EPBC Act Environmental Offsets Policy – submission on consultation draft

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invasive species council

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The Invasive Species Council campaigns for better laws and policies to protect the Australian environment from weeds, feral animals and exotic pathogens.

Formed in 2002, we were the first environment group in the world to focus solely on invasive species.

With introduced pests one of the top and growing threats to native species and ecosystems, involving complex biological and social interactions, this specialist focus is needed.

A non-profit organisation, we work with other groups on policy and legal reform, campaigning for action on high priority pests.

We have a strong commitment to using the best science available to inform our advocacy work and through our board, staff and membership have access to excellent in-house weed and pest expertise.

The Invasive Species Council is committed to fostering community participation and activism, supporting our members to have a voice on invasive species issues.

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1. Introduction

Against the backdrop of escalating biodiversity loss and environmental degradation with unceasing pressure for new destructive developments, offset policies are widely regarded as granting licences for destruction. There is no evidence that they have functioned in Australia (federally or in states/territories) as intended and they are widely criticised by conservationists and ecologists, in Australia and overseas. The Invasive Species Council shares the concerns of most other environmental NGOs that offset policies in Australia are misapplied to justify impacts on the environment that should not be approved. If the proposed EPBC Act offsets policy is to gain community support it is vital that the effectiveness of existing offsets be independently audited, that approved offsets are genuinely compensatory as assessed by independent experts, and that outcomes are independently monitored and enforced.

Despite reservations about how an offsets policy under the EPBC Act may be used, the Invasive Species Council makes several recommendations here to improve the potential of the policy to protect biodiversity, including by addressing invasive species threats to MNES subject to offset proposals. If offsets are used to genuinely compensate for residual impacts on MNES by approved actions (which do not have a significant impact on MNES) after all efforts have been made to avoid or mitigate impacts, they may provide the opportunity to reduce invasive species and other threats to MNES that would otherwise not be addressed and also provide broader biodiversity benefits. We recommend that there be a stronger focus in the policy on the potential to address invasive species threats. Issues are considered and recommendations made with respect to the following principles:

- Prioritise avoidance and mitigation, then maximise conservation value from offsets applied to residual impacts
- Require offsets to deliver genuine compensatory benefit
- Ensure that offset proposals have scientific credibility
- Define when offsets are inappropriate
- Target indirect offsets to address priority threats and recovery actions
- Account for uncertainty and risk
- Enforce offset contracts

2. Prioritise avoidance and mitigation, then maximise conservation value from offsets applied to residual impacts

ISC endorses the well-accepted principle, stated in the draft policy, that offsets should be applied only after every 'reasonable' effort is made to avoid and mitigate impacts in approved actions. Offsets 'compensate for any residual impact' and should not be used to justify actions with 'unacceptable' impacts. If the EPBC Act is used effectively for conservation, this implies that approved residual impacts subject to offsets should be minor.

We strongly endorse the principle in the draft policy that 'Offsets must deliver a conservation outcome that would not otherwise occur.' The addition should be at least equivalent to what is lost by the approved action.

It would be reasonable to also require that offsets for residual impacts are directed to projects that achieve the best conservation outcome for the subject MNES and maximise biodiversity value, other factors including cost being equal, rather than what suffices as equivalence. If two offset options have an equivalent cost but one achieves stronger biodiversity outcomes that option should be required or if an offset would achieve a better conservation outcome by contributing to a larger program that should be preferred. This should be based on advice from an independent expert panel. This is essential for the credibility of the offsets program.

Recommendation:

- As outlined in the draft policy, apply an offsets policy only after every reasonable effort is made to avoid and mitigate impacts and ensure that all approved offsets are for conservation measures that would not otherwise occur.
- Other factors (such as cost) being equal, direct offsets to measures that achieve the best conservation value for the affected MNES and biodiversity more generally, as assessed by an independent expert panel.

3. Require offsets to deliver genuine compensatory benefit

Critics of offset policies have highlighted the flawed logic or unrealistic assumptions underpinning many offset programs: that biodiversity destroyed or damaged by development is replaceable, portable, compressable or tradeable. Bedward et al. (2009) describe it as the assumption that 'biodiversity can be destroyed in one location and recreated in other, more convenient locations, to suit our preferred land-uses.' Burgin (2008) highlights the flaw of offsetting relic habitats or endangered species when the very reason for their endangerment is previous removal or fragmentation, and a trade between areas results in a net loss. The offsets policy must make very clear what counts as genuine compensation, in part by defining in more detail what does not count.

As the draft offsets policy notes, simply providing an equivalent or larger area of habitat with a conservation status (eg. a conservation covenant) does not necessarily provide an improved conservation outcome and achieve a gain for the affected MNES (and currently conservation covenants do not protect land from mining). Most MNES habitats should already be protected from clearing or new destructive uses by federal and state regulations. Offset arrangements should not be used to compensate for poor implementation of regulation and should therefore require measures that exceed what is required by law, to address threats such as invasive species which exceed duty of care and other legal requirements.

For offsets to achieve genuine compensation for approved impacts on MNES, they must be able to:

- create new habitat for the affected MNES through restoration, OR
- protect or improve habitat that would otherwise be (legally) destroyed or degraded by an existing or imminent land use OR
- prevent or limit threatening processes that are causing decline of the affected MNES.

To be genuinely compensatory, these offsets must achieve improvements in the conservation of the MNES commensurate with the loss caused by the approved development within a conservation-relevant timescale. This is difficult to achieve, and probably explains why there is a dearth of successful examples of offsets. We could find no case studies in the published literature of where successful offsets have been achieved in Australia. The offsets policy would be strengthened by case studies or examples of what the government considers successful (and unsuccessful) offsets.

3.1 Restoration offsets

Creating new habitat through restoration is unlikely to compensate for loss of remnant habitat for many MNES within a timeframe relevant to conservation. Losses due to an approved action are likely to be immediate but restoration generally won't deliver compensation for many years, if it succeeds at all (Wilkins et al. 2003, Cunningham et al. 2007, Munro et al. 2009). There have been few assessments of the effectiveness of restoration (Wilkins et al. 2003, Ruiz-Jaen and Aide 2005) and the few Australian assessments show that restoration can take decades to centuries or be unable to comprehensively compensate for loss of remnant habitat (see box below for examples of assessments). Wilkins et al. (2003) concluded that the 'development of species composition in restored sites toward a state that resembles appropriate reference sites is, at best, extremely slow and may not eventuate at all. If such a succession occurs the time scales required for restored sites to match the target state range from several decades and may extend to the order of centuries.' Invasive species are often a substantial impediment to restoration. For example, when the understorey of restoration sites is dominated by exotic species, it is arguably impossible to return it to native understorey and restore conditions suitable for most reptiles and invertebrates.

While restoration of threatened habitats is essential for conservation in Australia, its lack of proven effectiveness for recovery of many biodiversity values and the long time lag before biodiversity benefits may be realised limit its potential to be used for offset proposals. Wilkins et al. (2003) point out that 'policies that seek to balance or overcompensate losses of biodiversity with gains are fundamentally flawed if there is no feasible restoration technology to achieve replacement.' Restoration projects should not be accepted as offsets unless there is evidence that they will achieve compensatory recovery of the affected MNES rapidly enough to address current conservation needs. If there is no sufficient evidence to ascertain that it will be effective, it may be justifiable to approve restoration as an indirect offset if independent experts consider there are reasonable prospects of it succeeding and if it is used to scientifically assess the potential for restoration.

Approved restoration offsets will need to include requirements for ongoing management of invasive species as they can negate restoration benefits; eg. fox baiting was essential for mammals to colonise restored mining sites in Western Australia (Nichols and Grant 2007). This is acknowledged in the offsets policy, eg. in the statement that the 'purchase of existing unprotected habitat only provides a real conservation outcome if that habitat is protected in an enduring way and is actively managed for long-term conservation purposes.'

Assessments of restoration outcomes

This is not a comprehensive review of restoration effectiveness but a small sample of recent studies to demonstrate limitations to their capacity to compensate for destruction of remnant habitat.

Munro et al. (2009): A comparison of woodlot plantings (overstory eucalypts only) and ecological plantings (many species of local trees, shrubs, and understory) with remnants and paddocks in Gippsland. Ecological plantings could achieve similar overall structural complexity as remnant vegetation within 30–40 years but not species richness. Weed cover was high in paddocks and both types of plantings, and low in remnant vegetation. The ground cover in plantings was dominated by weeds, primarily exotic pasture grasses. The structural complexity achieved in plantings may provide habitat for some fauna but not for non-planted flora. They concluded that 'in the short term, even when best-practice revegetation techniques are used, plantings are unlikely to be a viable replacement of remnant vegetation in temperate forest communities.'

Cunningham et al. (2007): A comparison of vegetation plantings more than 20 years old with remnant habitat in 23 landscapes in south-eastern Australia. Restored habitat was inferior to remnant habitat for reptiles and arboreal marsupials. Concluded that restoration may not be able to effectively offset clearing of native vegetation for many species and otherwise could take decades to centuries.

Koch (2007): A review of bauxite mine restoration in jarrah forest in Western Australia. Vegetation composition reflects initial plantings, and floristic succession over 30 years does not move the site towards that of reference unmined sites. Because of limited potential for most indigenous species in the mediterranean areas of Western Australia to disperse into restored sites, unassisted recruitment of native plant species is extremely slow or nonexistent. It is difficult to change the vegetation composition of restored sites once it becomes established.

Nichols and Grant (2007): A review of assessments of vertebrate fauna in restored bauxite mining sites over 30 years. Successful recolonisation by most bird, reptile and mammal species. More than 95% of bird species recolonised, and species numbers, densities, and diversities in mined areas attained the values recorded in unmined sites <8 years after restoration. 21 of 24 reptile species recolonised restored mine sites, but species numbers and total reptile numbers tended to be lower in restoration than in unmined forest. Mammal recolonization varied between species depending on food and shelter requirements and possibly their abundance in the surrounding forest. Difficult to assess some rare mammal species because of low numbers due to increasing fox numbers in the region. Fox-baiting was essential.

Wilkins et al. (2003): A comparison of the floristic composition and structure of restoration areas of eucalypt woodland (0-9 years) with untreated pasture (control) and remnant vegetation (reference) in western Sydney. No evidence for a restoration trajectory from untreated pasture to remnant vegetation. The only floristic differences between restored sites and untreated pasture were slight and due to planted individuals. Species richness data indicated that restored vegetation supported no more native species and no fewer exotic species than untreated pasture. Restored vegetation had significantly more introduced species and less than half as many native species compared with remnant vegetation.

3.2 Offsets to stop destructive land uses

Protecting MNES habitat that would otherwise be destroyed or degraded by current or future land uses may offer the potential to compensate for loss elsewhere but raises questions about why such habitat is not protected under conservation regulations or recovery efforts. Genuine compensation is most likely to occur where existing use exemptions (such as under the EPBC Act) limit the capacity of governments to protect habitat subject to damaging use such as grazing. To ensure a genuine offset, there would have to be evidence that stopping the existing land use and implementing conservation management instead would promote recovery to the extent needed to compensate for the approved destruction. As the draft policy says, changing the land tenure for conservation needs to be supplemented by management for conservation and recovery of the subject MNES. If the approved action results in permanent destruction of MNES, compensation requires that conservation management of the offset site be funded in perpetuity (such as through a trust fund).

3.3 Offsets to reduce threatening processes

Addressing threatening processes (other than existing land uses) that are causing decline of the subject MNES may yield the greatest compensatory benefits, provided that such actions are not the legal responsibility of public or private landholders and would not otherwise occur. Invasive species and inappropriate fire regimes are the two threatening processes that may most effectively be addressed as offsets. The offsets policy document has classed 'reducing threats to the

protected matter on a site that is not part of the direct offset, for example by removing invasive species' as an indirect offset. There is no reason given for this and we recommend that it be classed instead as a direct offset on the basis that addressing invasive species threats can achieve substantial compensatory benefits in a short time frame. A positive outcome for an MNES may be more guaranteed when invasive threats are managed than when restoration is attempted or land tenure is changed. Norton (2008) notes that certainty of achieving the offset outcome is greater 'where the offset involves, for example, the removal of a degraded influence, such as an herbivore or predator, in an otherwise intact ecosystem' than offsets that involve restoration of significantly modified or where there are strong abiotic drivers of ecosystem processes that need to be reversed. Genuine compensation for destruction of a threatened plant species in one site may be achieved, for example, by a long-term commitment to control goats that threaten its existence in another area. An animal species threatened by exotic predators may benefit more from an offset commitment to a baiting program over a substantial area of habitat than from purchase and management of a smaller area of habitat. Compensation would require that the extent of loss predicted to occur without the proposed offset is at least equivalent to the approved destruction. Success would need to be assessed in terms of population recovery (not in numbers of invasive species killed or area sprayed for weeds).

In summary, the three categories of direct offset options offer have the following advantages and disadvantages.

Offset option	**How would compensation be achieved?**	**Advantages**	**Disadvantages / challenges**
Restoration of MNES or MNES habitat	Habitat restored equivalent to what was destroyed, within conservation-relevant timeframe.	Creates new habitat. Provides other conservation benefits.	Difficult or impossible to achieve restoration for many taxa. Time lag of decades to centuries to achieve compensation. Requires long-term monitoring and evaluation.
Protection of MNES from damaging land-uses	Protection of MNES from land-uses that would otherwise destroy MNES to an extent equivalent to that destroyed by approved action	May protect MNES from destructive existing land-uses that are not regulated (eg. due to existing use exemptions under the EPBC Act). Would benefit other species impacted by the land use.	Would be limited to circumstances in which regulation does not otherwise protect the MNES from destructive land uses. Challenging to calculate extent of benefit.
Protection of MNES from other threatening processes, eg. invasive species	Protection of MNES from threatening processes that would otherwise destroy MNES to an extent equivalent to that destroyed by approved action	Would protect MNES from threatening processes such as invasive species and inappropriate fire regimes that would otherwise not be addressed. Would benefit other species impacted by the threatening processes.	Would be limited to circumstances in which landholders are not obliged to address threatening processes. Challenging to calculate extent of benefit and requires long term monitoring and evaluation.

One challenge is to ensure that an offset timeframe is sufficient to achieve equivalence. Losses due to development are likely to be permanent, so some sort of trust arrangement would be needed to provide for offset delivery in perpetuity. Another challenge is the lack of baseline information by which to assess the equivalence of the proposed offset. For this and other reasons (particularly the potential for failure), any offset should aim to protect a substantially greater proportion of the affected MNES than is destroyed (see section 7). The question of equivalence needs to be subject to independent scientific assessment of proposals and monitoring.

Recommendations:

- Commission a scientific review of the potential for various offset options to achieve genuine compensatory benefits for MNES and develop guidelines that identify direct offset options in the three categories considered here: restoration, stopping destructive land uses, and addressing threatening processes. This would include reviewing restoration studies to identify the types of MNES for which restoration can provide compensatory benefit within conservation timeframes.
- Permit restoration as a direct offset only if there is evidence that it will achieve compensatory recovery of the affected MNES within conservation timeframes. Acknowledge the scientific evidence that restoration is unlikely to provide genuine compensation for many or most affected MNES. Include requirements for invasive species management in restored sites.
- Permit as offsets measures to stop damaging land uses and threatening process such as invasive species and inappropriate fire regimes when this will promote recovery of the MNES to an extent at least commensurate with losses under the approved action.
- Classify the management of invasive species threats to a protected matter as direct offsets rather than indirect offsets where there is evidence that this will achieve compensatory recovery of the affected MNES – even if they are not on purchased offset sites.
- If the approved action results in permanent destruction of a protected matter, require that offset measures such as invasive species management be funded in perpetuity (such as through a trust fund).

4. Define when offsets are inappropriate

We recommend that the offsets policy acknowledge that there are many circumstances under which offsets are not achievable and exemplify those circumstances (this may help address community scepticism about offsets being used to justify destruction that should not be approved). Many habitats and species are so rare or their habitat requirements so complex, poorly understood or difficult to restore that there are no options to compensate for destruction. Maron et al. (2010) exemplify this with an assessment of habitat availability for offsets for endangered southeastern red-tailed black cockatoos (*Calyptorhynchus banksii graptogyne*). 'Because of time lags in resource maturation, offsets were unable to achieve no net loss in the medium-term, and the most plausible offset scenarios were inadequate to compensate for habitat loss at year-100, when resource availability was lowest.' Where no compensatory benefit is feasible, further loss should be resisted.

Recommendation:

- Acknowledge in the offsets policy that there are many circumstances under which offsets are not achievable and exemplify those circumstances.

5. Target indirect offsets at priority threats and recovery actions

ISC supports the proposal to allow for some proportion of offsets to be indirect – defined in the draft offsets policy as 'measures that improve our knowledge, understanding and management of environmental values leading to improved conservation outcomes for the impacted protected matter' – provided they are approved by an independent scientific panel and directed to addressing priority threatening processes or implementing recovery actions for the affected MNES that would otherwise not be undertaken. As the draft policy points out, they are higher-risk measures because a compensatory outcome for the affected MNES is not guaranteed. However, they may also return greater conservation returns than a direct offset if the outcomes are of broader benefit than for the affected MNES.

As invasive species threats are one of the major causes of biodiversity decline and mostly poorly managed, indirect offsets may productively be focused on reducing their impacts: eg. contributing to a large-scale eradication program that benefits multiple species, funding research on more effective control measures for the subject MNES, or contributing to a biocontrol program. ISC recommends the

department develop guidelines that include criteria for and examples of acceptable indirect offsets. Offset value should be maximised by identifying for proponents options that would achieve the best potential biodiversity conservation outcomes.

In the previous section, we recommended that management of invasive species should be regarded as an option for a direct offset where this will achieve compensatory recovery even if it is not applied to a purchased offset site. Indirect offsets involving invasive species could be distinguished from direct offsets if they involve higher risk approaches (where there is insufficient evidence to guarantee an outcome) or constitute contributions to larger or longer-term programs or to research that won't deliver on-ground benefits in the short-term. There will be challenges with such projects in ascertaining that the offset will deliver benefits that otherwise would not occur.

Recommendations:

- Permit indirect offsets that are approved by an independent scientific panel and that are directed to addressing priority threatening processes or implementing recovery actions for the affected MNES that otherwise are unlikely to be undertaken.
- Develop guidelines with criteria for and examples of acceptable indirect offsets, including those that involve invasive species.

6. Ensure that offset proposals have scientific credibility

Offsets have been criticised as lacking a scientific basis. Burgin (2008), for example has written: 'decision making around offsets is largely conducted without an appropriate scientific underpinning.' For credibility it is vital that any offset proposals be assessed by independent scientific experts. This would have been an appropriate function for the Environment Commission proposed by the Hawke review of the EPBC Act, but rejected by the Government. Instead, we recommend that an independent scientific panel be established to propose and assess offset proposals, set monitoring requirements, review monitoring reports and conduct audits. The costs of this should be built into offset agreements. We support the proposed requirement for proponents to submit an annual report and recommend that standards for annual reporting require the inclusion of independently acquired or verified monitoring data by which outcomes can be scientifically assessed.

Recommendations:

- Establish an independent scientific panel to propose and assess offset proposals, set monitoring requirements, review monitoring reports and conduct audits, with the costs to be borne by proponents.
- Ensure that reporting standards require the inclusion of independently acquired or verified monitoring data by which outcomes can be scientifically assessed.

7. Account for uncertainties and risks

There are considerable uncertainties and risks associated with offsets, due to the often superficial knowledge of biodiversity values and threats, the inherent unpredictability of complex ecological interactions and the risks of offset failure. There are particularly high uncertainties when an offset is proposed to deliver compensatory value years in the future. It is important therefore to apply the precautionary principle to offset approvals (the precautionary principle is not mentioned in the draft policy), in determining whether a proposal should be approved and in the amount of offset required. Because of the many ecological uncertainties and the risks of failure, there should be a considerable margin of error in estimates of offset requirements, and the aim should be to protect and recover a substantially greater proportion of the affected MNES than is destroyed. This is also justified to compensate for indirect and cumulative impacts of development that are difficult to define and quantify in assessment of controlled actions.

It is important to account for time lags between destruction of biodiversity and compensation derived from an offset. Proponents are in effect gaining biodiversity on credit – destroy now and compensate later. Threatened biodiversity should not be treated like a financial transaction. When compensation for destruction is available to be applied as an offset, it should be delivered before destruction is permitted to occur (a 'savings' financial analogy is more appropriate for biodiversity). However, because there is a large gap between what should occur and what will occur, we submit that the offsets policy should adopt an approach to time lags that restricts the time permitted between destruction and compensation to what can be justified as a 'conservation timeframe', ie a timeframe specific to each

MNES within which compensatory benefits need to be achieved to avoid compromising their viability. This timeframe will be a matter for expert opinion but we recommend a substantial proportion of the compensation should be deliverable within 10 years unless considerably greater benefits can be achieved over a longer timeframe, as assessed by a scientific panel. Offset options involving the control of threatening invasive species have the advantage that they can be achieved within a relatively short time (although control typically has to be ongoing to maintain the benefit).

The longer the lag between destruction and compensation the greater the offset requirement should be, as McKenny and (2010) recommend: 'This involves estimating the time to maturity of a conservation action and applying a discount rate – a commonly used method for estimating the present value of future benefits.'

The risks of failure can be addressed to some extent by requiring a bond/insurance from proponents that can be used for conservation of the affected MNES should the offset fail to meet milestones set out in the offsets agreement.

Recommendations:

- Apply the precautionary principle when assessing offset proposals, defining the uncertainties in decisions for which it has greatest application.
- Specify that offsets must deliver compensation within a 'conservation timeframe' that will be defined for each affected MNES. Unless substantially greater benefits can be achieved over a longer timeframe, require that a substantial proportion of offset compensation should be achieved within 10 years. Apply a discount rate to estimate the value of future compensatory benefits.
- Require a bond or insurance from proponents that can be used for MNES conservation measures should the offset fail to meet milestones.

8. Enforce offset contracts

One of the major criticisms of offset regimes has been a lack of enforcement. The extent of compliance in Australian offset schemes is unknown due to a lack of publicly available auditing and reporting. In North America, where there has been a long history of requiring wetland creation as compensation for wetland destruction, there is evidence of extensive non-compliance: in Massachusetts 54% were non-compliant including 21.9% where there had been no attempt to construct the wetlands required as offsets, and 64.9% were smaller than agreed (Brown and Veneman 2001); in Florida, only 6% of 63 permits reviewed were in full compliance and no mitigation had been attempted in 34% (Race and Fonseca 1996, citing unpublished report 1991); a 1991 audit by the Florida Department of Environmental Regulation found that only 8% of freshwater sites and no tidal sites were evaluated as being ecologically successful (Race and Fonseca 1996); 67% of 76 monitored wetland projects constructed in the US from 1991-2002 failed to create or restore their minimum required (Matthews and Endress 2008); and in Canada 86% of 124 projects associated with fish habitat were not compliant with offset monitoring conditions so could not be assessed for effectiveness (Harper and Quigley 2005).

An offsets regime will achieve credibility only if there is adequate enforcement of offset agreements. ISC supports the proposed requirements in the draft offsets policy for:

- offset proposals to include clearly articulated measures of success linked to the purpose of the offsets and providing clear benchmarks about their success or failure.
- annual reports from the proponents, which will be made publicly available
- a public register of offsets that will include spatial information (for example GPSdata), information on the relevant protected matters and the ongoing management actions required.

These proposals go some way to promoting transparency but would be strengthened by requirements for independent monitoring (paid for by the proponent but commissioned by the government on the advice of the independent expert panel) to assess whether offset goals and milestones are achieved, regular audits and strong sanctions for non-compliance. The draft policy proposes that 'if the offsets are not delivering the desired outcome' the 'conditions of approval can be varied'. This may be appropriate if there are technical reasons why the conditions should be altered so as to achieve the desired outcome; however, sanctions should be applied where non-achievement is a compliance failure.

There could be a mechanism also for public contributions to monitoring – eg. birdwatchers could gather data which could help determine whether an action has genuinely helped a local bird population – that could also increase public confidence in the scheme. Where an offset program is to protect a threatened species by controlling an invasive species, it is important that compliance is

focused on the population status of the MNES, not on the number of feral animals or weeds killed.

Recommendations:

- In addition to governance proposals in the draft policy, require that offset projects are independently monitored to assess whether offset goals and milestones are achieved, that sanctions are applied for non-compliance and regular audits are conducted.
- Include where feasible mechanisms for involving the public in monitoring.
- Ensure that compliance is focused on achieving compensation, which would require that invasive species management offsets be assessed not on numbers of invasive species killed but on the population status of the affected MNES.

9. References

Bedward M, Ellis M, Simpson C (2009) Simple modelling to assess if offsets schemes can prevent biodiversity loss, using examples from Australian woodlands. Biological Conservation 142: 2732–2742.

Brown S, Veneman L (2001) Effectiveness of compensatory wetland mitigation in Massachusetts, USA. Wetlands 21:508–518.

Burgin S (2008) BioBanking: an environmental scientist's view of the role of biodiversity banking offsets in conservation. Biodiversity and Conservation 17:807–816.

Cunningham R, Lindenmayer D, Crane M, Michael D, MacGregor C (2007) Reptile and arboreal marsupial response to replanted vegetation in agricultural landscapes. Ecological Applications 17: 609–619.

Gibbons P, Lindenmayer DB (2007) Offsets for land clearing: no net loss or the tail wagging the dog? Ecological Management and Restoration 8: 26–31

Harper DJ, Quigley JT (2005) No net loss of fish habitat: a review and analysis of habitat compensation in Canada. Environmental Management 36: 343–355.

Hilderbrand RH, Watts AC, Randle AM (2005) The myths of restoration ecology. Ecology and Society 10(1):19. http://www.ecologyandsociety.org/vol10/iss1/art19/.

Koch J (2007) Restoring a jarrah forest understorey vegetation after bauxite mining in Western Australia. Restoration Ecology 15(4):S26–S39.

Maron M, Dunn P, McAlpine C, Apan A (2010) Can offsets really compensate for habitat removal? The case of the endangered red-tailed black-cockatoo. Journal of Applied Ecology 47: 348-355.

Matthews JW, Endress AG (2008) Performance criteria, compliance success, and vegetation development in compensatory mitigation wetlands. Environmental Management 41:130–141.

McKenney B, Kiesecker J (2010) Policy Development for Biodiversity Offsets: A Review of Offset Frameworks. Environmental Management 45:165–176.

Munro N, Fischer J, Wood J, Lindenmayer D (2009) Revegetation in agricultural areas: the development of structural complexity and floristic diversity. Ecological Applications 19: 1197–1210.

Nichols O, Grant C (2007) Vertebrate fauna recolonization of restored bauxite mines—key findings from almost 30 years of monitoring and research. Restoration Ecology 15(4): S116–S126.

Race MS, Fonseca MS (1996) Fixing compensatory mitigation: what will it take? Ecological Applications 6: 94–101.

Ruiz-Jaén M, Aide T (2005) Vegetation structure, species diversity, and ecosystem processes as measures of restoration success. Forest Ecology and Management 218: 159-173.

Wilkins S, Keith D, Adam P (2003) Measuring success: Evaluating the restoration of a grassy eucalypt woodland on the Cumberland Plain, Sydney, Australia. Restoration Ecology 11: 489–503.