



# Species Action Plan: Invasive Non-Native Species (INNS)

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## Introduction

### Definitions:

#### Non-Native Species

Any species which is outside its natural range in Pembrokeshire but which is present and capable of surviving and reproducing in the County.

#### Invasive Non-Native Species

Any species falling under the above definition and which causes damage to natural ecosystems or human economic, social or health interests by threatening native biodiversity.

## Scope

This grouped species action plan includes terrestrial, freshwater and marine INNS known to be present in Pembrokeshire or deemed likely to colonise the County or its coastal waters. Current national data from the GB Non-Native Species Secretariat (GBNNSS), local records from West Wales Biodiversity Information Centre (WWBIC), information held by Natural Resources Wales (NRW) and discussions with the relevant County Recorders were used to draft a list of species which could be of concern to biodiversity conservation in Pembrokeshire. Lead partners then used local knowledge and professional judgement to pare this list down to 36 species of concern in Pembrokeshire which are considered high priority for action based upon presence or likely future presence in the County, threat to native biodiversity, damage to infrastructure or property and available control measures.

This plan concentrates on those high priority species in Pembrokeshire, but does not preclude action to control or eradicate other INNS in the County and

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if new information comes to light, a species may be added or removed from the priority list.

Suggested actions in this plan are not intended to compel any partner to undertake a particular action, but instead to provide an overview of the strategic priorities of the Pembrokeshire Nature Partnership in order to guide partners in setting their own work programmes and provide a rationale to support appropriate actions across the Partnership. Actions contributing to the aims of this plan should be reported to the Partnership's Biodiversity Implementation Officer to enable the Partnership to identify new actions which could build on those already underway.

Whilst marine INNS are included in this plan, it is acknowledged that there are practical difficulties in both gathering data on the occurrence of these species and deploying effective control measures once identified. The emphasis for marine INNS must therefore be on bio-security measures to prevent the spread of species.

The plan excludes pathogens (disease causing organisms).

## **Vision Statement**

To ensure a strategic approach across Pembrokeshire to the monitoring, control and/or eradication of INNS in the County where both practicable and appropriate to safeguard the native biodiversity of Pembrokeshire.

## **Practical Control Measures**

The GB strategy for INNS adopts the three-stage hierarchical approach adopted by the Convention on Biological Diversity which details prevention, detection/surveillance and control/eradication as the three main ways of dealing with invasive species (with prevention given the highest priority).

### **Prevention includes:**

- Awareness raising amongst the public, the public sector (e.g. highways maintenance) and potential commercial pathways such as aquaculture, horticulture and the transport industry.
- Bio-security measures (including changing existing working practices where appropriate).
- Horizon-scanning for potential new threats and risk analysis of species and pathways identified.

### **Detection / surveillance:**

It is important that the presence of invasive non-native species is detected early, and the risks they pose are rapidly assessed. The sooner action is taken to address any threat, the greater the chance of success and the less costly it will be both in terms of biodiversity and other resources.

### **Mitigation, control & eradication:**

For the minority of species that are having a substantial negative effect, there are several options. These include mitigation of their negative impacts (for instance by establishing refuges for threatened species), control of the species, or eradication of the species where practicable. Control may be achieved through a spectrum of action including containing a species within a limited area, preventing (or slowing) its spread and localised population reduction or eradication in particular areas.

## **Risks**

Risks of INNS arriving or spreading include, but are not limited to:

- Increased mobility of species due to global trade and travel. This includes both the trade in species which can escape from their intended setting to the wider environment and species 'hitch hiking' on international transport routes (e.g. in ballast water or on the hulls of ships).
- New opportunities for colonisation due to climate change.
- 'Species meltdown' – the phenomenon whereby one INNS colonising an area will change the characteristics of that habitat creating opportunities for further INNS to colonise.

## **Impacts**

The two main impacts of INNS are:

- Loss of native biodiversity and resulting changes in the functioning of associated ecosystems.
- Economic impacts. These can be through direct damage to infrastructure (e.g. Japanese Knotweed or Buddleja damaging buildings, or Zebra Mussels clogging pipes and filters), financial burdens imposed by the need to tackle INNS once established, or less directly such as through loss in tourism revenue if the intrinsic appeal of a natural area is deemed to be degraded through INNS.

## **Reporting**

A major obstacle to coordinating strategic approaches to INNS management is the paucity of data on occurrence and distribution of species of concern. Systematic survey is resource intensive and therefore rare. The most practical approach is to encourage all interested parties to report INNS to a single point of contact where the records will be available to all partners. To this end, all reports of INNS, whether ad-hoc or the result of systematic survey, should be directed to [info@wwbic.org.uk](mailto:info@wwbic.org.uk) for inclusion on their verified database. There are several smart-phone apps available to record INNS and a selection are highlighted here: <http://www.nonnativespecies.org/index.cfm?sectionid=81> . In addition to the above, reports of alert species as identified under UK or EU schemes should be sent direct to [alert\\_nonnative@ceh.ac.uk](mailto:alert_nonnative@ceh.ac.uk) for immediate

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action. Alert species are identified in the species lists below. Reports should be accompanied by a photograph and grid reference.

## **Related Plans and Policies**

Other plans / policies / legislation directly affecting the management of these species in Pembrokeshire are:

- The Great Britain Invasive Non-Native Species Strategy 2015. GB Non-Native Species Secretariat.  
<http://www.nonnativespecies.org/index.cfm?sectionid=55>
- The invasive Alien Species of Union Concern:  
<http://www.nonnativespecies.org/index.cfm?sectionid=7>
- Species Control Agreements and Species Control Orders:  
<http://gov.wales/topics/environmentcountryside/farmingandcountryside/plantsseedsbiotechnology/invasive-non-native-species/species-control-agreements-and-orders/?lang=en>
- Priority Species for Action in Wales:  
<https://www.biodiversitywales.org.uk/Invasive-Non-Native-Group>
- SSSI Site Management Statements. Refer to Natural Resources Wales local offices.
- Core Management Plans for Natura 2000 Sites. Refer to Natural Resources Wales local offices or view online here:  
<https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/designated-sites/?lang=en>
- Rhododendron Clearance: recommendations for reducing the impact on the otter (Lyles, 2006). CCW report; Contact Natural Resources Wales local offices for details.
- Pembrokeshire Single Integrated Plan 2013 -2018. Available at:  
[http://www.pembrokeshire.gov.uk/content.asp?nav=101,126,2182&parent\\_directory\\_id=646](http://www.pembrokeshire.gov.uk/content.asp?nav=101,126,2182&parent_directory_id=646)
- Clean, check, dry campaign; promoting bio-security amongst water-users: <http://www.nonnativespecies.org/checkcleandry/index.cfm>
- Be Plant Wise; raising awareness of INNS issues amongst gardeners, pond owners and retailers:  
<http://www.nonnativespecies.org/beplantwise/index.cfm>

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## Species Considered High Priority for Action:

There follows a list of species considered high priority for action, grouped by habitat for ease of reference. Below that, the species are listed alphabetically by taxonomic name with information on threats, distribution and recommendations for action. Alert species are shown in red text.

### Terrestrial

<i>Anoplophora chinensis</i>	Citrus Longhorn Beetle
<i>Buddleja davidii</i>	Butterfly Bush
<i>Carpobrotus edulis</i>	Hottentot Fig
<i>Crassula helmsii</i>	New Zealand Pigmyweed
<i>Fallopia japonica</i>	Japanese Knotweed
<i>Harmonia axyridis</i>	Harlequin Ladybird
<i>Hippophae rhamnoides</i>	Sea Buckthorn
<i>Impatiens glandulifera</i>	Himalayan Balsam
<i>Leycesteria formosa</i>	Himalayan Honeysuckle
<i>Lysichiton americanus</i>	American Skunk-cabbage
<i>Petasites fragrans</i>	Winter Heliotrope
<i>Quercus ilex</i>	Evergreen Oak
<i>Rhododendron ponticum</i>	Rhododendron
<i>Spartina anglica</i>	Common Cord-grass
<i>Vespa velutina</i>	Asian hornet

### Freshwater

<i>Azolla filiculoides</i>	Water Fern
<i>Cabomba caroliniana</i>	Carolina Watershield
<i>Corbicula fluminea</i>	Asian Clam
<i>Crassula helmsii</i>	New Zealand Pigmyweed
<i>Dikerogammarus villosus</i>	Killer Shrimp

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<i>Dreissena bugensis</i>	Quagga Mussel
<i>Dreissena polymorpha</i>	Zebra Mussel
<i>Eriocheir sinensis</i>	Chinese Mitten Crab
<i>Hemimysis anomala</i>	Carrion Shrimp
<i>Hydrocotyle ranunculoides</i>	Floating Pennywort
<i>Ludwigia grandiflora</i>	Water Primrose
<i>Myriophyllum aquaticum</i>	Parrot's Feather
<i>Nymphoides peltata</i>	Fringed Waterlily
<i>Pseudorasbora parva</i>	Topmouth Gudgeon

## Marine

<i>Corbicula fluminea</i>	Asian Clam
<i>Crassostrea gigas</i>	Pacific Oyster
<i>Crepidula fornicata</i>	Slipper Limpet
<i>Didemnum vexillum</i>	Carpet Sea-squirt (Colonial Sea-squirt)
<i>Dikerogammarus villosus</i>	Killer Shrimp
<i>Dreissena bugensis</i>	Quagga Mussel
<i>Dreissena polymorpha</i>	Zebra Mussel
<i>Eriocheir sinensis</i>	Chinese Mitten Crab
<i>Hemigrapsus sanguineus</i>	Asian Shore Crab
<i>Hemigrapsus takanoi</i>	Brush Clawed Crab
<i>Homarus americanus</i>	American Lobster
<i>Rapana venosa</i>	Rapa Whelk
<i>Undaria pinnatifida</i>	Wakame / Japanese Kelp

## Species Information and Recommendations for Action

It should be noted that there are particular practical difficulties in monitoring and controlling INNS in the Marine environment. Once established, control measures may be ineffective. The emphasis is therefore strongly on bio-security in the Marine environment – assessing pathways and adopting appropriate measures to reduce the risk of spread. As a likely result of the many industrial, commercial and recreational activities in the area, the Milford Haven Waterway is one of the UK's 'hot-spots' for Marine INNS. Additional information on Marine INNS is available from the Marine Life Information Network (MarLIN) here: <http://www.marlin.ac.uk/>. The Marine Environmental Change Network's MarClim project is also a useful source of monitoring data at selected locations around the Coast (website available here: <http://www.marclim.co.uk/index.php?sec=info> ).

<b><i>Anoplophora chinensis</i> (Citrus Longhorn Beetle) *ALERT SPECIES*</b>	
Notes:	Very high risk. Damages a range of native broadleaved trees and shrubs as well as species of economic importance. Immediate action required if discovered. Specimen should be captured; kept in a sealed glass jar and the local FERA Inspector notified asap. This species is now subject to emergency measures taken by the European Commission which includes strategies to contain infestations where eradication is no longer an option.
Distribution:	Terrestrial. No records in Pembrokeshire. Recorded in Essex in 2008.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=242">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=242</a>
Control measures:	Not applicable. Currently not established in UK
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks.
<b><i>Azolla filiculoides</i> (Water Fern)</b>	
Notes:	Highly invasive: threat to aquatic habitats and to native species of plants & invertebrates. A threat to the St David's Coast and North-West Pembrokeshire Commons SACs. This species was banned from sale in England & Wales from April 2014.
Distribution:	Freshwater. 41 records in Pembrokeshire including sensitive sites (SSSIs & NNR)

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Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=451">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=451</a>
Control measures:	<a href="http://www.cabi.org/projects/project/32814">http://www.cabi.org/projects/project/32814</a> <a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Options for control/eradication are limited however action should be taken immediately if new sites are discovered.

### ***Buddleja davidii* (Butterfly Bush)**

Notes:	A very successful colonist of bare disturbed ground, walls/buildings quarries etc especially associated with urban/suburban sites. Highly invasive. Potential threat to biodiversity and to economic assets (can cause structural damage to buildings etc.).
Distribution:	Terrestrial. Widespread.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=581">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=581</a>
Control measures:	Site-specific decision.
Recommended Action:	Maintain vigilance. Assess pathways and risks. Control/eradicate on sites where biodiversity is threatened or on new sites. Action recommended on nature reserves or SSSIs

### ***Cabomba caroliniana* (Carolina Watershield)**

Notes:	High risk if discovered. Prevent from becoming established or spreading.
Distribution:	Freshwater. Not recorded in Pembrokeshire. Very rare in UK but has potential to spread. Introductions into the Basingstoke area in SE England via aquaria.
Factsheet:	<a href="http://www.nonnativespecies.org/downloadDocument.cfm?id=354">http://www.nonnativespecies.org/downloadDocument.cfm?id=354</a>
Control Measures:	<a href="http://www.cabi.org/isc/datasheet/107743">http://www.cabi.org/isc/datasheet/107743</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks.

### ***Carpobrotus edulis* (Hottentot Fig)**

Notes:	Potentially highly invasive and a threat to native cliff vegetation. High priority for action if found on new sites. Priority species for action in Wales.
Distribution:	Terrestrial. Localised, multiple sites. Mainly on Tenby south cliffs.

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Factcheet:	<a href="http://www.plantlife.org.uk/wild_plants/plant_species/hottentot-fig">http://www.plantlife.org.uk/wild_plants/plant_species/hottentot-fig</a>
Control Measures:	<a href="http://www.plantwise.org/KnowledgeBank/Datasheet.aspx?dsID=10648">http://www.plantwise.org/KnowledgeBank/Datasheet.aspx?dsID=10648</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Take measures to eradicate at new sites before it becomes established.

### ***Corbicula fluminea* (Asian Clam)**

Notes:	Rampant in Ireland and very invasive. National priority for Wales.
Distribution:	Freshwater & Marine (brackish). Not recorded in Pembrokeshire but recorded in Wales (Port Talbot Docks 09/03/2011).
Factsheet:	<a href="http://www.europe-aliens.org/pdf/Corbicula_fluminea.pdf">http://www.europe-aliens.org/pdf/Corbicula_fluminea.pdf</a>
Control Measures:	<a href="http://www.europe-aliens.org/pdf/Corbicula_fluminea.pdf">http://www.europe-aliens.org/pdf/Corbicula_fluminea.pdf</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. High priority if identified in the County.

### ***Crassostrea gigas* (Pacific oyster)**

Notes:	Out-competes and displaces native species including native oysters.
Distribution:	Marine. Isolated locations within the Milford Haven Waterway.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1013">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1013</a>
Control Measures:	Limited. Responds to temperature and it is possible that populations may increase as a result of elevated water temperature associated with thermal discharges to the Milford Haven Waterway.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Continue to monitor at known locations

### ***Crassula helmsii* (New Zealand Pigmyweed)**

Notes:	Extremely invasive; very high risk to biodiversity. This species was banned from sale in England & Wales from April 2014.
Distribution:	Terrestrial & freshwater. Localised, multiple sites. Has now become a serious conservation & management issue in ponds and pools on heaths in the St David's area, including sites within the North-West Pembrokeshire Commons SAC.

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Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1017">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1017</a>
Control Measures:	<a href="http://www.cabi.org/isc/datasheet/16463">http://www.cabi.org/isc/datasheet/16463</a> <a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Immediate action should be taken to control/eradicate this species if it appears on new sites; strategy for controlling its spread from existing sites is required. Promote 'clean, check, dry' campaign.

### ***Crepidula fornicata* (Slipper Limpet)**

Notes:	Adults live on the seabed on a variety of surfaces in a wide range of environmental conditions. Reaches its highest densities in wave protected muddy areas. Often attaches to the shells of dead and living hard-shelled invertebrates including scallops, crabs, whelks and mussels. Competes for both space and food with native species and changes local conditions through deposition of 'mussel mud'.
Distribution:	Well established on the southern coasts of England and Wales and spreading northward. Known from several sites in Pembrokeshire.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1028">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1028</a>
Control Measures:	Mechanical removal to reduce density, but unlikely to eradicate completely.
Recommended Action:	Monitor spread from established areas such as Milford Haven Waterway.

### ***Didemnum vexillum* (Carpet Sea-squirt [Colonial Sea-squirt]) \*ALERT SPECIES\***

Notes:	Highly damaging to native species/communities. Eradication program in one location in Wales (Holy Head marina) initially thought successful but persists albeit in small amounts. Continued effort (v. costly) will be required to control it. This is a UK alert species – report sightings immediately.
Distribution:	Marine. Not recorded in Pembrokeshire.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1209">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1209</a>
Control Measures:	<a href="http://www.nonnativespecies.org/index.cfm?pageid=227">http://www.nonnativespecies.org/index.cfm?pageid=227</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. High priority if identified in the County.

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<b><i>Dikerogammarus villosus</i> (Killer Shrimp) *ALERT SPECIES*</b>	
Notes:	Will kill native Gammarid (freshwater shrimp) species. This is a UK alert species – report sightings immediately.
Distribution:	Freshwater & marine. Not recorded in Pembrokeshire. Present in South Wales.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1219">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1219</a>
Control Measures:	Biosecurity is the best option. See: <a href="http://www.cabi.org/isc/datasheet/108309">http://www.cabi.org/isc/datasheet/108309</a> <a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. High priority if identified in the County. Promote 'check, clean, dry' campaign.

<b><i>Dreissena bugensis</i> (Quagga Mussel) *ALERT SPECIES*</b>	
Notes:	Similar to Zebra mussels but can out-compete them. Can clog water pipes, filters and turbines and alter ecosystems by filtering significant amounts of nutrient out of the water column. This is a UK alert species – report sightings immediately. Priority species for action in Wales.
Distribution:	Freshwater & marine. Not recorded in Pembrokeshire but present in Wales
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3831">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3831</a>
Control Measures:	Biosecurity is the most effective control.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. High priority if identified in the County.

<b><i>Dreissena polymorpha</i> (Zebra Mussel)</b>	
Notes:	Can clog water pipes, filters and turbines. High risk.
Distribution:	Freshwater & marine. Not recorded in Pembrokeshire. Present in Cosmeston Lakes (Vale of Glamorgan) and Cardiff Bay.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1250">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1250</a>
Control Measures:	Biosecurity is the most effective control.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. High priority if identified in the County.

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<b><i>Eriocheir sinensis</i> (Chinese Mitten Crab) *ALERT SPECIES*</b>	
Notes:	Known to cause some damage to flood banks and feeds on fish eggs (amongst other things). This is a UK alert species – report sightings immediately.
Distribution:	Freshwater & marine. Not recorded in Pembrokeshire. Recently spread into Wales via Dee estuary. Recorded in the Severn estuary near Bristol in 2015.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1379">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1379</a>
Control Measures:	Prevention is the only form of control.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. High priority if identified in the County.

<b><i>Fallopia japonica</i> (Japanese Knotweed)</b>	
Notes:	Extremely invasive. A serious threat to biodiversity and to economic assets (causes serious structural damage). National priority for Wales.
Distribution:	Terrestrial. This species is widespread throughout the County and has already caused considerable damage. Particularly associated with transport and river corridors or brown-field / development sites.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1495">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1495</a>
Control Measures:	<a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a>
Recommended Action:	Strategic approach to control/eradication from existing sites required. Bio-security measures required to prevent its spread. Immediate action required where it appears on new sites (the aim should be to eradicate it before it becomes established).

<b><i>Harmonia axyridis</i> (Harlequin Ladybird)</b>	
Notes:	Causing rapid declines in native ladybird populations in parts of the UK.
Distribution:	Terrestrial. First county record: 2008; recorded from several locations since then-mostly in south Pembrokeshire.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1668">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1668</a>

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Control Measures:	Methods of control include trapping of aggregates of beetles and/or use of insecticides. Insecticide use should be carried out in accordance with best practice guidelines available here: <a href="http://www.hse.gov.uk/pesticides/topics/using-pesticides.htm">http://www.hse.gov.uk/pesticides/topics/using-pesticides.htm</a> . Use of natural parasites and pathogens as control methods currently being investigated.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Action should be taken to eradicate it from new locations before it becomes established.

### ***Hemigrapsus sanguineus* (Asian Shore Crab)**

Notes:	Inhabits estuarine and marine habitats and occurs within the intertidal or shallow subtidal zones. It is typically found on more exposed rocky shores but also occurs in soft sediments under the shelter of rocks or shells, artificial structures, mussel beds and oyster reefs. Significant reductions in common shore crab abundance and mussel density where established.
Distribution:	Recorded in South Wales in 2014. No records in Pembrokeshire.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3818">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3818</a>
Control measures:	None known.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks.

### ***Hemigrapsus takanoi* (Brush Clawed Crab)**

Notes:	Inhabits muddy sediment in the intertidal areas of mudflats, estuaries, harbours, lagoons and sheltered bays. Competes with native crabs and a potential predator of shellfish.
Distribution:	Recorded in the Medway estuary in 2014. No records in Pembrokeshire.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3818">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3818</a>
Control measures:	None known.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks.

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<b><i>Hemimysis anomala</i> (Carrion Shrimp or Bloody-red Mysid)</b>	
Notes:	Can have significant impacts on ecosystems, causing dramatic decreases in some taxa and altering nutrient levels in water bodies.
Distribution:	Freshwater. Not present in Wales, but established in England
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1698">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1698</a>
Control Measures:	None Identified.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Promote 'clean, check, dry' campaign.

<b><i>Hippophae rhamnoides</i> (Sea Buckthorn)</b>	
Notes:	Highly invasive and a major threat to biodiversity. Sand dunes are especially vulnerable. A lot of resources have already been invested in its control/eradication from selected sensitive locations on the south coast of Pembrokeshire. Priority species for action in Wales.
Distribution:	Terrestrial. Localised: multiple sites
Factsheet:	Not available
Control Measures:	<a href="http://nora.nerc.ac.uk/7928/">http://nora.nerc.ac.uk/7928/</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Action should be taken to eradicate it from new locations before it becomes established.

<b><i>Homarus americanus</i> (American Lobster)</b>	
Notes:	American lobsters are larger, more aggressive, more fecund and inhabit a broader range of habitats than the European lobsters, and so could outcompete the native population. The blood disease <i>gaffkemia</i> is endemic in wild American lobsters and causes a rapid 100% mortality in the European lobster within a few days of exposure, although there is currently no evidence that the disease is present in European lobster populations. Priority species for action in Wales.
Distribution:	No established populations have been recorded, although 26 individuals were morphologically identified in the 23 years between 1988 and 2011 and it is assumed many more have been caught and not recorded. Nearest record Pwllheli, North Wales in 2016.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1736">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1736</a>

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Control Measures:	None known
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Awareness raising.

### ***Hydrocotyle ranunculoides* (Floating Pennywort)**

Notes:	Highly invasive and spreading rapidly. Can spread from the smallest root fragments and from its seeds. Forms dense mats of vegetation over water surfaces. Can grow 20cm a day and up to 15m from the bank in a single season. It can double its wet weight in 3 days. It suppresses native species by taking oxygen out of the water, leaving waters lifeless. It can also block waterways and cause flooding. Listed under Schedule 9 of the Wildlife and Countryside Act. This species was banned from sale in England & Wales from April 2014. Priority species for action in Wales.
Distribution:	Not present in Pembrokeshire
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1766">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1766</a>
Control Measures:	<a href="http://www.cabi.org/projects/project/33139">http://www.cabi.org/projects/project/33139</a> <a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Immediate eradication if this species is reported. Awareness raising.

### ***Impatiens glandulifera* (Himalayan Balsam)**

Notes:	Highly invasive; very easily spread via watercourses throughout catchments. Major threat to biodiversity in riparian corridors; also in wider countryside (it is well established in ditches etc. well away from streams and rivers). Expanding e.g. along water courses; road side ditches and verges. Has benefited from the recent sequence of wet summers. Priority species for action in Wales.
Distribution:	Terrestrial. Established & invasive throughout most of lowland Britain.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1810">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1810</a>
Control Measures:	<a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a> Hand pulling before it sets seed is effective.

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Recommended Action:	Action required to eradicate this species wherever it appears. Strategic action required on a catchment scale to eliminate it from rivers and other water courses. Investigate current distribution to identify suitable areas (sub-catchment scale) to target for eradication.
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### ***Leycesteria formosa* (Himalayan Honeysuckle)**

Notes:	Highly invasive. This species can cause structural damage that is on a par with <i>buddleja</i> . Threat to biodiversity and to economic assets.
Distribution:	Terrestrial. 41 records scattered through out the County, mostly around settlements. Spreading rapidly in the County.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1989">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1989</a>
Control Measures:	Dig out and burn on site.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Action should be taken to eradicate this species where ever it appears – before it becomes established.

### ***Ludwigia grandiflora* (Water Primrose) \*ALERT SPECIES\***

Notes:	Highly invasive and can have a devastating effect on native habitats. Its rampant growth out competes native species and can clog waterways. It spreads by stem fragments and also by seeds making eradication difficult. In the UK it is on a rapid response list meaning any known sites are targeted for immediate eradication. Listed on Schedule 9 of the Wildlife and Countryside Act. This species was banned from sale in England & Wales from April 2014. Priority species for action in Wales.
Distribution:	Not recorded in Pembrokeshire. Eradication programme in Garngoch pond, Penllergaer, Swansea now being monitored to assess effectiveness.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/downloadFactsheet.cfm?speciesId=2087">http://www.nonnativespecies.org/factsheet/downloadFactsheet.cfm?speciesId=2087</a>
Control Measures:	<a href="http://plantlife.org.uk/wild_plants/plant_species/water_primrose">http://plantlife.org.uk/wild_plants/plant_species/water_primrose</a> <a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Reports should be followed by immediate action for eradication.

Reviewed August 2017

<b><i>Lysichiton americanus</i> (American Skunk-cabbage)</b>	
Notes:	A new threat to biodiversity in Pembrokeshire. Highly invasive; spreads easily via ditches; water courses. This species will out-compete native flora wherever it becomes established. Removal of established populations can be very costly and difficult to achieve. Priority species for action in Wales.
Distribution:	Terrestrial. Localised, multiple sites in the County.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2110">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2110</a>
Control Measures:	<a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Action should be taken to eradicate it from all known sites as early coordinated action is likely to yield successful results. Awareness raising.

<b><i>Myriophyllum aquaticum</i> (Parrot's Feather)</b>	
Notes:	Invasive. Can rapidly dominate a water-body displacing native species. Causes flooding by blocking watercourses and drainage. Listed on Schedule 9 of the Wildlife and Countryside Act and is one of Natural Resources Wales' top 10 invasive species that are a threat to the aquatic environment. This species was banned from sale in England & Wales from April 2014. Priority species for action in Wales.
Distribution:	Localised, multiple sites
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2285">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2285</a>
Control Measures:	<a href="http://www.google.co.uk/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=1&amp;ved=0ahUKEwjA0Yv6w8zVAhVICsAKHY96Bn4QFqgmMAA&amp;url=http%3A%2F%2Fwww.nonnativespecies.org%2FdownloadDocument.cfm%3Fid%3D403&amp;usq=AFQjCNGTVC_RNfelmP35sZJpm4K3YKFcgw">http://www.google.co.uk/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=1&amp;ved=0ahUKEwjA0Yv6w8zVAhVICsAKHY96Bn4QFqgmMAA&amp;url=http%3A%2F%2Fwww.nonnativespecies.org%2FdownloadDocument.cfm%3Fid%3D403&amp;usq=AFQjCNGTVC_RNfelmP35sZJpm4K3YKFcgw</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Action should be taken to eradicate it from all known sites as early coordinated action is likely to yield successful results. Awareness raising.

<b><i>Nymphaeodes peltata</i> (Fringed Waterlily)</b>	
Notes:	High priority in selected areas only, where (if it appears) it would threaten rare/scarce native flowering plants.
Distribution:	Freshwater. Localised; multiple sites
Factsheet:	<a href="https://www.researchgate.net/profile/Jonathan_Newman3/publication/234111297_6_Fringed_Water_Lily/links/0912f50f40b0e3e2ed000000/6-Fringed-Water-Lily.pdf">https://www.researchgate.net/profile/Jonathan_Newman3/publication/234111297_6_Fringed_Water_Lily/links/0912f50f40b0e3e2ed000000/6-Fringed-Water-Lily.pdf</a>

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Control Measures:	<a href="https://www.researchgate.net/profile/Jonathan_Newman3/publication/234111297_6_Fringed_Water_Lily/links/0912f50f40b0e3e2ed000000/6-Fringed-Water-Lily.pdf">https://www.researchgate.net/profile/Jonathan_Newman3/publication/234111297_6_Fringed_Water_Lily/links/0912f50f40b0e3e2ed000000/6-Fringed-Water-Lily.pdf</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Action should be taken to eradicate fringed water lily if and when it appears on sensitive sites e.g. Dowrog Common; Ramsey Island; Bosherton Lily Ponds. Early coordinated action is likely to yield successful results.

### ***Petasites fragrans* (Winter Heliotrope)**

Notes:	Easily spread by Highways maintenance activity. Immediate action should be taken to control it at new sites
Distribution:	Terrestrial. Widespread especially in the South of the County and spreading.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2607">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2607</a>
Control Measures:	Cutting can spread this species. Appropriate herbicide application recommended. Herbicide use should be carried out in accordance with best practice guidelines available here: <a href="http://www.hse.gov.uk/pesticides/topics/using-pesticides.htm">http://www.hse.gov.uk/pesticides/topics/using-pesticides.htm</a>
Recommended Action:	Eradicate from new sites. Raise awareness amongst maintenance teams.

### ***Pseudorasbora parva* (Topmouth Gudgeon) \*ALERT SPECIES\***

Notes:	Out-competes native species. This is a UK alert species – report sightings immediately. Priority species for action in Wales. GB eradication priority.
Distribution:	Freshwater. Not recorded in Pembrokeshire. Present in Wales. Introduced to Millennium Coastal Park and Lledi (Llanelli). Eradication programme in progress.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2876">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2876</a>
Control Measures:	<a href="http://www.nonnativespecies.org/index.cfm?pageid=208">http://www.nonnativespecies.org/index.cfm?pageid=208</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Immediate action if identified.

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<b><i>Quercus ilex</i> (Evergreen Oak)</b>	
Notes:	Potentially a high risk to biodiversity.
Distribution:	Terrestrial. Established throughout the UK. At present, it is scattered throughout the County – as a result of planting schemes. Seedlings have been found in grassland on the Castlemartin Ranges.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2958">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2958</a>
Control Measures:	Mechanical removal.
Recommended Action:	Immediate action required if found in habitats outside woodlands, parks or gardens. Awareness raising. Discourage in planting schemes.

<b><i>Rapana venosa</i> (Veined Rapa Whelk)</b>	
Notes:	Highly invasive. Damage to shellfish beds. Priority species for action in Wales.
Distribution:	Marine. Not established in the UK. Not recorded in Wales yet but thought likely to arrive.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2972">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2972</a>
Control Measures:	No effective control known once established. Prevention is the best strategy.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. High priority if identified in the County.

<b><i>Rhododendron ponticum</i> &amp; hybrids (Rhododendron)</b>	
Notes:	Major threat to biodiversity. Habitats such as semi-natural deciduous woodland, lowland heathland and wetlands are vulnerable to invasion. Priority species for action in Wales. <b>Note:</b> this species is very susceptible to <i>Phytophthora</i> infection and it is known to have acted as a reservoir and source of infection of, e.g. larch plantations: potentially serious impacts on economic assets as well as biodiversity. <b>Note:</b> refer to Rhododendron Clearance: recommendations for reducing the impact on the otter (Lyles, 2006) if clearing this species near watercourses (see related plans and policies, above).
Distribution:	Terrestrial. Locally common-established in woodlands throughout the County. Capable of invading wetlands and heathlands.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3004">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3004</a>

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Control Measures:	<a href="http://www.forestry.gov.uk/fr/INFD-63JJVS">http://www.forestry.gov.uk/fr/INFD-63JJVS</a> <a href="http://www.forestry.gov.uk/pdf/fcpg017.pdf/\$FILE/fcpg017.pdf">http://www.forestry.gov.uk/pdf/fcpg017.pdf/\$FILE/fcpg017.pdf</a>
Recommended Action:	Strategic approach to prevention of spread required; on-going control/eradication from several sites in Pembrokeshire. Effort should be focused on wetland and woodland SSSIs.

### ***Spartina anglica* (Common Cord-grass)**

Notes:	High risk to biodiversity wherever it appears.
Distribution:	Terrestrial. Established throughout the UK. Widespread in Pembrokeshire <b>except the Nevern estuary</b> . Present in salt marsh throughout the Milford Haven Waterway & Daugleddau Estuary – where the damage to biodiversity has already been done.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3345">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3345</a> <a href="http://jncc.defra.gov.uk/page-1680">http://jncc.defra.gov.uk/page-1680</a> <a href="http://www.europe-aliens.org/pdf/Spartina_anglica.pdf">http://www.europe-aliens.org/pdf/Spartina_anglica.pdf</a>
Control Measures:	<a href="http://jncc.defra.gov.uk/page-1680">http://jncc.defra.gov.uk/page-1680</a> <a href="http://www.europe-aliens.org/pdf/Spartina_anglica.pdf">http://www.europe-aliens.org/pdf/Spartina_anglica.pdf</a>
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks. Immediate action aimed at eradicating this species should be taken if it appears in the Nevern Estuary – the only estuary in Wales which is currently free of <i>Spartina</i> .

### ***Undaria pinnatifida* (Japanese Kelp)**

Notes:	May be found on hard surfaces, including man-made structures from the low tide mark down as far as 15 metres in clear water. May also attach to bottom dwelling creatures, empty shells, loose cobbles and other seaweed species. Competes for space and resources with native species of kelp.
Distribution:	Recorded in the southern UK, including Pembrokeshire. Established in Milford Haven Waterway.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3643">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3643</a>
Control Measures:	None identified. Early detection is key.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Establish if spreading along the coast from Milford Haven Waterway.

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<b><i>Vespa velutina</i> (Asian hornet) *ALERT SPECIES*</b>	
Notes:	Threat to native pollinators which have not yet developed defence strategies exhibited by Asian Bees etc. This is a UK alert species, report sightings immediately. Priority species for action in Wales.
Distribution:	Terrestrial. Recorded in the UK for the first time in 2016. An individual was trapped in Somerset and a nest was destroyed in Gloucestershire.
Factsheet:	<a href="http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3826">http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3826</a> <a href="http://www.nationalbeeunit.com/index.cfm?pageid=208">http://www.nationalbeeunit.com/index.cfm?pageid=208</a>
Control Measures:	None identified. Early detection is key.
Recommended Action:	Maintain vigilance. Swift reporting if identified. Assess pathways and risks.

## Plan Aims

Code	Aim	Deadline	Comments
INNS1	Monitor the number, distribution and population size of INNS in Pembrokeshire and promote sharing of information amongst stakeholders to inform and coordinate management actions.	Lifetime of this plan	
INNS2	Provide a framework for coordination of INNS control actions across the County, thereby maximising the effectiveness of actions across appropriate landscape scale units (e.g. river catchment, transport corridors and networks of semi-natural habitats).	Lifetime of this plan	
INNS3	Undertake practical actions to prevent, detect and/or mitigate / control / eradicate INNS in Pembrokeshire.	Lifetime of this plan	

## Suggested Actions

Code	Action	Report By	Lead Role	Progress / Additional Information
INNS1.01	Establish a database of records of INNS in Pembrokeshire to encourage data sharing and collaborative control projects across the Pembrokeshire Nature Partnership.	April 2014	PNP	Implemented, but technical issues led to poor take up. Re-design planned.
INNS2.01	Produce and review an INNS Action Plan to provide clear advice on priorities and control options in the County and to maximise the effectiveness of individual stakeholder actions by providing a framework to coordinate effort across the Pembrokeshire Nature Partnership.	April 2014	PNP	Implemented. Ongoing.
INNS3.01	Promote national awareness raising initiatives through PNP networks (e.g. 'check, clean, dry' or 'plantwise').			Implemented. Ongoing.
INNS1.02	Assess and map extent of <i>Carpobrotus edulis</i> (Hottentot Fig) on Tenby South Cliffs and report back.		NRW	
INNS3.02	Eradication of Rhododendron at Esgyrn Bottom SSSI		NRW	
INNS3.03	Identify suitable areas (sub-catchment scale) where Himalayan Balsam eradication by volunteer groups is practicable			Underway. Ongoing. See PCNPA Stitch in Time Project.
INNS3.04	Identify opportunities to develop and support Community-led action to eradicate Japanese knotweed at a sub-catchment scale			Underway. Ongoing. See PCNPA Stitch in Time Project.
INNS3.05	Create and distribute a series of INNS factsheets for appropriate audiences (e.g. forestry workers, marina workers, recreational walkers).			Marine INNS Awareness Day, Milford 13/09/17.
INNS1.03	Monitor population of Pacific oyster within MHW		NRW	

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INNS3.06	Control of <i>Spartina anglica</i> in Nevern estuary.		PCNPA	Recorded in 2017. Dug out by ranger & volunteers.
INNS3.07	Control of Skunk Cabbage at various locations.		NRW	Project to control at various locations undertaken in 2017. Coordinated by Chris Lawrence.