lodge	Brochures
	Golden Glow Motel	Brochures
	Heywoods	Brochures
	La Mirage	Brochures
	Marama Resort	Brochures, Key Rings
	Midway Motel	Brochures
	Pineland	Brochures
	Pohutu Lodge	Brochures
	Rob Roy	Brochures
	Rotorua Mini Suites	Brochures
	Rotorua Motor Lodge	Brochures
	Rotorua Thermal Park	Brochures
	The Heritage	Brochures
	Ventura Inn and Suites	Brochures
Camping Grounds		
	All Seasons Holiday Park - Hannahs Bay	Posters, Brochures, Spray Bottles
	Blue Lake Top 10 Holiday Park	Posters, Brochures
	Cosy Cottage International Holiday Park	Posters, Brochures
	Holdens Bay Top 10 Holiday Park	Posters, Brochures, Boat Packets
	Lake Rotoiti Holiday Park	Brochures
	Redwood Holiday Park	Posters, Brochures, Key Rings, Pens
	Rotorua Family Holiday Park	Posters, Brochures
	Rotorua Thermal Holiday Park	Posters, Brochures
	Waiteti Trout Stream Holiday Park	Posters, Brochures
	Willow Haven	Brochures

Retail Outlets

Bill Davies Outdoor Sports World	Brochures
Hamill's	Brochures
Hunting and Fishing	Brochures
Kathmandu	Brochures
Mountain Designs	Brochures
Raft-About	Brochures
River Rats	Brochures, Stickers, Tri-folds
Stirling Sports	Brochures
O'Keefes	Brochures
Outdoorsman Headquarters	Brochures
The Happy Angler	Posters, Brochures
Rotoma's Trading Post	Brochures

Tauranga sites

Retail Outlets

Bivouac Outdoor	Brochures
Broncos Sports	Brochures
Burnsco Marine and Leisure	Brochures, Key rings
Camping and Outdoors	Brochures
Canoe & Kayak	Brochures, Key rings
Hunting & Fishing	Brochures
Sportsworld Papamoa	Brochures
Stirling Sports	Brochures
Waimarino Kayak Shop	Brochures, Key rings
Wright Sports	Brochures

Whakatane sites

Retail Outlets

Camping & Fishing	Brochures, DVDs
Hunting and Fishing	Brochures, DVDs
Stirling Sports	Brochures
Sportsworld	Brochures
Whakatane Great Outdoors	Brochures, DVDs

Tourism Centres

iSite Whakatane	Brochures
Citizens Advice Bureau	Brochures

Opotiki sites
Retail Outlets

Opotiki Bait & Tackle	Brochures
Hickeys Sports	Brochures

Tourism Centres

iSite Opotiki/ Department of Conservation	Brochures

Appendix 3 – List of Biosecurity New Zealand and Bay of Plenty Regional Council products distributed

- Lollipops.
- Boater and trekker spray bottles filled with 5% (50 ml) of Simple Green.
- Pens.
- “Stop the Spread” Fluorescent propeller flags.
- Pocket size information brochures (fold up).
- Posters.
- Boater and Trekker brochures.
- “Stop the Spread” Floating key rings
- Didymo Check, Clean, Dry stickers.
- “Stop the Spread” hats.
- Lakes information sheet showing aquatic pest plants and pest fish species.

Appendix 4 – Revised questionnaire

Lake/River _____ Boat Ramp_____ Date _____

Cleaned/checked boat prior to launching today? ☐ Yes ☐ No

☐ Already in water ☐ Only use this lake

Weed present on boat/equipment? ☐ Yes ☐ No

If yes – what species and where? _____

_____

Type of vessel? E.g. Boat, Jet Ski, jet boats etc _____

Origin of vessel? (last place used) _____

Origin of owners? (where users are from) _____

Recreational purpose? ☐ Fishing ☐ Skiing ☐ Other _____

River survey questions

How long should you leave an item to dry to successfully kill Didymo?	☐ Yes	☐ No
Is Didymo present in the North Island?	☐ Yes	☐ No
What does the 'check, clean, dry' slogan mean?	☐ Yes	☐ No
How much contaminated water would it take to spread Didymo?	☐ Yes	☐ No
What is the commonly used name for Didymo?	☐ Yes	☐ No

Boat ramp survey questions + river questions for lake users

Are pest fish such as Koi Carp and Catfish currently present within any Bay of Plenty waterways?	☐ Yes	☐ No
Is Hornwort an invasive species?	☐ Yes	☐ No
What are the four invasive species which are of concern in the Rotorua Lakes?	☐ Yes	☐ No
Is oxygen weed (*Elodea* and *Lagarosiphon*) native or non-native species?	☐ Yes	☐ No
Do you know what of the four invasive weeds occurs in this lake?	☐ Yes	☐ No

Level of interest in aquatic pest issues? ☐ Good ☐ Moderate ☐ Poor

Comments:

_____

_____

_____

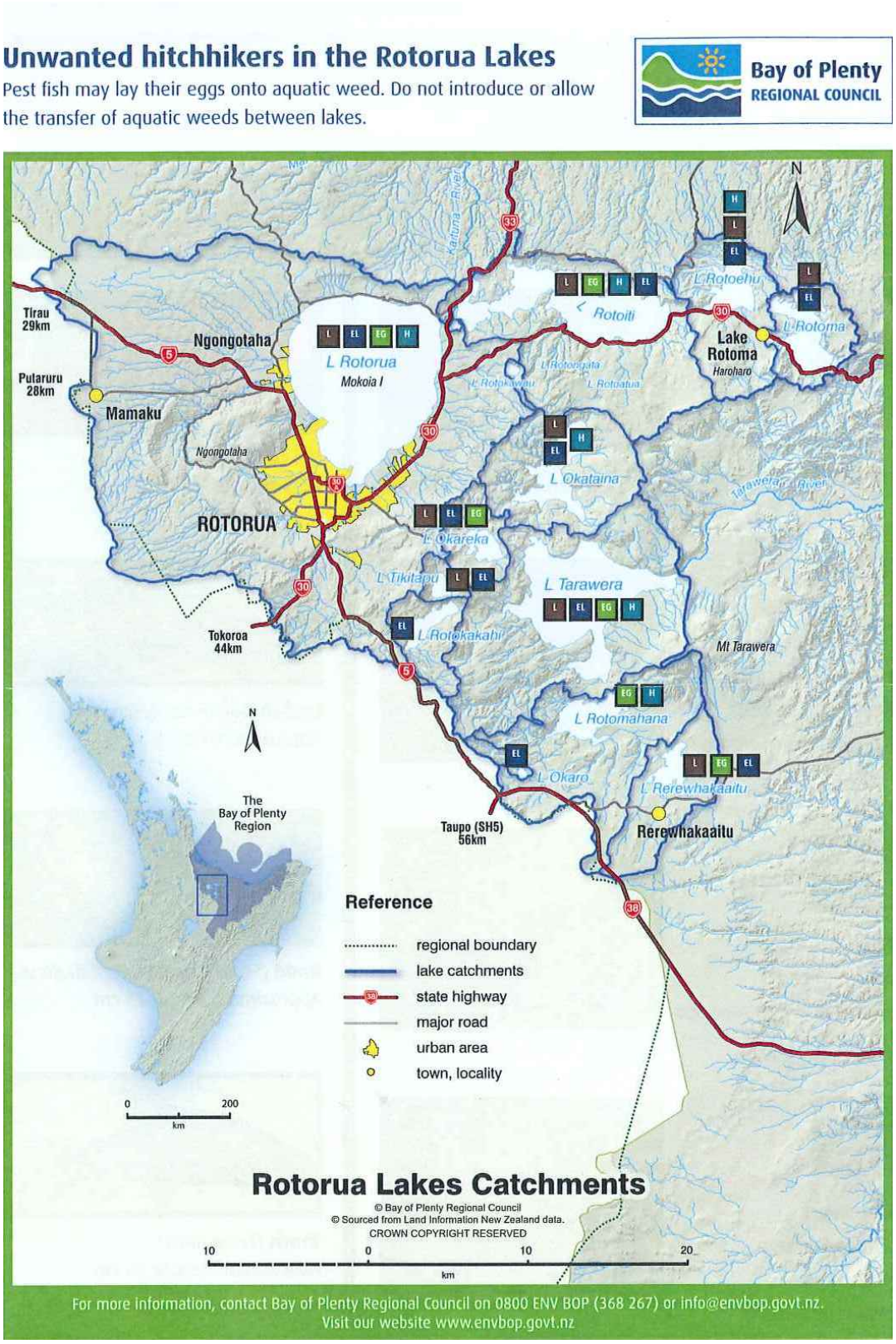
_____

Determining Awareness

(Number of questions right)

River Surveys	Boat Ramp Surveys
0-1 = Poor	0-3 = Poor
2-3 = Good	4-7 = Good
4-5 = High	8-10 = High

Appendix 5 – Unwanted hitchhikers in the Rotorua Lakes flyer



Are aquatic weeds and pest fish hitching a ride on your boat?

Stop the spread of aquatic pests

Ensure your propeller, anchor and chain, boat trailer and fishing gear are clean before launching.

L

Lagarosiphon

Lagarosiphon major

Native of South Africa

EL

Elodea

Elodea canadensis

Native of North America

EG

Egeria

Egeria densa

Native of South America

H

Hornwort

Ceratophyllum demersum

Native of Eurasia

Koi carp *(Cyprinus carpio)*

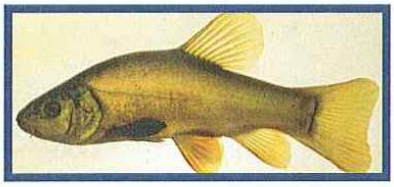
Approximate length 75 cm

Catfish *(Ameiurus nebulosus)*

Approximate length 30 cm

Rudd *(Scardinius erythrophthalmus)*

Approximate length 25 cm



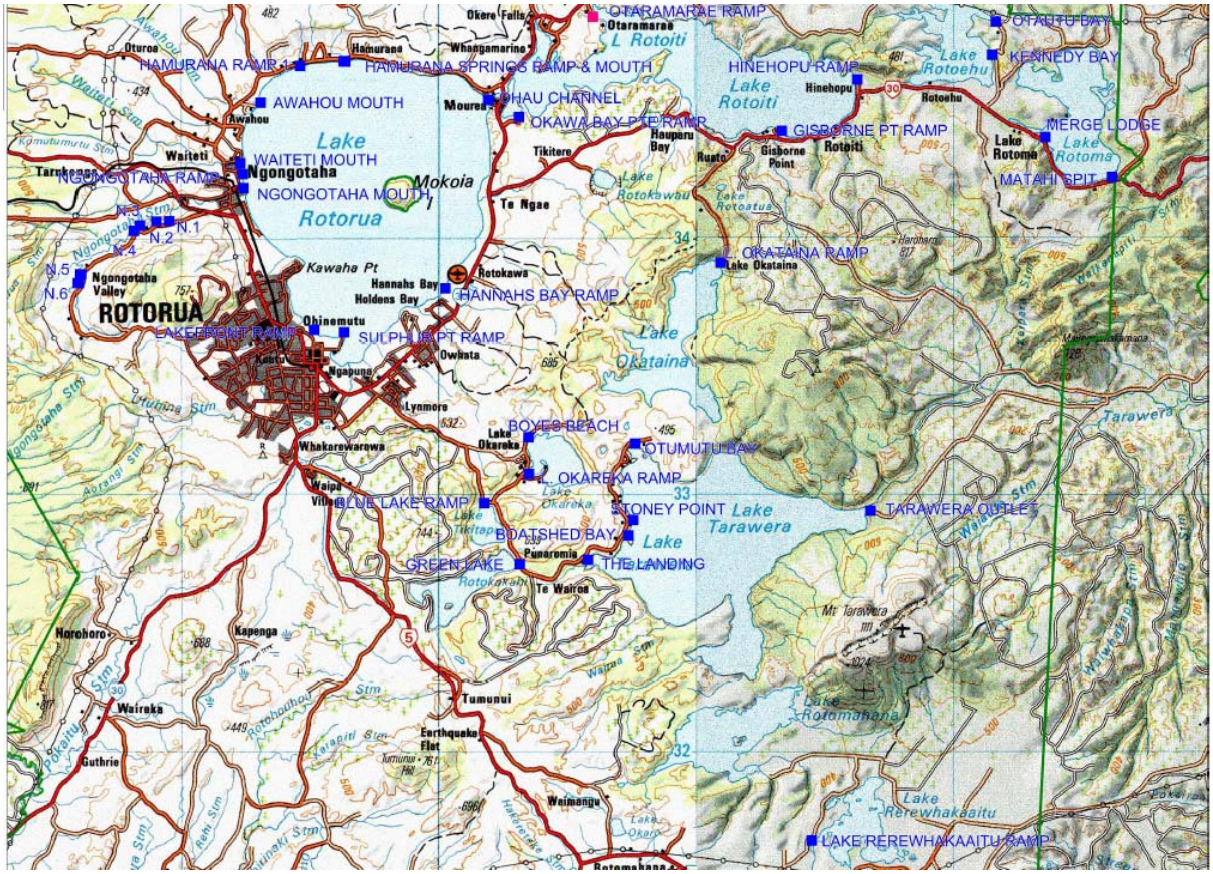
Tench *(Tinca tinca)*

Approximate length 35 cm

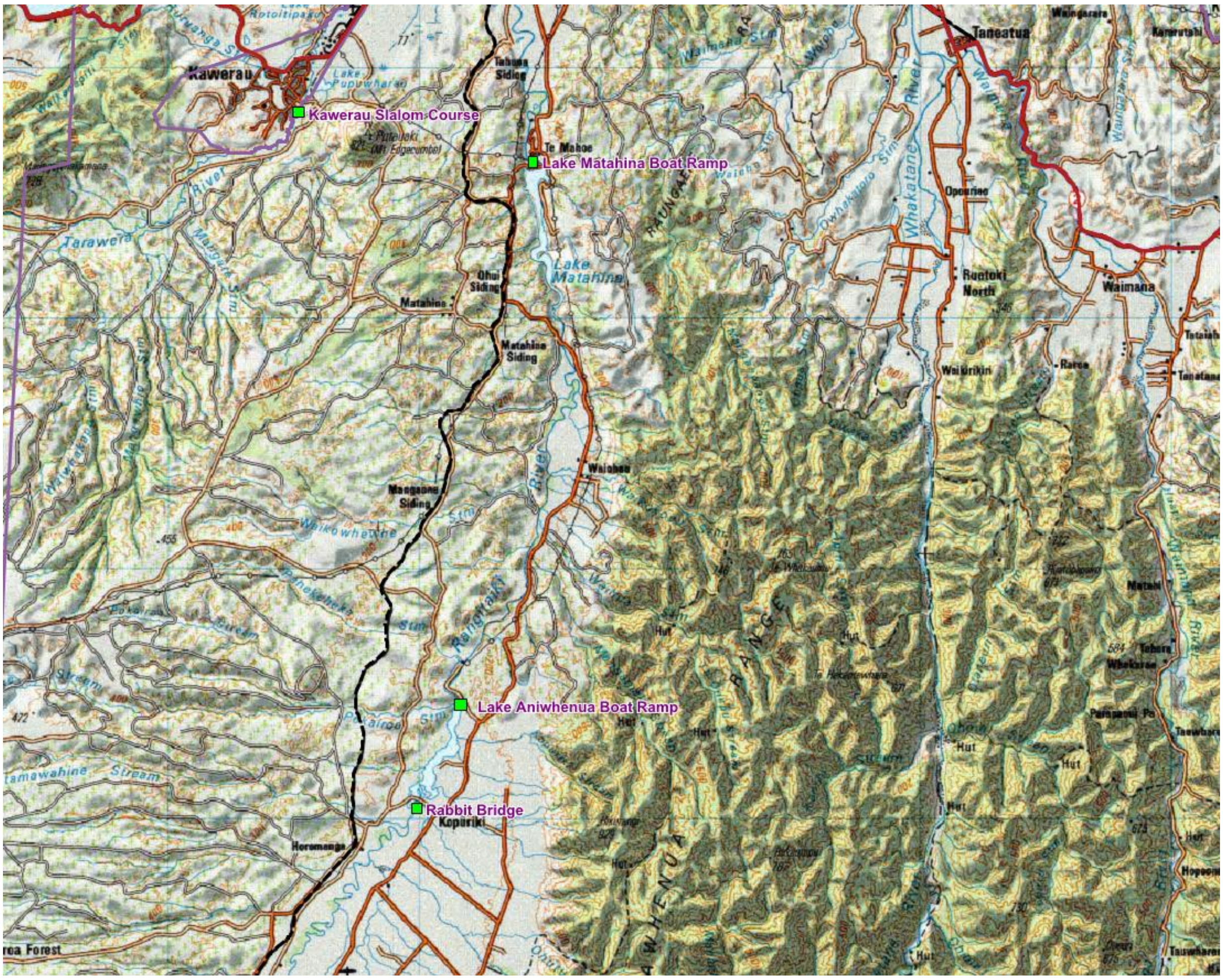
Pest fish photos supplied by NIWA

GDS10-2241

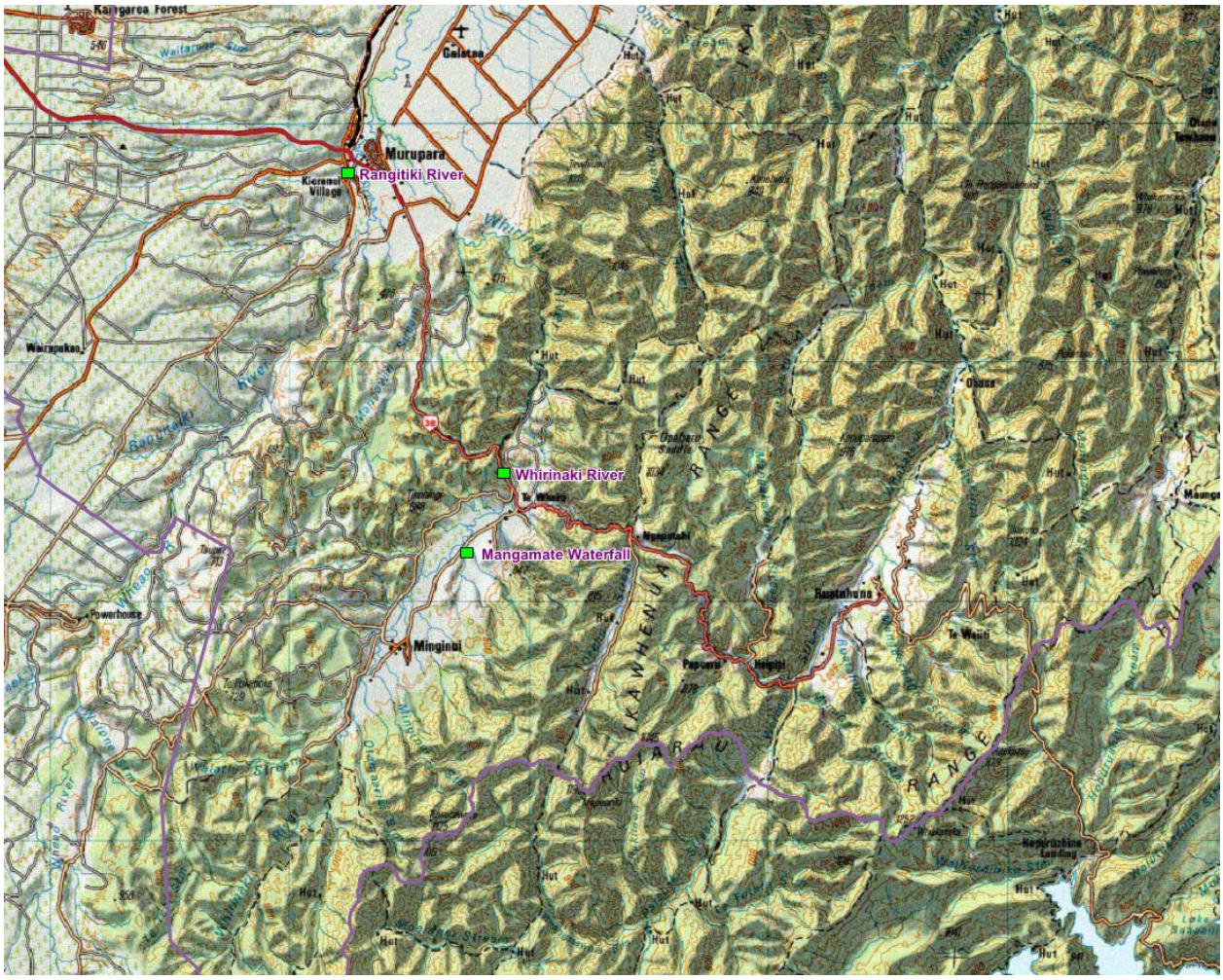
Appendix 6 – Sites visited in the Rotorua district



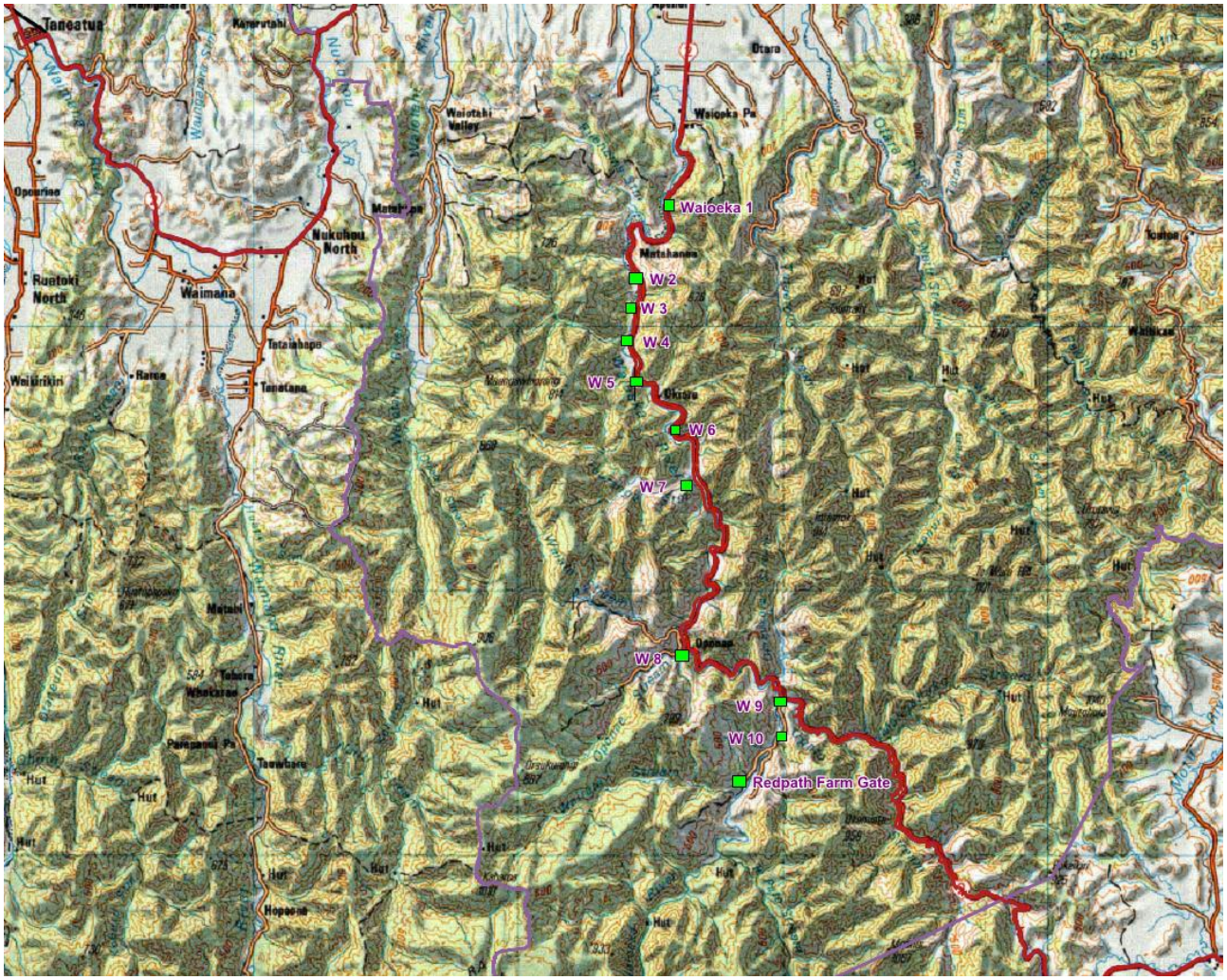
Appendix 7 – Sites visited in the Upper Whakatāne district



Appendix 8 – Sites visited in the Lower Whakatāne district



Appendix 9 – Sites visited on the Ōpōtiki district



Appendix 10 – Sites visited in the Western Bay of Plenty district