East of England Biodiversity Data Needs

Final Report

East of England Biodiversity Forum

Produced by
Somerset Environmental Records Centre

July 2007

East of England Data Needs
On behalf of the
East of England Biodiversity Forum

Produced by the Somerset Environmental Records Centre, Tonedale Mill, Wellington, Somerset, TA21 8JG. Tel: 01823 664450; Fax: 01823 652411
Email: info@somerc.com
by
Bill Butcher, Director
Maria Cruz, Project Officer

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Authorised by Bill Butcher, Director, 27/07/07

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1 SUMMARY

1. In the last few years the drivers requiring biodiversity data have increased in number, complexity and statutory backing.

2. Through in depth consultation, this project identified the drivers for biodiversity data in the East of England and analysed the mismatches between data requirements and the available data/ data services in the region.

3. The drivers studied require all four types of biodiversity data – habitats, species, sites boundaries and site quality. The identified needs require high quality data; update frequency is required to be around 5-yearly for all biodiversity data types.

4. Biodiversity data needs are consistent across the region. There is considerable overlap in the needs for biodiversity data across the ten principal drivers.

5. There are vast differences in existing data between counties in terms of scope, data quality and format. These differences are greater for habitats and species data than for sites data.

6. Coverage of BAP species is deficient across the region. On average, there is no data for 20% of BAP species present in each county. The datasets available have in general low currency but high accuracy and precision.

7. BAP habitats are differently covered across the region, with little data for BAP habitats in some counties. For the existing datasets, currency, accuracy and precision are variable.

8. Sites data is more complete across the region but its currency is variable. Coverage is higher for statutory sites than non-statutory. Existing data has both high accuracy and precision. There is little site quality data available in the region outside of statutory sites.

9. There is a significant mismatch between the identified biodiversity data needs and the existing data both in data scope (the needs are broader than the data) and data quality (the need is for higher data quality than is currently available). The mismatch is greatest when considering habitat data, less for species data and least for site data.

10. Delivery of many of potential biodiversity indicators is not currently possible as the required data is not being collected or available consistently across the region.

11. A number of recommendations were drawn from these results…

i) A Regional Biodiversity Information Group (RBIG) is established to act as a partnership to commission projects that will deliver common information needs across the region;
ii) Every local planning authority in the region, supported by its Local Records Centre and the RBIG, adopt the same LDF biodiversity indicators for Annual Monitoring Reports. These local indicators should then be aggregated up to form a robust regional biodiversity indicator for the Regional Spatial Strategy;

iii) The six Records Centres work with other data providers to meet the collective expressed customer requirements of the organisations needing biodiversity information, through a targeted programme;
iv) Local Records Centres develop their capacity to act collectively at regional level;
v) A regional unit is established to support the LRCs in the implementation of recommendation 4. The regional unit could comprise a member of staff or consultancy support and would be attached to one of the LRCs.

2 BACKGROUND

The project was commissioned by the East of England Biodiversity Forum through the East of England Wildlife Trusts.

The Biodiversity Forum has recognised that there is a significant mismatch between the requirements for biodiversity data in the region and the available data and services for data delivery. In the last few years the drivers requiring biodiversity data have increased in number, complexity and statutory backing. Key among these are regional planning, PPS9, Local Development Frameworks and biodiversity planning. A large number of biodiversity indicators are discussed in various documents and fora but few seem to be both meaningful and deliverable.

The project requires analysis of both the drivers and the available data/ data services in the region, with identification of any mismatches. With reference to the current frameworks and mechanisms available for data delivery, the project should develop costed recommendations for bridging the gap.

The Biodiversity Forum is aware that biodiversity data needs projects have been undertaken in other regions and wishes to avoid re-invention of wheels. It is also aware that Local Records Centres have metadatabases of available datasets and that analysis of regional data can build on a synthesis of these. The Forum desires the recommendations to be both challenging and realistic, firmly based in the real situation on the ground in the East of England Region.

3 DATA NEEDS/ DRIVERS FOR BIODIVERSITY DATA

The drivers have been well documented in other regional biodiversity needs projects, such as the South West NBN Pilot Project, and their requirements for biodiversity data are captured in various national guidance publications.

Considering these, the 10 key drivers for biodiversity data were identified (Figure 1).

Driver	Source	Scope	Data Needs
1. The Regional Planning Process	Planning and Compulsory Purchase Act, 2004; PPS11 Regional Planning	Regional	Regional Spatial Strategy; Regional Environment Strategy; indicators
2. Local Development Frameworks	Planning and Compulsory Purchase Act, 2004; PPS12 Local Development Frameworks	Local	Policy development; enhancement/mitigation planning; AMR indicator
3. Development Control	Town and Country Planning Acts PPS9, Biodiversity and Geodiversity	Local	Sites, habitats & species material considerations in decisions; mitigation planning
4. Strategic Environmental Assessment	The Environmental Assessment Of Plans And Programmes Regulations 2004	Regional/ Local	Environmental baseline; monitoring requirement
5. Environmental Impact Assessment	Protected species legislation. Environmental Assessment Regulations. Nerc duty	Regional/ Local	Impact assessment on sites, habitats, species
6. Biodiversity Action Planning/ Biodiversity 2010 PSA Target	England Biodiversity Strategy "Working with the grain of nature" / Treasury-Defra PSA Target / European commitment	National/ Regional/ Local	Habitats and species action plans, target development, monitoring; outcome reporting
7. Appropriate Assessment (EU Habitats Directive)	Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora; Conservation (Natural Habitats, & c.) Regulations 1994 (as amended)	Regional/ Local	Special Areas of Conservation (SACs); European protected habitats and species; monitoring
8. SSSI Condition PSA Target	Treasury/ Defra PSA Target	National	SSSI site quality
9. Agri-environment scheme support	EU Agricultural Regulations	Regional/ Local	Sites, BAP habitats and species
10. NERC Act Biodiversity Duty	Natural Environment and Rural Communities Act, 2006	Regional/ Local	Sites, habitats and species; indicator

Figure 1. Statutory origin and scope of the ten identified drivers.

Other important drivers identified included the Water Framework Directive and the need to monitor biodiversity effects of climate change.

3.1 Consultation

The needs for biodiversity data of each of these processes were assessed by one to one interviews with individuals in organisations dealing with these drivers (see Annex 1 for a list of organisations contacted). This information was supplemented by research of the literature, mostly published within the region but also from national sources and other regions (e.g. ODPM, 2004; ALGE, 2006).

Biodiversity data was categorised into four groups for the purposes of the study:

- Habitats
- Species
- Sites (interpreted as boundaries of areas selected against biodiversity criteria)
- Site Quality

A grouped category of "Biodiversity Enhancement Areas" was used within Sites to encompass conceptual areas such as Ecological Networks, Prime Biodiversity Areas, Green Corridors.

The scope and quality of the biodiversity data needed for these groups was assessed. Data quality was assessed in terms of the four principal parameters (please see Annex 2 for a description of these parameters):

- Coverage (percentage of the resource captured in the dataset);
- Currency (percentage of the coverage obtained during the last 5 years);
- Precision (geographic precision of datasets);
- Accuracy (estimate of confidence in data).

These were supplemented by questions on Update Frequency, Monitoring Rigour and Data Format (see Annex 2 for a description of the variables used).

When several sources were used for defining biodiversity data needs for a given driver, an average of the several responses obtained for quality of data needed was produced. Results obtained for data scope and data quality needed for the ten drivers are presented in the next section. For each variable studied we plotted graphs of the number of drivers in each class of the variable.

The purpose of this consultation and the presentation of the results in graph form is to examine whether data needs are different for each driver. If they are, the implication is that separate data collection and collation initiatives are needed to meet each. If they are not, the opportunity arises to design a single system to meet of all of the needs; furthermore the system might be capable of delivering both the whole datasets needs of the drivers and, in summary form, indicators for reporting purposes.

3.2 Results

3.2.1 **Sites Data**

Scope. Site data is required for all drivers studied (Figure 2). All drivers need data on European status sites and most (9 out of 10) need data on UK protected sites. Five of these drivers also require information on locally designated sites and four on biodiversity enhancement areas.

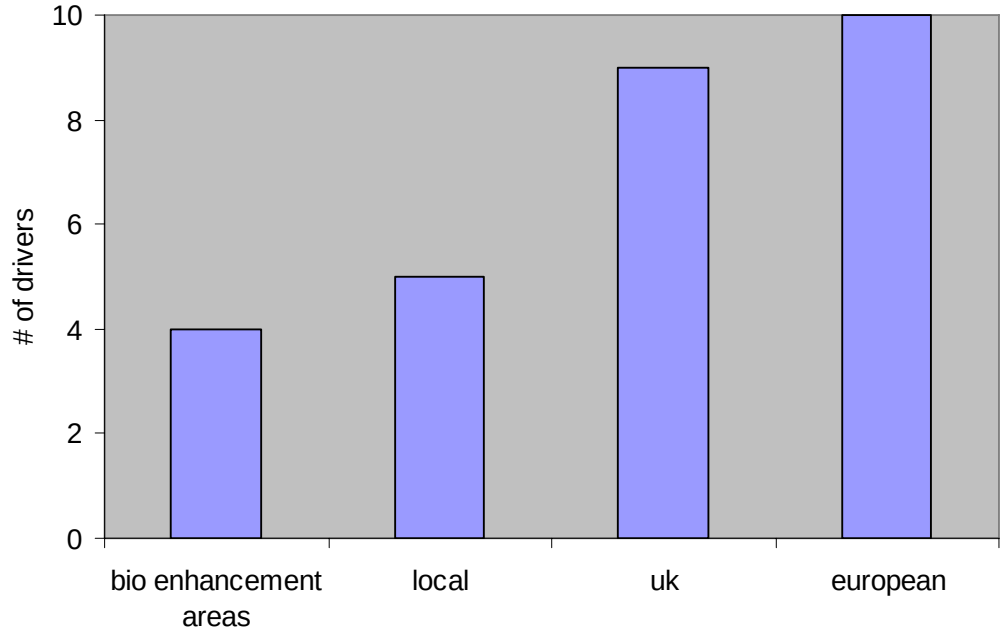

Figure 2. Type of sites for which there are data needs across the 10 drivers studied

Data Quality, Update Frequency and Format. In general, there is a need for high quality data, including data coverage, currency, precision, accuracy and monitoring rigour (Figures 3-7). There is a need for an update frequency of 5 years or less (Figure 8). The data needs to be in GIS for most of its users (Figure 9).

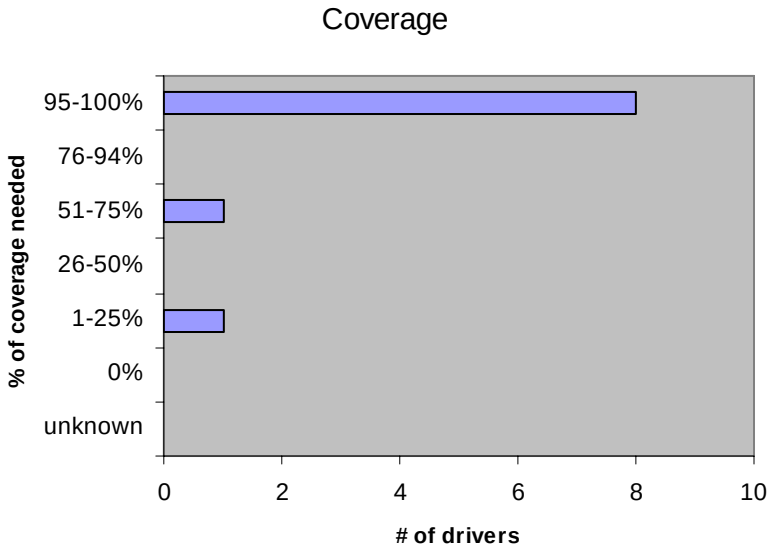

Figure 3. Data coverage needed for site data across the 10 drivers studied.

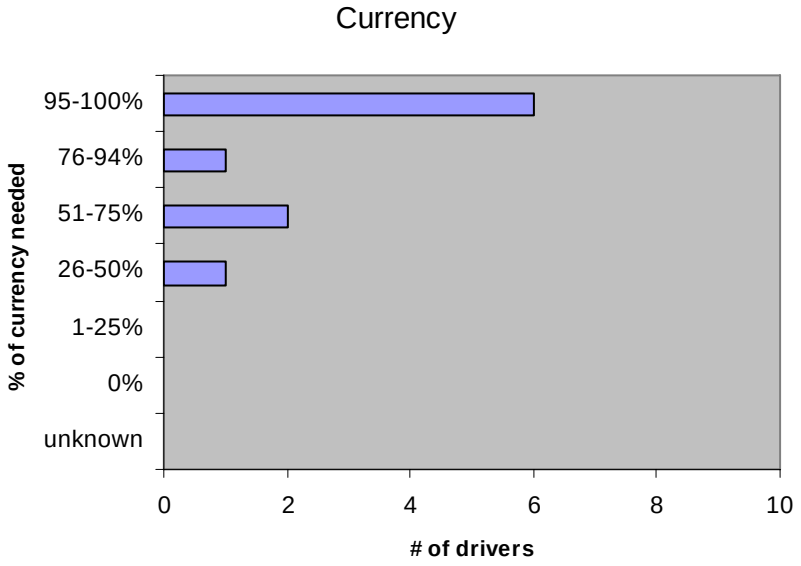

Figure 4. Data currency (as % of data obtained in the last 5 years) needed for site data across the 10 drivers studied.

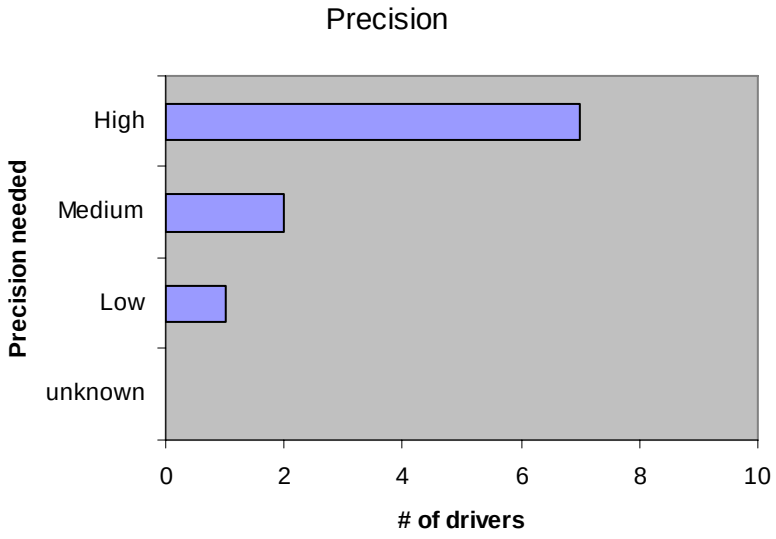

Figure 5. Data precision needed for site data across the 10 drivers studied.

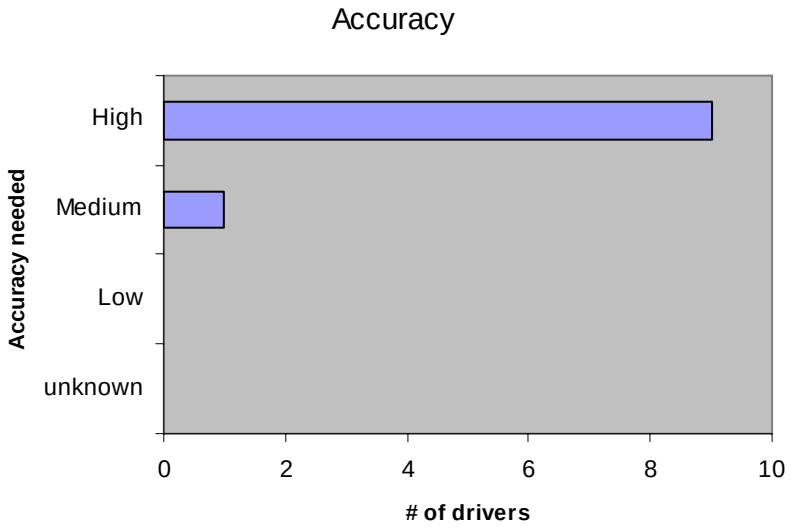

Figure 6. Data accuracy needed for site data across the 10 drivers studied.

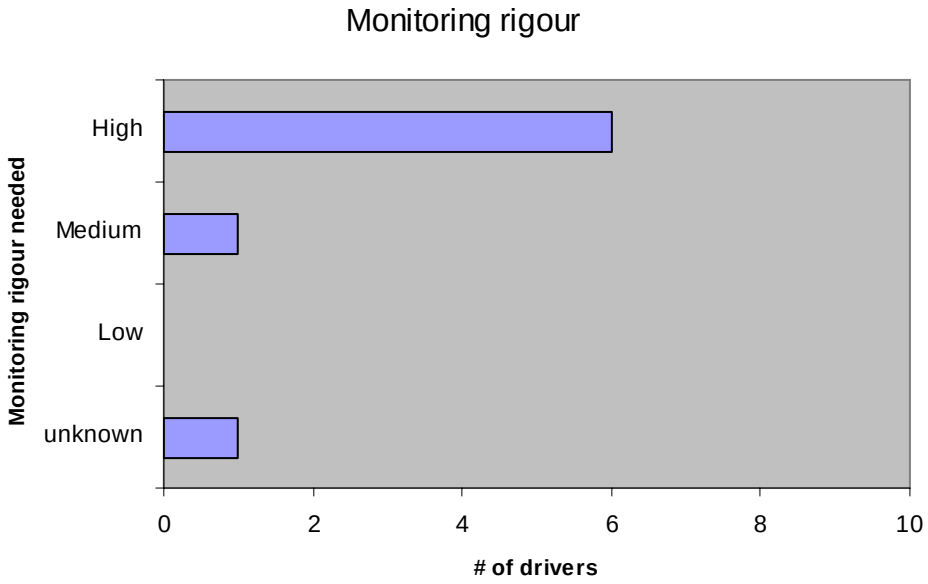

Figure 7. Monitoring rigour needed for site data across the 10 drivers studied.

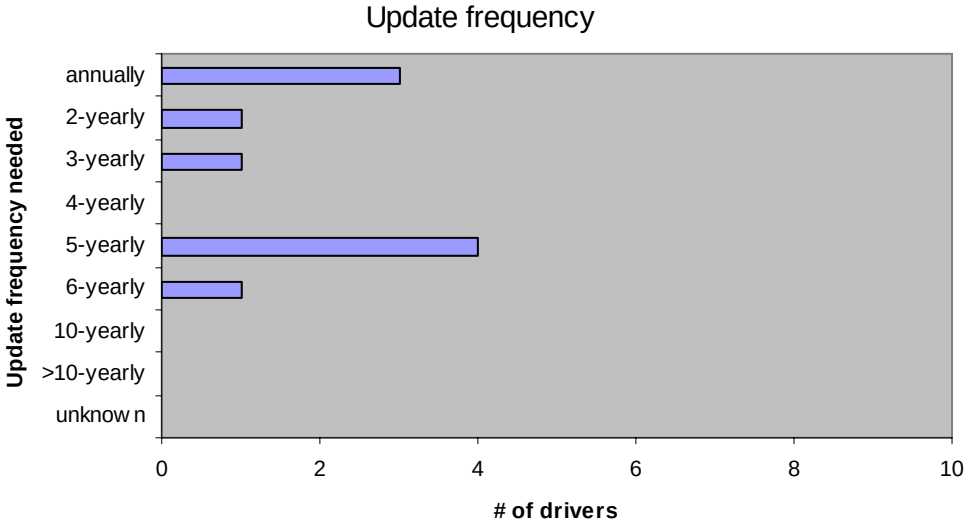

Figure 8. Update frequency needed for site data across the 10 drivers studied.

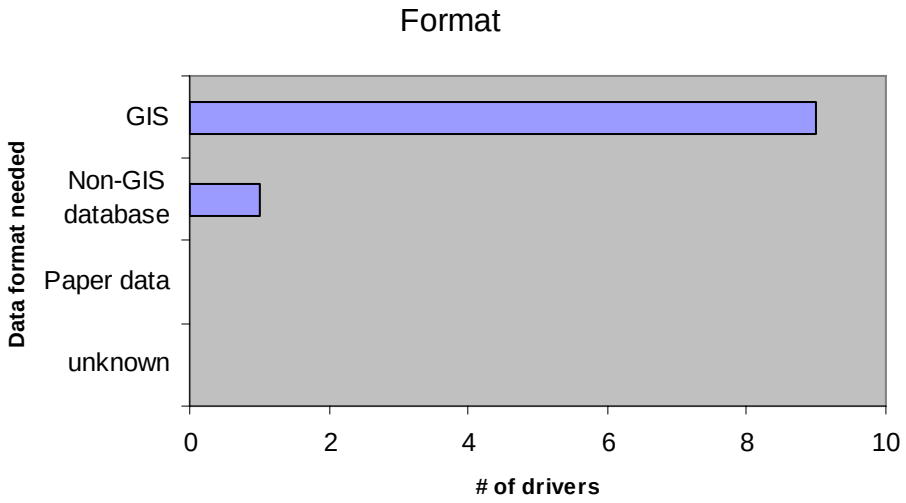

Figure 9. Data format needed for site data across the 10 drivers studied.

3.2.2 **Site quality data**

Scope. Site quality data is required for 6 of the 10 drivers studied (Figure 10). Four of these drivers only need information on quality of UK and European protected sites while two drivers (The Regional Planning Process and Strategic Environmental Assessment) also need quality data for locally designated sites and biodiversity enhancement areas.

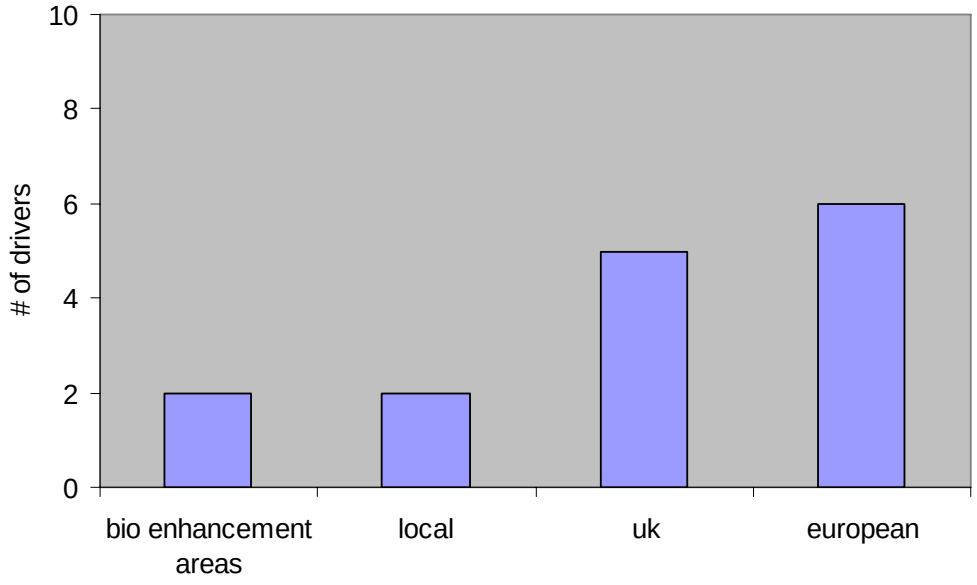

Figure 10. Type of sites for which there is a need for site quality data across the 10 drivers studied.

Data Quality, Update Frequency and Format. As for sites data, there is a need for highly up-to-date information and high quality data (including data precision, accuracy, currency and monitoring rigour). The data needs to be in GIS for most of its users.

3.2.3 **Species data**

Scope. Species data is required for nine of the ten drivers studied (Figure 11). Nine drivers require data on European Protected species, eight on National BAP species and seven on Local BAP species. Five of these drivers also need information on UK legally protected species.

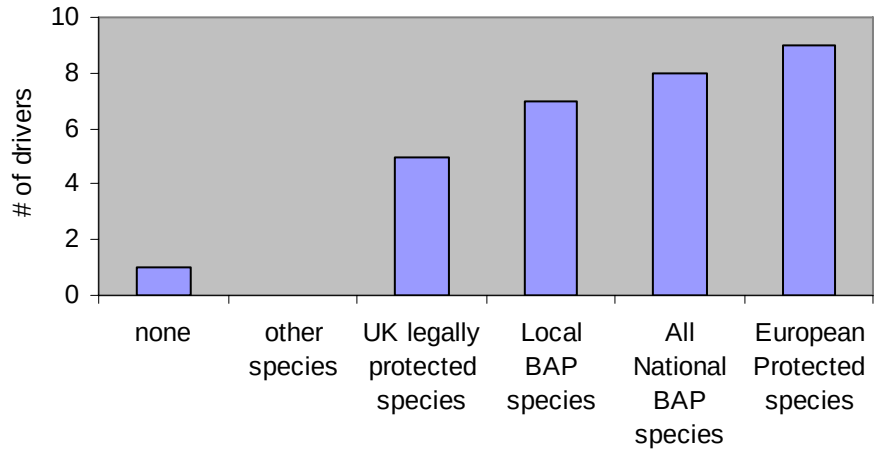

Figure 11. Species for which there are data needs across the 10 drivers studied.

Data Quality, Update Frequency and Format. It should be noted that the following requirements relate to the restricted range of priority species detailed above. Required coverage of existing data for species is variable (Figure 12): while three drivers require a coverage of 26 to 50% of species distributions, two drivers require a almost complete coverage (95% to 100%) of species distribution.

Required currency of species data is also variable (Figure 13). In general, there is a need for high precision, accuracy and monitoring rigour (Figures 14-16). There is a need for an update frequency of 5 years for most drivers (six out of nine) (Figure 17). All drivers require the data to be in GIS (Figure 18).

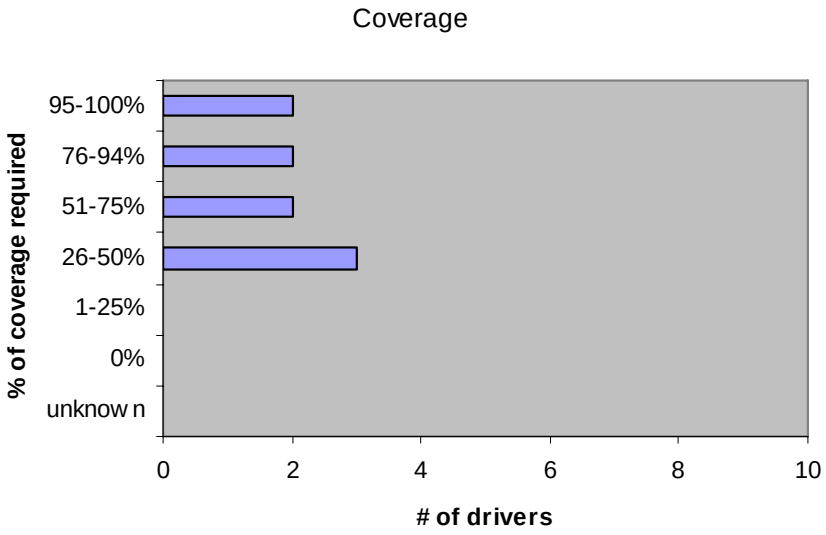

Figure 12. Coverage needed for species data across the 10 drivers studied.

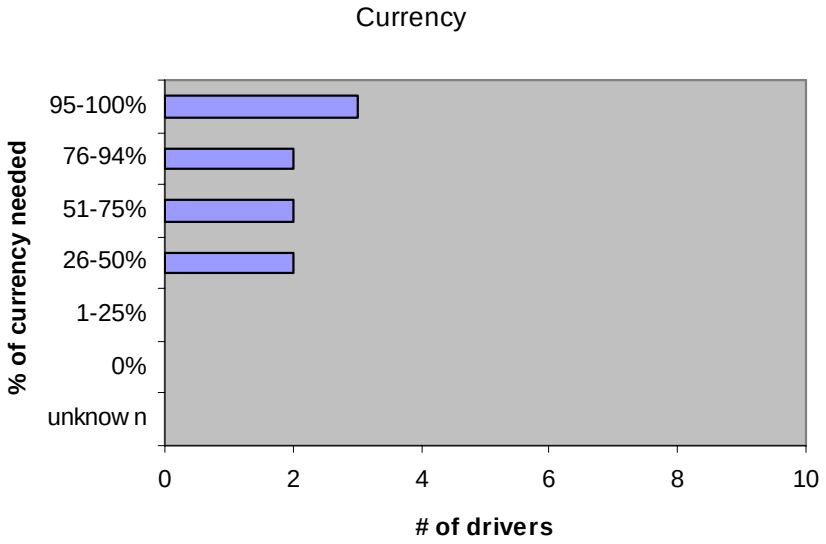

Figure 13. Currency (as % of data obtained in the last 5 years) needed for species data across the 10 drivers studied.

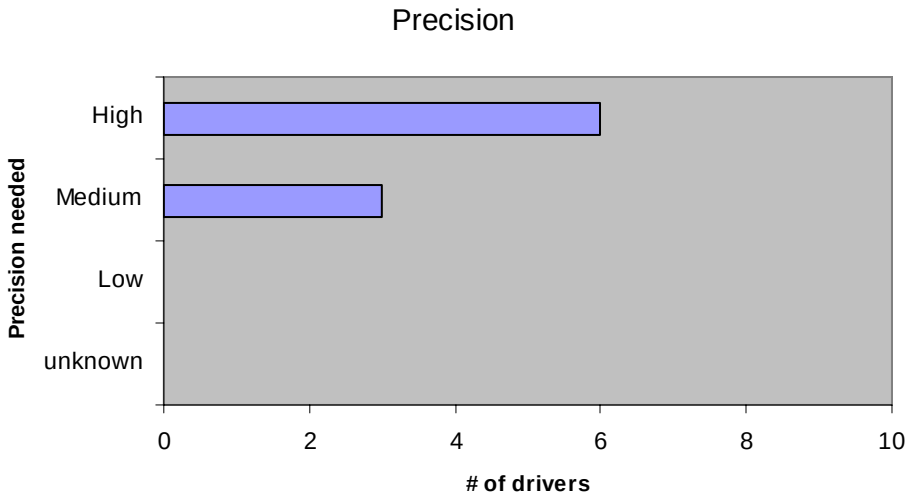

Figure 14. Precision needed for species data across the 10 drivers studied.

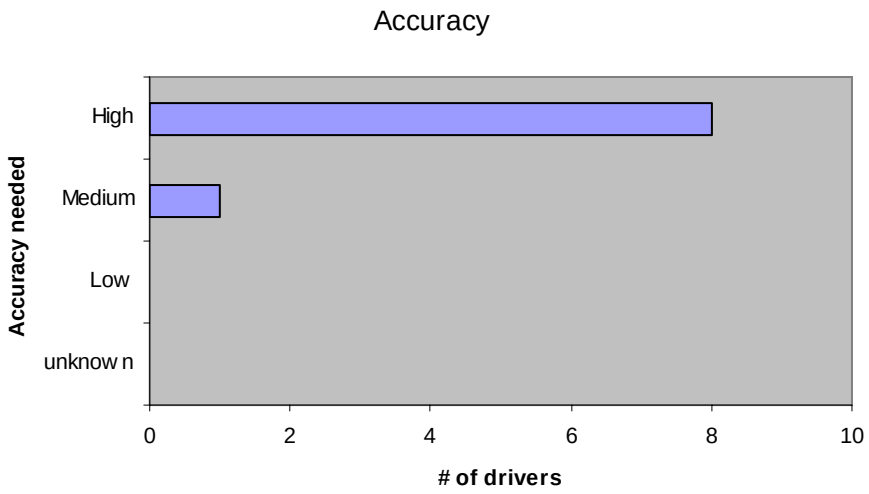

Figure 15. Accuracy needed for species data across the 10 drivers studied.

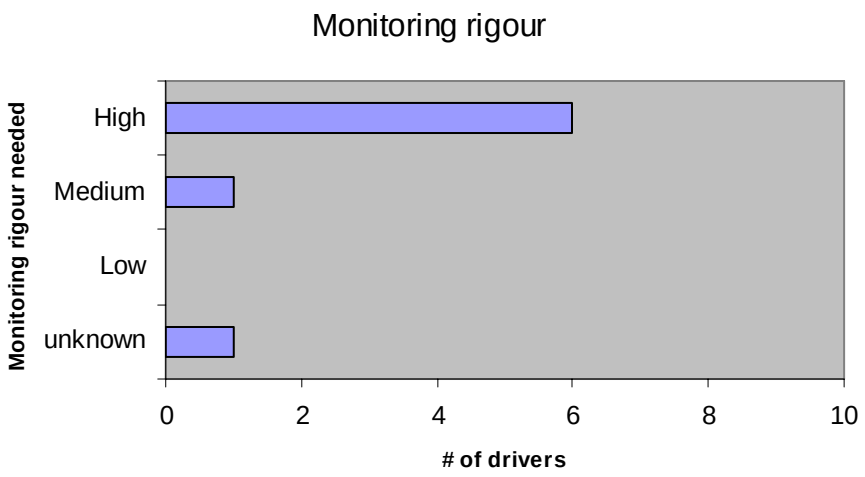

Figure 16. Monitoring rigour needed for species data across the 10 drivers studied.

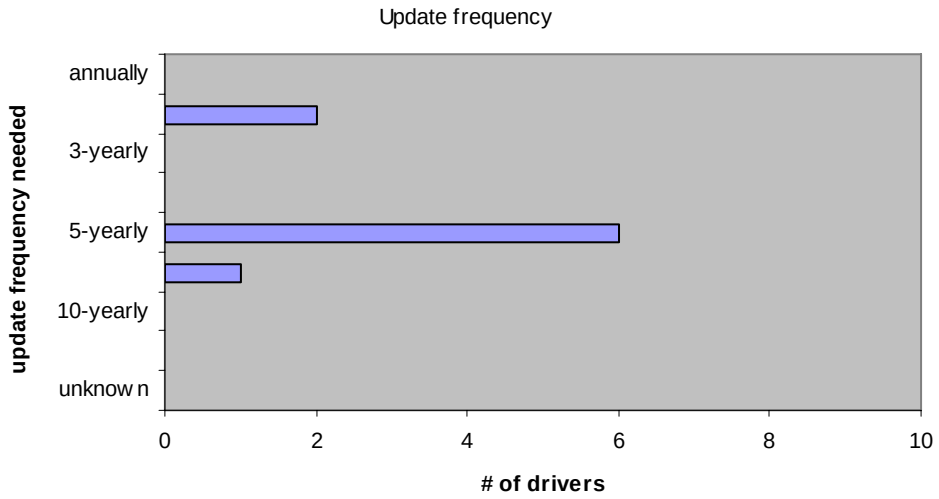

Figure 17. Update frequency needed for species data across the 10 drivers studied.

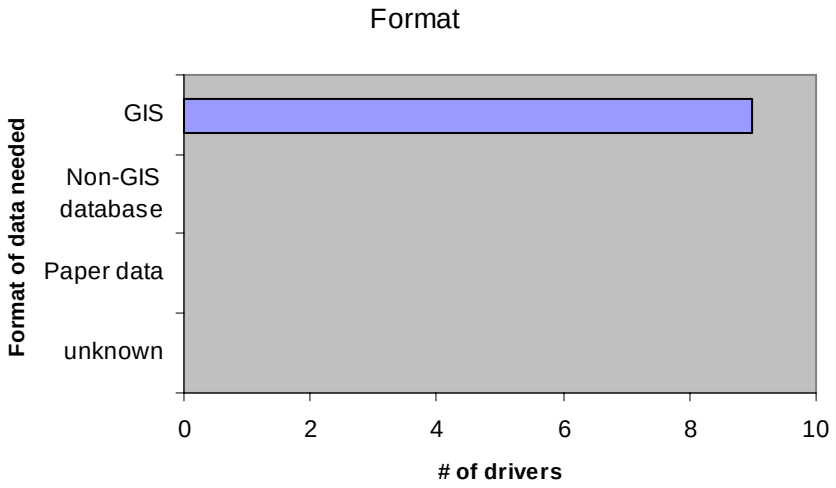

Figure 18. Data Format needed for species data across the 10 drivers studied.

3.2.4 **Habitat data**

Scope. Habitat data is required for all drivers studied (Figure 19). All drivers require data on Annex 1 habitats, nine on National BAP habitats and seven on Local BAP habitats. Only one driver (driver 8 – SSSI Condition PSA Target) requires data on all habitats.

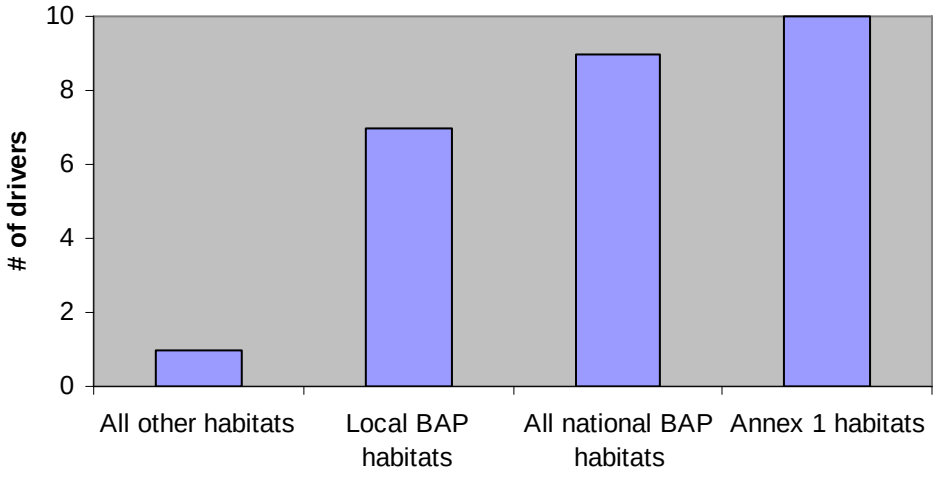

Figure 19. Habitats for which there are data needs across the 10 drivers studied.

Data Quality, Update Frequency and Format. Required coverage of habitat data is high (95% to 100%) for all but two drivers (Figure 20). There are no differences in coverage needed for different habitat types – coverage for "all habitats" should be 95% to 100% to fulfil data needs for driver 8. Required currency of habitat data is variable (Figure 21).

In general, there is a need for high precision and accuracy for habitat data (Figures 22 and 23); while the monitoring rigour required is variable (mostly high or medium) (Figure 24). There is a need for an update frequency of 5 years for most drivers (six out of ten) (Figure 25). Nine drivers require the data to be in GIS (Figure 26).

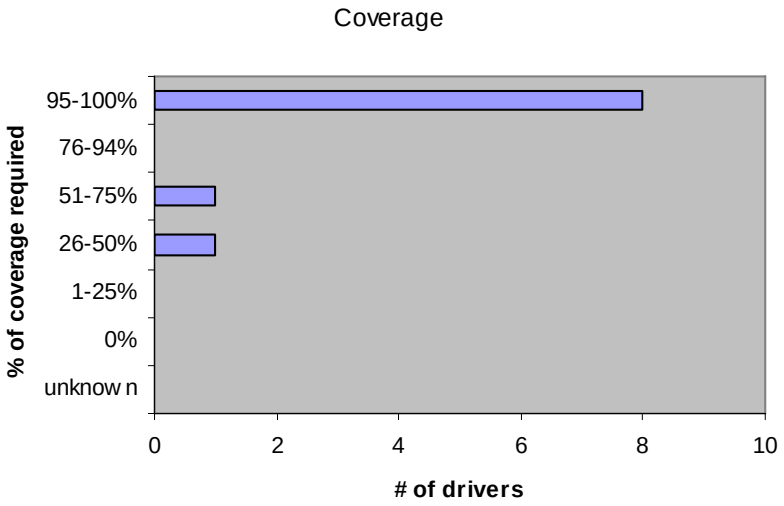

Figure 20. Coverage needed for habitat data across the 10 drivers studied.

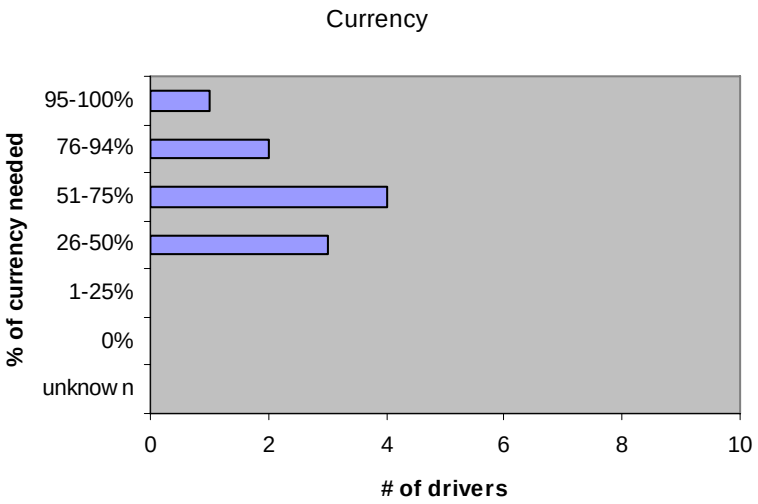

Figure 21. Currency (as % of data obtained in the last 5 years), needed for habitat data across the 10 drivers studied.

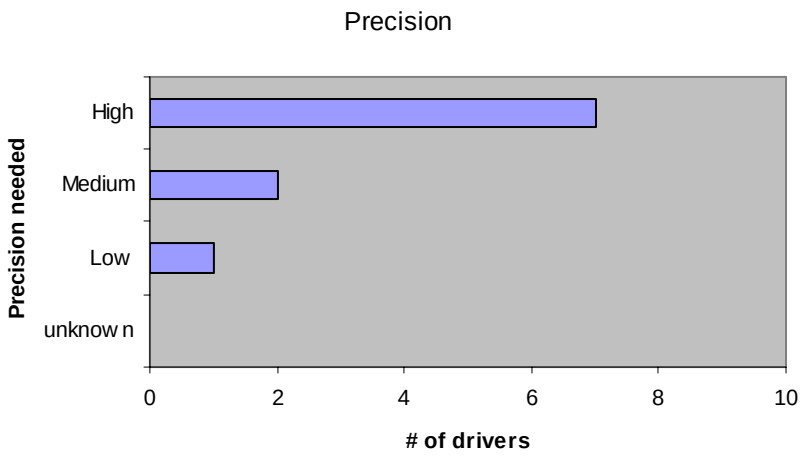

Figure 22. Precision needed for habitat data across the 10 drivers studied.

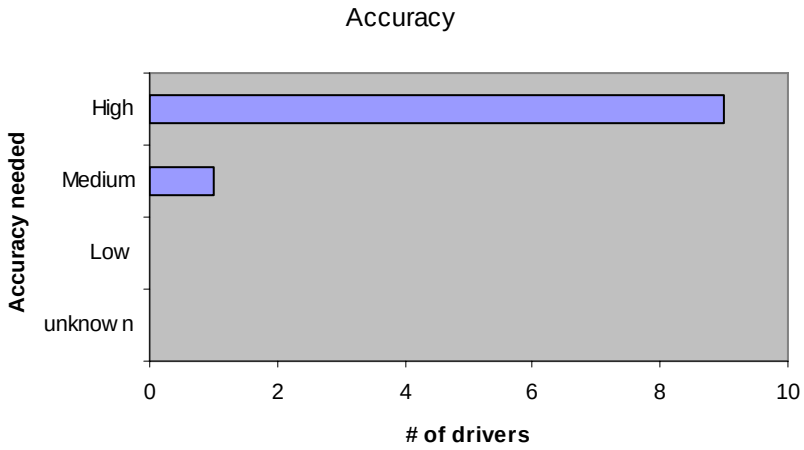

Figure 23. Accuracy needed for habitat data across the 10 drivers studied.

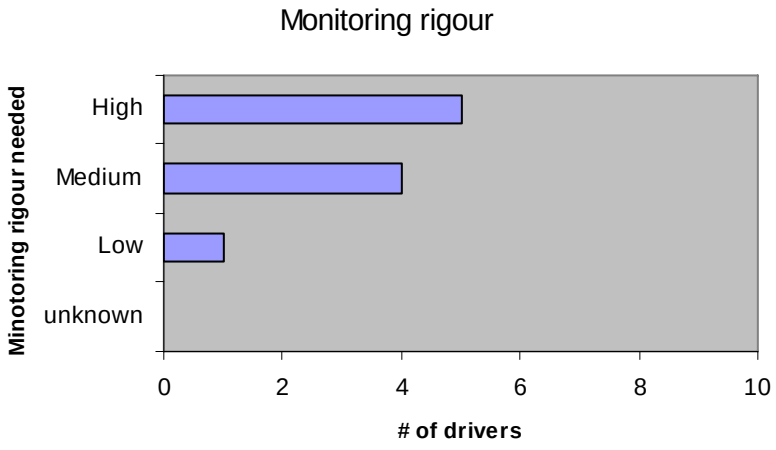

Figure 24. Monitoring rigour needed for habitat data across the 10 drivers studied.

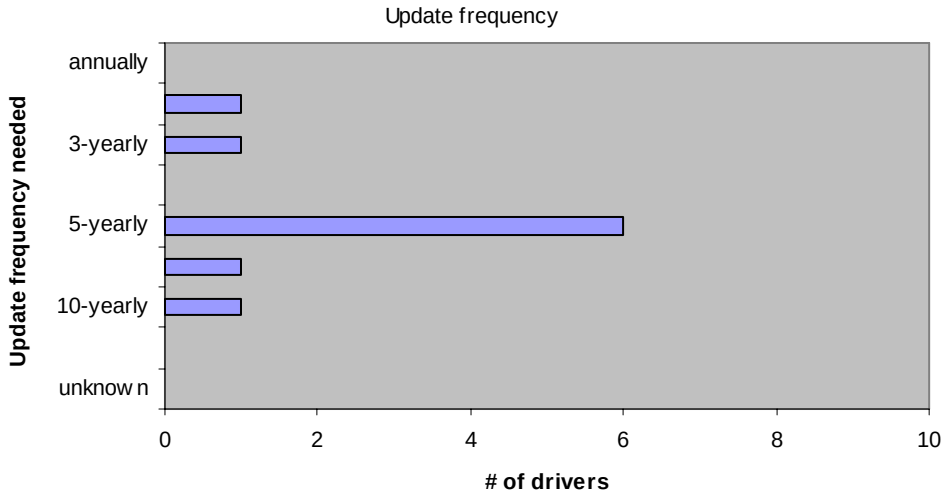

Figure 25. Update frequency needed for habitat data across the 10 drivers studied.

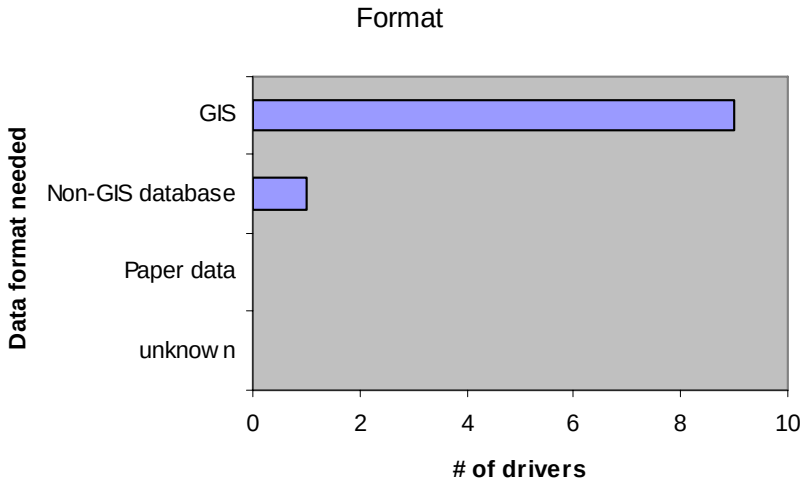

Figure 26. Data Format needed for habitat data across the 10 drivers studied.

3.3 Conclusions

The identified needs are for all four types of biodiversity data. Habitats, species and sites data is required for most of the drivers, site quality data for only six of them.

In general, species data needs refer to priority species (e.g., BAP species, UK protected, etc.), not all species.

Habitat data needs include mainly Annex 1 habitats, BAP habitats and LBAP habitats. "All habitats" are required for one driver.

Coverage of priority species needed varies between 26-50% for some drivers and total coverage for other drivers. It should be noted that these coverage requirements relate to

the restricted range of priority species detailed above. For Habitats and Sites, coverage needs to be fairly complete.

The drivers studied require high quality data, including high currency, precision and accuracy for sites, species and habitats. Update frequency is required to be around 5-yearly for all biodiversity data types.

Most biodiversity drivers require the data to be in GIS format.

Biodiversity data needs are consistent across the region. This is to be expected, as the drivers are regional, national or international, and, although they may be subject to slightly varying local interpretation, the need is essentially the same in each part of the region.

There is considerable overlap in the needs for biodiversity data across the ten principal drivers. With a few exceptions the needs are essentially the same.

The key exceptions to this are:

- Regional planners do not need access to species data, other than its use in an overall indicator
- For development control, EIA, appropriate assessment, agri-environment scheme and NERC Act purposes 100% coverage of BAP species is required; for indicator use in regional and forward planning, sampling programmes, represented by lower coverage requirements, will suffice.

Biodiversity data needs are primarily for whole datasets of raw or interpreted data that can be applied to the strategic or operational issue in hand, whether that is planning a new town or assessing the impact of a pipeline.

Indicators are also much in demand as headlines for non-technical reporting, but not as a substitute for real data.

4 EXISTING DATA

4.1 Consultation

Existing biodiversity data was assessed primarily by liaison with each of the six Local Records Centres in the region. This information was supplemented by contacts with some other organisations (e.g., Wildlife Trusts, naturalist societies), examination of regional/national datasets held in the region by Natural England, research reports and online databases such as the National Biodiversity Network and MAGIC.

The data format used for collecting information on and existing data was the same as for the drivers to allow for analysis of needs and data on the same basis for comparison (see section 3.1 above). For each biodiversity data group (habitats, species, sites and site quality) we collected information on the quality of the data available. For species, we focused on studying the quality of BAP and LBAP species data. As well, only the quality of BAP and LBAP habitats was assessed. See

Annex **3** for a description of the variables used. Questionnaires were filled in by the data holders except for a few exceptions where we conducted telephone interviews to complete the questionnaires. Organizations contacted in this consultation are listed in Annex 1. Although the data covered is not a complete assessment of all biodiversity data in the region, it should include the datasets that can be made available for data users.

When in a county there was more than one dataset for a given species, habitat or site, the dataset with higher quality was used in the data quality analysis across the region. Results obtained for existing data and its quality across the region are presented in the next section. Averages across the region were calculated by averaging the results for each county. For each variable studied we plotted graphs of the average across counties in each class of the variable.

4.2 Results

4.2.1 **Sites Data**

Coverage of sites data across the region is high (Figure 27). This data is based either on the LRCs or at the WTs. The currency of the existing data is very variable (Figure 28): some counties have had most data collected/updated in the last five years (Suffolk) while others have a variable currency, depending on the sites type. Precision and accuracy of existing data are in general high (Figures 29 and 30), while monitoring rigour is variable (Figure 31). Data for most sites is updated less than 10-yearly (Figure 32). All analyzed datasets were in GIS format (Figure 33).

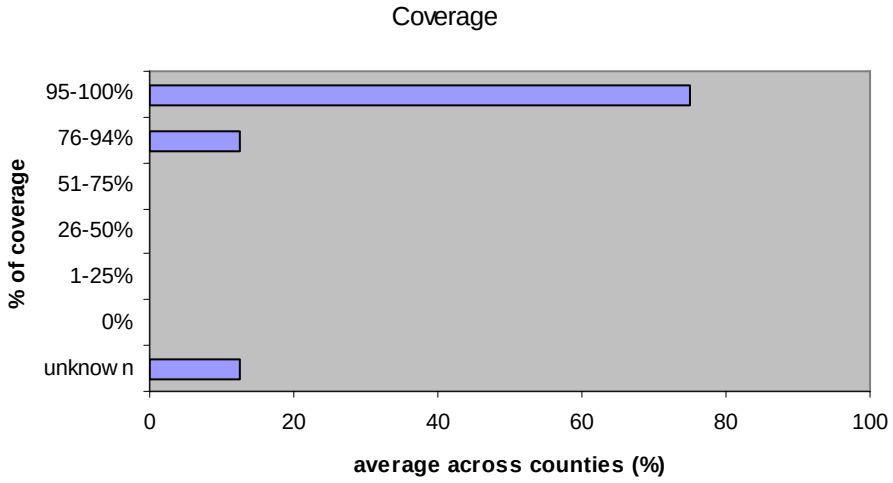

Figure 27. Across counties average percentage of coverage of available data for each data coverage range.

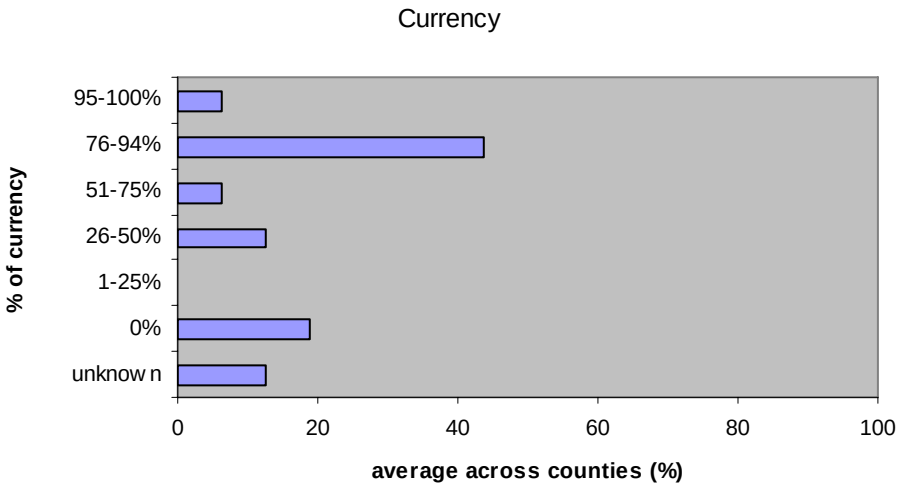

Figure 28. Currency (as % of data obtained in the last 5 years) of existing sites data across the region.

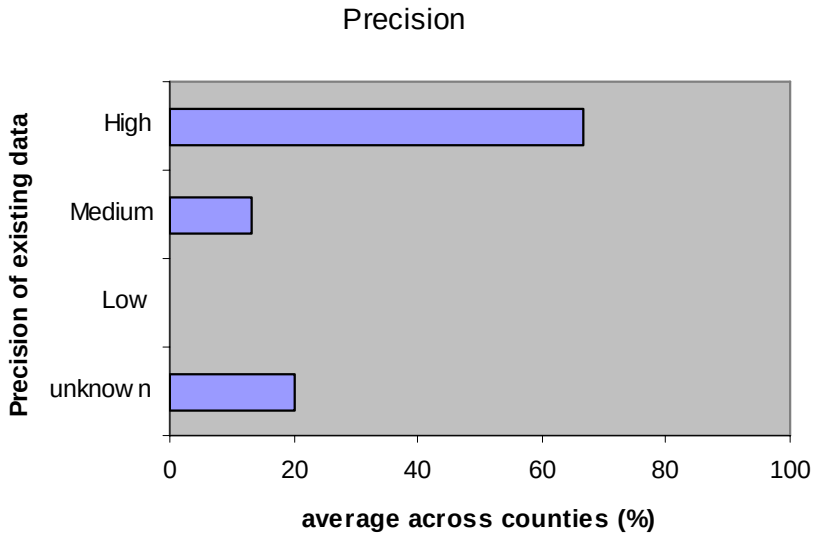

Figure 29. Precision of existing sites data across the region (in percentage).

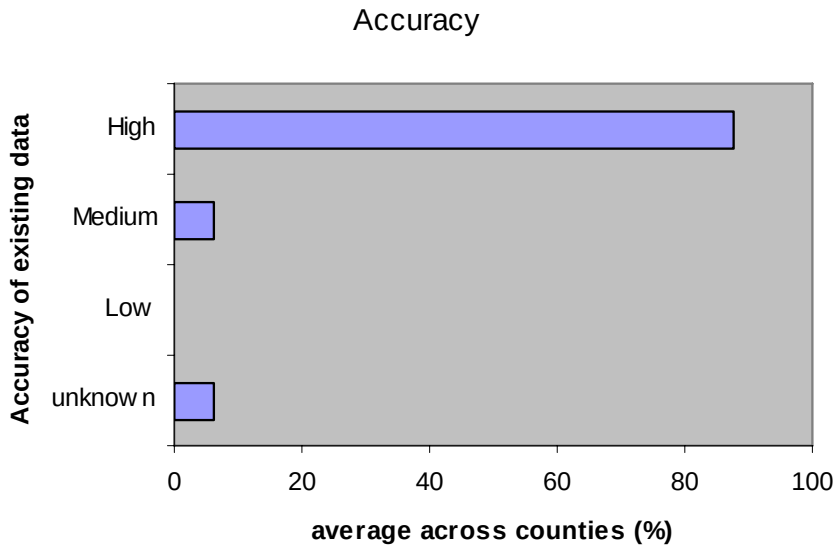

Figure 30. Accuracy of existing sites data across the region (in percentage).

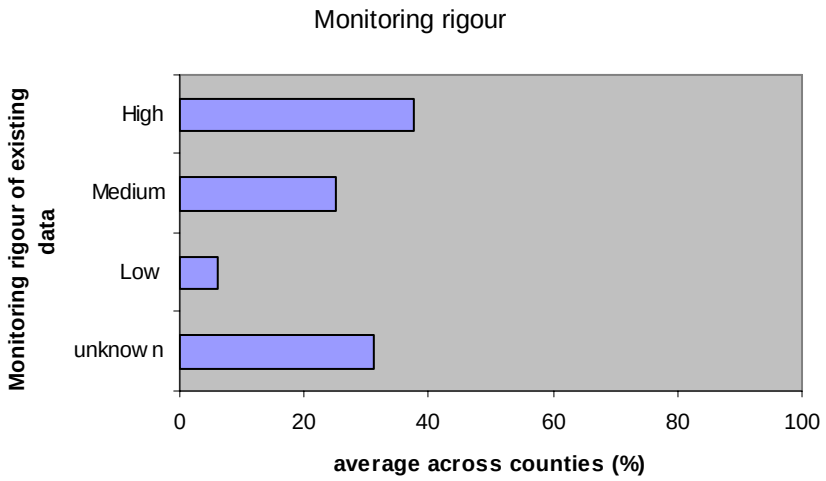

Figure 31. Monitoring rigour of existing sites data across the region (in percentage).

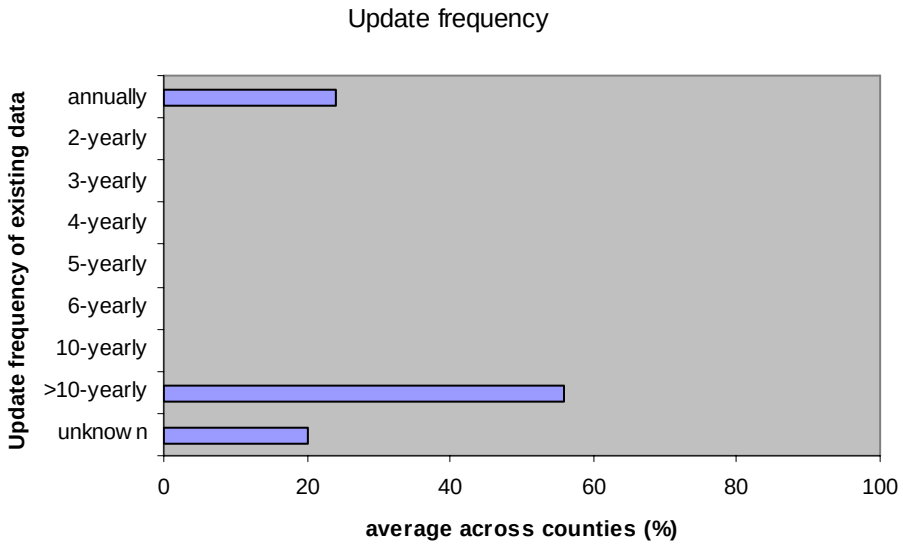

Figure 32. Update frequency of existing sites data across the region (in percentage).

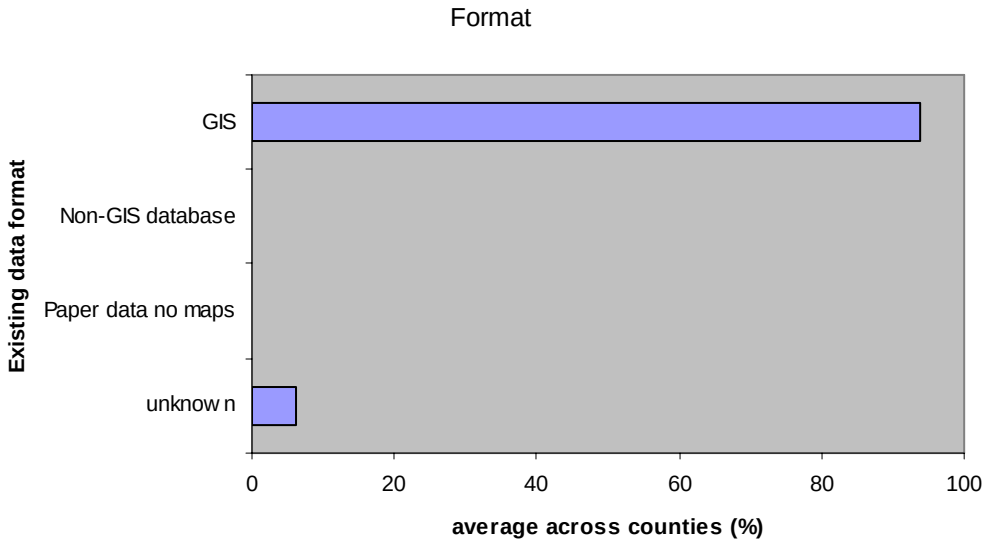

Figure 33. Format of existing sites data across the region (in percentage).

4.2.2 **Species Data**

For species, coverage across the region is highly variable (Figure 34). This data is scattered on the LRCs, the WTs and Naturalist Societies. The currency of the existing data is mostly low or unknown (Figure 35) as the update frequency is frequently over 10-yearly (Figure 36). Precision, accuracy and monitoring rigour of existing data are in general high (Figures 37 to 39). Datasets were in a range of formats including GIS, paper records and several non GIS databases such as Recorder (Figure 40).

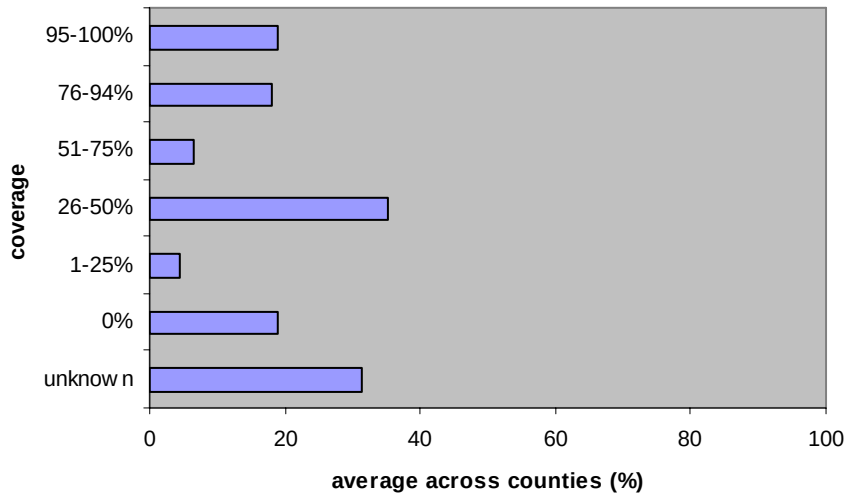

Figure 34. Across counties average percentage of coverage of existing data for BAP and LBAP species for each coverage range.

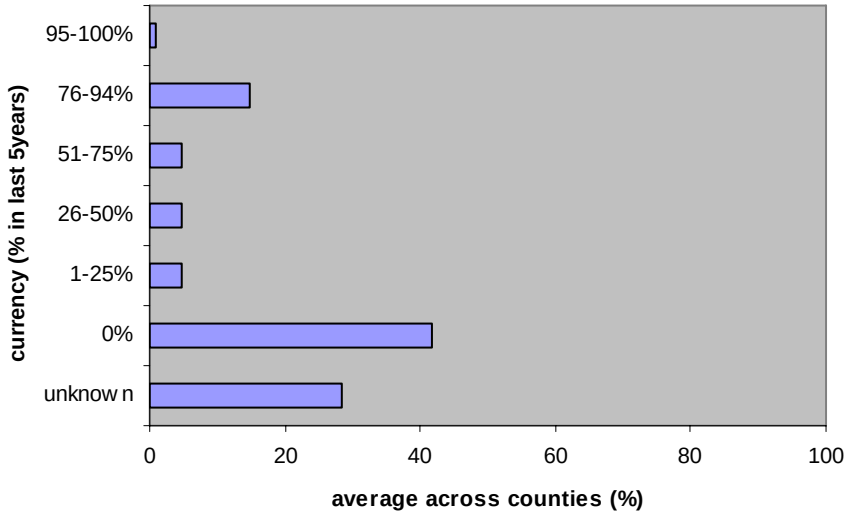

Figure 35. Average currency (as percentage of records from the last 5 years) of existing data for BAP and LBAP species across the region (in percentage).

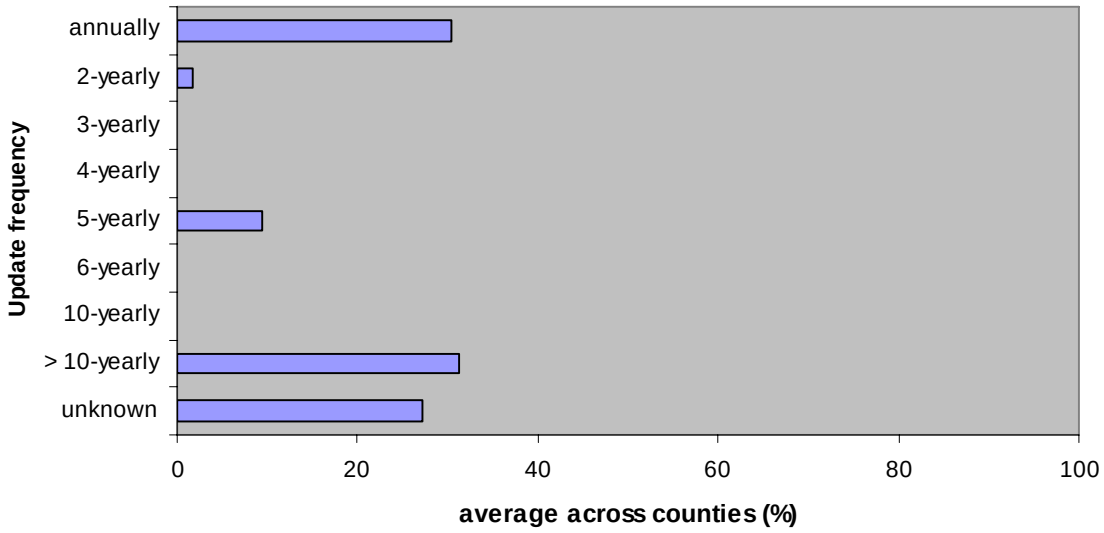

Figure 36. Update frequency of existing BAP and LBAP species data across the region (in percentage).

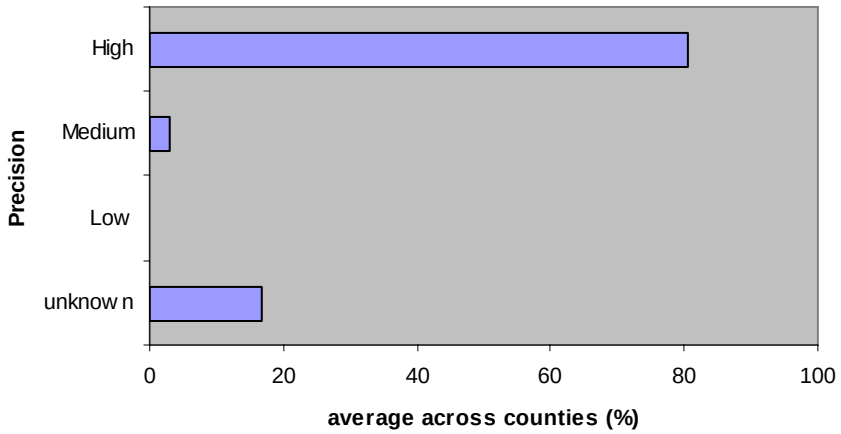

Figure 37. Precision of existing BAP and LBAP species data across the region (in percentage).

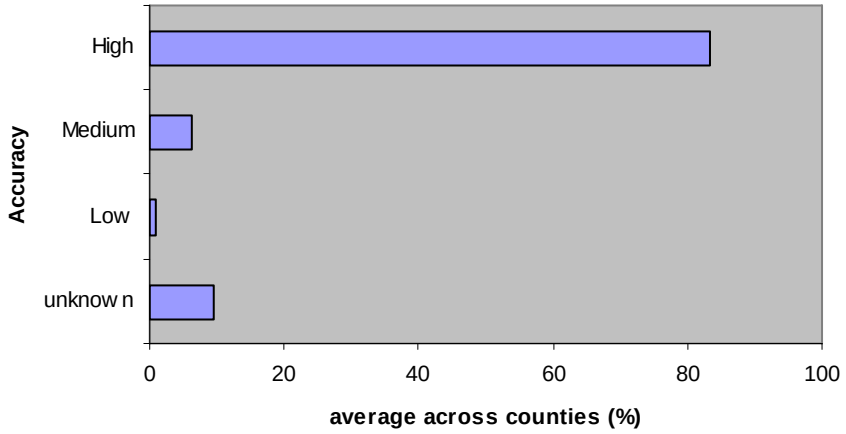

Figure 38. Accuracy of existing BAP and LBAP species data across the region (in percentage).

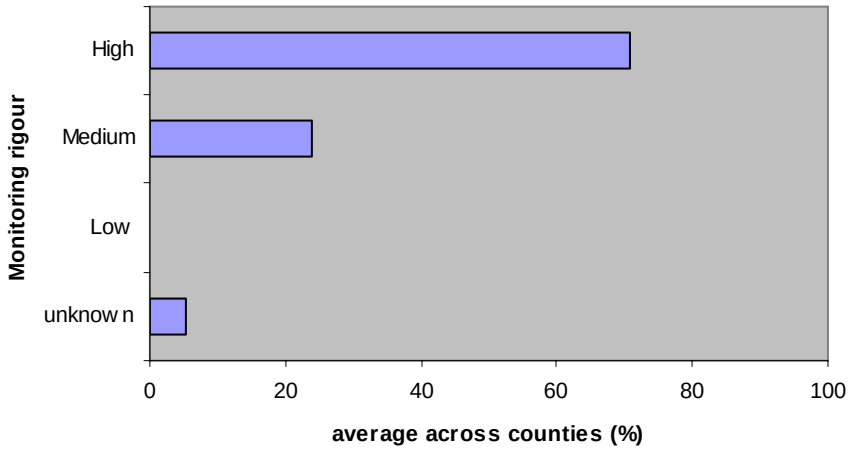

Figure 39. Monitoring rigour used to acquire BAP and LBAP species data across the region (in percentage).

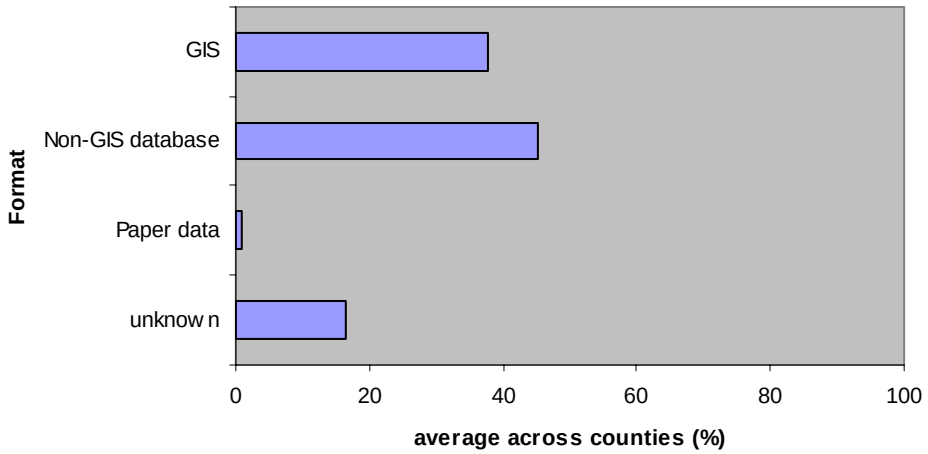

Figure 40. Format of existing BAP and LBAP species data across the region (in percentage).

4.2.3 **Habitat Data**

Habitats data across the region is patchy. Coverage of BAP and LBAP Habitats is high in some counties but non existing in others. On average, there is virtually no data for almost 60% of BAP and LBAP habitats that exist in each county (Figure 41). The existing data is either on the LRCs or the WTs. The currency of the existing data is either high (corresponding to recent surveys in Suffolk and Hertfordshire) or null (Figure 42) and the update frequency is 5-yearly or over (Figure 46). For about half of the datasets, there was no available information on its precision, accuracy or monitoring rigour (Figures 43 to 45). Precision and monitoring rigour are in general high while accuracy of the existing datasets is highly variable. Datasets are mainly in GIS format (Figure 47).

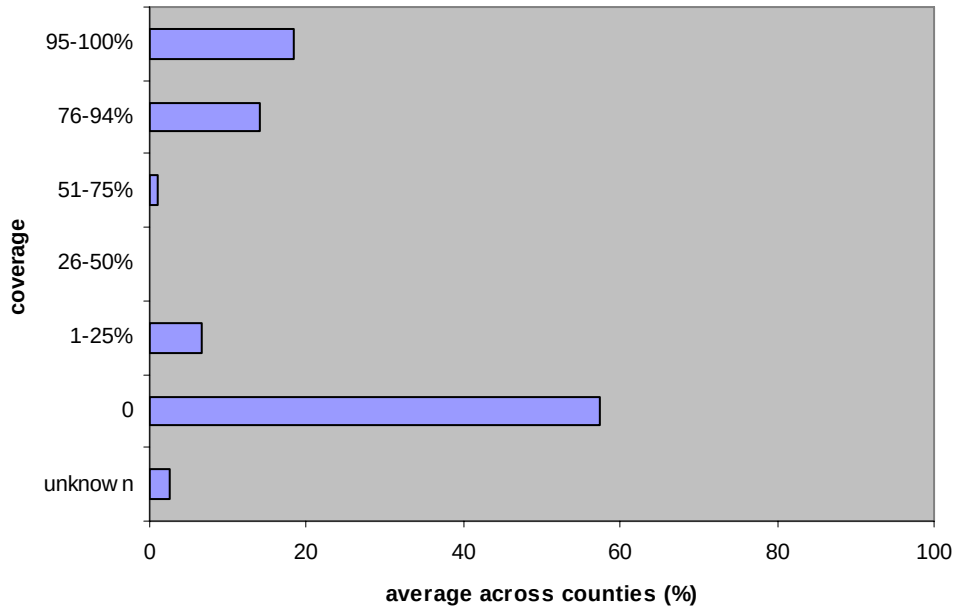

Figure 41. Across counties average percentage of coverage of existing data for BAP and LBAP habitats for each coverage range.

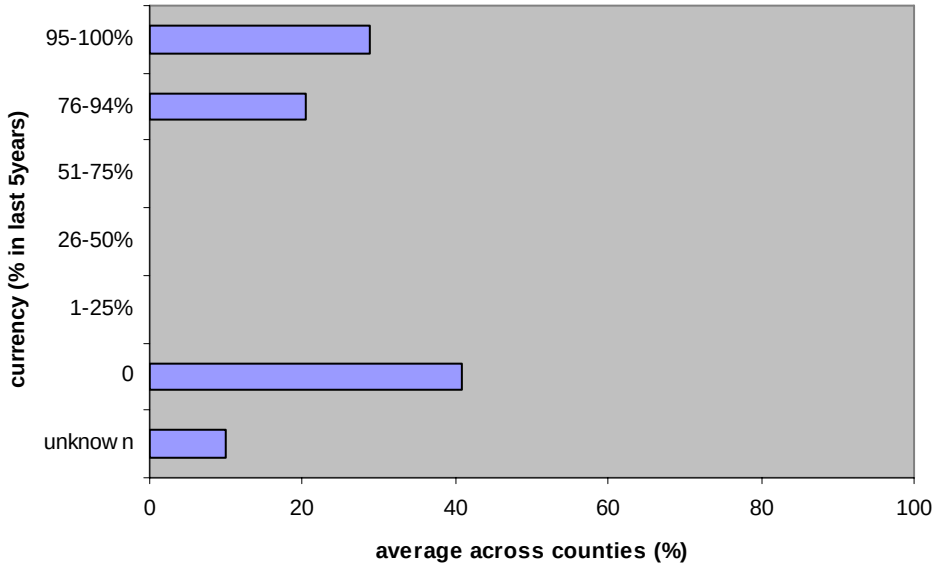

Figure 42. Average currency (as percentage of records from the last 5 years) of existing BAP and LBAP habitat data across the region (in percentage).

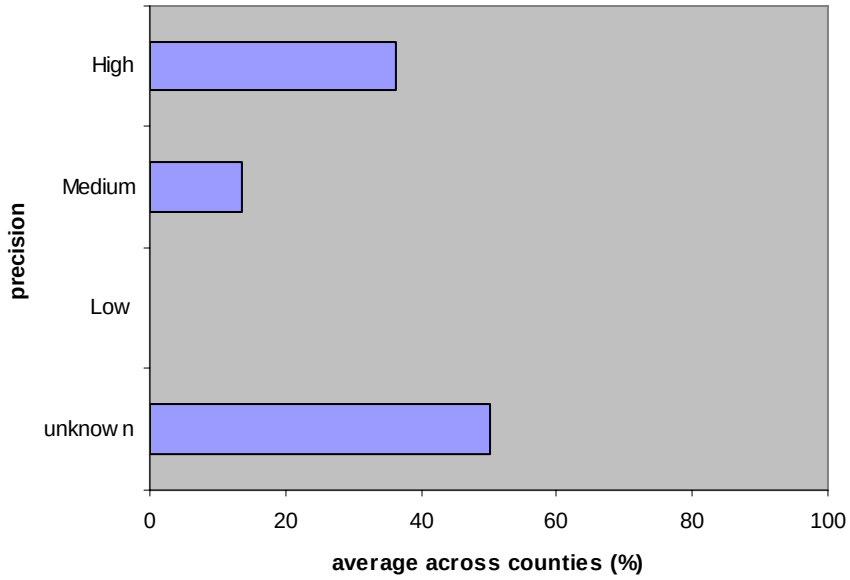

Figure 43. Average precision of existing BAPand LBAP habitat data across the region (in percentage).

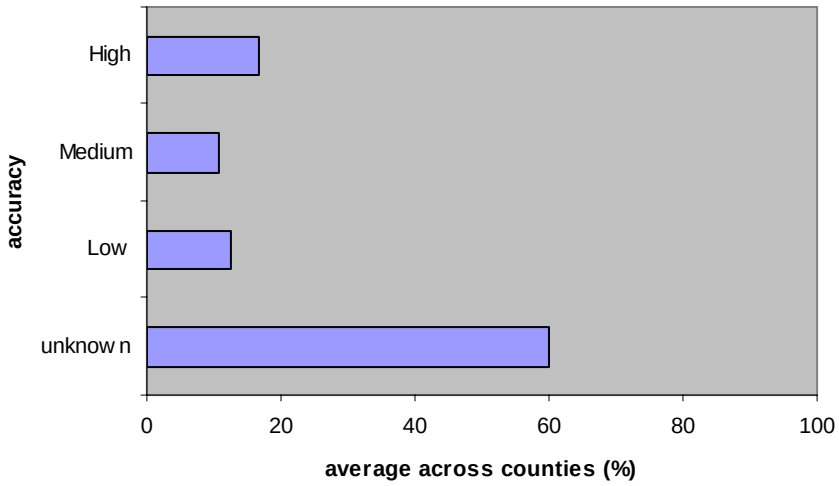

Figure 44. Average accuracy of existing BAP and LBAP habitat data across the region (in percentage).

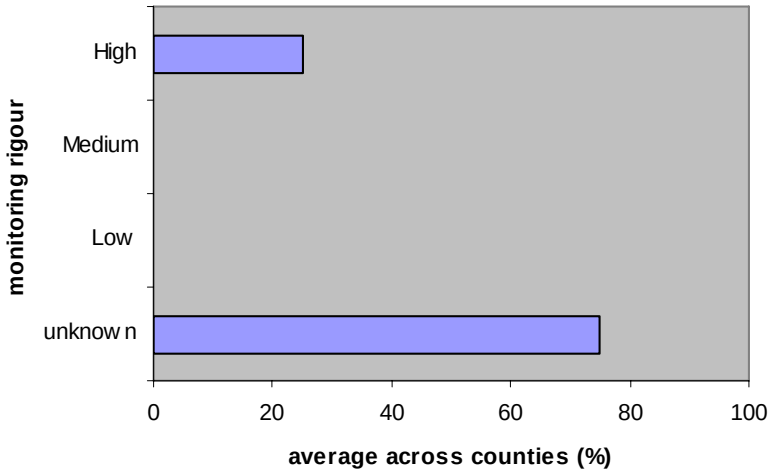

Figure 45. Average monitoring rigour of existing BAP and LBAP habitat data across the region (in percentage).

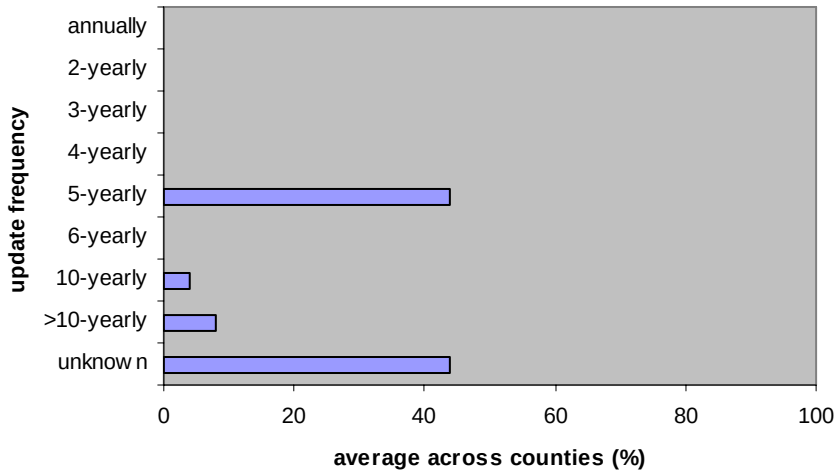

Figure 46. Average update frequency of existing BAP and LBAP habitat data across the region (in percentage).

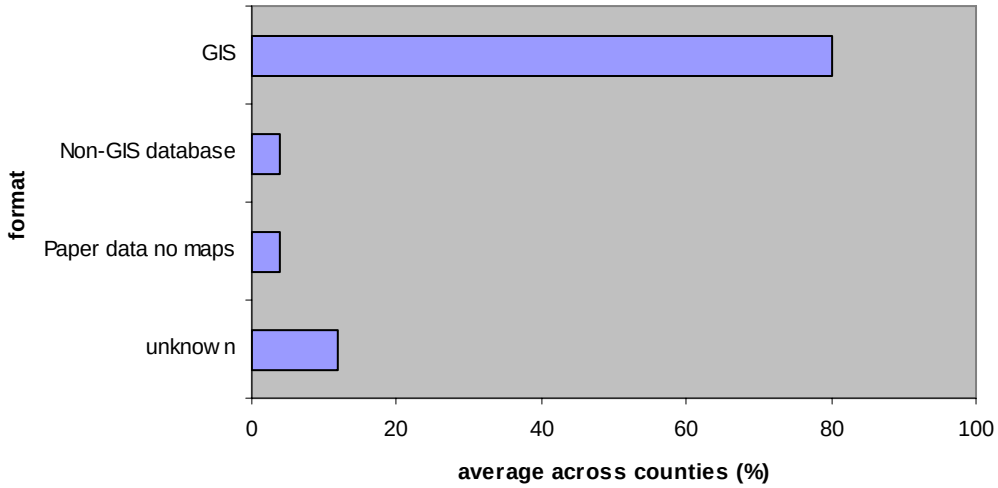

Figure 47. Average format of existing BAP and LBAP habitat data across the region (in percentage).

4.2.4 **Habitat data – regional datasets**

Habitat data held in Natural England and in the NBN Gateway was analyzed. There are regional datasets for 15 of the 26 existing BAP habitats in the region (Figure 48). Existing datasets have mostly low geographic precision (Figure 49) and medium accuracy (Figure 50).

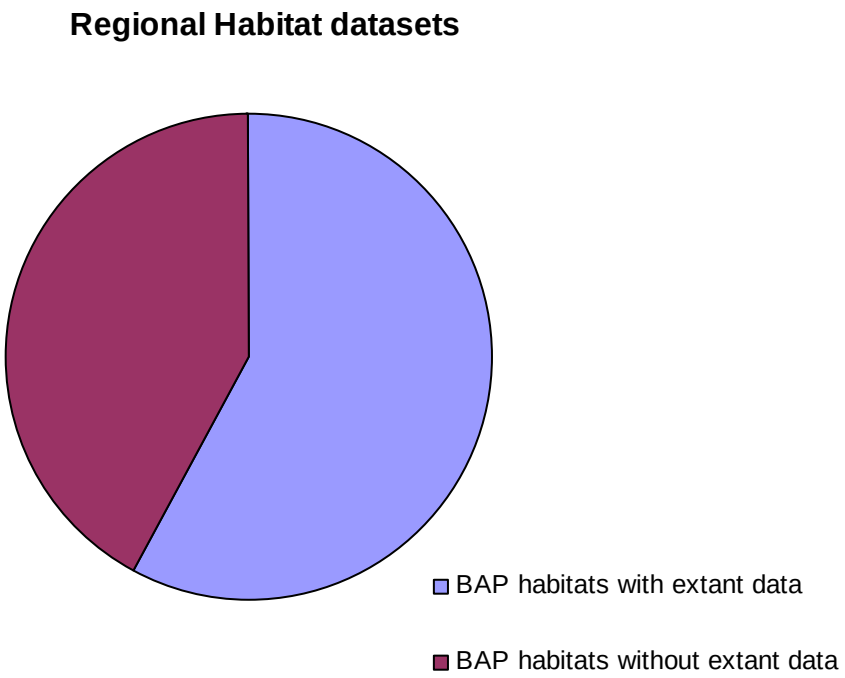

Figure 48. Percentage of BAP habitats captured in regional datasets (in percentage).

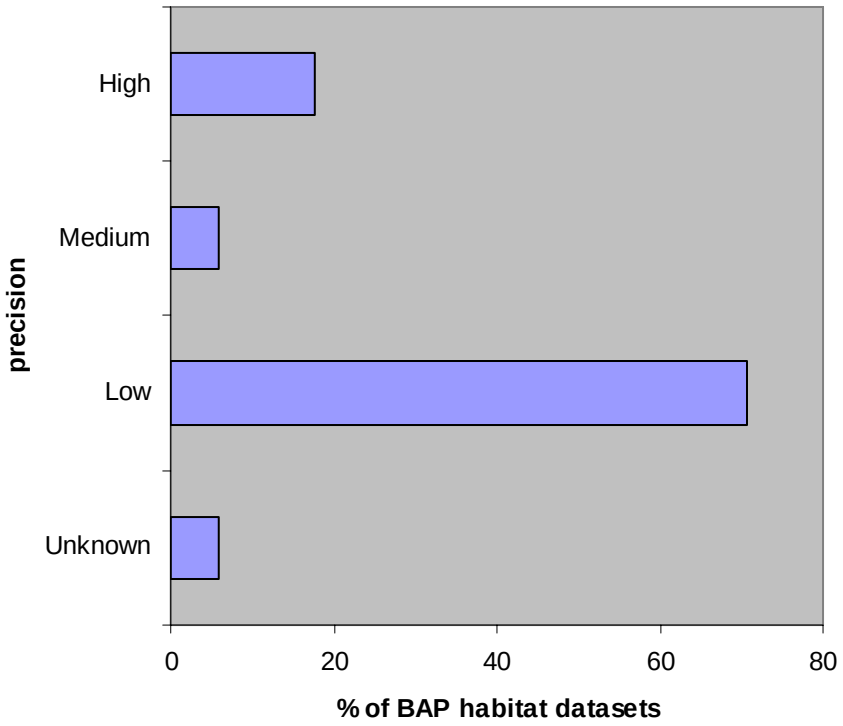

Figure 49. Precision of BAP habitat regional datasets (in percentage).

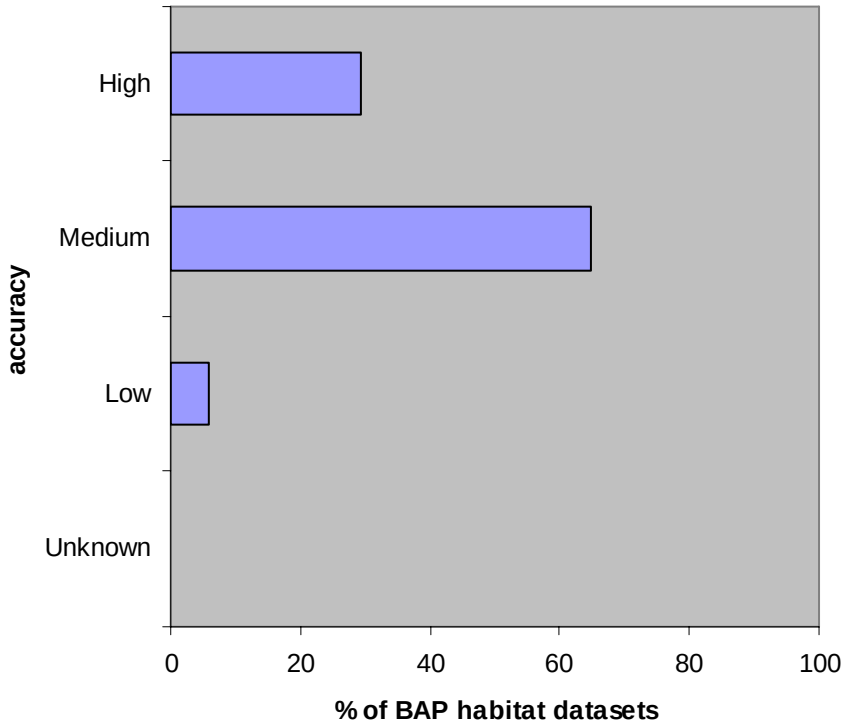

Figure 50. Accuracy of BAP habitats data in regional datasets (in percentage).

4.2.5 **Comparison between counties**

Existing BAP species data is very variable across the region, with some counties having data for all existing BAP species in the county and other counties where available data is scarce (Figure 51). Data coverage of existing BAP species in each county is variable (Figure 52) as is the accuracy of the datasets (Figure 53).

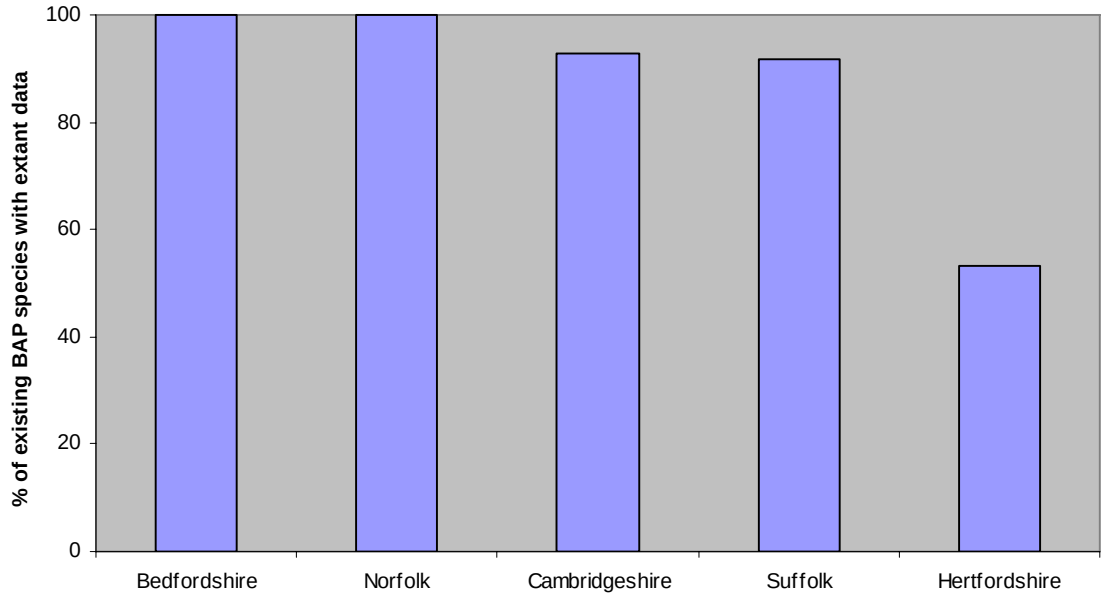

Figure 51. Percentage of BAP species present in each county for which there is available data (no assessment possible in Essex).

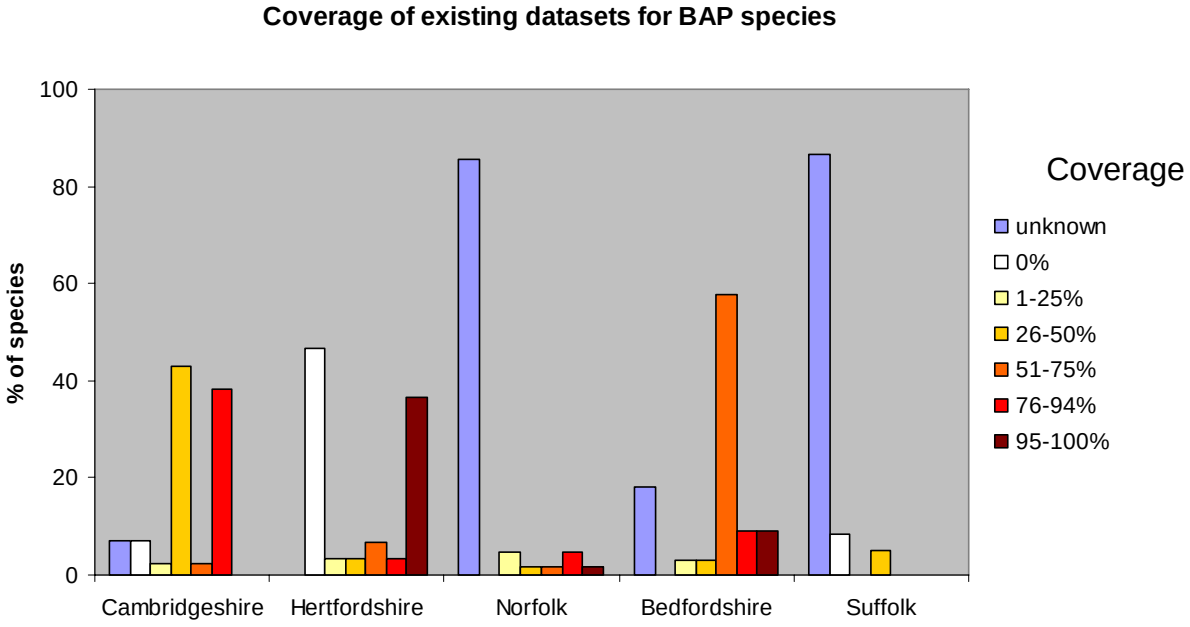

Figure 52. Coverage (as an estimate of percentage of the species' actual distribution which is represented in the existing datasets) for BAP species in each county (no assessment possible for Essex).

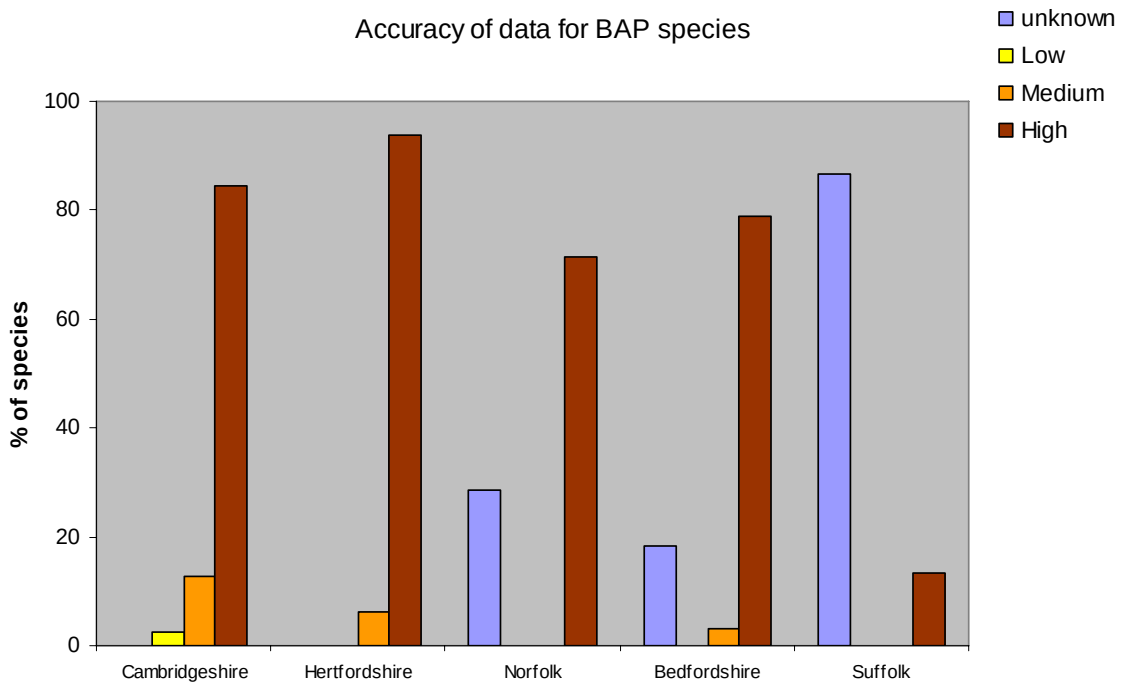

Figure 53. Accuracy of existing BAP species data in each of the region's counties (in percentage). (No assessment possible for Essex).

Datasets for BAP habitats in the region are scarce (Figure 55 and 56). Some counties have no habitat data. County datasets have, in general, higher precision and accuracy than the regional dataset. However, their currency is frequently low.

				Quality of existing data															
				Coverage				Currency				Precision				Accuracy			
	County	# Spp present	# Spp with data	unknown	low	medium	high	unknown	low	medium	high	unknown	low	medium	high	unknown	low	medium	high
Fungus	Suffolk	2	2	100%				100%				100%				100%			
	Essex	?	?																
	Hertf.	?	0																
	Norfolk	3	3	100%					66.7%		33.3%	33.3%		33.3%	33.3%	66.7%			33.3%
	Cambr.	?	0																
	Bedf.	?	0																
Lichens	Suffolk	3	3	100%				100%				100%				100%			
	Essex	?	?																
	Hertf.	?	0																
	Norfolk	3	3	100%					100%				100%			66.7%			33.3%
	Cambr.	?	1			100%			100%						100%				100%
	Bedf.	?	1	100%				100%				100%				100%			
Vascular Plants	Suffolk	11	11	100%				100%				100%				100%			
	Essex	?	?																
	Hertf.	6	6				100%		100%						100%				100%
	Norfolk	12	12	100%				41.7%	58.3%			58.3%		33.3%	8.3%	100%			
	Cambr.	11	8			100%		100%							100%			25%	75%
	Bedf.	4	4			75%	25%		50%	25%	25%			25%	75%				100%
Molluscs	Suffolk	5	5	100%				100%				100%				100%			
	Essex	?	?																
	Hertf.	?	0																
	Norfolk	5	5	100%					100%					100%		100%			
	Cambr.	?	1			100%			100%						100%				100%
	Bedf.	?	1			100%			100%					100%					100%
Beetles	Suffolk	?	1	100%				100%				100%				100%			
	Essex	?	?																
	Hertf.	?	1			100%			100%					100%					100%
	Norfolk	7	7	100%				42.9%	42.9%	14.3%		42.9%	28.6%	28.6%		100%			
	Cambr.	?	2	100%						50%	50%			50%	50%			50%	50%
	Bedf.	?	2	100%					100%			100%				100%			

Butterflies & Moths	Suffolk	2	2	100%				100%				100%				100%			
	Essex	?	?																
	Hertf.	?	0																
	Norfolk	?	1	100%				100%				100%				100%			
	Cambr.	?	1				100%		100%						100%				100%
	Bedf.	1	1	100%				100%				100%				100%			
Crustaceans	Suffolk	2	2	100%				100%				100%				100%			
	Essex	?	?																
	Hertf.	1	1				100%		100%						100%				100%
	Norfolk	1	1	100%				100%				100%				100%			
	Cambr.	?	1		100%				100%					100%					100%
	Bedf.	1	1				100%				100%				100%				100%
Amphibians	Suffolk	?	2	50%		50%		50%		50%		50%			50%	50%			50%
	Essex	1	1	100%					100%					100%					100%
	Hertf.	1	1				100%		100%						100%				100%
	Norfolk	3	3	33.3%	33.3%	33.3%		33.3%		66.7%					100%				100%
	Cambr.	1	1			100%			100%						100%				100%
	Bedf.	2	2		50%		50%	50%	50%			50%		50%		50%			50%
Birds	Suffolk	14	14	100%				100%				100%				100%			
	Essex	?	?																
	Hertf.	13	1				100%				100%				100%				100%
	Norfolk	15	15	86.7%	13.3%			20.0%	60.0%	20.0%		33.3%	60.0%	6.7%		100%			
	Cambr.	15	15				100%				100%				100%				100%
	Bedf.	15	15			100%				100%				100%					100%
Bats	Suffolk	2	2			100%			50%	50%					100%				100%
	Essex	2	2			50%	50%		50%		50%				100%				100%
	Hertf.	2	2				100%		50%		50%				100%				100%
	Norfolk	3	3	33.3%			66.7%		100%					100%					100%
	Cambr.	3	3			100%			33.3%	33.3%	33.3%				100%		33.3%		66.7%
	Bedf.	2	2	100%						100%		100%							100%
Other Mammals	Suffolk	6	6	100%				100%				100%				100%			
	Essex	5	3	66.70%		33%		66.70%			33%	66.70%			33%	66.70%			33%
	Hertf.	4	4		25%	50%	25%		75%		25%		25%	50%	25%			25%	75%
	Norfolk	4	4	50%		25%	25%		50%	50%				50%	50%	50%			50%
	Cambr.	4	4			100%		75%	25%						100%			25%	75%
	Bedf.	4	4			25%	75%			25%	75%			25%	75%				100%

Figure 54. Existing data for BAP species per taxonomic group and per county and its quality.

	BAP Habitats present	BAP habitats with extant data	Location of datasets	coverage of existing data				currency of existing data				Precision				Accuracy			
				unknown	Low	Medium	High	unknown	Low	Medium	High	unknown	Low	Medium	High	unknown	Low	Medium	High
Suffolk	19	11	SBRC	0	42.1	0	57.9	0	0	0	100	0	0	54.5	45.5	100	0	0	0
Essex	8	1	CC	0	87.5	0	12.5	0	100	0	0	100	0	0	0	100	0	0	0
Hertf.	15	3	HBRC	0	46.7	0	53.3	0	33.3	0	66.7	0	0	0	100	0	0	33.3	66.7
Norfolk	22	10	NWT	10	80	4	6	40	30	0	30	100	0	0	0	40	50	10	0
Cambr.	15	0	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x
Bedf.	13	0	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x
Region	26	15	NE	100	0	0	0	0	0	0	100	5.9	70.6	5.9	17.6	0	5.9	64.7	29.4

Figure 55. County and Regional BAP habitat datasets, their location and quality.

	Essex		Hertfordshire		Suffolk		Norfolk		Bedfordshire		Cambridgeshire	
BAP Habitats	**habitat present**	**extant data?**	**habitat present**	**extant data?**	**habitat present**	**extant data?**	**habitat present**	**extant data?**	**habitat present**	**extant data?**	**habitat present**	**extant data?**
Wet woodland			Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No
Lowland mixed deciduous woodland					Yes	Yes	Yes	Yes	Yes	No		
Lowland beech and yew woodland			Yes	No					Yes	No		
Lowland wood-pasture and parkland	Yes	No	Yes	Unknown	Yes	No	Yes	Yes	Yes	No		
Lowland meadows			Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No
Lowland calcareous grassland			Yes	No			Yes	Yes	Yes	No	Yes	No
Lowland dry acid grassland			Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Lowland Heathland	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No		
Fens	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No

Purple moor grass and rush pastures							Yes	No				
Reedbeds	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No
Coastal and floodplain grazing marsh	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No
Chalk rivers			Yes	No			Yes	Yes	Yes	No	Yes	No
Aquifer fed naturally fluctuating water bodies							Yes	No				
Eutrophic standing waters			Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Mesotrophic lakes							Yes	No				
Ancient and/or species-rich hedgerows	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Cereal field margins			Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Maritime cliff and slopes					Yes	Yes	Yes	No				
Saline lagoons	Yes	No			Yes	Yes	Yes	No				
Coastal sand dunes					Yes	Yes	Yes	No				
Coastal saltmarsh	Yes	No			Yes	Yes						
Coastal vegetated shingle					Yes	Yes						
Littoral and sublittoral chalk												
Mudflats					Yes	Yes						
Seagrass beds	Yes	No			Yes	No	Yes	No				
Other Habitats												
Traditional Orchards			Yes	Yes			Yes	Yes			Yes	No
Lowland Mixed Deciduous Woodland					Yes	Yes						
All habitats			Yes	Yes			Yes	Yes				

Figure 56. Existing habitat datasets per county.

4.3 Conclusions

Species data

Existing data covers a greater range of species including both priority species and common and widespread species.

Coverage of BAP species is deficient across the region. On average, there is no available data for almost 20% of BAP species present in each county.

The currency of the datasets is, in general, low but the datasets available have essentially high accuracy and precision. There is a considerable amount of data not yet in GIS format.

Most counties have a consistent database for most “important species” present in the county in one single location (LRCs). Essex has fragmented data in a number of organisations including Essex Field Club and Essex Wildlife Trust. The absence of an LRC has prevented a full assessment of Essex species data availability.

Habitat Data

Habitat existing data is extremely variable across the region. Some counties have had surveys of the entire county while others have almost no habitat data available. Thus, BAP habitats are differently covered across the region, with counties with a dataset for most BAP habitats present in the county and counties with no data for BAP habitats. At the county level, there are on average 57% of BAP habitats with nil coverage. For the existing datasets, currency, accuracy and precision are variable. There are regional habitat datasets for most BAP habitats (Natural England datasets); however their accuracy and precision are in general low or medium.

Site Data

Sites data is more complete across the region but its currency is variable. Coverage is higher for statutory sites than non-statutory. Existing data has both high accuracy and precision.

Site Quality Data

There is little site quality data available in the region outside of statutory sites.

General

Existing biodiversity data varies considerably across the region in terms of scope and data quality.

There are vast differences in existing data between counties. These differences are bigger for habitats and species data than for sites data. Data quality and format also vary between counties.

5 MISMATCHES BETWEEN DATA NEEDS AND EXISTING DATA

Conclusions drawn from the results

The results reported here indicate a significant mismatch between the identified biodiversity data needs and the existing data.

- This mismatch is present both in data scope (the needs are broader in scope than the data) and data quality (the need is for higher data quality than is currently available).

- The mismatch is greatest when considering habitat data, less for species data and least for site data.

- While there is an urgent need for high quality data for priority habitats, this is mostly lacking.

- For priority species, the same problem arises in some of the counties where the data is scattered or in a non-GIS format.

- The scope of available data for species is much broader than the stated requirements of the principal drivers. This difference amounts to thousands of species – there are extant records for many thousands of species in the region, but the scope of species that the drivers express an interest in is little more than a hundred species (note this will now be a higher number following the national BAP review). However it should be remembered that priority species can only be assessed in terms of decline and threat, which in turn can only be measured by monitoring a wider group than current priority species.

- Delivery of many of potential biodiversity indicators is not currently possible as the required data is not being collected or available consistently across the region.

Cultural mismatches

During conversations with stakeholder consultees and data providers we realised that there were other mismatches relevant to this work that could not be described through graphs and statistics. The following paragraphs attempt to describe our perception of this "cultural mismatch" and suggestions for generic actions to address it. These in turn lead on to the specific recommendations in section 8.

Our hypothesis is that few resources are flowing onto biodiversity monitoring because there is a lack of confidence among data users that the providers can deliver what they really need and a similar lack of confidence among the data providers that the users really understand the realities of biodiversity monitoring.

Our project is to build trust and understanding on both sides and thereby help to create a framework within which resources can begin to flow, real results get delivered, in turn releasing more resources.

Our observation is that key potential data users, especially those in regional bodies and local authorities not directly connected with the biodiversity business, are somewhat bemused by what they see as a rebuff when they ask for high quality biodiversity information. They find it difficult to understand why biodiversity information cannot be obtained through a few keystrokes on the computer systems of data providers, as social and economic information tends to be from practitioners in those sectors. They often fail to appreciate that biodiversity has orders of magnitude more variables in time and space than, say, crime statistics or productivity. They see references to large volumes of data, but rarely can any of it seem to produce the trend information they are looking for, or clear relationships between the biodiversity resource and policies. They struggle to recognise that biodiversity monitoring questions need to be precisely asked many years before the answers are required. They question why it is that the statutory agencies involved in nature conservation do not require all the same answers themselves, so leaving others merely to ask for copies. They often fail to see that they need to contribute resources to collective effort that will answer these new questions through robust systems over a period of time.

On the other hand we see data providers, especially in Local Records Centres, struggling to keep pace with the new demands that authorities seek to place on their data. Anxious to please, but rarely entirely succeeding, they offer the best analyses possible from the plethora of data available from voluntary and professional biological recording that has been undertaken for a wide variety of purposes, few of them monitoring. They often find it sufficiently challenging to harmonise these various activities at the county level, perceiving collective regional approaches as a desirable but onerous new level of complexity. Some, quite recent converts to a full user-led business approach, have little experience in finding out what their users want and designing a service to provide it. And when they try, they often discover a lack of clarity among the users in specifying their needs.

We see these issues on both sides, which can be described as almost cultural, as the main barriers to progress in this area. The potential solutions are challenging but clear.

1. The principal data users should invest more energies in gaining an overview of the complexities of biodiversity monitoring. This will help them frame their questions more clearly, with greater probability of receiving satisfactory answers.
2. The data providers should facilitate this process by explaining their business in clear, non-specialist terms.
3. The users similarly need to understand the long lead in times required for biodiversity monitoring; for example investing resources in a robust baseline developed over three years, followed by monitoring against it for the following decade is a sensible approach.
4. Data providers can facilitate this thinking by setting out clearly costed options that recognise that steady resourcing over a period of time is more realistic than stop-go investment.
5. Data providers should avoid confusing the story by process-related issues internal to the business (e.g. relationships between agencies, NGOs and volunteers). They need to communicate more effectively between themselves across the region, adopt common standards and present a united and professional service to the

users. The options need to be clear about relationships between cost and data scope and quality, so that commissioning partnerships know what they can expect with defined levels of budget.

6. Users should give more thought to their requirements, both as single organisations and collectively in partnerships. It is absolutely clear that biodiversity monitoring is both required and resource intensive, and good results will only be realised through pooling resources in partnerships. This means that each participant may need to compromise a little on specification, although the results of this project suggest that most requirements are held in common. In each case decisions need to be made on which aspects of data scope and quality are non-negotiable as opposed to others that might be adjusted. Partnerships tend to be difficult and energy sapping. Monitoring requires long lead in times. These two facts put together probably explain why the approach we are recommending here has never been done before.
7. Our overall approach therefore comprises complementary efforts at local and regional levels that support each other for the benefit of many different organisations and drivers The Biodiversity Forum needs to make a decision on whether the goal is sufficiently attractive to merit the investment of new energies.

6 INDICATORS

The indicators analysed require data of the four biodiversity categories chosen in this study – sites, site quality, habitats and species. Some indicators such as most of the Regional Environment Strategy Indicators and the Local Performance Indicators have a clear straightforward statement on how they're measured. However for other indicators it is unclear how they can be generated. Another problem is that the exact data required for the indicators is often not stated. For example, the Local Development Framework core output indicator requires to evaluate changes "in areas and populations of biodiversity importance" without defining the scope/ coverage needed for those assessments.

The results presented in previous sections clearly show that there is a lack of data to report on all these indicators and that a strategy for dealing with them consistently across the region needs to be put in place.

RENVS Indicator	Type of data required	Type of indicator (Biodiversity only)
Number and % of regional strategies including biodiversity benefits	Not biodiversity data	
% area of SSSIs destroyed, part destroyed, or in favourable condition	Site quality	Contextual
Area or number of locally important wildlife sites	Sites	Contextual
Achievement of regional and local BAP targets	Habitats, species	Outcome
% area of farms with Countryside or Arable Stewardship or ESA Agreements	Not biodiversity data	
Hectares in the region covered by large scale habitat creation	Habitats	Output
Flow in rivers and/or ground water levels	Not biodiversity data	
Number and % of local authorities with guidance for developers on biodiversity	Not biodiversity data	

Figure 1. Regional Environment Strategy Indicators and type of data required for each of them.

Library of Local Performance Indicators	Type of data required	Type of indicator (Biodiversity only)
Status of the local authority's contribution to the LBAP process;	Not biodiversity data	
Percentage of local authority owned and managed land, without a nature conservation designation, surveyed to identify presence of and opportunities for maintenance and or enhancement of biodiversity;	Not biodiversity data	
Percentage of local authority owned and managed land, without a nature conservation designation, managed for biodiversity;	Not biodiversity data	
Land designated as a SSSI within the local authority area;	Sites	Context
The percentage area of all land designated as SSSI which has been assessed, and found to be in favourable or unfavourable recovering condition: (a) in total and (b) by BAP broad habitat type.	Site quality	Context
Exercise of the local authority's planning function to protect SSSIs from development pressures: net loss of SSSI land to development planning.	Sites	Outcome
Percentage of the area of SSSI owned or managed by the local authority, assessed as favourable or unfavourable recovering condition: (a) in total and (b) by BAP broad habitat type.	Site quality, habitat	Outcome
Area of Local Nature Reserve (LNR) per 1,000 population (ha).	Sites	Context

Figure 2. Library of Local Performance Indicators and type of data required for each of them.

Regional Spatial Strategy Indicators	Type of data required	Type of indicator (Biodiversity only)
Regional stock and condition of Ramsar sites, Special Protection Areas, Special Areas of Conservation, National Nature Reserves and Sites of Special Scientific Interest (SSSI).	Sites, Site Quality	Context
Progress against East of England Biodiversity Targets	Habitats, species	Outcome
RSS Draft Monitoring Framework		
30 Areas and populations of biodiversity importance - New Core Output Indicator	Habitats, Species	Context
31 Condition of SSSIs, SACs, SPAs – In AMR, Significant effect.	Site quality	Context?

Figure 3. Regional Spatial Strategy Indicators and type of data required for each of them.

Local Development Framework core output indicator	Type of data required	Type of indicator (Biodiversity only)
Change in areas and populations of biodiversity importance, including:(i) change in priority habitats and species (by type); and (ii) change in areas designated for their intrinsic environmental value including sites of international, national, regional, sub-regional or local significance.	Sites, habitats, species	Context/ significant effects (see below)

Figure 4. Local Development Framework core output indicator and type of data required.

Species as biodiversity indicators

Biodiversity indicators need to fulfil a number of criteria. First, they need to be used across the region, thus they should occur in every LDF area. They also need to be known to be affected by development. Furthermore, if they are to be used consistently, it is desirable that high quality datasets are available, that they respond quickly to development and management practices and that they have a high nature conservation importance. In Figure 61 we test the possibility of using certain species or groups of species as indicators by analysing their fit against these criteria. Figure 62 depicts the quality and format of the data available for BAP bats and for great crested newts in the six counties. Although coverage is variable across the counties, the available data is in general of high precision and accuracy.

	Criteria	Bats	Otter	Water vole	GC Newt	Farmland birds	Butterflies
Essential	Occurs in every LDF area	Yes	No	No	Yes	No	Yes
	Known to be affected by development	Yes	?	?	Yes	Yes	?
Desirable	High quality existing data	Yes	Yes	Yes	Yes	Yes	Not for the whole region
	Responds fairly quickly	Yes	Yes	Yes	Yes	Yes	Yes
	High nature conservation importance	Yes	Yes	Yes	Yes	Yes	Yes

Figure 5. Summary of the adequacy of some species/ groups of species against indicators criteria used.

	County	Species present	Extant data?	Location of dataset	coverage	currency	precision	accuracy	format
Pipistrelle pipistrelle	**Suffolk**	Yes	Yes	SBRC	26-50%	1-25%	High	High	Gis
	Essex	Yes	Yes	EFC	76-94%	1-25%	High	High	Non-Gis
	Hertf.	Yes	Yes	HBRC	95-100%	76-94%	High	High	Gis
	Norfolk	Yes	Yes	NBRC	76-94%	1-25%	Medium	High	Non-Gis
	Cambr.	Yes	Yes	CPBRC	26-50%	26-50%	High	High	Gis
	Bedf.	Yes	Yes	BBC	?	51-75%	?	High	?
Barbastella barbastellus	**Suffolk**	Yes	Yes	SBRC	26-50%	26-50%	High	High	Gis
	Essex	Yes	Yes	EFC	26-50%	95-100%	High	High	Non-Gis
	Hertf.	Yes	Yes	HBRC	95-100%	0%	High	High	Gis
	Norfolk	Yes	Yes	NBRC	95-100%	1-25%	Medium	High	Non-Gis
	Cambr.	Yes	Yes	CPBRC	26-50%	76-94%	High	High	Gis
	Bedf.	Yes	Yes	BBC	?	51-75%	?	High	?
Rhinolophus hipposideros	**Suffolk**	No							
	Essex	No							
	Hertf.	No							
	Norfolk	Yes	Yes	NBRC	?	0%	Medium	High	Non-Gis
	Cambr.	Yes	Yes	CPBRC	26-50%	0%	High	Low	Gis
	Bedf.	No							
Triturus cristatus	**Suffolk**	Yes	Yes	SBRC	26-50%	26-50%	High	High	Gis
	Essex	Yes	Yes	RDS	?	1-25%	Medium	High	Gis
	Hertf.	Yes	Yes	HBRC	76-94%	1-25%	High	High	Gis
	Norfolk	Yes	Yes	NWT	51-75%	26-50%	High	High	Gis
	Cambr.	Yes	Yes	CPBRC	51-75%	1-25%	High	High	Gis
	Bedf.	Yes	Yes	BNHS	1-25%	1-25%	Medium	High	Non-Gis

Figure 6. Data quality for BAP bats and for Great Crested Newts datasets in each county.

7 THE STAKEHOLDERS WORKSHOP

7.1 Workshop aims

The main objective of the workshop was to explore whether there is an opportunity to move towards a matching of requirements and data provision. This could involve:

1. Critical examination of the stated requirements by user organisation representatives to assess whether lower specification data might meet their needs. If so, would this be in data scope, coverage, currency, precision or accuracy? What are the implications both of continuing to fail to get the data required and of changing the situation to facilitate improved data provision?

2. Critical examination of the current data to assess whether it will be possible, with reasonable resources, to raise the scope and quality of data provision. If so, what improvements could be made, with respect to data scope, coverage, currency, precision and accuracy? Should there be a shift in priorities to seek to meet the identified needs? What are the implications?

3. Can different approaches such as sampling and modelling be considered for a number of data needs? For which biodiversity groups could these approaches be used?

7.2 Workshop results – attendees views and comments

General comments

While there was general acceptance that the prioritised list of drivers was accurate, other drivers such as invasive species or climate change may also be important.
Who is financing data collection? Should the data needs of drivers that provide funding be prioritised?

First discussion session – Matching delivery to needs

Discussion group 1

Do we need to be more specific about data needs for individual species, rather than groups of species?
Do we need to record all species that are the subject of SAPs (Species Action Plans)?
Can we reduce requirements?
There is generally not enough funding to collect data needed. Some important drivers bring no funding with them, so how realistic can their requirements be?
Can we reduce the number of things to monitor?
Can we reduce the quality of data needed (precision and accuracy)?

Can we focus only on RDB, etc?
How far should we go to follow drivers' "fashions"? Data collection and monitoring are long term activities and there is a risk that priorities will be diverted by short term needs.
Can we use indicators or proxies to prioritise data collection?
Can we lower the update frequency of data?
Local Records Centres (LRCs) can to some extent choose what they actually record and use funding to fill the gaps in the data. Because LRCs depend on volunteers to collect data, they can't always choose what data is collected but they can prioritise which data is entered into databases and GIS.
Priorities accorded to habitat data may be reflecting current need (because of lack of data), but we shouldn't downplay requirements for species data.
Precision – older collectors are usually not GPS smart.
There is an urgent need to encourage younger recorders.
There may be scope for regional projects to fill the gaps that are evident at county level (e.g. A regional marine project funded by European fishing fund)

Discussion group 2

The data presented has been combined for analysis purposes – it is an average view that risks missing important mismatches (e.g. sites data seems very complete but is not, especially for local wildlife sites).

Most data is coming from designated sites while we need data in general for given habitats.

Delivery of data can be improved by, for example, standardization of product across LRC's.

Funding must match data needs – the gaps between existing data and needs are generally there because some drivers are not bringing funding with them.

Discussion group 3

A 5-year data update time scale may be unrealistic/ not feasible – in the spirit of reducing specifications to make them more achievable, maybe 10-yearly could be acceptable.

There are important differences between strategic, pro-active survey and monitoring approaches on the one hand and reactive approaches on the other. Different data needs lend themselves to different approaches.

While the emphasis on current data is correct, historical data can also be a useful trigger for further survey.

Aerial photo interpretation can be used to fill some habitat data gaps although field survey is essential for some habitats.

Would more data help action for species in advance of population crashes?

Condition data (site quality, habitat quality) is vital and rising in importance.

We should influence current data collection procedures so that we may answer questions in the future.

Discussion group 4

The results indicate a clear need to prioritize specific data needs (e.g. certain species, not all BAP species).

Do indicators indicate anything meaningful? How can we know that? Aren't they chosen according to fashions? Real datasets are needed for most purposes.

Changes in data needs are fashionable – if we're selective in data collection now, there is a risk that new species become priority species and we were disregarding data on it previously.

It is not easy to keep long-term datasets.

Some drivers do not provide the necessary funding to meet their needs. However, there could be partnerships between organizations that need data, as their data needs seem to be similar. This would be an important output of this project.

Second discussion session - *the 3 methods approach and indicators*

Statutory Agencies Group
This group agreed that it wasn't necessary to collect complete data on all biodiversity resources. In principle it accepted the suggested approach of mixing the 3 methods – complete survey, sampling and modelling.

LRCs Group

This group expressed interest in the recommendations but had some questions about how modelling would work out in practice:
Is a model robust enough to deliver the data required by so many of the drivers?
What if the data available for a species represents sub-optimal habitats and this distorts the model output?
How are the variables in the models collected?
How much does it cost compared with direct survey and sampling methods?

Local Authorities Group

Modelling may be useful for several drivers but there will be situations where raw data will be needed.

How will some outputs of modelling be used for mapping change over time?

LBAP Group

This group recognised that modelling may be useful for LDF, EIA, Development control, Habitat Regs esp. coastline), habitat creation and to map biodiversity hotspots.
Some habitats may be modelled better than others.
Modelling is already used for some habitats – e.g., hedgerows.
Remote sensing could be used in addition to modelling.
Could we select for some BAP habitats that can be Aerial Photo interpreted to start having consistent datasets across the region?
Questions on modelling costs, implications for LRCs and coordination body.

7.3 Main conclusions from the workshop

Funding doesn't match data needs – data needs must be more realistic and also more specific.

There could be partnerships between organizations that need data at the regional level, as their data needs seem to be similar.

The three methods approach may be a way forward – sampling or sampling and modelling may be used to fulfil data requirements for several drivers. There is a need to work out the details of which needs could be met by this approach and the method of delivery.

However there are several questions from the workshop attendees about model use, robustness, quality, costs and expertise needed to use them.

Aerial Photo Interpretation and remote sensing might also be used to fill the gaps for habitat data.

8 RECOMMENDATIONS

1. The Biodiversity Forum establishes a Biodiversity Information Group to act as a partnership to commission projects that will deliver common information needs across the region.

Rationale. This is a natural consequence of the striking finding in this project that almost all biodiversity information needs across the leading drivers and organisations are identical (see section 3). No one organisation has the resources to fund all of its own needs; working in partnership for collective effort has the potential to deliver most needs (see page 43). The common information needs can be defined by the group based on this report, prioritised, clearly stated and revised as needs change over time.

It is important that the proposed Biodiversity Information Group has strong professional advice from the Local Records Centres in the region (see section 5). This is essential to improve communication and mutual understanding of needs and technical constraints.

However the LRCs should also network with each other separately (see recommendation 4) to work towards common standards and meeting data scope and quality needs consistently across the region.

The Biodiversity Information Group itself must include the key national and regional players responsible for the processes that require biodiversity information – including Natural England, Regional Assembly, Regional Development Agency, Environment Agency, Forestry Commission, Wildlife Trusts as well as representation from planning authorities responsible for Local Development Frameworks.

Both the Biodiversity Information Group and the Regional LRC Group could operate as sub-groups of the Biodiversity Forum.

Using an existing group to take this role was rejected as an option because other candidate groups either do not have the high level representation required or are fully committed to other business. This group only needs to meet infrequently, perhaps twice a year, but needs to be focused on partnership information needs and commissioning projects.

Costs: the Biodiversity Information Group itself would require minimal extra resource as the staff time would be contributed by organisations represented. The costs of commissioned projects would clearly depend on the scope of the agreed projects. These costs would be subdivided across the partnership on a basis to be agreed by the group.

2. Every local planning authority in the region, supported by its Local Records Centre and the Regional Biodiversity Information Group, adopt the same LDF biodiversity indicators for Annual Monitoring Reports. These local indicators should then be aggregated up to form a robust regional biodiversity indicator for the Regional Spatial Strategy.

The indicators are:

- BAP habitats – changes in extent
- Bats
- Great Crested Newts

Rationale. Local Planning Authorities must report annually to central government on the success of their planning policies in Local Development Frameworks. Biodiversity data is by definition collected at local level. Regional indicators are only possible if data on the same subject is collected consistently across the region, using standard recording strategies. Bats and Great Crested Newts are the only species that fulfil the criteria of occurring in every LDF area; being known to be affected by development; high quality datasets being available (see Figure 54 and Figure 62 for county breakdown); responding quickly to development and management practices; and having a high nature conservation importance. Detailed considerations of the potential application of these indicators are provided in section 9.1.

This would be an interim indicator for use over the next five years. It does not meet the full requirements of the national core output indicator (see section 6), but no other indicator appears to be deliverable at present. This is because the existing data for most other BAP species is absent or poor quality, or too inconsistent across the region (see Figure 54). In five years the implementation of other recommendations in this report should enable the delivery after that date of a more comprehensive and robust indicator.

The selection of these indicators will contribute to other biodiversity information needs, including development control, BAP reporting and EIA. Changes in BAP habitat extent should be capable of monitoring through the BAP reporting process, through the linkage of text based reporting of habitat change in BARS to GIS in LRCs, and, critically, the Habitat Data Custodianship arrangements recommended to English Nature by SW LRCs (2005), now under consideration by Natural England. (See section 9.1 for detail on the indicators).

Individual local planning authorities could opt to include additional biodiversity indicators if they wished, provided they included the three elements recommended here (assuming the authority area has BAP habitat, bats and Great Crested Newts present).

Other options for indicator development were rejected. Allowing local selection of the most appropriate indicator would make any composite indicator at regional level meaningless, and fail to take opportunities of synergies between monitoring programmes across local authority boundaries. For example in some cases the same group might implement the monitoring for a species across all of the planning authority areas in a county, or even across neighbouring counties.

Costs: These will vary widely between local authority areas with variables such as size, proportion of BAP habitat, development pressure, coverage by existing survey and monitoring programmes. The costs at local level should be carried by the local authority as the information is required for LDF Annual Monitoring Reports. The costs at regional level, representing a proportion of the costs of the regional unit (see recommendation 4

below) should be carried primarily by the Regional Assembly as the indicator is required for the Regional Spatial Strategy.

3. The six Local Records Centres work with other data providers to meet the collective expressed customer requirements of the organisations needing biodiversity information, through a targeted programme which combines:

- **Comprehensive resource monitoring around the highest biodiversity and spatial priorities (see example in section 9.3).**
- **Sampling of other biodiversity.**
- **Modelling to predict occurrences of species and habitats where they have not yet been recorded and for targeting new survey (see section 9.4).**

Rationale. This recommendation is a potential solution to the key finding that there remains a significant gap between the biodiversity information needs of users on the one hand and the available information on the other (see section 5). Resources are not flowing at present largely because there is a lack of confidence on both sides that the gap can be bridged. Through this project users have started to recognise the need to lower their sights a little in order to get something useful achieved (see section 7.2 - workshop results). LRCs have also recognised the need to develop common standards across the region so that their valuable products at local level can also be used at the regional level.

The approach recommended here is quite new in this field, although not new at all in wider fields. It is complex in its combination of subject and spatial targeting. It requires new thinking and new skills to apply successfully. It seems capable of bridging the gap and, if its potential to deliver that is recognised, could release resources.

The rejected option here is business as usual. This would result in a continuing unbridgeable gap between user needs and available data, minimal additional resourcing and large amounts of professional and volunteer energy producing very little in terms of reporting on biodiversity changes.

Costs: This recommendation represents in part a re-focusing of strategic priorities for Local Records Centres that should be seen to be in their best interests in terms of business planning. With good management it should result in securing of further resources from local partnerships. The statistical and modelling expertise required is envisaged from a new regional unit (see recommendation 4 below) which will need to be primarily funded at regional level.

4. Local Records Centres develop their capacity to act collectively at regional level in the following areas:

- **Regional liaison point to collect data from LRCs and national, regional and local organizations**
- **Synthesis of data collecting and collation approaches between local and regional levels, such as the proposed LDF and RSS indicator.**

- **Development of standard methodologies across the six LRCs, leading to standard format data (see section 9).**
- **Statistical expertise for sampling programmes.**
- **Modelling expertise for modelling probable occurrences of species and habitats where they have not yet been recorded**
- **Regional liaison point between national/regional organisations with biodiversity information needs and the LRCs.**

Rationale. It is clear that some datasets need to be delivered to users at the regional level, and that these datasets need to have some region wide consistency. This can only be achieved by agreeing and adopting standard methods and recording strategies. Similarly the new processes identified in recommendation 3 are the same in each LRC and the work in addressing them is most efficiently organised collectively.

The rejected option is to try to do all this separately on a county basis. This is unlikely to happen because not every LRC will find the capacity to do it, and implementation will be at best very uneven, defeating the purpose. It would also be highly inefficient with the same issues being tackled six times instead of once.

Costs. This depends on how it is approached. The lowest cost option, of relying on existing staff in each already over-committed LRC, is unlikely to deliver for the reasons above. See also recommendation 5.

5. A regional unit is established to support the LRCs in the implementation of recommendation 4. The regional unit could comprise a member of staff or consultancy support and would be attached to one of the LRCs.

Rationale. Data is spread across numerous organisations and the connection and diffusion of information between them is not always straightforward. Moreover, the resources and expertise needed for the sampling and sampling plus modelling approaches are mainly the same across the region. Having one regional unit would: i) improve knowledge of and access to data; ii) reduce costs; and iii) improve modelling results.

Costs: An initial budget of £30,000 - 40,000 p.a. should secure the necessary human resources through whichever route is preferred by the Biodiversity Forum/ Biodiversity Information Group. It is important that this resource requirement should be sourced at national or regional level and avoid any competition with resources at county level; the latter must be focused on LRC development within the county, especially in the two counties in the region where the current LRC capacity level is below the nationally recognised minimum requirement. Furthermore the regional unit will only be effective if it is able to interact with six fully functioning Local Records Centres.

9 TOOLS FOR STANDARD DATA COLLECTION AND USE ACROSS THE REGION

a. Biodiversity Indicators

Potential Biodiversity Indicators for use in Local Development Framework Annual Monitoring Reports

Background

Planning authorities have a new requirement under the new planning process – to report to government (DCLG) on the impact of the Local Development Framework policies in an Annual Monitoring Report. Planning authorities have started to look to LRCs around the country to meet this new requirement in respect of biodiversity. Responses currently generally are inadequate and very variable, with no standard approach. SERC was asked by the East of England Biodiversity Forum to look at indicators and available data and to make recommendations for a better approach. Our thinking potentially has general applicability across England.

Our proposal

The national core output indicator for biodiversity in relation to LDFs, contained in national guidance, is:

> Change in areas and populations of biodiversity importance, including:(i) change in priority habitats and species (by type); and (ii) change in areas designated for their intrinsic environmental value including sites of international, national, regional, sub-regional or local significance.

Biodiversity indicators need to fulfil a number of criteria. First, they need to be used across the region, thus they should occur in every LDF area. They also need to be known to be affected by development. Furthermore, if they are to be used consistently, it is desirable that high quality datasets are available, that they respond quickly to development and management practices and that they have a high nature conservation importance. Using these criteria and analysis of available data across the East of England region, we propose the use of three indicators centred around

- Bats
- Great Crested Newts
- BAP Habitats

Our indicators are proposed as an interim solution that goes some way towards meeting the full core output indicator, but is deliverable in the short term. In the medium term it could be expanded to take in more BAP species and perhaps habitat quality.

The recommendation in the East of England is that every local planning authority in the region, supported by its Local Records Centre and the Regional Biodiversity Information Group, adopt the same LDF biodiversity indicators for Annual Monitoring Reports. These local indicators should then be aggregated up to form a robust regional biodiversity indicator for the Regional Spatial Strategy.

We believe that they can be achieved through a combination of existing survey and monitoring effort and new supplementary monitoring activity.

Existing survey and monitoring activity includes:

Bats

- Local Bat Group survey and monitoring
- National Bat Monitoring Programme (NBMP) (see Annex 5)
- Consultants' survey and monitoring
- Local Records Centre strategic monitoring and support

Great Crested Newts

- Local Reptile and Amphibians Group survey and monitoring
- National Amphibians and Reptiles Recording Scheme (NARS) (see below)
- Consultants' survey and monitoring
- Local Records Centre strategic monitoring and support

BAP Habitat

- County or sub-county level habitat survey, through local authorities and/or LRCs, using Phase 1 / IHS
- Consultants' habitat survey
- Natural England strategic survey and monitoring/ BAP Habitat Inventory updates

Issues to be resolved

1. The precise nature of the metric.

The options for species records include:

- Presence/absence at a defined precision level
- Populations
- Number of viable populations

For bats the options include
- maternity roosts,
- hibernacula,
- flight records or
- combinations of these record types

For great crested newts the options include

- counts
- breeding adults
- breeding sites
- occupied sites

The options for BAP habitat include extent or some measure combining extent and connectivity/ patch size. The potential use of thresholds (e.g. ignore changes less than 0.1 ha in patch size) should also be decided.

2. The degree to which methodologies should be prescriptive.

Bat survey and monitoring methodologies are evolving rapidly with technological advance.

There is a nationally agreed methodology for great crested newts as part of NARS (See Annex 4) but not all practitioners use it for all the purposes for which one might survey for newts. There may be other less costly and effective methods for locating breeding great crested newts. Modelling could be used to target monitoring effort.

For habitats IHS is not yet universally used across the UK. Translation from other habitat classifications can lead to data inaccuracies that outweigh any habitat change over time.

Ad hoc records and data collected using a mixture of methodologies will be of little use to populate the indicator. However this data can be used as a basis for targeting strategic monitoring.

3. The degree of linking with definite gross change events affected by the planning process.

There are subtle interpretations of the guidance that need to be considered in relation to the Core Output Indicator. Should the scope of the indicator be restricted to the direct effects of planning decisions? Arguably, the scope of the new planning process in terms of being broader and including positive action as well as constraining the negative, should indicate the wider interpretation. The inclusion of the Regional Biodiversity Map in the RSS, the need for LDFs to be consistent with the RSS and the inclusion of BAP target indicators in both the RSS and the Regional Environment Strategy, all support the wider interpretation.

If monitoring focuses on events where gross changes may occur (e.g. development over a pond occupied by great crested newts, habitat creation through BAP action) what about other changes occurring elsewhere in the planning authority area? Is it safe to ignore these in the absence of a comprehensive resource monitoring programme? What about metapopulations?

It may be best to approach this by offering a twin-track indicator that combines a context statistic (e.g. Great Crested Newts throughout the area) and a significant effects statistic (e.g. Great Crested Newts in areas directly affected by development). The former can be assessed through a sampling-based monitoring methodology. The latter will require

monitoring over a number of years before and after the development takes place – the type of monitoring that is sometimes stipulated by planning conditions or S.106 agreements, and arguably, should be standard practice in all cases where development is approved that could affect a European protected species. This would require collaboration between planners, the local authority ecologist, consultants employed by the developer, and the Local Records Centre.

Consultants already engaged in such monitoring are generally supportive of adopting standard methodologies and of depositing the results in a centralised system so that all practitioners can benefit from the collective experiences (IEEM conference, Ecological Impact Assessment, Bath Spa University, July 2006). They recognise that LRCs are the most appropriate places to deposit their data. What is currently lacking is standard guidance for the complete methodology/ data flow system that all consultants should use. There may be an opportunity to progress this through IEEM/ ALGE, once the 1App standard planning application system is introduced in October 2007.

Tools that support habitat monitoring

- BioPlan. The automated system that screens planning applications against biodiversity data held by Local Records Centres. Developed by SERC and applied in Somerset and now Kent. Shortly to be made available to LRCs nationally. Has the capability of highlighting locations where BAP habitats may be affected by development. Local authority ecologists can use the system to track case outcomes, both habitat loss and gain of habitats through mitigation. This information can be fed back to LRCs for GIS capture of changes in BAP habitat extent.

- BARS – Biodiversity Action Reporting System. Online database reporting system for players in national and local BAPs. Local biodiversity partnership networks should capture information on deliberate BAP habitat creation / restoration. Could be linked to GIS of BAP habitats in LRC, recording change in BAP habitat extent.

- IHS – Integrated Habitat System (see section 9.2).

As with species a twin-track context and significant effects approach might be the most rigorous solution to BAP habitat change monitoring. The context indicator could be achievable through assessment of randomly selected small areas (e.g. 0.25ha) on digital aerial photos of two dates e.g. 2008, 2013 and mapping changes in IHS habitat. The scope would need to be restricted to those BAP habitats that can be reliably interpreted from aerial photos without ambiguity and without the need for field survey. A large number of random squares could be sampled on this basis at relatively low cost, the number needed being determined by statistical analysis of variance. However the proposal relies on aerial photos being available, and five yearly rather than annual is probably the greatest currency achievable. Retrospective assessments would also be possible e.g. comparing 2008 with 2003, if the earlier photographs are available. Annual updates would rely on case specific reporting as described in the sections on BARS and BioPlan.

Resources that could be used to contribute

- LRCs
- Local Bat Groups
- Local HERPS groups
- BCT
- HCT
- Consultants feedback through IEEM standard procedure
- ALGE
- Local Biodiversity Partnerships
- Local SAPs and HAPs working groups
- Regional Biodiversity Partnerships

Wider benefits

Collecting more systematic data for these biodiversity resources will have the following benefits in addition to the immediate purpose of the LDF AMR indicator:

- RSS indicator at regional level. The inclusion of the Regional Biodiversity Map in the RSS, the need for LDFs to be consistent with the RSS and the inclusion of BAP target indicators in both the RSS and the Regional Environment Strategy, all support the wider interpretation.
- Development control biodiversity assessment
- BAP monitoring and delivery. Changes in BAP habitat extent should be capable of monitoring through the BAP reporting process, through the linkage of BARS to GIS in LRCs, and the Natural England proposals for Habitat Data Custodianship through LRCs.
- EIA

A modelling approach to Great Crested Newt monitoring

Great crested newts' distribution is correlated with number of ponds and geology. Other variables are probably important (e.g., surrounding habitat, pond area, etc). Modelling has been extensively used elsewhere for amphibian populations and generally gives good results. With modelling, it should be possible to detect ponds with a high probability of having GCN populations so that surveys can then be targeted.

After selecting the ponds to survey using modelling, a sampling strategy as the one developed by NARS could be followed. NARS engaged in a wide consultation process, talking to professional surveyors, academics and volunteers, inviting suggestions for procedures to follow and key data to collect during amphibian pond surveys (see below).

One to three visits to each pond during the GCN breeding period should be enough to determine GCN presence/absence.

The structure of amphibian populations in breeding ponds is usually fragmented and interconnected and may be described as metapopulations with successive extinction and colonisation events of single ponds. Although this will hamper the study of single populations' extinctions, it does allow trends to be detected in those metapopulations (as number of breeding ponds in use per year). Moreover, many amphibians display an enormous site fidelity; if that is the case with GCN, than a monitoring programme would potentially work very well.

Amphibians are very sensitive to habitat changes in both terrestrial and aquatic habitats and environmental factors; for these reasons they are likely to be be very sensitive to climate change as well. They are now considered the most threatened group among all vertebrates (IUCN red list, 2004). Monitoring GCN in the whole Eastern England region would provide a good dataset for future analyses.

Monitoring Bats

Bats show high feeding site fidelity within certain times of the year. Field transect surveys (as defined in the National Bat Monitoring Programme – see Annex 5) can be used at feeding sites. These surveys can be extended to a large sample. There is also potential to use vehicle-borne time expansion detectors and subsequent analysis of sonograms, a technique piloted by BCT successfully in Ireland and now being tested in England including Somerset.

Presence /absence data on bats is fairly available for the region and can be used to target these surveys. This method has been shown statistically robust - JNCC has been analysing data on the national bat monitoring scheme and has been able to detect changes to bat populations. As a complement, known roost sites, especially those located in areas with high development pressures, can be monitored. These would be specially useful to monitor bat species that are difficult to register in the field transects (e.g. horseshoe bats).

Bat monitoring requires high levels of expertise and expensive equipment (e.g. time expansion bat detectors); thus an investment would be required. However this investment should assure that a continued monitoring programme could be established.

Local Area Agreement Draft Biodiversity Indicator

Published by DEFRA for piloting purposes on 29 June 2007:

The indicator would be calculated as a simple percentage of sites (based on a representative sample within the administrative area of the Local Authority) where a positive biodiversity outcome has been delivered within the reporting period.

[The implications of this newly published draft indicator have yet to be determined. The relationship between this LAA indicator and the LDF AMR core output indicator is unclear. SERC has been invited by Defra to a meeting on 9 July to discuss the above – feedback will be included in the final report in mid July.]

b. IHS (Integrated Habitat System)

The Integrated Habitat System is a comprehensive framework for habitat mapping and monitoring habitat change using GIS. Developed by SERC in consultation with the nature conservation agencies over a five year period it is now in use in many parts of the UK. IHS includes BAP priority habitats in a hierarchical structure that links them with biodiversity broad habitats, Annex 1 habitats of the Habitats Directive and other categories commonly used in the UK. The full terrestrial and marine classification allows rigorous habitat mapping across and between organisations.

IHS has been used recently in the South East of England in a joint effort of all LRCs to produce a regional map. Existing county datasets in different formats and in different habitat classifications have all been translated into IHS and combined in a regional dataset has been produced. Having all habitat information combined in one single map has brought numerous benefits for the region not only in allowing for better data management and analysis to produce reports and statistics but also in attracting further resources for improving data quality.

Use of IHS allows for analysing data and data gaps across the region and simplifies data management. It has considerable advantages of synergy with local and regional BAP programmes, other monitoring initiatives linked to BAP, priority habitat inventory updates and LRC habitat mapping.

c. Example of application of subject and spatial prioritisation to habitat surveys

This is an example of a partnership commissioned regional biodiversity information project that might be considered by the group set up under recommendation 1. The precise scope, spatial targeting and specifications would need to be drawn up on a much more detailed basis in reality.

There are 462 habitat categories in IHS (Integrated Habitat System) Version 2.
All places have habitat. East of England region is around 1.9 million hectares.
The mean size of IHS habitat polygons in SE England is around 5 hectares.

A complete IHS habitat map of the region would therefore have around 380,000 polygons.

Some drivers require information on all habitats but only in some places.
Other drivers require information on only some habitats but everywhere they occur.
Most drivers stated that they need their habitat data made current (brought up-to-date) every 5 years. With lowering of specifications the drivers might accept a ten yearly programme.

If there was no subject and spatial prioritisation a continuous rolling programme of habitat monitoring would therefore require survey of 38,000 habitat polygons per annum. At an approximate cost of £5/polygon (API and targeted field survey methodology, bearing in mind the relatively high proportion of semi-natural habitat to be surveyed) this would cost £190,000 p.a.

With spatial targeting:

Only 33% of region where complete resource monitoring required. (Commissioning group selects the 33% using criteria such as the Regional Biodiversity Map, areas subject to high development pressures.)

= £62,700 p.a.

With subject targeting:

Only BAP and LBAP habitats require complete resource monitoring across the whole area – c100 of the 462 IHS categories, representing 15% of the region. A third of this has already been picked up in the spatial targets. Further 10% of region needs monitoring = 3800 polygons @ £5.

= £18,810 p.a.

Total targeted habitat survey cost = £81,510 p.a.

Subject and spatial targeting has reduced the cost by c.57% from £190,000 p.a. to £81,510 p.a. while still delivering most organisations' needs for habitat data.

The product could be distributed across the region in an approximation to that is shown in Figure 63. **This is a roughly mapped example using two criteria only**.

The product would take 10 years to complete.

The remaining 57% of the region would be modelled for its habitat occurrences using physical data sets e.g. geology, soils, slope, with the model informed other data sources including new targeted surveys and translation of all existing GIS habitat data into IHS.

The costs of this modelling would be part of the costs of the proposed regional unit (recommendation 5).

This project example would be scoped, specified and commissioned by the Regional Biodiversity Information Group (recommendation 1), implemented by Local Records Centres (recommendation 3) with specialist support from the Regional Unit (recommendation 5) and using standard regional approaches (recommendation 4). Data collection at the local level for the BAP habitat change of extent indicator (part of recommendation 2) would contribute to the project outputs; other project outputs will, in turn, contribute to the indicator, both at local and regional levels (recommendation 2).

This illustrates our overall approach of complementary efforts at local and regional levels that support each other for the benefit of many different organisations and drivers.

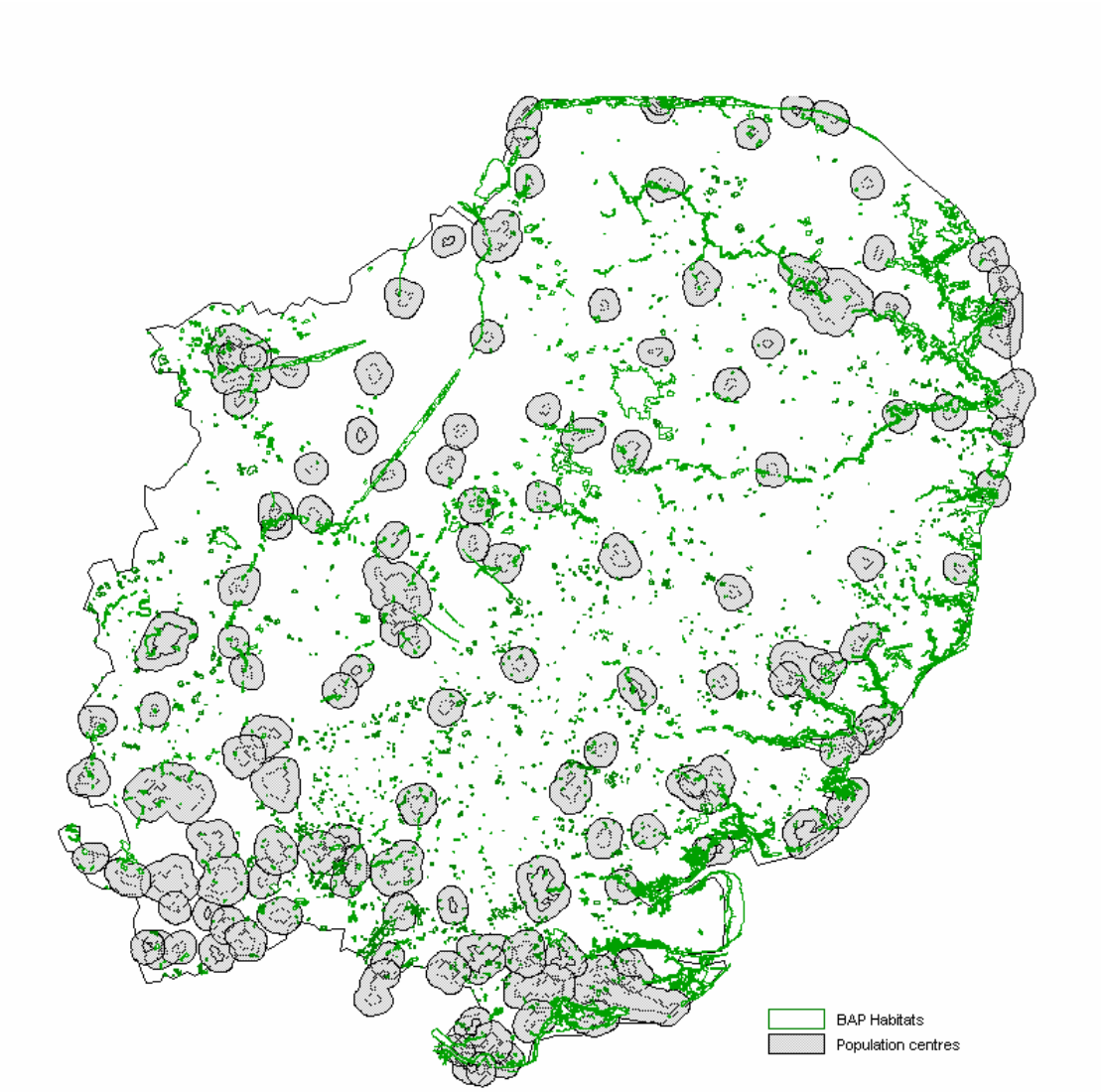

Figure 7. Example of spatial targeted map for the East of England region.

d. Application of modelling

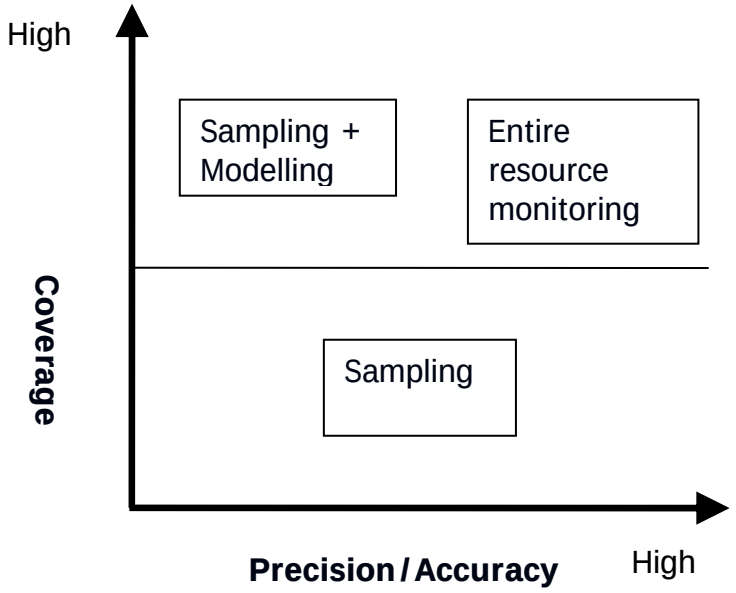

Figure 8. Use of different approaches according to data quality (coverage, accuracy and precision) needed.

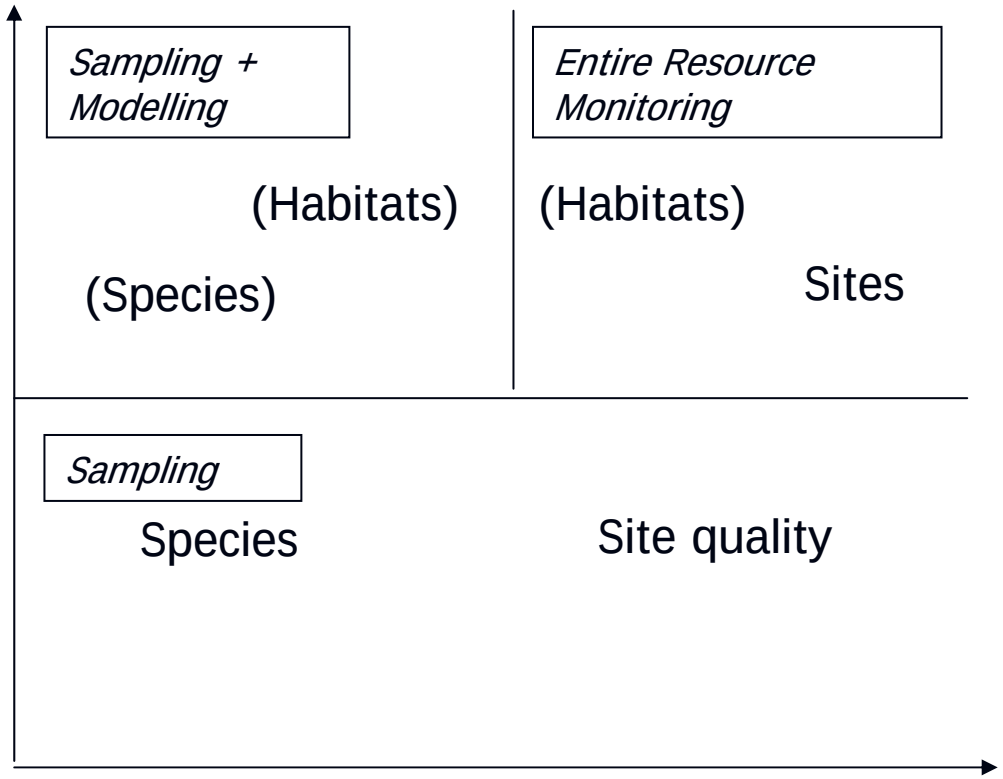

Figure 9. Use of different approaches according to type of biodiversity data needed.

Processes involved in modelling:

1. Getting data

1.1 Sampling (presence/absence data)
1.2 Using existing presence data

2. Statistical Analysis

2.1 Correlation with environmental variables available (e.g. elevation, soil wetness, pH, habitat, etc)

3. Modelling

3.1 Extrapolation based on correlated variables

Advantages of modelling:

- Tool to address coverage data quality issue
- Goes beyond existing data to predict where unrecorded species may be present
- Can be tested against real data
- Can be refined as more data is accumulated
- Produces measures on quality of the data (accuracy/ precision) for refining surveys and for data users
- Extensively applied in N America & continental Europe
- Replicates approach taken by experienced field biologists

10 REFERENCES

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SERC, 2005. Scoping study for technical and practical feasibility of applying the Integrated Habitat Classification System to South East England Local Records Centre Priority Habitat datasets. Somerset Environmental Records Centre for the South East England Biodiversity Forum. December 2005.

Annexes

Annex 1. List of organisations contacted during the consultation process. In grey are data providers; in white data users.

Anglian Water
Bedfordshire and Luton Biodiversity Recording and Monitoring Centre
Biological Records Initiative for Essex
Cambridgeshire and Peterborough Biological Records Centre
East of England Regional Assembly
Environment Agency
Essex Bat Group
Essex County Council
Essex Field Club
Essex Wildlife Trust
Forestry Commission
GO-East
Herts Biological Records Centre
Natural England
Norfolk Biological Records Centre
Norfolk County Council
Norfolk Wildlife Trust
Regional Biodiversity Coordinator for the East Of England
Suffolk Biological Records Centre
Suffolk LBAP
The Wildlife Trusts

Annex 2. Description of the variables used in the drivers questionnaire

Variables	Sites	Sites quality	Habitats	Species	Measurement/ Units
Type	For which sites types is it necessary to have data on presence of the site?	For which sites types is it necessary to have data on quality of the site?	For which habitats are there data requirements?	For which species are there data requirements?	Variable
Area	Is there a need for information on the area covered by the sites?	Is there a need for information on the area covered by different quality categories?	Is there a need for information on the area covered by the habitat?	Not applicable	Yes, No, Unknown
Coverage	What percentage of the area that should be designated as the site type should be captured in dataset?	What percentage of the designated sites area should be captured in dataset?	What percentage of the area covered by the habitat should be captured in dataset?	What percentage of the species distribution should be captured in dataset?	in percentage
Currency	What percentage of the coverage should be obtained during the last 5 years?	What percentage of the coverage should be obtained during the last 5 years?	What percentage of the coverage should be obtained during the last 5 years?	What percentage of the coverage should be obtained during the last 5 years?	in percentage
Precision	Geographic precision of mapped areas needed	Geographic precision of mapped quality data needed	Geographic precision of mapped habitats needed	Geographic precision of mapped species distribution needed	High (6 to 8 grid reference), medium (1-10Km^2 reference) or low (paper records)
Accuracy	Estimate of confidence in data; probability of having identified site erroneously	Estimate of confidence in data; probability of having identified site quality erroneously	Estimate of confidence in data; probability of having identified habitat erroneously	Estimate of confidence in data; probability of having identified the species erroneously	High (almost all records (100%) accurately assigned), medium (half or more of records accurately assigned) or low (less than half of records accurately assigned)
Update frequency	Frequency of revision of site boundaries needed	Frequency of revision of site quality needed	Frequency of revision of habitat distribution needed	Frequency of revision of species distribution needed	yearly, 2-yearly, 3-yearly… over 10-yearly, none, unknown
Monitoring rigour	Consistency and quality of monitoring criteria needed	Consistency and quality of monitoring criteria needed	Consistency and quality of monitoring criteria needed	Consistency and quality of monitoring criteria needed	High (monitoring methodology throughout region and time must be consistent), medium (monitoring methodology can be slightly variable) or low (methodologies may be highly variable)
Format	Format of the data needed	Format of the data needed	Format of the data needed	Format of the data needed	GIS; non-GIS database; paper; unknown

Annex 3. Description of the variables used in the existing data questionnaire

Variables	Sites	Sites quality	Habitats	Species	Measurement/ Units
Presence	Is the site type present in the county?	Not applicable	Is the habitat present in the county?	Is the species present in the county?	Yes, No, Unknown
Extant data?	Is there data available for the site type?	is there data available for the quality of the sites?	Is there data available for the habitat?	Is there data available for the species?	Yes, No, Unknown
Area	Area designated as the site type	Not applicable	Estimate of the area covered by the habitat	Not applicable	In hectares
Coverage	Estimate of percentage of the area that should be designated as the site type that has been designated and captured in dataset	Estimate of percentage of the designated sites area for which there is quality data	Estimate of percentage of the area covered by the habitat for which there is data	Estimate of percentage of the species distribution for which there is data	In percentage
Currency	Percentage of the coverage obtained during the last 5 years	Percentage of the coverage obtained during the last 5 years	Percentage of the coverage obtained during the last 5 years	Percentage of the coverage obtained during the last 5 years	In percentage
Precision	Geographic precision of mapped areas	Geographic precision of mapped quality data	Geographic precision of mapped habitats	Geographic precision of mapped species distribution	High (6 to 8 grid reference), medium (1-10Km^2 reference) or low (paper records)
Accuracy	Estimate of confidence in data; probability of having identified site erroneously	Estimate of confidence in data; probability of having identified site quality erroneously	Estimate of confidence in data; probability of having identified habitat erroneously	Estimate of confidence in data; probability of having identified the species erroneously	High (almost all records (100%) accurately assigned), medium (2/3 or more of records accurately assigned) or low (less than 2/3 of records accurately assigned)
Update frequency	Frequency of revision of site boundaries	Frequency of revision of site quality	Frequency of revision of habitat distribution	Frequency of revision of species distribution	Yearly, 2-yearly, 3-yearly… over 10-yearly, none, unknown
Monitoring rigour	Consistency and quality of monitoring criteria	Consistency and quality of monitoring criteria	Consistency and quality of monitoring criteria. depends on habitat classification used, etc	Consistency and quality of monitoring criteria. depends on expertise of samplers, etc	High (consistent monitoring methodology throughout region and time), medium (slightly variable monitoring methodology) or low (variable methodologies applied)
Format	Format of the data available	Format of the data available	Format of the data available	Format of the data available	GIS; non-GIS database; paper; unknown

Annex 4. NARS - National Amphibian and Reptiles Survey.

This is a volunteer survey, targeting the nationally widespread amphibians (including the great crested newt). The purpose of this survey is to provide robust assessments of their conservation status. To do this, we need to survey a representative sample of ponds across the UK in a systematic and repeatable way. The number of ponds surveyed will need to be large enough to provide reliable conclusions and allow extrapolation for the whole country. We hope to survey 400 randomly selected ponds.

Results will be submitted online via the NARRS website.

Up to three techniques will be used to survey the pond: visual search (including egg search), netting and torchlight survey (after dark).

Breeding ponds provide convenient and meaningful sampling sites for amphibians, so NARRS has been developing survey protocols for this habitat. To do this NARRS engaged in a wide consultation process, talking to professional surveyors, academics and volunteers, inviting suggestions for procedures to follow and key data to collect during amphibian pond surveys.

There is a considerable amount of pond survey experience collectively held by professional and volunteer surveyors - and many surveyors have already developed their own survey protocols. Synthesising existing practices into a single protocol, which will meet the needs of NARRS (allowing changes in conservation status to be measured) is a challenge. However, survey forms (for a single pond visit, or for up to three visits) and explanatory notes were produced earlier this year, and made available for field trials.

The protocols developed aimed to collect data concerning:
The surveyor, pond location and ownership
Data on the amphibians themselves
Data pertinent to variables that might affect the ease of detection of amphibians
Information about the pond habitat

Information about the pond habitat is necessary, as 'conservation status' is a measure not only of numbers of individuals/populations, but is also concerned with habitat quality. A habitat suitability index developed for the great crested newt (Oldham et al., 2000) was included in the survey form to gather such information. A version of this index has been used successfully by volunteers in Kent during great crested newt surveys co-ordinated by Kent Reptile and Amphibian Group. Although this index was developed for the great crested newt (a European Protected Species, and hence a key interest to NARRS), it is anticipated that the index may also provide information of relevance to the other species.

The survey forms one visit and three visits, and supporting notes trialled this spring are available for inspection. The survey forms will be subject to modification, based on feedback from field trials and ongoing research and statistical advice.

Annex 5. The National Bat Monitoring Programme (NBMP).

Run by the Bat Conservation Trust (BCT); Funded by the JNCC and BCT

The National Bat Monitoring Programme pilot was established in 1996 by BCT, with 5 years of funding from the then Department of the Environment (now Defra), with the aim of developing a volunteer network-based strategy to monitor bat population trends at a UK level. Since 2000 core funding for the programme has been provided by JNCC. Additional funding provided by (Natural England formally English Nature)and BCT.

Methods: the NBMP currently uses three methods to monitor bat populations, but is always investigating new surveillance methods in order to incorporate the more difficult and rarer species into the programme.

Field transect surveys. All UK resident bat species exclusively feed on a variety of insect prey. They navigate through the open countryside and detect their prey by emitting high frequency sounds, known as echolocation. These sounds can be made audible to the human ear using electronic bat detectors and in some cases the calls are very characteristic and the species can be easily identified. In the field surveys, trained volunteers are asked to visit randomly selected 1 km squares across the UK with a bat detector, and record when, where, how many times and which species they hear. For Daubenton's, a species known to forage predominantly over water, 1 km transects are selected along water courses and torches as well as bat detectors are used for species identification.
Field surveys are more statistically robust than the other methods, because sites are randomly selected and because there has been some testing of the data that have been collected, using different types of detector to validate the results. They are also the most difficult of the three survey types and require a high degree of skill.

Hibernation survey. Bats hibernate during the winter months and skilled volunteers are asked to count bats in known hibernation sites across the UK on two occasions between December and February. This is a non-random survey and may not be representative of the total population, but the survey is easy to carry out and sample sizes are relatively high.

Colony survey. Bats (mainly groups of females) tend to form maternity colonies during the summer months in order to give birth and raise their young. Many of the known roost sites are in occupied buildings and volunteers are asked to count bats during evening emergence from these sites across the UK in May and June. The intention is to obtain a maximum count of adults in each colony before females give birth. It is not a random selection of sites and may present similar problems to those of the hibernation survey.

Site coverage: UK wide, with nearly 1,000 sites being covered annually across all surveys.

Species coverage: greater horseshoe bat, lesser horseshoe bat, Daubenton's bat, Brandt's bat, whiskered bat, Natterer's bat, common pipistrelle, soprano pipistrelle, serotine, noctule and brown long-eared bat.

Survey power: power analysis of the survey results indicated that in the majority of surveys a minimum sample of 40 sites, with presence of the species in question, was required annually to detect declines of 25% over 25 years at a UK level. This sample size would also be required at each level of stratification, *i.e.* 40 sites in each country, GOR and Environmental Zone. At present, all surveys have sample sizes large enough to provide UK level Red and Amber Alert declines. The majority of surveys have large enough sample sizes to provide Red Alerts at the country level for England, but most surveys do not have the required samples sizes for Northern Ireland, Scotland or Wales. At present, sample sizes are generally too small to provide GOR and environmental zone analyses. This situation should improve as more years of data are added to the time series dataset.