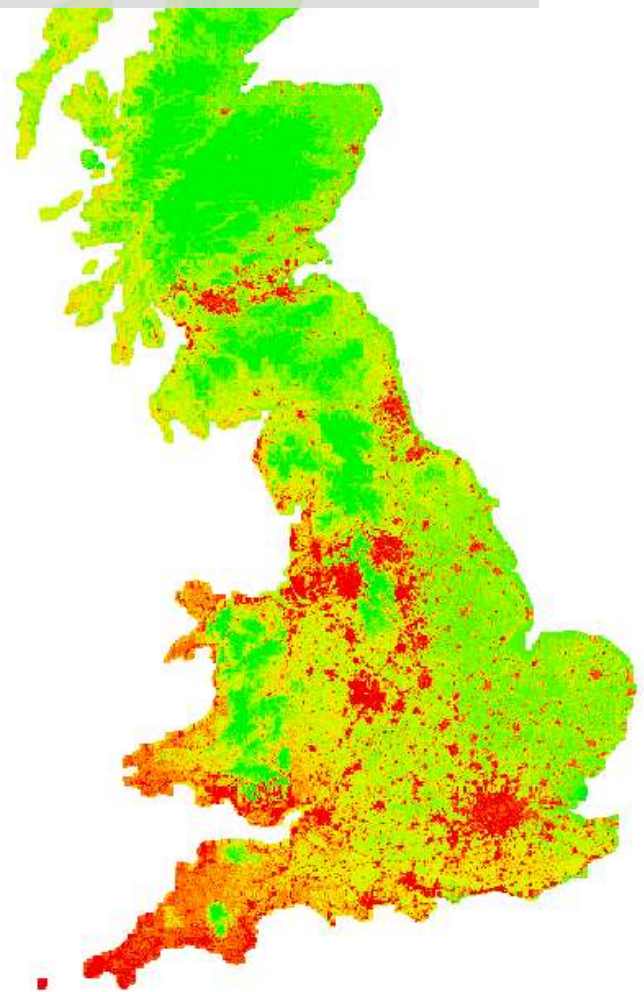


The importance of scale

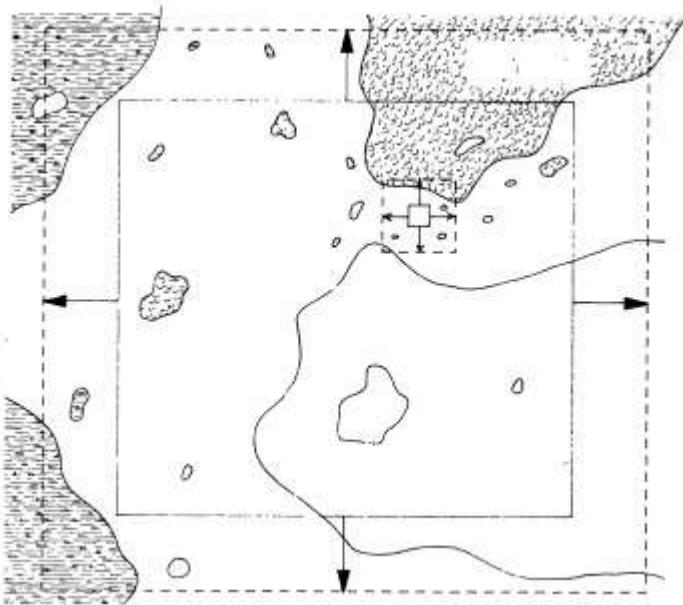


O.L. Pescott, CEH Wallingford,
olipes@ceh.ac.uk

Scale in ecology

“Investigators addressing the same questions have often conducted their studies on quite different scales. Not surprisingly, their findings have not always matched, and arguments have ensued.”

- J. Wiens (1989)



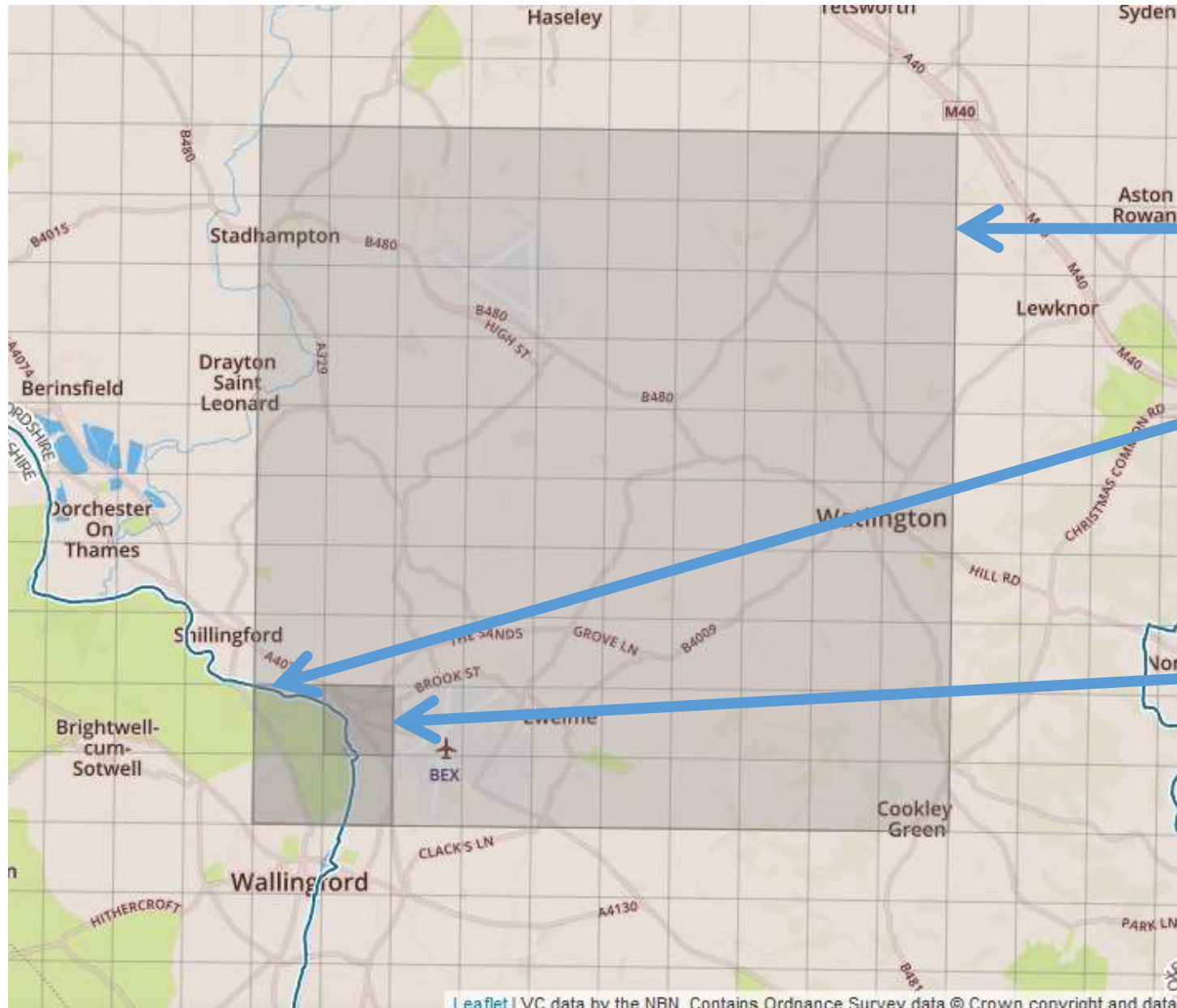
e.g. changing spatial scale
can change variation
within/between samples

Practicalities for invasion biology

- Understanding distributions
 - Spread
 - Conservation
- Communicating risk
 - Maps
 - Indicators
 - Prioritisation
- Understanding patterns
 - Species richness
 - 'Impacts'



Scale in British/Irish plant recording



10 x 10 km

2 x 2 km

1 x 1 km

+ plots

Changing recording practices relate to scale

Acer cam	239	Black per	515	arv	821	*ovi	1067	eff	1315	Mycel mur	1550
pla	230	Brach pin	516	dis	824	*rub	1070	inf	1317	Myoso arv	1551
pse	241	eri	517	eri	1649	Eicar ver	1076	subno	1320	ram	1563
Achil mil	243	Black per	515	arv	821	*ovi	1067	eff	1315	Mycel mur	1550
pta	9942	Brach pin	516	dis	824	*rub	1070	inf	1317	Myoso arv	1551
Adoxa mos	250	eri	517	eri	1649	Eicar ver	1076	subno	1320	ram	1563
Aegop pod	251	Black per	515	arv	821	*ovi	1067	eff	1315	Mycel mur	1550
Aescu hip	252	Brach pin	516	dis	824	*rub	1070	inf	1317	Myoso arv	1551
Aethu cyn	253	eri	517	eri	1649	Eicar ver	1076	subno	1320	ram	1563
Agrim eup	263	Bromo ere	12	Clino aci	838	Fraga ves	1087	Koele mac	1331	Myrio spi	1584
Agros*can	272	ram	530	vul	841	Fraxi exc	1091	Labur ana	2614	Narci*agg	1588
cap	262	Bromo com	540	Coniu mac	854	Fumar off	1094	Lactu ser	1348	Nastu*off	1594
gig	269	hor	541	Conop maj	860	Galan niv	862	Lamia gal	1347	off	1596
sto	276	Bryon dio	544	Convo arv	869	Galeo tet	2667	gal arg	1173	Neott ova	5442
Ajuga rep	277	Buddl dav	735	Conyz can	868	*tet	862.2	gal mon	1356	Nupha lut	1599
Alche mol	288	Butom umb	548	Cornu san	879	Galiu alb	1098	Lamiu alb	1358	Nymph alb	1605
*vul	289	Buxus sem	557	Coryl ave	873	apa	1099	amp	1361	Odont ver	1607
Alism pla	293	Calam epi	560	Coton hor	880	mol mol	1103	pur	1363	Oenan cro	1610
Allia pet	2249	Calli*agg	4526	*agg	183	odo	1104	Lapsa com	1364	fis	1611
Alliu urs	307	*sta	570	Crata lae	882	pal	1105	Larix dec	4444	Oenot*agg	1612



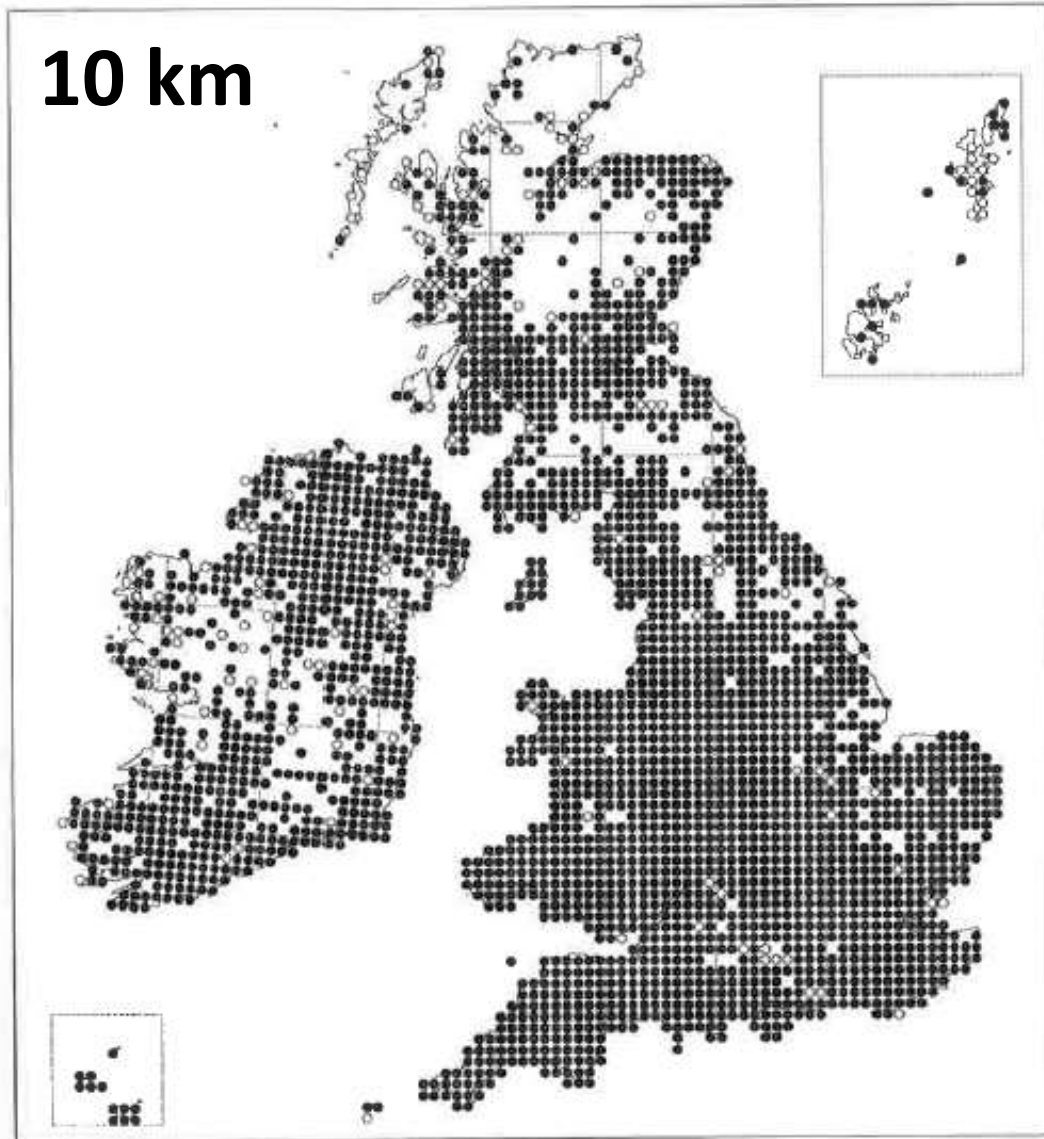
iRecord App



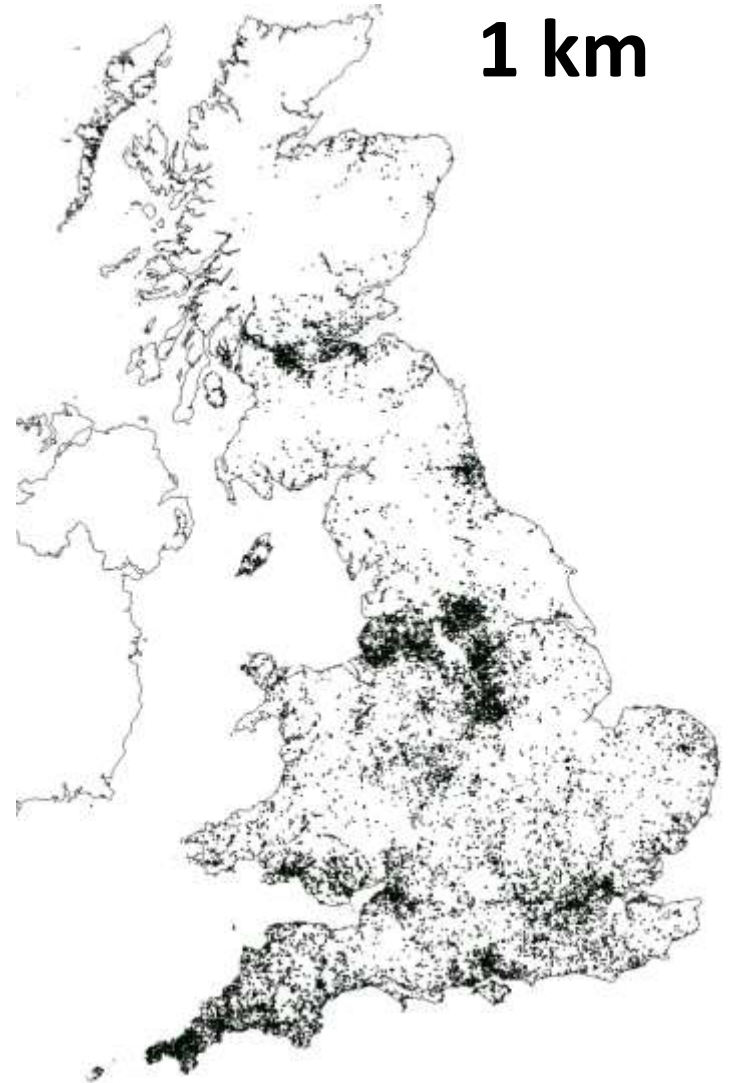
Anthr syl	341	acuti	620	car car	933	Glyce flu	1161	rep	1435	Parie jud	1651
Anthy vul	355	car	627	Desch ces	934	max	1164	vul	1436	Paris qua	1652
Antir maj	367	disti	628	fle	936	not	1169	Linum cat	1440	Pasti sat	1643.3
Aphan*agg	4520	divu	640	Digit pur	941	Gnaph uli	1174	Litho off	1443	Penta sem	1643.9
arv	376	flac	646	Dipsa*ful	952	Heder hel	1182	Loliu mul	1521	Persi amph	1660
Apium nod	381	hir	661	Dryop dil	952.1	hel hel	1183	per	1530	hyd	1663
Aquil vul	397	lepor	665	fil	955	Helia num	2613	Lonic nit	1531	lap	5439
Arabid tha	393	nig	675	Eleoc pal	1471	Helmi ech	1188	per	1537	mac	5481
Arcti lap	396	otr	681	Elode can	968	Herac sph	1191	Lotus cor	1447	Petas hyb	1672
*min	400	panicea	997	nut	975	Hespe mat	1194	ped	1454	Phala aru	1673
Arena lep	404	pen	7006	Elymu can	2560	Hiera*agg	1195	Lunar ann	1461	Phleu ber	1675
ser	412	rem	33	Elytr rep	979	Hippo com	1201	Luzul cam	1463	pra	1678
ser ser	413	rip	688	Epilo cil	981	Hippu vul	1202	for	2247	*pra	1687
Armor rus	357	spi	692	hir	983	Holcu lan	1207	pil	1465	Phrag aus	1694
Arrhe ela	421	svl	695	mon	984	mol	1219	Lycop eur	1470	Picea abi	1696

Understanding (recorded) distributions

10 km



1 km



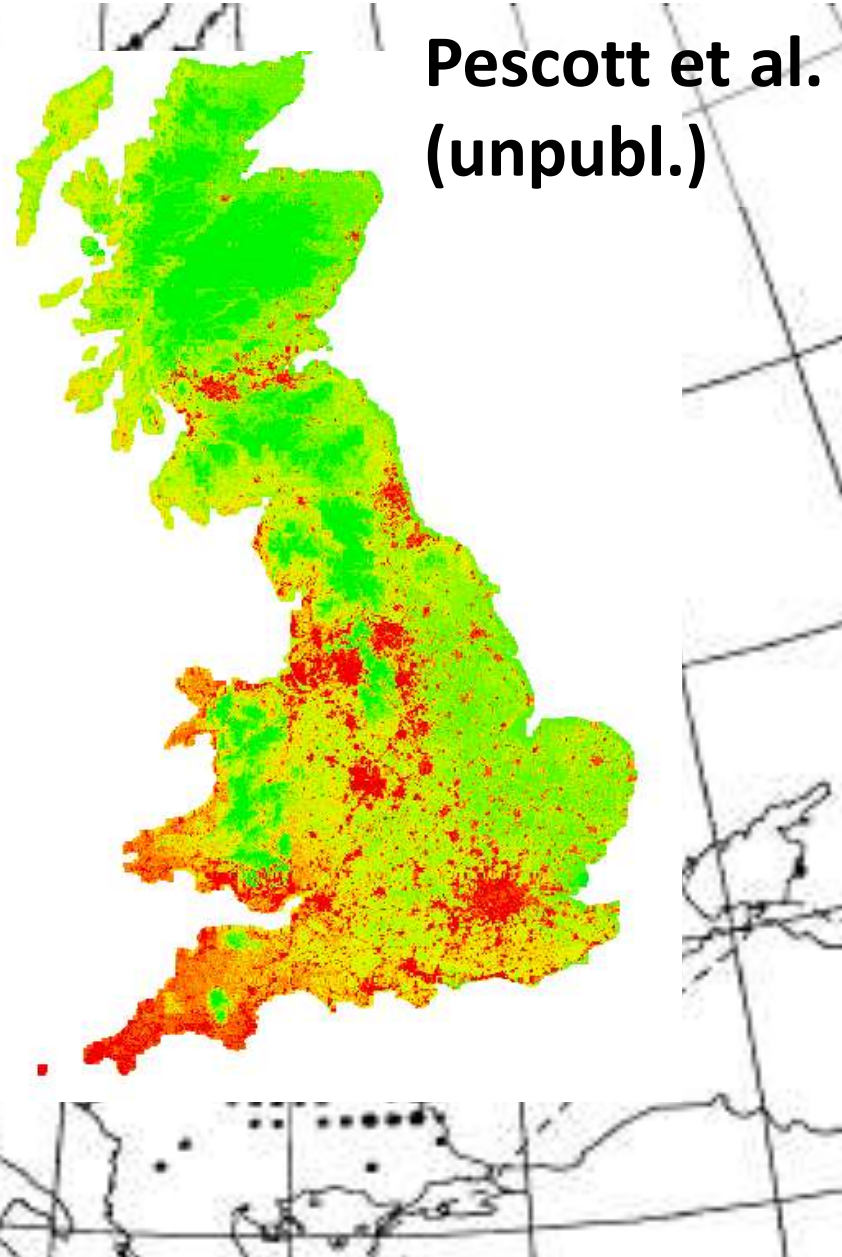
Fallopia japonica

Understanding (modelled) distributions

Beerling et al.
(1995)

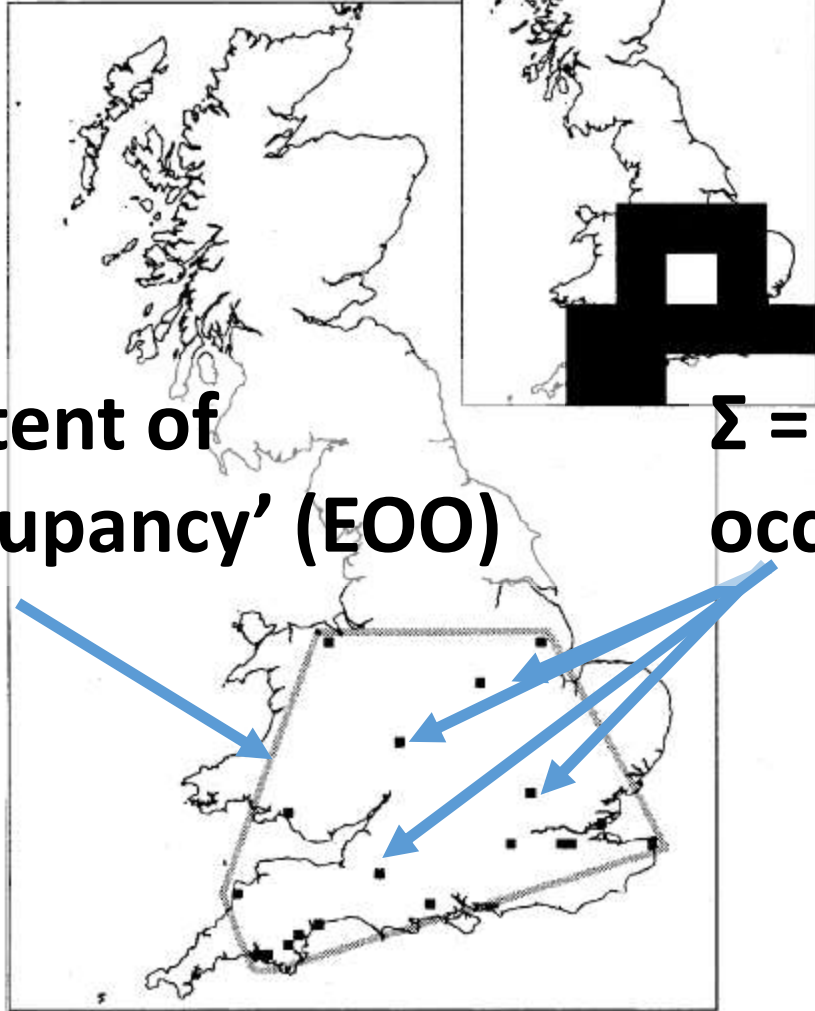


Pescott et al.
(unpubl.)

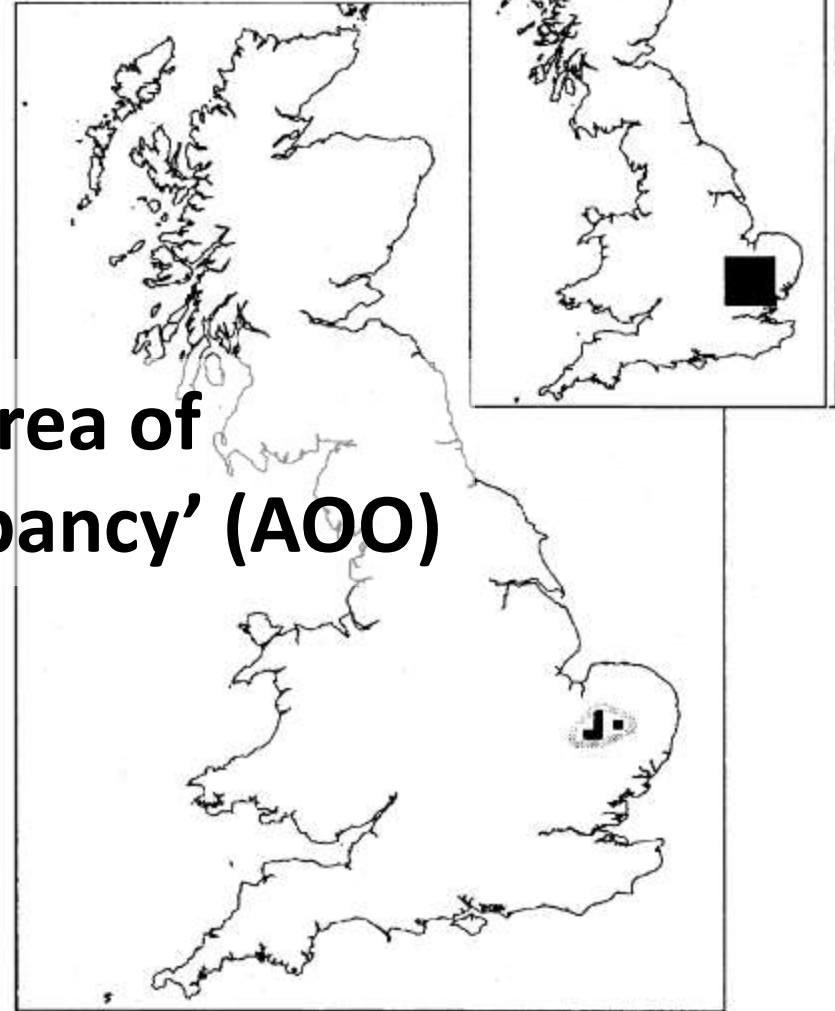


Some typical measures

a) *Dianthus armeria*



b) *Silene otites*



Invasive alien plant ‘indicators’

- Measure indicating some aspect of the environment
- A proxy for ecological ‘quality’
- Mark Hill et al. (2009) considered an occupancy indicator as a proxy for impact in the UK



Invasive alien plant 'indicators'

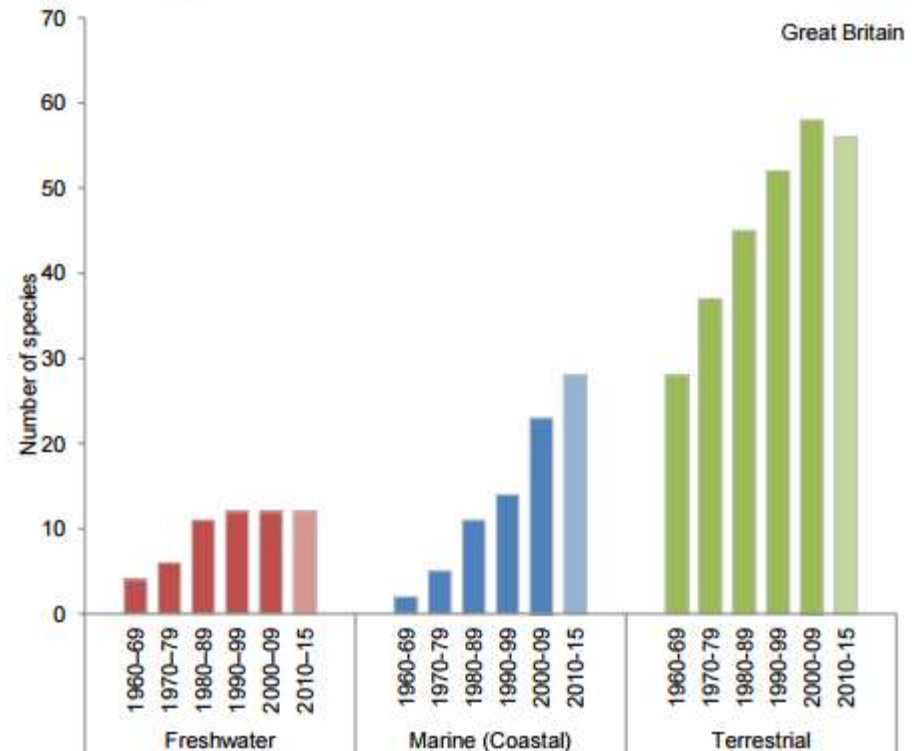
- Area (>10%) and count based



c. Terrestrial invasive species

Type: Pressure Indicator

Figure B6i. Number of non-native invasive species established in or along more than 10 per cent of Great Britain's land area or coastline, 1960 to 2015.

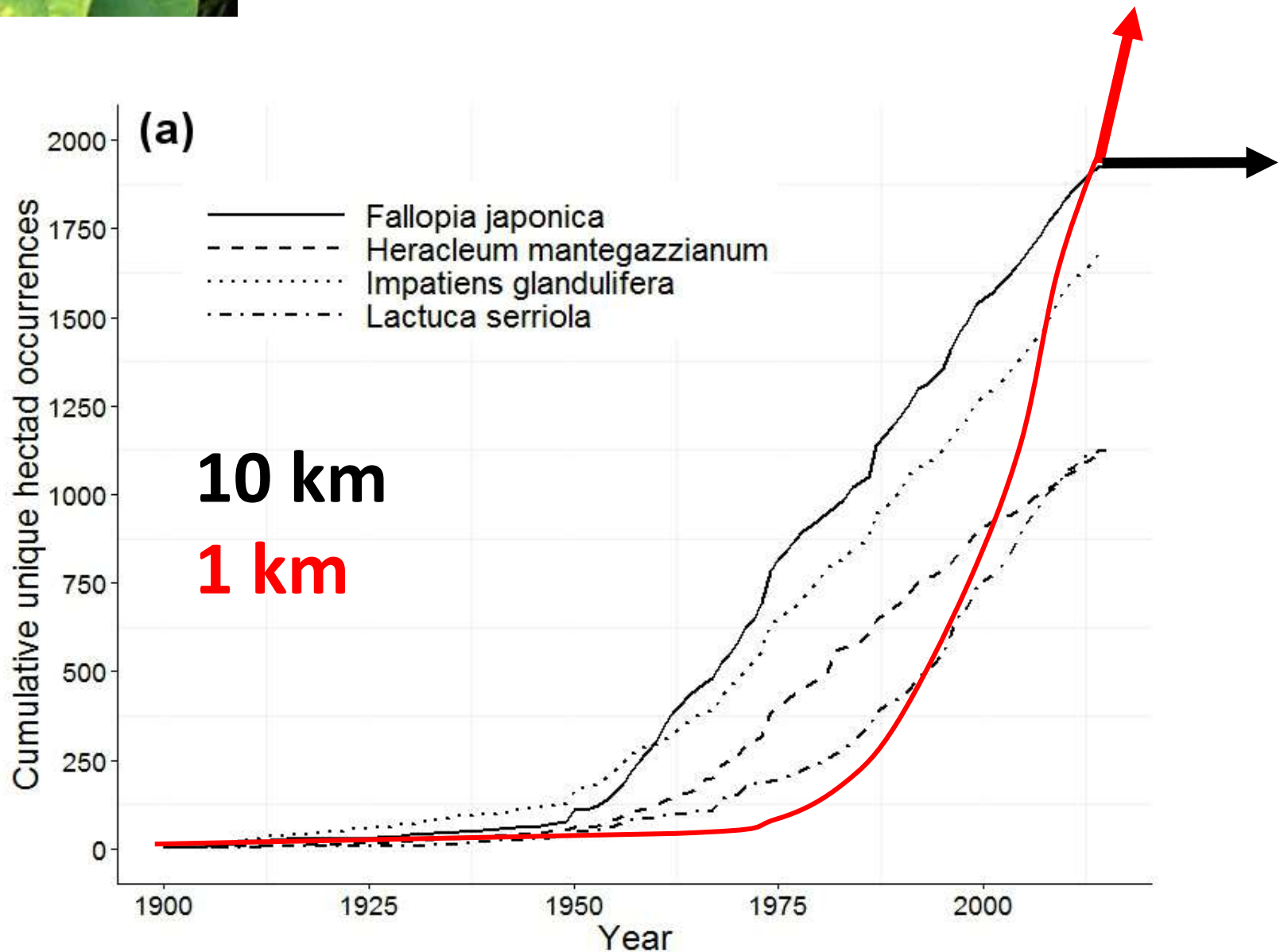


Notes: The last time period covers a shorter period than the other bars (2010–2015).

Source: Botanical Society of Britain & Ireland, British Trust for Ornithology, Centre for Ecology & Hydrology, Marine Biological Association, National Biodiversity Network Gateway.



Rates of change: *F. japonica*



Evaluating spread for prioritisation

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A prioritization process for invasive alien plant species incorporating the requirements of EU Regulation no. 1143/2014

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⁴*NERC Centre for Ecology and Hydrology, Edinburgh (UK)*

⁵*Ministry of Agriculture, National Plant Protection Organization, Montpellier Cedex 2 (France)*

⁶*Anses, Laboratoire de la Santé des Végétaux, Unité Entomologie et Plantes Invasives, Montferrier-sur-Lez Cedex (France)*

⁷*Julius Kühn Institut (JKI), Federal Research Centre for Cultivated Plants, Institute for National and International Plant Health, Braunschweig (Germany)*

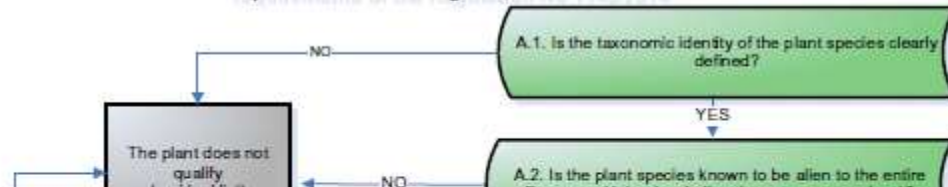
⁸*National Plant Protection Organization, Wageningen (The Netherlands)*

⁹*European and Mediterranean Plant Protection Organization, Paris, France*

When faced with a large species pool of invasive or potentially invasive alien plants, prioritization is an essential prerequisite for focusing limited resources on species which inflict high impacts, have a high rate of spread and can be cost-effectively managed. The prioritization process as detailed within this paper is the first tool to assess species for priority for risk assessment (RA) in the European Union (EU) specifically designed to incorporate the requirements of EU Regulation no. 1143/2014. The prioritization process can be used for any plant species alien to the EU, whether currently present within the territory or absent.

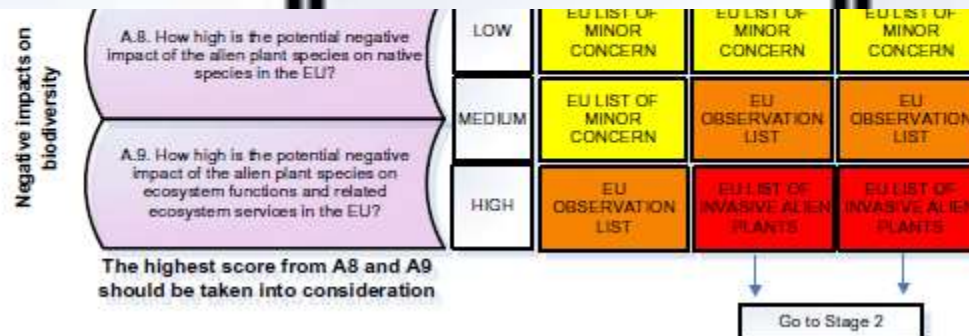
Evaluating spread for prioritisation

Decision scheme for the prioritization process for EU invasive alien plants incorporating the requirements of the Regulation No 1143/2014



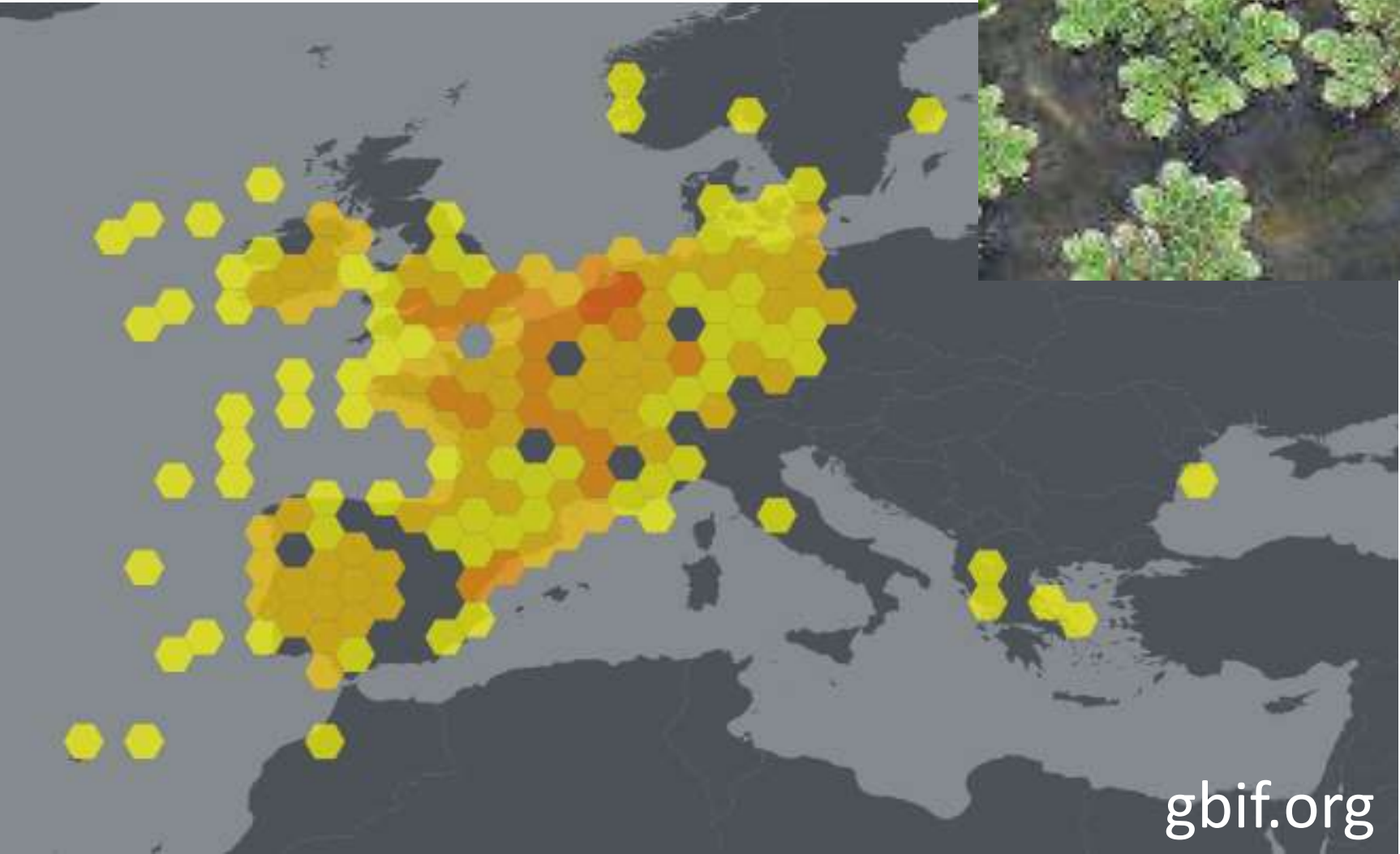
Yes, list the countries

A.7. How high is the spread potential of the plant species in the area under assessment?



Evaluating spread for prioritisation

Azolla filiculoides



Impacts can be hidden by scale



- **Maskell et al. (2006)**
 - Weak negative relationship between changes in alien cover and native diversity.
 - Invaded communities different
- **Thomas & Palmer (2015)**

Non-native plants add to the British flora without negative consequences for native diversity

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Edited by James H. Brown, University of New Mexico, Albuquerque, NM, and approved February 24, 2015 (received for review December 15, 2014)

Plants are commonly listed as invasive species, presuming that they cause harm at both global and regional scales. Approximately

extinctions on centennial or millennial timescales. Introduced plants have certainly contributed to vegetation change in many

Impacts can be hidden by scale




- **Maskell et al. (2006)**
 - 25 m plots paired over time within 1 km squares
- **Thomas & Palmer (2015)**
 - Plots not paired, all changes averaged to 1 km

Challenging the view that invasive non-native plants are not a significant threat to the floristic diversity of Great Britain

...hinder
communication

...create confusion
(and conflict)



Disregarding
scale can...

Disregarding
scale can...

...affect decision making

...result in different
patterns