



Assessment of the habitat value of Leard State Forest

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Summary

The Leard State Forest is located on the Liverpool Plains in Narrabri Shire, north-central New South Wales. Covering an area of 8,136 hectares, it is a large, relatively intact area of remnant native vegetation. The forest is within the Brigalow Belt South bioregion, one of Australia's 15 "biodiversity hotspots" (DSEWPC 2009). Ecological communities found in the forest include critically endangered box-gum grassy woodlands and native grasslands. 24 threatened species of animal and bird that are known to inhabit the forest, including the Regent Honeyeater, the Greater Long-eared Bat and the Koala (NPANSW n.d.).

In the Brigalow Belt South bioregion 61% of native vegetation has been cleared (NVAC 1999), and only 2.5% of the vegetated area is in reserves. Several coal mining projects are looking to expand operations into the forest, mainly using open-cut mining.

To understand how these projects would affect their local area, the Maules Creek Community Council (MCCC) has asked Economists at Large to consider the economic values of Leard State Forest. Environmental and ecological economics provide several methods for assessing the economic values of environmental resources. Some of these are described below, however due to the limited resources available for this report, we have not been able to conduct physical surveys of the forest itself. Instead, we have made a range of estimates based on Victoria's, BushBroker programme.

BushBroker is a market for native vegetation offsets. It is one of a growing number of market-based instruments being used to provide incentives for improvements in natural resource management. Under the programme, developers who would like to clear an area of native vegetation on their land negotiate with landowners whose land meets the complex 'like for like' rules under *Victoria's Native Vegetation Management – a Framework for Action* (DSE 2002). In each individual agreement landholders and developers negotiate prices privately. Price information collected across bioregions and published by the programme.

We have used price data from the Victorian BushBroker vegetation offset market to estimate a range of values relating to the native vegetation of the Leard State Forest:

Leard State Forest Area (ha)	8,134
Habitat hectare value using Victorian minimum value	\$162,680,000
Habitat hectare value using average minimum price across Victorian bioregions	\$630,385,000
Habitat hectare value using average of all BushBroker transactions	\$989,038,061
Habitat hectare value using average of Victorian bioregion averages	\$1,178,074,333
Habitat hectare value using average maximum price across Victorian bioregions	\$1,506,145,667

Leard State Forest

The Leard State Forest is located on the Liverpool Plains in Narrabri Shire, north-central New South Wales. Covering an area of 8,134 hectares, it is one of the most intact areas of habitat in the Brigalow Belt South bioregion (NPANSW n.d.). The Brigalow Belt is considered one of Australia's 15 "biodiversity hotspots" by the federal environment department. The biodiversity hotspots are areas which have high diversity of locally endemic flora and fauna, that are under risk from land management activities and provide high-value potential for conservation (DSEWPC 2009).

The Leard State Forest contains many rare and threatened ecological vegetation classes. Most important are several types of box-gum grassy woodlands and grasslands that are listed as critically endangered under the Environment Protection and Biodiversity Conservation Act. Some vegetation classes in the forest include:

- Yellow box-Blakely's red gum grassy woodland
- White box – white cypress pine grassy woodland
- White box – white cypress pine grassy open forest
- Pilliga box – white cypress pine grassy open woodland
- Weeping Myall grassy open woodland
- Narrow-leaved ironbark shrubby open forest
- Derived native grassland

Source: (Parsons Brinckerhoff 2010)

The forest also includes some areas of exotic grassland and areas used for forestry that are in a degraded condition.

The National Parks Association of NSW lists at least 24 threatened species of birds and animals known to inhabit the forest:

- Brown Treecreeper
- Hooded Robin
- Black-chinned Honeyeater
- Painted Honeyeater
- Pied Honeyeater
- Grey-crowned Babbler
- Speckled Warbler
- Diamond Firetail
- Varied Sittella
- White-browed Woodswallow
- Spotted Harrier
- Little Lorikeet
- Little Eagle
- Turquoise Parrot
- Barking Owl
- Masked Owl
- Black-necked Stork
- Eastern False Pipistrelle
- Greater Long-eared Bat
- Yellow-bellied Sheath-tail Bat
- Eastern Cave Bat
- Eastern Bent-wing Bat
- Little Pied Bat
- Koala

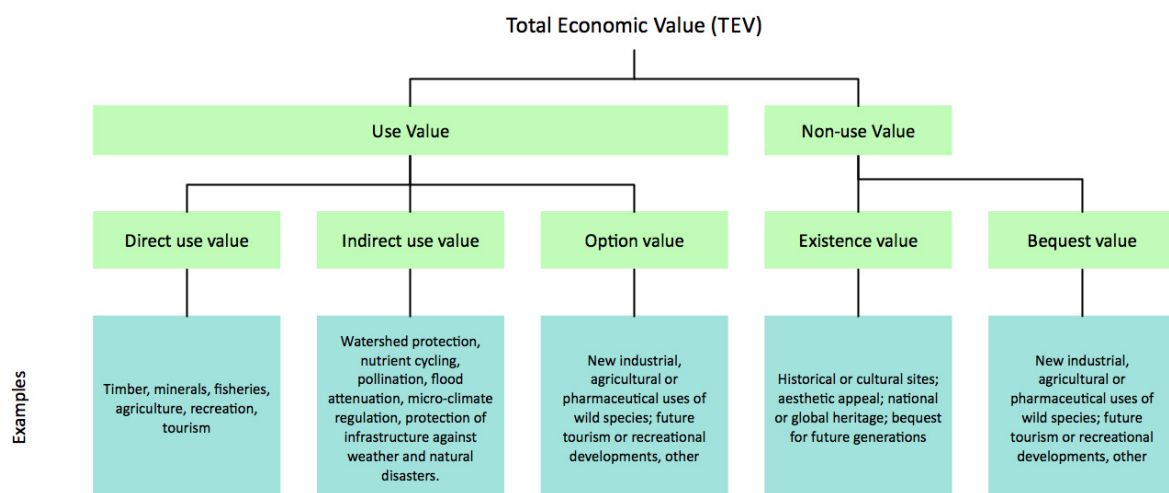
Source: (NPANSW n.d.)

Valuing habitat and environmental assets

Total Economic Value

Valuation of the environment is difficult. While benefits like clean air, water and a biodiverse environment benefit everyone, these benefits are generally not bought and sold in markets, making their valuation difficult. Some environmental goods and services are easy to identify – water, timber, going camping in a beautiful place – these are known as direct uses. Other indirect uses are less obvious – a stable climate, reduced erosion, protection from flooding, insects that pollinate crops. Still less obvious are non-use values – the fact that people value animals, plants and environments even though they may never see them. Economists generally try to assess all these values in relation to environmental goods, an approach known as Total Economic Value (TEV).

TEV and its various components – non-use values, use values and their various sub categories are shown in the diagram below with some examples.



Assessing all aspects of Total Economic Value involves many different studies and valuation techniques. Some examples include:

- Valuation of direct uses through goods prices, entry fees or travel cost methodology. See O'Connor et al. (2009) for an Economists at Large study on whale watching worldwide, showing that whale conservation contributes to an industry with revenue of over \$2.8 billion in 2008.
- Valuation of indirect uses through evaluation of avoided costs. The city of New York saved \$6-8 billion over 10 years by improving the integrity of ecosystems in their water catchments, rather than building and running a filtration plant. See (Chichilnisky and Heal 1998)
- Valuation of people's "willingness to pay" to protect a particular environmental good. See (Bennett, Dumsday, and Kragt 2007) for an example of the non-use value of Victorian forests.

Conducting such studies is expensive and time consuming. It is beyond the scope of this report to attempt such a large and detailed study of the Leard State Forest with physical assessments and social surveys. Because of the size of such studies, environmental values are often ignored in cost benefit analysis.

Benefits Transfer

Because of the expense and difficulty of these studies, economists often use “benefits transfer” estimate environmental values. This involves taking the results of a study of a particular environmental good or service in one area and using that as the basis for estimating values in another area. See Economists at Large (2008) for an example of benefits transfer, where values from a study on red gum forests in Victoria are transferred to red gum forests in NSW. Unfortunately we are unaware of any study or range of studies that are suitable to allow benefits transfer to assess the economic value of the Leard State Forest.

There are far too few comprehensive studies of ecosystems service valuation, biodiversity or landscape values in Australia. The result of this is that these environmental assets are given a value of zero in planning decisions, particularly in areas of productive land use. American study Scott et al. (2001) conclude that in productive agricultural areas where remnant vegetation is largely on private land, creative engagement of the private sector is crucial for conservation. One such approach that is gaining in popularity in Australia is market-based instruments.

Market-based instruments

Market-based instruments (MBIs) are being developed to create incentives for environmental goods. While there are many different programmes, they all try to create incentive and competition for environmental goods and services where none existed before. By creating supply and demand for a good or service, the scarcity of it and the costs involved in producing it, give it a market value. Well-known examples include water markets, or markets for emitting pollution.

MBIs to improve land management and conservation of biodiversity are also becoming widespread. Examples include conservation tenders and environmental markets. Conservation tenders involve landholders preparing a tender to receive funds in return for environmental improvements on their land. Environmental markets involve the buying and selling of a particular good or right, such as the right to clear native vegetation. In all cases, landholders retain the ownership of their land while these schemes provide an incentive to manage it partly for public, environmental good.

Environmental tenders

A successful environmental tender programme operates on the Liverpool Plains, close to Leard State Forest. The Liverpool Plains Land Management Committee, a community-based non-profit organisation, has been running tenders since 2001. Landholders prepare proposals of environmental improvements they could carry out on their land which will benefit the community

and the environment, and set the prices they would charge for carrying out these works. These proposals are assessed by the LPLM using a mathematical model incorporating the proposed benefits and the landholder's asking price.

While environmental tender programmes have been very successful in achieving conservation outcomes, it is difficult to use their results to estimate values of environmental goods outside their programme. It is difficult to compare the site-specific, often multi-criteria benefits provided by the tendered projects, and price information is often unavailable. Environmental markets, however, generally trade in more defined, quantifiable environmental goods and knowledge of market prices is important for participants, regulators and observers.

Environmental markets

Australia has two programmes that are working to put a market price on native habitat offsets, BioBanking in New South Wales and BushBroker in Victoria. BioBanking has had few transactions to date and has little publically available price information. BushBroker, on the other hand, has been operating for eight years, has had many transactions, and has publically-available price data.

BushBroker

The BushBroker programme trades in a specific good – native vegetation offsets. Different types of offset are bought and sold, relating to their ecological vegetation class. While individual transactions are private, general price information is readily available enabling market participants and observers to value their own needs and plan their participation in the market – if any.

The offsets are measured in “habitat hectares” an approach which incorporates habitat quality – environmental service value – and also enables market participants to assess their position.

What is a Habitat Hectare:

A habitat hectare is a site-based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation type. This measure can be consistently applied across the State.

If it is assumed that an unaltered area of natural habitat (given that it is large enough and is within a natural landscape context) is at 100% of its natural quality, then one hectare of such habitat will be equivalent to one habitat hectare. That is the quality multiplied by the quantity. Ten hectares of this high quality habitat would be equivalent to ten habitat hectares, and so on. If an area of habitat had lost 50% of its quality (say, through weed invasion and loss of understorey), then one hectare would be equivalent to 0.5 habitat hectares, ten hectares would equivalent to five habitat hectares, and so on.

Source: (DSE 2002) p18

BushBroker has regulations on how these offsets can be generated. The general guidelines are:

- The areas of habitat being offset and restored must meet complex “Like for like” rules under *Victoria’s Native Vegetation Management – a Framework for Action* (DSE 2002).
- The two sites must be within the same bioregion for high and very high conservation value vegetation classes, while medium and low value classes can trade within their own or adjacent bioregions.
- The offset is permanent; the offset site is permanently protected through a legally-binding Landowner agreement and ongoing monitoring.

In generating habitat hectares, some activities that landholders undertake include:

- | | |
|-------------------|-----------------------|
| • weed control | • revegetation |
| • rabbit control | • ecological burning |
| • stock exclusion | • bushfire prevention |
| • fencing | • ecological thinning |

The legislated requirement for clearers of vegetation to obtain habitat hectare offsets from landholders who can supply only limited amounts of these offsets introduces the economic concept of scarcity to habitat conservation. The demand and supply of these offsets will give them a price, which economists believe will bring about a more efficient allocation of these resources.

Landowners and developers negotiate prices one-on-one, so each sale is dependent on the circumstances of that particular transaction. Supply and demand of particular types of offset are important in the relevant regions. Timing is also important – when developers are in urgent need of offsets prices can be driven up. Landowner attitudes are also influential, with some motivated largely by interest in habitat, while others are motivated primarily by payment (BushBroker managers pers. com).

Using BushBroker prices to estimate the value of Leard State Forest

BushBroker price histories are not available for individual agreements or specific ecological vegetation classes. Even if this information were available these prices reflect supply and demand within a bioregion and may not be reflective of conditions around the Leard State Forest, under a similar market. Instead, we have used minimum and average habitat hectare prices to estimate a range of values.

Given that specific vegetation class prices cannot be transferred, it is worth noting in relation to the average values that:

- Woodland and grassland vegetation classes similar to those found in Leards State Forest are traded on BushBroker and are included in the average values.
- Vegetation classes traded under BushBroker including examples of very high, high, medium and low conservation significance, reflecting Leard State Forest's areas of threatened ecosystems as well as areas of lesser value.
- The percentage of native vegetation clearance in Brigalow Belt South Bioregion - 61% is similar to Victoria as a whole – 66% (DSE 2002 p7) – suggesting that demand and supply of offsets would potentially be similar.

We have assumed that 1 hectare of state forest would equal one habitat hectare. This is supported by Parsons Brinckerhoff (2010), who found the areas it had assessed comprised “native forest and woodland communities with relatively few exotic species and high natural species diversity. (p ix)” Future estimates of the forest's value incorporating physical assessment of the forest may relax this assumption as better data becomes available.

The table below shows the publicly available price history from the BushBroker programme from May 2006 to May 2011. These prices have been used to estimate a range of values for the habitat of Leard State Forest.

Bioregion	Number of Agreements	Total number of Habitat Hectares	Average price per Habitat Hectare *	Habitat Hectare price range * *
Gippsland Plain	21	29	\$149,000	\$85,000 - \$250,000
Goldfields	39	38	\$45,000	\$25,000 - \$66,000
Victorian Riverina	10	11	\$101,000	\$80,000 - \$110,000
Victorian Volcanic Plain	29	54	\$170,000	\$49,000 - \$267,000
Highlands-Southern Fall	14	74	\$34,000	\$20,000 - \$38,000
Other bioregions	11	25	\$370,000	\$206,000 - \$380,000
Total	95	231		

*Average across all agreements in each bioregion * *80+% of agreements in each bioregion fall in this range

From this price history we can derive a number of values:

	\$/ha
Minimum habitat hectare price	\$20,000
Average minimum of all bioregions	\$77,500
Average price across program (total habitat hectares/total ammount spent)	\$121,593
Average of bioregion average prices	\$144,833
Average maximum of all bioregions	\$185,167

From these average values we can estimate a range of values for the Leard State Forest:

Leard State Forest Area (ha)	8,134
Habitat hectare value using Victorian minimum value	\$162,680,000
Habitat hectare value using average minimum price across Victorian bioregions	\$630,385,000
Habitat hectare value using average of all BushBroker transactions	\$989,038,061
Habitat hectare value using average of Victorian bioregion averages	\$1,178,074,333
Habitat hectare value using average maximum price across Victorian bioregions	\$1,506,145,667

The wide range of values here reflects the difficulty in precisely monetising the value of the environment and its services. Nonetheless, we believe it is important to make such estimates to ensure that stakeholders clearly understand that environmental assets are scarce and have value. Conserving them should not be seen as a cost, but rather as protecting real and valuable assets that play a critical role underpinning market based economic activity. While there is no doubt that such environmental assets have value, there are all-too-few attempts to quantify them.

Points to note about these estimates:

- These are estimates of the value of habitat and ecosystems of the Leard State Forest. It is not an estimate of the total economic value (TEV) of the forest. Further research is needed to determine the TEV of the forest. As mentioned above, TEV includes:
 - Direct use values such as recreation, tourism and forestry;
 - Indirect use values or environmental service values such as impacts on ground and surface water volume and quality, carbon sequestration, impact on air quality, etc
 - Non-use values relating to how the people of NSW value the existence of the forest and its flora and fauna.
- While the habitat hectare approach does incorporate quality of habitat, and so some indication of environmental service value, these values should not be considered a present value of environmental services. Instead, these values reflect the scarcity of different vegetation class offsets – the demand for them and the supply of them in Victoria. While the percentages of native vegetation clearance is similar in both areas, forecasting the levels of supply and demand that would prevail in the Leards Forest area is impossible until a similar market is developed in NSW or detailed surveys are carried out.
- These values represent the replacement cost of the entire Leard State Forest, incorporating every ecological vegetation class found in the forest, at a scale of a fraction of a hectare, reflecting the small scale of transactions usually traded under BushBroker. Re-establishing and maintaining fragile ecosystems involve considerable capital costs, maintenance and commitment over many years, as reflected in the BushBroker prices.
- Estimates are based on transactions relating to smaller, often fragmented areas of habitat. The Leard State Forest is a relatively large area of in-tact habitat. Ecologists suggest large areas of habitat are of greater value than smaller, separated ones, ie the whole is greater than the sum of the parts. See Hawes (2011) who discusses this in relation to the Leard State Forest. Our estimates do not consider the impact of the small size of areas transacted.
- The size of the area in the Leard State Forest is significantly larger than the combined areas for all BushBroker transactions. Transaction costs associated with BushBroker sales are significant – the initial site inspection costs at least \$5,000 and many other costs are associated. Payments are held in non-interest bearing accounts for considerable periods, further inflating prices. If larger areas were being considered it is possible that considerable savings could be realised. See *BushBroker information sheet 22 – fees and services* for full details.

Conclusion

Leard State Forest contains remnant native habitat of considerable value. Valuing environmental assets such as native ecosystems is difficult, generally involving extensive physical and social surveys not possible in this report.

Victoria's BushBroker programme, a market based instrument aimed at providing incentives for conservation through the buying and selling of vegetation offsets, provides proxy prices for native vegetation values. By using the minimum and several average prices, we have estimated a range of values for the Leard State Forest.

Leard State Forest Area (ha)	8,134
Minimum value	\$162,680,000
Habitat value using average minimum price across bioregions	\$630,385,000
Habitat value using average of all transactions	\$989,038,061
Habitat value using average of bioregion averages	\$1,178,074,333
Habitat value using average maximum price across bioregions	\$1,506,145,667

Several factors should be considered with these estimates:

- They do not provide a full estimate of Total Economic Value.
- They are not a present value of a stream of environmental services, but represent the scarcity and replacement cost of vegetation offsets.
- These reflect market conditions in Victoria
- BushBroker prices are based on smaller areas of native vegetation, the sum of which may not be as valuable as an in-tact large area.
- Transaction costs in BushBroker are considerable

As such these estimates should not be taken as definitive, but should be used as the basis for further investigation, through physical and social methods. Given the paucity of total economic value studies in Australia, we encourage efforts to value the environmental assets of Leard State Forest in more detail. These estimates do, however, demonstrate that native vegetation has considerable economic value, which should be taken into account when making decisions in relation to the Leard State Forest.

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BushBroker website

<http://www.dse.vic.gov.au/conservation-and-environment/biodiversity/rural-landscapes/bushbroker>

Meeting between Rod Campbell of Economists at Large and BushBroker managers Penny de Vine and Anne Buchan, held at DSE 11am, 15th July, 2011.

BioBanking website

<http://www.environment.nsw.gov.au/biobanking/>

All documents relating to the Boggabri Coal Extension Project – the full environmental assessment, including appendix J Biodiversity assessment, and the MCCC's submission on the assessment can be found at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=3562

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