Accounting for Nature®

Provisional Guidelines for Methods to measure the condition of Native Bird Communities at a Project or Property Scale

Version 1.0

VERSION

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Introduction

These provisional Guidelines have been developed to assist in the development of Methods that use bird presence/absence surveys to produce Environmental Condition Accounts ('Environmental Account') under the *Accounting for Nature ® Standard*. They particularly focus on Methods aimed to measure the condition of native bird communities at a project or property scale.

Accounting for Nature acknowledge that there is a large degree of uncertainty around what is required to generate a scientifically robust, simple, and cost-effective Bird Condition Accounting Method. Therefore, these are provisional guidelines and aim to provide the best available guidance at the time they are written. As new information, experience, and data is acquired, these Guidelines will be continually updated to reflect the latest recommendations.

In particular, these Guidelines describe five key issues that should be considered when developing Bird Methods. These Guidelines present recommendations or key considerations for dealing with these issues, however it should be noted that there are likely to be other viable solutions to the issues and these Guidelines simply present one or two solutions or key factors to think about. AfN strongly encourages innovative methods (such as the incorporation of bioacoustic monitoring, for example), so long as the proposed methods are scientifically rigorous.

The five key issues of developing Methods to measure the condition of Native Bird Communities

1. Clarifying the purpose;
2. Metrics and Reference Condition Benchmark;
3. Survey Methods;
4. Sampling (Observer and Survey) Error; and
5. Control Sites

1. Clarifying the Purpose

There are many purposes for producing Environmental Accounts for native fauna, across a wide range of scales. The primary reason land managers wish to develop fauna (especially native bird) accounts is to describe changes in their condition in response to management driven change, as well as understanding the other pressures that impact on species persistence. Natural variation and other long and short term pressures such as climate change, activities beyond the property boundaries, and fragmentation of habitat will often create substantial short and long term change. Some pressures will cause a trend, most will be variation around a trend. These considerations affect the design of the Methods and also requires an understanding that long term data collection, carefully chosen control sites, and Reference Benchmark data help us observe such trends.

When making these judgements, it is important we recognise that Accounting for Nature's aspiration for widespread adoption will only succeed if the Methods are robust, practical and affordable.

Environmental Accounts vs environmental surveys

Benchmarking condition against an undegraded reference state is the key difference between an Environmental Account and typical environmental surveys. This is because the purpose of an Environmental Account is to describe the condition and change in condition of an environmental asset, against an undegraded 'reference' condition, not simply record what is observed. For example, species presence/absence surveys might be appropriate as an indicator of condition provided the data collection and accounts compilation methods are capable of describing change in condition. That principle applies to all fauna assets whether they be assemblages, guilds, representative species or individual species.

This has three implications for developing methods for native fauna accounts:

- firstly, the need to establish a Reference Benchmark;
- secondly, the data collection methods are able to produce a sufficient level of statistical confidence that the method is capable of detecting change, including some level of management driven change; and,
- thirdly, the duration of monitoring required to detect short and long-term trends.

This relates to both survey error (sample size) and when human observations are involved, observer error (expertise).

2. Metrics and Reference Condition Benchmarks

Metrics

The ideal Environmental Account for native bird communities would combine metrics of composition, species richness, and abundance within functional groups. As a minimum, the recommended metric to use for describing the condition of native bird communities is a modified species richness index, using presence/absence surveys from which the some of the following variables could be estimated. Alternatively, a metric could describe the condition of the assemblage, based on established, reliable statistical relationships.

For example, Fraser et al. (2019) identified that the key variables indicating condition in woodland bird communities in Australia (based on species lists from 2-ha 20-min surveys) included:

- Species richness
- Proportion of species that are small (<50 g)

They developed a metric that scaled from 0 to 1 (best condition possible) for each of six woodland regions of Australia, thus allowing benchmarking. Presence/absence observations cannot inform directly how the numbers of each species are changing, but changing abundance can be inferred from measuring how often a species is recorded compared to how often they could be expected to be recorded.

Reference Condition Benchmarks

An essential requirement of the Accounting for Nature Framework is that the current condition state is compared to a Reference Condition Benchmark (which describes an asset in an undegraded, pristine or best possible, condition). For a 'native bird community' account using presence/absence data, there are multiple ways that the Reference Condition Benchmark can be determined. However, in all instances, the Reference Benchmark should be determined first, as it then informs what survey techniques are required. This ensures that the current condition is comparable with the Reference Condition Benchmark.

Where no historical surveys or literature exist for helping to determine Reference Condition, Fraser et al (2019) note that the use of expert opinion to determine expected species assemblages can be used. As a minimum, the Reference Condition Benchmark is an estimated list of species (within each included guild/group) that are considered likely to inhabit/use the site prior to European settlement. If using a static Reference Condition Benchmark, then this list should resemble the species expected at the time of your surveys (for example if you only plan to survey in winter each year then this is what your list should be based off, alternatively if you plan to survey in each season, the list should reflect that).

Fraser et al (2019) further noted that a pristine Reference Condition for woodland bird species is generally (with slight variation between regions) expected to have:

- high species richness,
- a high proportion of species that are small (<50 grams) or associated with intact communities, and;
- a low proportion of species associated with degraded communities.

The Reference Condition Benchmark can be produced with advice from Birdlife Australia and/or local fauna experts for example from a Regional NRM body, however it should be noted that developing new benchmarks may come at a cost.

An important consideration when determining the Reference Condition Benchmark is deciding how to account for regional extinctions. For example, the Reference Condition Benchmark should include species that were expected to occur in the habitat, but are now regionally extinct. It is acknowledged that by including regionally extinct species in the Reference Condition Benchmark, the final Econd™ will likely be limited in what it can achieve. This is important so as not to mislead by implying the bird population is in an undegraded condition when it may not be.

In areas particularly prone to climatic variability where species presence is particularly sensitive to rainfall or drought or other uncontrollable variables, it is encouraged that in lieu of a static benchmark, a Dynamic Reference Benchmark is used. For example, separate wet year and dry year Dynamic Reference Condition Benchmarks could be developed for arid communities. Dynamic Reference Benchmarks can be informed by literature or expert opinion, or even through the establishment of local Reference Condition Benchmark sites that are determined to be the "best on offer."

Establishing local Reference Condition Benchmark sites can be used for both Static and Dynamic Reference Benchmarks, and would help address the wider challenges of climatic variation and survey error in bird monitoring as they would provide a comparable 'best on offer' benchmark that must be surveyed in conjunction with the target site. Because of this, it could substantially address both survey and observer error assuming the same survey technique and observer conduct surveys at both sites.

However, the problem with only using local Reference Condition sites for the Reference Condition Benchmark in such situations is that it could give a falsely high condition score because it would not take into account historic local extinctions. An extreme example would be that if only 30% of birds species were observed in both the local Reference Condition sites, and the monitoring sites, the account would still score an *Econd™* of 100.

To overcome this problem, the following actions are suggested:

1) Reference Condition Benchmark should established as discussed above, either through expert interpretation of historic data, or through establishment of local Reference Condition sites. However both methods should include known extinctions, so expert opinion may be required to enhance the reference condition determined by local Reference Condition sites. For example, data from Bird Atlas when combined with the Handbook of Australian, New Zealand and Antarctic Birds (HANZAB) and other known historical surveys in the area could be used to help determine these Reference Benchmarks.
2) If a Dynamic Reference Condition Benchmark is required, then surveys should be conducted within both the account boundary as well as within a local Reference Condition site ('Best On Offer' (BOO) site).
    - When reporting on survey results for an Account that includes Dynamic Reference Condition, then the results of surveys both within the account boundary, and within the local reference condition site, should be shown on the same graph. Both results should have standard error lines.
    - The Information Statement should be used to interpret the results. For example, "There was a decline in *species x* in this survey period, but the decline was also observed at the local reference site. This suggests that the decline was most likely to be a result of natural variation and or statistical errors (sampling and observer)."

3. Survey methods

The survey method used will be determined by the way that your metric benchmark value was derived. For example, the Fraser et al. (2019) metric required data in the form of complete species lists, collected from 2-ha 20-min surveys.

It is essential to consider the context of your account, and think about your ecosystem type, and how any existing methodologies might apply. There are a number of survey options that proponents could utilise. However, the most standard, and recommended approach is the Birdlife Australia, 2-ha 20-min surveys which is most suited to terrestrial birds.

The 2-ha 20-min surveys survey method includes the following (source: Birdlife Australia):

> *2-ha 20-min surveys*
>
> *This involves searching for birds in a two-hectare area for 20 minutes. The recommended shape for the two hectares is 100 m x 200 metres. You can use other shapes, such as a circle with a radius of 80 metres, or a strip 400 m long x 50 m wide. Only record birds within the two-hectare area. Birds flying over the search area should be included.*
>
> *Choosing a 2-ha search area*
>
> *Try to introduce a degree of randomness into your site selection. A good way to do this is to choose a site on a map before you arrive so your choice will not be influenced by the surroundings. You could also randomly choose from sites with similar habitat and management conditions.*
>
> *Your site should be representative of the particular habitat you are surveying. As much as possible, avoid mixing habitat types (e.g. half grassland/half forest, or half grazed/half ungrazed) in the same 2-ha search area, and avoid mixing management regimes. If you are surveying two nearby 2-ha areas on the same day make sure that the centre of the two areas are at least 400 metres apart, so there is no overlap between them.*

Method authors may modify the 20 minute per 2 ha method to suit their needs, or utilise other appropriate survey methods as required for their desired purpose. However, all survey methods must be scientifically rigorous and accepted by the SAC. For example, for waterbirds, the 20 minute per 2 ha survey method is suitable for small wetlands but for bigger wetlands (>2 ha) it is recommended that fixed route surveys that attempt to get reasonably full counts of all birds in the open water are used instead (a fixed time, a fixed route, with fixed stops). This highlights that your ecosystem type will dictate survey methods (i.e. a survey method that is suitable for woodlands, might not be suitable for arid zones or rainforests).

Another method - a Community-Based Observer scheme, which requires weekly recording of species observations (Saunders, D.A., 1993) was also developed as part of the regional environmental accounts trials and could be used.

Alternatively, instead of trying to measure all species within a site, a number of key indicator species (representative of the above condition variables) could be monitored as target species, which may be a more cost-effective option. By focussing on specific species, automatic monitoring such as by through the use of bioacoustic sensors and models might be a cost and time efficient option. Alternatively, specialised in-field survey techniques may be used for targeted or threatened species.

The Australian Government has published a variety of survey guidelines for Australia's threatened bird species –

https://www.environment.gov.au/epbc/publications/survey-guidelines-australias-threatened-birds-guidelines-detecting-birds-listed-threatened.

The following points should be considered when determining your survey methods, to help make sure the Method complies with AfN Environmental Account requirements.

1. Consider stratification of the property and where to conduct the surveys. *Your site should be representative of the particular habitat you are surveying, and the ecosystem type you are surveying should determine the methods used, as described above.* For example, for a property scale account, surveys should be conducted in each vegetation type on the property AND with survey sites further stratified into condition classes, such as broad condition states, the VAST framework, or by remnant/regrowth. This is similar to the stratification used in Native Vegetation Methods applied at the property scale.
2. Think about whether or not to group the bird species in the survey data into guilds. Consider what guilds are relevant for your Method/intended purpose. Common guilds can be based on diet, foraging behaviour, substrate or habitat, and activity period and Birdlife Australia might be able to assist with determining relevant guilds, if needed.
3. Consider how you want to treat resident, migratory, vagrant, exotic, and nuisance/pest/invasive species (remember a native bird might be considered exotic if outside it's natural range, or in a modified environment, e.g. noisy miner).
4. Think about how to classify/include birds flying over the search area.

4. Sampling (Observer and Survey) Error

Sampling error relates to both survey error (sample size) and, when human observations are involved, observer error (which depends on surveyor expertise).

The greatest challenge for Environmental Accounts that rely on survey data is to know whether the absence of a record of a species is whether it is because it wasn't there (true negative), or whether it was there but was not observed (a false negative). There three main ways you can get a false negative:

1. The bird was in the site but you didn't see it (estimated to occur around 20% of the time);
2. The bird regularly uses the site but it didn't happen to be there when you were there (occurs very often); or
3. The species needs and uses this site but just not part of its territory, or feeding area this year– often true in the arid zone.

The main ways to reduce the sampling error, and to prevent the likelihood of a false negative, is to increase the sample size (i.e. reduce survey error), and reduce the observer error by ensuring the observer has relevant expertise/experience. However, it is acknowledged that this bring with it significant cost implications.

Observer Error

The quality of fauna surveys by visual observation is quite dependent on the experience of the people undertaking the surveys. As a bare minimum, anyone conducting bird surveys should be confidently able to distinguish between bird species. The person should have demonstrated bird survey experience in the survey region, be familiar with the bird species in the region, and be able to visually and audibly identify species. The higher the Method Confidence Level, the more experience the person conducting the survey should be required to have, and each Method should disclose the specific experience/skill requirements of observers (for example, a Method might require an observer to have completed a specific training course).

Bioacoustic monitoring coupled with automatic bird call recognition, is a likely way to reduce observer error, however it is acknowledged that there are still considerable limitations in the implementation of bioacoustic monitoring, related with cost and accuracy.

Survey Error

At this point in time (January 2021), it is unclear what sample sizes are required for each Confidence Level for bird Methods. It is likely that bird surveys will require at least four times the number of sample sites and/or frequency of surveys compared to native vegetation, refer to Table 1. This is because there are more kinds of sampling error attributed to bird surveys.

Table 1. Typical native vegetation survey requirements and the likely sample sizes (distinct sites, or repeats at the same site, depending on size) required for bird surveys with an equivalent confidence level.

Assessment Unit Area	Level 1		Level 2		Level 3	
	Native vegetation	Birds	Native Vegetation	Birds	Native Vegetation	Birds
<2 ha	1	4	1	4	1 per 5 ha	4 per 5 ha
>2 and ≤20 ha	2	8	2	8	1 per 5 ha	4 per 5 ha
>20 and ≤60 ha	3	12	3	12	1 per 5 ha	4 per 5 ha
>60 and ≤500 ha	5	20	4	16	10	40
>500 ha	7	28	5	20	10	40

Therefore, to try to reduce survey error in bird surveys, key considerations must include:

1. Intra-annual variability. A key consideration is timing of surveys and this must be clearly described in the Method. This must be linked back to the purpose of your Environmental Account. All surveys within an account must be comparable with each other, and with the way the Reference Benchmark was derived, and therefore, the effects of seasonality must be considered. As a bare minimum, it is recommended that surveys should be conducted at a minimum of once a year, and at the same time of year. However, it is highly recommended that if resources permit, surveys are done more frequently, such as in each season.
2. Bird movement within the site. Birds move around a lot, so a way to account for bird movement is to increase the number of sample sites, and the frequency at which those sites are sampled.

These requirements will have likely lead to an increase in survey effort, which might be more expensive, depending how the surveys are conducted.

To be able to assess and improve methods into the future, AfN requires the Methods to include a step that involves calculating the standard error of the results in each account. This will allow AfN to better understand what sample sizes are required and can continually improve these guidelines, as we better understand the practicalities and implications of bird surveys under the AfN Framework.

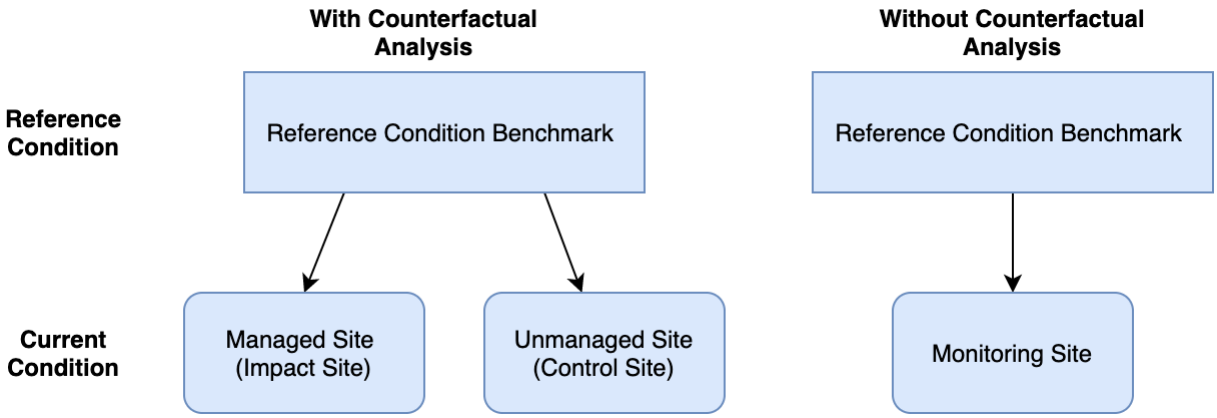
5. Control Sites

Some land managers may also wish to include control sites in their environmental account to determine whether specific management actions are having an impact on bird condition, by controlling for natural variation such as short-term changes in climatic variables such as rainfall patterns and longer term changes such as landscape fragmentation and climate change. This is known as a Counterfactual Analysis and is visualised below.

Counterfactual Analysis is not compulsory for Environmental Accounts, but are needed to attribute a change to a management intervention. Control sites must be comparable in their initial condition state to the impact site in terms of vegetation type and land use. It should also be noted that if local Reference condition sites are established for use in Dynamic Reference Benchmarking (as described above), the local Reference condition site, the impact site and the control site should all be monitored by the same observer and within a short time-frame (where feasible) to reduce potential error.

Control sites allows land managers to better demonstrate the result of their management practices on the condition of native birds on their property – a core reason (i.e. purpose) for undertaking a property scale account.

The Information Statement should be used to interpret the results. For example, "There was a decline in *species x* in this survey period, but the decline was also observed at the unmanaged control site, and within the local reference site. This suggests that the decline was most likely to be a result of natural variation and or statistical errors (sampling and observer), and not as a consequence of management actions on the property."



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