

Control of Floating Pennywort on the River Waveney 2010

Native Landscapes (Contractor) - Final Report



Paul Sims

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Foreword

Floating pennywort is widely regarded to be one of the most invasive plants to have been introduced to Britain in recent times. Introduced in the 1980s, it was first found growing in the wild in Essex in 1991 and has since spread to more than 90 sites, including the River Waveney. The plant can grow at up to 20cm per day, forming dense mats of vegetation which float on the surface of the water, out-competing native species, significantly increasing the risk of flooding and reducing the amenity value of the infested waterbody.

Floating pennywort was first found growing in the River Waveney just downstream of Diss in 2007. Despite a rapid response by staff from the Environment Agency and Broads Authority in 2007, and further concerted efforts to control the plant in 2008 and 2009, the infestation has spread rapidly downstream. By the end of 2009 it was clear that staff from the various partner organisations were unable to dedicate enough time to the project to properly tackle the problem, with the infested area now extending more than 11km downstream of Diss. In particular, the time intervals between surveys were too long for rapid removal of the plant to be facilitated, meaning that often the patches of floating pennywort were too large to be easily removed by hand before they were discovered.

Since Paul started work on the project in May 2010, we have made a huge amount of progress. Having someone on the river for two days a week during the plant's peak growth season, surveying and hand pulling the plant as necessary, has proven to be a highly efficient and cost effective way of tackling an infestation of the plant when it is still at an early stage of invasion.

Thanks in no small part to Paul's efforts over the last six months, we enter 2011 in a much better position, with eradication in the medium term now seeming a realistic aim. Many thanks to everyone who has worked on the project; I look forward to working with you all in 2011 and continuing our good work!



Mike Sutton-Croft

Co-ordinator, Norfolk Non-native Species Initiative

Control of Floating Pennywort on the River Waveney 2010 Native Landscapes (Contractor) – Final Report

Introduction:

My name is Paul Sims and my company Native Landscapes was chosen through a tendering process to carry out the contract: Control of Floating Pennywort on the River Waveney 2010.

The contract started on the 17th May and continued until the 5th of November. Initially, the river was surveyed from Diss Sewage Works to Earsham near Bungay. Following the completion of the initial survey, areas were identified which required regular attention based on the severity of the infestation.

Some landowners along the assigned stretch of river were met on site and informed of the activities taking place. Special thanks for their cooperation in this project must be given to:

- Mr Manning, The Old Mill, Waveney Road, Diss
- The Willows Campsite, Diss
- Mr J. Leada, Monks Hall Farm, Syleham
- Mr D. Casey, Needham Mill
- Mr J. Johnston, Mendham Mill

Throughout the contract, additional surveys were carried out to ensure further contamination downstream had not occurred. Following the completion of each month's work, meetings were attended and reports submitted. These contained details of where floating pennywort had been found, what quantities were found and how they were dealt with. Strategies on how best to deal with floating pennywort were agreed and instigated following each meeting.

Most floating pennywort was carefully removed by hand and spread on the banks of the river. Follow-up checks were made to ensure removed plant matter had died. The majority of floating pennywort was found growing in the margins of the river. It soon became apparent how difficult it was to manually remove floating pennywort from these areas due to the plant's ability to grow through other plants and the fact it breaks very easily. It was agreed at the Steering Group meeting in June 2010 that herbicides would be employed to deal with these areas.

2010 Overall Summary:

The main objective of this contract was to ensure the floating pennywort infestation on the River Waveney was controlled. In my opinion, this objective has been achieved.

Initially, floating pennywort was found concentrated between Diss Sewage Works and Scole Bridge. However, one small patch was later found growing between Hoxne Weir and Syleham Weir. As the season progressed, floating pennywort began appearing in large quantities between Scole Bridge and Billingford Bridge. In the majority of these areas, the infestations were growing in the margins and it was deemed necessary to treat these with herbicide. This was carried out during July and August, with follow-up treatments carried out in September and October.

No mechanical extraction was required during the contract; however, large areas of the river were subject to native weed growth, which in places did hamper efforts to survey and remove floating pennywort. Weed cutting was carried out by the Environment Agency in August between Syleham and Billingford. Although this made it easier to navigate the river, it was noted that floating pennywort began to appear further downstream afterwards, perhaps due to fragmentation.

The section of the River Waveney from Scole to Hoxne suffered badly through the summer months with heavy weed. These included blanket weed, duck weed and most notably *Azolla filiculoides*. Problems with these weeds were made worse by fallen trees which caused the weeds to build up, making it almost impossible to navigate by boat. Fallen trees were reported to the Environment Agency at the monthly meetings.

Conclusion/Recommendations

Floating pennywort appears to be a very adaptable aquatic plant and very prone to fragmentation. Although manual extraction is the most environmentally friendly way of removing plant material, it may not always be the most efficient. This is due to the plant's ability to grow from small fragments; however, it has not been proven conclusively as to what parts it can re-grow from. I carried out experiments at home to see what parts of floating pennywort could re-grow. My results showed that floating pennywort could sometimes grow roots from leaf stalks and can easily re-grow from internodes. Hair roots did not have the ability to grow into new plants.

Floating pennywort can grow under the surface of the water. As water levels dropped through the summer, floating pennywort became more prevalent. This may explain why initial sightings were limited as water levels were high, but progressed as water levels dropped. Floating pennywort tends to grow more rapidly in open sunny situations but will tolerate heavy shade. Bends in the river and overhanging trees were favoured growing places, but floating pennywort was also found in faster flowing water around weirs. This was probably a result of fragments being carried downstream and settling at the first snagging point.

Herbicide treatments were generally very effective; however, it was noted that follow-up treatments were usually required. This may have been due to the nature of the plant's growth. Initially, the plant sits very close to the surface of the water, which makes herbicide application difficult. As the plant matures, the leaves rise up off the surface of the water and herbicide can be applied more easily. At this stage, new growth is still very close to the water surface, sometimes under the surface and avoids contact. Even though herbicides are transported through the plant, it appears the internodes have the ability to partially block the passage of herbicides through the stems. Evidence suggests as the plant dies from the point of treatment the new growth can become detached, drift downstream and re-grow. This scenario can be avoided by "picking back" the new growth manually and treating the main area with herbicide.

Certain weather conditions also favoured the use of herbicides; dry sunny periods where temperatures were above 18°C were very effective, whereas dull and damp conditions often required follow-up treatments. Without the use of herbicides, eradication of floating pennywort would be impossible. As already stated, it is very difficult to manually remove floating pennywort from certain situations and herbicide treatments are the only effective method of dealing with these areas.

Throughout the contract, removed plant material was spread on open sunny banks and follow up checks took place to ensure all plant material had died off. During September, it was noted that removed plant material began to re-grow in the soil where it had been spread due to cooler and wetter weather conditions. These plants were removed and subsequent plant material was collected and composted at my address in Lowestoft.

Floating pennywort was found growing actively throughout October and would no doubt continue to grow through the milder parts of winter and early spring. Winter flooding could cause the further spread of floating pennywort; however, final surveys only showed floating pennywort growing as far as Needham. I would like to suggest a survey (including removal) be

carried out during February to ensure floating pennywort has not been carried further downstream by winter flooding.

As with any unwanted plant species, consistent effort and appropriate removal methods can result in complete eradication. I would suggest a similar programme of work takes place during 2011. The following table shows a guide to the operations which should be carried out:

Date	Operation
May 2011	<ul style="list-style-type: none"> • Survey from Diss sewage works to Earsham • Manually remove all floating pennywort • Remove plant material from site and compost • Follow up checks to ensure removed material is dead
June 2011	<ul style="list-style-type: none"> • Concentrate efforts between Diss and Hoxne • Manually remove free growing floating pennywort • Spread removed material on open sunny banks • Follow up checks to ensure removed material is dead • Carry out herbicide applications where necessary
July 2011	<ul style="list-style-type: none"> • Survey from Diss sewage works to Mendham • Manually remove free growing floating pennywort • Spread removed material on open sunny banks • Follow up checks to ensure removed material is dead • Carry out herbicide applications where necessary
August 2011	<ul style="list-style-type: none"> • Concentrate efforts between Diss and Syleham • Manually remove free growing floating pennywort • Spread removed material on open sunny banks • Follow up checks to ensure removed material is dead • Carry out herbicide applications where necessary
September 2011	<ul style="list-style-type: none"> • Survey from Diss sewage works to Earsham • Manually remove free growing floating pennywort • Remove plant material from site and compost • Carry out herbicide applications where necessary
October 2011	<ul style="list-style-type: none"> • Concentrate efforts where necessary • Manually remove free growing floating pennywort • Remove plant material from site and compost • Carry out herbicide applications where necessary

Overall, the contract to control floating pennywort in 2010 has been a success. Continued work on this project will prevent it spreading further downstream and hopefully ensure eventual eradication.

Finally, I would like to thank everyone for their contribution to this project and to say that I look forward to seeing the good work carried out so far continuing next year.

Paul Sims
Native Landscapes

Appendix 1: Monthly Reports

Native Landscapes (Contractor) Report for May – June 2010

Overall Summary

- Majority of floating pennywort found from Diss sewage works to Scole bridge
- Small patches of floating pennywort found from Scole bridge to Hoxne weir
- No floating pennywort found from Monks Hall (Syleham) to Mendham mill
- Removed floating pennywort spread on open, sunny banks at least 2.5 m from river
- Some awkward areas of floating pennywort left for chemical control

Health and Safety Issues

- First aid kit to be carried at all times
- Mobile phone MUST be carried at all times
- Probing sticks MUST be used when wading in water
- 1 person remains on land or boat with safety line whilst the other person is wading
- Rubber gauntlets MUST be used when removing floating pennywort
- Waterproof plasters MUST be used to cover cuts when working on water

Recommendations

- Weekly visits by contractor - Diss sewage works to Scole Bridge
- Fallen tree G.P.S. – TM144787 (OS230) to be removed to enable easier access
- Bungay canoe club and E.A. staff carry out surveys from Syleham to Bungay
- Landowners sent information on floating pennywort and given contact details
- Volunteers carry out debris clearance work - Diss sewage works to Scole Bridge
- Chemical control to be carried out monthly by contractor on awkward areas between Diss sewage works and Scole bridge
- Photographs to be taken before and after chemical control

Native Landscapes (Contractor) Report for June – July 2010

Overall Summary

- Majority of floating pennywort found from Diss sewage works to Scole Bridge.
- Small patches of floating pennywort found from Scole Bridge to Hoxne weir.
- No floating pennywort found from Mendham mill to Earsham (Bungay).
- Removed floating pennywort spread on open, sunny banks at least 2.5 m from river.
- Some awkward areas of floating pennywort from Diss to Scole Bridge treated with Roundup Pro Biactive and Topfilm 28/6/10.
- Initial herbicide treatment showed positive results by 12/7/10.
- Fallen tree G.P.S. – TM144787 (OS230) now removed.
- Fallen tree between Rose Lane Bridge and Stuston Bridge now removed.

Recommendations

- Weekly visits by contractor - Diss sewage works to Scole Bridge.
- Survey to be carried out to Needham Mill during August.
- Laminated information sheets could be created and erected at portage points between Needham Mill and Bungay.
- Bungay canoe club could be visited or sent information on floating pennywort.
- Further chemical control to be carried out by contractor at the end of July on awkward areas of floating pennywort between Diss sewage works and Scole Bridge.
- Aquatic weeds to be controlled (by herbicide) from Diss sewage works to Scole Bridge. To include: Common Reeds, Rushes and Yellow water Lilly.

Native Landscapes (Contractor) Report for July – August 2010

Overall Summary

- Majority of floating pennywort found from Diss sewage works to Scole Bridge.
- Multiple patches of floating pennywort found from Scole Bridge to Billingford weir.
- Very small amount of floating pennywort found from Billingford weir to Hoxne weir.
- No floating pennywort found from Hoxne weir to Syleham Mill.
- Removed floating pennywort spread on open, sunny banks at least 2.5 m from river.
- Some awkward areas of floating pennywort around Rose Lane Bridge treated with Roundup Pro Biactive and Topfilm 3/8/10.
- Laminated information sheets erected at Homersfield Bridge, Mendham Weir, Needham Mill and Weybread Weir on 26/7/10 and 2/8/10.
- Debris removed from river between Diss sewage works and Stuston Bridge. Rubble moved to edges of river and branches placed on banks.
- Overhanging branches between Diss sewage works and Scole Bridge cut back by contractor during surveys and moved to banks.

Recommendations

- Weekly visits by contractor - Diss sewage works to Scole Bridge.
- Survey to be carried out to Needham Mill during August.
- Further chemical control to be carried out by contractor in August on awkward areas of floating pennywort between Scole Bridge and Billingford weir.
- Additional laminated information sheets could be erected at Hoxne Weir, Syleham Mill and Bungay canoe club.
- Bungay canoe club could be visited or sent information on floating pennywort.
- Aquatic weeds to be controlled (by herbicide) from Diss sewage works to Scole Bridge during August. To include: Common Reeds, Rushes and Yellow water Lilly.

Native Landscapes (Contractor) Report for August – September 2010

Overall Summary

- Majority of floating pennywort found from Scole Bridge to Billingford weir.
- Small patches of floating pennywort found from Diss Sewage Works to Scole Bridge.
- Small patches of floating pennywort found from Billingford Weir to Needham Weir.
- Large patch of floating pennywort found downstream of Needham Mill by E.A. staff. Treated with Roundup Pro Biactive and Topfilm 2/9/10 TM232815.
- Patches of floating pennywort from Scole Bridge to Billingford Bridge treated with Roundup Pro Biactive and Topfilm 24/8/10 and 3/9/10.
- Weed cutting carried out from Hoxne weir to Billingford Bridge 1/9/10.
- Removed floating pennywort and spread on banks at least 2.5 m from river.

Recommendations

- Further chemical control may be required on areas of floating pennywort growing into margins between Scole Bridge and Hoxne weir during September.
- Follow up herbicide treatment required on large patch of floating pennywort downstream from Needham mill during September.
- Overhanging branches and fallen trees between Diss Sewage Works and Scole Bridge require cutting back and removal.
- Fallen tree requires removal Scole Bridge TM147785.
- Fallen tree requires removal downstream of Billingford Bridge TM169783.
- Fallen tree requires removal between Hoxne and Syleham TM196783.
- Fallen tree requires removal downstream of Syleham Mill TM216797.
- Fallen tree requires removal upstream of Needham Mill TM226808.
- Overhanging tree requires pruning at Needham Mill TM228811.

Native Landscapes (Contractor) Report for September – October 2010

Overall Summary

- Follow up herbicide treatment on floating pennywort carried out from Scole Bridge to Syleham Weir 16/09/10 + 17/09/10.
- Small patches of floating pennywort found from Diss Sewage Works to Scole.
- 1 small patch of floating pennywort found from Syleham Weir to Needham Weir.
- Large patch of floating pennywort upstream of Syleham Weir. Treated with Roundup Pro Biactive and Topfilm 16/09/10. Grid reference TM815232.
- 2 small patches of floating pennywort found downstream of Needham Mill. Treated with Roundup Pro Biactive and Topfilm 30/09/10. Grid reference TM817233
- Removed floating pennywort found growing on soil at “The Willows” campsite.

Recommendations

- Floating pennywort not to be spread on open ground from September onwards due to the possibility of re-growth. Contractor to arrange alternative disposal with steering group at monthly meeting.
- Further chemical control may be required on areas of floating pennywort growing into margins between Scole Bridge and Syleham Weir during October.
- Overhanging branches and fallen trees between Diss Sewage Works and Scole Bridge require cutting back and removal.
- Fallen tree requires removal Scole Bridge TM785148.
- Fallen tree requires removal downstream of Billingford Bridge TM783169.
- Fallen tree requires removal upstream of Hoxne Weir TM782184.
- Fallen tree requires removal between Hoxne and Syleham TM783194.
- Fallen tree requires removal between Hoxne and Syleham TM783195.
- Fallen tree requires removal downstream of Syleham Mill TM797215.
- Fallen tree requires removal upstream of Needham Mill TM808227.
- Overhanging tree requires pruning at Needham Mill TM811229.

Native Landscapes (Contractor) Report for October – November 2010

Overall Summary

- Floating pennywort growth rate significantly reduced, however mild weather conditions have enabled plants to continue to grow.
- Majority of actively growing pennywort found growing between Diss (Waveney Road) and Billingford Bridge.
- Sporadic patches of pennywort found between Billingford Bridge and Syleham Weir 08/10/10 and 04/11/10.
- Follow up herbicide treatment on floating pennywort carried out from Scole Bridge to Billingford Bridge 07/10/10.
- Floating pennywort found growing in margins at grid reference TM784180 + TM782184 + TM791206. Treated with Roundup Pro Biactive and Topfilm 08/10/10.
- Floating pennywort found from Diss Sewage Works to Scole Bridge removed manually. Floating pennywort found growing in margins at grid reference TM792123 + TM789128 + TM790131 treated with Roundup Pro Biactive + Topfilm on 21/10/10.
- Floating pennywort found growing in margins between grid references TM818235 to TM819236. Treated with Roundup Pro Biactive and Topfilm 22/10/10.
- Floating pennywort found from Stuston Bridge to Billingford Bridge removed manually. Floating pennywort found growing in ditch at grid reference TM783157 treated with Roundup Pro Biactive + Topfilm on 28/10/10.
- Herbicide treatments carried out during October appeared to be less effective than other treatments. This may be due to cooler air and water temperatures.

Appendix 2: Grid Reference, Severity and Removal Method

Date	Map Reference	Grade / Severity	Removal Method
17-05-10	TM785148 TM785148 to TM785155 TM785155 TM785155 to TM783157 TM783157 TM783157 to TM783163 TM783163 TM783163 to TM783167	Green Blue Green Blue Green Blue Green Blue	Manual NA Manual NA Manual NA Manual NA
18-05-10	TM783167 to TM784196 TM784196 TM784196 to TM785201	Blue Green Blue	NA Manual NA
24-05-10	TM785148 to TM786146 TM786146 TM786146 to TM789131	Blue Yellow Green	NA Manual Manual
25-05-10	TM785201 to TM812229	Blue	NA
03-06-10	TM793121 to TM793123 TM793123 to TM792124	Blue Green	NA Manual
04-06-10	TM792124 to TM791126 TM791126 TM791126 to TM790127	Green Red Green	Manual Manual Manual
07-06-10	TM790127 to TM790132	Green	Manual
08-06-10	TM812229 to TM834270	Blue	NA
14-06-10	TM793121 to TM793124 TM793124 to TM790132	Blue Green	NA Manual
15-06-10	TM787143 to TM790132	Green	Manual
21-06-10	TM834270 to TM	Blue	NA
22-06-10	TM793121 to TM793123 TM793123 to TM790132	Blue Green	NA Manual
28-06-10	TM793121 to TM793124 TM793124 to TM792125 TM789131 TM790132 TM789140 TM787144 TM786146	Blue Green Green Green Green Green Yellow	NA Chemical Chemical Chemical Chemical Chemical Chemical
29-06-10	TM787144 to TM785148 TM785148 to TM785154 TM785154 TM785154 to TM783158 TM783158	Green Blue Green Blue Green	Manual NA Manual NA Manual
29-06-10	TM783158 to TM783162 TM783162 TM783162 to TM783165 TM783165 TM783165 to TM783167 TM789131 to TM790136	Blue Green Blue Green Blue Green	NA Manual NA Manual NA Manual
05-07-10	TM789131 to TM787145	Green	Manual
06-07-10	TM783167 to TM783170 TM783170 to TM784172 TM784172 to TM785173	Green Blue Green	Manual NA Manual

	TM785173 to TM784180 TM784180 to TM784182 TM784182 to TM783183 TM783183 to TM781185 TM781185 to TM792213	Blue Green Blue Green Blue	NA Manual NA Manual NA
12-07-10	TM793121 to TM793123 TM793123 to TM790137	Blue Green	NA Manual
13-07-10	TM785148 to TM790137	Green	Manual
19-07-10	TM793121 to TM793124 TM793124 to TM790137	Blue Green	NA Manual
20-07-10	TM785148 to TM790137	Green	Manual
26-07-10	TM793121 to TM793123 TM793123 to TM790137	Blue Green	NA Manual
27-07-10	TM787144 to TM783167	Green	Manual
02-08-10	TM783167 to TM783171 TM783171 to TM785173 TM785173 to TM785174 TM785174 to TM783179 TM784178 to TM781185 TM781185 to TM792213	Green Blue Green Blue Green Blue	Manual NA Manual NA Manual NA
03-08-10	TM793121 to TM793124 TM793124 to TM790127 TM790127 to TM789128 TM789128 to TM790137	Blue Green Green Green	NA Manual Chemical Manual
04-08-10	TM785201 to TM790206 TM790206 TM790206 to TM792213 TM792213 TM792213 to TM795215 TM795215 TM795215 to TM805225 TM805225 TM805225 to TM812229 TM812229	Blue Green Blue Green Blue Green Blue Green Blue Green	NA Manual NA Manual NA Manual NA Manual NA Manual
16-08-10	TM785148 to TM790137	Green	Manual
17-08-10	TM793121 to TM793123 TM793123 to TM790137	Blue Green	NA Manual
24-08-10	TM787144 to TM783167	Green	Chemical
25-08-10	TM783167 to TM783171 TM783171 to TM785173 TM785173 to TM785174 TM785174 to TM783179 TM784178 to TM781185 TM781185 to TM792213	Green Blue Green Blue Green Blue	Manual NA Manual NA Manual NA
26-08-10	TM785148 to TM790137	Green	Manual
02-09-10	TM792213 TM792213 to TM795215 TM795215 TM795215 to TM805225 TM805225 TM805225 to TM817234 TM817234 TM817234 to TM819241	Green Blue Green Blue Green Blue Yellow Blue	Manual NA Manual NA Manual NA Chemical NA

	TM783195 to TM784197 TM784197 TM784197 to TM785200 TM785200 TM785200 to TM787203 TM787203 TM787203 to TM790206 TM790206 TM790206 to TM792210 TM792210 TM792210 to TM792213	Blue Green Blue Green Blue Green Blue Green Blue Green Blue	NA Manual NA Manual NA Manual NA Manual NA Manual NA
21-10-10	TM793121 to TM793123 TM793123 to TM790137	Blue Green	NA Manual
22-10-10	TM792213 TM792213 to TM804224 TM804224 TM804224 to TM818235 TM818235 to TM819236 TM819236 to TM819241	Green Blue Green Blue Green Blue	Manual NA Manual NA Chemical NA
28-10-10 28-10-10	TM790137 to TM789141 TM789141 TM789141 to TM787143 TM787143 TM787143 to TM784155 TM784155 TM784155 to TM783157 TM783157 TM783157 to TM783158 TM783158 to TM783162 TM783162 to TM783166 TM783166 TM783166 to TM783167	Blue Green Blue Green Blue Green Blue Green Blue Green Blue Green Blue	NA Manual NA Manual NA Manual NA Chemical NA Manual NA Manual NA
29-10-10	NA	NA	NA
04-11-10	TM783167 to TM784172 TM784172 TM784172 to TM784180 TM784180 to TM784181 TM784181 to TM782183 TM782183 to TM781184 TM781184 to TM784196 TM784196 TM784196 to TM790203 TM790203 TM790203 to TM792212 TM792212 TM792212 to TM792213	Blue Green Blue Green Blue Green Blue Green Blue Green Blue Green Blue	NA Manual NA Manual NA Manual NA Manual NA Manual NA Manual NA
05-11-10	TM793121 to TM793123 TM793123 to TM792125 TM792125 to TM790127 TM790127 to TM790137	Blue Green Blue Green	NA Manual NA Manual

Key to Grade / Severity:

O Blue	No floating pennywort found
O Green	Multiple patches of floating pennywort found up to 1 metre in diameter (up to 10% cover).
O Yellow	Patches of floating pennywort found 2 to 3 metres in diameter (up to 25% cover).
O Red	Large patches of floating pennywort found over 30% coverage of the river's width.

