

Environmental factor guidance: Terrestrial ecosystems

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1. Introduction

Under the *Environment Protection Act 2019* (EP Act), a proposal (proposed action or strategic proposal) that has the potential to have a significant impact on the environment must be referred to the Northern Territory Environment Protection Authority (NT EPA) for assessment. The NT EPA is responsible for deciding whether a proposal requires environmental impact assessment (EIA) under the EP Act. A proposal that undergoes EIA by the NT EPA must have an environmental approval granted by the Minister for Lands, Planning and Environment (Minister) before it can proceed.

To guide the EIA process the NT EPA has developed a series of environmental factors and objectives as a system for organising environmental information and identifying key values that require protection. The environmental factors assist in determining the potential significant impacts of a proposal on environmental values. This guidance provides advice about information and assessment requirements in relation to terrestrial ecosystems for preparation of EIA documents.

2. Purpose

The purpose of this guidance is to outline when and how the NT EPA's Environmental factor: Terrestrial ecosystems is considered in the EIA process. The guidance provides advice on:

1. A proponent's obligations in respect to the EP Act.
2. When to consider referral of a proposal based on potential impacts on terrestrial ecosystems.
3. Requirements of assessment documentation relating to terrestrial ecosystems.

This document is part of a series of guidance prepared by the NT EPA to support proponents through the EIA process. Accordingly, this guidance is meant to be read in conjunction with the other guidance documents, ensuring a fuller understanding of the EIA process and the NT EPA's requirements, as shown in Figure 1.

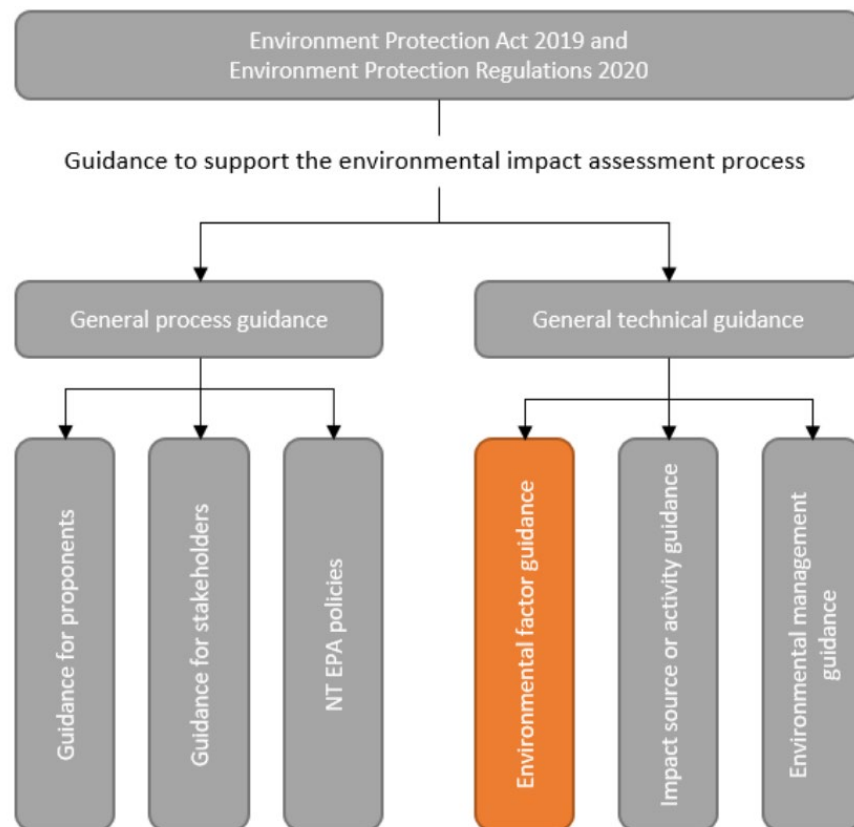


Figure 1 Environmental impact assessment guidance framework

3. Environmental factor: Terrestrial ecosystems

The NT EPA's objective for the Environmental factor: Terrestrial ecosystems is 'Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning'. The objective recognises that ecosystems comprise biotic and abiotic factors, and that there are complex interdependencies between them, which in turn affect the ecology and biodiversity values. The NT EPA recognises that an impact to any part of an ecosystem can impact the whole, and that multiple impacts across ecosystems can lead to catastrophic decline. The objective reflects the NT EPA's expected outcomes for this factor and aims to ensure that the biological diversity, integrity and function of the Territory's environment remain intact both now and for future generations.

The environmental values addressed under this factor include native flora and fauna species, threatened species, and significant and sensitive habitats. Terrestrial ecosystem values include sites or features important to ecosystem function and the viability of populations of native species. This guidance focusses on terrestrial ecological matters landward of highest astronomical tide.

There will necessarily be some overlap and connection between terrestrial ecosystem values addressed under this factor, and downstream aquatic, coastal and marine ecosystem values addressed under other factors, including wetlands, waterbodies, groundwater dependent ecosystems, benthic habitats and tidal estuaries. The EIA documents prepared by proponents must address the potential impacts on terrestrial ecosystems, and the interconnection and dependence of terrestrial and aquatic, coastal or marine ecological values.

Activities in terrestrial environments such as mining, land clearing and water extraction can indirectly impact downstream coastal and marine biodiversity values such as migratory shorebirds, sea grass, corals

and mangroves. Proponents should identify and address potential indirect and cumulative impacts on marine and coastal values associated with development in upstream terrestrial upstream.

For EIA purposes:

- Terrestrial fauna is defined as vertebrate and invertebrate animals living on land or using land for all or part of their life.
- Fauna habitat is defined as the natural environment of an animal or assemblage of animals, including biotic and abiotic elements, that provides a suitable place for them to live (e.g. breed, forage, roost or seek refuge).
- Flora is defined as native vascular plants. Flora habitat is defined as the natural environment of a plant or assemblage of plant, including biotic and abiotic elements, that provides a suitable place for them to live.
- Vegetation is defined as groupings of different flora across the landscape that occur in response to environmental conditions. Vegetation communities are often used as a surrogate for ecological community due to the close relationship between vegetation composition and structure and habitat provision.

Potential impacts on coastal and marine flora and fauna (e.g. migratory shorebirds, mangroves) are typically addressed under the marine ecosystems factor; however, these may be addressed under the terrestrial ecosystems factor, depending on the nature of the proposal being assessed and whether marine factors are triggered by the assessment.

In the NT, a number of terrestrial ecosystem values are formally recognised by legislation, policy, plans and guidelines, including but not limited to the following matters:

- species of conservation significance, including threatened fauna and flora under the *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act)
- essential habitat declared under the TPWC Act
- terrestrial ecosystem values recognised in management plans for parks and reserves declared under the TPWC Act¹
- significant and sensitive vegetation (and features) as identified in the Northern Territory Planning Scheme (NTPS) and the NTPS Land Clearing Guidelines
- protected environmental areas and environmental objectives declared under the EP Act
- Matters of National Environmental Significance and other matters protected under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Environmental Factor	Environmental Objective
Terrestrial Ecosystems	Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.

Ecological integrity is defined as an ecosystem's capacity to maintain composition, structure, functioning

¹ Management plans provide a statutory basis for how priority values of parks, including the biological, natural and cultural values, are protected and managed for the long term.

and self-organisation over time using processes and elements characteristic for its ecoregion and within a natural range of variability².

Ecological functioning refers to the biological, geochemical, and physical processes that occur within an ecosystem³.

3.1. How this factor links with other environmental factors

The NT EPA recognises that there are complex links between the Environmental factor: Terrestrial ecosystems and other environmental factors, within and across themes. Environmental impacts to terrestrial ecosystem values are considered by the NT EPA within the context of other factors, such as Culture and heritage, Community and economy, Inland waters environmental quality and Hydrological processes. Terrestrial ecosystem values may be considered by the NT EPA in line with other factors to assess impacts to the integrity of an ecosystem. Proponents should integrate the various parts of EIA documents that assess ecological impacts, so the relationships are clear.

Places of cultural heritage significance often coincide with terrestrial ecosystem values. Proponents should be aware of their obligations where archaeological or historical materials are encountered. An example is the importance of natural caves, rock shelters, tunnels and shafts to bat populations. Sites such as Kohinoor Adit and Kintore Caves Nature Park are declared heritage places under the *Heritage Act 2011* and home to large populations of Ghost Bats.

Vegetation is an important functional component of terrestrial ecosystems. A decline in the extent and condition of vegetation may precede the loss of its species and provide an indicator of the health of other elements of the environment. Loss of vegetation can impact upon many other environmental factors, including Terrestrial environmental quality and Inland water environmental quality (through erosion and mobilisation of sediment). Conversely, impacts to hydrological processes, Terrestrial ecosystems, Inland water environmental quality and other factors can affect the ecological processes that support terrestrial flora and fauna.

3.2. Application of this guidance

The EP Act requires a proponent to refer a proposal to the NT EPA for assessment if it has the potential for a significant impact on the environment. If a referral is required but is not made by the proponent, a statutory decision-maker may refer a proposal to the NT EPA for assessment, or the NT EPA may call in a proposal for assessment. If a proposal is referred based on its potential impacts to terrestrial ecosystems, the referral information should include the information specified in section 5.3 of this guidance. Proponents are encouraged to undertake their own investigations and seek pre-referral advice from DLPE about whether the proposal is likely to have the potential for a significant impact on terrestrial ecosystem values and whether ecological surveys of the proposal area (and adjacent areas that may be impacted) would be required to inform the EIA process.

If a referral has insufficient information about potential terrestrial ecosystem impacts, and the NT EPA decides to assess the proposal, it may request that a proponent provide further information in subsequent EIA documents such as a supplementary environmental report (SER) or environmental impact statement (EIS). The NT EPA may recommend that the Minister impose conditions (including biodiversity offset conditions) on an environmental approval that are necessary to manage terrestrial ecosystem impacts.

² Cresswell ID, Janke T, Johnston EL (2021). *Australia State of the environment 2021*, Australian Government Department of Agriculture, Water and the Environment, Canberra.

³ IUCN (2025). *Standards, methods and guidelines for cross-referencing ecosystem classifications and maps to the IUCN Global Ecosystem Typology. Version 1.0*. Switzerland: IUCN.

Proponents should consider the NT EPA's published guidance documents for advice on EIA statutory processes and timeframes, and technical guidance for the assessment of impacts to terrestrial biodiversity.

4. Considerations for environmental impact assessment

Proponents must identify, describe, and quantify terrestrial ecological values and the potential significant impacts on them. The management of such impacts is to be consistent with the environmental decision-making hierarchy whereby adverse impacts are first avoided, then mitigated and lastly offset.

The assessment and detail provided by the proponent's EIA documentation should be proportionate to the size of the proposal area, the scale of the proposal, and the extent of its impacts both on and off the proposal site.

Considerations for EIA for the Environmental factor: Terrestrial ecosystems include, but are not limited to:

- the current state of knowledge of vegetation, flora and fauna, the ecological processes that sustain them and the level of confidence in the prediction of impacts
- whether ecological surveys and analyses have been undertaken to a standard consistent with guidance and best practice
- the significance of native vegetation, its importance for flora and fauna and the risks and potential impacts posed by the proposal
- the quality and sensitivity of the terrestrial ecosystem values that would be impacted
- application of the environmental decision-making hierarchy to avoid, mitigate, then offset impacts to terrestrial ecosystems, where possible
- the potential significant impacts and the activities that would cause them, including direct, indirect and cumulative impacts
- the context, intensity, duration, magnitude and geographic extent of potential impacts to vegetation, flora and fauna
- whether proposed avoidance, mitigation and management approaches are practical and feasible
- whether the proposal area will be enhanced or restored in a manner that promotes biological diversity and ecological integrity.

The NT EPA often encounters the issues described below in its assessment of referred proposals for which terrestrial ecosystems is a key factor. Proponents are encouraged to engage early with the NT EPA and the DLPE Development Coordination Branch and/or Flora and Fauna Division, prior to preparing and submitting their referral information or other EIA documents.

Further detail on the information requirements for EIA is available in the NT EPA 'Guideline for assessment of impacts on terrestrial biodiversity'.

Level of existing knowledge

Knowledge about flora and fauna values and the distribution of biodiversity is limited across many parts of the NT, such as remote areas where detailed studies have not been undertaken or reliable field data is not available. Proponent EIA documents should identify and address knowledge gaps to allow the NT EPA to consider the adequacy of the assessment in the context of existing knowledge. Ecological field surveys may be required where there are address knowledge gaps, and reports on the results of such surveys should be included with EIA documentation.

Scientific gaps that can affect EIA include the discovery of new species, inadequate information on the distribution and abundance of flora and fauna, lack of understanding of terrestrial ecosystem processes, and lack of fine scale systematic vegetation classification and mapping.

Range restricted species

Restricted range species denote taxa with limited geographic distributions which are typically confined to specific habitats or bioregions. Their prevalence is often linked to unique environmental conditions or historical contingencies, rendering them susceptible to localised extinction events. Conservation assessments prioritise these species due to their disproportionate vulnerability and potential as indicators of ecosystem health.

Habitat loss and fragmentation

Habitat loss is the reduction or elimination of the space in which a species or community of organisms lives and reproduces, whereas habitat fragmentation is the reduction of continuous tracts of habitat to smaller, spatially distinct remnant patches. Land clearing and land use change can destroy, fragment, modify or degrade natural terrestrial habitats resulting in changes to the distribution, condition and abundance of native flora and fauna. Although much of the NT retains native vegetation cover, many areas are affected by habitat degradation and species decline.

Habitat loss and fragmentation affects the health and survival of individual populations, and potentially entire species. In parts of the NT large scale land clearing and loss of habitat has occurred. In addition to habitat loss, highly fragmented landscapes affect the ability of species to disperse. This may be a consideration in EIA where a proposal would significantly impact threatened fauna species.

Changing climate

The changing climate may impact terrestrial fauna through changes in temperature and rainfall patterns, which will influence the distribution and diversity of species. The scale, rate and nature of projected changes to climate, and the interactions between the changing climate and other threatening processes will determine the extent of impact. The NT EPA is focussed on proposal specific impacts that, when considered in combination with climate change, are likely to worsen impacts to terrestrial fauna.

Fire regimes

Changes to fire regimes can adversely impact flora and vegetation through alteration of the structure and composition of vegetation, increased erosion and expansion of weed and pest animal populations. Increased fires can interrupt the ecological processes that flora and fauna have adapted to and increase risk of predation.

Invasive species

Invasive species including weeds and pest animals can alter the distribution and abundance of native species, through competition, predation and interruption to ecosystem processes.

5. EIA of terrestrial ecosystems

Under section 11 of the EP Act, a 'significant impact' of an action is an impact of major consequence having regard to:

- (a) the context and intensity of the impact; and
- (b) the sensitivity, value and quality of the environment impacted on and the duration, magnitude and geographic extent of the impact.

Therefore, in assessing the potential significant impacts of a proposal, it is essential that proponents have regard to the terrestrial ecosystem values with consideration of the quality and sensitivity of the potentially impacted area, and the duration, magnitude and extent of potential impacts to those values.

5.1. Terrestrial ecosystem values

Terrestrial ecology includes biodiversity, vegetation communities, native plant and animal species and their habitats.

There are 67 Sites of Conservation Significance⁴ (SOCS) for biodiversity values in the NT comprising 42 sites of international significance and 25 sites of national significance. A small number of these SOCS are within the formal protected area system in the NT. For others, recognition as a SOC does not provide a form of regulatory protection but does indicate that a site may be considered of high conservation significance because it supports important environmental values including wetlands, large aggregations of wildlife, concentrations of threatened species or endemic species, or are considered botanical hotspots.

There is one endemic Threatened Ecological Community listed under the EPBC Act in the NT (Arnhem Plateau Sandstone Shrubland Complex), and one that may occur (The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin).

There are 2 priority places (recognised in the DCCEEW Threatened Species Strategy Action Plan 2022–2032⁵) in the NT (MacDonnell Ranges; and Kakadu and West Arnhem). While not recognised under NT legislation, potential impacts on the ecological values of these sites should be considered for proposals being assessed under the EP Act and EPBC Act, through a bilateral or accredited assessment process.

Sensitive and significant vegetation types are identified in the [Freehold land clearing guidelines](#) and [NT pastoral land clearing \(PLC\) guidelines](#)⁶ as communities such as rainforest, vine thicket, closed forest or riparian vegetation, mangroves, monsoon vine forest, sandsheet heath and vegetation containing large trees with hollows suitable for fauna habitat. Riparian vegetation is a significant and distinct forest community occurring on the banks of rivers or streams that directly influences the adjacent water body. Riparian vegetation shades and moderates temperature fluctuations in streams, creating suitable conditions for breeding in many aquatic species; maintaining dissolved oxygen levels; and restricting the occurrence of algal blooms.

Riparian vegetation can also protect stream banks from erosion and filter any sediment or nutrients in overland flow before the flow enters the stream, thus reducing sedimentation of aquatic habitats and reducing nutrient induced algal blooms. These areas have higher moisture and shade levels, and more productive organic soils compared to surrounding woodlands and thus support a distinct suite of plant and animal species, as well as providing an important refuge for woodland species during the dry season. Snags from fallen trees also create valuable fish habitat. Riparian vegetation is vulnerable to disturbances such as weed invasion, feral animals, fire, over-grazing, erosion, development and tourism.

The vegetation, flora or fauna values of a particular site may be considered significant for a range of reasons, including but not limited to those listed below.

⁴ [Ward, S. and Harrison, L. \(2009\). Recognising sites of conservation significance for biodiversity values in the Northern Territory. Department of Natural Resources, Environment, the Arts and Sport, Darwin, NT.](#)

⁵ DCCEEW (2022), Threatened species strategy action plan 2022–2032, Department of Climate Change, Energy, the Environment and Water, Canberra. CC BY 4.0

⁶ The land clearing guidelines for freehold and pastoral land are available on the NT Government website: <https://environment.nt.gov.au/rangelands/publications2/land-clearing-guidelines-and-management-plans>

Vegetation

- being identified as sensitive or significant vegetation within the meaning of the NT land clearing guidelines
- being identified as a threatened ecological community
- restricted distribution (whether natural or due to anthropogenic changes)
- degree of historical impact from threatening processes
- a role as a refuge for existing flora and fauna species
- providing habitat for significant flora or fauna species
- providing an important function required to maintain ecological integrity of a significant ecosystem.

Flora

- being identified as threatened or conservation significant species
- locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- new species or anomalous features that indicate a potential new species
- representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Fauna

- being identified as a threatened or conservation significant species
- species with restricted distribution
- extent of historical impact from threatening processes
- providing an important function required to maintain the ecological integrity of a significant ecosystem.

Fauna habitats may be significant if they provide important habitat for the life cycle of a threatened species e.g. foraging, breeding and roosting areas or where there are isolated or unique habitats or features such as wetlands freshwater springs, sinkholes and karst systems.

Where a proposal may impact data deficient or near threatened species, proponents should seek advice from the DLPE Flora and Fauna Division about the level of detail required for the purpose of EIA.

5.2. Potential impacts

Potential significant impacts to terrestrial ecosystems include direct, indirect and cumulative impacts on vegetation, flora and fauna.

Direct impacts on terrestrial ecosystems including loss, degradation, or fragmentation of populations range from temporary to permanent. The degree of disturbance and the biology and ecology of the species impacted determine the severity of direct impacts.

Indirect impacts include, but are not limited to:

- impacts on habitat, including abiotic factors (e.g. water, nutrients, or soil)
- disruption of reproductive cycles
- impacts on other species with important ecological functions, e.g. pollinators, seed dispersal vectors, essential symbiotic fungi
- introduction or promotion of weeds and/or disease
- modification of fire regimes
- altered hydrology, including increase or decrease of groundwater level and alteration of surface water flow.

Cumulative impacts on terrestrial ecological values potentially occur because of the impacts of the proposal combined with past, present and reasonably foreseeable impacts of other activities in the region. Cumulative impacts are to be assessed at a local and regional scale, and over time.

Impacts to terrestrial ecosystem values are also compounded by the current and forecast impacts of climate change e.g. more heat extremes, more time in drought, more intense short-duration storms, and continued decreases in seasonal rainfall.

5.3. Information required by the NT EPA

Proponent EIA documentation should describe, quantify and map terrestrial ecosystem values and the potential significant impacts on them. Assess the impacts on all potentially affected areas, whether on or off the proposal site. Include all stages of the proposal from initial development through to rehabilitation.

The assessment and detail provided by proponent EIA documents should be proportionate to the size of the proposal area, the scale of the proposal and the extent of its direct, indirect and cumulative impacts both on and off the proposal site.

The terrestrial ecosystems component of an EIA document should address the following matters:

- the proposal location and context within the local and regional ecosystem or landscape
- a description of the terrestrial ecological values that are present, or likely to be present, within the potentially affected area that would be impacted by the proposal, including threatened species and sensitive or significant vegetation
- assessment of the values and significance of terrestrial fauna, flora and vegetation types likely to be impacted at a local and regional scale by the proposal
- the adequacy of ecological surveys and the level of certainty about the presence or absence of ecological values
- a description of how the 'Principles of environment protection and management' under Part 2 of the EP Act have been considered in proposal planning, design, and implementation
- quantification of the likely impacts to terrestrial ecosystems in terms of:
 - the context, intensity of the impact, the sensitivity, value and quality of the environment impacted on and the duration, magnitude and geographic extent of impact
 - the predicted consequence of the impact on terrestrial biological diversity, ecological integrity and ecological functioning
- consideration of cumulative impacts of the proposal on terrestrial ecological values in conjunction with other existing and reasonably foreseeable proposed activities, and any consequent impacts to ecological integrity and/or biodiversity

- the degree of confidence with which the impacts of the action are known and understood
- measures to avoid, minimise and mitigate potential impacts on terrestrial ecological values, and the criteria that would be used to determine the success of avoidance and mitigation measures
- residual impacts on ecological values after all avoidance, mitigation and management measures have been implemented, and proposed offsets for significant residual adverse impacts on the terrestrial ecosystem that cannot be avoided or mitigated
- analysis of the above matters to a standard consistent with recognised contemporary published guidance, where available.⁷

Assessment of impacts under the terrestrial ecosystems factor may overlap with the assessment of aquatic and/or marine ecosystem factors. Proponents should integrate the various parts of EIA documents that assess ecological impacts, so the relationships are clear.

The NT EPA is committed to making biodiversity data generated for EIA purposes publicly available so it can be freely used, reused and redistributed for the benefit of the community, as outlined in its Biodiversity Data Policy. Proponents collecting ecological survey data for EIA purposes should refer to the NT EPA Guide for preparing biodiversity data packages.

Technical and process guidance documents related to EIA are available on the [NT EPA website](#).

6. Environmental approval

The Minister for Lands, Planning and Environment (the Minister) is responsible for granting or refusing to grant an environmental approval.

At the conclusion of the environmental impact assessment process the NT EPA provides its assessment report to the Minister and advises on the acceptability of a proposal. The NT EPA advises the Minister to grant or refuse to grant an environmental approval, including recommended conditions of approval when the advice recommends an environmental approval be granted. The Minister is not bound by the NT EPA's advice.

In its assessment report the NT EPA will advise on the acceptability of a proposal with respect to the Environmental factor: Terrestrial ecosystems. The NT EPA may recommend to the Minister that an environmental approval impose conditions to avoid, mitigate or manage impacts, or the NT EPA may refer a proponent to the NT Government's Offsets Principles and the Biodiversity Offsets Policy, and recommend terrestrial ecosystems impacts be offset.

An approval holder is responsible for complying with its environmental approval. An approval holder is legally required to develop and operate in accordance with its approval conditions and may be subject to enforcement action where there is a noncompliance.

7. Review

This guidance will be reviewed within 4 years after the date of publication. As a consequence of the review, or due to changes in the policy or regulatory environments, the NT EPA will re-examine and may alter the information in this document.

⁷ Including the Matters of National Environmental Significance Significant impact guidelines 1.1 under the *Environment Protection and Biodiversity Conservation Act 1999*.