

# Alligator weed control 2011/2012

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# 1 Introduction

Prior to 1990 there were two small infestations of alligator weed known in the Waikato region, one on land at Orongo near Thames, and the other a very small infestation in a small wetland area on the outskirts of Te Aroha. By 1990 the Orongo infestation was thought to be eradicated. In 1990 alligator weed was discovered on the lower Waikato River. Although control work began at this time, by 1999 it had spread further upriver and had also been discovered in Hamilton city. In 2003 it was found in Lake Whangape, and in a wetland area and paddocks on two dairy farms at Te Rore. Since 2004, several new infestations have been found throughout the region (see Environment Waikato Technical Report 2005/38).

Alligator weed (*Alternanthera philoxeroides*) has been described as one of the world's worst aquatic and terrestrial weeds. Originally from Brazil, alligator weed is now a major weed problem in parts of the United States, Australia, China, India, Thailand and Indonesia. It was first discovered in New Zealand in the northern Wairoa River, near Dargaville, in 1906. Alligator weed was an accidental introduction to New Zealand and is believed to have arrived with ship ballast water. It is now widespread in Northland where it has become a serious weed of waterways and cropping land. It is common in Auckland waterways and there are one or two sites in the Bay of Plenty, Christchurch and Taumarunui. There are several infestations in a range of habitats in the Waikato.

Aquatic alligator weed takes root in shallow water and on stream banks, or floats as 'rafts' of vegetation. Stems can grow up to 10 metres out over water, and up to 1 metre in height. Aquatic alligator weed grows very quickly and can rapidly overtake streams and drainage canals, clogging them with vegetation and trapping sediments, thus increasing the risk of flooding. In natural wetland areas alligator weed is a threat to native flora and fauna and is extremely difficult to eradicate once established in such a habitat. On rivers and lakes it can form large mats, altering natural vegetation, interfering with recreational activities and posing a threat to hydro power generation.

As a terrestrial weed, alligator weed is capable of rapid growth, particularly under warm, wet conditions and can out-compete crops and pastures. On land it tends to have a different growth form from that of the aquatic form, being more prostrate and developing a very deep root system. Alligator weed will take up heavy metals from the soil and is known to be toxic to some livestock.

Alligator weed's 'weediness' can be attributed to its tolerance of a wide range of habitats; very rapid growth rate under favorable conditions; extremely efficient vegetative reproduction, and its ability to quickly bounce back from conventional weed control techniques. It does not set seed in New Zealand, but the plant stems break easily and rapidly form root systems. Alligator weed is subsequently spread through the transport of stem fragments naturally via water movement, and through human activities such as boating, fishing, drainage works, agricultural contracting and soil movement – particularly soil movement associated with subdivision development.

Few herbicides are effective against alligator weed and most do not translocate very effectively into the root system. Even when above ground vegetation dies off, underground parts remain viable and vegetation very quickly reestablishes. In many cases, terrestrial alligator weed can remain 'dormant' underground for extensive periods, sometimes giving the impression it has been eradicated, but then reappears some months or even years later. Eradication of terrestrial alligator weed therefore requires persistent control aimed at exhausting or completely removing (physical control) the root system.

Waikato Regional Council has several Resource Consents to allow the use of the herbicide metsulfuron in aquatic situations to control alligator weed. In April 2012 it was discovered that while these consents covered requirements under the Resource

Management Act, they did not cover the requirements under the Hazardous Substances and New Organisms (HSNO) Act. As a result of this oversight, the use of herbicides in aquatic situations was suspended pending approval from the Environmental Protection Agency (EPA). An application seeking permission from the EPA has been submitted by a consortium of regional councils and the Department of Conservation (DOC) and a decision is expected in November 2012. An application has also been lodged with Council for a 'region-wide' consent enabling the use of specific herbicides in aquatic environments to control serious aquatic pest plants such as alligator weed. Spraying under current resource consents was suspended from April as a result of the requirement for HSNO permission.



Map 1: Regional distribution of Alligator Weed as at January 2011

## **2 Alligator weed control 2011/12 (Resource consent 112000)**

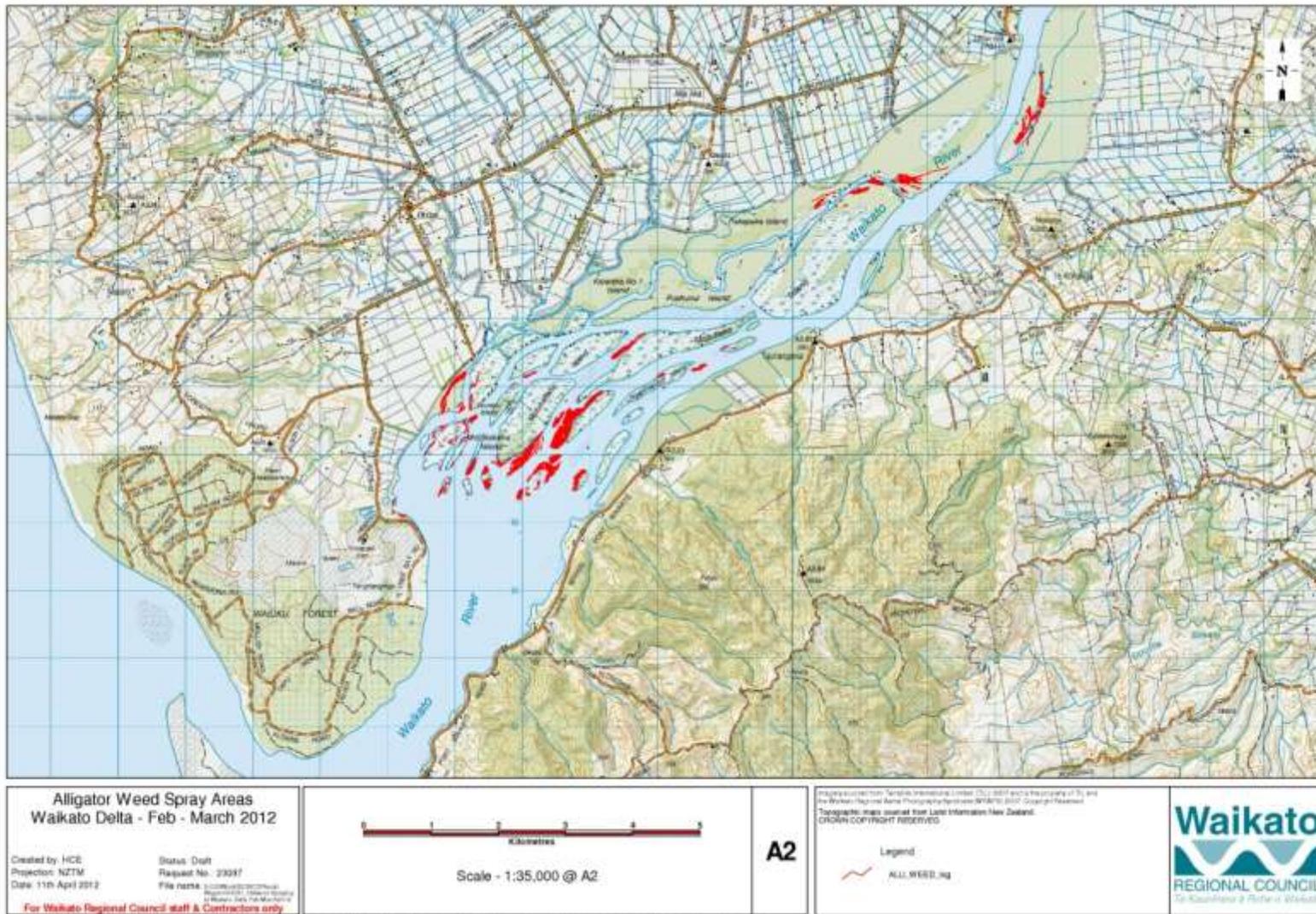
### **Waikato River delta (site 1)**

The delta area covers approximately 2,500 hectares with approximately 900 hectares of islands, which are tidal and subject to flooding. To ensure good coverage of alligator weed, spraying needs to be carried out at low tide when the weed is most exposed. Alligator weed is present as floating mats on the edges of islands (Figure 1) and is scattered on islands, particularly the islands towards the lower delta. Due to regular control work, alligator weed is confined in most areas. It is estimated to be present in about 5 percent of the delta area and large areas are free of alligator weed (Figure 2). Without regular control work, alligator weed would likely dominate inter-island channels and canals. Submerged weeds are also a problem, with canals and inter-island areas 'choked' in places, making access by ordinary boats difficult. Access for spraying many of the infestation areas can only practically be achieved by helicopter or airboat. Herbicide spraying has been carried out under Resource Consent 112000, using the herbicide metsulfuron-methyl at a concentration not exceeding 15 grams of metsulfuron-methyl to 100 litres of water.

Aerial spraying was carried out 30<sup>th</sup> and 31<sup>st</sup> January 2012 (57 hectares); 27<sup>th</sup> February 2012 (3.75 ha) and 15<sup>th</sup> March 2012 (1.5 ha) – a total of 62.25 hectares. Map 2 shows the GPS tracking of aerial work at the delta.

A contracted airboat operator worked a total of 25.5 days in the delta area during 2011/2012 covering areas known as; Hoods Landing, Maioro Bay, Fowl Run, Narrow Island, Holmes canal, Toe Toes, the Elbow, north of Tawanui Island, and near Klondike Road. Spraying from the airboat was carried out in October (5 days), December (4 days) January (8 days), February (5 days) and March/April ( 6.5 days).

West Waikato Weeds Ltd (Biosecurity Contractor) carried out some smaller scale control from a boat, using a gun and hose during March. Areas covered were the Holmes canal and western drain, and Aka Aka Stream. Land based spraying was also carried out by West Waikato Weeds Ltd along the Holmes canal (December/January) and Aka Aka-Otaua Drainage System properties and stop-banks (February), see Figure 3.



Map 2: Alligator weed spray areas at Waikato Delta – February – March 2012



**Figure 1: Alligator weed on edge of island**



**Figure 2: Large areas without alligator weed**



**Figure 3: Dead alligator weed in canal off the delta**

## **Waikato River (site 2)**

West Waikato Weeds (Biosecurity Contractor) carried out control from a boat using a gun and hose at sites along the river during November 2011 to April 2012. Patches of alligator weed between Huntly and Port Waikato were controlled and periodic surveillance was carried out upstream to Hamilton. West Waikato Weeds logged 36 days boat work for the delta and river areas. A small amount of surveillance was carried out between Taupiri and Ohinewai during July 2012. However, high rainfall over the winter period meant the River was in flood for long periods and precluded more work being done.

Land based spraying was also carried out by West Waikato Weeds at Mercer and Ngaruawahia.



**Figure 4:** Alligator weed along the river is easier to spot under willows over winter

### **Albie Philips Reserve, Port Waikato (site 3)**

Scattered alligator weed is present in the drain running through Albie Philips Reserve. West Waikato Weeds carried out control in the first half of the drain over summer. Spraying to keep the drain clear is also carried out by the local council.

### **Kariotahi Beach (site 4)**

Not checked this season.

### **Waikaretu Stream (site 5)**

Control carried out by West Waikato Weeds in March. Infestation is reducing but alligator weed still present in scattered patches.



**Figure 5: Alligator weed on Waikaretu beach**

### **Tuakau oxidation ponds (site 6)**

Managers of this site carry out spraying of the pond margins. Site will need reassessing next season. Ponds are due to be decommissioned.

### **Aka Aka drainage area (site 7)**

Direct control carried out during March by West Waikato Weeds. Drainage board spray contractors had also done some spraying in the past, however they were not able to be used this season so West Waikato Weed carried out control in drainage board areas from the canals rather than from land.

### **Lake Whangape and Whangape Stream (sites 8 & 9)**

Extensive control by a contractor has been carried out from land around Lake Whangape. A total of 401 hours was completed. Patches of alligator weed found on the Lake shore and banks of Whangape Stream were targeted using knapsack or gun and hose. Most areas are revisited at least once over the season.

Control in areas difficult to access from land was carried out from airboat during January (2 days) and February (1 day). Control of alligator weed in Whangape Stream was carried out from boat by West Waikato Weeds in November and February .

Extensive control has reduced alligator weed to small amounts on the lake and around the shore. However, livestock grazing and cropping on land adjacent to the lake has resulted in dispersal of alligator weed in these areas.

### **Sand quarry and River Road old dump site (site 10 & 11)**

The River Road site (old Horotiu landfill site) was visited several times by Exim contractors. A small amount of alligator weed is present on land, and in and around the pond. All alligator weed controlled by Exim. Only a very small amount of alligator weed has persisted at the pond site where the herbicide imazapyr has been trialled. A small

amount of alligator weed was discovered on the Waikato River bank, and this has been controlled. Checks of this area later in the season found no visible alligator weed.

The Hutchinson Road quarry site area has been under constant change as the new Waikato Expressway Ngaruawahia Bypass is being built. Council biosecurity staff have been working with the roading contractors to ensure all activities which may affect alligator weed are carried out in a manner that eliminates the risk of weed dispersal off site. Fifteen days work by Exim including a couple of days inspecting machinery.



**Figure 6: Ngaruawahia Bypass works in progress**



**Figure 7: Contractor's alligator weed notice**

## **Te Rore (site 12)**

Alligator weed persists in small patches through the wetland. Access is difficult. Aerial spraying of the wetland area (8 hectares) was carried out in January. Ground based control and follow up to wetland spraying was carried out November, January and April.

Extensive control of alligator weed on adjacent farmland was carried out throughout the season. Activities such as harvesting and cropping were affecting the ability to successfully reduce alligator weed at this site and had resulted in dispersal of the weed. Therefore, the property was made a Restricted Place under the Biosecurity Act to improve control over activities on the farm and minimise further weed dispersal.

### **Waikeria (site 13)**

No alligator weed seen here since 2004.

## **3 Other consents**

### **Te Onetea Stream (consent 119046)**

Regularly inspected by Department of Conservation (DOC) staff that carry out spot spraying. A trial weed boom has been set across the stream to catch alligator weed fragments as well as yellow flag iris seed, in an attempt to prevent these weeds establishing around Lake Waikare. While the boom is catching weed fragments, it does not capture yellow flag seed and cleaning and disposal of the debris proved problematic. DOC staff have installed floating seed catchers to trap yellow flag seed downstream of the boom. Council engineering staff have investigated an alternative boom which would be more effective and easier to clean. A decision is yet to be made on purchasing this model.

Land based contractors and DOC staff have carried out intensive surveillance around the Lake, and have controlled a small amount of alligator weed and a large amount of yellow flag iris which has recently infested the lake shores. Ongoing intensive survey and control is needed here to prevent these pests establishing and threatening the Whangamarino wetland.



**Figure 8: Weed boom, Te Onetea Stream**

## Whangamarino (consent 120913)

DOC has been monitoring this site and carry out control of alligator weed each year. The infestation has persisted at about the same level, but downstream from the original, possibly due to fragments dispersing downstream. No alligator weed has been found within the wetland.

## Ruahorehore Stream, Waihi (consent 121232)

Alligator weed at Ruahorehore is a priority for control due to it being the only aquatic infestation in the Waihou Piako catchment. Resource consent limits herbicide spraying in the Ruahorehore Stream to the months December-March and June-July, due to a water take by a nearby kiwifruit orchard. The amount of alligator weed present in the Stream has reduced from a total of approximately 539m<sup>2</sup> when first discovered, to approximately 24m<sup>2</sup> in January 2012. Some of this reduction in alligator weed is due to flood events which resulted in the weed being dispersed downstream.

Spot spraying of alligator weed was carried out in January. However, follow up spraying was not able to be done due to several high rainfall events. Herbicide spraying over water was then suspended pending permission from the EPA. Due to the high priority for control at this site, an application to the EPA for emergency works was lodged. Unfortunately by the time approval was granted there had been another flood and nearly all alligator weed present in the stream appeared to be either washed up on the bank, or had disappeared downstream (Figure 10). Establishment of alligator weed downstream from the Ruahorehore Stream has not yet been confirmed, and ongoing surveillance will be required along the Ohinemuri and Waihou Rivers.



Figure 9: Ruahorehore pre flooding, June 2012



**Figure 10: Ruahorehore August, after flood – alligator weed deposited on land**

### **Te Aroha – Grattan Rd/Poole Rd (consent 123378)**

Alligator weed was discovered in a regional council controlled drain in February 2011. Spraying was carried out in November 2011. It was checked again in February and no alligator weed was found.

### **Te Aroha – Bosson Rd (consent 115739)**

Alligator weed present on residential properties and in planted wetland/pond area at rear of one property. Herbicide spraying of small patches as they emerged was done by Exim contractors in November, January and February

### **Te Kowhai – Ngaruawahia Rd (consent 117655)**

Alligator weed at this site appears to be on land only with none found in wet areas. However, the infestation on land has spread throughout one paddock. Herbicide spraying was carried out in February and April.

### **Hamilton - SHWY 1 (consent 117652)**

Very small amount of alligator weed persists around a small pond. Last controlled February 2011.

### **Puketaha – Kiroa Rd (consent 117654)**

Alligator weed present only on land, none in water. Control was carried out November and February.

### **Kirikiroa Stream, Hamilton (consent 115549)**

Constructed wetland ponds at Somerset subdivision. After several years at zero density it was disappointing to find a small amount of alligator weed reappear in the constructed wetland area.

## Terrestrial sites

In addition to control of alligator weed in aquatic environments, there are several infestations being controlled on land.

**Orongo.** Alligator weed present on two neighbouring small drystock farms. This was a historic site in 1990 and thought to have been eradicated. After paddock remediation works alligator weed reappeared in 2003 and has been controlled annually since then. While it is down to low levels it never-the-less persists. Monitoring plots were set up in 2003, however plots have not been measured since 2010 as there was no alligator weed within the plots. Measurements will be recorded again next season.

**Hikutaia.** A small infestation of alligator weed on a dairy farm at Hikutaia. Originally present in one paddock only, a small plant was discovered in a new paddock this season. Discovered in 2006 and controlled since then with herbicide, this infestation also persists at low levels.

**Waihi.** Alligator weed associated with the Ruahorehore infestation is present on an adjacent dairy farm and was also discovered this season on the property's kiwifruit orchard across the road. There is a small amount of alligator on the stream margins, amongst plantings on the Newmont Mine side. The infestations are well established and will have an extensive root system making them difficult to eradicate. Control will be complicated in the kiwifruit orchard, as suitable effective herbicides may be limited.

**Te Rore.** Alligator weed was found at Te Rore in 2003. Originally limited to a wetland area and a few adjacent paddocks, it has since been found scattered across many paddocks on one of the properties. Wetland alligator weed has been sprayed aerially each year under resource consent and terrestrial alligator weed has been boom or spot sprayed annually. One dairy farm has been declared a Restricted Place and requires intensive management in order to achieve satisfactory control. Council pest plant management contractors liaise with the farm manager to ensure farm activities do not exacerbate alligator weed spread. There were more than 50 farm visits for control and machinery checks this season.

**Cambridge.** The Cambridge site is an eight hectare subdivision property on the outskirts of Cambridge. First discovered here in 2005, alligator weed has been intensively managed in an attempt to eradicate it prior to full development of the site. Control has included removal of soil from the site. No alligator weed found here since March 2010.

**Ohaupo.** Alligator weed discovered on this maize block in March 2007. It is declared a Restricted Place. The landowners are fully cooperative and very vigilant in assisting with management and control of alligator weed. Intensive control including physical removal has been carried out at this property and only two plants were found last year. Both were dug out.

**Ohinewai.** A small infestation of weed persists on this small drystock unit. Sprayed once this season.

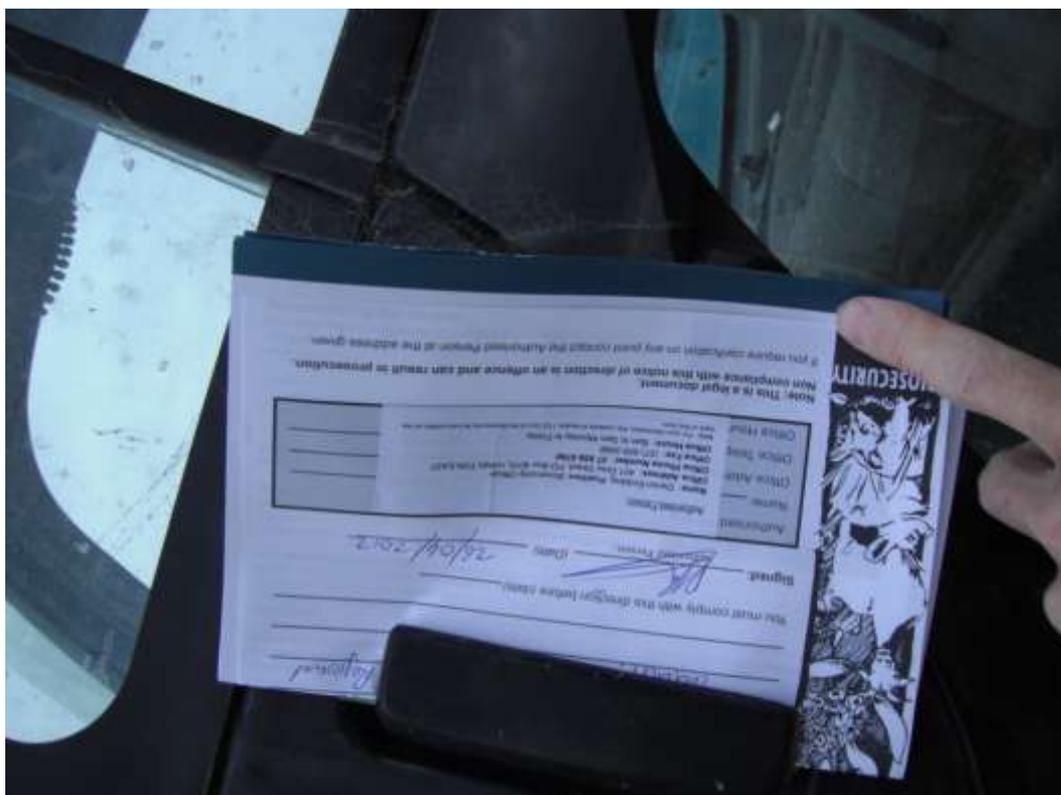
**Te Kauwhata.** A small infestation of alligator weed in one paddock on Wattle Road dairy farm. Needs to be checked next season as no record of work done since 2008.

**Pukekawa.** Alligator weed infestation on cropping land, mainly limited to a small amount in headlands but not seen since last controlled in 2009.

**Te Kowhai.** Alligator weed originally found in the stream in 2007 but now appears to be confined to land and proving to be persistent. Knapsack spraying was carried out in February and March. Property has been subdivided and therefore will need to be reviewed in terms of the risk of spreading alligator weed.

**Hamilton and surrounds.** Alligator weed was first discovered in Hamilton in 1999. Most of the current infestations appear to be associated with subdivision or roading developments. Alligator weed sites include subdivisions at Canaandale, Somerset Heights, San Marco and Flagstaff. Resolution and Wairere Drives are also alligator weed areas. The most recent site in Hamilton, found this season, is a single property with alligator weed on Knighton Road. As a small outlier site it was decided to physically remove the alligator weed and soil, using a digger, in an effort to achieve eradication quickly.

A digger was discovered to have been operating in a Restricted Place area and was issued with a notice of direction to ensure it was cleaned before moving on (Figure 11).



**Figure 11: Notice of Direction attached to digger**

Outside of Hamilton a new infestation was found at Brymer Road and this has also been physically removed, using a digger.

Most Hamilton sites are down to low levels but still persist. The aim is to control all sites at least twice a year but this was not achieved last year.

**Raglan.** A couple of very small infestations at Raglan were treated once and have not been seen since. A new, third site of extensive alligator weed was found in the lawn of a Raglan property while the PPMC was carrying out a compliance inspection.

**Motumaoho.** A new site of alligator weed on a dairy farm was confirmed after being reported by the landowner in January 2012. Extensive alligator weed is present in one paddock and small amounts in another couple of areas. Initial control was by boom spray and followed up with knapsack spraying. It appears the alligator weed has been present for several years and it is not known where it came from, as there has been no contracting machinery in that paddock in recent years.

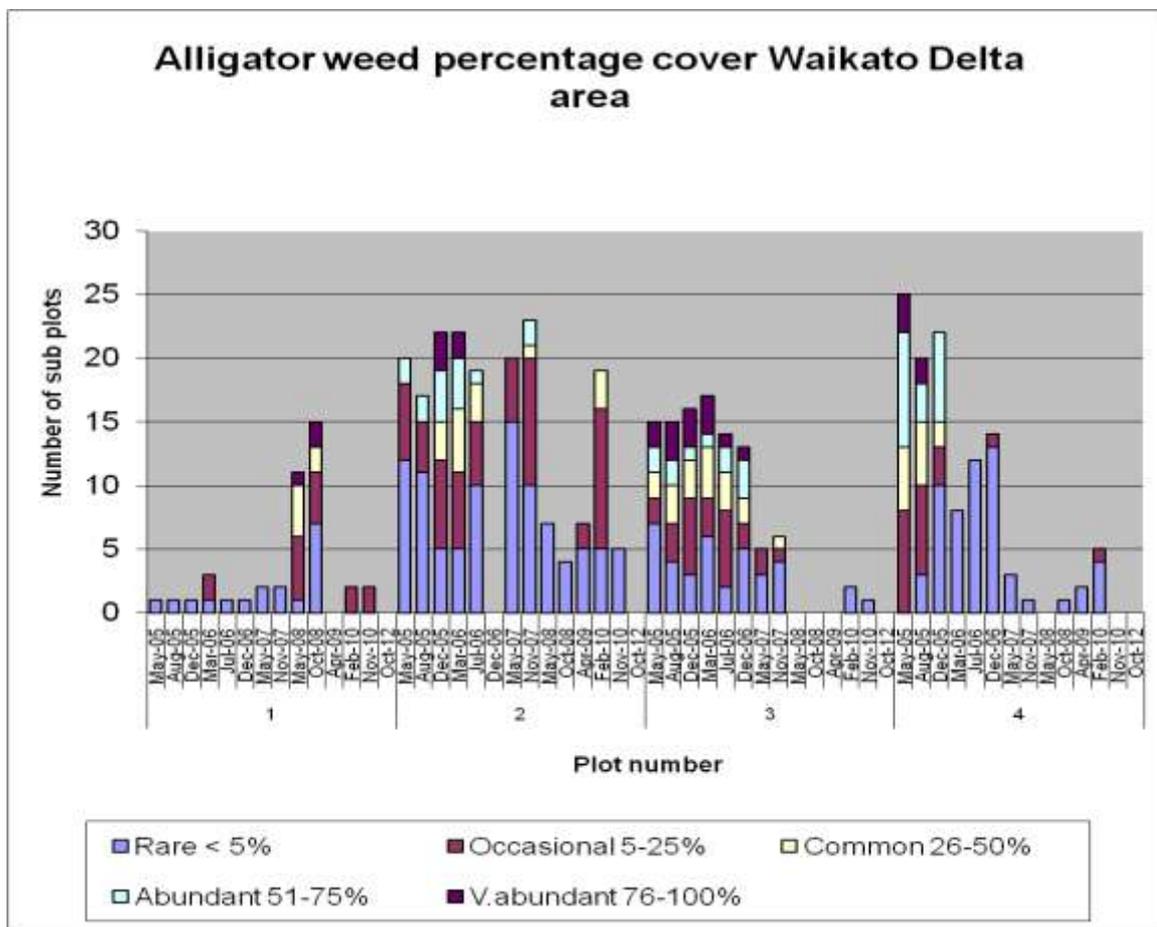
**Ruapuke Beach.** A small infestation of alligator weed was discovered at Ruapuke beach. It may have been transferred to this area by fishing nets.

**Other small sites.** Several other small sites of alligator weed are present in the region including on a farm at Hinuera, two small blocks at Te Pahu, several properties at

Matangi, and one at Kihikihi. A few are at zero density and others are down to very low levels of infestation.

## 4 Monitoring

Monitoring of control was carried out at the Waikato River delta and Ruahorehore sites.



Graph 1: Alligator weed percentage cover Waikato Delta Area

Graph 1 shows monitoring results since March 2005. Overall there has been a reduction in alligator weed in all plots, and alligator weed is at low levels. See monitoring photos for more detail.

At the last monitor in October 2012 no alligator weed was found in any plots. However, significant amounts of alligator weed were found in parts of the delta that missed control in the last season (Figure 12) or where the usual winter control could not be carried out due to holdups with consents (Figure 13).



**Figure 12: Alligator weed missed last season on island opposite Plot 3**



**Figure 13: Alligator weed that should have been controlled over winter**

Below photos show the plots since 2005.  
**Delta monitoring photos**

**Plot 1**



**1a May 2005**



**April 2009**



**Aug 2011**



**October 2012**

Plot 1 - Vegetation in 2005 was dominated by dense *Apium* which appears to keep the small amount of alligator weed at low levels. Since 2005 the area has been treated three times aerially and six times by airboat using gun and hose spraying targeting the alligator weed patches. Aerial control was carried out March 2007, March 2008 and March 2011. Airboat spot spraying was carried out in November 2007, October 2008, January 2009, February 2010, October and December 2012. In 2005 there was a small amount of alligator weed growing amongst water celery. After initial aerial control, water celery was controlled allowing alligator weed regrowth to be targeted for control. Alligator weed peaked in 2008, and after intensive control is at zero density in October 2012. Water celery is again dominant.

## Plot2



**Plot 2 May 2005**



**April 2009**



**August 2011**



**October 2012**

Plot 2 - Vegetation was dominated by water celery and sweet reed grass in 2005. Aerial control has been carried out four times and eight times by airboat using gun and hose spraying targeting the alligator weed patches. Aerial control was carried out in March 2007 and November 2007, November 2010, March 2011. Airboat control was carried out in January and May 2008, June 2009, January, February and June 2011, January and March 2012. In 2005, alligator weed was scattered across most of the plot area at low to abundant levels. In October 2012 sweet reed grass, water speedwell and rushes are establishing, muddy parts of the area appear to be washing away leaving a sandier substrate. No alligator weed was present in the plot area in October 2012.

### Plot 3



3a May 2005



Dec 2006



April 2009



Feb 2010

Plot 3 - In 2005 vegetation was a mix dominated by alligator weed and willow weed. Since 2005 control has been carried nine times out by airboat using gun and hose spraying targeting the alligator weed patches. Control was carried out in September and December 2006, February, November and December 2007, January and March 2008, April 2009, and March 2012. In 2005, alligator weed was scattered over most of the plot at low to abundant levels. At the October 2012 monitor, the plot area was submerged. Previous monitoring and similarities with Plot 2 indicates alligator weed is likely to be at low levels or zero density, and rushes appear to be establishing. As with Plot 2, muddy sediment appears to be eroding exposing a sandier substrate.

## Plot 4



**4c May 2005**



**April 2009**



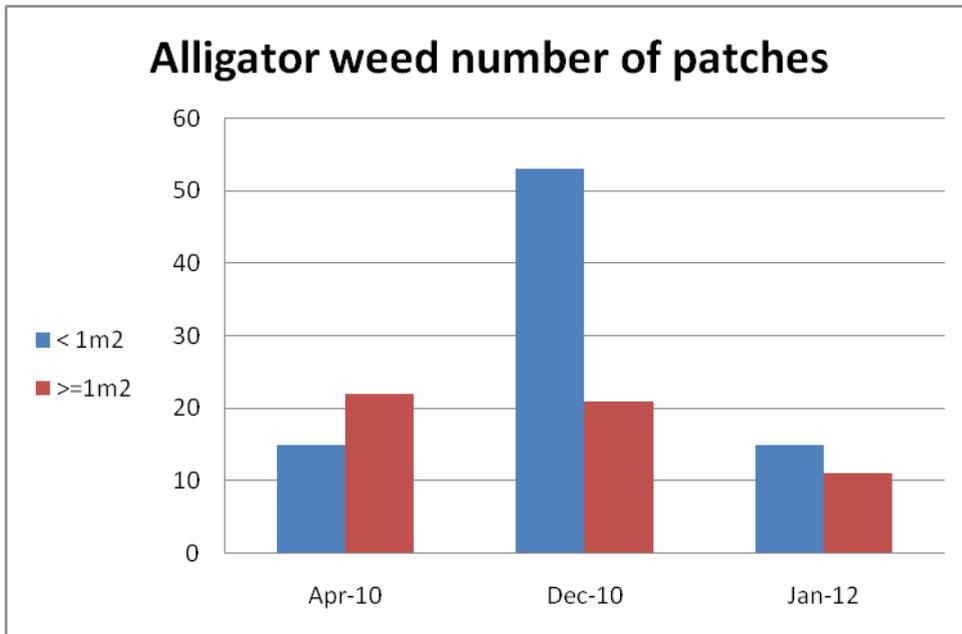
**August 2011**



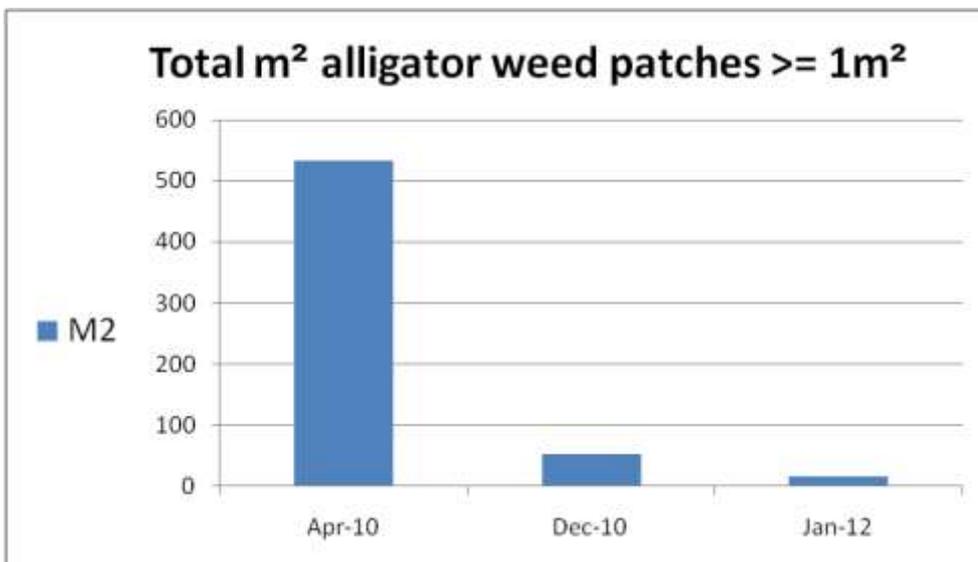
**October 2012**

Plot 4 – Vegetation in 2005 was dominated by alligator weed with some water pepper. Since 2005 aerial control has been carried out six times and nine times by airboat using gun and hose spraying targeting the alligator weed patches. Aerial control was carried out June 2005, August and December 2006, November 2007, November 2010, March 2011. Airboat control was carried out in August and November 2005, January, February, March and August 2006, January, February 2007, and February 2010. In 2005, alligator weed was present across all of the plot area at medium to abundant levels.

Results of alligator weed monitoring at Ruahorehore are shown in Graph 2 and 3. Alligator weed in the stream has reduced significantly. Unfortunately flooding has been a sizable factor in this rather than control.



Graph 2: Number of alligator weed patches  $\geq 1\text{m}^2$  and  $< 1\text{m}^2$



Graph 3: Total m² of patches  $> 1\text{m}^2$

## 5 Surveillance

General surveillance was carried out by boat along the Waikato River from Hamilton downstream, along the Waipa, Waihou and Ohinemuri Rivers. No new sites of alligator weed were found. DOC has carried out surveillance around Lake Waikare, where small amounts of alligator weed have been found and controlled on the Lake shore.

## 6 Notification

This report will be sent to:

- Group Manager, Resource Use Group, Waikato Regional Council
- Waikato Raupatu River Trust
- Huakina Development Trust
- Horahora Marae
- Department of Conservation
- Auckland/Waikato Fish and Game Council
- Onewhero/Tuakau Community Board

- Waikato Conservation Board
- Aka Aka/Otaua Land Drainage Subcommittee

## **7 Alligator weed control programme 2012/2013**

The Waikato Regional Council Biosecurity group has lodged an application for a region-wide consent which, if approved, will enable the use of four herbicides in aquatic situations for the control of aquatic pest plants. While working through the consent process it came to light that consent under the RMA does not constitute permission under the HSNO Act. As a result of this, an application to the Environmental Protection Agency for permission to use herbicides to control a range of plant pests has been lodged by a national consortium of regional councils and DOC.

A pre operational plan for alligator weed control for the 2012/2013 year will be completed once the consents decisions are finalised.