REGIONAL INVASIVE SPECIES MANAGEMENT PLAN (RIMPS): EAST OF ENGLAND REGION

Animal & Plant Health Agency

NATURAL ENGLAND

Bristol Zoological Society

Life

NATURA 2000

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The East of England Regional IAS Management Plan was compiled by the Norfolk Non Native Species Initiative and written by Joe Kenworthy, Katy Owen and Martin Horlock.

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Executive Summary

- This document is a part of the RAPID LIFE Project, a three-year EU Life funded project whose objective is to deliver a package of measures to reduce the impact and spread of IAS in freshwater aquatic, riparian and coastal environments across England. RAPID seeks to bridge the gap between high-level strategies (such as the GB IAS strategy) and action on the ground at local level.

- Using a template and guidance developed by national IAS experts, local experts have produced RIMPs for each of five regions in England: North, Midlands, East of England, South West and South East. The RIMPs will deliver consistent (but regionally tailored) recommendations on prevention, early warning, rapid response, eradication and control of IAS (in the above listed target environments) throughout England.

- The purpose of the current document is to guide IAS management activities in the East of England region and to help them to be strategic and coordinated with other regions.

- The size of the East of England region is 26700 km^2. It covers 13 counties (in whole or in part).

- In the development of this RIMP, local stakeholders were consulted throughout the process through one on one and email conversations, as well as additional feedback from experts. Where appropriate, each RIMP has been modified to incorporate feedback from this consultation. A total of 53 stakeholders were consulted during the development of the East of England RIMP.

- This document categorises IAS in the East of England region by priority. It also details pathways of introduction, the hotspots and areas of high conservation value and also the key stakeholders.

- In this document, IAS are allocated to a priority category for management based on their risk and relative occurrence in the region: Black – prevention; Red – eradicate; Amber & Green – long-term management.

- The RIMPs also contain information and/or links to information on IAS identification, reporting procedures and best practice management guidelines.

- This document will be used to encourage local action groups, county forums and specialists to continue to work together and develop comprehensive plans to tackle invasive non-native species at both local and regional scales.

- All of the RIMPs will need be reviewed periodically and updated as needed to reflect current trends, partnerships and best IAS management practices.

Introduction

It is widely recognised that invasive alien species (IAS) represent one of the greatest threats to biodiversity across the globe. RAPID (Reducing And Preventing IAS Dispersal) LIFE is a three-year (2017 -2020) EU funded project overseen by the Animal and Plant Health Agency (APHA), working in partnership with Natural England and the British Zoological Society, and coordinated by Alexia Fish. The project works to protect freshwater aquatic, riparian and coastal biodiversity by embedding a coordinated, strategic and evidence-based approach to managing IAS across England. In doing so, this project seeks to bridge the gap between high-level strategies and action on the ground at a local level.

Please note that "IAS" is the European term for invasive species, but as "INNS" (invasive non-native species) is the most commonly used term in the UK (and is synonymous with IAS), this term will be used for the most part throughout the rest of this document.

As part of the RAPID LIFE project, England has been split into five regions (Figure 1) and a Regional IAS Management Plan (RIMP) has been developed for each of these. These plans aim to deliver consistent, regionally relevant information and advice for prevention, early warning, rapid response, eradication and control of INNS. Each RIMP focuses on three key elements for invasive species management: 1) building partnerships and collaborations; 2) education and awareness raising; and 3) control and management. Each RIMP works to identify regional and local potential pathways and 'hotpots' for INNS introductions, assisting local stakeholder groups to identify priority areas on which to concentrate resources for awareness-raising and education.

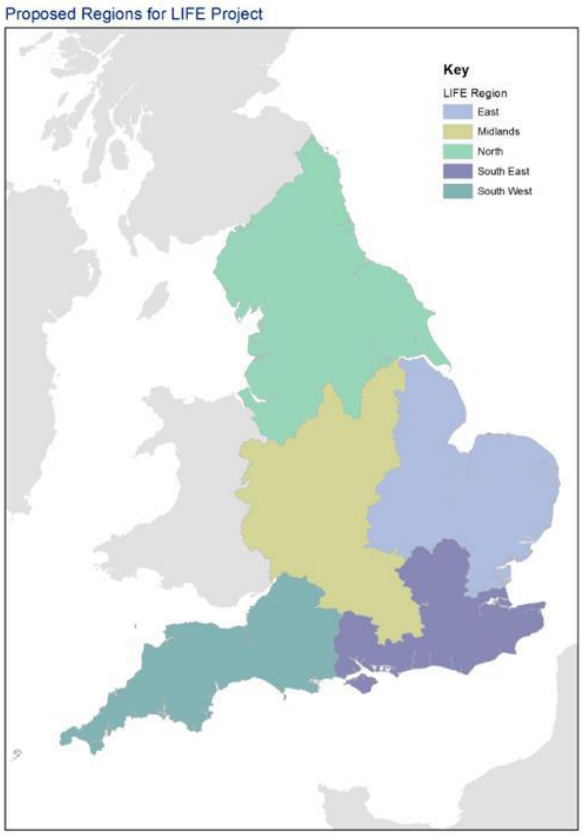


Figure 1. The RAPID LIFE Project covers England and divides the area into five regions

East of England RIMP

To determine management priorities, presence/absence and abundance data have been used to allocate INNS to a management priority category depending on risk to that particular region: Black – prevention; Red – eradicate; Amber and Green – long-term management. This RIMP also contains information and links to INNS identification guides, reporting procedures and good practice management guidelines. In this way, the five RIMP documents will establish a regionally-based framework across England to better support improved strategic delivery of effective INNS management. The aim is that these documents will be continuously updated in response to changes in INNS populations in each catchment and changing management priorities.

This RIMP focuses on the East of England region. This region has been subdivided further into distinct catchments for greater operational relevance as river catchments within the region are distinct in terms of geographical, topographical and demographical information (detailed below). These divisions used were made based upon river catchments in accordance with the Catchment Based Approach (CaBA). This approach incorporates whole systems to allow delivery of strategic improvements to these environments at a scale relevant to the local community, promoting collaborative working among local stakeholders, and incorporating individual management priorities based upon catchment requirements.

Broadland Rivers

The Broadland Rivers catchment includes the rivers Ant, Bure, Wensum, Yare and Waveney. These catchments drain into a tide dominated area of inland waterway known as the Broads and finally out to sea through the mouth of the River Yare at Great Yarmouth. The catchment covers approximately 3200 km^2 with a population of over 800,000 people. It is predominantly rural and the main urban areas are Norwich, Great Yarmouth and Lowestoft. The Broads is nationally and internationally designated for its unique habitat and is heavily used for tourism, particularly boating with around 280km of navigable waterway.

Cam & Ely Ouse

This catchment covers 904 km^2 in the centre of the Anglian River Basin District. Land use is principally agricultural, with centres of population and industry in the main towns of Swaffham and Watton. The catchment also contains ten surface water bodies and two lake water bodies.

Combined Essex

This catchment includes the rivers and tributaries of the Roach, Crouch, Chelmer, Blackwater, Colne and Stour. It covers Essex as well as small parts of Cambridge and Suffolk.

East Suffolk

This catchment includes the valleys, tributaries and estuaries of the Rivers Gipping, Deben, Alde, Thorpeness Hundred, Yox, Blyth and Lothingland Hundred. Natural England classifies this area as environmentally sensitive under the overarching designation 'Suffolk River Valleys'. This area also contains the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB).

Louth, Grimsby, Ancholme

This is a predominantly rural catchment extending from the Ancholme valley in the west to the coastal resort of Cleethorpes in the east encompassing Louth and Grimsby. The northern fringe of the Lincolnshire Wolds AONB is within the catchment. The River Ancholme forms part of a vital navigable network and connects to the Humber Estuary at South Ferriby. The principal urban areas around the estuary are Grimsby and Immingham with heavy industry dominating the landscape along the south Humber bank. Cadney and Covenham Reservoirs are key water company assets in the drinking water supply network. The Trent, Witham, Ancholme Transfer Scheme is a critical piece of infrastructure for managing water resources in the catchment.

Nene

The River Nene is the tenth longest river in the country, with a long history of human modification. Significant tributaries include the Ise and Willow Brook. The landscape is agricultural, composed of mixed farming. Within the catchment there are two large urban centres located in Northampton and Peterborough. The Rockingham Forest area covers a large area to the north of the catchment. The valley is rich in wildlife and features large areas of international significance.

North Norfolk

This catchment covers a relatively small area, composed of a narrow strip of land along the North Norfolk coast. This is a rural area, with the largest towns at Mundesley, Cromer, Sheringham, Holt and Wells-next-the-Sea. The main watercourses are the Rivers Hun, Burn, Glaven, Stiffkey and Mun. All are relatively short in length but important due to the biodiversity they support. Land use is mostly agricultural for cereal and root crop production, with some livestock and horticultural use. The landscape value of this catchment is recognised as part of the Norfolk Coast AONB.

North West Norfolk

The NW Norfolk catchment covers an area of approximately 1,000 km^2, stretching from Denver to Hunstanton. Major urban areas include Kings Lynn, Downham Market and Hunstanton. This region contains the River Great Ouse (north of the Denver Sluice), Rivers Heacham, Ingol, Babingley and Nar which flow into the Wash embayment. The Fenland region to the west is crossed by numerous man-made drainage channels. This catchment is predominantly rural with a population of 109,000. The countryside is mostly agricultural, with a quarter classified as 'high quality' and recognised as an important national and local resource. This area contains sites of exceptional environmental value including the River Nar, Roydon Common and Dersingham Bog. The entire Wash embayment is designated as a European Marine Site.

Old Bedford & Middle Level

This catchment covers an area of approximately 921 km^2. The local area comprises the Ouse Washes and the Middle Level rivers and drain. Major urban areas include Whittlesey, March, Ramsey and Chatteris. The area contains high quality soil for arable farming and agriculture and is therefore important to the local economy. During the winter, the Washes support significant numbers of water birds, leading to SPA and Ramsar protection.

South Essex

This area represents the catchment for the Rivers Crouch, Roach, and Mard. It covers a total of 727 km^2 with a population of 650,000. More than 20% of the catchment is urbanised, a figure that is likely to increase in the future following initiatives such as the Thames Gateway development. Other land uses are arable crop production and pasture.

Upper & Bedford Ouse

The Great Ouse is the fourth longest river in the UK, with a course of 230 km. It has been important historically for commercial navigation and for draining the low lying area through which it flows. Land use is almost entirely agricultural and the majority is in arable use.

Welland

The River Welland flows through Northamptonshire, Leicestershire and Rutland before slowing down as it becomes one of the four fenland rivers which drain the Fens, before entering The Wash. Major tributaries include Langton Brook, Eye Brook, the River Chater and the River Gwash. The predominantly rural catchment covers an area of approximately 965 km2, with a total length of more than 482 km of waterway.

Witham

This is an extensively rural catchment within the county of Lincolnshire with good agricultural land. The River Witham rises south of Grantham, passes through Lincoln and drains to the Wash embayment. Other significant rivers include the Rivers Brant, Till, Bain, Slea and the extensive network of drainage systems in the East and West Fens north of Boston. Drainage has historically had a significant effect on the catchment; much of the Fen areas are below sea level. Local Internal Drainage Boards maintain a network of drains, which control water levels. The catchment benefits from the Trent Witham Ancholme River Transfer Scheme. This is a key infrastructure link for managing water resources, maintaining summer water levels and meeting agricultural, public water supply and industrial needs. There are over 150 Sites of Special Scientific Interest (SSSIs) in addition to the southern tip of the Lincolnshire Wolds AONB.

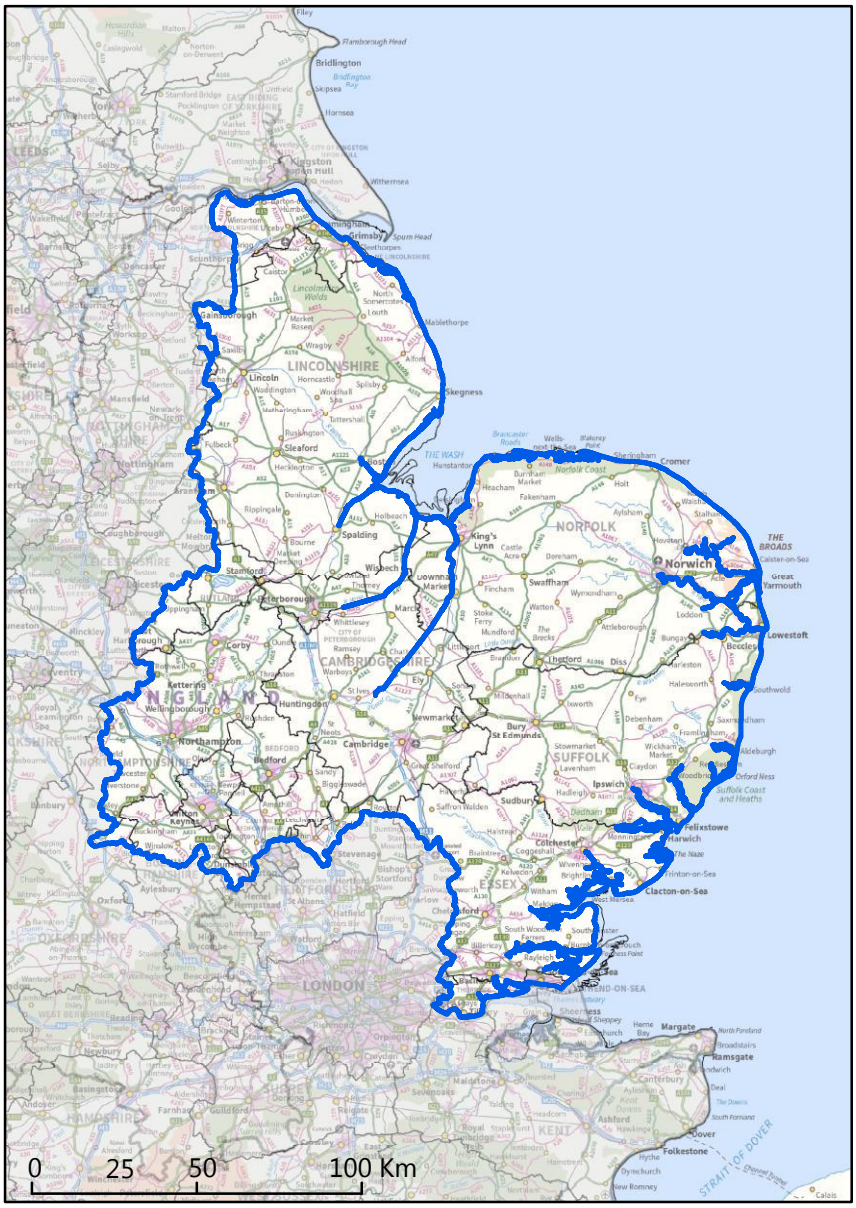


Figure 2. East of England RAPID LIFE region incorporating all or parts of Lincolnshire, Cambridgeshire, Northamptonshire, Leicestershire, Rutland, Bedfordshire, Buckinghamshire, Hertfordshire, Nottinghamshire, Oxfordshire, Norfolk, Suffolk and Essex

Section 1: INNS pathways and associated stakeholders

Invasive species can be introduced into new environments by a variety of different mechanisms, often called pathways of invasion. Understanding the mechanisms through which invasive species arrive in new areas is important in order to understand how to prevent or reduce further introductions. Usually via human activities, INNS can be introduced both intentionally (e.g. ornamental plant species) and accidentally (e.g. through "hitchhiking" or unintentional transfer with aquaculture species).

With respect to the RIMP target species more information can be found on the pathways dispersal and associated biosecurity toolkits can be found on the GB NNSS RAPID Life web pages:

http://www.nonnativespecies.org//index.cfm?pageid=615

Table 1 provides a summary of INNS pathways and associated stakeholders for catchments within the East of England region.

Table 1. Introduction Pathways and Stakeholders

Pathway	Description	Associated stakeholders
Transportation – Air	All modes of air transport e.g. aeroplanes. Stowaways in wheel wells, cargo holds etc.	- Airports (Norwich; Humberside; Cambridge; Southend) - HM customs and Excise - Freight companies - Airlines
Transportation – land/terrestrial	All modes of transport across ground , INNS can be transported as stowaways or along corridors made via each transporter (e.g. along roads and railways) - Cars, buses, trucks, quad bikes, boat trailer, bicycles - Trains - Construction vehicles and equipment - Hikers, hunters, anglers, horses, dogs/dog-walkers - Conservation volunteers/surveyors?	- Freight operators and haulage companies - Transport providers e.g. Eurostar, coach holiday companies - Land management agencies e.g. Councils, Wildlife Trusts, EA, NE, Water Land Management Alliance (WLMA), Internal Drainage Boards (IDBs) - Landowners e.g. Forestry Commission, National Trust, RSPB - Construction companies and building contractors - Ramblers, Walkers are Welcome, National Trails
Transportation – water/aquatic	All modes of water transport (industrial/commercial/recreation). - Ballast water/sediment, seas chests, engine compartments - Hull or other surface fouling on boats, kayaks, platforms, docks etc. - Stowaways in cargo or holds - Structures above the water line (e.g. turbine construction equipment, rigs etc.) - Movement of dredge material	- Port/boat yard/marina operators - Dredging/piling organisations - Offshore energy companies and maintenance contractors - Marine survey organisations - Cruise operators - Leisure craft members organisations e.g. RYA, sailing clubs, - Water sports schools and clubs e.g. British Canoeing - Water companies - Event/Regatta organisers - Anglers - Coastguards - Cargo ship operators
Transportation – shipping process	- Containers (interior and exterior) - Packing materials e.g. wooden pallets - Seaweed - Sand/earth/compost	- Freight operators and haulage companies - Suppliers and distributors - Trade organisations

Pathway	Description	Associated stakeholders
Tourism and re-locations	- Travellers themselves - Baggage - Pets, plants - Plants/animals transported for events e.g. agricultural shows, equestrian events, horticultural shows - Consumables e.g. food in caravans/campervans, carried as gifts	- Travel operators - Travel websites/bloggers - Members of the public
"Contamination" or Hitch-hiking	Seeds, spores and eggs attached to surfaces, other animals or in soil/sediment - Aquaculture equipment and stock - Water sports equipment (e.g. canoes) - Clothing/shoes	- CEFAS / local fishery managers - Leisure craft members organisations e.g. RYA, sailing clubs, - Water sports schools and clubs e.g. British Canoeing - Members of the public (e.g. walkers, ramblers, mountain bikers)
Horticulture i.e. plant and pond escapes	Imports of plants and sites of deliberate introduction, including dumping of horticultural and aquaculture waste sediment / water. Includes whole plants, cuttings, bulbs, roots, fruits and seed. Hitch-hikers on the plant (e.g. pathogens and parasites) or in water, growth medium or packing material. - Nurseries/garden centres - Botanical gardens - Landscaping - Plant research facilities - Aquariums	- Garden centres, nurseries - Royal Horticultural Society - Defra / APHA
Food products	Live seafood or other live food animals e.g crayfish, carp, plants and plant parts e.g. fruit, vegetables, nuts etc. - Accidental or intentional release - Hitch-hikers on or in the product (pathogens, parasites) - Hitch-hikers in water, food, packing, bedding, growth medium	- CEFAS / Local fishery managers - Local councils - EIFCA - MMO
Non-food products	Bait, aquarium/pet trade, aquaculture, work animals - Accidental or intentional release - Hitch-hikers on or in the product (pathogens, parasites) - Hitch-hikers in water, food, packing, bedding, growth medium	- CEFAS / Local fishery managers - Members of the public - Garden centres, nurseries - Pet shops

Section 2: Priority areas for education and awareness-raising

The identification of INNS priority areas is important in order to better focus resources such as INNS prevention and management, but also education and awareness-raising. These priority areas can be found in the table below to highlight the target audiences and related delivery mechanism.

Further information regarding good biosecurity practices for aquatic species can be found within the biosecurity toolkits found on the GB NNSS RAPID LIFE web pages:

http://www.nonnativespecies.org//index.cfm?pageid=615

http://www.nonnativespecies.org/index.cfm?pageid=622

The "Check Clean Dry" campaign provides further information for raising awareness and biosecurity issues for aquatic species:

http://www.nonnativespecies.org/checkcleandry/index.cfm

The "Be Plant Wise" campaign also provides further information regarding biosecurity issues relating to plant species:

http://www.nonnativespecies.org/beplantwise/

Table 2 provides a summary of stakeholder groups and priority areas within the East of England region. It provides example stakeholders within each group and presents various delivery mechanisms to tackle each of the priority areas.

Table 2: Priority areas education and awareness-raising

Stakeholder Group	Example stakeholders	Priority Area	Delivery mechanism
Air and land transporters	International / national travel hubs, freight/trains	Promote biosecurity issues to prevent and minimise hitchhikers and stowaways in goods or via tourism (baggage, food, pets)	Promote awareness of the impact of invasive species.
Freshwater transporters	Port and boat yard operators, berth/mooring owners e.g. Broads Authority, River's Trusts. Water companies	Use best practice methodologies regarding INNS for disposing of dredge material/spoil Promote biosecurity issues to prevent and minimise hitchhikers and stowaways in contaminated cargo	Promote awareness of the impact of invasive species. Promote the implementation of and enable training in codes of best practice regarding biosecurity issues
Marine/coastal transporters	Port Operators and associated orgs e.g. Victoria Group, Associated British Ports, Peel Ports Trinity House. Offshore renewables companies e.g. DONG energy, Scottish Power, Iberdrola, Vanguard, East Anglia Arra, dry dock and vessel maintenance companies (e.g. International ports)	Avoid pumping out of unsterilized ballast water in harbours Enhance knowledge of the role of hull fouling in the transport of INNS Use best practice methodologies regarding INNS for disposing of dredge material/spoil	Promote the implementation of and enable training in codes of best practice regarding biosecurity issues , e.g. requiring unsterilized ballast water to be discharged away from harbour, GBNNSS website for Biosecurity APHA (Animal Plant and Health Agency) can assist with supply of posters and other awareness material for display and signage (e.g. Check Clean Dry campaign)
Water users (Leisure)	Outdoor aquatic sports centres, canoes/kayaks/leisure craft users, private leisure operators, outfitters/equipment rental agencies, training providers/water sports schools and clubs, Royal Yachting Association, sailing clubs, event organisers e.g regattas etc. British Canoeing. Angling clubs.	Contaminated water sports or angling equipment The impact of hull fouling on pleasure craft spreading INNS among marinas Promote knowledge of biosecurity issues to clubs, participants and visiting users and awareness of the dangers arising from INNS	APHA (Animal Plant and Health Agency) can assist with supply of posters and other awareness material for display and signage (e.g. Check Clean Dry campaign) Raise awareness among community groups by liaising with retailers / sports centres, marinas and local clubs Locally based experts to work with associations to promote disinfection of equipment and use of appropriate facilities to eliminate the risk of accidental transfer of INNS GBNNSS website, particularly RAPID section and biosecurity
Off-road users e.g. quad bikes, mountain bikers, walkers.	E.g. clubs, members of the public	Promote knowledge of biosecurity issues to clubs, participants and visiting users and awareness of the dangers arising from INNS	Promote signage of INNS issues among retailers and on community notice boards

Stakeholder Group	Example stakeholders	Priority Area	Delivery mechanism
Construction / Contractors / Ground Maintenance Workers / Marine Surveyors	Windfarm maintenance and servicing organisations e.g SeaJacks, 4COffshore. Marine survey organisations e.g. Gardline, Fugro, SubSea7. Private environmental consultancies. Piling and dredging organisations. Marine aggregate contractors. Cefas and MMO. Natural England, Environment Agency. Local building contractors.	Promote general awareness of impacts and measures to prevent/control INNS Contaminated equipment / construction materials / sediment / soil	Locally based experts to work with associations to promote disinfection of equipment and use of appropriate facilities to eliminate the risk of accidental transfer of INNS GBNNSS website, particularly RAPID Life section
Land owners and managers	EA, NE, Wildlife Trusts. Water Land Management Alliance (WLMA) and Internal Drainage Boards (IDBs). Farmers and other large landowners. County and District Councils.	Bank management, movement of sand/earth, vegetation clearance and associated equipment. Intentional introduction or planting	APHA/local stakeholders to work with retailers to encourage distribution of codes and posters (available from APHA/Plantlife) and to advise the general public of INNS issues
Plant traders (terrestrial and aquatic)	Garden centres, online stockists, pet shops, exotics/ornamentals dealers. RHS, local clubs. Horticultural Trade Association	Sale from garden/aquatics centres and pet shops including hitchhikers in contaminated growth medium, soil, nursery stock etc. Promotion of existing codes of best practice covering the security and disposal of INNS Target gardeners to dispose plant material and/or soils responsibly Promote knowledge of biosecurity issues amongst tenants and resource users	Liaise with local industry and trade associations to advise members regularly of best practice in respect of INNS APHA/local stakeholders to work with retailers to encourage distribution of codes and posters (available from APHA/Plantlife) and to advise the general public of INNS issues Work with locally based experts to disseminate best practices and appropriate signage to reduce threats from INNS GBNNSS website, particularly RAPID section
Aquaculture and seafood	Cefas, EIFCA , local harvesting and supplier businesses	Importation of seed and stock from contaminated areas Movement of stock and water Biosecurity measures	Incorporation of INNS codes of good practice into industry codes of practice to enable effective biosecurity GBNNSS website, particularly RAPID section

Stakeholder Group	Example stakeholders	Priority Area	Delivery mechanism
General Public		General awareness of impacts and measures to prevent/control INNS	Local media campaigns Social media as a tool to inform and educate wider audiences GBNNSS website, particularly RAPID section RAPID Life project leaflet promoting awareness the dangers arising from INNS and the reporting system Promote the biosecurity guidance to all via locally based experts
Schools	Local colleges, universities, schools, forest school	General awareness of impacts and measures to prevent/control INNS	School visits focusing on ecological clubs and encouraging appropriate field trips Local wildlife charities/council community initiatives/locally based experts Social media as a tool to inform and educate wider youth audiences

Section 3: Key Regional Stakeholders

The following table is a list of regional stakeholders. This list contains the names of groups and agencies listed in sections 1 and 2, and others who are key stakeholders within the region that may either be heavily involved in recording or tackling INNS within the region, or who have a vested interest in maintaining the quality of the region, its habitats and wildlife. The list includes names of current contacts (where appropriate).

Table 3: Key regional Stakeholders

Stakeholder group	Website	Stakeholder location/catchment area within East of England
Government & Agency		
Environment Agency (INNS lead)	https://www.gov.uk/government/organisations/environment-agency	All
Animal and Plant Health Agency (APHA)	https://www.gov.uk/government/organisations/animal-and-plant-health-agency	
Marine Management Organisation	https://www.gov.uk/government/organisations/marine-management-organisation	All
Natural England (Lead Marine Adviser)	https://www.gov.uk/government/organisations/natural-england	All
Forestry Commission	https://www.forestry.gov.uk/	All
Eastern IFCA	http://www.eastern-ifca.gov.uk/	All
Internal Drainage Boards	https://www.ada.org.uk/member_type/idbs/	All
British Waterways Board	http://www.britishwaterways.co.uk/	All
GB non-native species secretariat	http://www.nonnativespecies.org/home/index.cfm	All
Department for Environment, Food and Rural Affairs (DEFRA)	https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs	All
Centre for Environment, Fisheries and Aquaculture Science (Cefas)	https://www.cefas.co.uk/	All
Local Authority		
Norfolk Biodiversity Information Service	http://www.nbis.org.uk/	Norfolk
Suffolk Biodiversity Information Service	http://www.suffolkbis.org.uk/	Suffolk
Greater Lincolnshire Nature Partnership	https://glnp.org.uk/	Lincolnshire

Wash and North Norfolk Coast Marine Partnership	https://wnnmp.co.uk/	Lincolnshire and Norfolk
Essex Biodiversity Project	https://www.essexwt.org.uk/protecting-wildlife/essex-biodiversity	Essex
Cambridgeshire and Peterborough Environmental Records Centre	https://www.cperc.org.uk/	Cambridgeshire
Leicestershire and Rutland Environment Records Centre (LRERC)	https://www.leicestershire.gov.uk/environment-and-planning/planning/leicestershire-and-rutland-environment-records-centre-lrerc	Leicestershire and Rutland
Local Councils	https://www.bedford.gov.uk/ https://www.buckscc.gov.uk/ https://www.cambridgeshire.gov.uk/ http://www.centralbedfordshire.gov.uk/ https://www.peterborough.gov.uk/ https://www.essex.gov.uk/Pages/Default.aspx https://www.london.gov.uk/ https://www.hertfordshire.gov.uk/home.aspx https://www.leicestershire.gov.uk/ https://www.lincolnshire.gov.uk/ https://www.milton-keynes.gov.uk/ https://www.norfolk.gov.uk/ https://www.nelincs.gov.uk/ http://www.northlincs.gov.uk/ https://www3.northamptonshire.gov.uk/pages/default.aspx http://www.nottinghamshire.gov.uk/ https://www.oxfordshire.gov.uk/ https://www.rutland.gov.uk/ https://www.southend.gov.uk/ https://www.suffolk.gov.uk/ https://www.thurrock.gov.uk/	Bedford (B) Buckinghamshire County Cambridgeshire County Central Bedfordshire City Of Peterborough (B) Essex County Greater London Authority Hertfordshire County Leicestershire County Lincolnshire County Milton Keynes (B) Norfolk County North East Lincolnshire (B) North Lincolnshire (B) Northamptonshire County Nottinghamshire County Oxfordshire County Rutland Southend-On-Sea (B) Suffolk County Thurrock (B)
NGO		
CABI	https://www.cabi.org/	All
RSPB	https://www.rspb.org.uk/about-the-rspb/	All
National Trust	https://www.nationaltrust.org.uk	Norfolk All
Norfolk Wildlife Trust	https://www.norfolkwildlifetrust.org.uk/home	Norfolk
Lincolnshire Wildlife Trust	https://www.lincstrust.org.uk/	Lincolnshire
Suffolk Wildlife Trust	https://www.suffolkwildlifetrust.org/	Suffolk
Essex Wildlife Trust	https://www.essexwt.org.uk/	Essex
Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire	https://www.wildlifebcn.org/	Bedfordshire Cambridgeshire Northamptonshire
Leicestershire and Rutland Wildlife Trust	http://www.lrwt.org.uk/	Leicestershire and Rutland

Norfolk Rivers Trust	https://norfolkriverstrust.org/	North Norfolk, Broadland
Lincolnshire Rivers Trust	http://www.lincsrivers.org.uk/	Lincolnshire
Essex and Suffolk Rivers Trust	https://essexsuffolkriverstrust.org/	Essex Suffolk
Canal and Rivers Trust	https://canalrivertrust.org.uk/	All
Action with Communities in Rural England (ACRE)	http://www.acre.org.uk/	Lincolnshire Cambridgeshire Leicestershire and Rutland Northamptonshire Bedfordshire Norfolk Suffolk Essex
Welland River Trust	www.wellandriverstrust.org.uk	Welland
Broads Authority	http://www.broads-authority.gov.uk/	Broadland Rivers
Wild Trout Trust	https://www.wildtrout.org/	All
Water Management Alliance	https://www.wlma.org.uk/	All
Peterborough Environment City Trust	https://www.pect.org.uk/	Nene
WLMA	https://www.wlma.org.uk/	All
Angling Trust	https://www.anglingtrust.net/	All
RYA	https://www.rya.org.uk/Pages/Home.aspx	All
British Canoeing	https://www.britishcanoeing.org.uk/	All
Essex Rivers Hub	http://www.essexrivershub.org.uk/	Combined Essex
Cambridgeshire and Peterborough Biodiversity Partnership	http://www.cpbiodiversity.org.uk/	Cambridgeshire
Froglife	https://www.froglife.org/	All
Bedfordshire and Luton Biodiversity Recording and Monitoring Centre	https://nbn.org.uk/members/bedfordshire-and-luton-biodiversity-recording-and-monitoring-centre/	Bedfordshire
NatureSpot	https://www.naturespot.org.uk/	Leicestershire and Rutland
Recreational and voluntary		
Local Action Groups (LAGS)	Contact details can be found on GBNNSS website: http://www.nonnativespecies.org/index.cfm?sectionid=71	All
Dedham Vale and Stour Valley Project	http://www.dedhamvalestourvalley.org/	Combined Essex
Thames Chase Trust	http://www.thameschase.org.uk/	South Essex
Essex River Wardens Project	https://www.essexwtrecords.org.uk/survey/river-wardens	Combined Essex
River Glaven Conservation Group	http://www.riverglaven.co.uk/	
Norfolk Mink Project	www.thenorfolkminkproject.org.uk/about-us/	
Lincolnshire Chalk Streams Project	https://www.lincswolds.org.uk/chalk-streams/lincolnshire-chalk-streams/lincs-chalk-streams	Lincolnshire

River Nene Regional Park community interest group.	http://www.riverneneregionalpark.org/	Nene
The Conservation Volunteers	https://www.tcv.org.uk/	Essex, Norfolk, Bedfordshire, Cambridgeshire
RiverCare	http://www.rivercare.org.uk/home/2773	
Association of River Nene Clubs	https://www.anrc.org.uk/	Nene
Nene Park Trust	https://www.nenepark.org.uk/	Nene
River Nene Regional Park	http://www.riverneneregionalpark.org/	Nene
Milton Keynes Parks Trust	https://www.theparkstrust.com/	Upper Ouse
The Greensand Trust	https://www.greensandtrust.org/	Upper Ouse
The Forest of Marston Vale Trust	https://www.marstonvale.org/	Upper Ouse
Boston and District Angling Association.	https://www.bostonanglingassociation.co.uk/	Witham
Grantham Angling Association Fly Fishing Section	http://www.granthamaa.org.uk/	Witham
Sleaford Navigation Trust	http://www.sleafordnavigation.co.uk/	Witham
Industry		
Anglian Water	https://www.anglianwater.co.uk/	
Essex Suffolk Water	https://www.eswater.co.uk/	
Farming and Wildlife Advisory Group	http://www.fwag.org.uk/	
CamEO Partnership (Rivers Trust and Anglian Water)	http://riverlark.org.uk/index.php/who-is-part-of-rlcp/cameo-partnership/	Cam Ely Ouse
Cambridge Water	https://www.cambridge-water.co.uk/	Cam Ely Ouse
British Sugar	https://www.britishsugar.co.uk/	Cam Ely Ouse
CamGrain	https://www.camgrain.co.uk/	Cam Ely Ouse
Produce World	http://www.produceworld.co.uk/	Cam Ely Ouse
National Farmers Union	https://www.nfuonline.com/home/	All
Association of inshore fisheries and conservation authorities	http://www.association-ifca.org.uk/	
UK Major Ports Group	http://www.ukmajorports.org.uk/	
British Marine	https://www.britishmarine.co.uk/	
Seabed users development group	http://www.sudg.org.uk/	
Shellfish association of great Britain	http://www.shellfish.org.uk/	

Section 4: Regional sites of high conservation value

The following areas have been designated of being of local importance through national and international directives. These are areas of high conservation value as designated by statutory directives. Those listed below form Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Ramsar designated sites. Within the region there are many Sites of Scientific Interest (SSSI) and National Nature Reserves (NNR) however these are often smaller areas that are located within designated SAC's, SPA's and Ramsar sites.

INNS species risks have been highlighted to provide an overview of potential and likely invaders that have been determined to be of concern within the area. Several INNS are already present within each site and would therefore not be included on this list as these would be targeted as part of the INNS management plans (Section 6).

Table 4: Regional sites of high conservation value

Site	Location	Habitat	Category	INNS Species Risks
Alde-Ore & Butley Estuaries	Alde-Ore Estuaries – East Suffolk	Estuarine, saltmarsh, intertidal mudflats and sandflats	SAC	American mink have been spotted in nearby rivers, New Zealand pygmyweed and signal crayfish are found in nearby waterways and could be transported by birds or contaminated boats
Alde-Ore Estuary	Alde-Ore Estuaries – East Suffolk	Estuarine, intertidal mud-flats, saltmarsh, vegetated shingle, saline lagoons, grazing marsh	SPA, SSSI, Ramsar	Zebra mussels coming from nearby Butley River. Pacific oysters are known in from locations within the Combined Essex and East Suffolk catchment, and the American oyster drill in Combined Essex, therefore both species could represent an INNS risk of further spread within and among locations.
Orfordness-Shingle Street	Alde-Ore Estuaries – East Suffolk	Estuarine, mudflats and sandflats, coastal lagoons, vegetated shingle, grazing marsh, saltmarsh	SAC	Zebra mussels coming from nearby Butley River, American mink have been spotted in nearby rivers, New Zealand pygmyweed and signal crayfish are found in nearby waterways. Combined Essex and East Suffolk catchment, and the American oyster drill in Combined Essex, therefore both species could represent an INNS risk of further spread within and among locations.

Site	Location	Habitat	Category	INNS Species Risks
Deben Estuary	Alde-Ore Estuaries – East Suffolk	Estuarine, saltmarsh, intertidal mudflats	SPA, SSSI	Zebra mussels coming from nearby Butley River, American mink have been spotted in nearby rivers, New Zealand pygmyweed and signal crayfish are found in nearby waterways. Combined Essex and East Suffolk catchment, and the American oyster drill in Combined Essex, therefore both species could represent an INNS risk of further spread within and among locations.
Broadland	Broadland	Freshwater, grazing marsh, fen, wet woodland	SPA, Ramsar	Marsh frogs have been found in locations surrounding The Broads and could migrate naturally or be transported through connecting waterways. Killer shrimp are known from locations in Ants Valley (e.g. Barton Broad) and could be moved elsewhere via contamination.
The Broads	Broadland	Freshwater, grazing marsh, fen, wet woodland	SAC	Marsh frogs have been found in locations surrounding The Broads and could migrate naturally or be transported through connecting waterways. Killer shrimp are known from locations in Ants Valley (e.g. Barton Broad) and could be moved elsewhere via contamination.

Site	Location	Habitat	Category	INNS Species Risks
Blackwater Estuary (Mid-Essex Coast Phase 4)	Essex Estuaries – Combined Essex	Estuarine, mudflats, saltmarsh, shingle, shell banks, grazing marshes, grassland, fleet and ditch systems	SPA, SSSI, Ramsar	Water fern has been found along estuaries north and South of the Blackwater, there is potential for transport via waterfowl movement. Combined Essex and East Suffolk catchment, and the American oyster drill in Combined Essex, therefore both species could represent an INNS risk of further spread within and among locations.
Great Yarmouth North Denes	Great Yarmouth Winterton Horsey – Broadland	Sand dune	SPA, SSSI	Pirri-pirri burr transported from other coastal sites in GB or as an escapee from a garden.
Winterton-Horsey Dunes	Great Yarmouth Winterton Horsey – Broadland	Sand dune, estuarine, mudflats and sandflats, heathland, grassland	SAC, SSSI	Pirri-pirri burr transported from other coastal sites in GB or as an escapee from a garden.
Humber Estuary	Humber Estuary – Louth, Grimsby, Ancholme	Estuarine, mudflats and sand flats, lagoons, sand dunes	SAC, SPA, SSSI, Ramsar	Pirri-pirri burr transported from other coastal sites in GB (e.g. established populations in North England) or as an escapee from a garden.
Benfleet and Southend Marshes	Greater Thames Complex – South Essex	Estuarine, saltmarsh, cockle shell banks, mudflats, grassland	SPA, SSSI, Ramsar	Chinese mitten crabs are found in the Thames and surrounding areas. Wireweed is located closely round the coast in Combined Essex and South England catchments.

Site	Location	Habitat	Category	INNS Species Risks
Thames Estuary & Marshes	Greater Thames Complex – South Essex	Estuarine, grazing marsh, saltmarsh, flooded clay and chalk pits, intertidal mudflats	SPA, Ramsar	Chinese mitten crabs are found in the Thames and surrounding areas. Wireweed is located closely round the coast in Combined Essex and South England catchments. Combined Essex and East Suffolk catchment, and the American oyster drill in Combined Essex, therefore both species could represent an INNS risk of further spread within and among locations.
Minsmere to Walberswick Heaths & Marshes	Minsmere to Walberswick Heaths and Marshes – East Suffolk	Heathland, acid grassland, vegetated shingle, grazing marsh, fen, saltmarsh, fresh water, woodland, sand dunes	SAC, SSSI	Pirri-pirri burr is already present but could be transported to other coastal sites in GB (especially by ramblers/birdwatchers) or as an escapee from a garden.
Minsmere-Walberswick	Minsmere to Walberswick Heaths and Marshes – East Suffolk	Heathland, acid grassland, vegetated shingle, grazing marsh, fen, saltmarsh, fresh water, intertidal mudflat, woodland, reed beds	SPA, Ramsar	Zebra mussels are found in the nearby Broadlands and could be transported by anglers, slipper limpets and giant rhubarb have also been reported in nearby Broadlands.
Norfolk Valley Fens	Norfolk Valley Fens – Cam Ely Ouse, Broadland	Fen, heathland, bogs and marshes, grassland, broad-leaved deciduous woodland	SAC	Water fern is found in the around Norfolk Broads, giant goldenrod is found in both nearby Broads and Cambridgeshire areas.
Rex Graham Reserve	Rex Graham Reserve – Cam Ely Ouse	Chalk grassland, broad-leaved deciduous woodland	SAC, SSSI	Water fern is found in the around Norfolk Broads. Giant goldenrod is found in both nearby Broads and Cambridgeshire areas.

Site	Location	Habitat	Category	INNS Species Risks
River Wensum	River Wensum – Broadland	Chalk river, fens, grassland, broad-leaved deciduous woodland	SAC, SSSI	Marsh frogs have been found in locations surrounding the broads and could migrate naturally or be transported through connecting waterways. Killer shrimp are known from locations in Ants Valley (e.g. Barton Broad) and could be moved elsewhere via contamination (e.g. on boats or angling equipment).
Rutland Water	Rutland Water – Welland	Reservoir, wetland and lakeside habitats	SPA, SSSI, Ramsar	Killer shrimp coming from Grafham Water (due to popular angling competitions being held in both places)
Stour and Orwell Estuaries	Stour and Orwell Estuaries – Combined Essex, East Suffolk	Estuarine, mudflats, low cliff, saltmarsh, vegetated shingle, grazing marsh	SPA, Ramsar	While it has been recorded in the Stour, the Spiny cheek and other crayfish species have been recorded in greater abundances in other locations in the Combined Essex region (e.g. the nearby Colne River) and could be transported by anglers moving between regions. Marine species such as wireweed, brush clawed shore crabs and Asian shore crabs are could spread within these estuaries.

Site	Location	Habitat	Category	INNS Species Risks
Gibraltar Point	The Wash and North Norfolk Coast – Witham	Sand dunes, saltmarsh, intertidal mudflat, freshwater marsh, open water	SPA, SSSI, Ramsar, NNR	Many invasive species (e.g. water fern, New Zealand pygmyweed, slipper limpets, giant goldenrod, the sideswimmer (*Gammarus tigrinus*), curly waterweed) have been recorded at this site, care should be taken to stop further spread or encroachment from adjacent areas. At Risk from pirri-pirri burr found at other locations within the wash.
North Norfolk Coast	The Wash and North Norfolk Coast – North West Norfolk, North Norfolk	Estuarine, mudflats and sandflats, coastal lagoon, saltmarsh, sand dune, sand beaches, grazing marsh, shingle	SPA, SAC, SSSI, Ramsar	Pirri-pirri burr transported from other coastal sites in GB and in North Norfolk and North West Norfolk or as an escapee from a garden. Many invasive species have been recorded around The Wash, care should be taken to stop further spread or encroachment from adjacent areas
The Wash & North Norfolk Coast	The Wash and North Norfolk Coast– Witham, Welland, Nene, North West Norfolk, North Norfolk	Marine and sea inlet, sandbanks, sand dunes, saltmarsh, intertidal mudflat and sandflats, mixed sediment reef, grazing marsh	SAC	Many invasive species (e.g. water fern, New Zealand pygmyweed, slipper limpets, giant goldenrod, the sideswimmer (*Gammarus tigrinus*), curly waterweed) have been recorded around The Wash, care should be taken to stop further spread or encroachment from adjacent areas

Site	Location	Habitat	Category	INNS Species Risks
The Wash	The Wash and North Norfolk Coast - Witham, Welland, Nene, North West Norfolk,	Sand dunes, saltmarsh, intertidal mudflat and sandflats, shallow waters, deep channels, gravel pits	SPA, SSSI, Ramsar, NNR	Pirri-pirri burr is present in places (North West Norfolk) but could be transported further, either from coastal sites via walkers/bird watchers or as an escapee from a garden. Many invasive species (e.g. water fern, New Zealand pygmyweed, slipper limpets, giant goldenrod, the sideswimmer (*Gammarus tigrinus*), curly waterweed) have been recorded around The Wash, care should be taken to stop further spread or encroachment from adjacent areas

Section 5: Regional hotspots for INNS

Data and recording

In producing this document it has been essential to consider what is known about the presence of invasive non-native species within the region. In order to establish the presence of species either currently or in in the past, and then produce the lists for action, it has been important to access comprehensive and robust data from a wide range of sources. Data has been obtained from a variety of sources including Local Environmental Records centres, local natural history societies and field clubs, online recording systems, mobile apps and ad hoc records provided during the consultation phase of the project. The NBN Atlas was also used as a way of identifying additional data sources and to help place records from the East of England into a national context when developing the action lists.

For the purposes of the project data has been used to build the lists for action and to develop species lists for the management catchments. Maps have been produced showing the number of records collected, and to show the number of species recorded. These maps have allowed the identification of hotspots for invasive species. This is however not without issues as these maps can provide a picture over-emphasising where recording is happening for reasons unrelated to the identification of invasive species, for instance at well-known birdwatching sites, and consideration needs to be given to how this may skew the overall picture of presence at a catchment level. The level of recording at these sites however does give confirmation that there is a network of people who are able and willing to record invasive species and who could perhaps be utilised for future work to identify and record species as the occur or establish in the management catchments.

All species records collected have been used in the assessment and development of the lists rather than restricting to very recent data. Whilst it is important to restrict data use to recent data to develop the action lists, older data can give vital information on the hotspots and potential of sites for future colonisation. For instance the historic extent of copyu prior to

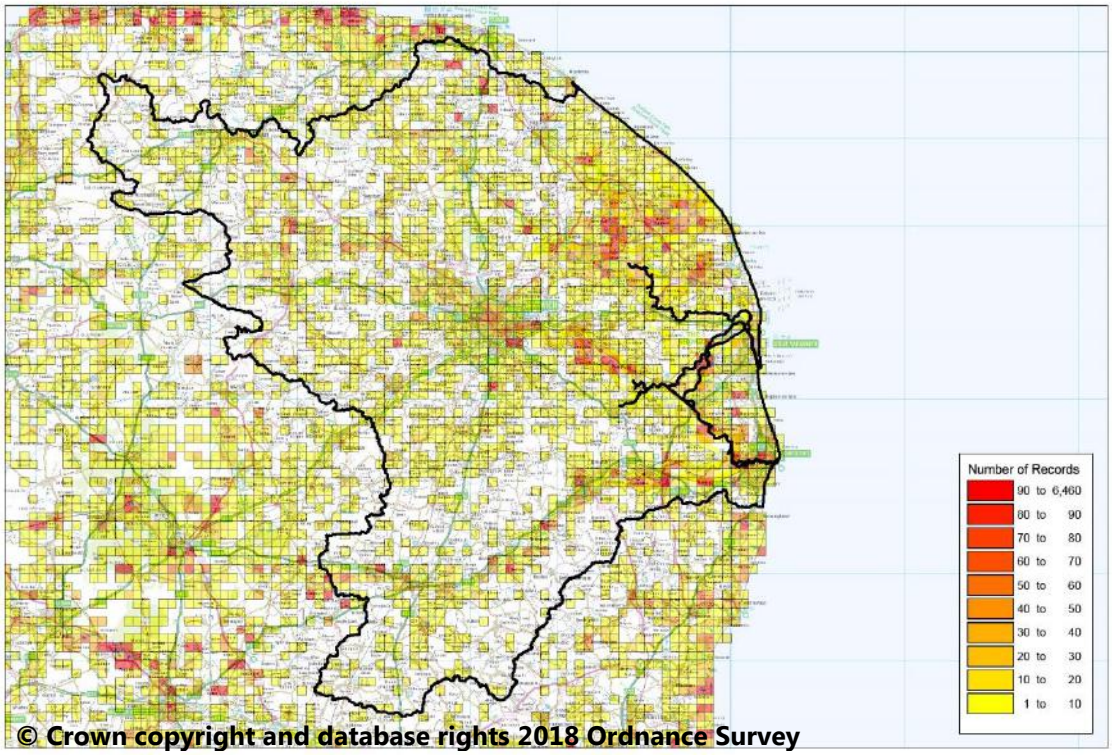
eradication can help to understand the potential spread of a newly established mammal species.

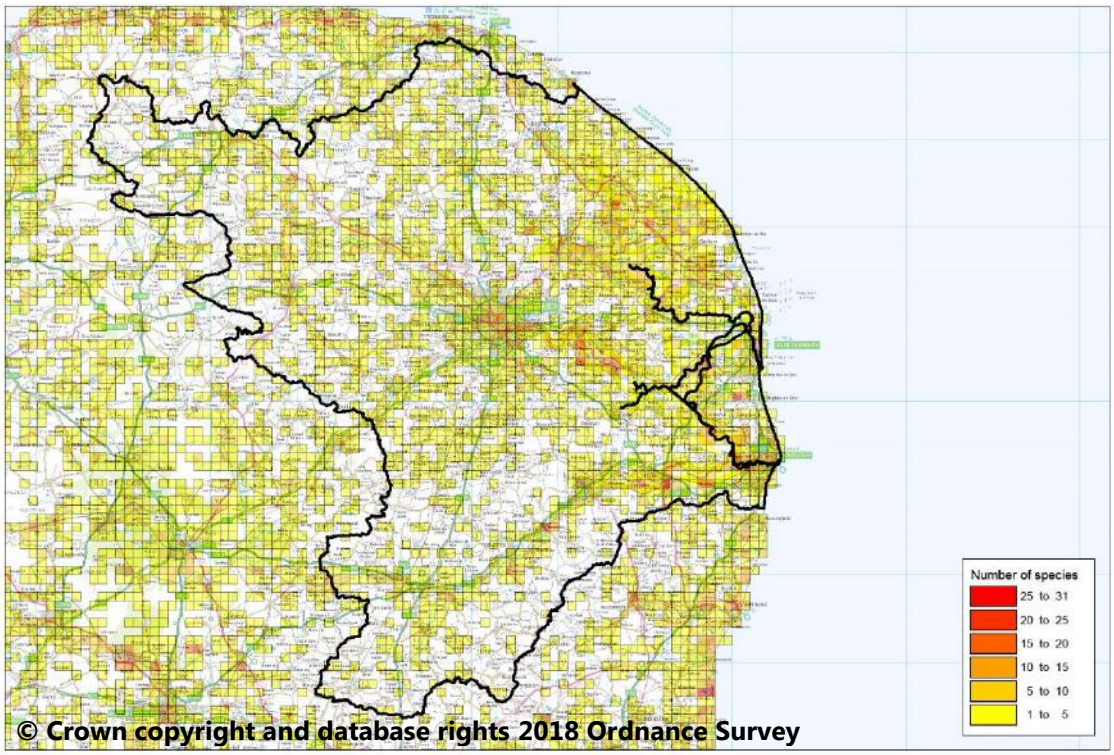
In order to ensure that RIMPs can become living documents and evolve to address future occurrences and establishment of species there will need to be a continued gathering of robust data and a mechanism for accessing it. At present the network of organisations providing biodiversity data allows access within a licensing framework based on a need to support this data collection, often with associated processing charges. Future work needs to recognise this as a component of any funding bids or support for recording networks. It is possible that a move to more provision of Open Data or equivalent licences may address this but there will still be a need to support and fund the networks and projects providing this.

Regional heat maps - hotspots

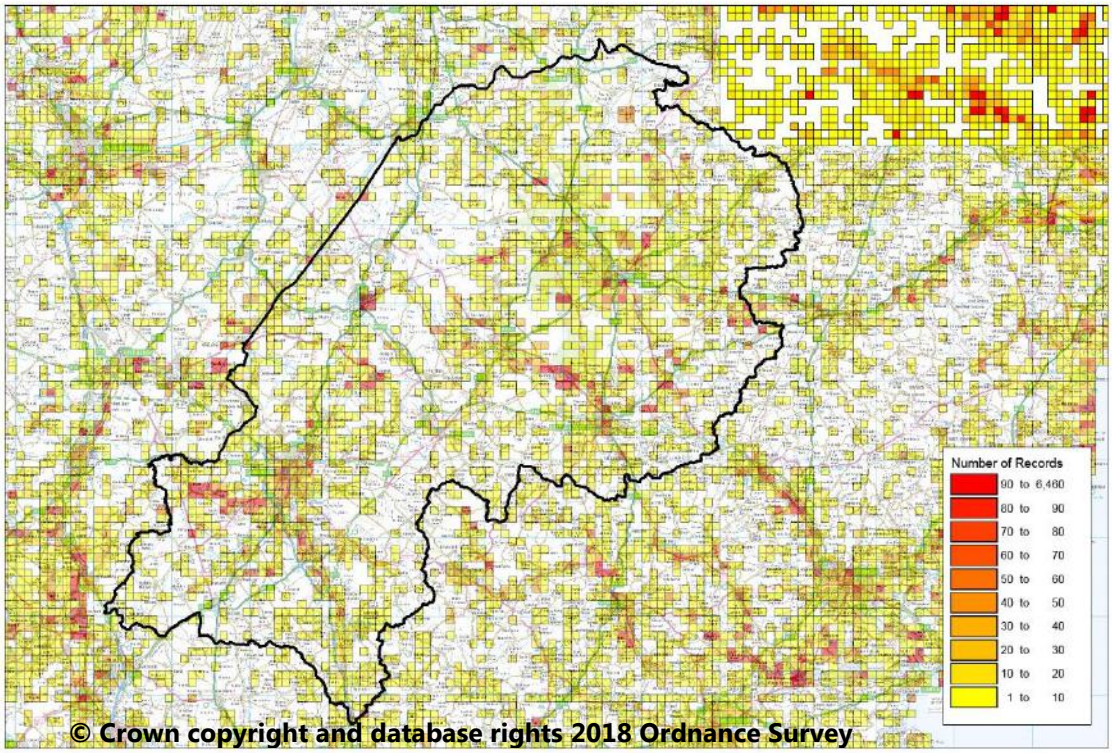
The following heat maps highlight the number of records collected, and the number of species recorded to highlight INNS hotspots within each catchment. These hotspots represent the intensity of occurrence of the number of reported sightings (records) and the number of species reported for all riparian terrestrial and coastal species.

Broadlands Catchment





Cam Ely Ouse


Number of Records
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60 to 70
50 to 60
40 to 50
30 to 40
20 to 30
10 to 20
1 to 10
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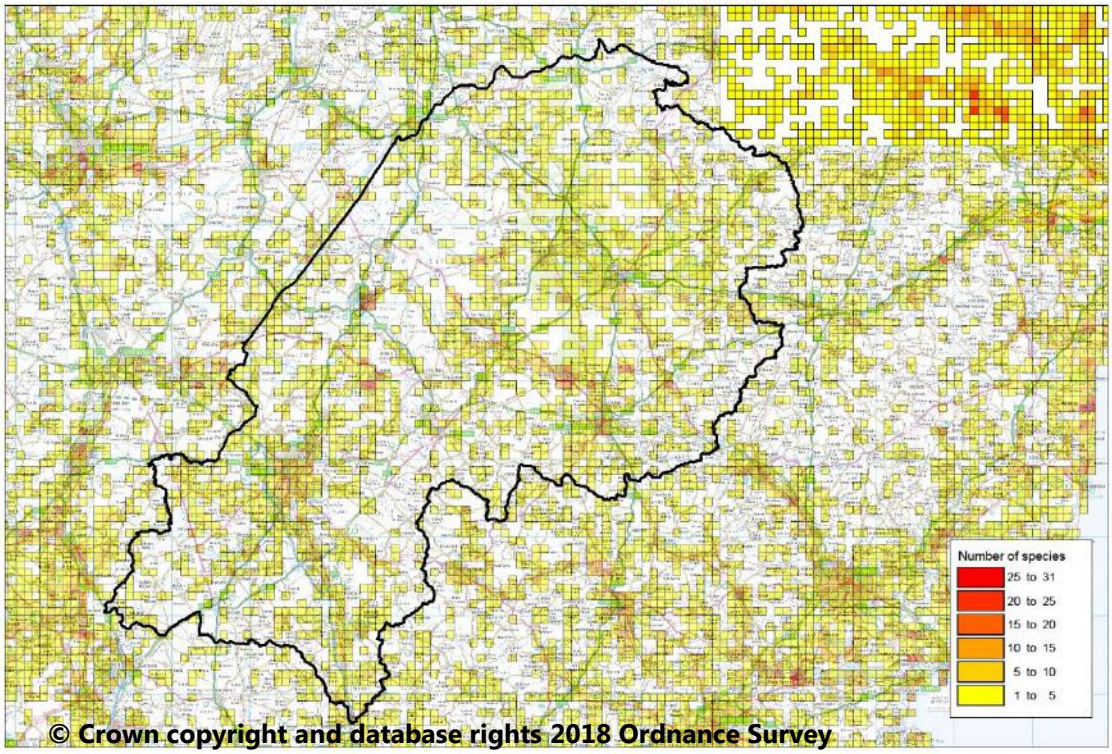
Number of species
25 to 31
20 to 25
15 to 20
10 to 15
5 to 10
1 to 5
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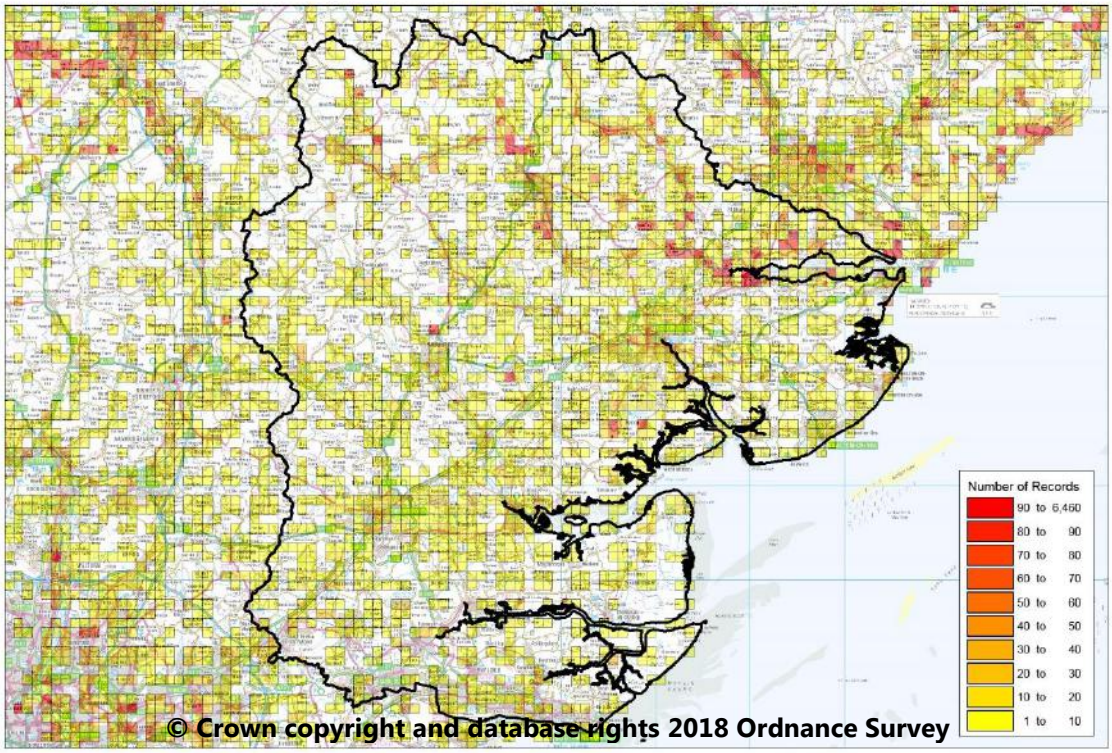
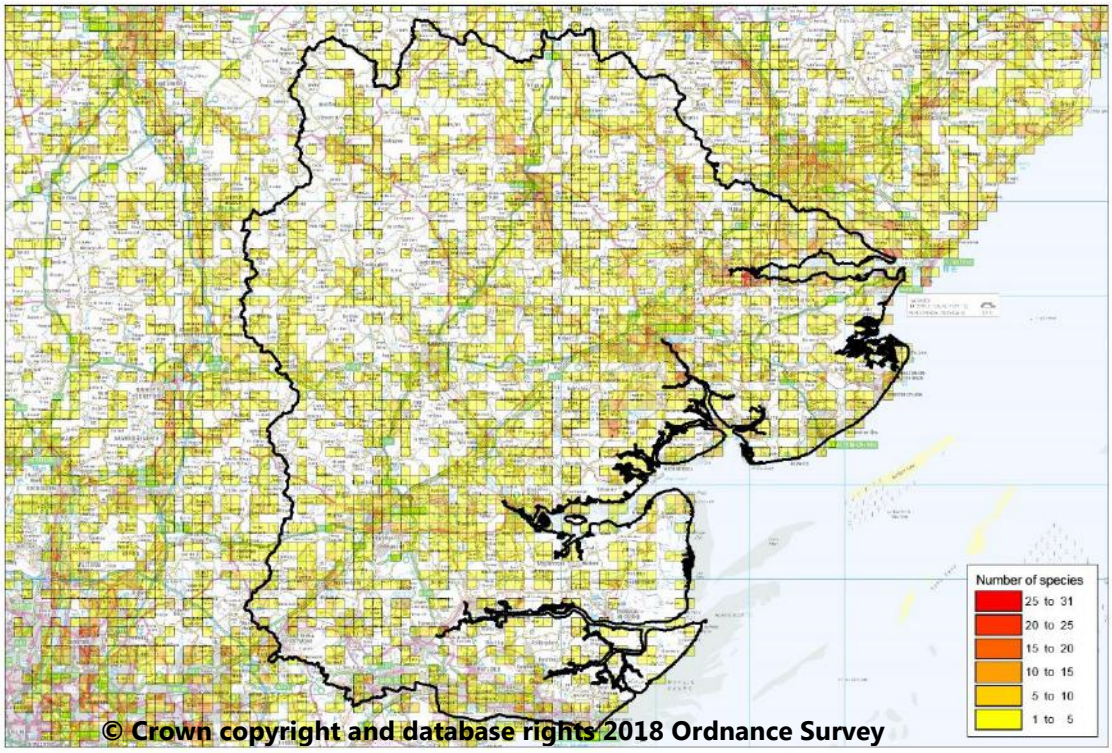
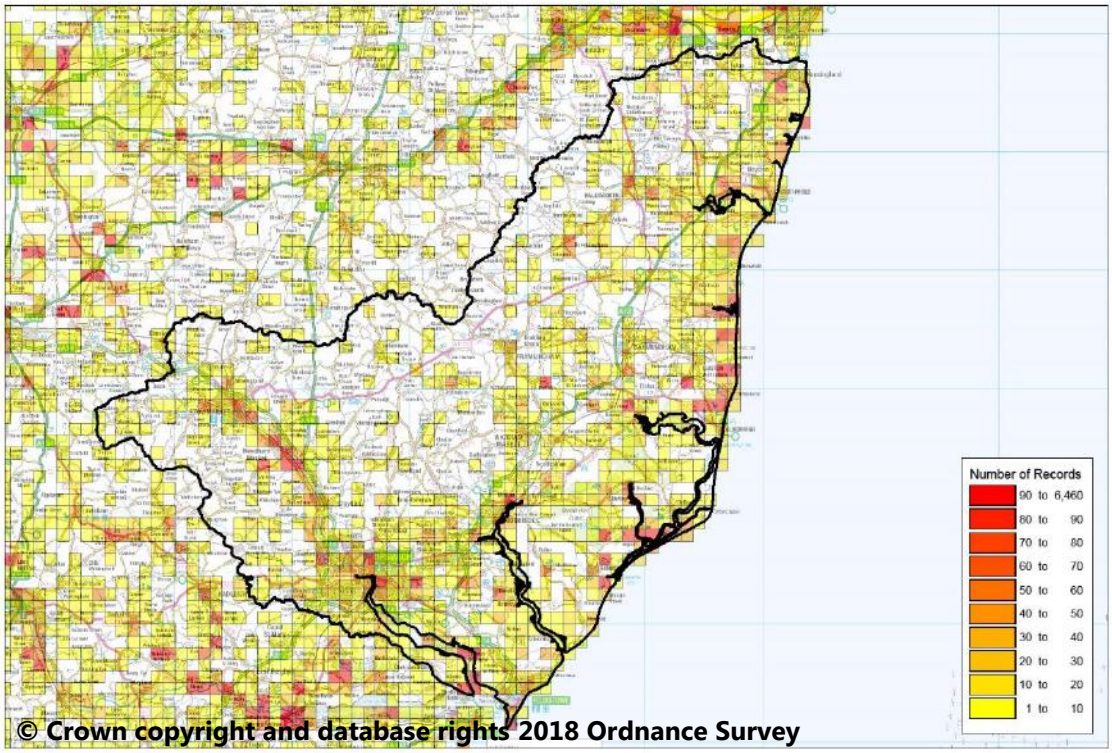
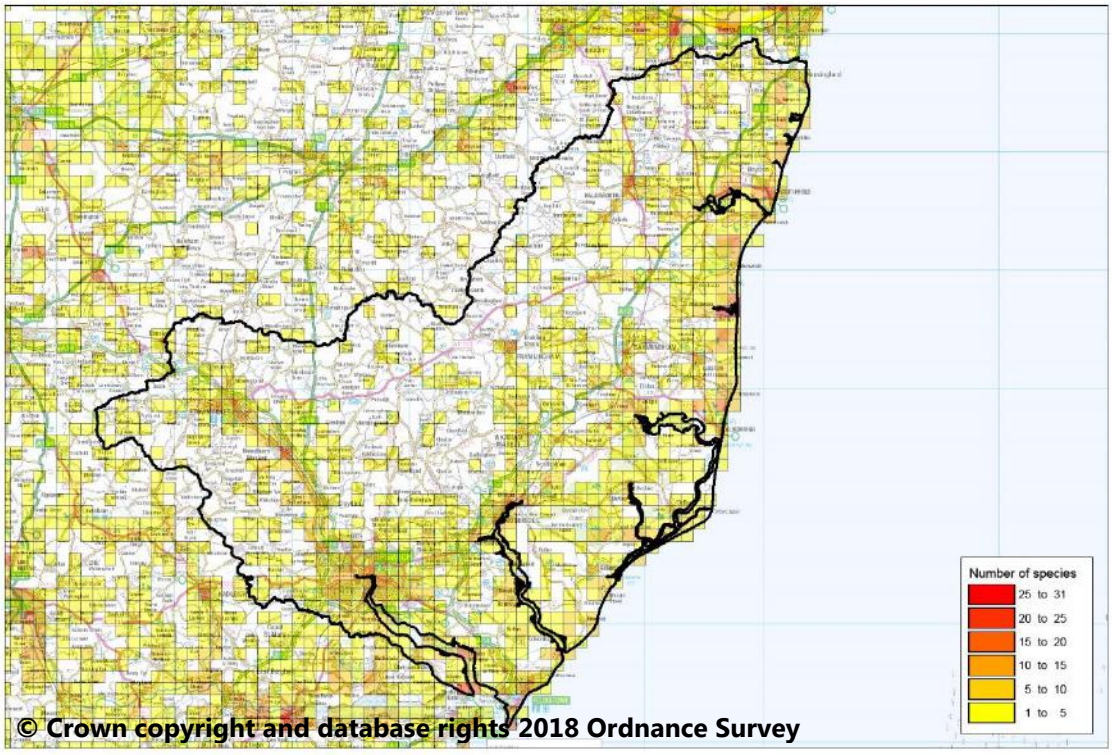
Combined Essex



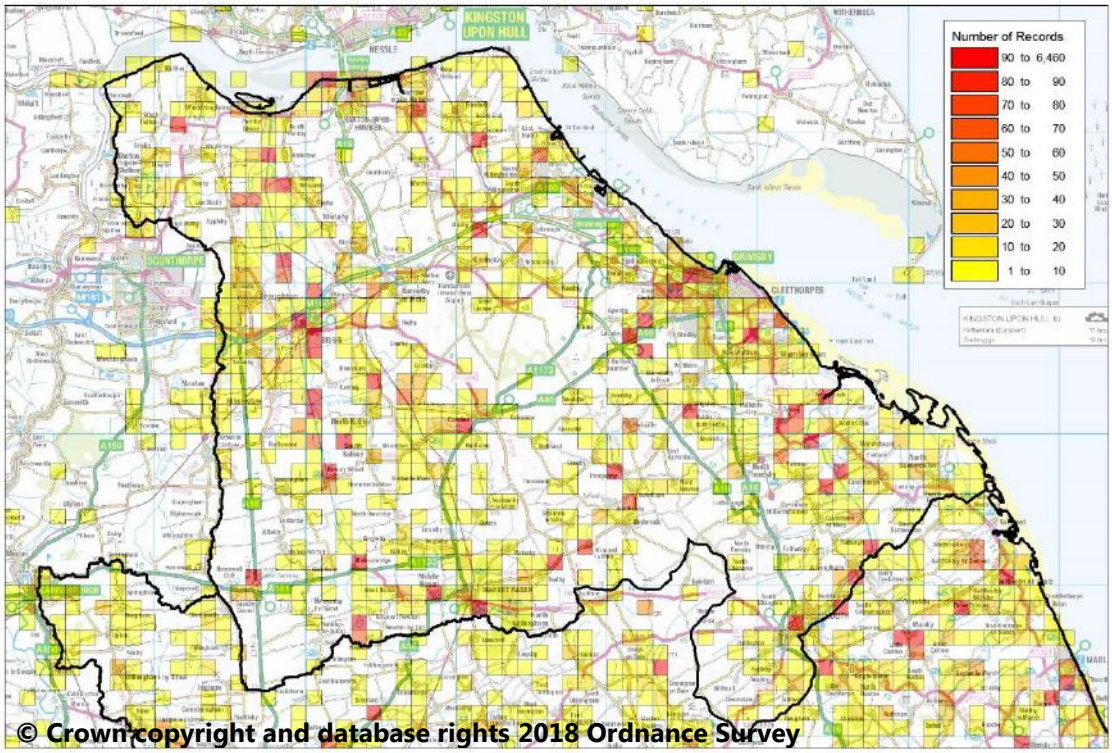


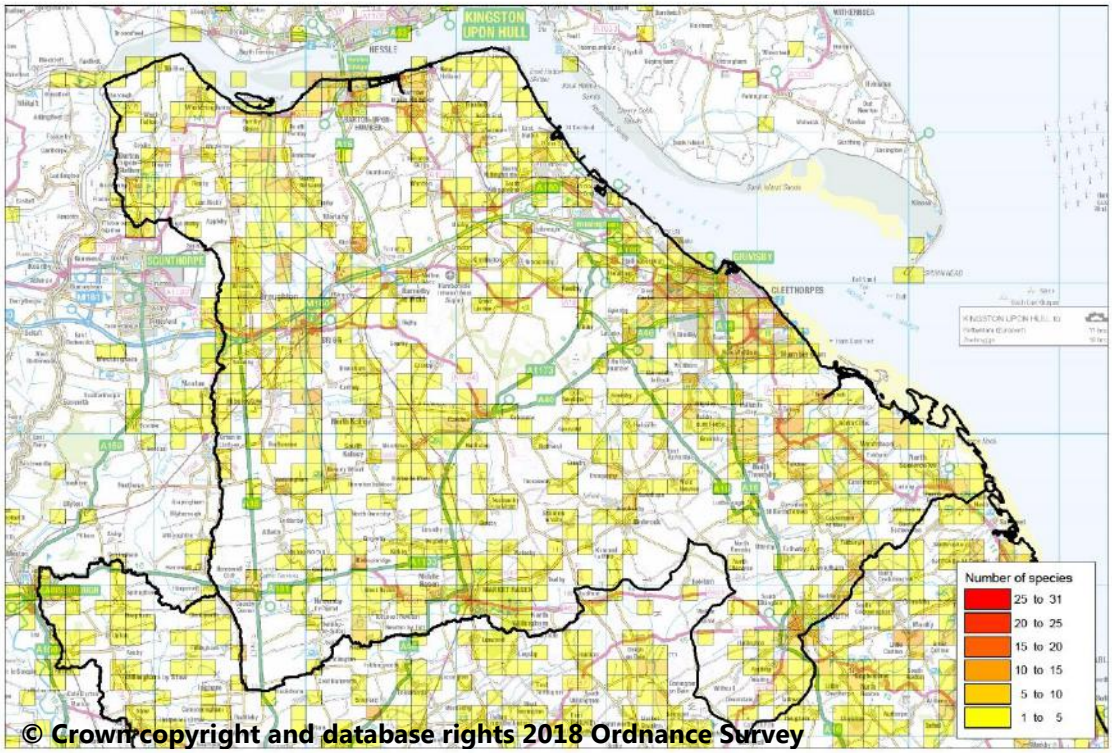
East Suffolk



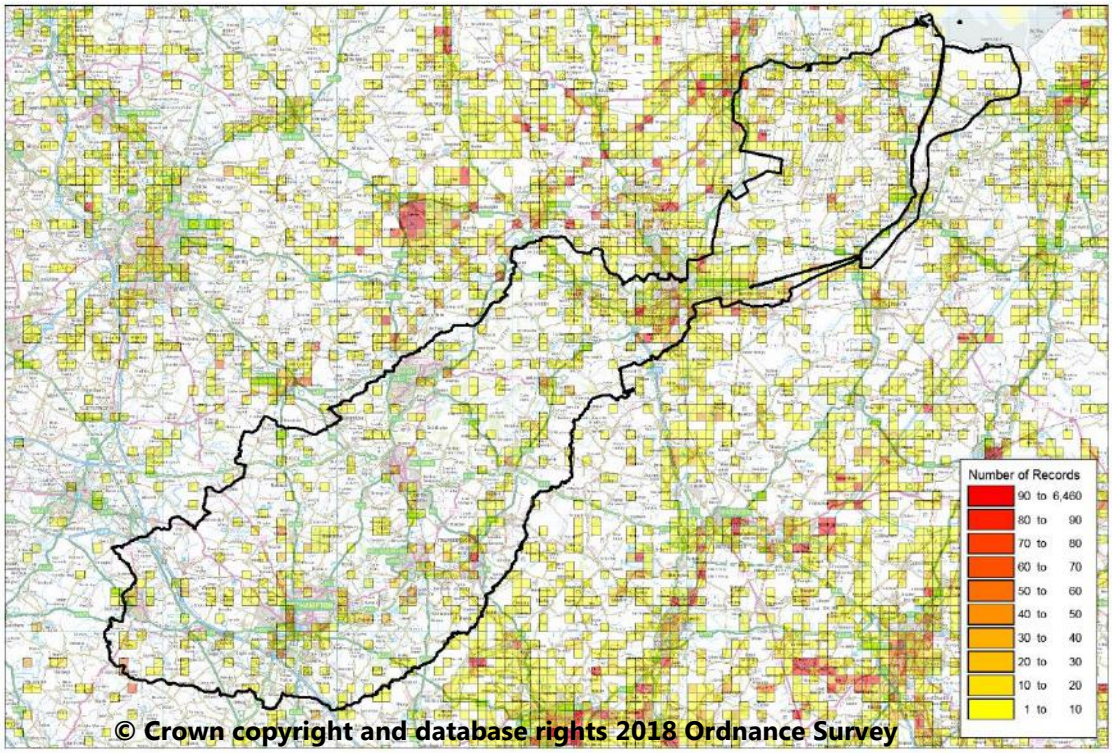


Louth Grimsby and Ancholme





Nene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1 to 10
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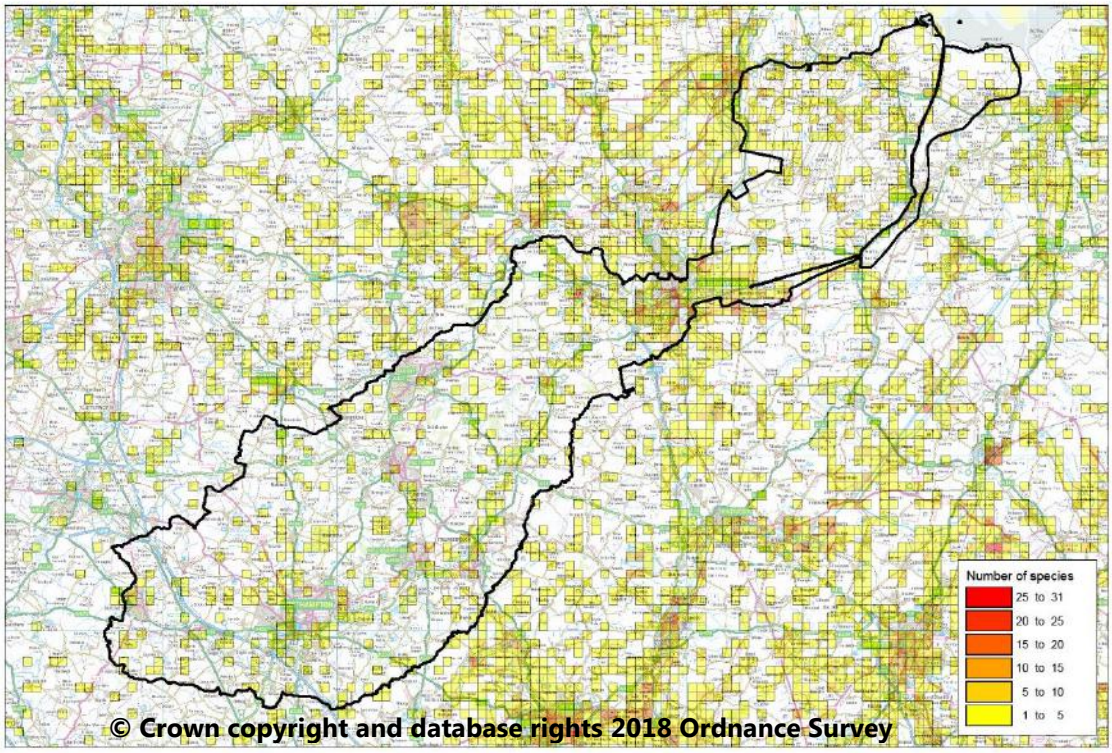
Number of species
25 to 31
20 to 25
15 to 20
10 to 15
5 to 10
1 to 5
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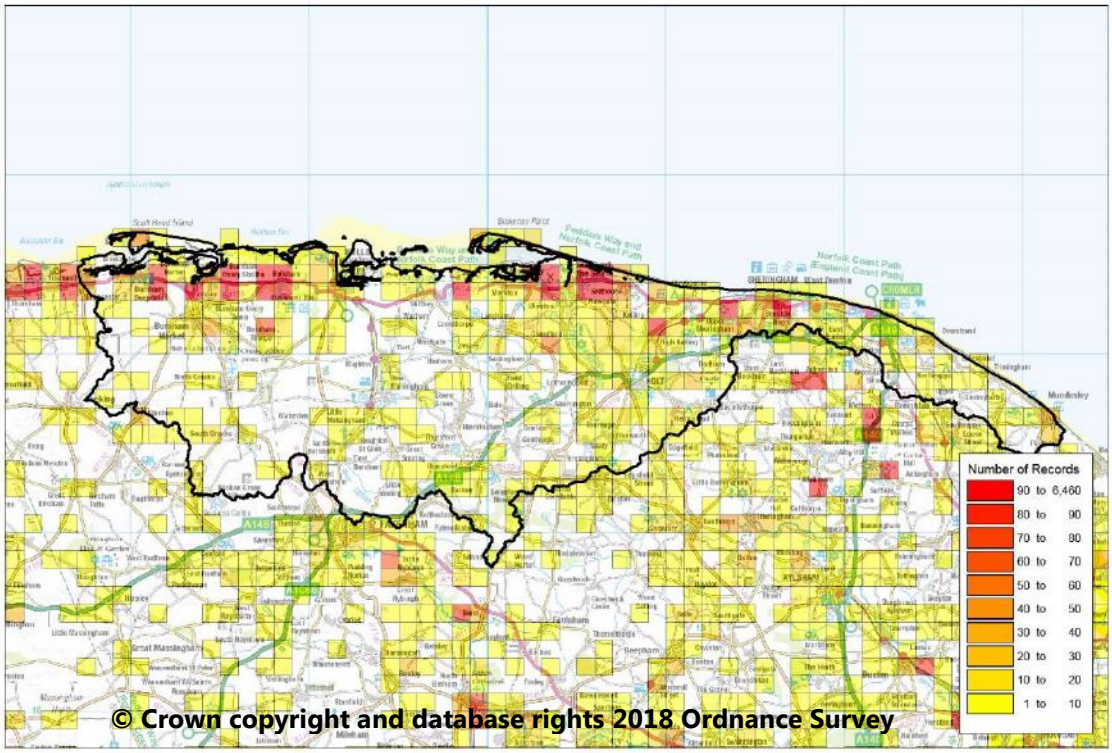
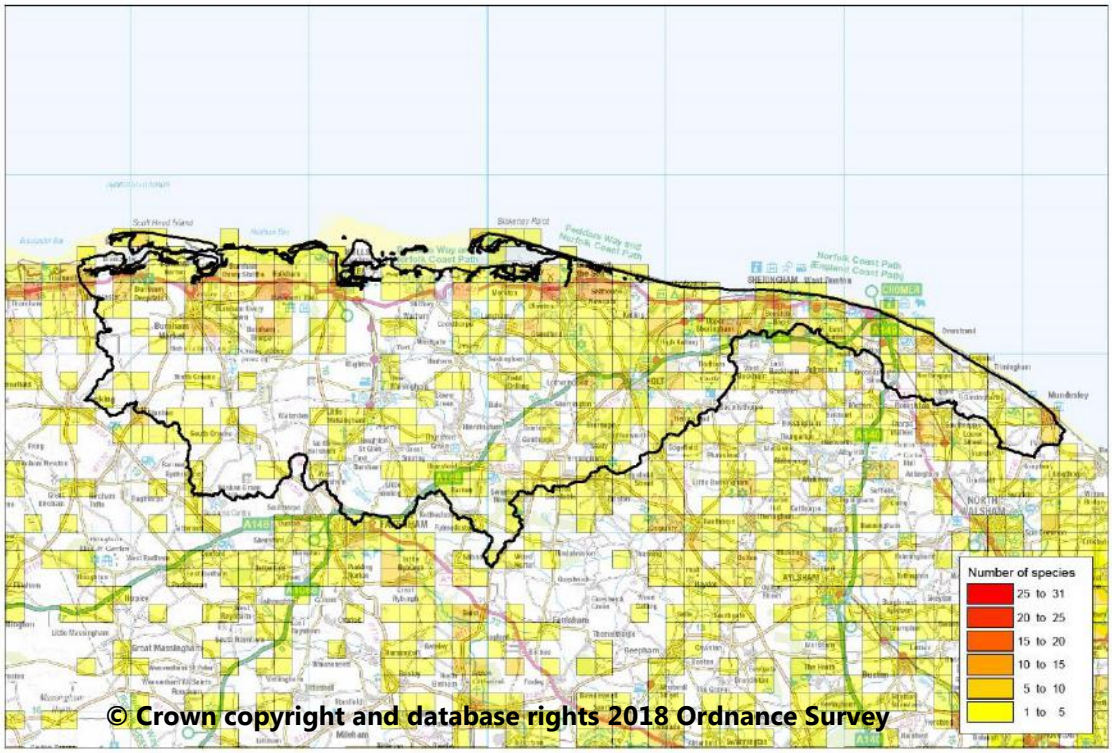
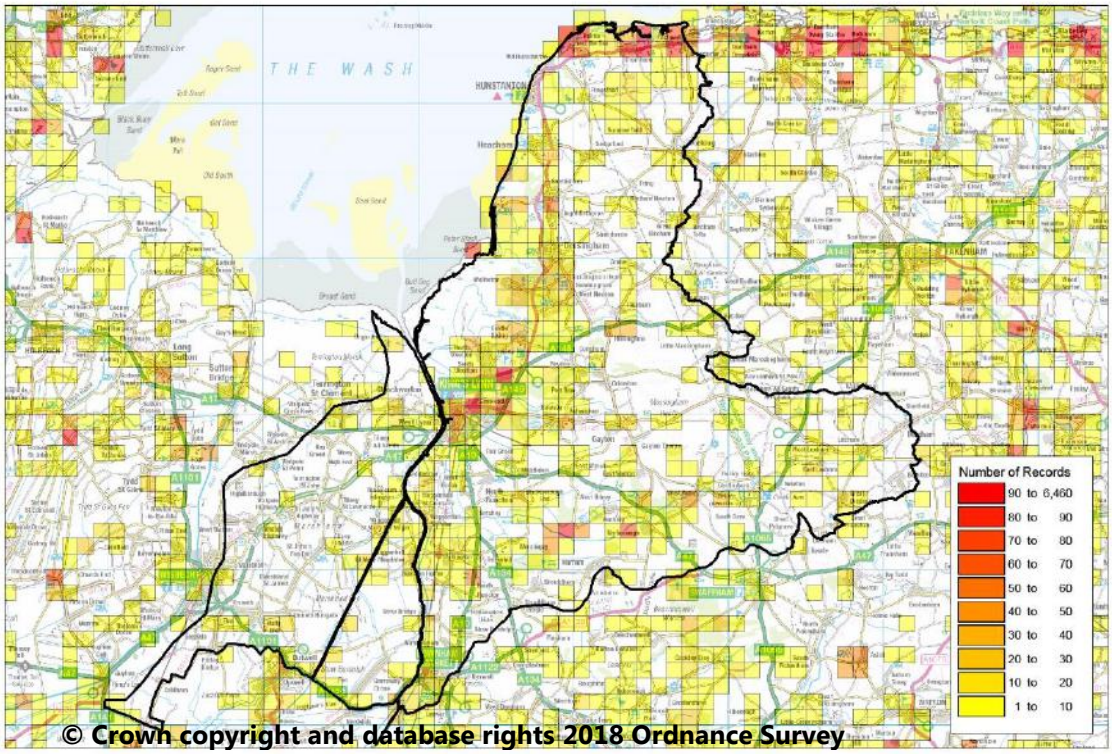
North Norfolk





North West Norfolk



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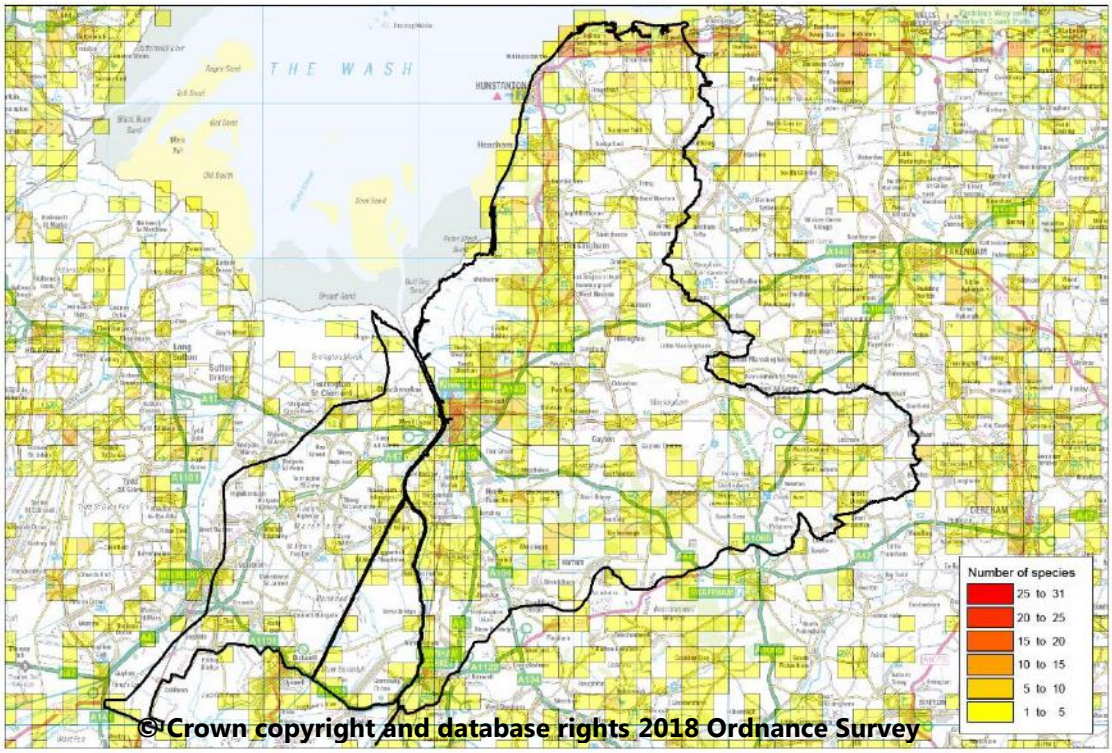

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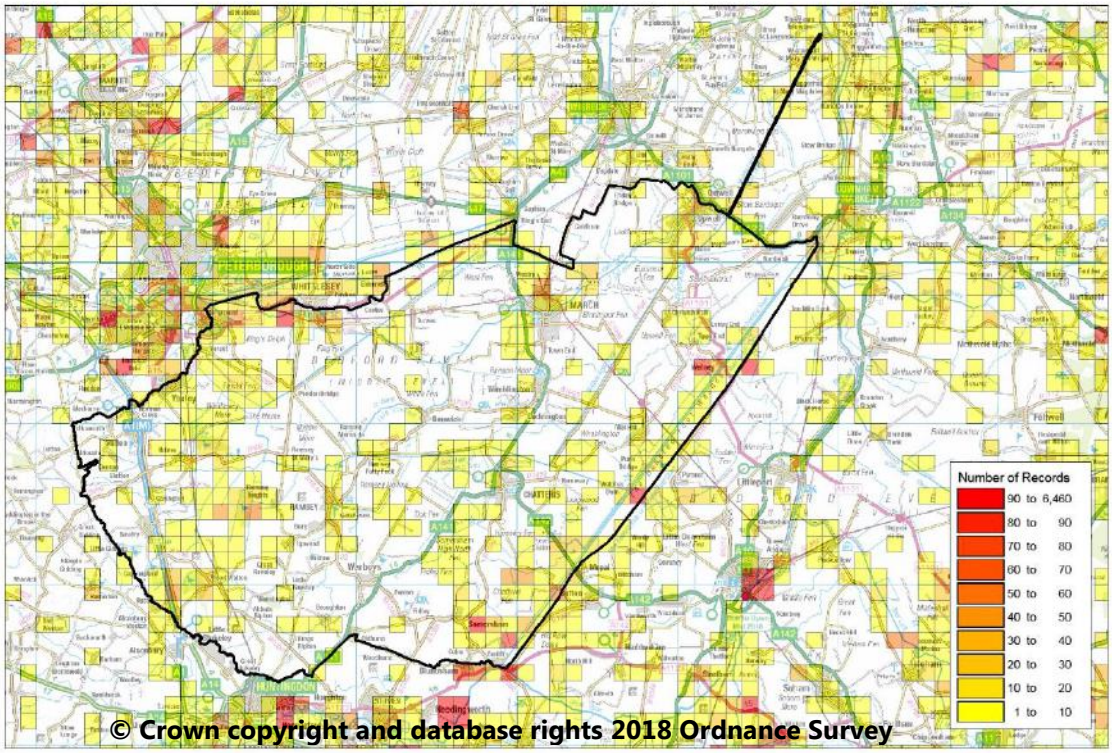
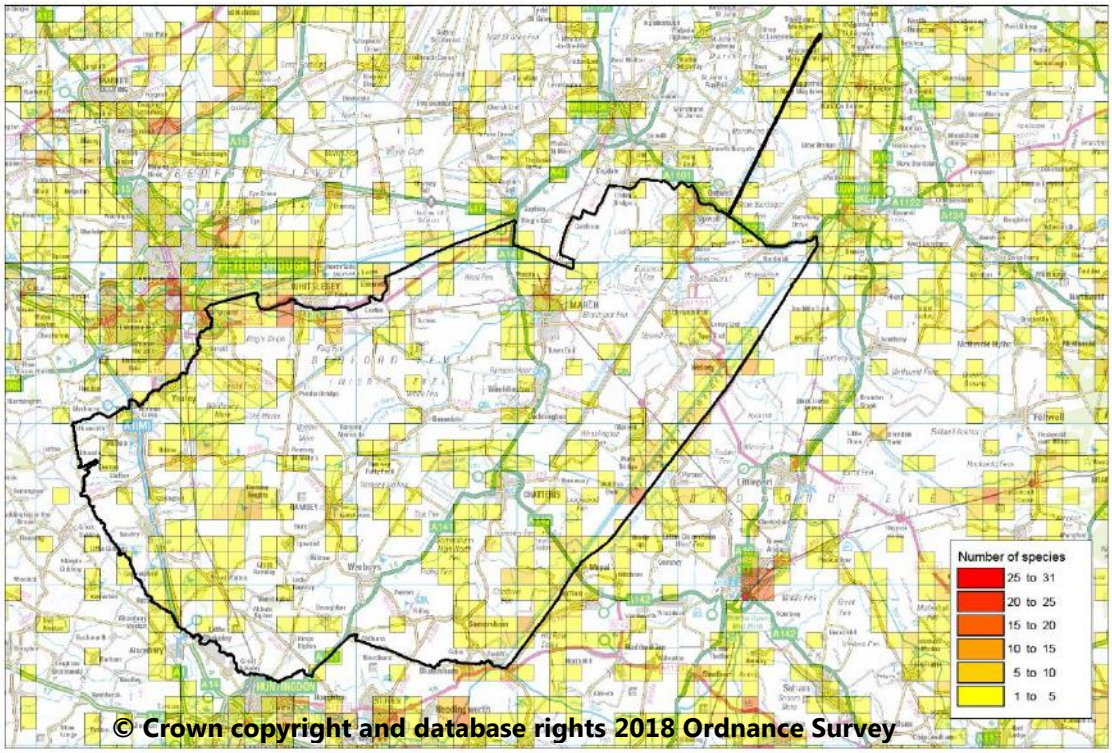
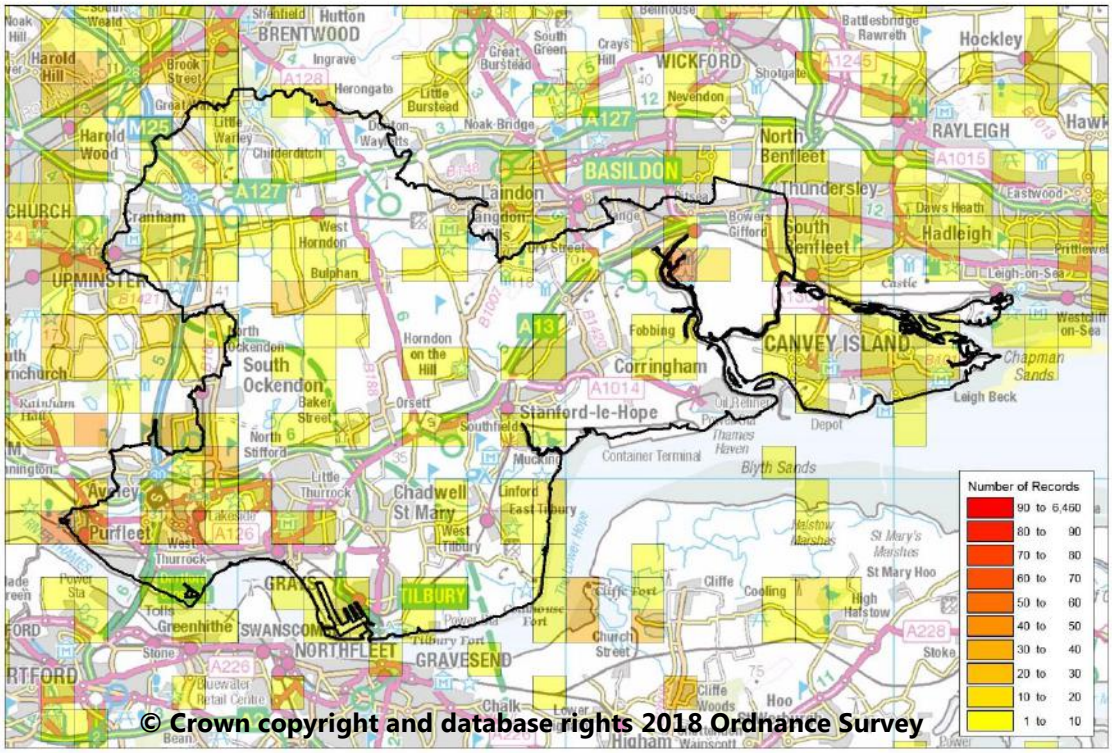
Old Bedford and Middle Level





South Essex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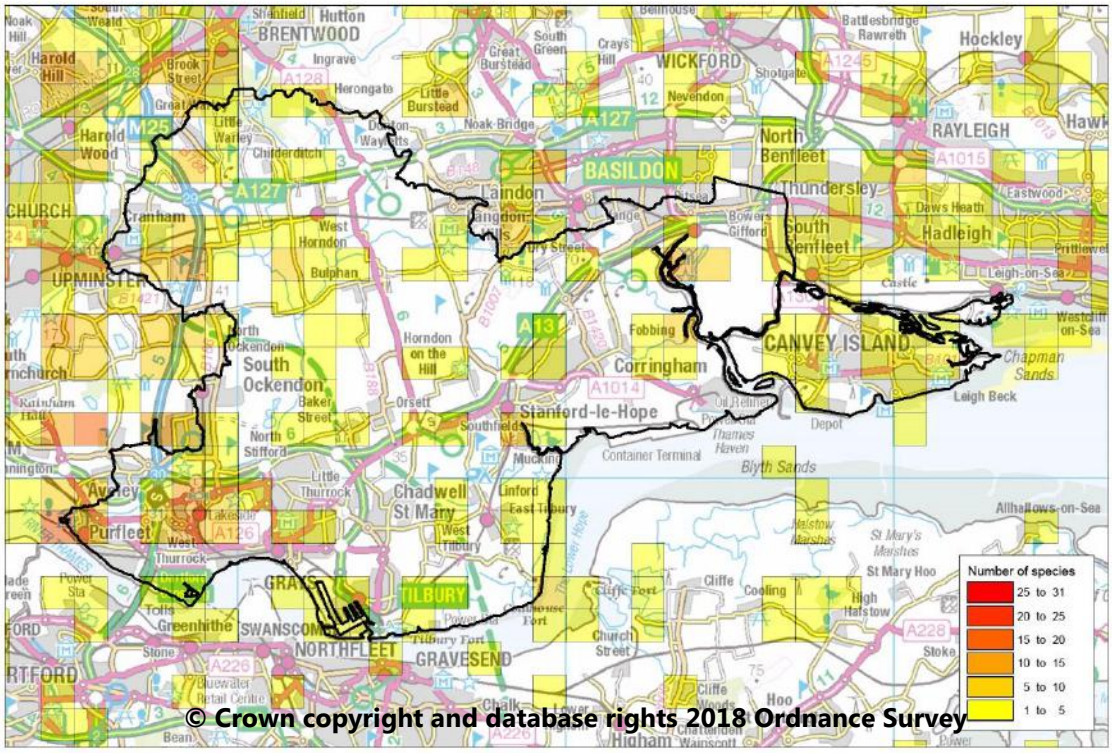
Number of species
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20 to 25
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5 to 10
1 to 5
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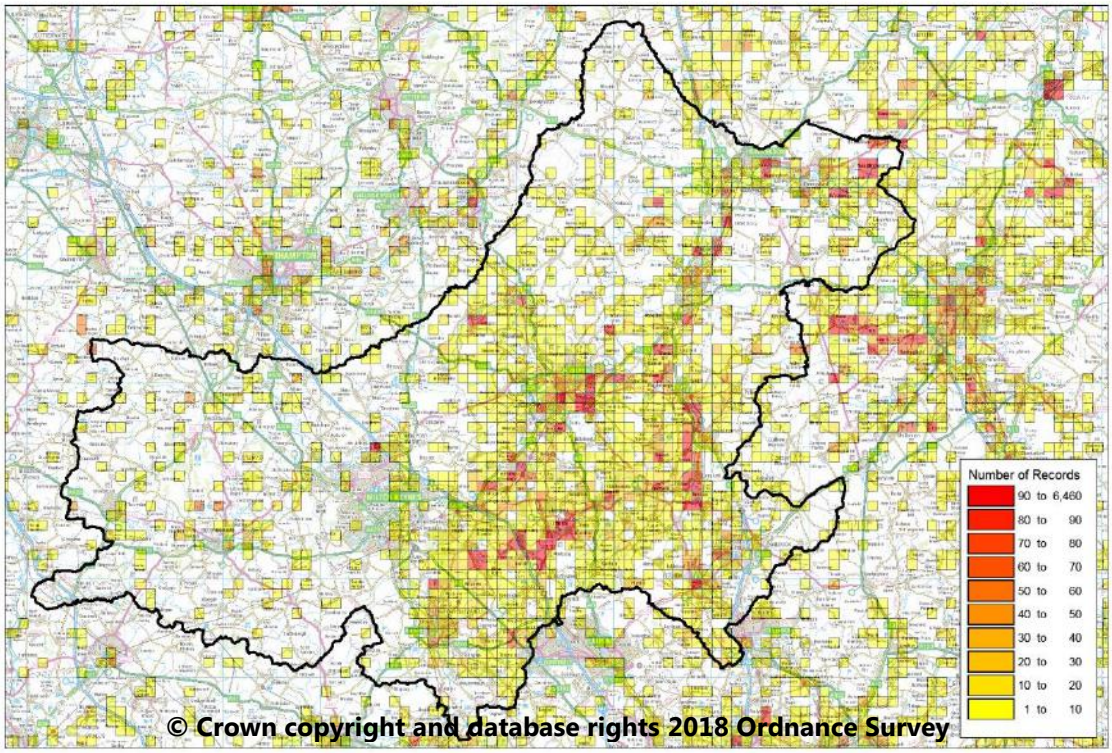
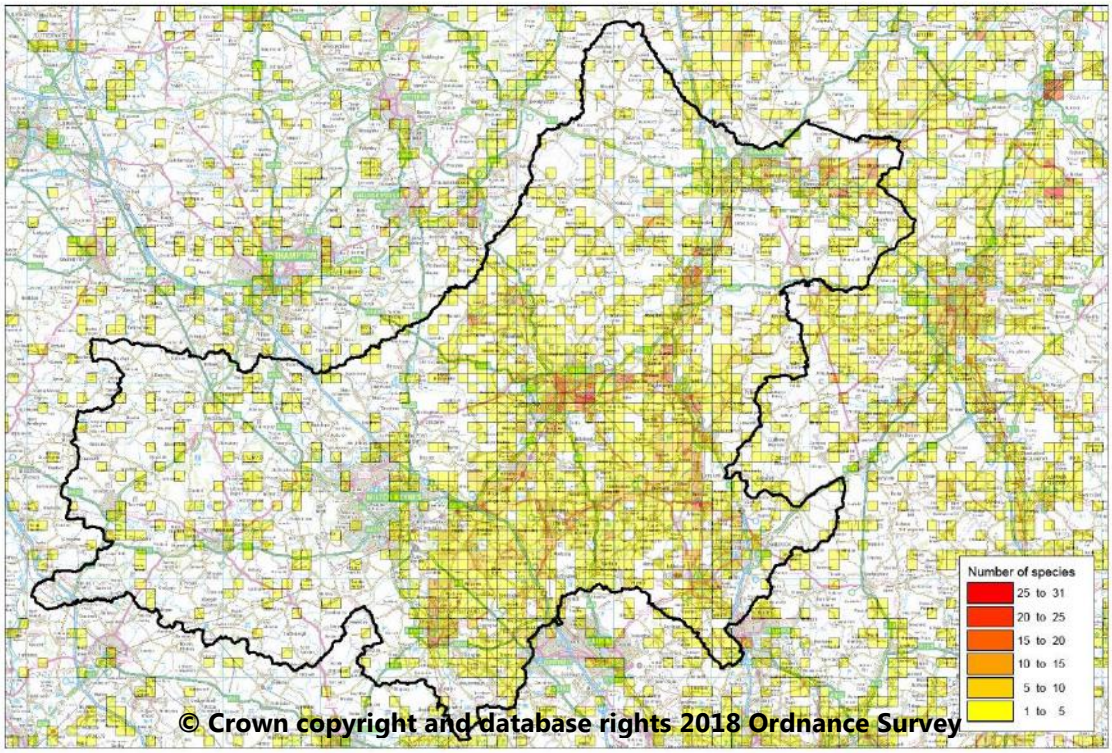
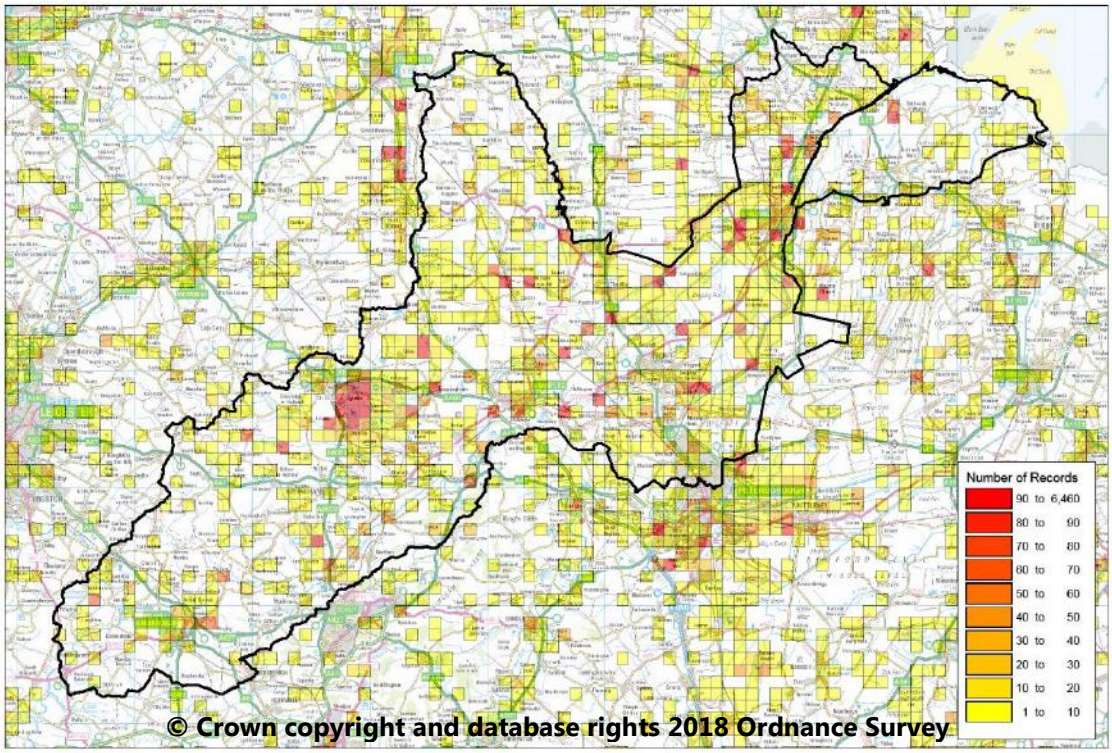
Upper and Bedford Ouse





Welland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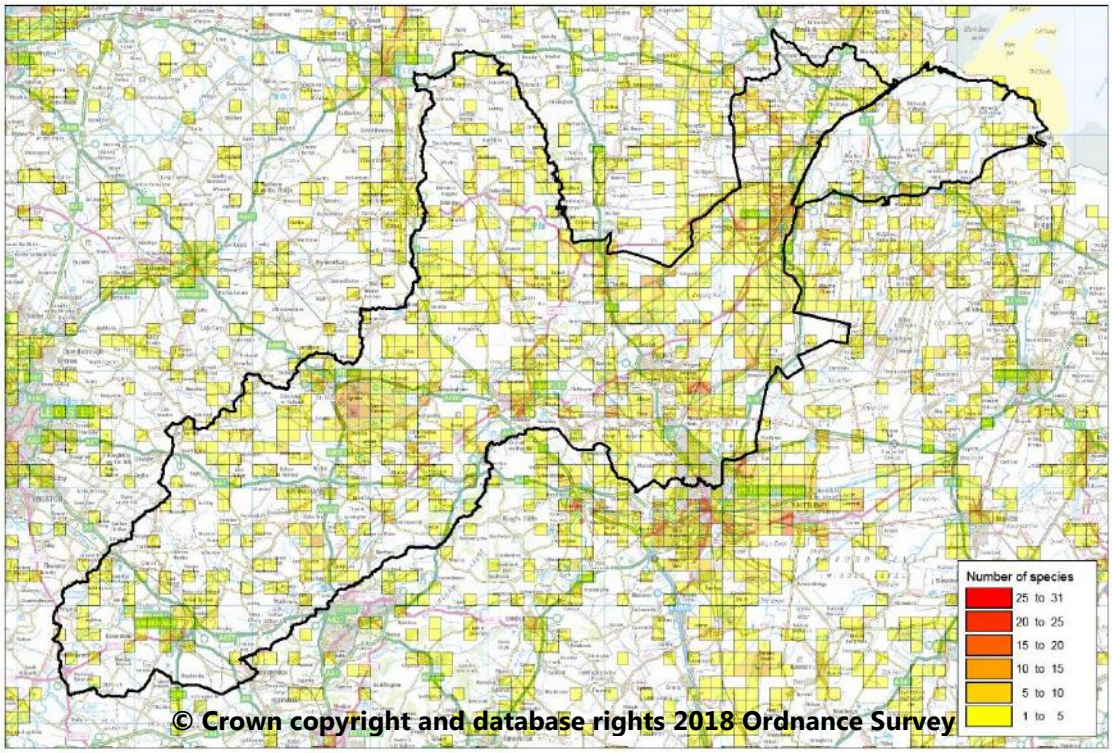
Number of species
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1 to 5
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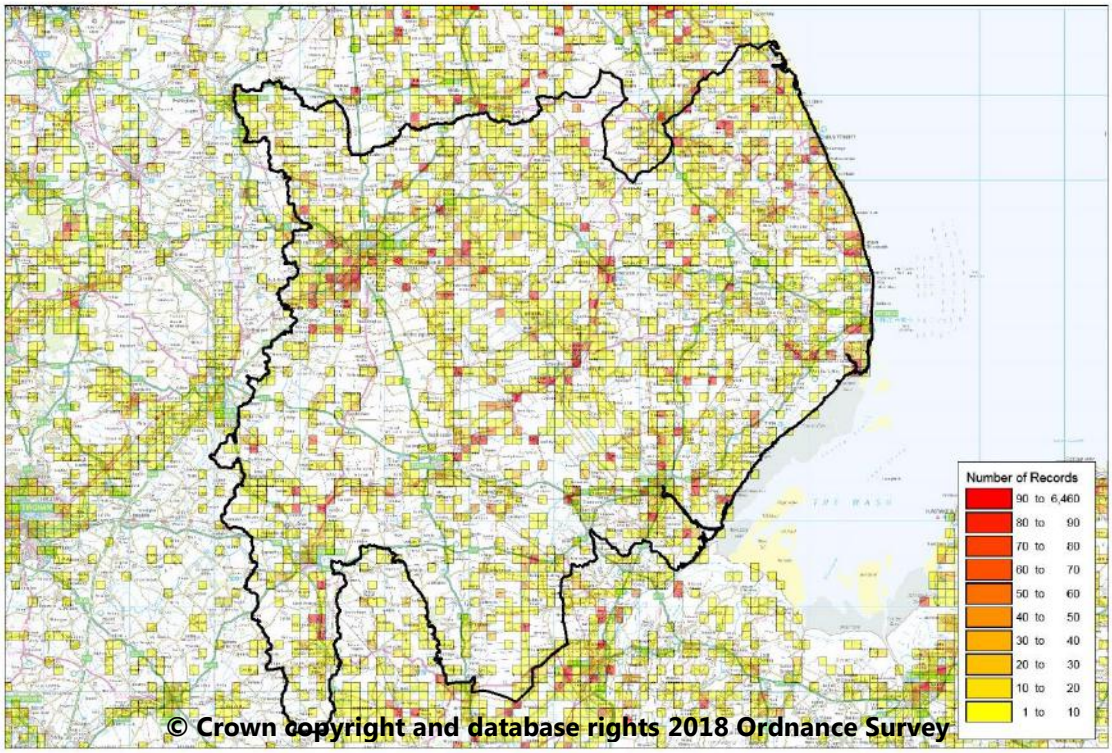
Witham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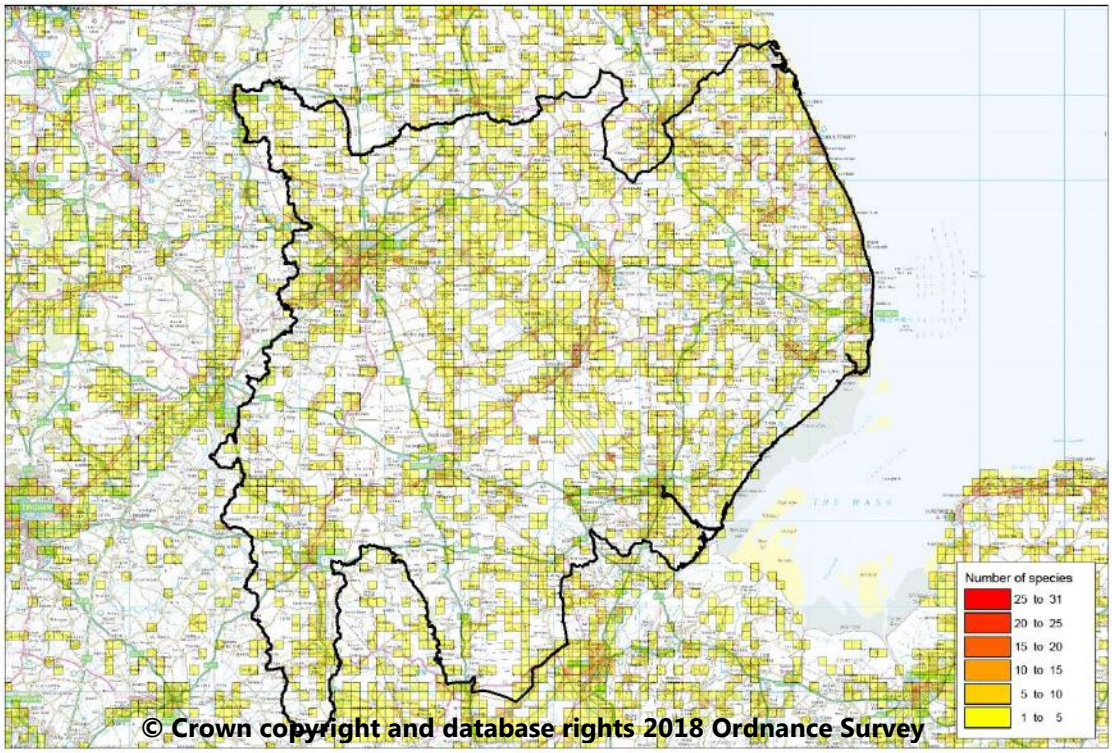
Number of species
25 to 31
20 to 25
15 to 20
10 to 15
5 to 10
1 to 5
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Regional hotspots

A selection of the major hotpots for INNS introduction in each catchment has been identified and provided below. These hotspots are defined as locations that contain significant numbers of invasive species that are likely to spread due to activities that take place within the location. Areas are also listed where there is significant risk of spread of a particular species due to the activities that take place within the location. This table outlines high risk areas likely to lead to invasions due to, for example, high numbers of recreational traffic. Often these areas are associated with high numbers of and total sightings of invasive species (see above).

Table 5: Regional hotspots for INNS

Site	Location	Habitat	Risk activities	INNS species risks
Norfolk Broads	Broadlands	Rivers, streams, freshwater	Dispersal to interconnecting waterways, contamination on peoples clothing, shoes, boats etc. as well as being a popular tourist destination.	New Zealand pygmyweed, floating pennywort, giant hogweed, Himalayan balsam, Japanese knotweed, parrot's feather
Barton Broad	Broadlands	Open water, reedbeds, fens and wet and dry woodland	Dispersal to interconnecting waterways, yearly regatta, popular fishing area.	Killer shrimp, zebra mussels, *Crangonyx*
River Yare (Yare valley)	Broadlands	Wet woodlands, shallow lakes, reedfen, meadows and wet grassland	Walking/rambling, river tourism, popular among anglers, host of fishing competitions	Nuttall's waterweed, American willowherb, giant knotweed, Corbicula fluminea, zebra mussel, American mink
Oulton Broad/Lake Lothing/Lowestoft Harbour	Broadlands	Lake, marsh, harbour	Tourist and sporting centre, Port of Lowestoft – provides traffic to/from European ports and provides berth for recreational and commercial vessels	Wakame, nuttall's waterweed Japanese knotweed, giant hogweed, Canadian goldenrod, zebra mussel, wakame, marine fouling species (e.g. leathery sea squirt).

Site	Location	Habitat	Risk activities	INNS species risks
Titchwell Marsh and Holme Dunes	North West Norfolk	Marshland	Popular bird watching location, they could spread to other locations	Numerous species of invasive birds and fowl, Chinese mitten crab, pirri -pirri burr
River Glaven and north Norfolk coastal path	North Norfolk	River, ponds and pools	General recreation	Ibis, giant hogweed, Japanese knotweed
Lackford Lakes (Bury St Edmonds), River Lark	Cam Ely Ouse	Lakes, river, grassland	Contamination from sailing and canoeing, walking and tourism to the area	Signal crayfish, Nuttall's waterweed, Himalayan balsam
River Ouse	Cam Ely Ouse	River banks	Natural dispersal, fouling	Chinese mitten crabs
Bourne Brook	Cam Ely Ouse	Stream	Walking – close to footpath, natural dispersal along river course	Himalayan balsam, giant hogweed
Dedham vale – River Stour, Flatford to Manningtree	Combined Essex	River, grassland, wet meadows.	River walking, natural dispersal, boating	Nuttall's waterweed, giant hogweed, Himalayan balsam, zebra mussel, crayfish
River Stour and Orwell estuary	Combined Essex and East Suffolk	Estuarine, mudflats, open water	River walking, natural dispersal, boating	Leathery sea squirt, wireweed, wakame, Pacific oyster, brush clawed shore crab.
Minsmere	East Suffolk	Dunes, coastal lagoons, reedbed, wet grassland, shingle vegetation	Coastal walking, bird watching. Seeds and fragments can easily be transported to new sites on shoes and clothing	Water fern, Canadian and Nuttall's waterweed, giant hogweed, pirri-pirri burr
River Gipping between Stowmarket and Needham	East Suffolk	River, lakes and woodland	River course follows major roads and train routes, coastal paths, angling hotspots	Himalayan balsam, waterweed, signal crayfish
Near Orford on the River Alde	East Suffolk	Estuarine, mudflats and sandflats	Natural dispersal, human activities boating and sailing	Leathery sea squirt, Asian shore crab, wakame, Pacific oyster
River Humber	Louth Grimsby and Ancholme	Intertidal sand and mudflats	Natural dispersal, fouling	Chinese mitten crabs, leathery sea squirt, wakame
River Freshney	Louth Grimsby and Ancholme	River, lake	Walking paths, angling	Waterweed
Snettisham	North West Norfolk	Coastal dunes, shingle, sand	Bird watching, coastal walking	Pirri-pirri burr
River Nene, west of Peterborough	Nene	River, lakes, meadows	Rowing and canoeing, Nene park – boating, walking, railway, water sports and recreation	Himalayan and orange balsam, waterweed

Site	Location	Habitat	Risk activities	INNS species risks
Old Bedford River	Old Bedford and Middle Level	River, wetlands, fens	Recreational tourism – walking, bird watching, fishing	Nuttall's waterweed
Woodwalton Fen	Old Bedford and Middle Level	Fen, meadows, reedbed and woodland	Recreation – walking trails, wildlife watching	Water fern, Nuttall's waterweed, zebra mussel
Grafham Water	Upper and Bedford Ouse	Reservoir	Contamination on recreational boats / anglers	Killer shrimps
Priory Lake and River Great Ouse	Upper and Bedford Ouse	River and lakes	Fishing lakes, boating lakes, country park recreation	Zebra mussel, floating pennywort
Paxten Pits to Buckden Lake	Upper and Bedford Ouse	Lakes, meadow, grassland, scrub and woodland	Fishing lakes, marinas, nature reserve	Water fern, Nuttall's waterweed, Himalayan balsam
Rutland water reservoir	Welland	Reservoir, wetland	Angling and water sports activities, aqua park, wildlife watching	Signal crayfish, zebra mussel, Nuttall's waterweed
Whisby nature park and surrounding lakes	Witham	Lakes, river	Foot paths and fishing lakes, sailing	New Zealand pygmyweed, Nuttall's waterweed, Jenkin's spire snail, American mink

Section 6: INNS management

Management and reporting INNS

In the preparation of regional INNS management priorities, it is essential to incorporate national policy and species-specific approaches so that high-level GB strategy is implemented at regional and local level. It is also important to consider existing regional and local INNS management so that the RIMPS complement these actions. In the latter case, one of the key objectives of RAPID is to increase the effectiveness of management through enhanced cooperation and strategic control across the wider landscape.

Management strategies are devised in line with the RAPID INNS management toolkits for freshwater, marine, alert species and incorporate good practice management guidelines. This information can be found on the RAPID webpage on the GBNNSS:

http://www.nonnativespecies.org/index.cfm?sectionid=139

Management with respect to the utilisation of good biosecurity practices should be encouraged, especially with regards to species that are difficult to completely eradicate.

For more information and guides visit The Green Blue Project and the RAPID INNS Management Toolkit: Freshwater Biosecurity Resources webpages:

https://www.thegreenblue.org.uk/

http://www.nonnativespecies.org/index.cfm?pageid=622

The Angling Trust also provides information on key aquatic INNS:

https://www.anglingtrust.net/page.asp?section=649&sectionTitle=Invasive+Non-Native+Species

Sightings of invasive species should be recorded with local recording networks and can also be reported online using the INNS Mapper tool.

http://ywt-data.org/inns-mapper/

This tool is also connected with iRecord and the National Biodiversity Network (NBN) atlas.

For "Alert" species, records should be submitted directly to GBNNSS or CEH. Further information can be found on the link below, details of which species are classed as alert species and where you can report sightings are included in the management section of the following tables.

http://www.nonnativespecies.org/alerts/index.cfm

INNS Prioritised management categories

In order to try and keep the document as up to date as possible only records from the past 10 years have been used. The following tables use the species sightings data (see Section 5) and include all species that have been observed in the East of England catchments since the year 2008. These tables are split into 4 categories: prevent (**BLACK**), eradicate (**RED**), long term management for high priority species (**AMBER**), and long term management for low priority species (**GREEN**).

Species on the prevent (**BLACK**) list are INNS that are prioritised for preventing arrival within the east of England and within each catchment. These include GB 'Alert' and other national 'High Risk' species and other species of regional concern. These are species that are not currently present and should be moved to the eradicate (**RED**) list if they are found – leading to

immediate removal. For black listed species report sightings to GB NNSS and/or local authorities as soon as possible for immediate action to prevent these species from gaining a foothold and spreading within the region or catchment.

Species on the eradicate (**RED**) list are of high priority to eradicate from the region or catchment. These species are of EU, GB or regional concern and can effectively be managed and removed. Once eradicated these species will be transferred to the prevent (**BLACK**) list to facilitate a rapid warning early response system to incursions.

For species of high concern that are too widespread and/or eradication is not a viable option (i.e. there is no known method of control), species will be placed upon the high priority species (**AMBER**) list for long term management. These are species for which the management objective is to reduce harmful impacts by containing/ controlling the invasion while working to reduce the overall size of the invasion.

Low priority species (**GREEN**) are those that have minimal impacts or where management is not effective. This is likely because impacts are as yet unknown or because species are well established that management is ineffective. For species that are well established and there is not scope to use control methods, the main action would be preventing further spread through good biosecurity practices.

Within the low priority (**GREEN**) list species that may not be truly invasive (i.e. causing harm and spreading) have been included. This is because there may be effects that are currently not known. For example many species have been in GB for decades but are not spreading but could if conditions change. This list also includes species that may have only been spotted a low number of times (for example the majority of the teal species) and while unlikely to be causing harm at the moment, if released in greater numbers they could cause harm in the future.

Table 6: INNS management priorities for East of England Region – Animals Prevent List

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
African Clawed Toad	*Xenopus laevis*	Medium (Found only in Louth Grimsby Ancholme catchment however there is possibility for accidental release)	Mud and vegetation in ponds	Used as a pet and laboratory animal, potential to escape and are often deliberately released, breeding in semi natural conditions have been known in GB	Potential carrier of the pathogenic amphibian chytrid fungus	GB NNSS Alert species: GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3762	GB NNSS Alert species, report as soon as possible:
American bullfrog	*Lithobates catesbeianus*		Deliberate release as unwanted pets, escape from garden ponds, accidental importation from fish stocks and aquatic plant trade. In other countries this species has previously been released as a biological control for insect pests and raised for human consumption.	Areas of still and slow moving water with high levels of aquatic and bank vegetation (e.g. calm water and deep pools in rivers and streams)	Feeds on native prey (including other amphibians, small mammals and birds, mollusc, crustaceans and insects). Causes predation on and competition with native amphibians. Possible carrier of the chytrid fungus *Batrachochytrium dendrobatidis* which can be passed to native species.	GB National Alert species: GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2040	EU blacklisted species, practice good biosecurity, raise public awareness, GB alert species - report sightings as soon as possible, targeted removal
Amur sleeper	*Perccottus glenii*	Low (although present and established in Eastern Europe)	In Europe this species has been transported for aquaculture leading to accidental release, it has also been released intentionally from aquaria of by anglers for use as bait. A hardy species it can survive human transportation over long distances	Fresh/brackish water, prefers slow moving or static waters (e.g. ponds, lakes) with large amounts of vegetation	Competition with native species for food, predation on native species, transmission of diseases to native species	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4365	EU blacklisted species. Raise public awareness

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Carpet Sea-squirt	*Didemnum vexillum*	Very likely (present in GB)	Strongly associated with marinas and is likely transferred by attachment to hulls of leisure crafts, it can also be transferred in ballast water and through movement of contaminated stock in the aquaculture trade.	Hard surfaces in coastal habitats, particularly on artificial structures in marinas and harbours (e.g. pilings, piers, boats, pontoons). It can also grow on cobble and gravel to 80m depth and on bivalves.	Can form large mats (colonies) smothering surfaces and species already present, this can significantly alter species natural species composition. It can smother aquaculture species (e.g. scallops, mussels) resulting in death, and/or significant cleaning costs.	GB National Alert species: http://www.nonnativespecies.org/alerts/index.cfm	GB non-native species secretariat management and guidance: http://www.nonnativespecies.org/index.cfm?pageid=227, http://www.nonnativespecies.org/index.cfm?pageid=624 If found in small patches, surfaces should be removed from the water, and if intertidal scraping to remove it could be considered. See Green Blue project and RAPID biosecurity webpages.
Coati	*Nasua nasua*	High (previous escapees from zoos have been recorded in GB)	Introduced into Europe for the pet trade, Escape from zoos	Forests and wetlands	This species could potentially compete with or predate on native wildlife	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2324	EU Blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/74001
Coypu	*Myocastor coypus*	Low (eradicated in GB, previously abundant in East of England)	Accidental escape e.g. from private keepers/collections	Wetlands	Destruction and damage of vegetation and habitats through grazing, burrowing can impact river banks resulting in flooding, coypus are a carrier of a nematode parasite that can cause dermatitis in humans ("nutria itch")	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2282	EU Blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/73537
Edible Frog	*Pelophylax esculentus*	Possible (a hybrid of the native pool frog Pelophylax lessonae and the invasive marsh frog P. ridibundus, it is previously known in EE and reported in SE GB)	hybridisation between hybrid of the native pool frog Pelophylax lessonae and the invasive marsh frog P. ridibundus, generally needs either species to be present to reproduce, deliberate introductions, Spreading along water courses	Large unshaded ponds, gravel pits, canals and other slow flowing water bodies.	Impact through hybridisation, can affect native amphibians (competition or vector of disease).	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2575	Raise public awareness

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Fox squirrel	*Sciurus niger*	Low (not recorded in the wild Europe)	Spreads along riparian corridors, Imported for the pet trade - potential escape mechanism	Riparian woodland	potential to outcompete the native red squirrel and pass on diseases to native fauna	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4362	EU Blacklisted species: CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/64742
Marbled crayfish	*Procambarus fallax f.virginalis*	Low (prefers warm waters (18-25 °C) for reproduction although able to survive in lower temperatures)	Species can clone itself, popular in the aquarium trade which often leads to potential for escape.	Freshwater channels, lakes, ponds, rivers and streams	Limited evidence of major impacts so far however could become a threat to native crayfish through competition and plague, burrowing could disrupt wetlands as with other invasive crayfish species.	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/110477	EU blacklisted species, practice good biosecurity, raise public awareness, rapid eradication of newly emerging populations. GBNNSS non-native crayfish management plan: http://www.nonnativespecies.org/index.cfm?pageid=472
Musk Rat	*Ondatra zibethicus*	Low (previously present in the EE and GB before eradication)	Originally introduced for fur farming and has escaped into the wild, natural expansion once established	Freshwater, along riverbanks dykes, lakes, ponds and wetlands.	Damage of marshland can destroy vegetation, burrowing in banks can undermine the flood defence capability and irrigation systems, burrowing can cause flooding, this animal is a vector of leptospirosis, which can be transferred to humans as Weil's disease.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2422	EU Blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/71816
Quagga Mussel	*Dreissena rostriformis bugensis*	High (newly recorded in UK)	In ballast water, contamination of boats and fishing gear, downstream expansion	Freshwater rivers canals and lakes, can survive marine waters and lives in brackish and estuarine waters in its natural range	Filter nutrients from the water to the detriment of other species, biofouling - blocks pipes and smothers ship hulls and other structures	GB National Alert species: http://www.nonnativespecies.org/alerts/index.cfm	No effective eradication method once established, Practice good biosecurity (check, clean and dry approach), See Green Blue project and RAPID biosecurity webpages, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/107770
Racoon	*Procyon lotor*	Low	Kept in zoos and as pets, potential for escape or deliberate release - they are released for hunting purposes in other parts of Eurasia	Woodland near water, urban areas	Threaten birds and displace native carnivores, pest species in urban areas, vectors of parasites and diseases which can be passed to humans and animals.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2839	EU Blacklist species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/67856

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Racoon dog	*Nyctereutes procyonoides*	Very likely, already present in mainland Europe, escapees have occurred in GB	Deliberate introduction and escape from fur farms (in Eastern Europe). Natural range expansion.	Damp forests, typically found near water	Competition for food and dens with native badger and foxes, potential to impact bird and amphibian populations, carriers of disease that can affect other animals, main vector of rabies within Europe.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2377	EU blacklist species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/72656
Red swamp crayfish	*Procambarus clarkii*	Medium (already established in parts of EE and isolated locations in GB)	Deliberate introduction to supplement stocks of native crayfish for consumption, it is likely escaped from aquaria or introduced intentionally from aquaculture facilities, natural expansion downstream is likely.	Ponds, ditches, canals and rivers, but potentially able to survive in inundated wetland, reed bed, drainage channels and coastal marshes	It is an aggressive predator and can cause a decline of native species due to predation, burrowing causes increase turbidity/decreased light penetration resulting in decreased recreational value for the water body, increased water processing and filtration costs and damage to banks resulting in flooding, this species is a carrier for crayfish plague.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2836	EU blacklisted species, practice good biosecurity, raise public awareness, rapid eradication of newly emerging populations. GBNNSS non-native crayfish management plan: http://www.nonnativespecies.org/index.cfm?pageid=472
Sacred ibis	*Threskiornis aethiopicus*	High (already present in GB although no breeding populations currently known)	Escape from captivity, vagrants from mainland Europe.	Wet grasslands and wetlands	Localised impacts through feeding on earthworms, insects, fish, small rodents, molluscs, crustaceans and amphibians as well as eggs of other birds, competition with native species for nest sights, due to this species feeding on rubbish dumps and slurry pits there is concern about the implications towards human health	GB NNSS alert species, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3537	EU Blacklist species, public awareness on impacts, GB NNSS alert - report sightings as soon as possible, https://secure.fera.defra.gov.uk/nonnativespecies/downloadDocument.cfm?id=942
Stone moroko / Topmouth Gudgeon	*Pseudorasbora parva*	High	Originally introduced as an ornamental species with subsequent escapes, due to small size it can escape from enclosed still-waters and rapidly colonise connected waterbodies, potentially introduced as a contaminant with other ornamental fish or through use as a baitfish	Vegetated small channels, ponds and small lakes and connected water bodies.	Can significantly decrease and stunt growth of native or farmed fish numbers through competition for food and space (including spawning habitat), a vector for parasites and infectious diseases (e.g. *Spherotecum destruens*)which can impact fisheries	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2876	EU Blacklist species, GB NNSS alert species, report sightings as soon as possible: http://www.nonnativespecies.org/index.cfm?pageid=552

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Virile crayfish	*Orconectes virilis*	High (It is well established in the Lea catchment (north London) and thought to be spreading)	Imported to Europe in the aquarium trade, accidental or deliberate release into the wild through disposal, natural expansion downstream is likely, transfer by birds or other predators.	Freshwater lakes, ponds and rivers.	Decrease native populations of crayfish through competition and as carriers for crayfish plague, potential to disrupt natural food webs through feeding, burrowing can destabilise river banks resulting in flooding.	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/72034	EU blacklisted species, practice good biosecurity, raise public awareness, rapid eradication of newly emerging populations. GBNNSS non-native crayfish management plan: http://www.nonnativespecies.org/index.cfm?pageid=472

Table 7: INNS management priorities for East of England Region – Plants and Algae Prevent List

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Alligator weed	*Alternanthera philoxeroides*	Low, currently present in mainland Europe	Possibly mistaken for or contaminating ornamental species	Warm waterways (freshwater)	Forms dense mats, choking waterways	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/4403	EU blacklisted species, practice good biosecurity, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/4403
Asiatic tearthumb	*Persicaria perfoliata*	Low (expected to spread to warmer subtropical regions)	Accidental introduction from ballast water and with ornamental shrubs, natural spread to neighbouring sites by water birds and animals	River and stream banks, wetlands	Rapidly smothers native vegetation and reducing available light (including ornamental and horticultural trees), this is a prickly shrub therefore restricts movement of animals and humans.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4378	EU blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/109155
Broadleaf watermilfoil	*Myriophyllum heterophyllum*	Low (found at a series of ponds in Horsham, West Sussex in 2016 and present in mainland Europe)	Used in the aquacultural and horticultural trade, may attach to boats and spread, fragments can regrow and be transferred along water or by humans.	Freshwater habitats and wetlands.	Rapid growth and dense mat formation impede water flow, block sunlight and reduce oxygen, in turn reduces native diversity.	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/34940	EU blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/34940
Carolina fanwort	*Cabomba caroliniana*	High, already present in some parts of GB	Brought in as aquatic ornamental plant, release by public with unwanted pond water	Lakes, ponds, small watercourses	Forms dense mats - eutrophic conditions	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=596	EU blacklisted species, practice good biosecurity, raise public awareness
Common milkweed	*Asclepias syriaca*	Low, currently present in mainland Europe	Brought in as ornamental plant, accidental escape	Grasslands, dunes, river valleys	Crowd out native plant spp. Toxic if ingested.	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/7249	EU blacklisted species, practice good biosecurity, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/7249
Floating primrose-willow	*Ludwigia peploides*	High	Originally introduced as an ornamental plant, it can double its extent in 4 weeks	Still or slow moving water	Outcompeting native species and clogging waterways	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3799	EU blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/31673
Himalayan Knotweed	*Persicaria wallichii*	High (previously recorded in North West Norfolk)	Horticultural trade has led to escaped plants from gardens or waste disposal. Seeds and fragments can be water and wind dispersed.	Marsh banks and riverbanks	Grows into dense stands that can displace native species and prevent them from growing / germinating from seeds	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/120210	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/120210

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Japanese stiltgrass	*Microstegium vimineum*	Very likely	Potential to be introduced from bird seed, contamination causing seed present within imported soils for use within the horticultural trade and road construction, dispersal from established population via waterway and animal vectors (i.e. attached to fur)	River corridors, forested wetlands, moist woodlands	Rapidly replaces natural communities, can overgrow vegetation, alters ecosystem processes such as nitrogen and carbon cycling, decomposition and fire regimes, it can impact the abundances and diversity of native fauna.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4327	EU blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/115603
Persian hogweed	*Heracleum persicum*	High (present in GB, previously recorded in East of England)	Originally grown as an ornamental, seed dispersed by waterways	Coastal habitats, wetlands and pastures	Forms dense stands that reduce biodiversity through shading and competition, can alter soil composition and cause erosion, Phototoxic sap when combined with UV radiation causes skin burns.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4366	EU blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/120209
Sosnowsky's hogweed	*Heracleum sosnowskyi*	Likely (present in mainland Europe, similarity to other species of hogweed could lead to this species being overlooked)	Planted for ornamental, culinary and medicinal purposes as well as use as a potential livestock fodder reasons, seeds spread by wind and water.	Disturbed, semi-natural habitats such as road and rail verges, waste ground, river and stream banks, disused agricultural land and meadows	Can invade and rapidly transform landscape, highly toxic to humans (causes skin burns)	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4376	EU blacklisted species: rapid eradication to prevent establishment: CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/108958
Tree Groundsel	*Baccharis halimifolia*	Medium already present in some parts of GB but not spreading	Brought in as ornamental plant, accidental escape	Coastal areas: dunes, saltmarsh, woodland etc.	Alters ecosystem structure, impacts dune dynamics	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=452	EU blacklisted species, practice good biosecurity
Water hyacinth	*Eichhornia crassipes*	Low, has been found in some parts of GB but rarely survives frosts	Brought in as ornamental plant, accidental escape	Water bodies	Forms dense mats - eutrophic conditions, loss of recreation/navigation	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1292	EU blacklisted species, rapid control: CABI invasive species compendium: https://www.cabi.org/isc/datasheet/20544 Rarely survives winters in the UK but should be reported and managed accordingly if it were to spread.
Whitetop weed	*Parthenium hysterophorus*	Low (subtropical species, not yet considered established in the EU)	accidental contamination from agricultural produce and farm machinery, once grown seeds can spread by humans animals and wind	Riverbanks and floodplains	Rapidly outgrows native species, produces a substance that inhibits growth of native species, contact with plant or pollen can produce serious reactions in humans and livestock (especially horses)	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4377	EU blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/45573

Table 8: INNS management priorities for East of England Region – Animals Eradicate List

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Goldfish	*Carassius auratus*	Likely introduced by people	Pet trade, accidental and deliberate release	Still and stagnant waters (ponds, lakes	Competes with and hybridises with native fish populations	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=655	Raise awareness, eradication programmes
Marsh Frog	*Pelophylax ridibundus*	High (already present and spreading from SE to EE)	Imported from Hungary and deliberate introductions into the wild have been recorded. Descendants either deliberately translated or their range naturally expanded.	Large unshaded ponds, gravel pits, canals and other slow flowing water bodies, present around marshland dykes and fisheries in GB.	Impact through hybridisation, can affect native amphibians (competition or vector of disease), loud calling can cause noise complaints in suburban areas.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2577	Raise public awareness
Ruddy duck	*Oxyura jamaicensis*	Possible (however successful eradication programmes have significantly reduced numbers in GB)	Introduced as part of wildfowl collections and escaped	Freshwater water bodies with emergent reeds, winters on lakes and reservoirs	Competition with native duck populations when population peaks, in GB the ruddy duck appears to occupy a vacant niche limiting negative impacts	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2486	EU blacklisted species, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/71368

Table 9: INNS management priorities for East of England Region – Plants and Algae Eradicate List

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
American skunk cabbage	*Lysichiton americanus*	High (present in most catchments)	Introduced as an ornamental plant and escaped into the wild, seeds spread along waterways and through bird and mammal dispersal.	Swamp forests and associated wetlands, fens, meadows, bogs, alluvial woodlands, streams, riverbanks, lakes and ponds	Large leaves build dense layers and block light, outcompeting native species and having a knock on effect to biodiversity.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2110	EU blacklisted species, http://www.nonnativespecies.org/index.cfm?pageid=413, http://www.nonnativespecies.org/index.cfm?pageid=624
Floating pennywort	*Hydrocotyle ranunculoides*	Very likely (widespread throughout EE)	Water plant trade; disposal of excess plant growth; natural means	Ponds, canals, drainage channels, ditches, streams and slow-flowing rivers.	Smothers water bodies reducing the numbers of native species and potentially increasing the risk of flooding. Can damage waterworks by blocking pipes and pumps.	http://www.nonnativespecies.org/index.cfm?pageid=143	EU blacklisted species, http://www.nonnativespecies.org/index.cfm?pageid=538, http://www.nonnativespecies.org/index.cfm?pageid=624
Hottentot-fig	*Carpobrotus edulis*	Medium – has been previously recorded in one location in East Suffolk	Ornamental plant, introduced through dumping garden waste	Sea cliffs, sand dunes, coastal banks, rocks and walls	Rapidly produces a monoculture that prevents growth of native species, alters the soils nutrient dynamics	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=669	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/10648
Uruguay Water-primrose	*Ludwigia grandiflora*	High (only known in a few locations around east Anglia but highly invasive)	Introduced as an ornamental species. Stem fragments be spread by animals, waterways and humans. Fruits can remain buoyant for weeks facilitating widespread dispersal along waterways.	Ponds, farm reservoirs and slow-flowing rivers and ditches	This species can outcompete native plants for light nutrients and pollinators by forming dense stands on mud or in water, it can facilitate oxygen depletion.	GB National Alert species: http://www.nonnativespecies.org/alerts/index.cfm	EU Blacklisted species, GB non native species secretariat management and guidance: http://www.nonnativespecies.org/index.cfm?pageid=275, http://www.nonnativespecies.org/index.cfm?pageid=624
Water Fern	*Azolla filiculoides*	High - Already present throughout GB	Origin in botanic gardens, potentially spread by machinery or contaminated clothing	Coastal areas, ponds, lakes, canals, ditches and slow flowing rivers	Forms dense coverage that blocks light, compromises oxygen diffusion and restricting animals, limits recreation	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=451	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/8119

Table 10: INNS management priorities for East of England Region – Animals Amber Management Species List

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
American Mink	*Neovison vison*	High	Escape from fur farms, deliberate releases, establishment of populations	Vegetated areas of lakes and rivers, streams, coasts and marshlands as well as brackish areas	Preys on fish, farmed animals (including lambs and chickens) and game birds impacting aquaculture, farmer's hunters and anglers. It is a voracious predator killing more than it needs and has helped facilitate the near extinction of the water vole in GB	http://www.nonnativespecies.org/index.cfm?pageid=539, http://www.nonnativespecies.org/index.cfm?pageid=624	http://www.nonnativespecies.org/index.cfm?pageid=539, http://www.nonnativespecies.org/index.cfm?pageid=624
American Oyster Drill	*Urosalpinx cinerea*	Low (low abundance in GB, has been previously identified in Combined Essex catchment)	Unintentional introduction on oysters	Coasts and estuaries	Predates on oysters, may compete with native dogwhelk, considered a pest to the oyster industry	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3664	Prevention of settlement is recommended, good biosecurity practices to prevent movement, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/60187
American Slipper Limpet	*Crepidula fornicata*	High (already present and widespread in the region)	Transported in the aquaculture industry on contaminated oysters, can contaminate floating debris, be found in ballast water, ship's hull fouling and through contaminated soil.	Estuaries, coastal, intertidal, mudflats, predominantly found on sandy and gravelly bottoms	Alters sediment distribution, biodiversity and suspended matter when found in high abundances	http://www.nonnativespecies.org/index.cfm?pageid=624	http://www.nonnativespecies.org/index.cfm?pageid=624 See Green Blue project and RAPID biosecurity webpages.

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Amphibalanus improvisus	*Amphibalanus improvisus*		Attached to ships hulls and in ballast water, also found attached to aquaculture species such as oyster shells, spreads along interconnected waterways	Marine hard surfaces (manmade or natural)	Fouls artificial substrates (e.g. boat hulls), can form dense layers and compete for space with other species	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/91903	Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/, CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/91903 See Green Blue project and RAPID biosecurity webpages.
Asian Shore Crab	*Hemigrapsus sanguineus*	Highly likely to be spread by human transport	Transport through ballast water and hull fouling, transport along with aquaculture species is also possible, natural larval dispersal	Intertidal areas of estuarine and marine shores, usually on exposed rocky shores however can also live under rocks and shells, on artificial structures , mussel beds and oyster reefs	It can reduce numbers of native shore crabs and reduce mussel densities which could conflict with multiple bivalve aquaculture species	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3818	Raise awareness of the problem of fouling species, e.g. Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/. See Green Blue project and RAPID biosecurity webpages.
Asiatic Clam	*Corbicula fluminea*		Can be spread via ballast water, expansion of range is occurring in GB	Freshwater habitats, still waters and flowing rivers, prefers sand and gravel habitats	Forms dense populations, has a high filtration rate and produces large amounts of pseudofaeces, this could alter ecosystem dynamics, large densities can block intake pipes and irrigation channels	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=897	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/88200

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Bloody-red Mysid	*Hemimysis anomala*		Intentional introduction as a food source for fished species, spread naturally, in ballast water and potentially contaminated equipment and boats used across different areas for recreation	Freshwater and brackish water in areas with loose stones	Form large colonies and can alter ecosystem through feeding (omnivorous). They can reduce food stocks (zooplankton) of fished species causing economic concerns.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1698	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/108015
Brush clawed shore crab	*Hemigrapsus takanoi*	Highly likely to be spread by human transport	Transport through ballast water and hull fouling, transport along with aquaculture species is also possible, natural larval dispersal	Intertidal areas of estuarine harbours lagoons and bays, usually on sheltered muddy sediment in low energy areas, within sites it can be found under boulders and hard substrates	This species can displace native shore crabs.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3815	Raise awareness of the problem of fouling species, e.g. Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/. See Green Blue project and RAPID biosecurity webpages.
Bugula simplex	*Bugula simplex*	High	Ballast water, attached to ships hulls	Harbours and marinas, artificial and natural surfaces in marine waters	Grows into dense concentrations overgrowing native species, they can foul hulls , underwater machinery and aquaculture facilities	Erect bryozoan	Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.
Bugula stolonifera	*Bugula stolonifera*	High	Ballast water, attached to ships hulls	Harbours and marinas, artificial and natural surfaces in marine waters	Grows into dense concentrations overgrowing native species, they can foul hulls , underwater machinery and aquaculture facilities	Erect bryozoan	Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Chinese mittencrab	*Eriocheir sinensis*	High	Shipping (in ballast water), clinging to ships hulls, mariculture / aquaculture contamination, Interconnected waterways	Estuaries (saline waters) and rivers with muddy banks, salt marshes, open water bays	Impact native populations through predation and competition, causes siltation in gravel runs used for fish spawning (salmon, trout), potential disease carrier, degrades river banks resulting in reparation costs	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1379	EU blacklisted species, practice good biosecurity, raise public awareness See Green Blue project and RAPID biosecurity webpages.
Compass Sea Squirt	*Asterocarpa humilis*	High	Attached to ships hulls and ballast water	Marinas harbours and aquaculture facilities, hard structures	Smothering hard surfaces, can form large clumps that could block pipes	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4133	Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.
Demon Shrimp	*Dikerogammarus haemobaphes*	High	Unintentional introduction by anglers (fouling), in ballast water, transferred through movement of fish stocks and foraging birds, natural range expansion.	Rivers lakes and canals	Kill native species including young fish and significantly alter ecosystems	GB National Alert species: http://www.nonnativespecies.org/alerts/index.cfm	Practice good biosecurity (check, clean and dry approach), GB non-native species secretariat management and guidance: http://www.nonnativespecies.org/index.cfm?pageid=559
Egyptian Goose	*Alopochen aegyptiacus*	High	Brought in as an ornamental species, possible escapes from captivity, expansion from present population	Wetland habitats (lakes, ponds, reservoirs, estuaries, sewage works, swampy woodland and meadows), farmland	Competition with native species for food and nest sites. Can cause physical damage through grazing and eutrophication in still waters from droppings.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=140	EU blacklisted species, Raise public awareness, manage populations

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
False Dark Mussel	*Mytilopsis leucophaeata*	High	Boat fouling	Estuaries attached to hard substrates (natural and artificial)	Rapid reproduction can lead to fouling, especially problematic for coolant water systems, clogging water intakes and pipes, can have similar ecological effects as the Zebra mussel, *(Dreissena polymorpha*)	http://www.iucngisd.org/gisd/speciesname/Mytilopsis+leucophaeata	http://www.iucngisd.org/gisd/speciesname/Mytilopsis+leucophaeata
Freshwater hydroid	*Cordylophora caspia*	High	Possibly introduced on timber and spread via shipping, transported via hull fouling and in ballast tanks	Estuaries, lagoons and coastal lakes	Possible displacement of other species, causes fouling and is known to be a nuisance in water cooling systems, blocking pipes and filters	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=900	Raise awareness of the problem of fouling species, e.g. Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/. See Green Blue project and RAPID biosecurity webpages. Manual cleaning, eradication using heat or chlorine and use of biocides could help control and curtail spread
Japanese Skeleton Shrimp	*Caprella mutica*	High	Shipping and aquacultures, attached to algae, on ships hulls and in ships sea chests (ballast water)	Marine reef habitats and artificial substrates, not currently found in natural habitats	Potentially aggressive, in high densities this species can block water intakes on pumps or settle on mussel lines, causing significant economic impacts	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=647	Raise public awareness, Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Killer Shrimp	*Dikerogammarus haemobaphes*	Very likely (currently found in multiple catchments)	Unintentional introduction by anglers (fouling), in ballast water, transferred through movement of fish stocks and foraging birds, natural range expansion.	Rivers lakes and canals	Kill native species including young fish and significantly alter ecosystems	GB National Alert species: http://www.nonnativespecies.org/alerts/index.cfm	Practice good biosecurity (check, clean and dry approach), GB non-native species secretariat management and guidance: http://www.nonnativespecies.org/index.cfm?pageid=559
Leathery Sea Squirt	*Styela clava*	Likely - fouling species present around GB and some locations in EE	Transport on ships hulls through fouling and in ballast water	Coastal hard surfaces, particularly in artificial structures such as marinas and harbours	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3430	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3430	Promote awareness of fouling species and transport, Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/, See Green Blue project and RAPID biosecurity webpages. CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/62274
Orange Cloak sea squirt	*Botrylloides violaceus*		Hull fouling and ballast water, attached to aquaculture species	Artificial substrates and hard coastal shores	Forms large colonies able to smother aquaculture facilities animals and hard substrates, able to block intake pipes and compete with other sessile invertebrates	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=514	Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Orange-tipped sea squirt	*Corella eumyota*		Attached to ships hulls and ballast water	Marinas harbours and aquaculture facilities, hard structures	Smothering hard surfaces, can form large clumps that could block pipes	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=902	Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.
Pacific/ Portuguese oyster	*Magellana gigas*	High (likely to escape from farming, expand from present ranges)	A farmed species around GB, escape likely	Hard substrates in shallow and intertidal coastal areas	Forms dense aggregations to the exclusion of other species, forms reefs changing habitats and ecosystem processes, shells are sharp and pose hazard to humans	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1013	http://www.nonnativespecies.org/index.cfm?pageid=624
Ruby bryozoan	*Bugula neritina*	High	Ballast water, attached to ships hulls	Harbours and marinas, artificial and natural surfaces in marine waters	Grows into dense concentrations overgrowing native species, they can foul hulls , underwater machinery and aquaculture facilities	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=585	Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.
Sideswimmer	*Gammarus tigrinus*		Transported in ballast water originally, since introduction has spread naturally and via attachment/transport via recreational boats	Brackish water rivers, lakes and canals	Replaces native invertebrates, predation on some native species, sometimes linked to destruction of fishing gears and injuring fish caught in nets	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1572	Promote awareness of fouling species and transport, Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Signal crayfish	*Pacifastacus leniusculus*	High	Imported to be farmed for food but escaped or released into the wild through water courses and across land, natural expansion up and downstream and across land is likely.	Freshwater lakes, ponds, canals, streams and rivers, can also survive brackish waters.	Decrease native populations of crayfish through competition and as carriers for crayfish plague, potential to disrupt natural food webs through feeding, burrowing can destabilise river banks resulting in flooding.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2498	EU blacklisted species, practice good biosecurity, raise public awareness, rapid eradication of newly emerging populations. GBNNSS non-native crayfish management plan: http://www.nonnativespecies.org/index.cfm?pageid=472
Spiny cheek crayfish	*Orconectes limosus*	High (present in many EE catchments)	Deliberate introduction to supplement stocks of native crayfish in mainland Europe, Also used in pet trade, in GB it is likely escaped from aquaria or introduced intentionally into ponds as fish food, likely contamination from fish farms and as food bait, natural expansion downstream is likely, dispersal across land to nearby waterways, transfer by birds or other predators.	Freshwater lakes, ponds and rivers.	Decrease native populations of crayfish through competition and as carriers for crayfish plague, potential to disrupt natural food webs through feeding, burrowing can destabilise river banks resulting in flooding.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2441	EU blacklisted species, practice good biosecurity, raise public awareness, rapid eradication of newly emerging populations. GBNNSS non-native crayfish management plan: http://www.nonnativespecies.org/index.cfm?pageid=472

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Terrapins	Multiple species	Medium, natural dispersal is low, likely to be introduced by people. Not known to breed successfully in GB.	Native to mainland Europe, Species are generally released or escaped via the pet trade	Freshwater ponds and streams, wetlands	Possible effects on insect larvae, earthworm and aquatic vegetation species	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1318, http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3566	Raise public awareness, EU Blacklist species red eared terrapin, http://www.nonnativespecies.org/index.cfm?pageid=624
Tricellaria inopinata	*Tricellaria inopinata*	High	Ballast water, attached to ships hulls	Harbours and marinas, artificial and natural surfaces in marine waters	Grows into dense concentrations overgrowing native species, they can foul hulls , underwater machinery and aquaculture facilities	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/62274	Promote awareness of fouling species and transport, Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/, See Green Blue project and RAPID biosecurity webpages. CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/62274

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Turkish Crayfish	*Astacus leptodactylus*		Deliberate or accidental release into the wild after being brought in to GB for sale in fish markets	Lakes, ponds, rivers and reservoirs, also brackish water	Potential to alter food chain through feeding and competition, minimal impact on native crayfish	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=381	Practice good biosecurity, raise public awareness, rapid eradication of newly emerging populations. GBNNSS non-native crayfish management plan: http://www.nonnativespecies.org/index.cfm?pageid=472
Zebra Mussel	*Dreissena polymorpha*	High	Transported by shipping, spreads along waterways	Estuaries, rivers and lakes with firm surfaces for attachment	This species can foul pumps, forbays, and holding tanks, trashracks, and condenser units and can form dense aggregations that can restrict water flow on piping, increase corrosion of piping and riveting. It can also impact biodiversity by attaching to other animals or removing viable substrate, through rapid feeding it decrease phytoplankton and can increase dissolved nutrients in the water through increased amounts of faeces production	GB non-native species secretariat factsheet: GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1250	GB non-native species secretariat management and guidance: http://www.nonnativespecies.org/index.cfm?pageid=305, http://www.nonnativespecies.org/index.cfm?pageid=624

Table 11: INNS management priorities for East of England Region – Plants and Algae Amber Management Species List

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
American Willowherb	*Epilobium ciliatum*	High (widespread in EE)	Possibly introduced on imported timber and spread from naturally from timber yards, often moved in soil, attached to animals and vehicles	Damp marshland rivers and ponds	Outcompetes smaller shrubs	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/114114	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/114114
Brazilian Giant-rhubarb	*Gunnera manicata*	Medium (only present in Louth Grimsby Ancholme, East Suffolk, upper Bedford and Witham catchments in low abundances), not as invasive as the other species of Giant Rhubarb	Ornamental species and used as an architectural herb, slow spread and seed is often not viable in the UK	Lake margins and streamsides, moist ground	Large leaves prevent growth of other species, potential to suppress biodiversity and alter ecosystems, it can block drains and streams and increases the risk of flooding	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1646	See information regarding Giant Rhubarb: CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/107826
Canadian Goldenrod	*Solidago canadensis*	High - Widespread throughout EE catchments	A horticultural species spread via waste disposal and natural dispersal	Waysides, waste ground, river banks, unmanaged grasslands and open scrub	Can grow in dense aggregations	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3323	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/50599

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Curly waterweed	*Lagarosiphon major*	High	Introduced as an oxygenating plant in the aquarium trade, transference of fragments on machinery recreational equipment and clothing.	Streams and ponds, still water, eutrophic calcareous canals ponds gravel pits and lakes	Dense growth can deplete oxygen, disrupt erosion-deposition processes, block light, outcompete native plants, disrupt movement of animals and predator-prey relationships, absorb sunlight increasing overall water temperature, die back can result in eutrophic conditions, can facilitate mosquito breeding areas. Socially, this species can restrict recreational water activities, sailing and watersports. Rotting material can be deposited on beaches after storms.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1888	EU blacklisted species, http://www.nonnativespecies.org/index.cfm?pageid=624
Early Goldenrod	*Solidago gigantea*	High - Widespread throughout EE catchments	A horticultural species spread via waste disposal and natural dispersal	Uncut grasslands, wetland edges, riparian habitats, forest edges	Once established it can outcompete native species	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/50575	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/50575
Giant hogweed	*Heracleum mantegazzianum*	High	Originally introduced as an ornamental plant and deliberately planted around rivers and ponds, seeds dispersed by wind, water and humans.	Lowland streams and rivers, waste ground, rough pastures	Forms dense stands that reduce biodiversity through shading and competition, Phototoxic sap when combined with UV radiation causes skin burns.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1705	EU blacklisted species, http://www.nonnativespecies.org/index.cfm?pageid=154

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Giant Knotweed	*Fallopia sachalinensis*	High (present throughout EE although not as common as Japanese knotweed)	Ornamental species that has escaped through river flooding and disposal, rhizome material can be spread via waterways	Riverbanks, lake shores, lowland disturbed areas	Forms tall and dense thickets that compete with native vegetation for space, light, nutrients and water, can cause significant changes to native community composition, weaken flood defences (however in dense aggregations may help to protect them), infestations can deter development due to cost of eradication (similar to Japanese Knotweed)	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1498	Raise public awareness, establish a rapid response protocol, see information regarding Japanese knotweed
Giant-rhubarb	*Gunnera tinctoria*	High - present in numerous catchments and highly invasive	Introduced as an ornamental plant and has escaped into the wild. Plant can regenerate from rhizome fragments, seeds dispersed by birds, water and humans.	Margins and banks of ponds, rivers, streams and interconnected waterways.	Large leaves cause shading and prevent growth of native species, blockage of drains and streams, degradation of agricultural and recreational land, soil erosion.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1647	EU blacklisted species, control: CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/107826
Himalayan balsam	*Impatiens glandulifera*	High	Introduced as a garden plant and sown by beekeepers, explosive seed heads facilitate spread over distances, seeds spread by waterways.	Widespread particularly along riverbanks, floodplain forests and wet meadows	Shallow root system does not bind sediment leading to erosion following die back, can shade and crowd out native species, attracts pollinators possibly to the detriment of native species, dense stands can impede water flow and increase likelihood of flooding.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1810	EU blacklisted species, http://www.nonnativespecies.org/index.cfm?pageid=147

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Japanese Knotweed	*Fallopia japonica*	Very likely	1) Inappropriate disposal of garden and building site waste material. 2) Inappropriate removal methods used where it is already a problem. 3) Downstream spread of rhizome material from river banks. 4) Transport of contaminated topsoil. 5) Intentional introduction as ornamental garden plant spread to unaffected areas.	Occurs throughout most of Great Britain	Can have major impacts on biodiversity, integrity of river morphology etc. in localised area, with a lesser impact elsewhere. Impact can be high in urban areas/developments where buildings are undermined. It can hybridise with giant knotweed which can often be more vigerous.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1495	http://www.nonnativespecies.org/index.cfm?pageid=226
New Zealand Pygmyweed	*Crassula helmsii*	High (already present)	Originally used as an oxygenating plant in ponds, escape via discarding contents of ponds, can spread by fragmentation attached to boats, machinery, clothing and waterfowl	Ponds, lakes, reservoirs, canals and ditches, damp mud	Dense mats cause shading, deplete oxygen and cause a decline of diversity, mats can be mistaken for solid ground and lead to death of animals when they cannot get out of the water. Mats can obstruct water-borne transport, navigation and flood defences	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1017	http://www.nonnativespecies.org/index.cfm?pageid=624
Nuttall's waterweed	*Elodea nuttallii*	High	Brought in as an ornamental plant has resulted in accidental and deliberate release, spreads through fragmentation	Nutrient-rich lakes and ponds, slow flowing water	Rapid growth causes tangled mats that block light, chokes recreational water channels and hydroelectric plants	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1304	EU blacklisted species, control: CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/20761
Orange Balsam	*Impatiens capensis*	High - already present throughout the region	Projectile seeds, dispersed along waterways, similar to Himalayan Balsam	Riverbanks	Similar to Himalayan Balsam	Similar to Himalayan balsam although smaller with orange flowers	See methods for Himalayan Balsam

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Parrot's feather	*Myriophyllum aquaticum*	Very likely (already present)	This is an aquaculture / horticulture species, spreads through dumping of contaminated garden plants, potential escape / expansion from gardens, transfer along interconnected waterways through natural expansion or via stem fragments.	In GB it often occurs in eutrophic conditions in freshwater lakes and ponds, ditches, reservoirs, canals and flooded mineral workings, in its native range it also occurs in floodplain lagoons, river backwaters, marshes, fens and ditches.	Dense growth can disrupt natural erosion-deposition process, disrupt animal movement, block light disrupt predator-prey dynamics, lead to oxygen depletion, absorb sunlight to increase water temperature, facilitate mosquito breeding grounds. Dense growth can also cause flooding, interfere with irrigation, transport, hydroelectric power production, fisheries, recreation and interfere with fisheries. In large amounts it can prevent recreation in water bodies. Most of these impacts are unlikely in GB unless populations increase.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2285	EU blacklisted species, http://www.nonnativespecies.org/index.cfm?pageid=541
Pickerel weed	*Monochoria vaginalis*	Medium - currently uncommon in UK but occurrences are increasing. Present in Broadland Rivers and Combined Essex catchments	Used in garden ponds and boggy areas, can buy for horticultural purposes, potential for this species to escape.	Swamps, marshes, open wet places, along ditches, freshwater pools and mudflats	Rapidly growing species, noxious	CABI invasive species compendium: https://www.cabi.org/isc/datasheet/34807	Known control and eradication is limited. CABI invasive species compendium: https://www.cabi.org/isc/datasheet/34807

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Pirri-Pirri Burr	*Acaena novae-zelandiae)*	High - found in numerous coastal sites in EE	Ornamental species, colonises through burs that attach to fur and clothing	Coastal and sandy soils and sand dunes	Dense growth can suppress other plants	http://www.nonnativespecies.org/index.cfm?pageid=624, http://www.nonnativespecies.org/downloadDocument.cfm?id=1404	RAPID good practice management toolkit: http://www.nonnativespecies.org/index.cfm?pageid=624 https://secure.fera.defra.gov.uk/nonnativespecies/downloadDocument.cfm?id=1770
Wakame	*Undaria pinnatifida*	High (spread throughout SE and some EE catchments)	Unintentional with Pacific oysters and attached to ships hulls	Subtidal marine areas, artificial structures especially in marinas, attached to pontoons, pylons, buoys etc.	Competition for space with native kelp species, fouling commercial shellfish	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3643	No effective management procedures. Promote awareness of fouling species and transport Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.
Wireweed	*Sargassum muticum*	High - already widespread around the South and West coasts of GB, currently only found within Combined Essex	Fouling on boats , shellfish and commercial oyster fisheries	Coastal sites, intertidally and subtidally on hard surfaces, such as in rock pools	Fouling aquaculture species, it can impair recreational activities in harbours, fast growing and can outgrow native species, blocking light, increases sedimentation in rock pools	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3141	Most methods of management are limited to control. CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/108973

Table 12: INNS management priorities for East of England Region – Animals Green Management Species List

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
A sea spider	*Ammothea hilgendorfi*		Transport on ships hulls	Shallow subtidal waters	Limited impact	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=186	See Green Blue project and RAPID biosecurity webpages.
A tube worm	*Hydroides ezoensis*	Low - rarely spotted, only known in Broadland catchment	Originally introduced on cars and in ballast water, low rate of natural spread	Marine reef habitats and artificial substrates, not currently found in natural habitats	Unknown	http://jncc.defra.gov.uk/page-1699	Raise public awareness, Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/
American jack knife clam	*Ensis directus*		Exploited commercially in UK waters	Sand or muddy sand in the low intertidal and subtidal areas in marine and brackish water	In abundance it can impact communities and sediment structure due to burrowing, potential recreational impact due to stepping on them (similar to native razor clams)	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1322	
American Piddock	*Petricolaria pholadiformis*		Accidental introduction from aquaculture (e.g. Pacific Oyster), natural dispersal via floating vegetation	Estuarine and marine areas		CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/108908	

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Atlantic Rangia	*Rangia cuneata*	Recently introduced to GB in Lincolnshire	Unknown	Brackish water	Unknown	GB NNSS risk assessment http://www.nonnativespecies.org/downloadDocument.cfm?id=1526	Unknown, Promote awareness of fouling species and transport, Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/
Bitterling	*Rhodeus amarus*		Imported and released, probably for ornamental purposes, natural spread along waterways that have Unionid mussels that are required for reproduction	Still or slow-flowing water with dense aquatic vegetation and sand-silt bottom	Mostly unknown, acts as a parasite in unionid mussels and may predate upon fish eggs.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3001	
Bladder snails	*Physa spp*	Introduced to GB 1800-1825	Various, natural spread	Freshwater	Unknown	bladder snails	Unknown / difficult in high numbers
Canada Goose	*Branta canadensis*	High - widespread throughout UK	Originally deliberately introduced but has since spread naturally	Still and slow flowing waters	Heavy grazers of aquatic and farmland vegetation, droppings can pollute waters and cause a slipping hazard, suspected of transmitting Salmonella to cattle.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=533	Eradication is difficult and expensive. See CABI invasive species compendium: https://www.cabi.org/isc/datasheet/91754
Caspian mud shrimp	*Chelicorophium curvispinum*	Has been identified in most EE catchments although is still rare		Rivers estuaries and brackish water on hard rocky substrates	Creates silty tubes than can change the ecosystem, can form high densities although impact is minimal	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/108307	Raise public awareness and maintain good biosecurity.

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Chinese Water Deer	*Hydropotes inermis*		Ornamental animals that have accidentally escaped and established slowly expanding populations	Marshes with reeds, sedges or coarse grasses,	Minimal, although has been known to eat crops	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1770	
Common Carp	*Cyprinus carpio*	widespread	Introduced for aquaculture and angling, spreads by reproduction, now widespread	Warm, deep, slow-flowing and still waters, rivers, prefers vegetation and soft bottoms	Reduce water quality and degrade habitats, alter ecosystems	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1135	Raise public awareness
Crucian Carp	*Carassius carassius*	Medium	Transported for angling purposes	Freshwater	Minimal, positive impact where introduced for recreational water body users (e.g. anglers)	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/90564	Probably susceptible to rotenone (a known piscicide)
Darwin's barnacle	*Austrominius modestus*	Already widespread	Attached to ships hulls and in ballast water, now established in the UK	Intertidal hard surfaces (manmade or natural)	Fouling, competes with native species	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1301	Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ See Green Blue project and RAPID biosecurity webpages.
Fresh water shrimps	*Cryptorchesti a cavimana*	Low number of sightings in Broadlands and East Suffolk	Unknown	Rivers	Unknown	Small shrimps	Unknown

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Jenkins' Spire Snail	*Potamopyrgus antipodarum*	High - Widespread throughout GB	Introduced in drinking water barrels from Australia and released, natural spread	Estuaries, standing and flowing freshwaters	Can establish dense population and quickly crowd out other snails and invertebrates	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2811	Effective control once established is difficult. CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/43672
Manila Clam	*Ruditapes philippinarum*		Used in bivalve fisheries, accidental release / escape likely, it can be found contaminating oyster seed	Coastal sediments		CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/61697	Practice good biosecurity, Check Clean Dry campaign: http://www.nonnativespecies.org/checkcleandry/ , Raise public awareness
Midwife Toad	*Alytes obstetricans*		Accidental import of tadpoles with nursery water plants	Warm humid areas, ponds	Minor, potential carrier of pathogens	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=148	
Muntjac deer	*Muntiacus reevesi*	High - already widespread throughout the EE region	Originally an ornamental species that escaped or were released deliberately. They have since spread naturally.	Largely found in wooded areas but prefer to be close to streams	Feeding on brambles and shrubs can lead to damage and degradation of habitat for other species. This species has been observed to displace native roe deer	GB NNSS: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2263	Control by shooting as part of deer management plan
Orange-striped anemone	*Diadumene lineata*	First recorded in GB before 1800 and commonly found on coasts	Unknown origin, naturally dispersed	Marine	Unknown	Marlin website: https://www.marlin.ac.uk/species/detail/2299	Unknown

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Pile worm	*Alitta succinea*					CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/107757	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/107757
Planaria torva	*Planaria torva*		Associated with canals and port areas	Freshwater lakes, canals and slow-flowing streams	Competition with native flatworms is a possibility	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2745	
Northern River Crangonyctid	*Crangonyx pseudogracilis*	Medium (already widespread in high numbers)	Accidental introduction on garden plants	Lakes, permanent and temporary ponds, rivers, streams and interstitial habitats	Can sometimes replace native populations	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1010	Correct disposal of aquatic and garden waste, raise public awareness
Quahog	*Mercenaria mercenaria*	Likely - present in SE and Essex catchments	Introduced with oysters and has since spread naturally	Sheltered brackish and marine water	Limited as this species is also used as a fishery species	GBNNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2206	Enact good biosecurity practices
Rainbow Trout	*Oncorhynchus mykiss*	High	Escape from fish farms	Freshwater and marine	Competitive, can displace native trout	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/71813	Raise awareness, practice good biosecurity, eradication programmes

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Sand Gaper	*Mya arenaria*	Introduced to GB in 1899	Natural dispersal	Brackish waters, estuaries, and marine habitats	Potential ecological changes	http://www.iucngisd.org/gisd/speciesname/Mya+arenaria	http://www.iucngisd.org/gisd/speciesname/Mya+arenaria
Slender-tube amphipod	*Monocorophium acherusicum*	Recorded since 1935	Native to mainland Europe, probably introduced by shipping processes	Estuaries		GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=914	
Smooth Coil Snail	*Helicodiscus singleyanus*		Rare species spotted in the Upper Bedford catchment	Soils	Unknown		Unknown
Sunbleak	*Leucaspius delineatus*		Accidental introduction / inadvertent dispersal with aquaculture species, spreads naturally downstream and connected waterbodies, eggs can contaminate anglers nets and be spread among locations	Rivers ponds and lakes	Predates on eggs of other fish species, potential carrier for the non-native parasite *Ergasilus briani*	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/77347	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/77347
Tadpole physa	*Physella gyrina*	Only identified rarely in East Suffolk catchment within EE	Unknown, possible escape	Rivers and wetlands	Unknown	http://www.habitas.org.uk/molluscireland/species.asp?ID=59	Removal as part of a management plan

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Water flea	*Daphnia (Daphnia) ambigua*	rarely identified so far in Combined Essex and East Suffolk catchments	Unknown	Cool deep water	Unknown	Water flea	Unknown
Wautier's Limpet	*Ferrissia (Petancyclus) wautieri*		Aquarium species	Freshwater			
Wels Catfish	*Silurus glanis*		Originally introduced for aquaculture but has also been stocked for angling purposes	Lowland rivers, backwaters and well vegetated lakes	Potential impact on predated species, it has a wide ranging diet, in GB it is typically used as an angling or food fish	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3269	
Zander	*Sander lucioperca*		Introduced for recreational fishing	Rivers and lakes	Preys on native species affecting native fish populations, an important recreational fished species	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3131	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/65338

Table 13: INNS management priorities for East of England Region – Plants and Algae Green Management Species List

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Angular Sea-fig	*Carpobrotus glaucescens*	Rarely found in GB, has been observed in the East Suffolk catchment	Horticultural plant that has since spread naturally and via dispersion of stem fragments	Rocks, cliffs, walls and roadside verges by the sea	Currently no known effects	Online atlas of British and Irish Flora: https://www.brc.ac.uk/plantatlas/plant/carpobrotus-glaucescens	Unknown
Annual Buttonweed	*Cotula australis*	Has been identified only within the Witham catchment although rarely	Unknown, possibly horticultural escape		Unknown	Grows in a thin mat	Unknown
Arrow Bamboo	*Pseudosasa japonica*	Rare occurrences observed in most EE catchments	Horticultural species, possible escape		Unknown	Bamboo	Unknown
Branched Horsetail	*Equisetum ramosissimum*	Low, rare spot in the Witham catchment.	Unknown, possible escape		Unknown		Unknown
Broad-leaved Bamboo	*Sasa palmata*	Low - Rare find in some EE catchments	Unknown, possible escape	Rivers and wetlands	Unknown	Bamboo	Unknown

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Buttonweed	*Cotula coronopifolia*	Found in many EE catchments although rare in abundance	Unknown, possibly horticultural escape		Unknown	yellow button like flowers	Unknown
Canadian Waterweed	*Elodea canadensis*	Widespread		Nutrient-rich lakes and ponds both		GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1303	
Cape-pondweed	*Aponogeton distachyos*	Has been rarely found in Broadland, combined Essex and Witham	Horticultural aquatic plant, possible escape	Unknown	Unknown	http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=302	Unknown
Dwarf Bamboo	*Pleioblastus pygmaeus*	Rare occurrences observed in south Essex catchments	Horticultural species, possible escape		Unknown	Bamboo	Unknown
Fish-plant	*Houttuynia cordata*	Rare- has been spotted in the wild only in South Essex catchment	Ornamental plant, can spread through fragmenting	Freshwater plant	Unknown	Orange-scented, heart-shaped leaves and tiny yellow flowers	Unknown

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Greater Cuckooflower	*Cardamine raphanifolia*	Rarely found in GB, has been observed in the Combined Essex catchment	horticultural plant that was first recorded in the wild over 100 years ago, spreads along rivers	Rivers and stream sides	Unknown	Online atlas of British and Irish Flora: https://www.brc.ac.uk/plantatlas/plant/cardamine-raphanifolia	Unknown
Hairy Bamboo	*Sasa ramosa*	Low - spotted only in Welland (rare in the wild)	Unknown, possible escape	Rivers and wetlands	Unknown	Bamboo	Unknown
Hybrid Monkeyflower (M. guttatus x luteus)	*Mimulus x robertsii*		Unknown, hybrid species	Streambanks and river shingle	Unknown		Unknown
Large-flowered Waterweed	*Egeria densa*	High	Widely sold for aquarium and as an oxygenating plant	Canals, ponds and quarries	Rapid growth can block light, disrupt recreation in waterways and smothering, effects unlikely unless populations increase	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1290	Herbicide
Least Duckweed	*Lemna minuta*		Likely introduced accidentally but has since spread via contaminated clothing, equipment and animals	Standing water, slow-flowing water courses such as canals and rivers and in backwaters	Not known	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1940	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/108968

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Monkeyflower	*Mimulus guttatus*	Widespread throughout EE	Introduced through cultivation, spread by seed and by stolons	Streambanks and river shingle	It can form dense aggregations but unlikely to cause major impacts	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2231	Unknown
Musk	*Mimulus moschatus*	widespread throughout Western England with some sightings in EE	Introduced through cultivation, spread by seeds	Streambanks and river shingle	Unknown		Unknown
Narihira Bamboo	*Semiarundinaria fastuosa*	Low - spotted only in Combined Essex (rare in the wild)	Unknown, possible escape	Rivers and wetlands	Unknown	Bamboo	Unknown
New Zealand Bitter-cress	*Cardamine corymbosa*	Rarely spotted in Broadland, East Suffolk and Witham catchments	Brought in with garden compost and has escaped and spread (often a garden weed)	Unknown	Unknown	Bright green leaves, white flowers	Herbicides
New Zealand Willowherb	*Epilobium brunnescens*		Originally brought in for horticulture and has since spread, possibly escaped via wind dispersal	Stream beds, flushes, disturbed river gravel and other open, moist rocky places, in areas of high rainfall	Sometimes overgrowing native plants	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=1335	Herbicide

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Rhododendron	*Rhododendron ponticum*	High - widespread throughout EE region	Originally introduced for horticultural purposes and has since spread	Moorland, woods, screes, rocky banks, derelict gardens and streamside's.	Outgrows and outcompetes native species - to the complete exclusion of those species. Tends to invade moorland inhabited by game birds.	http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3004	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/47272
Seaside Daisy	*Erigeron glaucus*	Low - has been found in most EE catchments but rarely	Unknown, possible horticultural escape, still for sale	Coastal areas and sand dunes	Unknown	Daisy	Unknown
Townsend's Cord-grass	*Spartina maritima x alterniflora = S. x townsendii*		Hybrid species	Sheltered estuarine mudflats	Rapid growth rates can cause decline of mudflat habitat, it can also alter succession in ecosystems by replacing native pioneer species. It can also benefit coastlines by helping to stabilise sediments		Unknown
Turion duckweed	*Lemna turionifera*	rarely found in EE and GB in the wild	unknown, possible escape	lakes ponds, rivers and streams	unknown		unknown
Water Bent	*Polypogon viridis*	widespread throughout most EE	spreads as a weed of nurseries	lowland, often in waste areas		http://www.brc.ac.uk/plantatlas/plant/polypogon-viridis	unknown

Common Name	Latin Name	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Water-lettuce	*Pistia stratiotes*	low (tropical warm water species)	Accidental or deliberate release from ornamental, aquaculture and pet trade. Possible hitchhiker	brackish lagoons, freshwater lakes, ponds reservoirs and irrigation channels, also possible in estuaries and rivers	rapidly forms dense mats, impacting recreation, irrigation and drainage, navigation and fishing, it influences nutrient balance and plankton diversity causing degrading water conditions	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/41496	CABI invasive species compendium: https://www.cabi.org/ISC/datasheet/41496

Table 14: INNS management priorities for each catchment - Animals

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
A tube worm													
A sea spider													
African Clawed Toad													
American bullfrog													
American jack knife clam													
American Mink													
American Oyster Drill													
American Piddock													
American Slipper Limpet													
Amphibalanus improvisus													
Amur sleeper													
Asian Shore Crab													
Asiatic Clam													
Atlantic Rangia													
Bitterling													
Bladder snails													
Bloody-red Mysid													
Brush clawed shore crab													
Bugula simplex													
Bugula stolonifera													
Canada Goose													

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
Carpet Sea-squirt													
Caspian mud shrimp													
Chinese mitten crab													
Chinese Water Deer													
Coati													
Common Carp													
Compass Sea Squirt													
Coypu													
Crucian Carp													
Darwin's barnacle													
Demon Shrimps													
Edible Frog													
Egyptian Goose													
False Dark Mussel													
Fox squirrel													
Fresh water shrimps													
Freshwater hydroid													
Goldfish													
Japanese Skeleton Shrimp													
Jenkins' Spire Snail													
Killer shrimps													
Leathery Sea Squirt													
Manila Clam													
Marbled crayfish													

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
Marsh Frog													
Midwife Toad													
Muntjac deer													
Musk Rat													
Northern River Crangonyctid													
Orange cloak sea squirt													
Orange-striped anemone													
Orange-tipped sea squirt													
Pacific/Portuguese oyster													
Pile worm													
Planaria torva													
Quagga Mussel													
Quahog													
Racoon													
Racoon dog													
Rainbow Trout													
Red swamp crayfish													
Ruby bryozoan													
Ruddy duck													
Sacred ibis													
Sand Gaper													
Sideswimmer													
Signal crayfish													

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
Slender-tube amphipod													
Smooth Coil Snail													
Spiny cheek crayfish													
Stone moroko / Topmouth Gudgeon													
Sunbleak													
Tadpole physa													
Terrapins													
Tricellaria inopinata													
Turkish Crayfish													
Virile crayfish													
Wautier's Limpet													
Water flea													
Wels Catfish													
Zander													
Zebra Mussel													

Table 15: INNS management priorities for each catchment – Plants and Algae

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
Alligator weed													
American skunk cabbage													
American Willowherb													
Angular Sea-fig													
Annual Buttonweed													
Arrow Bamboo													
Asiatic tearthumb													
Branched Horsetail													
Brazilian Giant-rhubarb													
Broadleaf watermilfoil													
Broad-leaved Bamboo													
Buttonweed													
Canadian Goldenrod													
Canadian Waterweed													
Cape-pondweed													
Carolina fanwort													
Common milkweed													
Curly waterweed													
Dwarf Bamboo													
Early Goldenrod													
Fish-plant													

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
Floating pennywort													
Floating primrose-willow													
Giant hogweed													
Giant Knotweed													
Giant-rhubarb													
Greater Cuckooflower													
Hairy Bamboo													
Himalayan balsam													
Himalayan Knotweed													
Hottentot-fig													
Hybrid Monkeyflower													
Japanese Knotweed													
Japanese stiltgrass													
Large-flowered Waterweed													
Least Duckweed													
Monkeyflower													
Musk													
Narihira Bamboo													
New Zealand Bitter-cress													
New Zealand Pygmyweed													

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
New Zealand Willowherb													
Nuttall's waterweed													
Orange Balsam													
Parrot's feather													
Persian hogweed													
Pickerel weed													
Pirri Pirri Burr													
Rhododendron													
Seaside Daisy													
Sosnowsky's hogweed													
Townsend's Cord-grass													
Tree Groundsel													
turion duckweed													
Uruguay Water-primrose													
Wakame													
Water Bent													
Water Fern													
Water hyacinth													
Water-lettuce													
Whitetop weed													
Wireweed													

Section 7: Future work and recommendations

The document

It is intended that this document be regularly updated to reflect changes in species presence, distribution and approaches to management. To this end it is envisaged that an regular review of the document should take place.

This will take the following approach:

- An assessment of available data to update the action and catchment species lists
- A review of current management approaches to update recommendations
- Update of action lists based on occurrences of new species
- Review of current legislation to incorporate any changes
- A consultation event to update stakeholders on progress and to gather additional information

Using these an updated RIMP will be produced and promoted to stakeholders.

The messages

The contents of the RIMP should be used to provide information that can be promoted to stakeholders and the wider public. This could take the form of regular social media posts by LAGs and others, press releases, targeted workshops, signage at the hotspots identified and other appropriate methods. Previous projects such as the Check, Clean Dry campaign and Be Plantwise can provide guidance on how to approach this

Supporting data collection

There is an ongoing need for recording of invasive species in order to act as an early warning system and to inform management. To this end recording of species needs to be encouraged and supported. The data gathered for this document has shown that there is a wealth of data available and a network of people actively recording species information. Work should be undertaken to support and develop this to ensure that robust data is available in the future. This should be developed through the stakeholder workshops as part of the annual review. Opportunities should also be taken to work with established local recording networks and the NBN to support the collection and publication of invasive species data.

Appendix I: Glossary

Term	Explanation
Alert species	Are target species of concern for GB. Sightings should be reported immediately to GB NNSS and/or local authorities
Biocontrol	The use of a natural enemy or predator to control an invasive non-native species
Biosecurity	A set of preventative measures designed to reduce the likelihood of transferring INNS (such as the Check, Clean Dry campaign)
Black list	A list of invasive non-native species for which there are measures in place to prevent its entry to a country or region. Black list species are associated with high risk of severe detrimental impacts on native biodiversity, health or economy.
Early detection	When an INNS arrives and it is quickly noticed or recorded and this information is passed on to the relevant authorities, enables rapid response.
Eradication	Removing a species entirely from the region, or country, using INNS control and management methods.
GB INNS strategy	A document from GBNNSS (2008, 2015) outlining aims and objectives underpinning action on INNS in Great Britain until 2020.
GBNNSS	The Great Britain Non-Native Species Secretariat.
Hotspot	Areas at greatest risk of INNS impact, introduction or transfer.
IAS	Invasive Alien Species (European term for INNS)
INNS	Invasive Non Native Species (also known as IAS)
Non-native species	Species that have been introduced to areas outside of their natural range – i.e. human mediated dispersal
Pathway	Term used to describe the way in which INNS can become introduced or spread to a region including the potential purpose, route and mode of introduction.
Prevention	Stopping a species of INNS coming into the region or into the country through counter measures (usually biosecurity).
RAPID LIFE	RAPID is a three-year EU Life funded project whose objective is to deliver a package of measures to reduce the impact and spread of INNS in freshwater aquatic, riparian and coastal environments across England.
Rapid response	The instigation of action against an INNS threat at a stage when a locally, regionally or nationally important strategic win might still be achievable.
Regions	As part of the RAPID LIFE project, England has been split into five regions of which this RIMP covers the East of England region
RIMP	Regional INNS Management Plan. There are 5 RIMPs for England of which this one is related to the East of England (EE)
Riparian	Habitats along the sides of river banks, lakes or wetlands.

Appendix II: Map of RAPID LIFE regions

Appendix III: List of INNS of European Union concern

The following list represents species governed by Regulation (EU) 1143/2014. The species designated on this list are subject to measures and restrictions designed to limit the spread of these species. These restrictions relate to the keeping, importing, selling, breeding and growing of the following species.

A) Plants	Common name	Latin name
	Alligator weed	*Alternanthera philoxeroides*
	American skunk cabbage	*Lysichiton americanus*
	Asiatic tearthumb	*Persicaria perfoliata*
	Broadleaf watermilfoil	*Myriophyllum heterophyllum*
	Chilean rhubarb	*Gunnera tinctoria*
	Common milkweed	*Asclepias syriaca*
	Crimson fountaingrass	*Pennisetum setaceum*
	Curly waterweed	*Lagarosiphon major*
	Eastern baccharis	*Baccharis halimifolia*
	Fanwort	*Cabomba caroliniana*
	Floating pennywort	*Hydrocotyle ranunculoides*
	Floating primrose-willow	*Ludwigia peploides*
	Giant hogweed	*Heracleum mantegazzianum*
	Indian balsam	*Impatiens glandulifera*
	Japanese stiltgrass	*Microstegium vimineum*
	Kudzu vine	*Pueraria lobata*
	Nuttall's waterweed	*Elodea nuttallii*
	Parrot's feather	*Myriophyllum aquaticum*
	Persian hogweed	*Heracleum persicum*
	Sosnowsky's hogweed	*Heracleum sosnowskyi*
	Water hyacinth	*Eichhornia crassipes*
	Water-primrose	*Ludwigia grandiflora*
	Whitetop weed	*Parthenium hysterophorus*

B) Animals	Common name	Latin name
	American bullfrog	*Lithobates catesbeianus*
	Amur sleeper	*Percottus glenii*
	Asian hornet	*Vespa velutina nigrithorax*
	Chinese mittencrab	*Eriocheir sinensis*
	Coati	*Nasua nasua*
	Coypu	*Myocastor coypus*
	Egyptian goose	*Alopochen aegyptiacus*
	Fox squirrel	*Sciurus niger*
	Grey squirrel	*Sciurus carolinensis*
	Indian house crow	*Corvus splendens*
	Marbled crayfish	*Procambarus fallax* f. *virginalis*
	Muntjac deer	*Muntiacus reevesi*
	Muskrat	*Ondatra zibethicus*
	Pallas' squirrel	*Callosciurus erythraeus*
	Raccoon	*Procyon lotor*
	Racoon dog	*Nyctereutes procyonoides*
	Red swamp crayfish	*Procambarus clarkii*
	Red-eared, yellow-bellied and Cumberland sliders	*Trachemys scripta*
	Ruddy duck	*Oxyura jamaicensis*
	Sacred ibis	*Threskiornis aethiopicus*
	Siberian chipmunk	*Tamias sibiricus*
	Signal crayfish	*Pacifastacus leniusculus*
	Small Asian mongoose	*Herpestes javanicus*
	Spiny-cheek crayfish	*Orconectes limosus*
	Stone moroko	*Pseudorasbora parva*
	Virile crayfish	*Orconectes virilis*

Appendix IV: Non-native wetland bird species

There are many non-native bird species that have been observed in the EE catchments. Many of these species have either escaped from collections or are considered vagrant to GB, however few are currently classed as invasive and causing a problem (listed in Section 6). Due to the high number of sightings of non-native birds in the EE, this list has been compiled to highlight the species that have been found in EE during the last 10 years and in which catchments. At present these species are not currently classed as invasive however if numbers were to increase and/or animals were to form breeding populations, these could become invasive in the future. Therefore those that have been identified have been listed here for reference purposes only.

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
American Wigeon													
Argentine Blue-billed Duck													
Australian Shelduck													
Baikal Teal													
Bar-headed Goose													
Black Swan													
Black-crowned Night Heron													
Blue-winged Teal													
Bufflehead													
Canvasback													
Cape Teal													
Cape/South African Shelduck													
Chestnut Teal													
Chilean Flamingo													

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
Chiloë Wigeon													
Emperor Goose													
Falcated Teal													
Ferruginous Duck													
Fulvous Whistling Duck													
Glossy Ibis													
Greater Flamingo													
Hawaiian Goose													
Hottentot Teal													
Lesser Canada Goose													
Mandarin Duck													
Maned Duck													
Marbled Duck													
Muscovy Duck													
New Zealand Scaup													
Puna Teal													
Purple Swamphen													
Red-breasted Goose													
Red-crested Pochard													
Ringed Teal													
Ross's Goose													
Ruddy Shelduck													
Scarlet Ibis													

Common Name	Broad-land	Cam Ely Ouse	Louth Grimsby Ancholne	Combined Essex	East Suffolk	Nene	North West Norfolk	North Norfolk	Old Bedford	South Essex	Upper and Bedford Ouse	Welland	Witham
Silver Teal													
Snow Goose													
Southern Pochard													
Speckled/Chilean Teal													
Swan Goose													
Trumpeter Swan													
White-checked Pintail													
White-faced Whistling Duck													
Wood Duck													
Yellow-billed Pintail													

Appendix V: Terrestrial species

The following table list species that have been identified during RIMP creation process as species of concern within GB and EU, however these are not truly riparian aquatic species and so not the focus of the RIMP. Many of these species may occasionally visit or be found in riparian habitats and so are listed here for reference. These species are of UK and GB concern and any sighting should be reported as soon as possible.

Common Name	*Latin Name*	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Asian hornet	*Vespa velutina*	High, recent recordings in the South of England	Accidental release in France and subsequent spread	Tall trees in urban and rural areas. Also found in structures – garages, sheds, decking	Predator of social wasps and bees (e.g. honeybees) and other invertebrate insects. This can result in large losses of commercial honeybees and also result in large eradication and replacement costs. Multiple stings can cause serious health problems	GB NNSS alert species, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3826	GB NNSS alert species, report as soon as possible: http://www.nonnativespecies.org//alerts/index.cfm?id=4
Asian longhorn beetle	*Anoplophora glabripennis*	Medium risk – not yet recorded in GB however interceptions have been made	Introduction via hardwood timber and timber products, stowaways on land vehicles, natural dispersal (up to 1km).	Woodland. In GB have only been found in warehouses where they were intercepted.	Can attack and kill tree species, altering woodland habitats and reduce biodiversity. This can be problematic and costly in urban wooded areas.	GB NNSS alert species, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=243	Report sightings as soon as possible: http://www.brc.ac.uk/risc/alert.php?species=asian_longhorn
Eurasian Eagle Owl	*Bubo bubo*	High (present in GB with estimated 65 lost into the wild each year – it has been known in EE catchments)	Captive birds lost in the wild and deliberate introductions	High cliffs and rocky outcrops	Preys on native mammals and have been known to attack birds, potential threat to small dogs and other pets	GB NNSS alert species, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=573	GB NNSS alert species, report as soon as possible, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=573
Indian house crow	*Corvus splendens*	High – arrival is expected (found in Ireland, Netherlands and Denmark)	Daily movements of up to 20km, its main pathway of invasion is by travelling on ships impacting port cities	In urban areas, occurs in high densities of human population	A nest predator, feeds on carrion and rubbish and is a known disease carrier in urban locations. Often regarded as a pest, it can also impact and damage crops, livestock farming, and tourism.	GB NNSS alert species, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=924	Report sightings as soon as possible: http://www.brc.ac.uk/risc/alert.php?species=indian_housecrow

Common Name	*Latin Name*	Risk of Introduction	Pathways	Areas affected	Impacts	Identification	Management
Invasive garden ant	*Lasius neglectus*	High (it has spread among European countries with a few records confirmed in GB)	Accidentally introduced in plant material or soil (e.g. from garden centres).	Gardens, parks and houses	Formation of super colonies covering a large area, known to attack and outcompete other ants to become dominant. Encourages large aphid populations on trees.	GB NNSS alert species, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3807	Report Sightings as soon as possible: http://www.nonnativespecies.org/alerts/index.cfm https://secure.fera.defra.gov.uk/nonnativespecies/downloadDocument.cfm?id=1505
Kudzu vine	*Pueraria lobata*	Medium (tropical species capable of living in temperate regions)	Has been used in other countries as an ornamental plant, food and fodder	Road and rail sides, forest and marginal habitats, grassland, river and stream banks, wetlands and abandoned fields.	Smothering other species, suppressing their growth by blocking light, modifies the structure of the ecosystem	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4379	EU blacklisted species, CABI: https://www.cabi.org/isc/datasheet/45903
Monk Parakeet	*Myiopsitta monachus*	High (isolated breeding colonies in London and Hertfordshire)	Breeding populations found in the UK, potential for others to escape from collections	Woodlands and urban areas	Has been observed to kill and through competition limit food resources of native birds. Can be considered a nuisance (e.g. noise) and carry diseases to other birds and humans.	GB NNSS alert species, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=2281	Report Sightings as soon as possible: http://www.brc.ac.uk/risc/alert.php?species=monk_parakeet
Pallas' squirrel	*Callosciurus erythraeus*	Not yet recorded in GB	Escape from captivity or deliberate release for ornamental reasons	Forest, parks and gardens	This species cause damage to trees by removing bark resulting in economic impacts to forestry sector. They can also displace native squirrel species.	GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=4363	EU Blacklisted species
Siberian chipmunk	*Tamias sibiricus*	Medium (no breeding in wild reported)	Escapees and deliberate release of captive animals. Often kept as pets.	Coniferous and mixed boreal and temperate forests, parks, gardens and cemeteries	Predates on ground nesting birds, competes with small native woodland animals, this species is a vector for diseases (including rabies) and can cause damage to urban areas.	GB NNSS alert species, GB NNSS factsheet: http://www.nonnativespecies.org/factsheet/factsheet.cfm?speciesId=3472	Report Sightings as soon as possible: http://www.brc.ac.uk/risc/alert.php?species=siberian_chipmunk