

# Integrated biodiversity monitoring across spatial scales

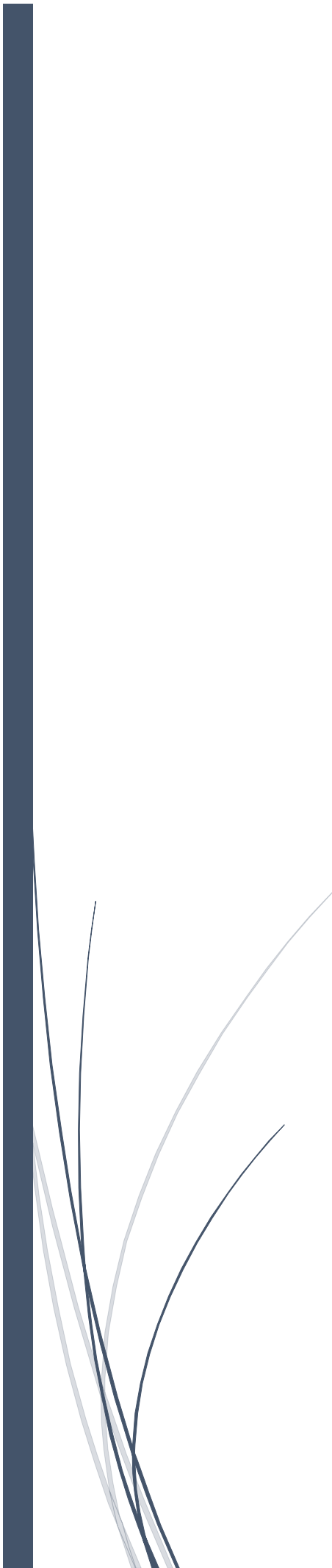
Decision guide report form





UK Centre for  
Ecology & Hydrology



**JNCC**  
Joint Nature Conservation Committee



Key		Document guidance note		Key decision
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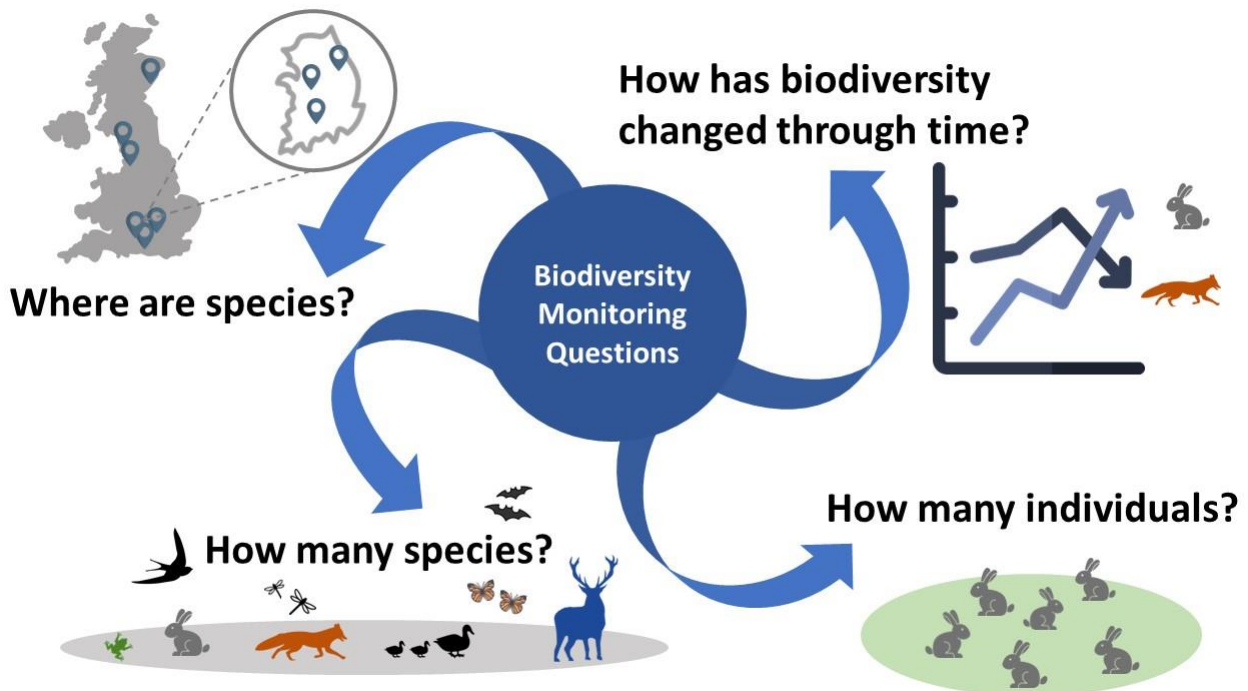
### 1. Purpose statement

Why do you need to undertake biodiversity monitoring at a local scale? What are the drivers and the primary goals of monitoring?

Outline the primary reasons for monitoring biodiversity at local scales and then **go to Section 2**.

### 2. Define the question

What question(s) are you intending to answer through monitoring biodiversity at a local scale?



**Figure 1.** Broad-scale questions in biodiversity monitoring projects.

**Add answers below**

<b>2a What is your spatial scale of interest?</b> <i>Define the spatial scale of monitoring operations. E.g., a site, multiple sites, a region, etc.</i>	
<b>2b What species will you be monitoring?</b> <i>State what biodiversity you will be monitoring. E.g., a single species, several specific species, all species, all known populations, etc.</i>	
<b>2c Are you interested in biodiversity status, change or both?</b> <i>Status = Static metrics. E.g., a species distribution, abundance, occupancy, number of populations. Change = Variation over time. E.g., population trends.</i>	
<b>2d Which year(s) are of primary interest to your monitoring purpose?</b>	

**2e** Use your **answers** from 2a-d above to define your local-scale question, in full:

*E.g., My organisation is interested in establishing a monitoring project for <insert 2a answer> to monitor <insert 2b answer> to assess <insert 2c answer> in <insert 2d answer>.*

**2f** Which broad-scale category of biodiversity monitoring question (see Figure 1) and corresponding output applies to your local-scale question? *Indicate answer with X under the applicable category.*

Question	Where are species?	How many species?	How many individuals (abundance)?	How has biodiversity changed through time?
Outputs	Species distribution maps	Species richness metrics and maps	Population abundance indices	Trends in distribution / abundance / richness




**Please complete the remaining sections in the context of your biodiversity monitoring question.**

**Go to Section 3.**

### 3. Data availability

Are there existing datasets relevant to your question?

*Add answers below*

<b>3a Are there existing datasets?</b>	Yes / No
	 <b>If no, a new data collection project is required. Go to Section 5.</b>
<b>3b Which datasets are available?</b> <i>Which existing data is applicable for answering your question? Who are the data providers?</i>	
<b>3c Go to Section 4.</b>	

### 4. Data suitability

Will the extent of existing data be adequate for answering your monitoring question?



- **Consult with advisors to determine whether existing data can be used to answer your question in full.**
- **Assess the dataset(s) for potential implicit biases (e.g., perform a Risk of Bias assessment).**

*Add answers below*

<b>4a Which advisors will be able to help determine whether existing datasets can be used to answer your question in full?</b> <i>List them here and then contact them accordingly.</i>	
<b>4b Is the data adequate to answer the question?</b>	Yes / No







If **yes**, a new data collection project is not required. Finish here and proceed to analysis.



If **no**, a new data collection project is required. Go to Section 5.

## 5. Designing a new data collection project

*Add answers below*

<p><b>5a</b> Is there data available from standardised monitoring schemes?</p>	<p>Yes / No</p> <p><b>If <u>yes</u>, go to 5b.</b> <b>If <u>no</u>, go to 5c.</b></p>
<p><b>5b</b> Is it possible to expand an existing standardised monitoring?</p>	<p>Yes / No</p>
<p> <b>If <u>yes</u>, establish new sites and apply the same sampling methodology.</b></p> <ul style="list-style-type: none"> <li>• Use the results from carrying out data suitability assessments during Section 4 to inform the number, location and frequency of monitoring.</li> <li>• The new data collected flows into the national dataset and modelled together.</li> </ul>	
<p> <b>If <u>no</u>, set up new semi-structured / opportunistic monitoring.</b></p> <ul style="list-style-type: none"> <li>• Use the results from carrying out data suitability assessments during Section 4 to inform the number, location and frequency of monitoring.</li> <li>• Maximise the spatial overlap between the new dataset and previously existing datasets.</li> <li>• Implement a data integration analytical framework.</li> </ul>	
<p><b>5c</b> Can you implement some structured monitoring?</p>	<p>Yes / No</p>
<p> <b>If <u>yes</u>, set up a new structured/semi-structured monitoring project.</b></p> <ul style="list-style-type: none"> <li>• Use the results from carrying out data suitability assessments during Section 4 to inform the number, location and frequency of monitoring.</li> <li>• Refer to the <b>Sampling Methods Table</b> for further guidance on methods, data and resource requirements.</li> <li>• Implement a data integration analytical framework.</li> </ul>	
<p> <b>If <u>no</u>, conduct opportunistic monitoring.</b></p> <ul style="list-style-type: none"> <li>• Use the results from carrying out data suitability assessments during Section 4 to inform the number, location and frequency of monitoring.</li> <li>• Refer to the <b>Sampling Methods Table</b> for further guidance on methods, data and resource requirements.</li> <li>• The new data collected flows into national dataset and modelled together.</li> </ul>	

## Biodiversity Monitoring: Sampling Methods Table

Questions					
	Where are species	How many species	Species abundance	How has species distribution / abundance / richness changed through time?	How has species distribution / abundance / richness changed in response to environment / intervention?
<b>Sampling method</b>	<ul style="list-style-type: none"> <li>- Atlas-type project.</li> <li>- Focused recording.</li> <li>- Potentially mass participation projects (e.g. bioblitz)</li> <li>- Aggregated records from local environmental record centres</li> <li>- Existing species databases within Local Natural History Groups</li> </ul>	<ul style="list-style-type: none"> <li>- Mass participation projects (e.g. bioblitz)</li> <li>- Aggregated records from local environmental record centres</li> <li>- Existing species databases within Local Natural History Groups.</li> </ul>	<b>Gold standard</b> Structured recording; consistent detection methods/equipment.	<b>Gold standard</b> structured recording; consistent detection methods/equipment.	<b>Gold standard</b> Structured recording; consistent detection methods/equipment.
			<b>Intermediate</b> Reduced effort or semi-structured recording	<b>Intermediate</b> Reduced effort or semi-structured recording	<b>Intermediate</b> Reduced effort or semi-structured recording
			<b>Minimum viable option</b> Opportunistic monitoring with effort recording	<b>Minimum viable option</b> Opportunistic monitoring with complete lists and effort recording	<b>Minimum viable option</b> Opportunistic monitoring with effort recording

<b>Survey design</b>	<ul style="list-style-type: none"> <li>- Defined geographic area of interest.</li> <li>- Site selection strategy, convenience sampling and volunteer self-selection.</li> <li>- Naturalistic vs. urbanised settings.</li> <li>- Repeats within the sampling season. Depends on detectability of species: average 2-4 visits per season on an ad-hoc basis.</li> <li>- Focus resources on surveying new sites rather than re-surveying existing sites.</li> <li>- Single-/two year sampling – data should be collected from a comparable time period (e.g., within the same year, same month) for the given context.</li> <li>- Species identification validation procedures in place.</li> </ul>	<ul style="list-style-type: none"> <li>- Convenience sampling</li> <li>- Site-based survey or defined geographic area of interest</li> <li>- Repeat visits to the same sites at fixed intervals (within the same year) to record a range of species where detectability varies across the seasons.</li> <li>- Single-year sampling.</li> <li>- Species identification validation procedures in place.</li> </ul>	<b>Gold standard</b> <ul style="list-style-type: none"> <li>- Fully randomised or stratified sampling design</li> <li>- Repeats within the sampling season</li> <li>- Standardised effort</li> <li>- Single-/two year sampling.</li> </ul>	<b>Gold standard</b> <ul style="list-style-type: none"> <li>- Fully randomised or stratified sampling design</li> <li>- Repeats within the sampling season, at timed intervals.</li> <li>- Standardised effort</li> <li>- Annual survey replication.</li> <li>- Sites resampled every year.</li> </ul>	<b>Gold standard</b> <ul style="list-style-type: none"> <li>- Before - After - Control - Intervention (BACI) design</li> <li>- Spatial replicates at randomly chosen sites</li> <li>- Repeats within the sampling season, at timed intervals.</li> <li>- Standardised effort.</li> </ul>
			<b>Minimum viable option</b> <ul style="list-style-type: none"> <li>- Recorder self-selection of sites</li> <li>- Measurable effort</li> </ul>	<b>Minimum viable option</b> <ul style="list-style-type: none"> <li>- Recorder self-selection of sites</li> <li>- Repeats within the sampling season, at ad hoc intervals.</li> <li>- Measurable effort</li> <li>- Regular (e.g. every other year) survey replication.</li> <li>- Most sites resampled regularly.</li> </ul>	<b>Minimum viable option</b> <ul style="list-style-type: none"> <li>- Before - After - Control - Intervention</li> <li>- Spatial replicates at sites chosen by the recorder</li> <li>- Repeats within the sampling season, at ad hoc intervals.</li> <li>- Measurable effort.</li> </ul>
<b>Surveyor information</b>	<ul style="list-style-type: none"> <li>- Professional surveyors</li> <li>- General public, community scientists, experienced ecologists</li> </ul>	<ul style="list-style-type: none"> <li>- Professional surveyors</li> <li>- General public, community scientists, experienced ecologists</li> </ul>	<ul style="list-style-type: none"> <li>- Professional surveyors</li> <li>- Community scientists trained in survey methodology and species identification</li> </ul>	<ul style="list-style-type: none"> <li>- Professional surveyors</li> <li>- Community scientists trained in survey methodology and species identification</li> </ul>	<ul style="list-style-type: none"> <li>- Professional surveyors</li> <li>- Community scientists trained in survey methodology and species identification</li> </ul>
<b>Outputs</b>	<ul style="list-style-type: none"> <li>- Species distribution maps</li> </ul>	<ul style="list-style-type: none"> <li>- Species richness metrics and maps</li> </ul>	<ul style="list-style-type: none"> <li>- Local population abundance estimates</li> </ul>	<ul style="list-style-type: none"> <li>- Trends in distribution / abundance / richness through time</li> </ul>	<ul style="list-style-type: none"> <li>- Effect of intervention on distribution / abundance / richness</li> </ul>