

Freshwater non-native species management initiatives

Natural England Research Report NERR023

Freshwater non-native species management initiatives

Eliot Taylor and Esther Lycett

Atkins Limited



Published on 8 December 2008

The views in this report are those of the authors and do not necessarily represent those of Natural England. You may reproduce as many individual copies of this report as you like, provided such copies stipulate that copyright remains with Natural England, 1 East Parade, Sheffield, S1 2ET

ISSN 1754-1956

© **Copyright Natural England 2008**

Project details

This report results from research commissioned by Natural England in order to pilot county level strategic approaches to freshwater non-native species management. The work was undertaken under Natural England contract SAE03-02-058 by the following team: Eliot Taylor and Esther Lycett at Atkins Limited.

A summary of the findings covered by this report, as well as Natural England's views on this research, can be found within Natural England Research Information Note RIN023 – Freshwater non-native species management initiatives.

This report should be cited as:

LYCETT, E. & TAYLOR, E. 2008. *Freshwater non-native species management initiatives*. Natural England Research Reports, Number 023.

Project manager

Dr Stewart Clarke
Natural England
Northminster House
Peterborough
PE1 1UA

Tel: 01733 455564

Fax: 01733 455147

stewart.clarke@naturalengland.org.uk

Contractor

Atkins Limited
Woodcote Grove
Ashley Road
Epsom
Surrey
KT18 5BW

Tel: +44 (0)1372 726140

Fax: +44 (0)1372 740055

www.atkinsglobal.com

Acknowledgments

We would like to thank the stakeholders and chairs involved in both pilot initiatives for their time and contributions to the project.

Summary

Non-native species are recognised as a major threat to biodiversity and are a reason for the unfavourable condition of a number of Sites of Special Scientific Interest (SSSI).

Currently, there is no single body with sole responsibility for the control or management of non-native species. The majority of management efforts are, therefore, carried out in a piecemeal approach by numerous separate organisations, individuals and volunteer groups.

One of the problems of this approach is that there is, for example, a risk of re-infestation if non-native species management is not addressed in a coordinated manner on a wider scale. Past experience has shown that there is significant benefit to be gained from implementation of a coordinated approach, for example where existing control and management efforts are coordinated across a wider scale, and that this achieves greater impact with relatively little additional input.

Based on the above, this project aimed to set up two pilot non-native species management initiatives to demonstrate the benefits of a coordinated approach and to act as best practice guidance for other similar initiatives across the country.

The two pilots were established in Norfolk and Cumbria and involved a range of stakeholders identified by Natural England and its consultants. This initial list of stakeholders was further developed during the process following input and suggestions from the stakeholders themselves.

This report concentrates on and documents the process undertaken in establishing the two groups. It highlights the challenges encountered and the lessons learned and, from these, goes on to make recommendations as to how further, similar future initiatives should be established. It also outlines suggestions and recommendations for new national research and development requirements that would benefit the management and control of non-native species across the country as a whole.

Through this project a number of actions were identified that would be most efficiently addressed at a national level. It was clear that for some non-native species there is a lack of information on ecology, distribution and control methods; this is essential for establishing a management programme and could be undertaken through the risk analysis panel of the GB non-native species mechanism. A programme of research towards novel management and control methods was also identified as a national priority.

It is widely recognised that tackling non-native species nationally will require large sums of money and significant coordination. A recommendation from this project is for a national central fund to be established to assist with the set up of county based non-native species initiatives and to provide match funding for a coordinator role for each initiative.

Contents

1	Introduction	1
	Strategies for freshwater non-native species management: pilot project	1
2	Process	4
	Stage 1: Identification of an appropriate scale at which to run the initiative	4
	Stage 2: Identify and contact relevant stakeholders	5
	Stage 3: Organise and facilitate workshops	8
	Workshop 1	8
	Workshop 2	10
	Stage 4: Draft targets and actions	11
	Specific targets and actions	15
	Stage 5: Ensuring engagement and sustainability of the process	18
3	Non-native species: the national context	20
4	Conclusions	22
5	References	24

Appendices

Appendix 1 Freshwater Non-native Species Initiative Terms of Reference	25
Appendix 2 Freshwater Non-native Species Initiative Coordinator Terms of Reference	26
Appendix 3 Energy Investment Model	28
Spectators	28
Victims	29
Champions/Players	29
Cynics	30
Appendix 4 Awareness Raising Campaign, New Zealand	31
Appendix 5 County specific non-natives species lists and categorisation	33
Norfolk	33
Cumbria	37

List of tables

Table 1	Key freshwater non-native species initiative stakeholders	7
Table 2	Aspirations of stakeholders and reasons for involvement	7
Table 3	Selected targets for a hypothetical non-native plant control strategy	16
Appendix 5:		
Table A	Final list of non-native species in Norfolk for further consideration	33
Table B	Prioritisation of Species of Concern in Norfolk	35
Table C	Final list of non-native species in Cumbria for further consideration	37
Table D	Prioritisation of Species of Concern in Cumbria	38

List of figures

Figure 1	Steps in addressing a non-native species problem in a waterbody	2
Figure 2	The Energy Investment Model	6
Figure 3	Proposed interaction between national, regional and local levels	20
Appendix 3:		
Figure A	Lineberry's Energy Investment Model	28

1 Introduction

Strategies for freshwater non-native species management: pilot project

- 1.1 Invasive non-native species are recognised as a significant threat to biodiversity and freshwater habitats appear to be particularly susceptible. A number of freshwater Sites of Special Scientific Interest (SSSIs) in England are currently in unfavourable condition due to the presence and impact of non-native species. Species such as Australian swamp stonecrop *Crassula helmsii* and North American signal crayfish *Pacifastacus leniusculus* are now widespread in many areas of England and are having wide-reaching adverse effects. In contrast, other species have been introduced more recently and their further spread may be preventable.
- 1.2 There are already numerous local and national groups involved in non-native species management; these include statutory bodies such as Natural England and the Environment Agency, non-statutory bodies and small local volunteer groups. However, there is a general consensus that such work is often undertaken in isolation from other relevant activities or is geographically limited in scope. In part this probably stems from the fact that no one organisation has overall responsibility for the control and management of non-native species (Defra, 2003).
- 1.3 Experience in controlling problem species has indicated that eradication is difficult and that there is, for example, a risk of re-infestation from neighbouring sites or upstream sections if a strategic approach is not adopted. Past experience suggests that coordinated control programmes, which have the support of a wide range of partners and stakeholders, may have a much greater chance of success in the long term. There are several projects where such an approach has been adopted; two good examples being the Cornish Knotweed Forum (URL: www.projects.ex.ac.uk/knotweed) and the Tweed Invasives Project (URL: www.tweedforum.com/projects/content/pdf/obj2125?view=108). Figure 1 outlines the steps in a management programme to tackle a non-native species problem at site level highlighting the central role of an overall strategy within this process.
- 1.4 A range of terms have been adopted to describe these multi-partner coordinated approaches. The term 'forum' is frequently employed but during the early stages of this project a number of stakeholders commented on the need for groups to be 'outcome focused' and concerned with practical action to combat non-native species problems. The term 'initiative' has been adopted to better reflect this practical approach.
- 1.5 Natural England recognises the importance of working with a range of partners and stakeholders to address invasive non-native species problems (see RPS, 2006) and has advocated such an approach especially as a means of delivering 'programmes of measures' for aquatic non-native species problems under the EU Water Framework Directive.
- 1.6 The Water Framework Directive requires environmental objectives to be set for water bodies and protected areas, compliance with standards and the implementation of programmes of measures to meet those objectives. The primary objective of the directive is for all water bodies to achieve good (ecological and chemical) status but there are other requirements such as preventing deterioration and meeting specific objectives for 'protected areas'. These objectives and programmes of measures form part of the River Basin Management Plans (RBMPs) and are derived through River Basin Liaison Panels (RBLPs), partnerships of a range of public, private and voluntary sector organisations that will be affected by the RBMPs; in England the overall responsibility of the Plans lies with the Environment Agency (Defra, 2006). The presence of non-native species may be identified as a 'significant water management issue', requiring attention

through this process. The river basin focus and an emphasis on stakeholder engagement in integrated catchment management make the directive ideally suited to tackling freshwater non-native species problems.

- 1.7 Long term control of non-native species pressures is dependent upon strategic action and risk assessment at both the UK level and at a more local scale. The scale of many non-native species problems, however, is such that a national level approach is confined to establishing regulatory frameworks and generic risk assessment procedures, for example the UK Non-native Organism Risk Assessment Scheme (Defra, 2005). Addressing non-native species problems that prevent the achievement of good ecological status or unfavourable condition in designated freshwater sites (SSSIs) will require action targeted within a specific waterbody and will also need to consider potential sources of re-infestation. Furthermore, the UK presents a number of distinct biogeographic regions, each with their own legacy of infestations. Therefore, it is not appropriate to set priorities for action at a national level, although the agencies must continue to work together at the national level to identify any policy changes required, establish best practice and identify generic research and development issues.

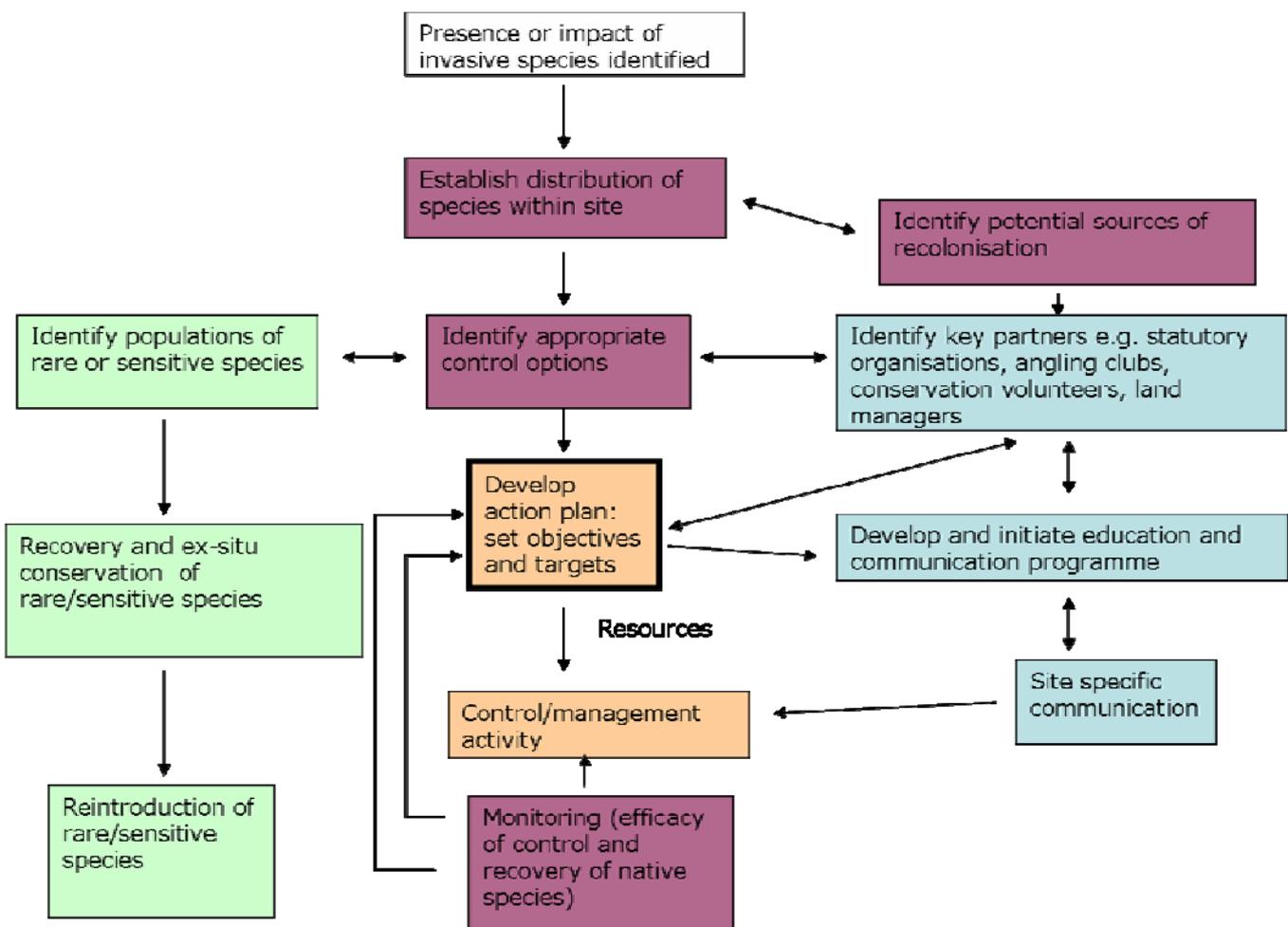


Figure 1 Steps in addressing a non-native species problem in a waterbody

- 1.8 The establishment of non-native species management ‘initiatives’ has the potential to ensure better coordination of such existing activities, to capture learning and promote best practice and ultimately to produce significant results with relatively small additional input. This project was designed to demonstrate the potential of such coordinated and strategic approaches for managing freshwater non-native species by initiating two county-based pilot initiatives; one in Cumbria and one in Norfolk. The main objectives of the project were as follows:
- To establish an initiative, comprising key individuals and organisations, in each of the two counties.
 - To organise and facilitate two workshops for each initiative.
 - To assist each initiative in developing a suite of targets/objectives and a work plan to deliver these.
 - To produce a report describing the work undertaken, critically evaluating the process and detailing lessons learned.
- 1.9 This report is the output of the last of these objectives. It highlights the challenges encountered and the lessons learned. From these, it makes recommendations as to how further initiatives of a similar nature should be established in the future and goes on to make suggestions and recommendations for national research and development requirements for non-native species management as a whole. These recommendations are presented throughout the report.

2 Process

2.1 The process followed during this project is likely to be appropriate for other locally based initiatives; it comprised four main stages:

- 1) identify an appropriate area at which to establish and run the initiative
- 2) identify and contact stakeholders
- 3) set up and run initial workshops
- 4) develop and agree targets and work plans.

Throughout the process it is vital to ensure that the initiative continues beyond the initial workshops. Although the activities undertaken in the four steps above assist in this process, there are other elements that may be employed during and beyond these four main stages:

- 5) ensure engagement and sustainability.

Stage 1: Identification of an appropriate scale at which to run the initiative

2.2 It is important to identify an appropriate scale at which to attempt to establish a coordinated, stakeholder driven approach to non-native species management. Previous work (RPS, 2006) and the work undertaken for this project both indicate that initiatives should be established using administrative boundaries, as opposed to hydrological or ecological boundaries. This is because the vast majority of stakeholder groups operate at, or at least incorporate elements of, administrative boundaries. This is irrespective of, and indeed in the first instance overrides, the fact that management of non-native species, as well as the issues caused by non-native species, often 'operate' more at either hydrological (for example, catchment) or ecological levels. Once an initiative has been established, however, particularly if initiatives can be established side-by-side, issues such as scale can be better addressed and the appropriate resources brought to bear. It is also possible for initiatives to operate at the broad-scale of a county or other administrative district but to take account of, and incorporate elements of other features or scales, such as the catchment.

2.3 The initiatives in this project were established at county level. It is also recommended that there should be strong links at the catchment level through the Water Framework Directive River Basin Liaison Panels (RBLPs). RBLPs encompass an element of unitary boundary whilst operating primarily on a catchment scale. Importantly, programmes of measures are identified at the river basin level for each waterbody in order to achieve the targets set in the RBMP. This is particularly valuable where non-native species are identified as a significant water management issue. Links can be made with the RBLP through the Environment Agency locally.

Recommendation 1

- New non-native species initiatives should be established using county as the basic area for their composition but also link with the River Basin Liaison Panels through the Environment Agency.

Stage 2: Identify and contact relevant stakeholders

- 2.4 It is important to identify all potentially interested and relevant parties at the outset. The organisations and individuals with an interest in addressing issues raised by the presence and spread of freshwater non-native species are numerous and wide ranging; they include both statutory and non-statutory organisations, conservation volunteer groups and key user (recreational) groups. The structure and composition of non-statutory organisations varies from county to county and it is therefore important to compile a list of potential stakeholders in consultation with key individuals who have detailed local knowledge.
- 2.5 Within the larger individual organisations there are also likely to be a number of positions and teams with an interest in addressing issues raised by the presence and spread of freshwater non-native species. For example, within the Environment Agency, non-native species raise issues for both flood risk management and biodiversity teams and will increasingly be of concern to those responsible for implementing programmes of measures for the EU Water Framework Directive. Where this is the case, experience gained from this project suggests that, in the first instance, it is best to agree one person within that organisation to take the lead role. They should consult and coordinate with all relevant colleagues within their organisation and then act as the sole representative at meetings, feeding information both ways. This is because, whilst it is important to get the involvement of all relevant positions and teams within the larger organisations, a smaller stakeholder group is more manageable and productive at the outset of such processes. Once established and working effectively, different individuals can be brought in from time to time as and when necessary.
- 2.6 Once a core group has been identified, stakeholders themselves may also identify others locally whose involvement is essential. This can be done both as a formal process at the outset and informally as the process roles out. The former can be done by sending a complete list of all those people invited to the inaugural meeting of a new initiative to everyone attending and inviting them to identify any further stakeholders they feel should also be involved. The latter is achieved as the process roles out and as gaps in the current composition are highlighted. For example, the development of work programmes may identify key landowners whose cooperation is necessary to undertake survey or control work.
- 2.7 Gaining the agreement and support of stakeholders already involved in non-native species management work, or those dealing with the consequences of the impacts of non-natives species, will be relatively easy. There are, however, other stakeholders, key to the success of such initiatives, whose role is not considered, either by themselves or others, as a priority (and sometimes even as a need or possibility). Such stakeholders will need a more careful approach than that taken to the main groups outlined above in order to ensure their inclusion. An appropriate approach might be through a one-to-one, usually face-to-face, meeting in order to discuss the topic and to be able to explain the significance of the impacts of non-natives species, how these relate directly to the stakeholder and to outline how their particular involvement is crucial in eliciting or developing solutions to the problems.
- 2.8 Even when all key stakeholder groups are adequately represented in an initiative, when it comes to decision-making, and especially to committing resources such as funding or time, these representatives are not necessarily always the 'right people'. This is often because, in the first instance, those that are chosen to, or who have the time to, represent their organisation are not in a position to commit funding or resources. To some extent this issue can be overcome by involving staff on the ground or specialist staff, gaining their commitment and relying on them to negotiate within their own organisations. On balance it is generally better to populate the initiative with those who have practical experience than those with more strategic roles but less hands-on experience. Organisational commitment is also facilitated, for example, by specific actions of the initiative, such as creation of species categories (see Section 2.19), development of broad targets

and actions (see Sections 2.29-2.51) and agreeing a terms of reference for the initiative and coordinator post (see Sections 2.39-2.44).

2.9 Even in an initiative where the right people, at the right level, in the right stakeholder organisations are represented, there will be individual personalities that influence the running, and potentially the overall success of, stakeholder groups. For example, if a particular member of the initiative, especially a well known, energetic or influential one lacks motivation to keep the process moving, success for the initiative as a whole will be more difficult. The Energy Investment Model developed by Claude Lineberry in the 1980s is a useful theory in this respect. Lineberry classified people involved in particular programmes, employed by organisations or involved in initiatives (such as non-native species management) into four main groups based on a combination of their attitude to the process and their energy levels. The model's output (see Figure 2) is also very useful in developing appropriate management methods and attitudes to employ with people in the different categories. Further details of Lineberry's Energy Investment Model are given in Appendix 3: Energy Investment Model.

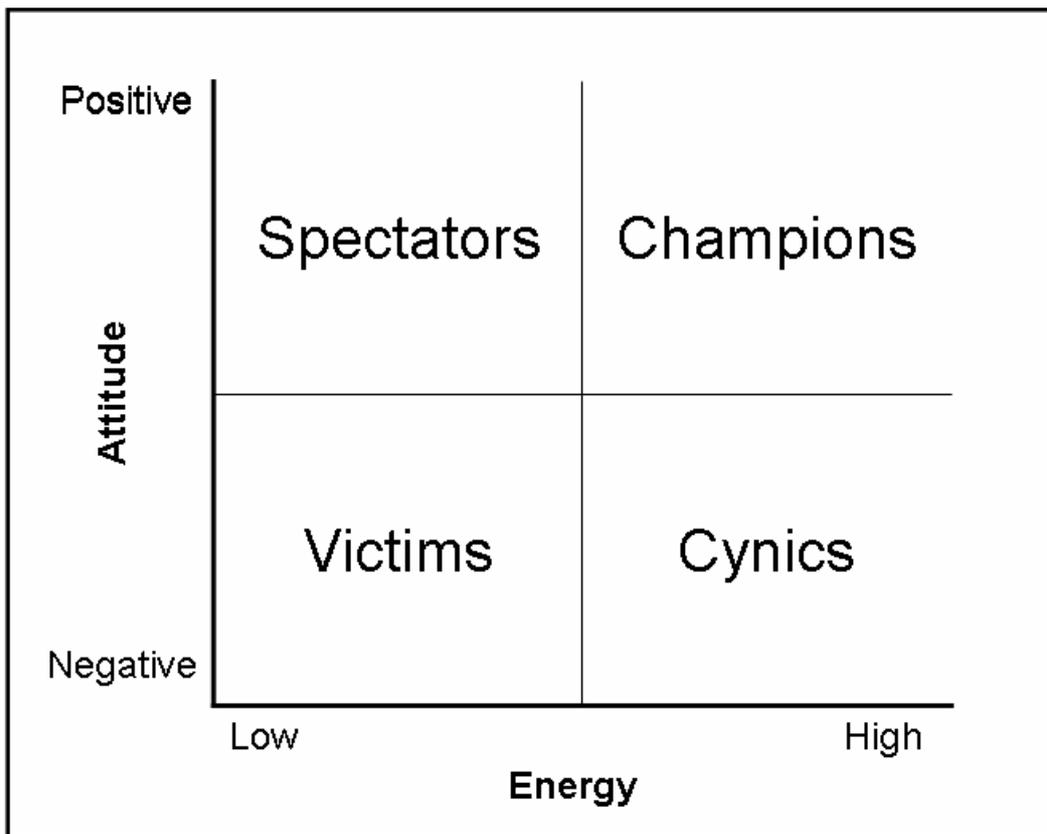


Figure 2 The Energy Investment Model

2.10 Table 1 shows the core stakeholders involved in the Norfolk and Cumbria initiatives in this project. This list is not exhaustive; stakeholder involvement varies by location and detailed thought will need to be given as to who should be involved in each different location.

Table 1 Key freshwater non-native species initiative stakeholders

Environment Agency	Local groups and volunteers
Natural England	Specialist groups, for example, Freshwater Biological Association
National Park Authorities	Farming and Wildlife Advisory Group
Universities	Wildlife Trusts
Councils	Landowners (or representatives for example, CLA)
Water companies	National Farmers Union
National Trust	Anglers consultative groups
British Trust for Conservation Volunteers	Local biodiversity partnerships
British Waterways	River Trusts
Internal Drainage Boards	

2.11 Aspirations and reasons for joining the process were equally as wide ranging as Table 2 shows.

Table 2 Aspirations of stakeholders and reasons for involvement

Representing volunteers who may be involved in future hands-on work	Need for science and evidence base to make effective decisions
Coordinated control	Find out about funding
Answers to problem species	Help in data collation
Identification of potential problem species	Awareness and clarity of visions, targets and dates
Meeting potential partners	Gain support for current activity
Link up with other projects	Use of GIS & mapping tools for now and future
Definition of best practice	Gain strategic ideas for non-native species issues
Join the process	Get useable enforceable and powerful legislation
Simplification of communication to user groups	Convince local authorities of the need for concerted action
A one-stop-shop for information	Understand how individual organisations can help

Recommendation 2

- Limit the number of individuals from each organisation at the outset. Ask stakeholders who wish to send more than one representative to consult internally and agree on one person to act as a representative. Other individuals can be brought in as and when necessary at a later date.
- Use stakeholders identified *a priori* to assist in identification of other stakeholders as the process develops.
- Take a more personal approach to ensure engagement of stakeholders who might see themselves as unimportant to the process but who are in fact key.

- Develop agreed and documented outputs from meetings, for example, work plans, ToRs etc for members to take away for approval by decision-makers.
- Use Lineberry's 'Energy Investment Model' to determine the nature of each of the stakeholders in the initiative and thus how to manage and approach them.

Stage 3: Organise and facilitate workshops

- 2.12 A balance needs to be struck between holding meetings and ensuring action on the ground. Although it is important to limit the number of meetings prior to starting any visible actions (to avoid the perception or accusation that the initiative is merely a 'talking shop'), it is also clearly important to discuss the current status quo of local non-native species management. This is needed to consolidate information and formulate the best plan to set up and manage a coordinated approach to non-native species management and is best achieved through face-to-face discussions with all interested parties around the table.
- 2.13 In order to assist with local engagement, experience from this project shows that it can be a great help to the initial process to involve a reputable chairperson to head the initiative and facilitate group discussions - at least at the outset. The presence of such a chair encourages those unclear of either the purpose or worth of the project to make a positive decision about their own involvement. The chair should be somebody of at least county renown and preferably with some experience in the field of non-native species management, dealing with the effects of non-native species and of stakeholder engagement processes.
- 2.14 In order to further promote commitment from all parties, meetings should be organised and hosted by one of the key stakeholders. For this project, meetings were organised by an independent 3rd party, that is, Atkins, working for Natural England, and the meetings were held at the offices of one of the stakeholder organisations. This approach worked well, although there was some scepticism as to why the initiative was being organised by a consultancy rather than by Natural England itself or by another local or national organisation.

Recommendation 3

- There is a need to strike a balance between discussion and action. Action without discussion may result in uncoordinated work; discussion without action will result in cynicism about the process.
- Involve a local 'celebrity'. If the process is seen to be headed by a locally reputable person, this may enhance commitment from other stakeholders. Care needs to be taken in choosing such a chairperson as stakeholders from a wide range of groups, interests and organisations need to be brought in for the initiative to work successfully.
- Have initial meetings held in, and if possible organised by, one of the local stakeholder groups.

Workshop 1

Present information and a rationale for the proposed coordinated stakeholder approach

- 2.15 Experience from this project has shown that stakeholder engagement was greater when given a rationale and explanation as to why the proposed approach to non-native species management is being promulgated. In this instance this was provided by Natural England, at the outset of the first meeting.

Identify non-native species that are of concern both within and adjacent to the initiative's area

- 2.16 In order to establish a work plan or programme of management, it is vital first to understand what species are present within, or are a threat to, the county and what the impacts of these are. An initial checklist of freshwater non-native species is needed in order to help compile a county-based list for prioritisation. For this project, the lists given in the UK Technical Advisory Group on

the Water Framework Directive 'Guidance on the assessment of alien species' and the Defra (2007) consultation 'Review of Schedule 9 to the Wildlife and Countryside Act 1981 and the ban on sale of certain non-native species' were used, combined with local knowledge.

Consider and consolidate existing information to identify any gaps and needs

2.17 In order to be able to start planning, as much information as possible is needed on various aspects of the non-native species present, for example:

- level of concern about species in the county/country
- approximate location in the county/country
- rate of spread at the affected sites, across the county and across the country
- mode and route of spread
- any additional (local) knowledge about adverse impacts
- ability to, existing method of and county effort in control.

2.18 Such information can be gathered initially from the stakeholders and, where insufficient information is available to the group, this can be highlighted and an action agreed for further information gathering.

Prioritise species for action

2.19 Given the large number of species of local issue, and in order to begin formulating targets and a work plan, these must be prioritised for action. A process of local categorisation is important because national scale priorities may be inappropriate for application at the county level. For example, a species may be widespread in England but not yet present in a given county, effort at county level would therefore focus on preventing the species' introduction whereas elsewhere control might be a priority. During the course of this project, the following categories were developed for this purpose:

- **Category 1:** Species of high impact and concern that are very widespread, well established and in need of concerted, coordinated and extensive action to control/eradicate. Examples include Australian swamp stonecrop *Crassula helmsii*, Japanese knotweed *Fallopia japonica*, Himalayan balsam *Impatiens glandulifera* etc.
- **Category 2:** Species that are of high impact and concern but that currently have a restricted distribution and only require action at those specific sites in order to control/eradicate them. Examples in this project included signal crayfish *Pacifastacus leniusculus* in Cumbria and floating pennywort *Hydrocotyle ranunculoides* in Norfolk.
- **Category 3:** Species currently absent within the county boundary but that are either present nearby or considered of great concern anywhere else in the country and with the potential for spread. Such species require a 'watching brief' so action can be taken to prevent establishment. Specific examples vary from county to county.
- **Category 4:** Species that are widespread and well established but whose presence is generally accepted as they appear to have little or no adverse impact and whose eradication would cause damage to native species. Action for such naturalised species should focus on preventing their spread to other sites. Examples include Canadian and Nuttall's pondweeds *Elodea canadensis* and *E. nutallii*.
- **Category 5:** Species for which the group had insufficient data to classify.
- **Category 6:** Species that are not thought to be a threat to the county.

Initiate discussion on process, including reference to resources (financial and practical)

2.20 In addition to work on species themselves, there is also a need at the first meeting to discuss the process, that is, how the initiative itself might be run, who should coordinate it, how it will be funded etc. It is useful to begin the first workshop by discussing the species that are causing concern in the county as this raises interest and creates a sense of urgency and ownership, but

once this has been done there is a need to start to explore the mechanics of the initiative as a whole. Discussions on process in this project raised the following issues:

- how the initiative will be funded
- the need for a coordinator
- the need for terms of reference for the initiative and the coordinator.

Recommendation 4

2.21 Based on the experience gained in this project, it is recommended that the broad objectives of the first workshop should be along the following lines:

- Present information on, as well as a rationale for, the proposed approach to non-native species management, that is, a coordinated, stakeholder driven process and discuss and agree this approach with the stakeholders present.
- Identify non-native species that are of concern both within and adjacent to the initiative's area.
- Consider and consolidate existing information immediately available to the stakeholders about these species of concern and to use this to identify any gaps and needs.
- Utilise existing information to prioritise species for action and with the aim of producing a work plan.
- Initiate discussion on process, including reference to resources (financial and practical).

Workshop 2

Elicit feedback on the first workshop

2.22 It is always useful to seek feedback and to use this to amend existing methods and approaches. Positive feedback from this project highlighted the following issues:

- "It was useful to get all interested parties together and develop closer links."
- "There is strength in the diverse membership of the group and in the proposed partnership approach."
- "It was useful to raise the awareness of the issues surrounding non-native species and develop some sort of prioritisation for the different species."
- "It was good to have recognition from Natural England that non-native species and their management is a problem."
- "It is good that such an initiative is actually starting."
- "There is a good existing knowledge base in the group."

2.23 From this positive feedback it was apparent that both the idea of the initiative and the species specific issues addressed in the first workshop were generally welcome.

2.24 Negative feedback from this project highlighted the following issues:

- "The lack of knowledge within the assembled group about some of the non-native species meant that too much time was spent on prioritisation of species."
- "There is a lack of resources/funding to deal with the scale of the problem."
- "Some funds that are available are not being accessed."
- "There is an urgent need to drive forward and get significant financial resources in place."
- "Certain key stakeholders, such as major landowners and farmers etc, were absent at first meeting."
- "Nothing has, as yet, been agreed on tackling problems in the future."
- "This should have been nationally driven."
- "There must not be too many workshops before action."

- 2.25 From the negative feedback it was apparent that although the initiative is appreciated, there was a desire for action on the ground as soon as possible. It was also clear that there is a need to ensure that key stakeholders, such as landowners and managers, are involved at the outset and that funding sources are identified and secured. It was also clear that some stakeholders felt that a little more preparatory work, for example, presentation of lists of non-native species and ensuring adequate information is available on each of them, would have made the prioritisation process easier.
- 2.26 All of this feedback can be used to amend or promote the process as and where necessary.

Develop Terms of Reference

- 2.27 The need for terms of reference was identified in the workshops, not least as it was perceived to be one possible route through which to precipitate funding. For this project, Atkins and Natural England developed two draft terms of reference for discussion and amendment; one for the initiative as a whole and one for a coordinator to run the initiative. These were discussed at the second workshops and final versions agreed (see Appendices 1 & 2).
- 2.28 The need for a coordinator was identified through discussions over all four workshops; there was general agreement that although non-native species work was deemed important and necessary to meet statutory obligations (for example, SSSI work) there were insufficient resources available to make significant progress. A dedicated post would be able to coordinate work on the ground to concentrate efforts, identify and procure funding, tools and chemicals, and be a central contact for information for stakeholders and the general public. It was agreed that a coordinator role would be essential for the success of the initiatives.

Develop broad targets and actions for each category and ensure the future of the initiative

- 2.29 These elements of the second workshop are addressed in Stage 4.

Recommendation 5

- 2.30 Based on the experience gained in the first workshop, and assuming a similar approach will be taken elsewhere, the following are recommended as suitable objectives for the second workshop:
- Elicit feedback on the process to date, that is, stakeholder identification, methods of contact, first workshop etc and to use this feedback to amend this, or future, processes as appropriate.
 - Develop a terms of reference for the initiative as a whole, as well as for a coordinator post.
 - Develop broad targets and actions for each of the species categories.
 - Ensure the future of the initiative.

Stage 4: Draft targets and actions

- 2.31 The six categories (developed in Workshop 1) can be used as a framework against which to assign broad targets and actions. Targets and actions should recognise that surveillance and prevention are the most important aspects of non-native species management; the need for control and eradication should be avoided, by preventing arrival, wherever possible. In this project, many of the targets and actions identified by the stakeholders for each category were in fact cross-cutting actions, that is, actions that were relevant to all species in all categories. Such actions would, therefore, also be relevant to any future initiatives although some need to be addressed at the national, as opposed to the county, level. The main cross-cutting actions identified related to awareness raising and education, collection and validation of species specific information, mapping and monitoring, coordination and funding and the collation of information on existing efforts. Category specific actions are outlined in Sections 2.40-2.46.

Recommendation 6

- The initiative as whole, and any targets and actions it sets, should recognise that surveillance and prevention are the most important aspects of non-native species management; the need for control and eradication should be avoided.

Awareness raising and education

- 2.32 Targeted awareness raising and education is crucial in gaining the support and involvement of others both within and outside the initiative. The adverse effects of non-native species should be publicised such that the population can identify with and 'own' the problem and recognise the value of mitigation. Awareness raising and education are also useful in stimulating action from the general public, as well as in other key organisations. An example of a successful, widespread awareness raising campaign in New Zealand was provided at one of the workshops, details of this are provided in Appendix 4.
- 2.33 The lack of information about non-native species, as well as of their adverse impacts, is an issue in itself. For example, garden centres may actually be unaware of the presence of non-native species 'piggy-backing' on the native species, or of the potential adverse impacts of the uncontrolled spread of non-native species, that they sell. They could be provided with advice and possibly be persuaded to stock native, non-invasive species instead. An awareness raising campaign targeted at local garden centres could be highly successful in restricting the introduction of non-native species to the wild. This action may, however, be addressed by Defra following the recent consultation on species proposed for the ban of sale and by the Horticultural Code of Practice (Defra, 2005).
- 2.34 In order for people or organisations to be able to undertake effective control or management programmes, there is also a need for clear guidance on what are appropriate measures for the control of different species in different places. Clearly this information needs to be provided at a national level; there was a tendency for the initiatives to want to develop this material themselves.
- 2.35 Using an online 'reporting tool' has been proved to be very effective. An example is provided by the harlequin ladybird project where members of the public are encouraged to report sightings, supported by photographs. This has resulted in over 20,000 records being logged since March 2005 (Defra, 2008). This particular project was initiated by the Centre for Ecology and Hydrology (CEH), Cambridge University and Anglia Ruskin University through the National Biodiversity Network Trust with start-up funding from Defra. This approach could be very effective for selected freshwater non-native species that are readily identified and can be publicised through the media. Appropriate recording schemes for non-native species are probably most effectively managed at a national level although clearly will utilise and collate data collected at a more local or regional level. Work is underway under the auspices of the GB non-native species programme board to investigate the potential of existing species recording schemes to provide information on the distribution and spread of non-natives.

Recommendation 7

- A general programme of targeted awareness raising and education is an essential action in gaining the support and involvement of others both within and outside the initiative.
- The overall lack of information about non-native species, as well as of their adverse impacts, needs to be addressed. National action is probably needed on this but thinking and acting locally can help to precipitate national action.
- Clear guidance on control methods of different species needs to be developed and widely circulated.
- Develop an on-line reporting mechanism for freshwater non-native species.

Collection and validation of species specific information

- 2.36 Although there was a great deal of knowledge among the stakeholders themselves, there is also a need to collect and validate species specific information on the complete range of non-native species prior to launching other initiatives. Such unequivocal information would remove the need for detailed, and sometimes irrelevant, discussions as to whether or not a particular species is actually of concern, thereby making the process of listing and prioritising species for different areas easier. This would also negate one of the frustrations expressed about the process by stakeholders.
- 2.37 Such a process might be best rolled out nationally so as to reduce duplication of effort each time a new initiative is started. The GB non-native species mechanism's 'risk analysis panel' exists to provide a structured framework for assessing such risks posed by any non-native organism to species, habitats or ecosystems in all or part of the UK.

Recommendation 8

- Collate as much information as possible about all non-native species and the impacts that they can or might have on the wider environment prior to launching an initiative - come well prepared.

Monitoring, mapping and data storage

- 2.38 A vital tool in the control and management of non-native species is the ability to be able to accurately map the location of species of concern already in the county. It is also vital to know the whereabouts of other species of concern not yet in the county but with the potential to arrive. Accurate mapping can only be achieved through a comprehensive monitoring programme. Regular, repeated monitoring also allows the spread of existing species to be recorded and, hopefully, confirms the continuing absence of others. At the very least, it should act to record the arrival of new species early enough for them to be immediately dealt with. Maps can also be used to identify problem areas, target monitoring needs and to support awareness raising efforts.
- 2.39 Given suitable training and information, stakeholders, volunteers and members of the public (spurred on through the awareness raising and public education programmes) can also be used as a task force to achieve monitoring. A prime example is the Kent catchment in Cumbria, where a number of volunteers work together (co-ordinated by two dedicated volunteers) to tackle Himalayan balsam along the river. As well as hands on removal, the group has undertaken a survey programme to identify distribution of the plant and to prioritise action and as an awareness raising campaign, they produced an information leaflet which was distributed to private properties along the river as a result of funding provided by the South Cumbria Rivers' Trust.
- 2.40 Data on non-native species are currently stored by a number of local organisations as well as by national recording initiatives. All such information sources should be collated so that there is a single point of reference data for each initiative and this should be linked to national reporting schemes. This dataset should be regularly updated, audited and validated and then used as the basis for a reporting process that identifies areas for concern, for example, locations where information is lacking, sites where species area spreading, being controlled etc.

Recommendation 9

- Develop and agree a detailed county-wide monitoring and mapping programme that can accommodate the involvement of a range of stakeholders and the general public, as well as trained scientists, which should be linked to national schemes.
- Develop and agree a single point for the collection, collation and storage of data on non-native species within the county. Ensure regular, publicised reporting of the status quo based on this data.

Collation of information on existing efforts

- 2.41 It is clear that non-native species management is already being undertaken by a number of organisations, usually as the presence of non-native species impacts on other aspects of that organisation's remit. The underlying rationale for such work may vary depending on the focus and remit of those undertaking the work. The benefit of coordination is that apparently unrelated activity can be linked to achieve benefits for multiple objectives (for example, biodiversity, angling, navigation flood risk management, etc.)
- 2.42 Control and management work is also already being undertaken on a small but widespread scale by groups of motivated and aware individuals and volunteers. Such existing work would greatly benefit from a (better) coordinated approach so that all efforts can be co-located or concentrated to work in harmony, rather than the current piecemeal approach where re-infestation often still occurs.
- 2.43 The knowledge and learning from existing efforts, for example, on most effective removal/management methods, disposal best practice etc., should also be collated and disseminated in order to improve future action.
- 2.44 Such best practice guidance might be most effectively developed nationally, although to some extent control methods need to be tailored to the site in question. For example, widespread herbicide application may not be appropriate on environmentally sensitive sites and may require more targeted techniques of application.

Recommendation 10

- Existing work would greatly benefit from a (better) coordinated approach so that all efforts can be co-located or concentrated to work in harmony.
- Knowledge and learning from existing efforts should also be collated and disseminated in order to improve future action.

Other general issues

- 2.45 Tackling non-native species management nationally will require significant funding. A proportion of this funding could be spent on research and development of novel control methods. For example, extensively researched and thoroughly tested biological control methods can be very successful; there are already weevils available for the control of species such as *Azolla* and *Salvinia*.
- 2.46 The pilot initiatives identified a range of policy areas that could be developed to provide incentives and deterrents for behaviour related to non-native species management. Grants and payment schemes such as the Entry Level Stewardship (ELS) and cross compliance measures could be used to encourage management on farmland, resulting in either increased payment for management work or a reduction in payment for not addressing non-native species problems. Section 106 agreements could be used to tie developers into managing non-native species problems as part of the planning permission.
- 2.47 Consideration should be given to the incorporation of catchment-based approaches within the agreed county scale initiative as freshwater non-native species are most rapidly spread throughout catchments and action at this level might be most effective. Links to the Water Framework Directive RBMP will ensure a catchment focus.

Recommendation 11

- A proportion of funding needs to be spent on research and development of novel control methods for use nationally.
- Existing legislation, not necessarily directly linked with non-native species, can be used to encourage better management, for example, on farmland.
- New legislation can be developed and recommended as outputs from individual initiatives.

- Incorporation of catchment scale approaches into the county wide initiatives needs to be given serious consideration.

Specific targets and actions

2.48 Specific targets and actions to deal with species in each of the six categories determined in Section 2.16 need to be established. Due to the lack of detailed information on the extent, location, impact, etc. of all non-native species at this early planning stage, it is still difficult to assign specific targets or create detailed work plans for each species, for example, eradication of species X from catchment Y by fixed date Z. Some more general targets and actions can, however, be set or agreed, upon which more details can be developed once sufficient information is available. Although the actions and targets developed for each category during the course of this project were largely dependent on the county and specific areas in which the species occurred, they are still useful for directing future initiatives in how to establish their own targets because they identify the steps required in order to make the next level of specification. Appendix 5 shows how the species were categorised for the two initiatives.

Category 1 - Species of high impact and concern that are very widespread

2.49 Experience gathered during this project demonstrated that control/management work of at least some of the species in this category is already being undertaken on a local scale by a number of bodies, albeit in an uncoordinated manner. Targets for species within this category should, therefore, focus on collating information on these existing efforts, determining what methods are currently being employed, what the known distribution of species is etc. Coordinating existing efforts, and working at a catchment scale, will be more effective than working independently. Understanding the full extent of the distribution of species in this category will also enable an effective management programme to be developed, for example, by starting control/eradication work at the upper most sections of a catchment, working downstream, avoiding downstream spread etc. Consultation with landowners will also be necessary to tackle isolated patches, which if left unchecked, could become a source of re-infestation. Where possible the targets set for species in this category should be guided to making long-term, species specific 'visions', for example, 100% eradication within a catchment, for example as shown in Table 3.

Table 3 Selected targets for a hypothetical non-native plant control strategy

	Target	Comment
Increasing geographical scale 	Eradicate giant hogweed from river reach by 2009	Eradication may be feasible in areas where a species has only recently been recorded.
	Reduce coverage of Australian swamp stonecrop by 50% in water body (by end 2010)	Where complete eradication is unfeasible it may be possible to reduce biomass to a level where the impact of the species is reduced and ongoing routine management is sufficient to prevent further spread (this is analogous to scrub or bracken control in terrestrial sites).
	Prevent balsam from establishing within for example, river SSSI	Such targets are appropriate where a problem species is known to be established upstream or on land surrounding the SSSI. The strategy must include preventative measures as control is most effective and least expensive at the earliest stages of establishment.
	Establish location of balsam populations upstream of SSSI or in adjacent areas (by mid 2008)	Monitoring and data collation is an essential part of the strategy and enables accurate risk assessment.
	Control balsam within 50m of tributary x (by 2009)	Control outside the SSSI should be prioritised with greatest effort focused on upstream areas and adjacent land.
	Prevent parrot's feather establishing within strategy area	The strategy should also anticipate future problems and aim to 'hold the line' against species known to have invasive tendencies.

Recommendation 12

- Understand current distribution of species by identifying and collating information sources.
- Prioritise species for action and develop long term species-specific visions.
- Collate information on current management efforts and coordinate participating bodies.
- Develop consultation strategies to involve landowners and general public.

Category 2 - Species of high impact and concern but with restricted distribution

2.50 Species in this category provide ideal candidates for high-profile 'quick wins' to publicise action on non-native species in general. Species in this category provide such because eradication of specific species at isolated sites is a lot easier than, for example, trying to deal with species spread across a whole catchment area. Publicising early success stories ('quick wins') will also attract further support, demonstrate that the new initiative exists and is working and give strong support with which to seek (additional) funding. In order to effect 'quick wins', information is needed on what species are located where so that the affected sites can be prioritised for action. Species in this category are not widespread, so action should not only target eradication but also prevention of the spread of these species to other sites and areas. Education and awareness raising, particularly among recreational water users, should be a high priority for species in this category.

Recommendation 13

- Understand current distribution of species by identifying and collating information sources.
- Prioritise sites for action and identify potential for quick wins.
- Establish education and awareness raising among water users.

Category 3 - Species requiring 'watching brief'

2.51 Targets for species in this category should focus entirely on preventing establishment through actions such as collating data on distribution outside of the county, documenting likely routes and modes of spread, establishment of 'smart monitoring', etc. The latter should be aimed at survey and reporting of areas still unaffected but that are at most risk of infestation, to ensure that they remain free from species in this category. Links need to be made with similar initiatives, and/or relevant stakeholder groups, in neighbouring counties and an early warning system developed so that pre-agreed action can be initiated as soon as any threat becomes apparent. It is also necessary, therefore, to have a pre-agreed method of control to be utilised, by whom etc., in place prior to the arrival of any of the species in this category.

Recommendation 14

- Investigate ecology of species and assess the potential for their spread and establishment (routes and modes) within the county.
- Establish 'smart monitoring' as an early warning system.
- Establish links with neighbouring county initiatives/relevant stakeholder groups etc.
- Establish a pre-agreed method of control in anticipation.

Category 4 - Species widespread but accepted at existing sites

2.52 Targets for species in this category should focus on identifying sites where they are already established, identifying their potential for spread as well as the areas/sites they are most likely to spread to and preventing such spread from occurring.

Recommendation 15

- Establish extent of naturalised sites.
- Identify potential routes of, and sites likely for, spread and target its prevention.
- Establish monitoring or surveillance programme.

Category 5 - Species with insufficient information

2.53 An information gathering exercise is required for species in this category. Once further data is available it should be possible to re-classify all of the species here to one of the other categories. Some of this information gathering may be better carried out at a national level, that is, given as a specific task to species or taxa groups (molluscs, aquatic plants, etc) specialist and then disseminated to local initiatives rather than being tackled locally.

Recommendation 16

- Undertake research and update known impacts and current distribution.
- Reassess category based on new information.

Category 6 - Species not thought to be a threat to the county

2.54 Although species in this category were not considered to be a problem in the areas covered by the initiatives established by this project, some form of 'watching brief' and surveillance mechanism will still be required to identify and prevent any potential future invasions. Joining the existing IUCN backed invasive species email discussion forum (see Bibliography for details) may be part of such a 'surveillance mechanism' as this discussion group provides information on the impacts, distribution etc. of invasive species world wide. The impact of species within this

category may be currently unknown or even predicted to be minor. However, a precautionary approach may be warranted particularly in the face of potential climate change.

Recommendation 17

- Confirm status through information gathering.
- Consider effects of climate change.
- Establish a surveillance mechanism.

Stage 5: Ensuring engagement and sustainability of the process

- 2.55 Experience gathered through this project and elsewhere, for example, other similar approaches and initiatives, suggests that each new initiative needs a 'central coordinator' to be responsible for the non-native species management programme in that county. This person would be responsible for developing and managing awareness raising campaigns, providing guidance and directing management work based on existing efforts etc. In the current climate of budget cuts, however, locating possible funding sources for creation of a coordinator post is particularly difficult. Failure to address this challenge is, however, likely to be a major barrier to the success of any newly proposed non-native species management initiative.
- 2.56 During the course of this project, a solution to this issue was proposed by the stakeholders themselves. The solution was for as many stakeholder organisations as possible to contribute small amounts of money (for example, up to £5K on an annually renewing basis) to a central fund to pay the coordinator's post. By spreading the financial burden, such an approach helps to reduce the cost to an acceptable level for individual organisations and yet also creates enough of a fund for the creation of a coordinator post to become an achievable target. Similar funding arrangements have been widely used to fund local Biodiversity Action Plan coordinators. Funding by such a mechanism is still, however, likely to result in the larger stakeholder organisations providing the core funds. Their ability to provide these smaller 'seed-funds' does, however, ensure that costs are manageable for those groups and encourages others to provide whatever they can, whether it be other still smaller sums of money or help in-kind, such as manpower, machinery, other practical help such as volunteers etc.
- 2.57 The exact tasks that a coordinator should undertake and be responsible for are outlined in a draft terms of reference shown in Appendix 2 but essentially the coordinator should provide a 'one-stop-shop' for all freshwater non-native species issues for organisations, volunteer groups and the general public in the county. Once in post, the coordinator can also research and pursue other funding streams and in-kind-donations to continue the general work of the initiative as a whole (as opposed to the coordinator per se) on the ground. The success of this strategy is demonstrated for example by the Tweed Forum, where the coordinator was able to secure financial and in-kind support from a number of sources, including a large herbicide manufacturer, farmers and land owners, lottery funding, councils and land-fill tax credits. Other duties identified include development and promotion of best practice guidelines, coordination of statutory organisations and the development and promotion of revised/new policy to address non-native species issues.
- 2.58 As has already been stated, it is clear that creation of a dedicated 'coordinator' is essential for the success of any new initiative. Making the appropriate arrangements and raising funds for such a role, however, takes time to organise. This gap, or 'interim period', may result in the initial momentum gained being lost and the process falling away. It is, therefore, strongly advised that during this interim period 'champion(s)' are identified to take the process forward during this period. The role of the champion(s) should be to maintain contact with all original members of the initiative, identify any new stakeholders, calling meetings to discuss progress and, crucially, to facilitate recruitment of the coordinator.

- 2.59 Champion(s) should not be expected to fully fund, nor necessarily host, the coordinator post once established but they do need to agree the eventual location of this individual. Experience from this project has shown that ideal champion(s) come from stakeholder groups with an existing brief that is closely related to non-native species management (or the impacts of non-native species) and thus who have a keen professional, and preferably personal, interest in the success of the initiative. Ideal champions might also be drawn from projects similar to the proposed non-native species management initiative, for example, a county-wide biodiversity group etc.
- 2.60 Identifying champion(s) can, however, prove difficult, not least due to the recent raft of new environmental legislation that has led to a large increase in workload for many of the individuals employed by, or located within, interested and involved stakeholder groups.
- 2.61 Allocation of cross-cutting and category specific actions to champion(s) in the interim period is, however, vital in ensuring that the initiative does not stagnate. Experience drawn from this project has shown that although all stakeholders maybe in agreement that the initiative was a good idea and should continue into the future, they are reticent to put their name to actions. One way of promoting action by stakeholders, that is, creating champion(s), is by allocating agreed actions in a 'round table exercise' where each member is asked, in front of all the others, which of the agreed actions they will take on during the interim period. This not only encourages actions to be taken up but also really ensures that each representative signs up to the process.
- 2.62 Sign-up can also be encouraged if key stakeholders are primed and ready to offer some action, funding or support before the workshops start. Such action helps to create momentum and a positive and enabling environment in which smaller organisations, and those who perhaps perceive themselves as 'more peripheral' organisations, as well as volunteers and individuals, can act.

Recommendation 18

- Develop a post of 'coordinator' for each initiative.
- Outline the roles and responsibilities of the initiative as a whole, and the coordinator post in particular, through the development and agreement of terms of reference.
- Spread the financial load - use 'seed funding' provided through small contributions from many stakeholders to create a central funding pot to pay for the coordinator post. Then, once in place, make one of the roles of the coordinator to source further funding for the initiative as a whole.
- Identify 'champion(s)' - these are individuals who will take on actions during the interim period, that is, between the end of the initial meetings and the appointment of a coordinator.
- Create champions by allocating actions in round table meetings and by priming key stakeholders *a priori*.

3 Non-native species: the national context

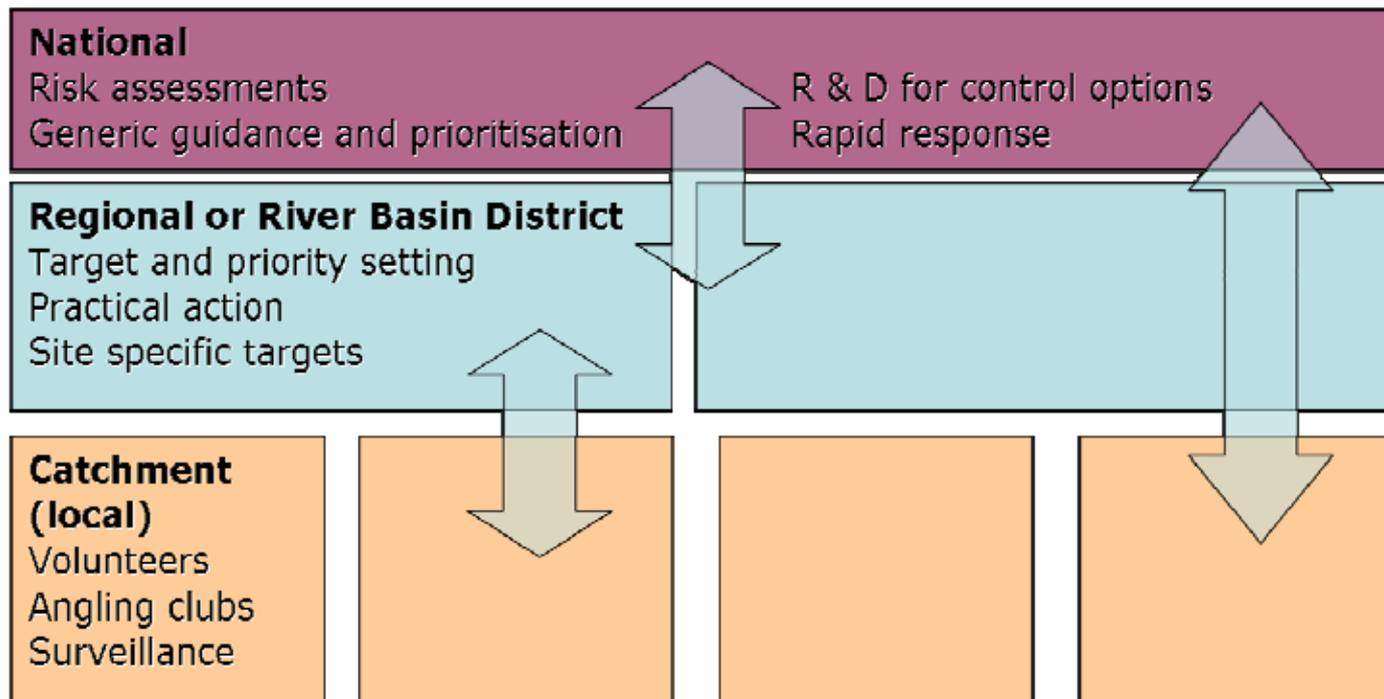


Figure 3 Proposed interaction between national, regional and local levels

- 3.1 Through this project, a number of actions and recommendations were identified that would be best addressed at the national level to avoid duplication of effort among initiatives. Figure 3 illustrates how national, regional and local efforts need to interact. A common theme of the workshop discussions was the need for information on species ecology, distribution and control methods. In addition a number of research needs were identified. It is evident that much of this work could be delivered most effectively through a national programme to avoid regional and local groups duplicating effort. In order that regional and local effort has the greatest effect these groups need to have a practical focus but will need to be supported by national guidance, information and a directed programme of research and species risk assessment. Existing work is beginning to address some of these needs although further national coordination may be required.
- 3.2 At the national level, non-native species issues are beginning to be addressed by the GB non-native species mechanism set up by Government in recognition of the widespread problem. There are a number of components to the GB non-native species mechanism including a programme board and risk analysis panel. The programme board, supported by the 'Non-native Species Secretariat', delivers strategic consideration of the threat of invasive non-native species across Britain. The board consists of representatives from administrations and agencies, such as the Central Science Laboratory, Environment Agency, Department for Transport and the Joint Nature Conservation Committee.
- 3.3 The Non-native Species Secretariat is currently building a database for research (and management) on non-native species, which is intended to capture information on all research, monitoring or management (control) directed towards non-native species in Britain with the aim of capturing a range of details to measure how much action against non-native species is occurring,

how this is split between species and crucially how much this is costing. Surveillance and monitoring of non-native species are key components of the developing GB Non-native Species Strategy. Surveillance for newly arrived species provides intelligence on what species are entering and becoming established in Britain as well as indicating what are the main means of entry. Monitoring the status of more established non-native species is also important to establish if they are becoming invasive over time.

- 3.4 It is widely acknowledged that considerable sums are needed to address non-native species nationally. It is important that some of this money is directed at developing novel control techniques. Some of the current methods are expensive and time consuming and may not be sustainable; research into new methods could reveal more sustainable and effective approaches, thus reducing the overall resource requirement.
- 3.5 For a number of species discussed during this project, insufficient information was available on ecology, distribution and impacts making prioritisation very difficult. Information needs to be gathered nationally on all the species identified through the risk assessment process to be readily available to non-native species initiatives.
- 3.6 The role of the risk analysis panel of the GB non-native species mechanism is to ensure the provision of robust risk-based evidence to underpin decision making on non-native species and aid the Programme Board and others in prioritising resources. The identification of non-native species and confirmation of their threat should be undertaken nationally. The risk assessment scheme was created for the purpose of identifying potential problems and thus the tools for confirming status of species and whether they should be included in such initiatives already exist. This would remove the uncertainty and debate over what should and should not be included in local non-native species initiatives and avoid unnecessary work.
- 3.7 Before implementing local initiatives in other areas, consideration should be given to setting up a central fund that would be immediately available to new initiatives to help with the funding of the coordinator role essential to the success of the group. Money could be provided as match funding to provide assistance rather than the sole fund. This may also act as encouragement to stakeholders to commit funding or other resources more readily and would provide visible support of the process. It is envisaged that in this way small amounts of centrally sourced funding could deliver significant outcomes on the ground by better coordinating existing effort and securing match funds from partners.

Recommendation 19

- Develop a national programme of data gathering to provide local groups with sufficient information on non-native species locally, including ecology, distribution and impacts. This would include risk assessment of species.
- Undertake research and development of novel techniques to improve non-native species control.
- Set up a central fund nationally to provide support funding for coordinator posts.

4 Conclusions

- 4.1 Trial initiatives established at county level in Norfolk and Cumbria have demonstrated the potential for coordinated partnership approaches. The workshops indicated that in both counties there was already considerable non-native species monitoring, recording and control taking place but that often this was uncoordinated and inadequately resourced. The need to address freshwater non-native species was acknowledged by a wide range of partner organisations and stakeholders and there was widespread enthusiasm and a high degree of commitment in both counties. The potential benefits of establishing similar initiatives in other counties are likely to be similar.
- 4.2 The workshops demonstrated a high level of awareness of non-native species problems and the need to tackle these for a range of reasons. However, it was widely acknowledged that current effort was not as effective as it should be. Although freshwater and riparian non-native species are a significant threat to a number of statutory obligations and biodiversity commitments, most organisations represented admitted that they lacked the resources to develop appropriate strategies or programmes of work. A major recommendation from both initial workshops was that a collaborative funding proposal be developed to support a coordinator post. Such a post was considered vital to ensuring that the initiative developed beyond the work already underway. Key roles for the coordinator would include collating information on the distribution of problem species and existing control/management effort, developing coordinated work programmes and developing funding proposals for major work elements.
- 4.3 Comparisons were made with structures and processes already in place to help deliver regional and local elements of the UK Biodiversity Action Plan. Multi-partner funded projects and posts are already a strong feature of this work and similar funding models could be easily adapted to cover non-native species work. Central funds to initiate the first workshops and assist in the collation of information would be invaluable in getting other initiatives off the ground, if match funds were also available for coordinators this might help partners to secure financial commitments from their own organisations. Joint working within the initiative needs to be well defined and understood by all subscribing members; terms of reference were drafted for each group to ensure this.
- 4.4 This pilot project started to develop species lists by category in order to begin to formulate targets and action plans. Species which were not thought to be of concern to the county and those for which insufficient information was available were grouped into two categories: Category 6 - species that are not thought to be a threat to the county and Category 5 - Species for which the group had insufficient data to classify. The remaining species were considered to have impacts of varying degrees and were categorised based on spatial features: Category 1 species are widespread and well established needing county wide action; Category 2 species have a restricted distribution and require site specific action; and Category 3 species are not currently present within the county but are elsewhere in the country and have the potential to spread requiring a 'watching brief'. Category 4 was created for those species that are widespread and well established, but whose presence is somewhat accepted due to either having little or no adverse effect or because the removal process would be more detrimental than their presence. The details of these categories are given in Appendix 5.
- 4.5 A number of constraints to action within each of the two counties were identified. In some cases these constraints relate to a lack of local data, information or resources but in other cases the need is for more strategic work which might benefit a number of initiatives. The former gaps should be addressed through the developing initiative and in particular through the coordinator role. It is evident that some of the more strategic needs, such as research on the ecology and impact of specific non-native species and the development of novel control techniques, would be most effectively considered at a national level. Therefore, a key recommendation arising from the pilots is that a national tier of work is developed to produce guidance and provide support to the

local level. This would be developed in parallel with nationally prioritised and managed research projects which might be carried out under the auspices of the GB non-native species programme board.

- 4.6 The Norfolk and Cumbria pilots have involved a wide range of stakeholders and whilst the process has focused upon biodiversity aspects there are clearly a range of drivers for non-native species management. By recognising these multiple benefits a co-ordinated partnership approach to management is more likely to succeed in gaining extra resources and effort. Nevertheless the approach outlined here is intended to have biodiversity, SSSI and Water Framework Directive objectives at its heart. SSSI objectives were readily incorporated into overall plans because the importance of dealing with non-native species risks and impacts to the most valuable and sensitive sites was widely recognised. Wider biodiversity and other socio-economic concerns can also be incorporated as the initiatives are seen as a possible mechanism for delivering practical aspects of the GB non-native species strategy. Such initiatives are seen as a simple way of ensuring that a wide range of stakeholders and practitioners are involved in planning and defining non-native species strategies at a scale that is relevant to them.
- 4.7 In addition to their contribution to the GB non-native species strategy these local initiatives are seen as a valuable component of the Water Framework Directive programme of measures for each river basin district. Discussion with other organisations has shown that it may not be appropriate to establish the initiatives at the river basin district level because there is a risk that existing good work focused at the local authority level is not recognised. Furthermore there is a risk that other drivers and objectives are lost due to the strict timetables and processes associated with the Water Framework Directive. Nevertheless good links between the initiative members and the RBLP will be critical in ensuring the success of both. Differences in institutional structures and existing projects between Norfolk and Cumbria indicate that there is not necessarily one scale that is always appropriate and each region or area will need to consider the geographical scope and organisational mix that best suits them.

5 References

- Cornish Knotweed Forum URL: www.projects.ex.ac.uk/knotweed [Accessed December 2008].
- Defra. 2003. *Review of non-native species policy*. Defra Publications, London.
- Defra. 2005. *Helping to prevent the spread of invasive non-native species: Horticultural code of practice*.
- Defra. 2006. River basin planning guidance URL: www.defra.gov.uk/environment/water/wfd/pdf/riverbasinguidance.pdf [Accessed December 2008].
- Defra. 2007. *Consultation on the review of Schedule 9 to the Wildlife and Countryside Act 1981 and the ban on sale of certain non-native species*. URL: www.defra.gov.uk/corporate/consult/wca-schedule9/index.htm [Accessed December 2008].
- Defra. 2008. *Public help to chart impact of most invasive ladybird on Earth* URL: www.defra.gov.uk/news/issues/2008/biodiversity-0702.htm [Accessed December 2008].
- GB non-native species mechanism URL: www.nonnativespecies.org/02_GB_Coordination/ [Accessed December 2008].
- IUCN Invasive Species Specialist Group URL: www.issg.org/index.html#ISSG [Accessed December 2008] - to join the group send an email, without a subject header, to 'Aliens-L-join@indaba.iucn.org' OR 'listadmin@indaba.iucn.org' with the message: 'subscribe Aliens-L' in the main body of the email. When you have subscribed you will get a message with instructions for using the list.
- RPS. 2006. *Strategic control of non-native invasive aquatic plants*. English Nature Research Report No. 686. URL: <http://naturalengland.communisis.com/NaturalEnglandShop/product.aspx?ProductID=3009aee1-0c41-4ac3-b9a7-78110982cbdc> [Accessed December 2008].
- Tweed Forum Invasives Project. URL: www.tweedforum.com/projects/content/pdf/obj2125?view=108 [Accessed December 2008].
- UK Technical Advisory Group on the Water Framework Directive: *Guidance on the assessment of alien species*. URL: www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/TAG%202004%20%28PR1-16-03-04%29 [Accessed December 2008].

Appendix 1 Freshwater non-native species initiative terms of reference

Vision

A county whose natural environment is free from the impacts of freshwater invasive species.

Aims and objectives

The aim of the Initiative is to promote the co-ordinated and strategic approach to the management of freshwater invasive species across the county by working in partnership.

Specifically the Initiative will engage in the following activities:

- 1) “Horizon scanning” - identification of species of concern not currently in the county but that would cause problems should they become established here.
- 2) Preventing the arrival and establishment of species identified in 1 above.
- 3) Eradication of existing invasive species, wherever possible.
- 4) Control and management (containment, reduction and mitigation) of established invasive species.
- 5) Monitoring (survey and recording), mapping and reporting of existing infestations and of sites and areas currently not impacted by invasive species.
- 6) Education and awareness raising.

Membership

The Initiative’s membership will consist of representative bodies (such as institutions, associations, trusts, agencies, authorities etc.) with a legal or institutional requirement, or technical interest, in issues relating to the management of freshwater invasive species, or the impacts thereof. The Initiative’s coordinator may, with the agreement of the initiative, invite other groups, organisations, and/or individuals, (for example, particular species experts, landowners etc.) as required.

Representation at meetings will generally be limited to one individual from each of the Initiative’s members. Each of the initiatives member groups will provide a ‘key contact’ and a named ‘second’. Key contacts and seconds should be the person(s) within the member group most closely involved in addressing freshwater non-native species issues for that member group although representation at a more senior level may be required and requested by the Initiative’s coordinator should issues such as funding commitments need to be addressed.

Initial membership will be agreed by the group as a whole and subsequent membership will be at the invitation of the Initiative’s coordinator and approval by the initiative as a whole.

Meetings

The initiative will meet regularly at the request of the coordinator. An agreed meeting schedule will be determined at the beginning of each financial year (April).

Membership

A list of current members should be inserted as appropriate.

Appendix 2 Freshwater non-native species initiative coordinator terms of reference

Overall aims and objectives

The Freshwater Non-native species Initiative coordinator will oversee coordination of the initiative, the aims and objectives of which are stated in Appendix 1. The main aims and objectives of this post will be to promote the coordinated and strategic management of freshwater non-natives species in the county.

Management is used in its widest sense and in this context specifically refers to all of the following:

- 1) "Horizon scanning" - identification of species of concern not currently in the county but that would cause problems should they become established here.
- 2) Preventing the arrival and establishment of species identified in 1 above.
- 3) Eradication of existing invasive species, wherever possible.
- 4) Control and management (containment, reduction and mitigation) of established invasive species.
- 5) Monitoring (survey and recording), mapping and reporting of existing infestations and of sites and areas currently not impacted by invasive species.
- 6) Education and awareness raising.

Specific tasks

To promote, coordinate and undertake (as appropriate) the following:

- 1) Act as a central point, or key contact, for all freshwater invasive species issues in the county.
- 2) Build and strengthen communication between initiative partners and external groups, including planners, through regular meetings, exchange of information on current management, species occurrence etc, both within and outside the county.
- 3) Organise regular meetings of the initiative.
- 4) Identify and coordinate inputs from and actions for "champions" - these are individuals who work at the catchment level throughout the county.
- 5) Raise awareness of invasive species and their adverse ecological, social and economic impacts. Develop and roll out a "public education and awareness programme".
- 6) Encourage reporting of invasive species by landowners and the general public, especially recreational users of freshwater, for example through the establishment of a public-facing, web-based reporting system and publicising the existence of the initiative and the coordinator role.
- 7) In association with existing appropriate bodies (local and national), develop and promote a monitoring programme aimed at establishing and documenting the present location, extent and spread of invasive species. The essential aim of which is to record all occurrences of invasive species both within and adjacent to the county.
- 8) In association with an organisation such as the biological Records Centre develop a centralised recording system (database), preferably by extension or development of an existing similar system(s). Utilise the information recorded, to provide a regular synopsis of the invasive species situation to be distributed to all members of the initiative, publicised in the press, added to the initiative's website etc.
- 9) Further develop the broad actions and targets already agreed for the six main categories of invasive species in the county. This should be by the development of SMART targets for the management of each species, or species group, and designed to ensure their achievement.

- 10) Regularly review these targets and continue to review and develop revised workplans for species to further the aims of the Initiative.
- 11) Co-ordinate and/or undertake research required to fill any information gaps about existing, and possible new, invasive species relevant to the county.
- 12) Co-ordinate current and planned individual activities of the initiative's member groups, in order to achieve management.
- 13) Liaise with other county coordinators and national organisations to:
 - a) Identify, promote and encourage development of new methods for invasive species management.
 - b) Identify, promote and encourage development of new methods, including legal instruments, to prevent the further introduction of new non-native species.
 - c) Promote the use of appropriate native freshwater species in horticulture, aquaculture etc. to replace the non-native species currently being sold, used etc.
- 14) Develop and share information with the initiative's members, landowners and the general public for the advancement of co-ordinated management.
- 15) Develop, agree and implement a funding and resourcing strategy for the initiative, composed of both financial and 'in-kind' contributions.
- 16) In all matters, to work in partnership with others both within and outside the Initiative's immediate membership.
- 17) Promote and advise on relevant health, safety and insurance issues to all involved in practical management of invasive species in the county.
- 18) To undertake any other related matters as determined by the initiative's regular meetings.

The coordinator will be jointly funded by members of the initiative and will ideally be based in the offices of one of its non-governmental/non-regulatory members.

Appendix 3 Energy investment model

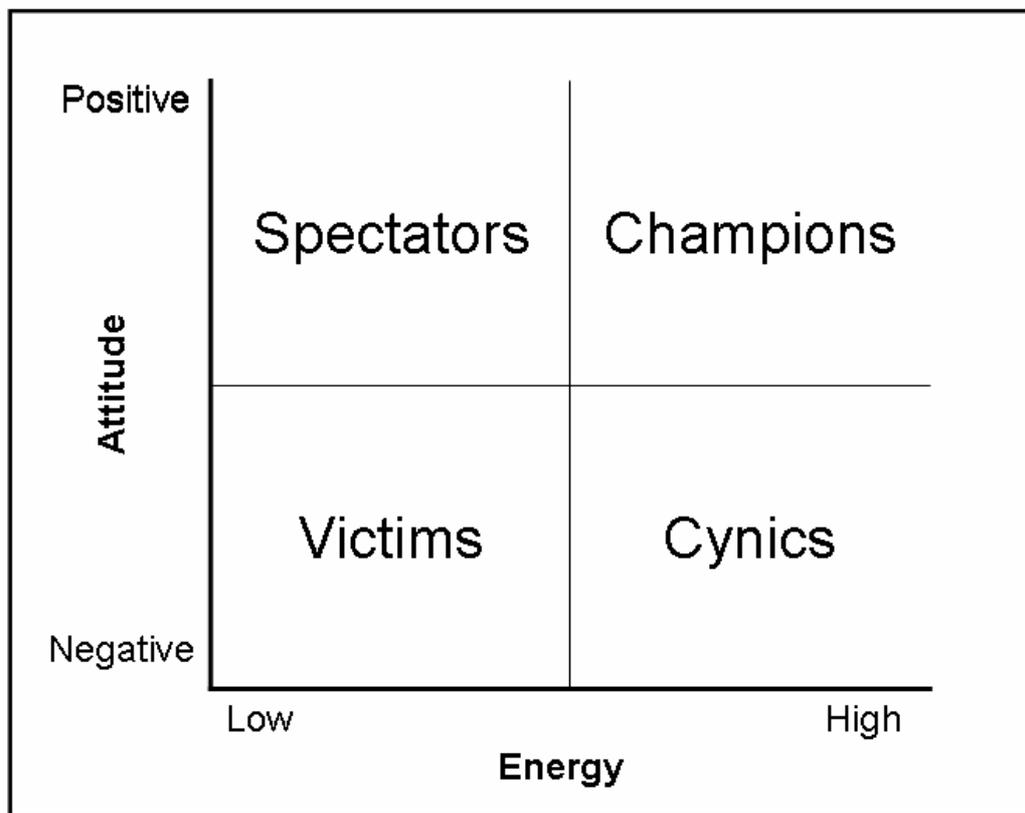


Figure A Lineberry's Energy Investment Model

Spectators

Feel

- positive about the changes
- anxious and lacking in confidence
- reluctant to get involved
- threatened
- “we're forgetting what made us who we are”
- afraid of being a victim of the numbers game
- reluctant to take risks.

React by

- acknowledging need but resisting change
- working harder than ever at previously successful behaviour
- avoiding taking risks
- trying to 'ride it out' until things return to normal
- keeping a low profile.

Need

- understanding and help in coping with stress, fear and frustration
- carefully paced activities - be careful not to overwhelm
- development job opportunities
- a safe place to test new learning and experience success - simulations work well
- effective role models, feedback, encouragement and some challenge.

Victims

Feel

- between unhappy and depressed
- bruised self esteem
- overwhelmed by work
- powerless, fearful of mistakes.

React by

- blocking out changes
- avoiding confronting issues
- retreating into 'safe' activities
- avoiding risk
- waiting for things to 'return to normal'
- avoiding thinking about what might happen.

Need

- understanding, support and help in dealing with stress, fear and frustration
- effective supervisors and peers who can help calm the waters
- phased-in transition with bridges to 'the old ways'
- development in plane, rather than job change
- protection from quick empowerment that might be viewed as set-up for failure
- a series of mini-challenges and crafted success experiences - rebuild confidence.

Champions/players

Feel

- challenged and stretched
- comfortable with the need for change
- anxious about transition - but open to possibilities
- optimistic about the long-term future
- in control of own destiny
- not afraid of short-term mistakes or setbacks.

React by

- seeing the silver lining hidden beneath the dark clouds
- viewing ambiguity and change as challenge and opportunity
- finding humour in difficult situations and using it as a tool
- treating life as a continuous learning experience
- expanding personal comfort zone.

Need

- reward and support for being the key player in the transition process
- flexible growth opportunities coupled with visible rewards
- latitude to model effective behaviour for others
- relief from being caught in crossfire - that is, trying to be all things to all people
- high impact development assignments.

Cynics

Feel

- not listened to
- determined to block the changes
- surprised at (and unsympathetic to) the stress felt by others
- angry at the world
- frustrated with the confusion and 'whining'
- overly confident in own ability.

React by

- expressing frustration over pain and hesitancy of others
- arguing against changes
- pressing for quick actions - then criticising them
- being oblivious to core challenges
- leading 'victims' down the garden path.

Need

- the challenge to 'do it' for themselves
- check and balance from others
- accountability with periodic review and monitoring
- help to become aware of core challenges
- feedback, encouragement, support
- pairing with a 'player'.

Appendix 4 Awareness raising campaign, New Zealand

This example from New Zealand took a multi-pronged approach to awareness raising:

Media

- press releases
- radio interviews
- targeting of TV gardening, fishing, hunting and news shows
- relevant information on Campaign agencies' websites
- adverts in various media (press, radio) at key relevant points in the year.

Rewards

- public competitions and rewards for capturing pests.

Signage

- roadside information banners/signs near or at affected or vulnerable sites.

Annual events

- Site visits for the public to affected and unaffected sites to illustrate the issue and its consequences.

Facilities

- On-site facilities to wash down boats and other water equipment to prevent spread.
- Experts would be provided to talk to public groups (including schools, angling clubs, etc), on request and at own initiative, about the issue.

Monitoring programme and reporting back

- Campaign staff in constant contact with team responsible for monitoring the pest situation in the field, and reporting back to the public to keep the issue alive and up to date in the public's mind.

Campaign material

The following material would vary in content according to the target audience, and would include colour photographs and graphics. Gardening shops, pet shops, fishing and hunting shops would all be targeted, as would schools. Native alternatives would be suggested to the pests.

- Posters.
- Leaflets.
- Flyers.
- Fridge magnets & stickers.
- Information insert for Fishing Licence.
- Pest species animated in fancy dress costume and used for parades, school visits, etc.
- Stuffed specimens of the pest species used for public education talks etc.

- Display graphics created which vividly illustrate the damaging effects of the pest species on the native environment.

Legal issues

- The sale of exotic pest species would ideally be banned for sale by garden/etc shops, or if this was unsuccessful then the managers of these shops would be educated about the issue and requested to cease trading the relevant species. A folded leaflet which opens into an attractive poster would be freely available from garden shops illustrating and describing each exotic pest species and then next to its picture would be a photograph of a native species which could be used instead.
- At the start of the fishing season there would be a patrol by enforcement officers of the most popular fishing areas to educate the anglers and also to ensure they understood how to prevent the spread of the exotic species and were actively doing so.

Appendix 5 County specific non-natives species lists and categorisation

Norfolk

Table A Final list of non-native species in Norfolk for further consideration

Species with high impact on native habitats and biota:

Australian swamp stonecrop <i>Crassula helmsii</i>	Floating pennywort <i>Hydrocotyle ranunculoides</i>
Water fern <i>Azolla filiculoides</i>	Parrot's feather <i>Myriophyllum aquaticum</i>
Monkey-flowers <i>Mimulus cupreus</i> , <i>M. guttatus</i> & hybrid	Giant hogweed <i>Heracleum mantegazzianum</i>
Nuttall's pondweed <i>Elodea nuttallii</i>	Japanese knotweed <i>Fallopia japonica</i>
Himalayan balsam <i>Impatiens glandulifera</i>	Canadian pondweed <i>Elodea canadensis</i>
Rhododendron <i>Rhododendron ponticum</i>	Chinese mitten crab <i>Eriocheir sinensis</i>
Red swamp crayfish <i>Procambarus clarkii</i>	Signal crayfish <i>Pacifastacus leniusculus</i>
Freshwater amphipod <i>Crangonyx pseudogracilis</i>	Freshwater copepod <i>Lernaea cyprinacea</i>
Zebra mussel <i>Dreissena polymorpha</i>	Jenkin's spire shell <i>Potamopyrgus antipodarum</i>
Common carp <i>Cyprinus carpio</i>	Goldfish <i>Carassius auratus</i>
Topmouth gudgeon <i>Pseudorasbora parva</i>	

Species with low impact on native habitats and biota:

Sweetflag <i>Acorus calamus</i>	Montbretia <i>Crococsmia x crocosmiiflora</i>
Orange balsam <i>Impatiens capensis</i>	Lupin <i>Lupinus nootkatensis</i>
Pink purslane <i>Montia sibirica</i>	Cape pondweed <i>Aponogeton distachyos</i>
Giant butterbur <i>Petasites japonicus</i>	Tapegrass <i>Vallisneria spiralis</i>
Brook charr <i>Salvelinus fontinalis</i>	Largemouth bass <i>Micropterus salmoides</i>
Orfe <i>Leuciscus idus</i>	Pumpkinseed <i>Lepomis gibbosus</i>
Rainbow trout <i>Oncorhynchus mykiss</i>	Grass carp <i>Ctenopharyngodon idella</i>
Rock bass <i>Ambloplites rupestris</i>	

Table continued...

Species with unknown impact on native habitats and biota:

Large-flowered water-thyme <i>Egeria densa</i>	Sunbleak <i>Leucaspis delineatus</i>
Curly water-thyme/water-weed <i>Lagarosiphon major</i>	Bitterling <i>Rhodeus sericeus</i>
Least duckweed <i>Lemna minuta (minuscula)</i>	Sterlet/Sturgeons All except <i>A. sturio</i>
Narrow-clawed (Turkish) crayfish <i>Astacus leptodactylus</i>	European (wels) catfish <i>Silurus glanis</i>
Noble crayfish <i>Astacus astacus</i>	Pikeperch (zander) <i>Sander lucioperca</i>
Freshwater coelenterate <i>Craspedacusta sowerbyi</i>	Freshwater copepods <i>Achtheres percarum</i> , <i>Ergasilus briani</i> , <i>E. sieboldi</i> , <i>Neoergasilus</i>
Freshwater molluscs <i>Corbicula fluminea</i> , <i>Ferissia wautieri</i> ,	<i>japonicus</i> , <i>Tracheliastes polycolpus</i>
<i>Marstoniopsis scholtzi</i> , <i>Menetus dilatatus</i> , <i>Physa acuta</i> ,	Freshwater oligochaetes <i>Branchiura</i>
<i>Musculium transversum</i> , <i>P.gyrina</i> , <i>P. heterostropha</i>	<i>sowerbyi</i> , <i>Limnodrilus cervix</i>
Freshwater triclads <i>Dugesia tigrina</i> , <i>Phagocata woodworthi</i> , <i>Planaria torva</i>	Other freshwater malacostracans <i>Asellus communis</i> , <i>Corophium curvispinum</i>
	Black bullhead <i>Ameirus melas</i>

Species considered for addition to Schedule 9 to the Wildlife and Countryside Act 1981 and the Ban on Sale of Certain Non-native Species:

Snow goose <i>Anser caerulescens</i>	Bar-headed goose <i>Anser indicus</i>
Emperor goose <i>Anser canagicus</i>	Barnacle goose <i>Branta leucopsis</i>
Black swan <i>Cygnus atratus</i>	Ruddy shelduck <i>Tadorna ferruginea</i>
Red-crested pochard <i>Netta rufina</i>	Spiny-cheek crayfish <i>Orconectes limosus</i>
Few flowered leek <i>Allium paradoxum</i>	Water hyacinth <i>Eichhornia crassipes</i>
Three cornered garlic <i>Allium triquetrum</i>	Water lettuce <i>Pistia stratiotes</i>
Hybrid knotweed <i>Fallopia japonica x F. sachalinensis</i>	Duck potato <i>Sagittaria latifolia</i>
Giant knotweed <i>Fallopia sachalinensis</i>	Giant salvinia <i>Salvinia molesta</i>
Giant rhubarb <i>Gunnera tinctoria</i>	Italian crested newt <i>Triturus carnifex</i>
Water primrose <i>Ludwigia peploides</i> , <i>L. uruguayensis</i> (= <i>L. grandiflora</i>)	Red-eared terrapin <i>Trachemys scripta elegans</i>
Ruddy duck <i>Oxyura jamaicensis</i>	African clawed toad <i>Xenopus laevis</i>
American bullfrog <i>Rana catesbeiana</i>	Marbled crayfish <i>Procambarus sp</i>
Carolina water-shield (or fanwort) <i>Cabomba caroliniana</i>	Marsh frog <i>Rana ridibunda</i>
	Edible frog <i>Rana esculenta</i>

Additional species:

Egyptian geese <i>Alopochen aegyptiacus</i>	Mink <i>Mustela vison</i>
Canada geese <i>Branta canadensis</i>	Greylag geese <i>Anser anser</i>
Fringed water lily <i>Nymphoides peltata</i>	Terrapins sp
Water net <i>Hydrodictyon reticulatum</i>	Other non-native <i>Myriophyllum sp</i>
<i>Elodea callitrichoides</i>	<i>Spirodella punctata</i>
<i>Sagittaria graminea</i>	<i>Lemna valdiviana</i>
Chinese water deer <i>Hydropotes inermis</i>	Muntjac <i>Muntiacus reevesi</i>

Table B Prioritisation of Species of Concern in Norfolk

(1) Species widespread in Norfolk and requiring control:	
Ruddy duck <i>Oxyura jamaicensis</i>	Signal crayfish <i>Pacifastacus leniusculus</i>
Mink <i>Mustela vison</i>	Zebra mussel <i>Dreissena polymorpha</i>
Australian swamp stonecrop <i>Crassula helmsii</i>	Common carp <i>Cyprinus carpio</i>
Least duckweed <i>Lemna minuta (minuscula)</i>	Mirror Carp
Japanese knotweed <i>Fallopia japonica</i>	Canada goose <i>Branta canadensis</i>
Himalayan balsam <i>Impatiens glandulifera</i>	Greylag goose <i>Anser anser</i>
Giant hogweed <i>Heracleum mantegazzianum</i>	Egyptian goose <i>Alopochen aegyptiacus</i>
(2) Species present at specific sites and that require attention (remediation, prevention, eradication etc):¹	
Chinese Water Deer <i>Hydropotes inermis</i>	Freshwater molluscs <i>Corbicula fluminea</i>
Floating pennywort <i>Hydrocotyle ranunculoides</i>	European (wels) catfish <i>Silurus glanis</i>
Parrot's feather <i>Myriophyllum aquaticum</i>	Pikeperch (zander) <i>Sander lucioperca</i>
Goldfish <i>Carassius auratus</i>	Giant knotweed <i>Fallopia sachalinensis</i>
Grass carp <i>Ctenopharyngodon idella</i>	Red-eared terrapin <i>Trachemys scripta elegans</i>
Narrow-clawed (Turkish) crayfish <i>Astacus leptodactylus</i>	Marsh frog <i>Rana ridibunda</i>
(3) Species not currently present in Norfolk, but present in neighbouring counties and that have potential for impact in Norfolk and that require watching brief:²	
Chinese mitten crab <i>Eriocheir sinensis</i>	Giant rhubarb <i>Gunnera tinctoria</i>
Other non-native <i>Myriophyllum</i> spp	Water primrose <i>Ludwigia peploides, L. uruguayensis (L. grandiflora)</i>
Spiny-cheek crayfish <i>Orconectes limosus</i>	Duck potato <i>Sagittaria latifolia</i>
Water lettuce <i>Pistia stratiotes</i>	Giant Salvinia <i>Salvinia molesta</i>
Red swamp crayfish <i>Procambarus clarkia</i>	American bullfrog <i>Rana catesbeiana</i>
Topmouth gudgeon <i>Pseudorasbora parva</i>	Italian crested newt <i>Triturus carnifex</i>
Largemouth bass <i>Micropterus salmoides</i>	South African clawed toad <i>Xenopus laevis</i>
Large flowered water thyme <i>Eriaria densa</i>	Marbled crayfish <i>Procambarus</i> sp
Curly water weed <i>Lagarosiphon major</i>	Water hyacinth <i>Eichomia crassipes</i>
Noble crayfish <i>Astacus astacus</i>	
Sterlet/sturgeons All except <i>A. sturio</i>	
(4) Species which are widespread but whose eradication would cause damage to native species and would require extensive resources but whose spread to other sites should be prevented:	
Water fern <i>Azolla filiculoides</i>	Rhododendron <i>Rhododendron ponticum</i>
Canadian pondweed <i>Elodea canadensis</i>	Orfe <i>Leuciscus idus</i>
Nuttall's pondweed <i>Elodea nuttallii</i>	Rainbow trout <i>Oncorhynchus mykiss</i>

Table continued...

¹ It was agreed that the locations at which species in this category are known should be carefully monitored to assess whether they are spreading

² It was agreed that there is a need for a high level of surveillance for all species in this category

(5) Species for which insufficient information was available from those present to be able to prioritise:

South American Waterweed <i>Elodea calatrachoides</i>	Freshwater molluscs <i>Ferissia wautieri</i> , <i>Marstoniopsis scholtzi</i> , <i>Menetus dilatatus</i> ,
<i>Spirodela punctata</i>	<i>Musculium transversum</i> , <i>Physa gyrina</i> ,
Fringed water lily <i>Nymphoides peltata</i>	<i>P.heterostropha</i>
Water net, green algae <i>Hydrodictyon reticulatum</i>	Freshwater copepods <i>Ergasilus sieboldi</i> ,
Small duckweed <i>Lemna valdiviana</i>	<i>Achtheres percarum</i> , <i>E. briani</i> , <i>Neoergasilus</i>
Freshwater molluscs <i>Physa acuta</i>	<i>japonicus</i> , <i>Tracheliastes polycolpus</i>
Freshwater oligochaetes <i>Branchiura sowerbyi</i> ,	Black bullhead <i>Ameirus melas</i>
<i>Limnodrilus cervix</i>	Sunbleak <i>Leucaspis delineatus</i>
Freshwater malacostracan <i>Asellus communis</i>	Bitterling <i>Rhodeus sericeus</i>
Grassy arrowhead <i>Sagittaria graminea</i>	Carolina water-shield/fanwort <i>Cabomba</i>
Pumpkinseed <i>Lepomis gibbosus</i>	<i>caroliniana</i>
Rock bass <i>Ambloplites rupestris</i>	Other terrapin sp
Freshwater coelenterate <i>Craspedacusta sowerbyi</i>	Edible frog <i>Rana esculenta</i>
Freshwater triclads <i>Phagocata woodworthi</i> ,	Freshwater copepod <i>Lernaea cyprinacea</i>
<i>Planaria tova</i>	Tapegrass <i>Vallisneria spiralis</i>
Giant butterbur <i>Petasites japonicus</i>	

Cumbria

Table C Final list of non-native species in Cumbria for further consideration

High impact on native habitats and biota:	
Australian swamp stonecrop <i>Crassula helmsii</i>	Floating pennywort <i>Hydrocotyle ranunculoides</i>
Water fern <i>Azolla filiculoides</i>	Monkey-flowers <i>Mimulus cupreus</i> , <i>M. guttatus</i> and hybrids
Canadian pondweed <i>Elodea canadensis</i>	Nuttall's pondweed <i>Elodea nuttallii</i>
Japanese knotweed <i>Fallopia japonica</i>	Himalayan balsam <i>Impatiens glandulifera</i>
Giant hogweed <i>Heracleum mantegazzianum</i>	Rhododendron <i>Rhododendron ponticum</i>
Signal crayfish <i>Pacifastacus leniusculus</i>	Freshwater copepod <i>Lernaea cyprinacea</i>
Freshwater amphipod <i>Crangonyx pseudogracilis</i>	Chinese mitten crab <i>Eriocheir sinensis</i>
Jenkin's spire shell <i>Potamopyrgus antipodarum</i>	Common carp <i>Cyprinus carpio</i>
Topmouth gudgeon <i>Pseudorasbora parva</i>	
Goldfish <i>Carassius auratus</i>	
Low impact on native habitats and biota:	
Sweetflag <i>Acorus calamus</i>	Montbretia <i>Crocsmia x crocosmiiflora</i>
Orange balsam <i>Impatiens capensis</i>	Lupin <i>Lupinus nootkatensis</i>
Pink purslane <i>Montia sibirica</i>	Cape pondweed <i>Aponogeton distachyos</i>
Giant butterbur <i>Petasites japonicus</i>	Bitterling <i>Rhodeus sericeus</i>
Brook charr <i>Salvelinus fontinalis</i>	Rainbow trout <i>Oncorhynchus mykiss</i>
Grass carp <i>Ctenopharyngodon idella</i>	
Unknown impact on native habitats and biota:	
Curly water-thyme <i>Lagarosiphon major</i>	Least duckweed <i>Lemna minuta</i>
Freshwater triclads <i>Dugesia tigrina</i>	Freshwater molluscs <i>Corbicula fluminea</i>
<i>Phagocata woodworthi</i>	<i>Ferissia wautieri</i> , <i>Marstoniopsis scholtzi</i>
<i>Planaria torva</i>	<i>Menetus dilatatus</i> , <i>Musculium transversum</i>
Other freshwater malacostracans	<i>Physa acuta</i> , <i>P. gyrina</i> , <i>P. heterostropha</i>
<i>Asellus communi</i> , <i>Corophium curvispinum</i>	Freshwater copepods <i>Achtheres percarum</i>
Freshwater oligochaetes <i>Branchiura sowerbyi</i>	<i>Ergasilus briani</i> , <i>Neoergasilus japonicus</i>
<i>Limnodrilus cervix</i>	<i>Tracheliastes polycolpus</i> , <i>Ergasilus sieboldi</i>
Pikeperch (zander) <i>Sander lucioperca</i>	European (wels) catfish <i>Silurus glanis</i>
Other species:	
Skunk cabbage <i>Symplocarpus foetidus</i>	Mink <i>Mustela vison</i>
Canada geese <i>Branta canadensis</i>	Greylag geese <i>Anser anser</i>
Roach <i>Rutilus rutilus</i>	Red Eared Terrapins <i>Trachemys scripta elegans</i>
Ruddy duck <i>Oxyura jamaicensis</i>	Ruffe/Pope <i>Gymnocephalus cernuus</i>
Koi <i>Cyprinus carpio</i>	Giant knotweed <i>Fallopia sachalinensis</i>
Himalayan knotweed <i>Persicaria wallichii</i>	Giant rhubarb <i>Gunnera tinctoria</i>
South African clawed toad <i>Xenopus laevis</i>	

Table D Prioritisation of Species of Concern in Cumbria**Species widespread in Cumbria and requiring control:**

Australian swamp stonecrop <i>Crassula helmsii</i>	Giant hogweed <i>Heracleum mantegazzianum</i>
Japanese knotweed <i>Fallopia japonica</i>	Mink <i>Mustela vison</i>
Himalayan balsam <i>Impatiens glandulifera</i>	

Species present at specific sites and that require attention (remediation, prevention, eradication etc):

North American Signal crayfish <i>Pacifastacus leniusculus</i>	Goldfish <i>Carassius auratus</i>
Roach <i>Rutilus rutilus</i>	Water fern <i>Azolla filiculoides</i>
Canada Geese <i>Branta canadensis</i>	Curly water-thyme/weed
Greylag Geese <i>Anser anser</i>	<i>Lagarosiphon major</i>
Rainbow trout <i>Oncorhynchus mykiss</i>	Koi <i>Cyprinus carpio</i>
Chinese mitten crab <i>Eriocheir sinensis</i>	Himalayan knotweed <i>Persicaria wallichii</i>
Common carp <i>Cyprinus carpio</i>	Giant rhubarb <i>Gunnera tinctoria</i>
	Skunk cabbage <i>Symplocarpus foetidus</i>
	Giant knotweed <i>Fallopia sachalinensis</i>

Species not currently present in Cumbria, but present in neighbouring counties and that have potential for impact in Cumbria and that require watching brief:

European (wels) catfish <i>Silurus glanis</i>	Floating pennywort <i>Hydrocotyle ranunculoides</i>
Pikeperch (zander) <i>Sander lucioperca</i>	South African clawed toad <i>Xenopus laevis</i>
Topmouth gudgeon <i>Pseudorasbora parva</i>	
Zebra mussel <i>Dreissena polymorpha</i>	

Species which are widespread but whose eradication would cause damage to native species and would require extensive resources but whose spread to other sites should be prevented:

Canadian pondweed <i>Elodea canadensis</i>	Nuttall's pondweed <i>Elodea nuttallii</i>
--------------------------------------------	--------------------------------------------

Species for which insufficient information was available from those present to be able to prioritise:

Freshwater copepod <i>Lernaea cyprinacea</i>	Monkey-flowers <i>Mimulus cupreus</i> , <i>M. guttatus</i> and hybrids
Freshwater amphipod <i>Crangonyx pseudogracilis</i>	Giant butterbur <i>Petasites japonicus</i>
Freshwater molluscs: <i>Corbicula fluminea</i> , <i>Ferissia wautieri</i> , <i>Marstoniopsis scholtzi</i> , <i>Menetus dilatatus</i> , <i>Musculium transversum</i> , <i>Physa acuta</i> , <i>Physa gyrina</i> , <i>Physa heterostropha</i>	Cape pondweed <i>Aponogeton distachyos</i>
	Least duckweed <i>Lemna minuta</i> (<i>minuscula</i>)
	Freshwater triclads: <i>Dugesia tigrina</i> , <i>Phagocata woodworthi</i> , <i>Planaria torva</i>

Table continued...

Species that were not considered to pose a threat or have the potential to cause problems in the county:

Pink purslane <i>Montia sibirica</i>	Freshwater copepods <i>Achtheres percarum</i> , <i>Ergasilus briani</i> , <i>Ergasilus sieboldi</i> , <i>Neoergasilus japonicus</i> , <i>Tracheliastes</i> <i>polycolpus</i>
Bitterling <i>Rhodeus sericeus</i>	
Brook charr <i>Salvelinus fontinalis</i>	Jenkin's spire shell <i>Potamopyrgus antipodarum</i>
Montbretia <i>Crocasmia x</i> <i>crocosmiiflora</i>	Freshwater malacostracans <i>Asellus communis</i> , <i>Corophium</i> <i>curvispinum</i> , <i>Musculium transversum</i> , <i>Physa acuta</i> , <i>Physa gyrina</i> , <i>Physa heterostropha</i>
Orange balsam <i>Impatiens capensis</i>	
Grass carp <i>Ctenopharyngodon idella</i>	Red Eared Terrapins <i>Trachemys scripta elegans</i>
Sweetflag <i>Acorus calamus</i>	
Lupin <i>Lupinus nootkatensis</i>	
Freshwater oligochaetes <i>Branchiura</i> <i>sowerbyi</i> , <i>Limnodrilus cervix</i>	
Ruddy duck <i>Oxyura jamaicensis</i>	



Natural England works for people, places and nature to conserve and enhance biodiversity, landscapes and wildlife in rural, urban, coastal and marine areas.

www.naturalengland.org.uk

© Natural England 2008