



Remote assessment of biodiversity values

Biodiversity Assessment Method guide

Department of Climate Change,
Energy, the Environment and Water



Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the Traditional Custodians of the lands where we work and live.

We pay our respects to Elders past, present and emerging.

This resource may contain images or names of deceased persons in photographs or historical content.

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Artist and designer Nikita Ridgeway from Aboriginal design agency Boss Lady Creative Designs created the People and Community symbol.

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1. Purpose

The guide is for accredited assessors applying the Biodiversity Assessment Method 2020 (BAM) in situations where access to land on which impacts are likely to occur is not possible. The guide's use is limited to specific types of development.

The guide allows for the remote assessment of biodiversity values using a combination of existing data, tools, information and surrogate sites, where appropriate.

2. Application of this guide

The guide can only be used for critical state significant infrastructure.

Approval to use this guide for a biodiversity assessment must be obtained from the Department of Climate Change, Energy, the Environment and Water (the department) via the Biodiversity Offsets Scheme Help Desk because it provides an alternative way to apply the BAM. If approval is not obtained, on-ground assessment in accordance with the BAM must be undertaken to complete the biodiversity assessment report.

In seeking approval, a clear and genuine reason for not being able to access part of the subject land must be provided. On-ground assessment must be used for accessible parts of the subject land. Approval to use this guide will only be given when there is no alternative to on-ground assessment available.

In seeking approval, information on how the assessment will be carried out in accordance with section 3 of this guide must be provided.

Evidence of the department's approval to use this guide is to be included in the biodiversity development assessment report (BDAR) submitted to the decision-making authority. The BDAR should then be prepared in accordance with section 4 of this guide.

3. Undertaking remote assessment

3.1 Identifying areas of land on which to apply the BAM (land categorisation)

Land with low conservation value (defined as Category 1 under the *Local Land Services Act 2013* [LLS Act]) does not need to be assessed in applying the BAM. If this guide is being used to undertake remote assessment, all land is to be assessed in accordance with the BAM and this guide (that is, considered Category 2 under the LLS Act) unless there is specific evidence demonstrating the land:

- has been subjected to ongoing cultivation
- does not contain critically endangered ecological communities, critically endangered plants or natural grasslands (or habitat for these entities).

If parts of the site are accessible, the standard requirements of the BAM should be applied. This means that fieldwork should be completed to confirm land categorisation (for example, Category 1 is confirmed by site-based floristic assessment).

Documentation of land categorisation must be documented in the BDAR, including a map clearly showing any Category 1 land.

3.2 Use of surrogate sites

A surrogate site is an accessible site that is selected to be assessed instead of a restricted access area and is an assessment option only available in this guide. Surrogate sites allow for the assessment of biodiversity in accordance with the BAM through the collection of on-ground data considered representative of the restricted access area.

3.2.1 Selecting surrogate sites

When using a surrogate site for assessing native vegetation, the surrogate site is to be located within the subject land, or outside but near the subject land.

A surrogate site must also:

- be as close as possible to the restricted access area
- be within the same Interim Biogeographical Regionalisation of Australia (IBRA) subregion
- be likely to have the same plant community type/s
- be in the same broad condition state (vegetation composition, structure and function)
- have a similar land-use history.

To ensure it is representative of the restricted access area, consider the site's:

- geology and soils
- landscape position

- elevation, aspect and slope
- mean annual rainfall
- other documented flora and fauna records from the local area.

3.2.2 Using surrogate sites for threatened species survey (species credits)

Surrogate sites may be used to determine the presence of candidate species when the surrogate site meets the requirements outlined in section 3.2.1 and, relative to the restricted access area:

- has a comparable patch size
- has a comparable level of connectivity to areas of native vegetation
- is in a landscape with comparable native vegetation cover and condition state
- is likely to have the same habitat constraints and geographic limitations, where relevant to the candidate species.

Targeted surveys at surrogate sites are also suitable where the landscape is homogenous.

3.2.3 Where surrogate sites are not suitable for threatened species survey (species credits)

The use of surrogate sites is not appropriate for all candidate species or in all situations, including:

- where there are significant knowledge gaps in relation to a species' ecology or life history traits
- where it is difficult to make assumptions about the extent and density of populations without information collected onsite
- where specific habitat features must be present for the species to use the site, and these cannot be observed or predicted remotely with confidence.

For example:

- Glossy black cockatoos – surrogate sites are not likely to be suitable for determining the presence of potential nest trees (living or dead trees with hollows greater than 15 cm diameter, in a stem that has a diameter greater than 30 cm and with an angle of at least 45 degrees, and that is higher than 8 m above the ground), or signs of breeding (begging birds of any age or sex, lone adult males, or an occupied nest) where the assessor has been unable to determine whether those requirements are present in the restricted access area.
- *Rotala tripartita* – the ecology of this plant likely precludes the use of surrogate sites to assess its presence given there are extreme fluctuations in abundance and extent of the species across its range. In addition, individuals are not visible above ground during dry periods, making detection difficult.

Seek the department's confirmation on the appropriateness of using surrogate sites to confirm presence of candidate species.

3.2.4 Documenting the use of surrogate sites

Document support for the use of surrogate sites in the BDAR along with the surrogate site(s) location, labelled maps and aerial imagery, with tabulated GPS references (see sections 4.1 and 4.2 for further information on BDAR documentation).

3.3 Use of novel technologies and decision-support tools

The tools, data and products listed in sections 4.1 and 4.2 to remotely assess biodiversity values can be supplemented by new technologies, as these rapidly advance with increasing accuracy and precision. For example, improvements are being made in spatial modelling, and to other mapping products that estimate or predict vegetation condition or presence of threatened species or their habitat.

When considering the application of a novel technology or decision-support tool, seek agreement from the department and document this in the BDAR. Undertake this early in the biodiversity assessment process.

4. Preparing a biodiversity assessment report using this guide

In preparing a BDAR under this guide, accredited assessors should:

- use sections 4.1 and 4.2 to set out the approach to remotely assessing biodiversity values in areas of the subject land with restricted access in relevant sections of Stage 1 of the BAM (subject to any additional requirements of approval to use this guide)
- consider and document steps taken to avoid and minimise impacts, and assess direct, indirect, prescribed and serious and irreversible impacts in accordance with Stage 2 of the BAM
- prepare a single BDAR that describes the assessment of the entire subject land including those areas with restricted access, and document outcomes.

4.1 Remote assessment under the BAM for native vegetation, threatened ecological communities and vegetation integrity

BAM sections 2 through to 4.1 are to be applied as per BAM 2020.

Note: Steps in the assessment performed automatically by the BAM-Calculator (BAM-C) are not included in this section.

BAM Chapter 4 – Assessing native vegetation, threatened ecological communities and vegetation integrity

BAM section 4.2 Identify and map plant community types and ecological communities

Remote identification of plant community types (PCTs) and threatened ecological communities (TECs) will require professional judgement, supported by clear reasoning and use of one or a combination of the following methods:

- plot-based survey in accordance with BAM section 4.2.1 at surrogate sites (see section 3.2 of this guide)
- reference to fine-scale vegetation mapping available for the site (for example, local government area vegetation mapping)
- previous surveys over the subject land
- existing site-specific or nearby plot data from the BioNet Vegetation Information System data in the BioNet Atlas application
- reference to the State Vegetation Type Map
- new or emerging technologies (see section 3.3 of this guide).

Information requirements

In addition to the requirements set out in BAM Appendix K, provide:

- a map that displays the PCTs and/or TECs assigned to the areas with restricted access based on the above remote assessment methods. Clearly identify on the map that the PCTs and/or TECs have been assigned by remote assessment.
- evidence of the information used to support the decision, including the accuracy, assumptions and age of the data and associated products used.

BAM section 4.2.1 Perform a plot-based vegetation survey

Where a surrogate site is used to identify the most likely PCTs, a plot-based survey is to be undertaken in accordance with BAM section 4.2.1 (see section 3.2 of this guide).

Information requirements

In addition to the requirements set out in BAM Appendix K, provide:

- justification for the basis on which PCTs were assigned over areas with restricted access, including reference to the surrogate site, specific data and other source material
- evidence of agreement from the department regarding the selection of the surrogate site, PCTs and source material.

BAM section 4.2.2 Identify threatened ecological communities

Within the restricted access area, assume TEC association with the assigned PCT wherever an association is identified in the BioNet Vegetation Classification database, unless evidence is available that demonstrates the vegetation is not a TEC.

Such evidence could include:

- use of a BAM-compliant plot-based assessment of surrogate sites (see section 3.2 of this guide)
- reference to fine-scale TEC vegetation mapping available for the site (for example, local government area vegetation mapping)
- previous surveys over the subject land
- nearby Vegetation Information System (VIS) plot data
- use of information provided by a relevant vegetation/ecological community specialist/s (that is, not necessarily an 'expert' for the purposes of the BAM)
- relevant published scientific literature
- new or emerging technologies (see section 3.3 of this guide).

Information requirements

In addition to the requirements set out in BAM Appendix K, provide:

- justification for excluding a TEC that is associated with a PCT in the restricted access area assessment by reference to the Threatened Species Scientific Committee final determination for the TEC. Note the PCT may be associated with more than one TEC, and each TEC must be addressed separately
- evidence of the information used to support the decision, including the accuracy, assumptions and age of the data and associated products used
- a map showing areas that have been assumed as TEC and areas excluded as TECs under this method.

BAM section 4.3.1 Map vegetation zones

Use aerial imagery and other supporting information (for example, relevant spatial data) to determine approximate condition states to map vegetation zones.

Where delineation of vegetation zones is difficult, and/or where approximate condition state for mapping vegetation zones is uncertain, vegetation zones are to be assigned according to the PCT boundaries assuming a single condition state.

Information requirements

In addition to the requirements set out in BAM Appendix K, provide:

- reasoning to support delineation and mapping of vegetation zones across areas of the subject land with restricted access
- a map showing vegetation zones developed using this method.

BAM section 4.3.3 Assess vegetation integrity (vegetation condition)

Determine the current vegetation integrity of each vegetation zone on the areas of restricted access on the subject land by use of:

- benchmark condition data from the BioNet Vegetation Classification database for PCT(s) assigned at section 4.2 of this guide
- BAM-compliant plot-based assessment of surrogate sites. Where a surrogate site is used to identify a PCT at section 4.2 of this guide, then the same surrogate site must be used to determine vegetation integrity
- previously collected BAM-compliant survey data from the subject land where data is less than 5-years-old
- new or emerging technologies (see section 3.3 of this guide).

A mix of options may be used, depending on the specific circumstances of each vegetation zone and the context of the site.

Information requirements

In addition to the requirements set out in BAM Appendix K, provide:

- a description of the adopted approach to assign vegetation integrity attribute scores
- a table setting out the source and vegetation integrity scores of the vegetation zones occurring across restricted access areas
- reference to, or evidence of, any discussions and/or agreements with the department and details of all source material, including references and dates
- a table that sets out unique BAM plot identifiers for each plot undertaken in each vegetation zone over accessible portions of the subject land and surrogate sites. These identifiers are to be used when entering relevant data into the BAM-C, to allow for cross-referencing.

BAM section 4.3.4 Sample vegetation integrity survey plots

Where surrogate site data are used to determine the vegetation integrity score, sample in accordance with BAM section 4.3.4. Fulfil minimum plot number requirements set out at BAM Table 3.

Information requirements

In addition to the requirements set out in BAM Appendix K provide:

- evidence of agreement from the department regarding the selection of the surrogate site.

4.2 Remote assessment method under the BAM for the habitat suitability of threatened species

Note: Steps in the assessment performed automatically by the BAM-C are not included in this section.

BAM Chapter 5 – Assessing the habitat suitability for threatened species

BAM sections 5.1 through to 5.2.1 are to be applied as per BAM 2020.

BAM section 5.2.2 Assess the habitat constraints and vagrant species on the subject land

Determine the presence of relevant habitat constraints by examination of existing information, such as previous assessments undertaken over the subject land, aerial imagery, topographic, geology and soils mapping.

In determining the presence of habitat constraints, apply professional judgement and justify decisions based on information and data.

Assume presence of habitat constraints that cannot be confidently confirmed remotely, such as:

- burrows
- epiphytes
- fallen/standing dead timber, including logs
- hollow-bearing trees
- rocky substrates
- native groundcover.

Vagrant species are to be addressed according to the BAM 2020.

Information requirements

In addition to the requirements set out in BAM Appendix K:

- record the methods used and assumptions made regarding the identification of habitat constraints in the BDAR.

BAM section 5.2.3 Further assessment of candidate species credit species

In most cases, the presence and condition of microhabitat, and the condition of habitat constraints will not be able to be confirmed remotely.

Assume microhabitats for the candidate species are present, and assume habitat constraints are not degraded.

Species are not assessed further if an expert report has been prepared that states that habitat or species are unlikely to be present (see BAM section 5.2.4 below).

Information requirements

In addition to the requirements set out in BAM Appendix K:

- record the assumptions made regarding microhabitats and condition of habitat constraints in the BDAR.

BAM section 5.2.4 Determine the presence of a candidate species credit species

Determine presence of each candidate threatened species in areas with restricted access by one or a combination of the following:

1. assuming the species' presence:
 - a. assume presence of species if there is difficulty or uncertainty in determining presence, or where a suitable surrogate site (see section 3.2 of this guide) has not been identified for targeted survey and there is no expert available to prepare an expert report
2. providing evidence in an expert report
3. undertaking targeted survey at approved surrogate sites.

BAM section 5.2.4 is applied where a species' presence is based on important habitat mapping.

A combination of the above options may be used to determine the presence of species credit species in areas with restricted access. The option/s selected will depend on the target species, availability of suitable surrogate sites, and landscape context. Targeted surveys at surrogate sites are likely to be most suited where the landscape is homogenous.

Where a species is confirmed to occur at a surrogate site, information regarding extent and density of the species, where suitable, can be used to inform the drafting of polygons.

All species credit species known or assumed to be present require further assessment in BAM section 5.2.5.

Information requirements

In addition to the requirements set out in BAM Appendix K, for each candidate species credit species, document whether the species is either:

- assumed present
- present based on an important habitat map
- determined to be (or likely to be) present by an expert report
- present based on targeted surveys at surrogate sites.

BAM section 5.2.5 Determine the area or count, and location of suitable habitat for a species credit species (a species polygon)

A species polygon must be prepared for each species credit species that is known or assumed to be present in areas of the subject land with restricted access based on BAM section 5.2.4.

In drafting polygons for both count and area species, base estimates on densities determined by reference to one or a combination of the following:

- analysis of data collated from suitable reference sites, as described in the *Biodiversity Assessment Method 2020 operations manual – Stage 1*
- surrogate site data
- results of previous surveys relevant to the candidate species
- information contained within the Threatened Biodiversity Data Collection (TBDC, accessed via NSW BioNet)
- published literature
- advice obtained from the Biodiversity Offsets Scheme Help Desk
- specialist advice.

Count species

For count species, estimate the number of individuals likely to be present on the subject land. Where there is uncertainty around the extent of the population of a species over a site, estimates are to be extrapolated over the entire area of the PCT associated with the species.

Area species

For area species, a polygon is to be designed that identifies the area of suitable habitat on the area with restricted access. Where habitat constraints have been identified in the TBDC and it is uncertain whether those habitat constraints occur within the areas of the subject land with restricted access, species polygon boundaries are to align with the extent of the PCT associated with the species.

Important habitat map

Include the entire area of the subject land that is within the mapped area for the species polygon. Further information in relation to the design of species polygons can be found in the BAM operations manual – Stage 1, relevant survey guidelines and the TBDC.

Information requirements

In addition to the requirements set out in BAM Appendix K:

- document the approach used to generate area and count estimates in the BDAR
- identify any limitations on the use of surrogate data and document this in the BDAR, and provide justification for the method used to design the species polygon
- prepare a map that distinguishes polygons based on assumed presence, using the results of surrogate sites, or recorded species presence, and include in the BDAR
- similarly, prepare spatial data to reflect the separate polygons
- include the approach and information used to prepare the species polygon in the BDAR.

BAM section 5.3 Threatened species survey requirements

Where the use of a surrogate site has been approved, perform a targeted survey for candidate species at the surrogate site, unless any of the following apply:

- an expert report has been obtained for the relevant portion of the areas of the subject land with restricted access
- the species is assumed to be present at the areas of the subject land with restricted access
- an important habitat map has been prepared for the species that covers the areas of the subject land with restricted access.

5. Using the BAM-Calculator for remote assessment

In using the BAM-C for biodiversity assessment under this guide, accredited assessors should:

- create separate parent BAM-C cases for areas of the subject land that are accessible and those with restricted access
- create multiple child cases under each parent case where, for example, the proposal extends over multiple IBRA subregions, or for linear projects where there are multiple development areas
- use appropriate descriptors throughout the BDAR and consistent labelling for data entered into the BAM-C. This includes the use of unique vegetation plot identifiers to distinguish between those undertaken over accessible areas versus those in areas of restricted access.

6. Refining credit obligations post-approval

Where this guide has been used, the decision-making authority may require credit obligations to be refined post-approval when land access is possible. This could occur through modification of development consent or approval, or where a condition of approval allows credit obligations to be refined with approval.

Advice on undertaking a post-approval assessment should be sought from the relevant decision-making authority. Accredited assessors are required to apply the BAM in these post-approval assessments, and this must be done in accordance with conditions of accreditation. While it is expected that this reassessment will reduce the offset requirements, any additional species credit species or impacts that are identified post-approval will also need to be offset.

An addendum to the approved BDAR should be submitted to the decision-making authority with evidence obtained in accordance with the BAM and, where relevant, this guide to justify proposed credit changes.

The reassessment must be undertaken before any clearing has occurred or other activities that will impact on the biodiversity as a result of the development.

Appendix A: Online resources

Online resources

- [Application for login access to BioNet](#)
- [Assessor resources: Guides, tools and databases](#)
- [Biodiversity Assessment Method 2020](#)
- [Biodiversity Assessment Method 2020 operational manual – stage 1](#)
- [Biodiversity Assessment Method 2020 operational manual – stage 2](#)
- [Biodiversity Assessment Method 2020 operational manual – stage 3](#)
- [Biodiversity Assessment Method Calculator \(BAM-C\)](#)
- [Biodiversity Assessment Method Calculator user guide](#)
- [Biodiversity experts](#)
- [Biodiversity Offsets and Agreement Management System \(BOAMS\)](#)
- [Biodiversity Offsets Scheme \(BOS\) Help Desk](#)
- [BioNet Atlas – Species sightings](#)
- [BioNet resources](#)
- [BioNet Threatened Biodiversity Data Collection](#)
- [BioNet Vegetation Classification](#)
- [BioNet Vegetation Classification user manual](#)
- [BioNet vegetation maps](#)
- [BioNet web services – How to access the BioNet web service using Excel and Power Query: A BioNet quick guide \[PDF 1MB\]](#)
- [BioNet web services](#)
- [Determining native vegetation land categorisation for the application of the Biodiversity Offset Scheme \[PDF 950KB\]](#)
- [NSW Planning Portal: Major Projects](#)
- [Environment and Heritage – public registers](#)
- [Directory of Important Wetlands in Australia \(DIWA\)](#)
- [Environment Protection and Biodiversity Conservation Act – referrals list](#)
- [Historical imagery viewer](#)
- [Native Vegetation Act 2003 public register](#)
- [NSW \(Mitchell\) Landscapes – Version 3.1 – SEED data portal](#)
- [NSW Interim Biogeographic Regions of Australia \(IBRA region and subregions\) – Version 7](#)
- [NSW threatened species](#)
- [PlantNET NSW](#)
- [Saving our Species program](#)

- [SEED data portal \(Sharing and Enabling Environmental Data\)](#)
- [NSW Cadastre Web Service – SEED digital cadastral database](#)
- [State Vegetation Type Map](#)
- [Threatened species profile search](#)
- [Vegetation Condition Benchmarks](#)

Legislation

- [Biodiversity Conservation Act 2016](#)
- [Biodiversity Conservation Regulation 2017](#)

Biodiversity Offset Scheme support

Additional support for the application of the BAM to areas for critical state significant infrastructure projects with restricted access is available via the BOS Help Desk Customer Portal.

Shortened forms

Term	Description
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BDAR	Biodiversity development assessment report
BOS	Biodiversity Offset Scheme
IBRA	Interim Biogeographic Regionalisation for Australia
PCT	plant community type
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community