



NORTHERN TERRITORY
PLANNING SCHEME

land clearing guidelines

Technical Report No. 27/2002
Land Clearing Guidelines

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CONTENTS

LAND CLEARING GUIDELINES 2006 UPDATED VERSION	1
1. PURPOSE AND STRUCTURE	1
2. IMPACTS OF CLEARING	1
3. LAND CLEARING POLICY	2
4. MANDATORY CLEARING APPROVALS	2
5. LAND CAPABILITY	5
6. BIODIVERSITY PROTECTION	5
7. NATIVE VEGETATION CLEARING & PROPERTY DEVELOPMENT PLANS	6
8. SITE SELECTION	7
9. OPERATIONAL TECHNIQUES	12
10. EROSION & SEDIMENT CONTROL	17
11. SUBDIVISION & LINEAR DEVELOPMENTS	18
FURTHER READING	20
GLOSSARY	21
LAND CLEARING GUIDELINES SUMMARY	25
ADVICE & ASSISTANCE	27

Land Clearing Guidelines

2006 updated version

Since the first land clearing guidelines for the Northern Territory were introduced in February 2002 there have been a number of significant changes to both the control of clearing and the administration of those controls.

This 2006 updated version amends Technical Report Number: 27/2002 Land Clearing Guidelines. The principles and key guidelines remain unchanged and the content has only been amended to reflect recent legislative and departmental changes.

1. Purpose and structure

These guidelines provide technical advice for planning and undertaking land clearing in the Northern Territory. Advice is provided for use by land owners, managers and developers on how to plan and clear in a manner that will avoid/minimise adverse environmental impacts.

The guidelines apply to all land uses and tenures, regardless of the size of the area concerned. Clearing on mining leases is guided primarily through the application of environmental management plans provided under the *Mines Management Act*. While these guidelines provide basic information on how to clear in an environmentally responsible manner, detailed advice and assistance should be sought from the relevant government agencies.

Land owners and managers are responsible for managing their land. These guidelines are designed to help owners and managers meet their responsibilities when considering purchase of a property which they intend to clear, planning to clear or clearing if permitted.

2. Impacts of clearing

To date (2005), less than 1.0% of the Northern Territory has been cleared for all development including urban, infrastructure, agricultural and mining. Inappropriate clearing of native vegetation has contributed to land degradation and loss of biodiversity in other parts of Australia. The Northern Territory has the opportunity to ensure that clearing for urban, agricultural and industrial development is planned and implemented to avoid land degradation and protect the Territory's unique biodiversity.

Well planned and executed clearing is necessary for the growth of towns and industries and development of the Northern Territory's social and economic environment. Inappropriate clearing, however, can contribute to land degradation and loss of biodiversity by:

- damaging or destroying significant vegetation communities and native wildlife habitats;
- damaging or destroying corridors for the movement of native wildlife;
- increasing the risk of erosion by exposing the soil to wind and water and concentrating and channelling water;
- reducing water quality;

- creating conditions suitable for the invasion or spread of weeds;
- disturbing the natural cycling of nutrients (such as phosphorus and nitrogen) within the environment.

Some of these impacts are important not only at the site of clearing, but also in the broader catchment. Poor clearing practice can contribute to a decline in public amenity, by affecting scenic and recreational values.

In the national context, vegetation clearance has contributed to an increase in the greenhouse gas, carbon dioxide. Greenhouse gases trap the earth's radiation and warm the air. Recent increases in the amount of greenhouse gas means that more heat is being trapped, which in turn has contributed to a change in the earth's climate.

For all these reasons, clearing needs to be limited to what is sensible and necessary for further economic development.

3. Land clearing policy

“The Northern Territory is committed to sustainable land use, through minimising the impacts of land clearing on the Territory’s natural resources. Therefore, clearing of native vegetation in the Northern Territory requires approval for all land tenures”.



4. Mandatory clearing approvals

Prior approval for clearing native vegetation must be sought for:

- **the Litchfield Shire;**
- **the Namarada/Dundee Beach area,**
- **Certain zones within existing planning areas; such as the Community Purpose zone in Darwin,**
- **Unzoned land outside of planning control areas; and**
- **Pastoral Leases across the Territory.**



Clearing may also be prohibited in areas subject to declarations under the:

- *Heritage Conservation Act;*
- *Northern Territory Aboriginal Sacred Sites Act;*
- *Soil Conservation and Land Utilization Act;*
- *Territory Parks and Wildlife Conservation Act;* and the

- Highway Control Plan.

Clearing may also be controlled through the assessment of developments under other Northern Territory legislation such as the *Environmental Assessment Act*.

The Commonwealth *Environmental Protection and Biodiversity Conservation Act* may also be invoked if a development is likely to have an environmental impact of any of the matters of national environmental significance.

It is the responsibility of the land owner or manager to ensure that all mandatory approvals for clearing are obtained. Should approval not be obtained before clearing of native vegetation occurs, heavy penalties may be applied.

4.1 Litchfield Shire

A Development Permit must be sought from the Development Consent Authority prior to the removal of more than 1 hectare of native vegetation on most allotments covered by the Litchfield Area Plan 2004. The Litchfield Area Plan 2004 is a Development Provision of the NT Planning Scheme and covers land within the Litchfield Shire.

An application for a Development Permit must be lodged with Development Assessment Services of the Department of Planning and Infrastructure. The application must be on the approved form and should include a Native Vegetation Clearing & Property Development Plan and demonstrate how these guidelines have been applied. Applicants are encouraged to discuss their plans with appropriate Government agencies prior to lodgement and well in advance of the intended time of clearing.

Applications to clear are assessed by the Vegetation Clearing Committee of the Development Consent Authority. In most cases, relevant Government departments also assess development applications and a site inspection is undertaken. A report is made to the Development Consent Authority including a recommendation on whether the application should be approved and any special conditions that may need to be imposed.

Land owners in the Litchfield Shire are currently permitted to clear up to 1 hectare of their allotment without approval. Clearing must not result in soil erosion or water quality problems on adjoining or down stream allotments.

4.2 Pastoral Leases

The clearing of vegetation on Pastoral Leases must be done in accordance with these guidelines and only with the prior approval of the Pastoral Land Board. Further information about how to develop and lodge an application can be sought from the Pastoral Branch of the Department of Natural Resources, Environment and the Arts.

4.3 Unzoned Land

Clearing of native vegetation on unzoned land is controlled by the Clearing of Native Vegetation development provisions under the *Planning Act 2005*. Under these controls a landholder is permitted to clear up to 1 hectare in total without consent (excludes firebreaks). Further clearing requires a permit. The controls outline a number of criteria that must be taken into account when considering a clearing application.

An application for a Development Permit must be lodged with Development Assessment Services of the Department of Planning and Infrastructure. The application must be on the approved form and should include a Native Vegetation Clearing & Property Development Plan and demonstrate how these guidelines have been applied. Applicants are encouraged to discuss their plans with appropriate Government agencies prior to lodgement and well in advance of the intended time of clearing.

Applications to clear are assessed by the Department of Natural Resources, Environment and the Arts. In most cases, relevant government agencies also assess applications and a site inspection is undertaken. An assessment report with recommendations is made for consideration by the Native Vegetation Assessment Panel and the Minister for Natural Resources, Environment and Heritage.

4.4 Other legislative controls

Sacred sites

Clearance certificates for works on or surrounding Aboriginal sacred sites must be sought from the Aboriginal Areas Protection Authority, which will advise if there are any issues requiring attention as part of the clearing process. As part of the assessment process, all applications to clear land are referred to the Aboriginal Areas Protection Authority for assessment against the sacred sites register.

Heritage and archaeological sites

The NT Heritage Register lists all places and objects that have been formally declared to be of heritage value. A place or object listed on the Register is then protected under the *Heritage Conservation Act*. Written permission from the Minister for Natural Resources, Environment & Heritage must be sought before any such place is disturbed.

All prehistoric archaeological places are provided with 'blanket' protection under the *Heritage Conservation Act* and written permission from the Minister for Natural Resources, Environment and Heritage must also be sought before any disturbance occurs. Relatively undisturbed areas that have not been previously surveyed may need to be surveyed.

Soil conservation

Restricted Use Areas, Areas of Erosion Hazard or areas over which a Soil Conservation Order has been placed under the *Soil Conservation and Land Utilization Act*, cannot be cleared without the prior approval of the Commissioner for Soil Conservation. Approval to clear may be granted with certain conditions.

Essential habitats and harvest of vegetation

Essential habitats may be declared under the *Territory Parks and Wildlife Conservation Act*. Permission to undertake certain activities in these areas must be sought from the Minister for Natural Resources, Environment and Heritage.

Permission for the commercial harvest of vegetation, or the non-commercial harvest of protected plant species, must also be sought under the *Territory Parks and Wildlife Conservation Act* from the Director of the Biodiversity Conservation Division within the Department of Natural Resources, Environment and the Arts. All native orchids and cycads are protected species.

5. Land capability

Land capability is the ability of land to accept a type or intensity of use permanently, or for specified periods under specific management, without permanent damage.



Land capability is assessed by considering:

- land resource attributes such as soils, slope, and drainage;
- the intended use of that land;
- the activities or inputs required to achieve that use;
- the risk of damage to the land, (both on-site or off-site); and
- the inter-relations between each of the above.

It is necessary to select areas for clearing by carefully assessing land capability and the limitations and constraints, which it may impose on the proposed development. Land should only be cleared if the risk of degradation is low and the resultant area is capable of being used for the purpose for which it was intended. Limitations or constraints include:

- slope;
- erodible soils;
- waterlogging or seasonal inundation;
- rock outcrop; and
- off-site impacts, such as alteration to drainage in neighbouring properties.

There are some environments, which should not be cleared under any circumstances, and others in which advice should be sought from the relevant experts before clearing is undertaken. A summary of these is provided in the section on Site Selection.

6. Biodiversity protection

Biodiversity refers to the variety and variability of plants, animals and other living organisms and the ecosystems in which they occur.



There is a clear link between the retention of native vegetation and the protection of biodiversity. To reduce the impacts of clearing, it is important to protect the plants, animals and/or ecosystems which may be a particularly important component of biodiversity. This includes:

- sensitive or significant plant and animal species including rare, endangered or threatened species;
- sensitive or significant plant communities, such as mangroves, rainforests, vine thickets and those along waterways; and

- other plant communities which provide corridors for wildlife movement between habitats.

The retention and maintenance of buffer zones around areas, including any of the above, is strongly recommended. Set aside time before clearing to gather relevant information, talk to experts, and make decisions about how to minimise environmental impacts.

7. Native Vegetation Clearing & Property Development Plans

A key step in planning is the development of a written Native Vegetation Clearing & Property Development Plan. In some cases this is required by law, but in all cases, it is strongly recommended.



Planning is required to:

- identify issues and problem areas at an early stage; and
- avoid areas likely to cause ongoing maintenance or management problems.

Aspects of the clearing operation such as site selection, operational techniques (including timing, felling and ongoing management) and the need for erosion and sediment control measures need to be considered in the planning stage.

The development of a written Native Vegetation Clearing & Property Development Plan will assist in the planning process by identifying specifically what you want to do, and by speeding up any approval process.

A Native Vegetation Clearing & Property Development Plan should clearly identify all aspects of the clearing operation that can potentially impact on the environment, and devise ways in which that impact can be minimised or avoided.

A Plan may take the form of a brief report and maps to demonstrate how these guidelines are to be followed. It should be a practical plan that can be used by all people involved in the operation. A Native Vegetation Clearing & Property Development Plan that involves clearing for commercial horticultural or agricultural purposes must also be accompanied by documentation that confirms the availability of a water supply of sufficient quality and quantity for the operation proposed.

The information on which a Native Vegetation Clearing & Property Development Plan should be based, and the recommended components are outlined on the following pages.

8. Site selection

Decisions regarding the location and extent of clearing should be based on:

- Land capability;
- Biodiversity protection; and
- The ability to complete clearing within the time and budget allocated. Land degradation can result if clearing and replanting is not completed as planned.

The retention of buffers and native vegetation corridors is strongly recommended.



8.1 “No –Go” & “clear with care” areas

There are certain areas which should not be cleared at all or which should only be cleared if advice has been sought relating to how impacts can be minimised.

Do Not Clear Areas

- Drainage Lines, watercourses, wetlands or seepage zones,
- Sensitive or significant vegetation communities such as rainforest, vine thicket or closed forest;
- Areas not immediately required for the intended use
- Areas afforded protection under various legislation such as:
 - *Essential habitats*
 - *Heritage and archaeological places*
 - *Aboriginal sacred sites and*
 - *Restricted use areas, areas of soil conservation hazard and areas over which a soil conservation order is in place.*

Clear with Care Areas

- Erosion prone soils
- Previously eroded areas
- Areas undergoing rehabilitation
- Seasonally waterlogged soils or seepage areas
- Areas infested with noxious weeds
- Buffers to watercourses
- Slopes over 0.5%.

Special circumstances

In some cases, clearing is undertaken in legally gazetted or otherwise pre-determined sites. Road alignments, for example, are often pre-determined and cannot feasibly be altered. Clearing for

firebreaks is required by law and must be undertaken. The control of noxious weeds is also legally required and may require clearing.

In such circumstances, particular attention must be paid to when and how clearing is undertaken. Temporary and/or permanent soil conservation structures may be required and guidelines for erosion and sediment control will apply.

8.2 Buffers and corridors

Waterways

Vegetation within and/or surrounding waterways is known as riparian vegetation.

Riparian vegetation:

- maintains bank stability and prevents erosion;
- maintains water quality and the health of aquatic plants and animals;
- filters sediment and restricts the spread of chemical pollutants and fertilisers; and
- provides habitat for wildlife and corridors for their movement throughout the country.

Native vegetation must be retained adjacent to waterways.

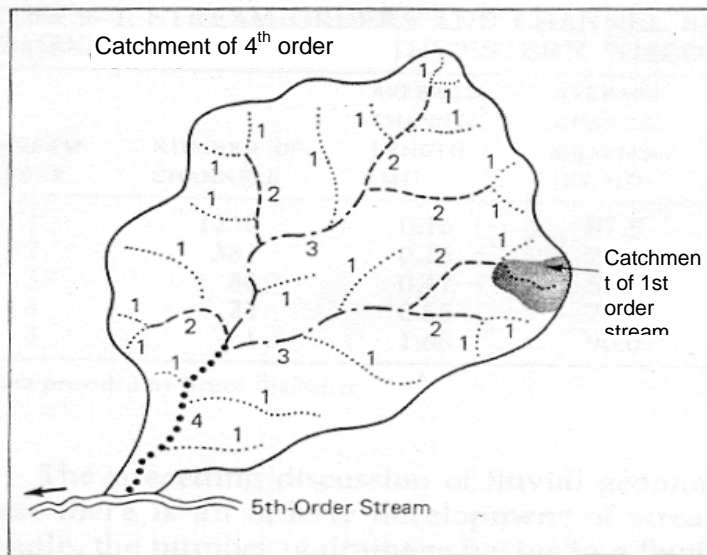
The recommended width of such buffers depends on the size and character of a waterway. This can vary from well-defined watercourses, such as creeks or rivers, to less well-defined drainage lines, seepage areas and wetlands.

Stream order

More well-defined waterways or “watercourses” are commonly classified according to a hierarchy of stream order. Stream order describes the relative size and frequency of well-defined watercourses. Watercourses with no tributaries are first order streams. Stream order only increases when two streams of the same order join. Two first-order streams join to form a second-order stream, two second-order streams join to form a third-order stream, and so on. Rivers will be fifth- or sixth-order streams. Stream order can be determined from a topographic map.

The order of a stream will determine the minimum size of the buffer required. The buffer width should be measured from the primary bank.

The primary bank lies at the outer edge of the waterway.



Drainage lines

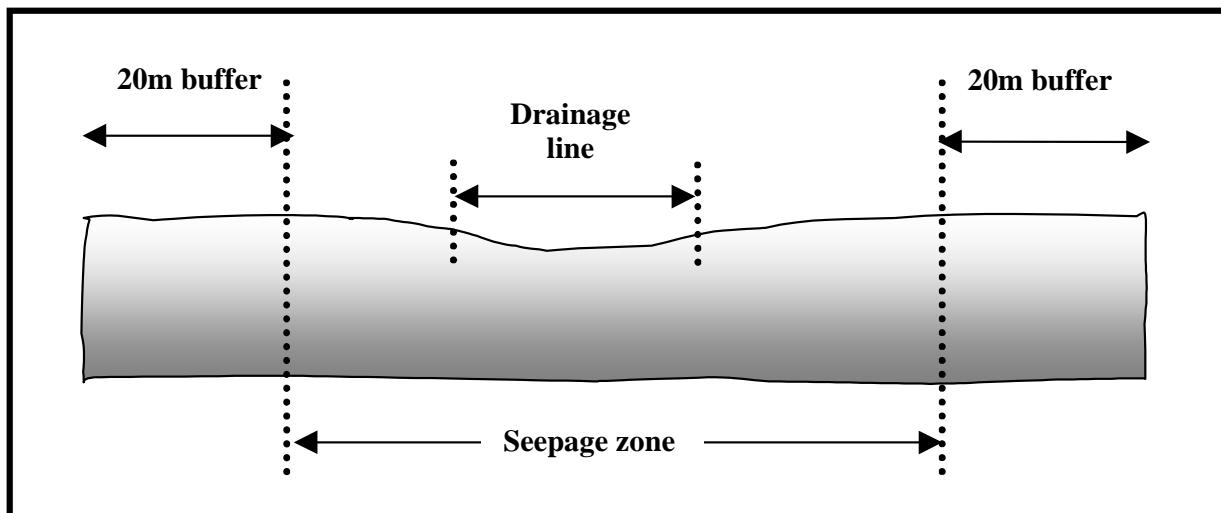
Drainage lines collect and safely channel runoff into more significant waterways or water bodies. Disturbance of drainage lines can have serious consequences in terms of flooding and erosion both on- and off-site.

Drainage lines often have no obvious channels and can be difficult to define, especially during the drier months of the year. Certain types of vegetation indicate wet or seasonally inundated areas and seepage zones. Such areas are largely unsuitable for development and can extend above the 1% annual exceedence probability (AEP) flood line.

STREAM ORDER & RECOMMENDED BUFFER WIDTHS

Waterway	Stream order	Buffer width	Measured from:
Drainage lines	Not applicable	20 m	The outer edge of the seepage line or zone (see below)
Intermittent streams	First & second	25-50 m	The primary bank of the outer stream channel where there is more than one channel or the stream is braided.
Creeks	Third & fourth	100 m	As above
Rivers	Fifth and sixth	250 m	As above
Wetlands	Not applicable	200 m	The maximum flood level* OR the edge of the active floodplain (whichever is the wider)

* Defined as the official 1% AEP flood line or the maximum flood level according to the best available information.



Special circumstances

Flexibility in applying these buffer recommendations may be appropriate if certain circumstances can be demonstrated:

These circumstances relate to:

The size and shape of a property in relation to the watercourse.

- *Buffers of the recommended width may not be feasible on very small properties.*
- *Properties on which the boundaries and the waterway and associated buffers present unmanageable parcels of land.*

The nature or character of the waterway and riparian vegetation.

- *The character or form of a floodplain or wetland may require that a buffer be wider. If there is no riparian vegetation, the buffer may be smaller.*

In these circumstances, decisions regarding appropriate buffer widths should be made by:

- *Carefully inspecting the site; and*
- *Gathering land information and advice regarding land capability and biodiversity*

Native vegetation corridors and zones

Viable networks of wildlife habitat will only be maintained if wide connecting corridors of native vegetation are retained.

Native vegetation corridors and zones provide:

- habitat and refuge areas for native wildlife;
- corridors for native wildlife movement;
- protection for waterways, and
- buffers for restricting chemical spray drift; and public amenity.

Native vegetation corridors should be positioned on a property to enable wildlife movement to adjacent land. They can coincide with drainage lines or be positioned along boundaries to provide connection between habitats. Corridors are generally only viable if at least 100 m to 200 m wide and are therefore relevant on larger properties and in regional planning.

Smaller buffers around boundaries of 25 m to 50 m may be retained on properties less than 20 ha in size for visual amenity or the restriction of chemical spray drift and are often viable wildlife corridors if maintained.

Narrow corridors are vulnerable to wind and insect damage and weed invasion and will degenerate over time. Weed and fire management must be considered in the planning and ongoing maintenance of such areas.

PROPERTY SIZE & NATIVE VEGETATION BUFFERS

Purpose	Block size (ha)	RECOMMENDED Buffer width (m)	MINIMUM Buffer width (m)	LOCATION
Visual amenity	< 2	25 - 50	25	Boundary
Chemical spray	2 - 20	50	25	Boundary
	20 - 100	100	50	Boundary / drainage lines
Wildlife corridors	> 100	200	100	Boundary / Drainage Lines / habitat connection

8.3 Practical site issues

There are a number of practical issues that should be considered in a clearing operation. These include:

- Determining areas subject to waterlogging and seasonal inundation;
- Interpreting slopes. Slope is a particularly important factor in soil erosion;
- Clearly marking the area to be cleared; and
- Managing site access.

Waterlogging and seasonal inundation

It is extremely important to be aware of the state of land to be cleared under different seasonal conditions. In the Top End, carry out site inspections late in the wet season to, and/or get land information that will, identify wet or waterlogged areas. If inspections can only be carried out in the dry season, the presence of trees such as pandanus, grevillea, swamp mahogany, brush box and paperbarks can indicate seasonally wet conditions.

In Central Australia a predominance of coolabah, dense stands of mulga, or perennial grasses such as silky browntops and cotton bush indicate drainage areas. Official flood level information may be available and local anecdotal information can be useful.

Interpretation of slope

The steepness and length of slope is a particularly important factor in soil erosion. A steep slope occurs when there is a large change in height over a given distance. A long slope is one, which is sustained over a long distance, regardless of its steepness. Given the high intensity of rainfall in the Northern Territory, significant soil erosion can occur on small slopes, even down to 1% in certain conditions. It is difficult to determine these slopes by eye.

The interpretation of slope by eye is not a reliable method and can take many years of experience.

The detail of slope information required will depend on the size and nature of the area to be cleared and its intended use. Contour or topographic maps, string lines, water levels and electronic levels can be used to obtain slope measurements of varying accuracy. Advice regarding the use of any of these methods can be obtained from the Department of Natural Resources, Environment and the Arts.

9. Operational techniques

For each step in the clearing operation:

- **Minimise soil disturbance**
- **Avoid channelling and concentration of water**
- **Minimise the length of time soil is exposed to wind and water**
- **Avoid disturbance to areas not to be cleared**

The time of year and seasonal conditions under which clearing is undertaken are critical factors in minimising environmental impact.



While the following operational guidelines will help to minimise environmental impact, the nature of the intended land use and the land capability will determine if an erosion hazard exists and structural erosion and sediment control measures are required.

9.1 Timing

The time of year and seasonal conditions under which clearing is undertaken will affect the cost, ease, duration and environmental impact of the operation. Clearing should be undertaken when soil moisture conditions are optimum. This avoids the need for regrowth control, which reduces costs and minimises soil disturbance.

Decisions regarding the best time to clear should be based on an assessment of the likelihood, duration and intensity of rain and resultant soil moisture conditions. These factors are particularly critical when clearing for linear structures, given the higher potential for concentration of water and erosion.

Soil moisture

Soil moisture conditions primarily determine the best time of year for clearing. If the soil is too wet, machinery efficiency will be impaired by bogging and track slip. This disturbs the soil unnecessarily and increases the potential for erosion. If the soil is too dry, machinery wear and fuel usage is increased, tree trunks tend to break, and sucker regrowth is more likely.

Moisture conditions must allow a clean pull of timber to prevent the snapping of trunks and reduce the potential for regrowth and the need for follow-up work.

Recommended clearing times

Given natural seasonal and climatic variability across the NT, the most appropriate time to clear will depend on geographic location and seasonal conditions. Experience, local knowledge and advice from the relevant experts should be used to work within the recommendations provided below.

Top End

Depending on the season, the best times are likely to occur:

- Early in the wet season following first rains but before the monsoon arrives in November – December.

Make sure soil is protected throughout the rest of the season,

- Late in the wet season (March/April); or
- Early in the dry season (May).

Central Australia

The best conditions are likely to occur:

- After rainfall, once moisture conditions are suitable for safe machinery operation. As a long term average 71% of annual rain at Alice Springs falls in summer, but in 14% of years, winter rainfall has exceeded summer rainfall.

9.2 Felling

The scale and nature of the final land use mainly determine how felling is undertaken. Environmental impacts vary according to the methods of felling. These impacts should be considered and minimised.

Flagging the site

Sites to be cleared should be well flagged to avoid confusion and unnecessary removal of vegetation. The land owner or manager and plant operator should inspect the site together prior to clearing to confirm requirements.

Site access

Uncontrolled access to a site which is being (or has just been) cleared may have environmental impacts. Access should be managed to prevent the introduction of weeds or the unnecessary compaction or rutting of soils by vehicle movements.

Machinery

- Use a stick rake rather than a blade to fell vegetation if possible.
- Do not flat blade as this removes topsoil, which could result in channel formation along the cleared line.
- If flat blading is the only option, use erosion control works to divert water flow from the development.
- Depending on the final land use, an alternative to grading after the initial clearing may be to slash as low as possible and rake and remove excess material. Ongoing maintenance may need to be considered in these circumstances.

Clear felling (chaining)

Careful timing and technique is extremely important in clear felling operations. Large areas of soil are exposed at the one time and heavy machinery can significantly disturb the soil. The potential for impact is high and structural soil conservation works may be required.

Strip clearing

Strip clearing involves the clearing of broad lines of vegetation along the contour leaving intervening strips of native vegetation (buffers). Buffers reduce the speed of stormwater runoff and the potential for erosion. Strips must be appropriately spaced, accurately surveyed to follow the contour, have good ground cover and prevent the downslope concentration of runoff.

STRIP CLEARING ADVANTAGES AND DISADVANTAGES

Advantages	Disadvantages
<ul style="list-style-type: none">• Land in higher slope categories can be cleared, reducing the amount of soil conservation works required.	<ul style="list-style-type: none">• May reduce the productive capacity of the overall area to an unacceptable level.
<ul style="list-style-type: none">• Buffers provide shelter for domestic animals, and if of a sufficient size, corridors and habitat for native wildlife (page 26).	<ul style="list-style-type: none">• Buffers can present weed, pest and fire management problems
<ul style="list-style-type: none">• Staged development can reduce erosion potential and overall costs.	<ul style="list-style-type: none">• Changed circumstances may later require the removal of buffers necessitating the use of soil conservation works in higher slope areas.
<ul style="list-style-type: none">• Buffers can provide wind protection for crops and reduce chemical spray drift.	

Selective clearing

Selective clearing can be undertaken with lighter machinery such as graders and can cause less soil disturbance than heavy machinery. At a small scale selective clearing can be undertaken using chemicals, chainsaws or machinery. Sucker regrowth can be a problem.

Debris & Windrow management

Push debris with a stick rake to either side of the alignment and burn or remove to prevent the concentration of runoff. This may not be necessary in more arid, less densely vegetated areas.

Windrows concentrate water, increase the potential for erosion, and should be removed following construction and maintenance. Windrows, which cannot be removed, should be aligned down the slope (at right angles to the contour) or in a manner, which is appropriate for the safe disposal of runoff. In some cases, such as in the rehabilitation of borrow pits, vegetation can be respread over the area during rehabilitation. This should be done in a manner, which does not concentrate runoff.

For underground linear developments such as pipelines or cables, vegetation may be carefully respread over the alignment to discourage water concentration.

Minimise soil disturbance by:

- Pushing debris with a stick rake, rather than a blade; and
- Using tines rather than blades to flatten windrows.

Avoid channelling and concentration of runoff by:

- working along the contour; and
- removing windrows immediately following construction or maintenance

Sucker control

Reduce soil disturbance by using a blade plough rather than a disc plough, if further cultivation is not essential to the intended use. The use of disc ploughs should especially be avoided in wet conditions.

Chemical control can be used as an alternative to mechanical control. This has the advantage of minimising further soil disturbance, depending on the intended final land use. Advice on chemical sucker control can be obtained from the Department of Natural Resources, Environment and the Arts.

9.3 Ongoing management

Following clearing, minimise the potential for land degradation:

- Work along the contour,
- Establish and maintain a good vegetation cover or use other appropriate surface protection measures as soon as possible, and
- Maintain drainage and erosion and sediment control works.

Working machinery along the contour minimises the risk of water channelling and concentrating downslope. This is particularly important during wet conditions.

Therefore:

- plant crops along the contour.
- drive vehicles or heavy machinery along the contour to prevent the concentration of runoff along wheel ruts.
- Minimise the length of time that soil is exposed to wind and water:
- establish and maintain good vegetation cover, or use other appropriate surface protection measures (such as mulch, heavy plastic or geotextile), as soon as preparation is complete;
- manage and maintain improved pastures and restrict their spread beyond your boundary;
- control and manage weed infestations:
- Only clean machinery should enter and leave the site;
- Be particularly aware of weeds which are seeding;
- Obtain weed information from the Department of Natural Resources, Environment and the Arts; and
- Be aware of legal requirements under the Weeds Management Act to control the growing, spread and eradication of noxious weeds.

10. Erosion & sediment control

Prevention is better (and cheaper) than cure!



Structural erosion and sediment control measures should be used if it is necessary to clear land, which presents an erosion hazard. Such measures include contour banks, cross drains, drop structures, flumes, sediment traps and basins and buffer strips.

The type, extent and permanency of measures required will depend on:

- soil type;
- slope;
- proposed land use; and
- the seasonal conditions under which soil is likely to be exposed.

Erosion and sediment control

- As a general rule, erosion and sediment control measures are recommended on all cleared land with slopes greater than 1%. The following table provides examples of slope thresholds over which structural erosion and sediment control measures are recommended for various land uses.
- Strip clearing and buffers may increase the thresholds over which works are recommended. Soil type must be considered. It should also be noted that erosion can occur on slopes less than 1% given the right conditions.
- Determine requirements for erosion and sediment control measures and in particular, ensure drainage works are protected.
- Avoid the use of open unlined drains wherever possible, as they tend to be highly erodible.
- Stabilise and revegetate construction access tracks and hardstand areas as soon as development is complete.

SLOPE THRESHOLD GUIDELINES FOR SOIL CONSERVATION WORKS*

SOIL CONSERVATION WORKS RECOMMENDED ON SLOPES OVER:			
Land Use	Pasture improvement	Annual agricultural cropping	Tree cropping
SLOPE	1%	1%	2%
	Once pastures are established, grazing must be managed to ensure adequate cover.	Provided that minimum till is used.	With a well established and maintained ground cover. 1% With no ground cover.

- *Thresholds are provided as examples only. Each site needs to be assessed in terms of soil type, slope, proposed use and the season during which soil is exposed.*

11. Subdivision & Linear Developments

In addition to the principles and operational techniques previously described, special attention should be paid to the following points when clearing for subdivision developments. Developments across drainage lines and waterways can be difficult to construct, maintain and rehabilitate. Fire control is also hard across rough terrain. As a general rule, impacts tend to be higher at sites where the environment makes construction difficult. Rehabilitation of these sites will also tend to be more problematic.

The cleared line should only be as wide as required for the intended purpose, bearing in mind any firebreak regulations, which may be in place. Use the same alignment for a number of purposes wherever possible. For example, roads may double as suitable firebreaks.

Erosion and sediment control measures will be required to provide for the regular and safe disposal of water. These should be planned and constructed either prior to, or during construction. It is particularly important that water does not concentrate along the alignment.

Linear developments include roads, tracks, fencelines, boundary lines, firebreaks, pipelines and exploration lines.

They are particularly prone to erosion as:

- water can be concentrated and channelled in one direction; and
- this concentration is often directed downslope and over long distances.

11.1 Site selection

For subdivision alignments;

- Select well-drained sites above peak flood levels.
- Pay particular attention to drainage across the catchment in which the subdivision is proposed.
- Consider potential off-site impacts on water flow both into and out of the site. Think of the neighbours!
- Consider the on-site impacts of existing drainage.
- Do not locate boundaries or access tracks across sensitive areas.
- Consider drainage into and out of individual blocks.
- Make allowance for drainage easements and plan for their subsequent management.
- Retain poorly drained land, or land subject to flooding, within a single block.
- Retain land steeper than 10% within a single block.
- Do not locate boundaries across sensitive areas.
- Consider potential building envelope sites and ensure suitable access is available.
- Ensure the drainage network is kept functional and non-eroding.

For linear alignments wherever possible always locate;

- On high ground.
- On stable, "hard" country (such as gravely soils or spinifex plains).
- Along the crest of broad gentle rises, ridge lines and/or catchment boundaries; or
- Along the contour, where it is not possible to follow crests.

Further Reading

Applegate RJ (1983), *Guidelines for the rehabilitation of borrow pits in the Top End*, Conservation Commission of the NT, Technical Report No. 13, NT Government Printer, Darwin.

Chamber of Mines and Petroleum (Inc), Department of Mines and Energy and Conservation Commission of the NT (undated), *Code of conduct for mineral exploration in environmentally sensitive areas in the Northern Territory*.

Conservation Commission of the NT and Department of Mines and Energy (1991), *Guidelines for mineral exploration in coastal areas of the Northern Territory*. Government Printer of the NT.

Department of Lands, Planning and Environment (1999), *Environmental guidelines for reclamation in coastal areas*, Environment and Heritage Division.

Houghton PD and Charman PEV (1986), *Glossary of Terms used in Soil Conservation*, Soil Conservation Service of NSW.

GLOSSARY*

Alignment

A route for a linear development such as a road, fence line, firebreak, railway line, power line or pipeline.

Biodiversity

The variety and variability of living organisms and the ecological complexes in which they occur.

Blade plough

A heavy duty implement fitted with V-shaped blades which cut beneath the soil surface.

Buffer

An area of land used or designed to isolate one area of land from another so that adverse effects arising from one area do not affect the other. Native vegetation buffers can be used, for example, to protect drainage lines, watercourses or sensitive vegetation communities and to improve public amenity.

Catchment

The source area for runoff flowing to a particular point.

Clean pull of timber

Occurs when soil moisture conditions are suitable for clearing, and timber is laid down with the majority of roots pulled out of the ground.

Clear felling

The removal of extensive tracts of native vegetation at a time.

Clearing of native vegetation means the removal or destruction, by any means, of **native vegetation** on an area of land, other than:

- (a) the removal or destruction of a declared weed within the meaning of the *Weeds Management Act* or of a plant removed under the *Plant Diseases Act*;
- (b) the lopping of a tree;
- (c) incidentally through the grazing of livestock;
- (d) the harvesting of **native vegetation** planted for harvest;
- (e) the clearing of firebreaks or roads for access to the land or other land;
- (f) in the course of Aboriginal traditional use, including the gathering of food or the production of cultural artefacts;
- (g) by fire;
- (h) the removal or destruction of **native vegetation** occurring on a **site** previously cleared in accordance with a permit issued under the Act; or
- (i) incidentally through mowing an area previously cleared of **native vegetation**;

* *Many definitions sourced from Houghton and Charman (1986)*

and includes the selective removal of a species of plant, a group of species of plants, a storey or group of storeys in whole or in part;

Contour

A line connecting points of equal elevation.

Development Consent Authority

The Development Consent Authority is established under the *Planning Act*. Divisions of the Authority determine development applications within their division area. Outside those areas, the consent authority is the Minister. The Authority is comprised of a chairperson and four members, two nominated by local council and two appointed by the Minister for Planning & Lands for a period of up to two years.

Discing

Cultivating or otherwise working the soil with an implement comprised of a series of heavy duty steel discs which cut and penetrate the soil.

Drainage line

A channel down which surface water naturally concentrates and flows. Drainage lines may become temporarily inundated as storm water flows across a catchment to more significant waterways or water bodies. The period of inundation is usually no more than 24 hours, however, water may be held for extended periods over the wet season. Unlike *watercourses*, drainage lines often do not form well-defined channels.

Drainage system

Areas surrounding and including drainage lines and watercourses. These areas are subject to periods of inundation, may be subject to seasonal waterlogging and have vegetation types which often indicate a wetter environment than the surrounding country. Alterations to drainage systems may adversely impact on the drainage of adjacent land.

Easement

An easement allows an individual or company a right to use or engage in some activity over land that is owned by someone else. For example, a sewerage easement to the Power and Water Authority gives PAWA certain rights.

Endangered species

Species in danger of extinction and whose survival is unlikely if the causal factors continue operating.

Erosion and sediment control measures

Activities based on structural works, vegetation management, tillage operations and/or other management options designed primarily to achieve control of soil erosion and sedimentation.

Erosion hazard

The susceptibility of an area of land to the agents of erosion such as wind and water. Erosion hazard is dependent on a combination of climate, landform, soil, land use and land management factors. See *erosion risk*.

Erosion risk

The intrinsic susceptibility of an area of land to the agents of erosion such as wind and water. Erosion risk is dependent on a combination of climate, land form and soil characteristics. As opposed to *erosion hazard*, land use or management factors are not considered in determining erosion risk.

Habitat

The natural environment in which plants or animals exist.

Horticulture

Vegetable and fruit cropping.

Land capability

The ability of land to accept a type and intensity of use permanently, or for specified periods under specified management, without permanent damage.

Land degradation

The decline in quality, including the capability, of natural land resources, commonly caused through improper use.

Land resources

Physical, chemical and biological elements relating to the land. Includes geology, soils, landform, vegetation and the location and behaviour of water in the landscape.

Land unit

An area of relatively uniform landform, soils and vegetation types.

Native Vegetation

Means terrestrial and inter-tidal flora indigenous to the Northern Territory, including grasses, shrubs and mangroves.

Pasture improvement

The replacement of native cover by introduced species to be used for grazing.

Primary bank

The first bank at the edge of a waterway. A secondary bank is usually found beyond the primary bank and tends to include more productive land.

Public amenity

Scenic or recreational enjoyment provided to the public by a given area of land.

1% annual exceedence probability (AEP) flood line

The line adjacent to a waterway at which the probability of floodwaters reaching that height is 1% in any given year.

Rare species

Species which are uncommon but which are not currently considered endangered or vulnerable.

Rehabilitation

The treatment of degraded or disturbed land to achieve an agreed level of capability and stability, preferably at least equal to that which existed prior to degradation or disturbance.

Runoff

That portion of rainfall not immediately absorbed into, or detained upon the soil, and which thus becomes surface flow. Runoff is the major agent of water erosion. The amount of runoff depends on rainfall intensity and duration, slope, surface roughness, vegetation cover, and surface soil conditions including moisture content.

Map scale

The relation, expressed as a ratio, between a unit of length on a map and the actual length it represents on the land surface.

Riparian vegetation

Vegetation belonging to a river bank and located from the normal river level to the edge of the floodplain.

Sediment

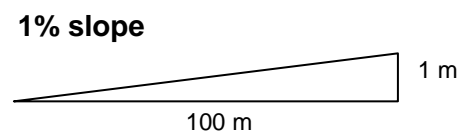
Material that is being or has been removed from its original site by the action of wind, water or gravity.

Seepage zone

Land that through a combination of topography, slope, soil type, poor drainage and/or shallow ground water tables is subject to waterlogging and/or inundation for extended periods; usually of a minimum of two or more weeks.

Slope

An incline in the land's surface, upward or downward, from the horizontal. Slope can be expressed as a degree, percentage or ratio. A 1% or 100:1 slope rises one metre over a distance of 100 m and is equivalent to just under 6°.

**Soil erosion**

The detachment and transportation of soil and its deposition at another site by wind, water or gravitational effects. Accelerated soil erosion occurs primarily as a result of the influence of human activities.

Stick rake

An attachment for heavy machinery consisting of a number of vertical bars. A stick rake is used to push debris, but allows soil to pass through.

Stream order

Describes the relative size and frequency of well-defined watercourses.

LAND CLEARING GUIDELINES SUMMARY

STREAM ORDER & RECOMMENDED BUFFER WIDTHS

Waterway	Stream order	Buffer width	Measured from:
Drainage lines	Not applicable	20 m	The outer edge of the seepage line or zone (see below)
Intermittent streams	First & second	25-50 m	The primary bank of the outer stream channel where there is more than one channel or the stream is braided.
Creeks	Third & fourth	100 m	As above
Rivers	Fifth and sixth	250 m	As above
Wetlands	Not applicable	200 m	The maximum flood level* OR the edge of the active floodplain (whichever is the wider)

* Defined as the official 1% AEP flood line or the maximum flood level according to the best available information.

PROPERTY SIZE & NATIVE VEGETATION BUFFERS

Purpose	Block size (ha)	RECOMMENDED Buffer width (m)	MINIMUM Buffer width (m)	LOCATION
Visual amenity Chemical spray	< 2	25 - 50	25	Boundary
	2 - 20	50	25	Boundary
Wildlife corridors	20 - 100	100	50	Boundary / drainage lines
	> 100	200	100	Boundary / Drainage Lines / habitat connection

LAND CLEARING GUIDELINES SUMMARY

SLOPE THRESHOLD GUIDELINES FOR SOIL CONSERVATION WORKS*

SOIL CONSERVATION WORKS RECOMMENDED ON SLOPES OVER:			
Land Use	Pasture improvement	Annual agricultural cropping	Tree cropping
SLOPE	1%	1%	2%
	Once pastures are established, grazing must be managed to ensure adequate cover.	Provided that minimum till is used.	With a well established and maintained ground cover.
			1%
			With no ground cover.

* Thresholds are provided as examples only. Each site needs to be assessed in terms of soil type, slope, proposed use and the season during which soil is exposed.

ADVICE & ASSISTANCE

INFORMATION	AGENCY & LOCATION	PHONE NO.
TOPOGRAPHIC & CADASTRAL MAPPING, AERIAL PHOTOS	MapsNT – Land Information Division Department of Planning and Infrastructure	
	First floor, Nichols Place, Cnr Cavenagh & Bennett Streets Darwin	8999 7010
	1 st Floor, Alice Plaza Todd Mall Alice Springs	8951 5316
LAND & WATER RESOURCES (land unit mapping) (Soil conservation) (Land capability advice) (Groundwater advice)	Natural Systems Division Department of Natural Resources, Environment and the Arts	8999 4455
	4th floor, Goyder Centre, 25 Chung Wah Terrace Palmerston	8973 8100
	Randazzo Building, 16 Katherine Terrace Katherine	8951 9208
	1 st floor Alice Plaza Todd Mall Alice Springs	
NATIVE FLORA & FAUNA	Biodiversity Conservation Division Department of Natural Resources, Environment and the Arts	8999 4401
	2nd floor, Goyder Centre, 25 Chung Wah Terrace Palmerston	8951 8211
	Tom Hare Building, Arid Zone Research Institute, Stuart Highway Alice Springs	
WEED MANAGEMENT	Natural Resource Management Division Department of Natural Resources, Environment and the Arts	8999 2020
	Berrimah Farm, Berrimah	8973 8101
	Randazzo Building 16 Katherine Terrace Katherine	8962 4495
	99 Patterson Street Tennant Creek	8951 8195
	Arid Zone Research Institute, Alice Springs	

INFORMATION	AGENCY & LOCATION	PHONE NO.
ENVIRONMENTAL ASSESSMENT	Environment Protection Agency Department of Natural Resources, Environment and the Arts	8924 4143
ARCHEOLOGICAL & HERITAGE PLACES	2nd floor, Darwin Plaza, Smith Street Mall	8951 9201
	1 st Floor, Alice Plaza, Todd Mall Alice Springs	
ABORIGINAL SACRED SITES	Aboriginal Areas Protection Authority	
	1st floor, TII Building, 74 Cavenagh Street Darwin	8981 4700
	Belvedere House, Cnr Bath and Parsons Street Alice Springs	8952 6366
PRIMARY INDUSTRIES (Horticulture advice) (Agriculture advice)	Department of Primary Industries, Fisheries and Mines	
	Berrimah Farm Makagon Road , Berrimah	8999 2284
	Katherine Research Station Katherine	8973 9739
DEVELOPMENT ASSESSMENT SERVICES (Clearing in Litchfield Shire)	Development Consent Authority Department of Planning and Infrastructure	
	Ground Floor, Cavenagh House, 38 Cavenagh Street Darwin	8999 7867
CLEARING ON PASTORAL LAND	Pastoral Land Board	
	3rd Floor, Goyder Centre, 25 Chung Wah Terrace Palmerston	8999 4667
	Randazzo Building, 16 Katherine Terrace Katherine	8973 8104
	1 st Floor Alice Plaza, Todd Mall Alice Springs	8951 9220
CLEARING ON UNZONED LAND	Land Clearing Branch Natural Resource Management Division Department of Natural Resources, Environment and the Arts	
	3 RD Floor, Goyder Centre, 25 Chung Wah Terrace Palmerston	8999 3631
	Randazzo Building, 16 Katherine Terrace Katherine	8973 8111
	1 st Floor Alice Plaza, Todd Mall Alice Springs	8951 9208

- Information is also available on the NT Government's web site:
<http://www.nt.gov.au/nreta/naturalresources/nativevegetation/index.html>



Northern Territory Government

Department of Planning and Infrastructure