How to make biodiversity surveys relevant to your project

Business implications and relevance

- *Biodiversity surveys are invaluable! Surveys are essential for implementing the mitigation hierarchy efficiently and for making projects bankable.*
- *Lenders and stakeholders require an objective and data-based approach to mitigation, rather than standard ESHIA descriptions.*
- *Good survey design ensures data are relevant, creates opportunities for avoidance and minimisation, and avoids project delays.*

How can biodiversity surveys support projects?

Biodiversity surveys enable the evaluation of risks and impacts, support the design and implementation of effective mitigation actions and provide long-term monitoring data to demonstrate project outcomes. Global biodiversity data – usually available through online databases – are invaluable for understanding potential *risks* early in project screening and scoping. However, site-specific biodiversity data collected through iterative rounds of survey are required to *confirm risks* and *assess impacts* and ensure that appropriate, sufficient and cost-effective *mitigation* is in place to achieve biodiversity goals for all further phases of project design and implementation (Figure 1). Good practice includes sharing project survey results with the global community, e.g., through national and global biodiversity platforms such as the Global Biodiversity Information Facility (GBIF).

Projects frequently conduct three types of biodiversity survey:

1. **Risk surveys** are undertaken early in project development to assess project risk and enable prioritisation of mitigation effort. They are broad in scope and so tend to be low-resolution. Although the scope is broad, effort should still focus on groups of species at greatest risk of impact. Outputs will include a ground-truthed habitat map and improved spatial understanding of biodiversity risk. Data gathered will inform risk assessments, such as a Critical Habitat Assessment (CHA) or a No Net Loss Feasibility Analysis.
2. **Impact and mitigation surveys** are undertaken during project design. They are focused on features at highest risk of impact and provide quantifiable data for residual impact assessment and mitigation planning as part of the Environmental, Social, Health Impact Assessment (ESHIA) process. Iterative rounds of surveys may be required to assess and mitigate risk, especially for poorly known species or species with seasonal movements or cycles. Robust data underpin a project's approach to biodiversity management and support effective communication with stakeholders.

At a glance

- Effective mitigation of project impacts on biodiversity requires site-specific data on biodiversity features present in the area and their direct and indirect interactions with project operations
- Site-specific biodiversity data is rarely available prior to projects starting, so must be collected through biodiversity surveys
- Good practice projects can usefully plan for three types of biodiversity survey over a project lifetime: 1) risk surveys; 2) mitigation surveys and; 3) monitoring baseline surveys
- Mapping the objectives of biodiversity surveys ensures that the biodiversity data collected are fit for purpose and project resources are efficiently used.

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3. **Monitoring baseline surveys** are undertaken *after* deciding upon the approach to biodiversity mitigation but *prior* to impacts occurring. The surveys are designed to be repeatable so that the effectiveness of mitigation actions can be tracked over the project's lifetime through comparisons with the monitoring baseline. This allows assessment of progress against project goals and any relevant regulations, policies or lender requirements.

In some circumstances, for example where biodiversity risks are low, it may be possible to combine survey events. For example, a desk-top risk assessment (such as a CHA) may be undertaken, followed by the field surveys to update the CHA and inform impact and mitigation measures – instead of conducting separate risk survey and impact and mitigation surveys.

Project phase	Scoping	Design		Construction & Operation
Survey type	Risk surveys	Impact & mitigation surveys	Monitoring baseline	Monitoring surveys
Purpose	• Define biodiversity at risk of project impact	• Enable impact assessment and quantification • Develop mitigation measures	Provide a baseline to: • Track effectiveness of mitigation measures • Track project progress towards biodiversity goals	
Scope	*Desk-based screening for broad understanding of risk* Broad	Species-based	Proxies where appropriate	
Effort	• Low-resolution e.g. presence/absence of species and preliminary understanding of distribution based on a vegetation/habitat map • If there is existing good ground data, e.g., when surveys have been conducted in an adjacent areas, then little additional effort may be required.	• Detailed for high risk species e.g. abundance; number of groups; distribution in relation to potential project impacts • Distribution within the wider landscape for endemic species • Sufficient to provide quantitative data	• Simple, repeatable methods and use of proxies • Species-specific indicators only where required • Use of indicators that can be statistically evaluated against thresholds	
Output	• Ground-truthed vegetation/habitat map • Broad spatial understanding of biodiversity risks	• Mapping of the ecology, distribution and population of highest risk species	• Monitoring baseline • Repeatable monitoring methods	
Informs	• Risk assessment e.g. Critical Habitat Assessment • Feasibility of meeting project biodiversity goals • Nature and scale of biodiversity program	• Updates of assessments of risk • ESHIA • Biodiversity action and management plans • Monitoring & evaluation plan	• Reporting to stakeholders • Adaptative management and mitigation and offset actions	

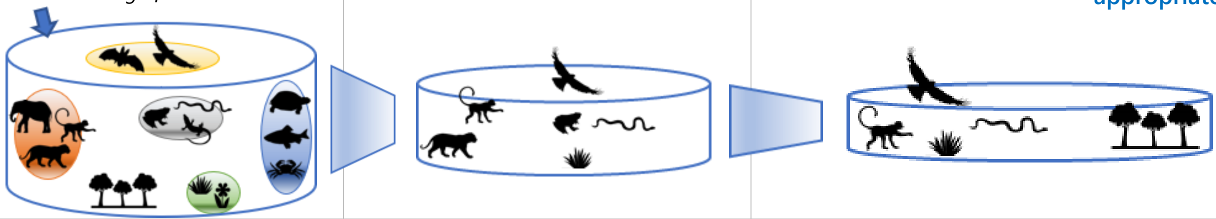

Figure 1: Biodiversity surveys are iterative within the project cycle; first surveys inform assessments of biodiversity risk.

Tracking and telemetry: while not essential for every survey, radio telemetry can be a useful tool for monitoring animal population, behaviour and range.

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1. Risk surveys – key practices

Well scoped and executed risk surveys inform and facilitate design choices *early* in the development cycle when it is easier and cost-effective to do so. However, without appropriate guidance, poorly scoped and executed surveys are common. Getting survey design and implementation wrong means that further surveys have to be commissioned and leads to delays, budget overruns and, in some cases, biodiversity impacts that once could have been averted. Following the key practices below makes for all-round better risk survey design and implementation – and helps to avoid pitfalls.

Key practice	Considerations	How
1. Clearly define **scope and objectives** based on project risks.	Surveys are broad in scope but effort is focused on biodiversity that is important for the project due to intrinsic risk, stakeholder concerns, lender requirements, national policies or corporate commitments. Risk surveys aim to understand the presence/absence of these species and their likely distribution within the study area.	Undertake desk-based risk screening to inform scope of surveys, e.g. to identify highest risk taxa, (species where possible) and any important biodiversity areas and habitat types to survey.
2. Use a preliminary land-cover map to design **sampling approach**.	Land-cover maps guide the focus of survey designs to areas where high-risk biodiversity is likely to be found. Results for all taxa will be reported against a common land-cover classification to enable an integrated analysis. Drawing on local knowledge can help further focus survey effort to sites where rare species are believed to occur.	Create a preliminary vegetation / habitat map using desktop datasets (e.g. existing maps and satellite imagery). Once in the field, ground-truth the map and undertake interviews with appropriate stakeholders to target survey effort.
3. Make your **study area** big enough to be able to interpret risks at an ecologically appropriate scale.	For information to be meaningful the study area should encompass ecological units identified *as biodiversity sees it*: for example, consider species and population movements and population connectivity. Study area should cover indirect and cumulative impacts as well as direct impacts to ensure risks are assessed within a landscape context.	Define the broad study area by intersecting the location of project infrastructure, area of influence of direct, indirect and perceived impacts with broad ecological units to ensure none are missed (Figure 2).
Outputs and use of outputs	• ***Vegetation/habitat map and broad spatial understanding of biodiversity risks.*** • ***Data used to inform risk assessment, e.g., Critical Habitat Assessment (CHA) or No Net Loss Feasibility Analysis, and define highest biodiversity risks for further detailed impact and mitigation surveys (which often form the basis of the ESHIA).***	

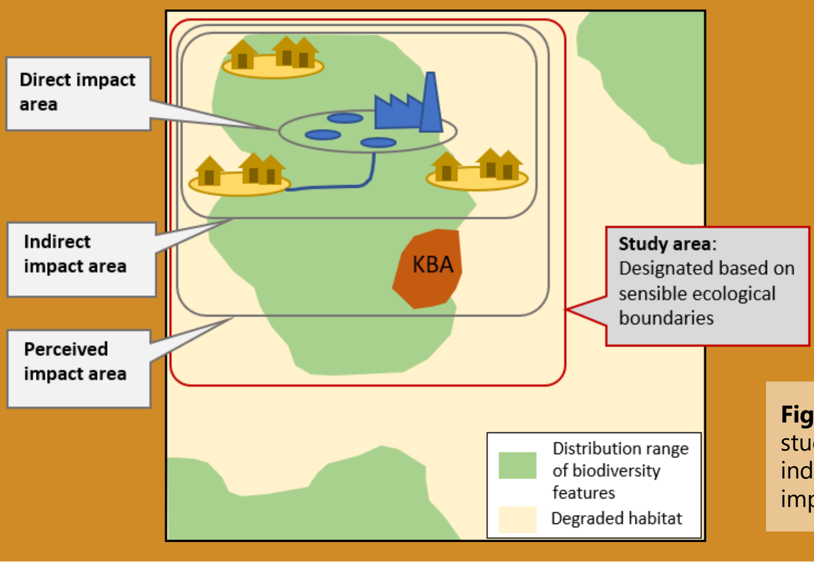

Figure 2: The risk survey study area includes direct, indirect and perceived impact areas.

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2. Impact and mitigation surveys – key practices

A deeper understanding of the ecology, distribution and abundance of highest risk biodiversity features is required to design and implement targeted and effective mitigation measures and quantify residual impacts. The three key practices to consider for developing impact and mitigation surveys are:

Key practice	Considerations	How
1. Clearly **define survey scope and objectives** based on key project design choices informed by impact risk.	To be useful, data collected must allow a project to choose between different mitigation options and focus on biodiversity features (habitats and species) that are at greatest risk and consequence of impact. Data collected enables the quantification of impact; a key output is a ground-truthed vegetation / habitat map.	Use early project infrastructure plans to describe alternative mitigation options that require evaluation. Undertake risk-based action planning to focus survey effort on features and highest risk.
2. Ensure **timely availability** and **communication of data**.	Undertake surveys early in project development process, to inform the design and adaptive management of mitigation measures. Consider potential trade-offs between data quality and timeliness of data availability to inform design. Involving project design team (engineers) in decisions about survey methods and timing; not just about results, can increase buy-in and utility of data.	Explicitly map survey timelines against project development decision points to identify deadlines and allow sufficient time for biodiversity surveys prior to key design decisions.
3. **Tailor quality and quantity** of information in proportion to risks.	The level of effort put into surveying depends on impact risk and consequence; indicators of what is sufficient are frequently defined in consultation with experts and stakeholders and/or by statistical approaches such as confidence intervals or accumulation curves. Multiple rounds of surveys build an understanding of a species' ecological requirements, population and distribution due to wet and dry season variations and/or migration patterns etc.	Identify species with habitat requirements or movements requiring multiple surveys. Design survey effort to align with risk and stakeholder/ expert expectations as appropriate.
Outputs and use of outputs	• ***Knowledge of ecology, distribution and population of highest risk species.*** • ***Data used to design mitigation measures to reduce biodiversity impacts, assess the scope and scale of residual impacts and inform the project's approach to biodiversity monitoring and evaluation.*** • ***Potential to use data for publications and to demonstrate to stakeholders the informed approach the project is applying to mitigate impacts.***	

Reeds and rivers: ecologists surveying an aquatic habitat to "ground"-truth desk-top surveys.

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3. Monitoring baseline surveys – key practices

Previous rounds of survey directly inform the design of a project's monitoring programme. Monitoring is a critical component of biodiversity management as it enables a project to demonstrate biodiversity outcomes (losses and gains). Below is an overview of key practices to enable an effective monitoring programme.

Key practice	Considerations	How
1. **Scope** and **objectives clearly linked** to **impacts**.	Monitoring indicators should link with predicted impact pathways to enable adaptive management of mitigation measures. Proxies are frequently used to track and demonstrate outcomes but for highest risk features direct measurement of population or extent may be required.	Develop a monitoring and evaluation plan based on the state-pressure-response framework (or similar impact plan / logical framework).
2. Use **repeatable methods**.	Standardised methods enable the project to compare data between survey events and with the monitoring baseline to demonstrate project outcomes. On-going affordability of the surveys is an important monitoring design consideration; include a plan for how data will be analysed and presented as part of survey design to ensure appropriate levels of effort are applied.	Clearly assess trade-off between level of detail/complexity and repeatability. Develop detailed methods and protocols for data collection. Train field team to ensure standardised data collection.
3. Clear **protocols for analysis, data management, evaluation and reporting**.	Early investment into establishing systems and protocols for data input and management enable timely analysis and information sharing with relevant stakeholders. This ensures the best use of the wealth of biodiversity data collected over the lifetime of a project.	Set up a database to manage raw and processed biodiversity data. Define how it will be used and nominate a staff member to have oversight and ownership. Include ability for other teams (e.g. social team) to view/access data to enable an integrated approach to biodiversity management.
Output and use of output	• ***A robust monitoring baseline and repeatable methods and protocols for tracking changes in selected indicators.*** • ***Data to demonstrate effectiveness of project mitigation to stakeholders, adaptively manage mitigation effort as required to achieve biodiversity goals.***	

Corals and clear water: transect and quadrat reef surveys.

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Surveys in practice – case studies

Iterative rounds of survey focused on high biodiversity risks enabled two projects to minimise impacts to species of conservation concern, address stakeholder concerns and design a monitoring approach to demonstrate long-term outcomes.

Case study one: Chimpanzees and mining

A desk-top screening identified an overlap between chimpanzee ranges and a mining concession; stakeholders confirmed sightings in the area. Iterative surveys developed the project's understanding of risk, enabled avoidance measures to be embedded into project design (see our Chimpanzee IBN) and established the monitoring baseline. On-going monitoring surveys track mitigation effectiveness (Figure 3).

Survey type	**Risk surveys**	**Mitigation surveys**	**Monitoring baseline** **Monitoring surveys**
Objective	• Confirm presence in the study area • Preliminary understanding of distribution	• Estimate abundance and number of communities • Understand habitat use • Confirm distribution in the study area	• Define population and threat indicators • Assess changes in population and threat indicators (e.g. number of communities and extent of suitable habitat)
Study design	• Cover suitable habitats that overlap with potential direct and indirect project impacts (based on a land cover map)	• Focus effort to understand abundance, number of communities and habitat use in areas of direct impact • Understanding of abundance in wider indirect impact area	• Focus on sites where reliable, comparable data sets can be collected and where mitigation actions are undertaken
Methods	• Interviews with local communities • Recces and camera traps	• Transects • Genetic analysis • Repeat surveys in wet and dry season	• Genetic analysis and/or transects • Land cover changes based on satellite imagery
Outcome	Confirmation of species presence and broad distribution in the project study area	Identification of the number of communities and their population abundance, understanding of importance of different habitat types	Demonstration that mitigation actions support the conservation of chimpanzee communities in the study area

Figure 3: Survey approach for a Critically Endangered species focuses on understanding distribution of communities and abundance to enable effective mitigation measures, impact quantification and monitoring design.

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Case study two: New plant species and hydropower

A desk-top screening identified the potential for endemic aquatic plant species within the study area of a project. This triggered a focus on aquatic plant species as part of the risk screening surveys and the subsequent discovery of a species new to science. Further impact and mitigation surveys focused on searching for the species outside the project's study area to support understanding of the significance of impact. The surveys also assessed the ecological requirements of the species to support mitigation planning – translocation in this instance. Monitoring surveys will focus on tracking growth and reproduction of translocated specimens to demonstrate progress towards a net gain biodiversity goal (Figure 4).

Survey type	**Risk surveys**	**Mitigation surveys**	**Monitoring baseline** / **Monitoring surveys**
Objective	• Identify which freshwater plant species present in the study area	• Improve understanding of species ecology and distribution (beyond the project study area) • Identify potential relocation sites and establish translocation trials	• Define population and threat indicators • Assess changes in population and threat indicators at translocation sites
Study design	• Surveys of freshwater habitats that overlap with potential direct and indirect project impacts (based on a land-cover map)	• Focus effort in areas identified as suitable habitat from habitat modelling	• Focus effort on translocation sites
Methods	• Searches along rivers and tributaries and collection of specimens of unknown species • Genetic analysis and species descriptions	• Searches in suitable habitats outside the project study area • Translocation trials in suitable sites	• Site visit to monitor translocated populations and selected variables to evaluate translocation success and wider potential threats to translocated populations
Outcome	Discovery and description of a species new to science	Identification of translocation sites	Demonstration translocation is successful and plants are growing and reproducing

Figure 4: Survey approach for a newly discovered endemic plant species focuses on understanding distribution beyond the project footprint to and monitoring translocated specimens to achieve a net gain outcome.

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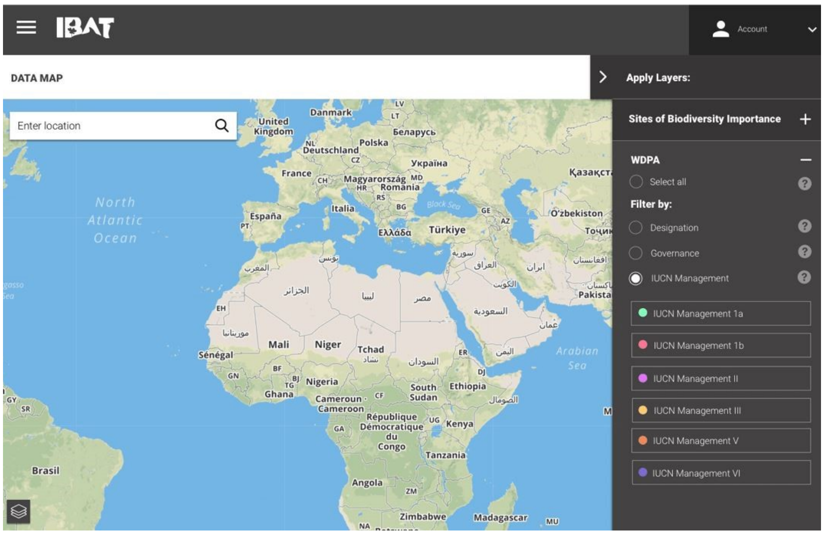

Desk-based risk screening, using tools such as IBAT (Integrated Biodiversity Assessment Tool), is the vital first step towards well-scoped and executed surveys.

Once in the field, **ground-truthing** the desk-top studies and **expert identification** of species help to avoid project delays, additional costs and impacts on biodiversity.

The Biodiversity Consultancy works together with industry to achieve an ecologically sustainable basis for development by tackling complex biodiversity challenges and by supporting positive conservation outcomes.

Our business-focused approach can:

- Identify and avoid risks before they occur
- Deliver projects on time and at cost
- Transform environmental challenges into opportunities
- Demonstrate shared value to stakeholders
- Build a positive brand and sustainable business

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