BioBanking
Biodiversity Banking and Offsets Scheme

The science behind BioBanking

Department of
Environment, Climate Change and Water NSW

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Published by:
Department of Environment, Climate Change and Water NSW
59–61 Goulburn Street
PO Box A290
Sydney South 1232
Ph: (02) 9995 5000 (switchboard)
Ph: 131 555 (environment information and publications requests)
Ph: 1300 361 967 (national parks information and publications requests)
Fax: (02) 9995 5999
TTY: (02) 9211 4723
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

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A scientific approach to assessing biodiversity

The aim of the Biodiversity Banking and Offsets Scheme (BioBanking) in New South Wales is to generate conservation gains while streamlining the biodiversity assessment process for developments. Under the scheme, landowners manage their biobank site in order to either improve or maintain the site's overall biodiversity values. Developers can offset the impacts of their development site – after they have minimised and mitigated the impacts on the site – by purchasing matching biodiversity credits from the biobank site owner.

Biodiversity values encompass the composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats. BioBanking is underpinned by the best available science and is market based to achieve the best overall outcome for biodiversity. The Department of Environment, Climate Change and Water NSW (DECCW) operates the scheme under Part 7A of the *Threatened Species Conservation Act 1995.*

The scheme's centrepiece is the 'improve or maintain biodiversity values' test, as set out in the BioBanking Assessment Methodology. The methodology provides a rules-based approach to determine whether a development can proceed. If the development can proceed, the loss of biodiversity values on the development site from removing native vegetation, habitat of threatened species and threatened species themselves can be offset through the gain in biodiversity values from undertaking management actions on the biobank site.

This paper provides background material about the science that underpins the methodology.

Relationship with the NSW State Plan

In the NSW State Plan, the NSW Government sets goals for improving the extent and condition of native vegetation and for promoting recovery of threatened species. The government has adopted these goals to arrest the trend of the past 200 years for biodiversity to decline due to land clearing, development, introduction of exotic species and altered land management.

Some developments are inconsistent with these goals because they entail clearing of native vegetation and have negative impacts on biodiversity, which includes threatened species. The solution is not necessarily to reject the development activities outright, because the people of NSW enjoy large economic and social benefits as a result of them. A much better approach is to achieve social, economic *and* environmental outcomes. Innovative approaches are required so the community can benefit from housing, jobs and amenities and so that biodiversity is conserved and improved for existing and future generations.

The key to ensuring conservation of the state's biodiversity is to optimise investment in biodiversity so that the most effective actions are undertaken in locations that can provide lasting biodiversity benefits and cost-effectiveness.

The rationale for BioBanking

Stakeholders have been using biodiversity offsets in NSW since the mid-1990s. These offsets have usually involved setting aside an area of land, which has often been adjacent to the land being cleared.

Although some good results have been achieved using this approach, there are many cases where the biodiversity offset has been located on land where long-term conservation is unlikely to succeed. For example, offsets have either been located on land zoned for development or land close to infrastructure or existing urban areas, where habitats were already degraded and fragmented and the land-use activities on the adjoining land would inevitably lead to a reduction in the offset area's biodiversity values.

Improving on the existing approach

1. Offset areas have been inconsistent

Under the existing approach, many offsets have been determined on an *ad hoc* basis. The amount of land set aside has often been based on a subjective offset ratio of land to be developed to land to be conserved. For example, in the case of an offset ratio of 1:1 for development and conservation, a 10-hectare development would require 10 hectares of land to be set aside for conservation. Recent biodiversity offsets in NSW have ranged from 1:1 to 1:25. The existing offset determinations are subjective, are rarely based on scientific rigour, can entail protracted negotiations and uncertainty for developers, and can have poor outcomes for conservation. BioBanking provides a consistent, repeatable and transparent means for calculating offsets using biodiversity credits.

2. It has been insufficient to merely set land aside

In redressing the loss caused by the impacts of development, biodiversity gains are not necessarily made merely by setting land aside for conservation. The condition of ecosystems is not static. In many locations, there is an existing trajectory of degradation from previous poor management, fragmentation, weeds and feral animals. Biodiversity values will continue to decline unless we arrest this trend through active management of offset sites.

BioBanking ensures active management occurs on the offset site in order to counterbalance the loss in biodiversity value caused by the development. Without active management, offsets do not improve or maintain biodiversity.

3. Offsets have been fragmented

Under the existing approach, multiple small parcels of land have been haphazardly set aside as offsets for developments. Fragmentation of the land around the offset sites inevitably leads to degradation of biodiversity values, due to lack of connectivity and declining condition caused by activities on neighbouring land. BioBanking provides a transparent process that ensures the biodiversity offset is located on land where improvements in biodiversity are secured in a cost-effective manner.

4. High-value areas for biodiversity have not necessarily been conserved

Under the existing approach, the rules have been unclear as to what constituted biodiversity values, what land could not be developed, and what biodiversity values could be offset. Under BioBanking, however, all parties clearly know what land can and cannot be developed (red-flag areas cannot be developed). DECCW has incorporated some flexibility in the rules for land on which development cannot proceed so that local circumstances can be taken into account.

5. Outcomes have been uncertain

Under the existing practices for offsetting biodiversity, financial and legal security can take years to negotiate, and monitoring is often not undertaken on an ongoing basis. BioBanking provides a framework which has legal and financial security, and an ongoing monitoring and compliance program.

The objectives of BioBanking

To improve on the existing approach to biodiversity offsets, the NSW Government has established BioBanking to assess a development's impacts on a site's biodiversity values and to measure the biodiversity gains through active management of biobank sites. The BioBanking Assessment Methodology:

- is underpinned by the improve or maintain test to ensure overall biodiversity values are improved or maintained
- is a consistent, repeatable and transparent method for assessing biodiversity values on both development sites and offset sites
- is scientifically robust
- translates the assessment results into a market-based instrument, biodiversity credits.

Scientific principles that underpin BioBanking

According to Gibbons *et al* (2009), the scientific principles that underpin the improve or maintain test in BioBanking are:

- biodiversity encompasses the structure, function and composition of ecological communities on the scale of the site, the region, the state and the nation
- examples of all ecological communities are managed for biodiversity conservation, and sites are assessed relative to broader-scale conservation priorities, according to the ecological community's conservation status
- long-term viability of ecological communities is enhanced, and sites are assessed according to their viability.

Development and review of the methodology

The BioBanking Assessment Methodology is similar to the Environmental Outcomes Assessment Methodology, which is used to assess biodiversity and threatened species under the *Native Vegetation Act 2003.* Using the BioBanking Assessment Methodology, an accredited BioBanking Assessor applies the 'improve or maintain' test for biodiversity values, and uses the same data and ecological principles that are used for assessment of biodiversity and threatened species under the *Native Vegetation Act 2003*.

In developing the methodology, DECC drew on input from scientists, practitioners, stakeholders and a Ministerial Reference Group. Expert panels of more than 30 scientists contributed data to the Threatened Species Profile Database. The databases in the BioBanking Credit Calculator contain information about more than 1600 vegetation types. They also contain the characteristics of listed threatened species, populations and ecological communities, including habitat needs, distribution, response to management actions, life-history strategies, survey requirements, and the species' ability to withstand loss in numbers and/or extent.

To ensure the methodology would be rigorous, usable and objective, DECC commissioned an independent peer review. The reviewers were three Australian leaders in the field of biodiversity assessment methods: Professor Hugh Possingham, of the University of Queensland; Mr David Parkes, of the Victorian Department of Sustainability and Environment; and Dr Phil Gibbons, of the Australian National University.

The terms of reference of the peer review were to assess whether the methodology:

- was based on sound science
- met the requirements of the *Threatened Species Conservation Amendment (Biodiversity Banking) Act 2006*
- would be as simple as possible without leading to any compromise of its scientific integrity.

In the *Peer Review of the May 2007 Draft of the BioBanking Assessment Methodology* (Possingham *et al.*, 2007), the reviewers concluded:

> *Overall we believe that the BioBanking Scheme is sound and will provide a significant improvement over the existing system for protecting threatened species and communities. We acknowledge the difficulties encountered when developing approaches that seek to find a workable balance between planning practicalities and science complexities, and therefore consider the proposed BioBanking Scheme an admirable attempt in many ways, and congratulate the various contributors to this challenging task.*

The methodology

The underlying rationale

An accredited BioBanking Assessor uses the methodology to assess the biodiversity values of both development sites and biobank sites according to the following seven criteria:

1. state and national priorities
2. regional value
3. 'Landscape Value'
4. 'Site Value'
5. threatened species
6. management actions
7. the area (hectares) of the land to be developed (the development site) or managed for biodiversity (the biobank site)

State and national priorities and regional value

State and national priorities are determined according to listed threatened ecological communities. The regional value is determined according to the vegetation type's conservation status (per cent cleared in the catchment management authority area). Generally, vegetation types that are greater than 70 per cent cleared or that are listed as either an Endangered Ecological Community or a Critically Endangered Ecological Community cannot be developed and will trigger a red flag.

BioBanking uses a comprehensive classification system for ecological communities incorporating 12 vegetation formations, 99 vegetation classes and more than 1600 vegetation types.

Landscape Value

Landscape Value is an assessment of the negative impacts on a development site or the positive improvements at a biobank site on the spatial configuration of vegetation. Assessment of Landscape Value on development and biobank sites is based on:

- change in the percentage of native vegetation cover within the 1000-hectare and 100-hectare assessment circles
- change in connectivity of the site's vegetation with surrounding vegetation
- total adjacent remnant area – the area of native vegetation that is not in low condition and that is linked to the next area of native vegetation.

The assessment circles are used to measure the change in the extent of native vegetation cover. The level of fragmentation of native vegetation is also considered in the Landscape Value assessment (Figure 2). A development that increases fragmentation in the landscape has a greater impact on biodiversity values than a development that retains corridors and connectivity. Similarly, a biobank site located adjacent to a large vegetation remnant has more biodiversity values than a biobank site located adjacent to small isolated areas.

Figure 1 Assessment of percent native vegetation cover within 1000-hectare and 100-hectare circles

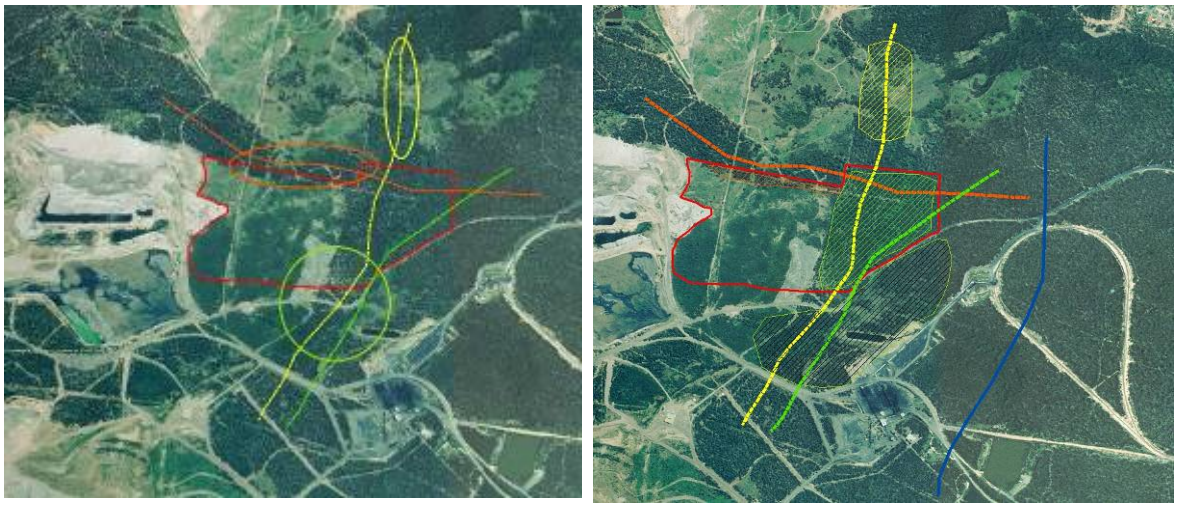

Figure 2 Assessment of connectivity

The width of the linking vegetation is assessed. The ellipses and circles show the area where the narrowest width of each connecting link occurs.

The condition of the diagonally hatched areas (the linking vegetation) is assessed.

Site Value

Site Value is determined from surveys of vegetation condition on the site. The condition of 10 site attributes is assessed against benchmark values to determine the Site Value score. The higher the Site Value score, the greater the value of the site for biodiversity values, including threatened species.

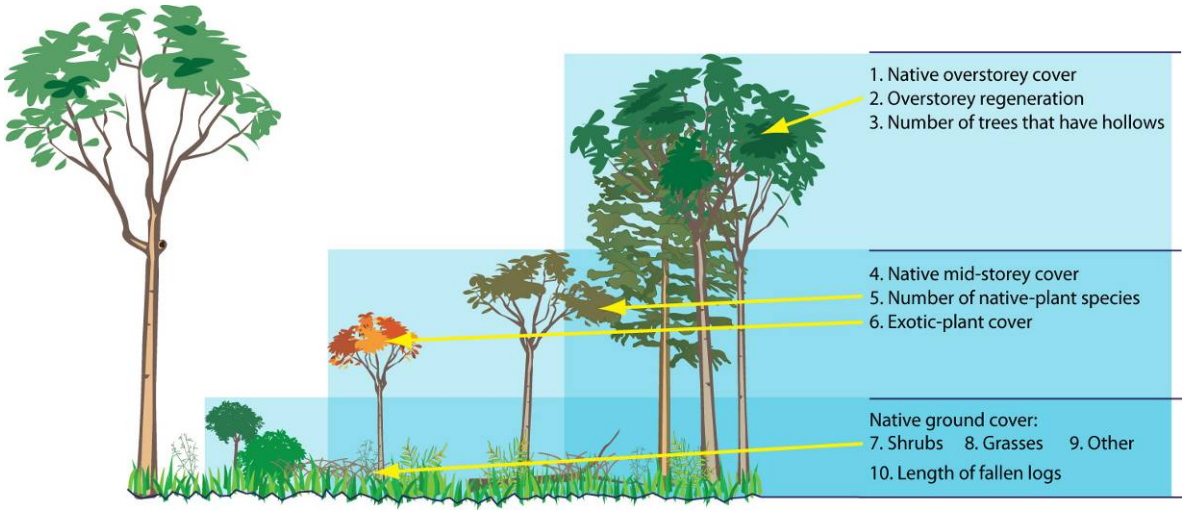

Figure 3 Site attributes

Threatened species

Threatened species are assessed according to a targeted survey, their association with vegetation type and other habitat features, and their geographical distribution. Species that can be reliably predicted from habitat features and geographical location do not have to be surveyed. All other species, including all threatened flora, are assessed using a survey. Information from the Threatened Species Profile Database is used in this assessment. The database contains information about the habitat requirements and distributions of species, management actions for improving the species' habitats, and the species' likely responses to the management.

Management actions

The biobank site owner undertakes management actions to improve the site's biodiversity and offset the loss of biodiversity values on development sites. The management actions are tailored for each biobank site and its threatened species. Management actions include undertaking conservation grazing, controlling weeds and feral animals, re-planting, and controlling human disturbance.

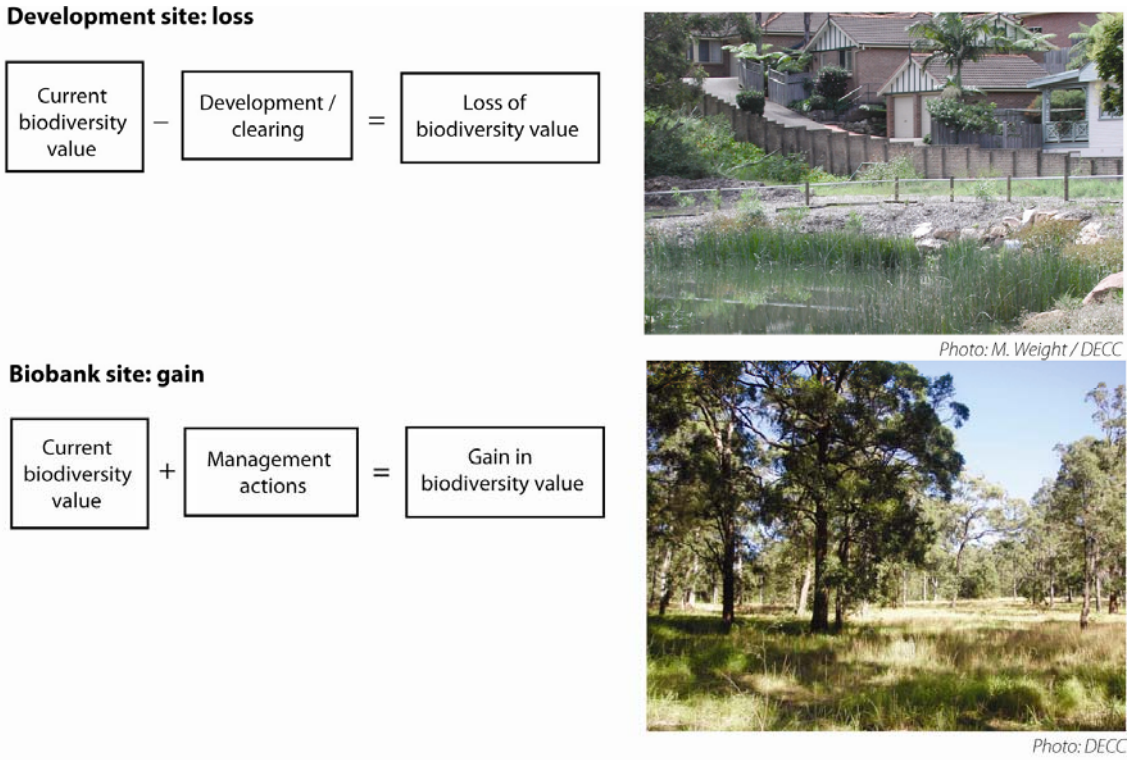

Figure 4 Loss in biodiversity values at the development site and gain in biodiversity values due to management actions the biobank site owner undertakes on the biobank site.

Area

Larger areas of habitat support more species and other biodiversity values. Larger areas are also more resilient to degradation such as from infestation by weeds. Area is measured in hectares and is used as a multiplier for both the Site Value and Landscape Value in the methodology.

Biodiversity credit calculations

The software version of the methodology, the BioBanking Credit Calculator, calculates the number of credits required to offset a development or the number of credits created at a biobank site. The calculator uses: the equations from the methodology, its in-built databases and field data collected at site. The field data is collected and entered into the calculator by trained and accredited BioBanking Assessors.

Ecosystem credits are calculated for general biodiversity values and when occurrence of a species can be predicted from habitat features. Species credits are calculated when occurrence of a species cannot be predicted from habitat features.

The calculator produces a report that states the number and type of biodiversity credits created at a biobank site or required to be offset for a development site. The methodology for assessing the biodiversity values of a site is therefore consistent, transparent and repeatable.

Credit calculations

The number of ecosystem credits required in order to offset the impacts on biodiversity on the development site is determined according to the following equation using data collected on the site:

$$\text{Number of ecosystem credits required to offset the development} = \left(\frac{\text{loss in Site Value} \times \text{area}}{\text{threatened species' response to management actions}} \right) + \text{loss in Landscape Value} \times \text{area}$$

The number of ecosystem credits created at a biobank site is determined according to the following equation using data collected at the site:

$$\text{Number of ecosystem credits created at a biobank site} = (\text{improvement in Site Value} \times \text{area}) + (\text{improvement in Landscape Value} \times \text{area})$$

Species credits are calculated for individual species when the species' occurrence cannot be predicted from habitat features. Details of calculations for both ecosystem credits and species credits are included in the methodology.

Consistency between biodiversity values lost and gained

Under the existing approach, there is no consistent method for determining whether the biodiversity values at the offset site match the biodiversity values lost at the development site. Under BioBanking, the methodology contains rules to ensure the biodiversity values created on a biobank site match those lost on a development site. Developers must purchase credits that are either:

- the same vegetation type or another vegetation type in the same formation that contains the same predicted species

or:

- a more cleared vegetation type that contains the same threatened species.

This ensures that the offsets improve the habitat for the same species as those affected by the development.

Benefits of the BioBanking Assessment Methodology

The BioBanking Assessment Methodology is an objective and transparent method for assessing biodiversity offsets. It is applied so that positive actions for biodiversity are equal to or exceed the unavoidable losses from development. The resultant investment in biodiversity conservation through the purchase of biodiversity credits, directs funds to productive management actions in cost-effective locations. Buying and selling credits is an integral part of the BioBanking Scheme. Linking biodiversity conservation to economic activity provides the impetus and resources to improve or maintain overall biodiversity.

Benefits for conservation: biodiversity values are either improved or maintained

BioBanking addresses the limitations of the existing situation where land is set aside for offsets without ongoing management plans. Under BioBanking, active management of biobank sites is required through activities such as revegetation, strategic grazing, and control of weeds and feral animals. In return for actively managing their land, biobank site owners receive funds for improving the land's biodiversity values.

Furthermore, Biobanking improves or maintains biodiversity by minimising further destruction of high biodiversity value areas by directing development to land that has lower biodiversity values or uncertain future viability.

Applying the biobanking methodology in case studies has shown the areas required for offsets are similar to current practice, producing offset ratios of 1:1.3 to 1:8.8 for a medium-size development. But because there are more options for offsets under BioBanking, costs are likely to be lower, benefits for biodiversity better and biodiversity outcomes more secure.

For developers – greater certainty and potentially lower costs

BioBanking provides greater certainty for developers. It allows them to identify potential biodiversity constraints such as the existence of high biodiversity conservation areas, and predict the cost of potential offsets. Developers can also more confidently estimate the cost and time involved in the biodiversity assessment process and can purchase credits at any stage of the project proposal. When a developer obtains a biobanking statement, the consent authority – such as the local council – is not required to consider the development's likely impacts on threatened species, so the period for the development assessment is shorter. Cost comparisons between the existing approach and the BioBanking Scheme will become clearer in time.

The cost of biodiversity credits has two components:

1. the cost of the ongoing management actions
2. establishment cost and profit

Under the existing approach, management of the land is often undertaken by either the local council or the NSW Government. The cost of management is estimated to be the

same under BioBanking, but the responsibility for the management is transferred to the landowner.

By contrast, land value varies and is strongly influenced by proximity to services, infrastructure, and existing towns and cities. According to a preliminary economic study, under the existing approach land that is used for biodiversity offsets is more expensive than land that could be used for BioBanking. This difference is due to the greater flexibility under BioBanking, to choose land located in an area distant from the development site but where the 'improve or maintain' rule will still apply. It is estimated that lower land prices will lead to a reduction in total costs per hectare of offsets, so the scheme will be a cheaper option than the existing approach.

Conclusion

BioBanking improves or maintains biodiversity values by providing a mechanism to fund the management of biobank sites to improve biodiversity in perpetuity. It also meets the socio-economic objectives of the business community by providing more certainty and being more time effective for developers. Furthermore, in applying a consistent and transparent approach to assessing the impacts of developments on biodiversity values, DECCW can assure stakeholders and other people of NSW that the socioeconomic objectives and biodiversity issues will be better balanced and that the decision-making process will be more effective.

Further reading

Briggs J 2005, *Threatened Species Assessment Tool. Version 1.7: An Assessment Tool for Use in the NSW Property Vegetation Plan Developer Operational Manual*, Department of Environment and Conservation NSW, Environmental Protection and Regulation Division, Queanbeyan.

Department of Environment and Climate Change NSW 2008, *BioBanking Assessment Methodology*, Department of Environment and Climate Change NSW, Sydney.

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Gibbons P, Ayers D, Seddon J, Doyle S & Briggs S 2005, *BioMetric Operational Manual*. *Version 1.8: A Terrestrial Biodiversity Assessment Tool for the NSW Property Vegetation Plan Developer*, Department of Environment and Conservation NSW, CSIRO Sustainable Ecosystems, Canberra http://www.environment.nsw.gov.au/projects/BiometricTool.htm.

Gibbons P, Briggs SV, Ayers D, Seddon J, Doyle S, Cosier P, McElhinny C, Pelly V & Roberts K 2009, 'An operational method to rapidly assess impacts of land clearing on terrestrial biodiversity', *Ecological Indicators*, vol. 9, pp. 26–40.

Gibbons P & Lindenmayer DB 2007, 'Offsets for land clearing: no net loss or the tail wagging the dog?', *Ecological Management and Restoration*, vol. 8, pp. 26–31.

Possingham H, Gibbons P & Parkes D 2007, *Peer Review of the May 2007 Draft of the BioBanking Assessment Methodology*, Department of Environment and Climate Change NSW, Sydney http://www.environment.nsw.gov.au/resources/biobanking/bbpeerrev07457.pdf.

NSW Government 2005, Native Vegetation Regulation 2005, *Environmental Outcomes Assessment Methodology*, NSW Government, Sydney http://www.environment.nsw.gov.au/vegetation/eoam.htm.

NSW Government 2002, *Green Offsets for Sustainable Development: Concept Paper*, NSW Environment Protection Authority, NSW Department of Land and Water Conservation, NSW National Parks and Wildlife Service, and Planning NSW. Sydney http://www.environment.nsw.gov.au/resources/greenoffsets/greenoffsets.pdf.

Databases

Threatened Species Profile Database
http://www.environment.nsw.gov.au/biobanking/biobankingtspd.htm

Vegetation Types Database
http://www.environment.nsw.gov.au/resources/nature/BioMetric_Vegetation_Type_CMA.xls

Vegetation Benchmarks Database
http://www.environment.nsw.gov.au/resources/nature/BioMetric_benchmark_data_reviewedAugust2006.xls