

HUNTER VALLEY OPERATIONS



EPBC 2016-7640

Annual Compliance Report

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Declaration of accuracy

In making this declaration, I am aware that sections 490 and 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents. The offence is punishable on conviction by imprisonment or a fine, or both. I declare that all the information and documentation supporting this compliance report is true and correct in every particular. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.



Signed

Full name (please print) Michael LloydPosition (please print) Environmental & Community Coordinator

Organisation (please print including ABN/ACN if applicable)

HV Operations Pty Limited (ABN 76 606 478 399)Date 31 January 2022

Cover Photo: Spotted gum woodland (*Corymbia maculata*) at Mitchelhill West.

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1 Introduction

Hunter Valley Operations (HVO) became a jointly controlled operation between Glencore (49%) and Yancoal (51%) on 4 May 2018, following previous periods of ownership by Yancoal, Rio Tinto and Mitsubishi. Certain mining operations at HVO are regulated by Commonwealth approval, EPBC 2016/7640.

This annual compliance report has been prepared in accordance with the Annual Compliance Report Guidelines (Commonwealth of Australia 2014) and addresses compliance with the conditions of the EPBC 2016/7640 approval. The period covered by this report is for the calendar year 2021. For ease of reporting, HVO transitioned the reporting year from the November to October period to the calendar year with the January 2021 extended report submission.

As a result, this report covers the period 1 January 2021 to 31 December 2021 (the reporting period).

1.1 Background

Hunter Valley Operations is located at Lemington, approximately 24 kilometres northwest of Singleton in the Hunter Valley, NSW. The Commonwealth Minister for the Environment, under provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), issued approval EPBC 2016/7640 for the continuation of open cut coal mining operations, within the HVO mine complex, in areas that were previously approved by the State after the commencement of the EPBC Act 1999. Approval was granted on 10 October 2016 and the action commenced on 1 November 2016.

The EPBC 2016/7640 approval (last modified in August 2017), requires various offsets to be established as a result of the impacts upon Matters of National Environmental Significance (MNES). The offsets are required in respect of the following protected matters:

- Central Hunter Valley Eucalypt Forest (CHVEF) - 61ha;
- Swift Parrot (*Lathamus discolor*) foraging habitat – 68.1ha;
- Regent Honeyeater (*Anthochaera phrygia*) breeding and foraging habitat – 68.4ha; and
- Green and Golden Bell Frog (*Litoria aurea*) breeding (2.6ha) and foraging habitat (102.7ha).

The Offset Strategy (Biodiversity Offset Strategy – State Approved Mining (EPBC2016/7640)), approved by the Minister on 23 October 2017, details the offset areas that are to be secured and managed in relation to this approval. The offset areas are summarised below as the:

- Wandewoi Biodiversity Area (BA) – To offset approximately 63% of the action's impacts on Central Hunter Valley Eucalypt Forest (CHVEF) and 100% of the action's impacts on the Swift Parrot.
- Mitchelhill BA - To offset the residual 37% of the action's impacts on CHVEF and 53.9% of the Regent Honeyeater impacts.
- Condon View BA - To offset the remaining 46.1% of the Regent Honeyeater impacts.
- Crescent Head BA - To offset 99.25% of the action's impacts on the Green and Golden Bell Frog (GGBF). The residual 0.75% offset for the GGBF is being provided through other compensatory measures. HVO is contributing the residual funds towards a GGBF Habitat Mapping project at Crescent Head which is managed by the Biodiversity & Conservation Division of the NSW Department of Planning, Infrastructure and Environment.

In accordance with the approval, the Wandewoi BA, Mitchelhill BA, Condon View BA and the Crescent Head BA offset sites are to be secured in perpetuity with legally binding agreements.

HVO has been working with Commonwealth and State agencies to finalise the legally binding arrangements that will secure the offset sites in perpetuity in the most appropriate manner. As noted elsewhere in this Annual Compliance Report, HVO encountered difficulties in determining which mechanism for securing the offset sites would be acceptable to the NSW agencies responsible for biodiversity conservation. It is now proposed that HVO enter into a Conservation Agreement pursuant to s305 of the EPBC Act to satisfy the requirement for offset security.

An overview of the consultation that has taken place between HVO and DAWE to finalise this matter is set out in the following chronological timeline:

27 September 2018: An approval variation request was submitted to the former Department of the Environment and Energy (DoEE) (now Department of Agriculture, Water and the Environment, DAWE). The variation sought to extend the date by which the offsets had to be secured due to the ongoing dialogue with the various State and Commonwealth agencies about the most appropriate mechanism to satisfy the in-perpetuity security requirement in HVO's conditions of approval. DoEE officers were in agreement with the request, however, given that HVO was also discussing the proposal to substitute a component of the Wandewoi BA for the Hook property, the DoEE asked that the variation request be resubmitted to include all matters being discussed at the time.

18 October 2018: The second variation request was submitted to DoEE that proposed to:

- a) vary the approval to allow for the grassland component of the Wandewoi offset to be swapped for a property that contains the critically endangered Central Hunter Valley eucalypt forest and woodland;
- b) vary the approval to extend the date by which the offsets must be secured;
- c) vary the approval to permit the use of a s305 Conservation Agreement under Part 14 the EPBC Act to secure the offset sites in perpetuity; and
- d) request approval of the Minister for the HVO offset sites to be secured by entering into a s305 Conservation Agreement.

This second variation request required the revision of the Biodiversity Offset Strategy, the existing Biodiversity Areas Management Plans, the EPBC calculations and the preparation of a management plan and a specific weed management plan for the Hook Property. Ecological assessments of the Hook property were supplied to DoEE for review and preliminary acceptance of the quality of the proposed offset variation to ensure that the proposed Hook BA met the required quantum of impact.

21 November 2019: HVO provides to DoEE the GGBF residual impact calculation report and the spreadsheet with the management costs and potential projects as suggested by the NSW Biodiversity and Conservation Division of DPI&E.

25 November 2019: DoEE approves the GGBF residual offset liability calculations and proposed projects.

30 January 2021. DAWE agrees that the HVO Offset Strategy, the Biodiversity Areas Management Plan and EPBC calculations are appropriate to send to the Delegate for consideration.

12 July 2021: Following consideration of HVO's second variation request, the draft variation to EPBC 2016/7640 conditions of approval was provided by DAWE for HVO to review.

3 August 2021: HVO's response to the proposed conditions of approval was submitted to DAWE.

27 October 2021: After addressing the comments provided by DAWE, and having regard to the draft conditions of approval that have been provided by DAWE, HVO submitted the revised HVO Offset Strategy, the Biodiversity Areas Management Plan and EPBC calculations to DAWE for consideration by the Delegate. HVO considers these documents to be in final form, subject to approval by the Delegate.

9 November 2021: DAWE provided a draft Conservation Agreement for review by HVO for the purpose of implementing the security arrangement for the HVO offset sites.

17 November 2021: DAWE provided a second version of the draft conditions of approval to HVO for its review.

3 December 2021: HVO's feedback on the draft Conservation Agreement and the second draft conditions of approval were provided to DAWE.

20 December 2021: HVO and DAWE participated in a meeting to discuss HVO's feedback on the draft Conservation Agreement. At the conclusion of that meeting, DAWE indicated that it would respond to HVO's feedback in early 2022.

As of the time of the report submission, HVO's second variation request is still being considered by DAWE along with the final documents that were provided by HVO to DAWE in connection with the second variation request (being the revised Biodiversity Offset Strategy, Biodiversity Areas Management Plan and EPBC calculations). It should be noted that, although the Hook property is yet to be formally accepted by DAWE as an offset property for CHVEF and the Swift Parrot, those documents include the Hook property as an offset site.

The reason for this is that the Hook property is part of the EPBC variation that has been formally requested by HVO and which has been incorporated in the HVO Biodiversity Areas Management Plan. The Hook

property is currently being managed according to the submitted Management Plan and thus, this Annual Compliance Report includes works undertaken within the Hook property.

2 Condition of Compliance

2.1 EPBC 2016/7640

Condition Number	Condition	Compliance status	Evidence/Comments
1	The person taking the action must not clear more than 54.4 hectares of the Central Hunter Valley Eucalypt Forest and woodland (CHVEF) ecological community from the Riverview Pit and 6.6 ha of the CHVEF ecological community from within the West Pit and must limit all vegetation clearing to within the project disturbance boundaries defined at Schedule 1, Figures 1 - 4.	Compliant	Disturbance limited to within project disturbance boundaries through the HVO Ground Disturbance Permit process. From within the EPBC areas, HVO has, in total, cleared 37.5 ha of CHVEF from Riverview Pit and 5.7 ha of CHVEF from West Pit. All vegetation clearing was restricted to within the State and Commonwealth approved project boundaries.
2	The person taking the action must prepare and submit a Vegetation Clearance Plan (VCP) for the Minister's approval to mitigate impacts of the action on the CHVEF ecological community, the Regent Honeyeater (<i>Anthochaera phrygia</i>), Swift Parrot (<i>Lathamus discolor</i>) and the Green and Golden Bell Frog (<i>Litoria aurea</i>). The VCP must include:	Compliant	Vegetation Clearance Plan (VCP) was submitted to the Department of Environment and Energy (DoEE) and approved by the Acting Assistant Secretary 24 October 2016. The VCP was modified in 2019 to update the format to reflect the current ownership of HVO.
2a	Clear delineation of vegetation to be cleared, as per the disturbance boundary shown in Schedule 1 Figures 1 - 4, and vegetation that is to be retained.	Compliant	These areas are outlined within Section 2.1 and Chapter 3 of the VCP. The areas to be cleared are first identified and approved within the GDP. In the field, the areas to be cleared were delineated by a surveyor prior to clearing.
2b	Pre-clearance survey methods, which must include but not be limited to the following requirements:		
	i. A qualified ecologist must undertake a pre-clearance survey within 24 hours prior to the removal of potential foraging, nesting or breeding habitat for the Regent Honeyeater or foraging habitat for the Swift Parrot in areas identified in Schedule 2, Figures 1 - 5.	Compliant	Chapter 3 of the VCP. All pre-clearance surveys were undertaken by qualified ecologist within 24 hrs prior to the commencement of clearing activities. No species listed or nests were identified during the surveys.
	ii. If during pre-clearance surveys, Regent Honeyeater or Swift Parrot individuals are identified within the clearance area the VCP must specify the use of a two stage clearing protocol where non-habitat trees are cleared 24 hours prior to any habitat trees being cleared, to encourage fauna to move out of a habitat area.	Compliant	Section 3.2 and 3.3 of the VCP. No species listed or nests were identified during the surveys.

iii.	In the event an active Regent Honeyeater nest is identified during pre-clearance surveys, vegetation clearing and overburden removal within 100 m of the active nest should be delayed up until the Regent Honeyeater nest is no longer actively being used .	Compliant	Section 3.3 of the VCP. No species listed or nests were identified during the surveys.
iv.	A qualified ecologist must undertake pre-clearance surveys within a 2 week period prior to the removal of potential breeding habitat for the Green and Golden Bell Frog. Surveys are to be undertaken within all potential breeding habitat areas identified in Schedule 2, Figure 2 as well as a 200m buffer around each potential breeding habitat area.	Compliant	Section 3.3 of the VCP. Ecological pre-clearance surveys undertaken during the reporting year, using the methodology detailed in the Vegetation Clearance Plan. Surveys focussed on waterbodies and any potential habitat trees for the Regent Honeyeater, Swift Parrot and other protected species. No GGBF were found during the survey.
v.	Pre-clearance survey methods for the Green and Golden Bell Frog must meet the survey effort requirements for the Green and Golden Bell Frog stipulated in the Survey Guidelines for Australia's threatened frog (2010) Commonwealth of Australia	Compliant	Section 3.3 of the VCP. Ecological pre-clearance surveys undertaken during the reporting year, using the methodology detailed in the Vegetation Clearance Plan. Surveys focussed on waterbodies and any potential habitat trees for the Regent Honeyeater, Swift Parrot and other protected species. No GGBF were found during the survey.
vi.	In the event Green and Golden Bell Frog individuals, metamorphs or tadpoles are located during pre-clearance surveys, they are to be handled and translocated in accordance with the Hygiene protocols for the control of diseases in frogs (2008) Department of Environment and Climate Change (NSW).	Compliant	Section 3.3 of the VCP. No GGBF were observed or heard within the EPBC area during the reporting period. The applicable hygiene protocols were implemented during the pre-clearance surveys.
2c	Include measures to avoid, suppress and control the spread of plant pathogens (such as <i>Phytophthora cinnamomi</i>) and <i>chytrid</i> fungus that may degrade habitat for protected matters . The action must not commence until the Vegetation Clearance Plan, required by Condition 2, has been approved by the Minister .	Compliant	Chapter 4 of the VCP. The VCP includes hygiene protocols to manage the spread of potential pathogens. The VCP requires wash down facilities to be used to remove soil and mud from clearing machinery prior to entering the HVO complex. The VCP also outlines measures to avoid the spread of Chytrid fungus from survey equipment, clearing machinery and during frog handling. HVO requires Ground Disturbance Permits (GDP) to be approved prior to any disturbance activities. Applicable GDPs prepared during the reporting year required proponents to comply with the veg clearance procedures required by HVO's EPBC 2016/7640 approval condition 2.
3	The approved Vegetation Clearance Plan must be implemented.	Compliant	Measures required by the VCP have been implemented for disturbance associated with Ground Disturbance Permits (GDP's).

4	To compensate for residual impacts to protected matters the person taking the action must, under a legally binding agreement , secure in perpetuity 405.8 ha at the Wandewoi Biodiversity Area , described in 4(a)(b) and (c) within three (3) years from the date of this approval. The Wandewoi Biodiversity Area must include:	Compliant	Wandewoi Biodiversity Area was required to be secured in perpetuity by 10 October 2019. Due to the ongoing drought that occurred up to 2020 impacting the likelihood of success of the required rehabilitation of 230ha at Wandewoi, HVO proposed to substitute the grassland component of the Wandewoi BA for the CHVEF on the Hook property. This would require a revision of the boundaries of the Wandewoi BA on acceptance. Thus, as noted in Section 1 above, a request for an extension to this date requiring Wandewoi to be secured was submitted to the then DoEE on 27 September 2018 and 18 October 2018. Discussions with DAWE have continued since that time. At the time of this report submission, DAWE are preparing a submission for the Delegate to vary the conditions of approval.
4a	405.8 hectares of the CHVEF ecological community;	Compliant	Section 3.1 of the HVO Biodiversity Areas (BA) Management Plan summarises the vegetation communities within the BA: 175.8ha of Grey Box Woodland (CHVEF CEEC) and 230ha of Grey Box Derived Native Grassland (DNG). The revised HVO Biodiversity Areas Management Plan that was submitted to the DoEE for approval on 18 October 2019 includes detail on the Hook property and (in line with the discussions to date with DAWE) proposes the Wandewoi BA to be 234.1 ha within the larger 406.3 ha property.
4b	175.8 hectares of foraging habitat for the Swift Parrot; and	Compliant	Section 3.1 of the HVO Biodiversity Areas (BA) Management Plan summarises the vegetation communities within the BA: 175.8ha of Grey Box Woodland (CHVEF CEEC). This woodland component at Wandewoi remains unchanged in the revised HVO Biodiversity Areas Management Plan that includes detail on the Hook property.
4c	40 ha of regenerating foraging habitat for the Swift Parrot.	Compliant	Section 3.1 of the HVO Biodiversity Areas (BA) Management Plan summarises the vegetation communities within the BA: 230ha of Grey Box Derived Native Grassland (DNG). The DNG areas at Wandewoi will be regenerated to CHVEF, including 40 ha of foraging habitat for the Swift Parrot. The revised HVO Biodiversity Areas Management Plan proposes a larger regenerating foraging habitat area at Wandewoi as a result of the EPBC calculations with the Hook property swap.

5	<p>To compensate for residual significant impacts to 22.7 ha of Class A condition CHVEF from the Riverview Pit extension area the person taking the action must identify a direct offset site that meets requirements of the EPBC Act Offset Policy and secure the offset in perpetuity under a legally binding agreement within 12 months from the date of approval of the Offset Strategy at Condition 10.</p>	Compliant	<p>Direct offset site at Mitchelhill detailed in Biodiversity Offset Strategy (Condition 10) was to be protected under a legally binding agreement by 23 October 2018. A conservation mechanism to secure the BAs was discussed with the NSW Biodiversity Conservation Trust and the Office of Environment and Heritage. A suitable mechanism could not be agreed upon and the DAWE has agreed that a s305 conservation mechanism may be appropriate. A request for an extension to this date to allow the HVO BAs to be secured under a s305 was submitted to the DoEE on 27 September 2018 and 18 October 2018. The date extension requires an approval variation which the DAWE intends to include with the Wandewoi variation. At the time of this report submission, DAWE are preparing a submission for the Delegate to vary the conditions of approval.</p>
6	<p>To compensate for residual significant impacts to 68.4 ha of breeding and foraging habitat for the Regent Honeyeater the person taking the action must identify a direct offset site that meets requirements of the EPBC Act Offset Policy and secure the offset in perpetuity under a legally binding agreement within 12 months from the date of approval of the Offset Strategy at Condition 10.</p>	Ongoing	<p>Direct offset sites at Mitchelhill and Condon View detailed in Biodiversity Offset Strategy (Condition 10) is to be protected under a legally binding agreement by 23 October 2018. A conservation mechanism to secure the BAs was discussed with the NSW Biodiversity Conservation Trust and the Office of Environment and Heritage. A suitable mechanism could not be agreed upon and the DAWE has agreed that a s305 conservation mechanism may be appropriate. As noted in Section 1 above, a request for an extension to this date to allow the HVO BAs to be secured under a s305 was submitted to the DAWE on 27 September 2018 and 18 October 2018. The date extension requires an approval variation which the DAWE intends to include with the Wandewoi variation. As at the time of this report, DAWE are preparing a submission for the Delegate to vary the conditions of approval.</p>

7	To compensate for residual significant impacts to 2.6 ha of breeding habitat and 102.7 ha of foraging habitat for the Green and Golden Bell Frog the person taking the action must identify an offset package that meets requirements of the EPBC Act Offset Policy and secure a direct offset site in perpetuity under a legally binding agreement within 12 months from the date of approval of the Offset Strategy at Condition 10	Ongoing	Direct offset sites at Crescent Head detailed in Biodiversity Offset Strategy (Condition 10) is to be protected under a legally binding agreement by 23 October 2018. A conservation mechanism to secure the BAs was discussed with the NSW Biodiversity Conservation Trust and the Office of Environment and Heritage. A suitable mechanism could not be agreed upon and the DAWE has agreed that a s305 conservation mechanism may be appropriate. As noted in Section 1 above, a request for an extension to this date to allow the HVO BAs to be secured under a s305 was submitted to the DAWE on 27 September 2018 and 18 October 2018. The date extension requires an approval variation which the DAWE intends to include with the Wandewoi variation. As at the time of this report, DAWE are preparing a submission for the Delegate to vary the conditions of approval.
8	Prior to securing the direct offsets required by Conditions 4, 5, 6 and 7 the direct offset sites and legally binding agreements must be agreed to by the Minister .	Compliant	Direct offset sites have been approved by the Assistant Secretary (DoEE) on 23 October 2017 through approval of the Biodiversity Offset Strategy – State Approved Mining (EPBC2016/7640) dated October 2017.
9	The action cannot continue for more than 12 months from the date of approval of the Offset Strategy at Condition 10, unless the direct offset sites required by Conditions 5, 6 and 7 have been secured in perpetuity under a legally binding agreement by the person taking the action .	Ongoing	Direct Offset Sites detailed in Biodiversity Offset Strategy (Condition 10) are to be protected under a legally binding agreement by 23 October 2018. The DoEE has agreed that a s305 conservation mechanism may be appropriate. To facilitate this, a change to the conditions of EPBC 2016/7640 is required and, hence, as noted in Section 1 above, a variation to extend the date required to secure the BAs was submitted on 27 September 2018 and 18 October 2018. No formal response to the request has been received as at the time of this report. DAWE are preparing a submission for the Delegate to vary the conditions of approval.
10	Within six (6) months from the commencement of the action the person taking the action must prepare and submit an Offset Strategy for the Minister's approval. The Offset Strategy must specify the development of the offset package and how direct offset sites required by Conditions 5, 6 and 7 will be identified, secured and managed in perpetuity. The Offset Strategy must:	Compliant	Biodiversity Offset Strategy (BOS) – State Approved Mining (EPBC2016/7640) submitted to DoEE on 1 May 2017. Approved by the Assistant Secretary (DoEE) on 23 October 2017.
10a	Describe the development of the offset package and identify the proposed direct offset sites required by Conditions 5, 6 and 7, include a detailed description of the direct offset sites and demonstrate how the direct offset sites meet the EPBC Act Offset Policy and provide an adequate offset for the residual significant impacts to protected matters .	Compliant	Chapter 3, 4 and 5 of the BOS.

10b	Include proposed timeframes in which the direct offset sites will be secured by a legal binding agreement and a detailed description of how the legally binding agreement will secure the direct offset sites in perpetuity.	Compliant	Section 6.1 and 6.2 of the BOS. Note that discussions are continuing with the DAWE regarding implementing a s305 conservation mechanism to secure the sites in perpetuity.
10c	Proposed measures for the long term management of the direct offset sites . The Offset Strategy approved by the Minister must be implemented	Compliant	Section 6.4, 6.5 and 6.6 of the BOS. Biodiversity Offset Strategy (BOS) – State Approved Mining (EPBC2016/7640) approved by the Assistant Secretary (DoEE) on 23 October 2017. Direct Offset sites detailed in the BOS have been purchased and the management activities outlined in the BOS are being implemented at the BAs.
11	For the protection of the CHVEF as well as habitat for the Regent Honeyeater, Swift Parrot and Green and Golden Bell Frog the person taking the action must prepare and submit a Biodiversity Offset Management Plan (BOMP) for the Minister's approval within 12 months from the date of this approval. At a minimum, the BOMP must:	Compliant	Biodiversity Offset Management Plans were submitted to the DoEE for approval on the 10 October 2017 for the following: Wandewoi BA; Mitchelhill BA; Condon View BA; and Crescent Head BA. The DoEE's comments were incorporated into the BOMPs prior to resubmission. A revised BOMP that collates the various management plans into the one document was submitted to the DOEE on 31 October 2019.
11a	Clearly identify the direct offset sites described in Conditions 4, 5, 6 and 7. This must include offset attributes, shapefiles , textual descriptions and maps to clearly define the location and boundaries of the direct offset sites .	Compliant	Section 3.1 and 3.3 of the HVO BA Management Plan (MP) describes the direct offset site for CHVEF and Swift Parrot relevant to Condition 4 of the approval. Section 3.2 of the HVO BA Management Plan (MP) describes the direct offset site for CHVEF and Regent Honeyeater relevant to Condition 4 and Condition 6 respectively of the approval. Section 3.4 of the HVO BA Management Plan (MP) describes the direct offset site for Regent Honeyeater relevant to Condition 6 of the approval. Section 3.5 of the Crescent Head BA Management Plan (MP) describes the direct offset site for Green and Golden Bell Frog relevant to Condition 7 of the approval. The revised Biodiversity Area Management Plan submitted in 2019 addressed these matters in Section 3 for the respective BAs.

11b	Provide a description of the offset attributes for each protected matter and how the offset site meets the offset requirements under Conditions 4, 5, 6 and 7.	Compliant	<p>Section 3.1 and 3.3 of the HVO BA MP describes the offset attributes for the CHVEF and Swift Parrot relevant to Condition 4 of the approval.</p> <p>Section 3.2 of the HVO BA MP describes the offset attributes for the CHVEF and Regent Honeyeater relevant to Condition 4 and Condition 6 respectively of the approval.</p> <p>Section 3.4 of the HVO BA MP describes the offset attributes for Regent Honeyeater relevant to Condition 6 of the approval.</p> <p>Section 3.5 of the HVO BA MP describes the offset attributes for Green and Golden Bell Frog relevant to Condition 7 of the approval.</p> <p>The revised Biodiversity Area Management Plan submitted in 2019 addressed these matters in Section 3 for the respective BAs.</p>
11c	Provide a survey and description of the current condition (prior to any management activities) of the direct offset sites identified in Conditions 4, 5, 6 and 7.	Compliant	<p>Section 3.1 and 3.3 of the HVO BA MP describes the offset attributes for the CHVEF and Swift Parrot relevant to Condition 4 of the approval.</p> <p>Section 3.2 of the HVO BA MP describes the offset attributes for the CHVEF and Regent Honeyeater relevant to Condition 4 and Condition 6 respectively of the approval.</p> <p>Section 3.4 of the HVO BA MP describes the offset attributes for Regent Honeyeater relevant to Condition 6 of the approval.</p> <p>Section 3.5 of the HVO BA MP describes the offset attributes for Green and Golden Bell Frog relevant to Condition 7 of the approval.</p> <p>The revised Biodiversity Area Management Plan submitted in 2019 addressed these matters in Section 3 for the respective BAs.</p>
11d	<p>Include detailed management actions, including regeneration and revegetation strategies to be undertaken at the direct offset sites to improve the ecological quality of these areas. The BOMP must also include:</p> <ul style="list-style-type: none"> <li data-bbox="309 1107 1128 1187">i. Management actions relating to improving habitat quality for protected matters including but not limited to: weed management, feral animal management, erosion and sediment control and fire management. <li data-bbox="309 1198 1128 1305">ii. A description and timeframes that management measures would be implemented to improve the condition of CHVEF and habitat for the Regent Honeyeater, Swift Parrot and the Green and Golden Bell Frogs on the direct offset sites. <li data-bbox="309 1316 1128 1369">iii. Performance and completion criteria for evaluating the management of the direct offset sites, and criteria for triggering remedial action. <li data-bbox="309 1380 1128 1412">iv. A program to monitor and report on the effectiveness of these 	Compliant	<p>Chapter 5 of the HVO BA MP describes the detailed management actions, timing, performance criteria and completion criteria relevant to the direct offset site for the CHVEF and Swift Parrot.</p> <p>Chapter 5 of the HVO BA MP describes the detailed management actions, timing, performance criteria and completion criteria relevant to the direct offset site for the CHVEF and Regent Honeyeater.</p> <p>Chapter 5 of the HVO BA MP describes the detailed management actions, timing, performance criteria and completion criteria relevant to the direct offset site for the Regent Honeyeater.</p> <p>Chapter 5 of the HVO BA MP describes the detailed management actions, timing, performance criteria and completion criteria relevant to the direct offset site for the Green and Golden Bell Frog</p>

	measures, and progress against the performance and completion criteria.		Chapter 6 of the HVO BA MP describes the monitoring program.
	v. A description of potential risks to the successful implementation of the plan, a description of the measures that will be implemented to mitigate against these risks and a description of the contingency measures that will be implemented if defined triggers arise.		Chapter 7 of the HVO BA MP provides a description of potential risks and corrective actions.
	vi. Details of who would be responsible for monitoring, reviewing, and implementing the plan.		Chapter 2 of the HVO BA MP provides responsibilities for the MP
12	The BOMP approved by the Minister must be implemented at the direct offset sites required to meet the requirements of Conditions 5, 6 and 7 within three (3) months from the date the offsets are secured under a legally binding agreement .	Not triggered	Direct Offset Sites required to meet Conditions 5, 6 and 7 are to be protected under a legally binding agreement by 23 Oct 2018. The DoEE has agreed that a s305 conservation mechanism may be appropriate. A request for an extension to this date to allow the HVO BAs to be secured under a s305 was submitted to the DoEE on 27 September 2018 and 18 October 2018. DAWE are preparing a submission for the Delegate to vary the conditions of approval. Note that the direct offset sites are being managed in accordance with the DoEE-reviewed draft management plan.
13	To ensure timely compensation for significant impacts to protected matters , the approved BOMP must be implemented at the Wandewoi Biodiversity Area within one (1) month from the date the BOMP is approved, regardless if the Wandewoi Biodiversity Area has been secured under a legally binding agreement .	Not triggered	Wandewoi BA Management Plan was submitted to DoEE for review and approval on the 10 October 2017. Management activities outlined in the BOMP are being implemented including: cultural heritage surveys, fencing, removal of grazing activities, track management, weed spraying and vertebrate pest control.
14	The person taking the action may choose to revise a management plan approved by the Minister without submitting it for approval under Section 143A of the EPBC Act , if the taking of the action in accordance with the revised management plan would not be likely to have a new or increased impact on a protected matter under the conditions of this approval. If the person taking the action makes this choice, they must:	Not triggered	
14a	Notify the Department in writing that the approved management plan has been revised and provide the Department with an electronic copy of the revised management plan;	Not triggered	
14b	Implement the revised management plan from the date that it is submitted to the Department; and	Not triggered	
14c	For the life of this approval, maintain a record of the reasons the person taking the action considers that taking the action in accordance with the revised management plan would not be likely to have a new or increased impact on a protected matter under the conditions of this approval.	Not triggered	

15	The person taking the action may revoke its choice under Condition 14 at any time by notice to the Department . If the person taking the action revokes the choice to implement a revised management plan, without approval under Section 143A of the EPBC Act, the management plan approved by the Minister must be implemented	Not triggered	
16	Condition 14 does not apply if the revisions to the approved management plan include changes to offsets provided under the management plan in relation to a matter protected by a controlling provision for the action, unless otherwise agreed in writing by the Minister . This does not otherwise limit the circumstances in which the taking of the action in accordance with a revised management plan would, or would not, be likely to have new or increased impacts .	Not triggered	
17	If the Minister gives a notice to the person taking the action that the Minister is satisfied that the taking of the action in accordance with the revised management plan would be likely to have a new or increased impact on a protected matter by the conditions of this approval, then:	Not triggered	
17a	Condition 14 does not apply, or ceases to apply, in relation to the revised management plan; and	Not triggered	
17b	The person taking the action must implement the previous management plan most recently approved by the Minister	Not triggered	
	To avoid any doubt, this condition does not affect any operation of conditions 14, 15 and 16 in the period before the day the notice is given. At the time of giving the notice the Minister may also notify that for a specified period of time that Condition 14 does not apply for one or more specified plans required under the approval	Not triggered	
18	If, at any time after 5 years from the date of this approval, the person taking the action has not substantially commenced the action, then the person taking the action must not substantially commence the action without the written agreement of the Minister.	Compliant	The action has commenced as per the notified Commencement of Action (1 November 2016).
19	Within 30 days after the commencement of the action, the person taking the action must advise the Department in writing of the actual date of commencement .	Compliant	Department of Environment and Energy advised by letter dated 9 November 2016 that the action had commenced in accordance with the approved Vegetation Clearance Plan on the 1 November 2016.
20	Unless otherwise agreed to in writing by the Minister , the person taking the action must publish all management plans, referred to in these conditions of approval on their website. Each management plan must be published on the website within 1 month of being approved by the Minister or being submitted under Condition 14.a	Not triggered	The HVO Biodiversity Areas Management Plan will be published when approved by the Minister.

21	<p>The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the VCP, Offset Strategy and Biodiversity Offset Management Plan required by this approval, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media.</p>	Compliant	<p>All disturbance-related activities received prior approval through HVO's GDP process. Records of activities and outcomes are maintained by site personnel and stored within the document management system.</p> <p>Activities have been undertaken in accordance with the applicable conditions of approval and HVO's approved policies, plans and strategies.</p>
22	<p>Within three months of every 12 month anniversary of the commencement of the action, the person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans as specified in the conditions. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the Department at the same time as the compliance report is published. Reports must remain on the website for the period this approval has effect. The approval holder may cease preparing and publishing compliance reports required by this condition with written agreement of the Minister to do so.</p>	Compliant	<p>HVO has published on its website compliance reports for the previous compliance reporting years. This compliance report outlines HVO's compliance with the approval conditions for 2021 (1 January 2021 – 31 December 2021).</p> <p>Note that the reporting year was transitioned to the calendar year during the 2020 reporting year. The report submitted 31 January 2021 represented 14 months of activity to account for the additional months following the November commencement of the action.</p>
23	<p>Upon the direction of the Minister, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor must be approved by the Minister prior to the commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.</p>	Not triggered	

2.2 Vegetation Clearance Plan

Commitment	Compliance status	Evidence/Comments
1. A GDP will be completed and approved prior to any clearance in the extension areas.	Compliant	The GDP process is a mandatory process at HVO prior to any surface disturbance activities. All clearance activities that have occurred within the extension areas have gained prior conditional approval through HVO's GDP process.
2. Conduct pre-clearance surveys for CHVEF in accordance with Section 3.1.1	Compliant	Pre-clearance surveys have been undertaken prior to all clearance activities within the extension area.
3. Identify clearance limits on plans and on the ground.	Compliant	Prior to clearing, HVO surveyors peg and delineate the limit of the area to be cleared.
4. Conduct pre-clearance surveys for listed species in accordance with Section 3.3, 3.4 and 3.5.	Compliant	The pre-clearance surveys include targeted surveys for the listed species outlined (GGBF, Regent Honeyeater and Swift Parrot).
5. Manage listed species during vegetation clearance in accordance with Section 3.3.4, 3.4.4 and 3.5.4.	Compliant	None of the listed species have been identified as occurring within the area during the pre-clearance surveys or clearance activities.
6. All clearing machinery involved in vegetation and/or topsoil clearance in the extension areas will visit the wash-down facility for cleaning prior to entering the EPBC areas.	Compliant	HVO's The Vegetation Clearance Plan process requires all earthmoving contractors undertaking clearing activities within HVO's EPBC areas to document and provide evidence that equipment wash downs have occurred prior to coming onsite. The GDP process is used to condition equipment washdown as required.
7. Disinfection measures are implemented in accordance with Section 4.1.2.	Compliant	All equipment is washed to remove vegetation and loose soil prior, and following, the pre-clearance surveys. This process is outlined in the pre-clearance survey reports.
8. Records will be kept in accordance with Section 5.2.	Compliant	<p>Actions occurring during the pre-clearance surveys have been documented in each pre-clearance survey report.</p> <p>HVO's GDP process is used to document washdown requirements for earthmoving equipment.</p>
9. Publish the annual compliance report on the proponent's website.	Compliant	This compliance report will be placed on the HVO public website prior to submission.

3 New Environmental Risks and Potential threats to Matters of National and State Environmental Significance

No additional environmental risks or threats to matters of national environmental significance have been identified during the reporting period.

4 Summary of Climatic Conditions

Table 4.1 shows the monthly rainfall compared to the long term average for the BAs. The rainfall received during 2021 exceeded the annual average.

Table 4.1. Rainfall received during 2021 against the average annual rainfall occurring at each of the BAs.

Site	Weather station	Annual Rainfall Received (mm)	Annual Average (mm)	Surplus/Deficit (mm)
Condon View	Puty Tea Rooms # 61209	893	743.8	+149.2
Crescent Head	Crescent Head # 59047	1520.2	1455	+65.2
Hook	Elderslie # 61092	943	719.5	+223.5
Mitchelhill	Muswellbrook (St Heliers) # 61374	902.2	633.7	+268.5
Wandewoi	HVO	910.2	639.9 [#]	+270.3

[#] Jerrys Plains (61130) Annual Average.

5 Management and Monitoring Schedule

Established offset sites at Wandewoi, Mitchelhill, Hook, Condon View and Crescent Head Biodiversity Areas (BAs) offset the impacts on *Lathamus discolor* (Swift Parrot), *Anthochaera phrygia* (Regent Honeyeater), *Litoria aurea* (Green and Golden Bell Frog) and Central Hunter Valley Eucalypt Forest and Woodland (CHVEFW). The Crescent Head offset area is the only site established to offset impacts to GGBF; the monitoring requirements for this BA are discussed separately in this report.

The objectives for each offset are outlined in Table 5.1.

Table 5.1: Offset objectives for each BA.

Offset area	CHVEFW	Swift Parrot	Regent Honeyeater	Green and Golden Bell Frog
Wandewoi BA	Y	Y		
Mitchelhill BA	Y	Y	Y	
Hook BA	Y	Y		
Condon View BA			Y	
Crescent Head BA				Y

The Biodiversity Management Plan identifies the key conservation outcomes of the long-term management and protection of the offset areas. These outcomes are outlined in Table 5.2.

Table 5.2: Desired conservation outcomes for the HVO offset areas as outlined by the proposed HVO Management Plan (HVO 2021).

Conservation outcome	Wandewoi BA	Mitchelhill BA	Hook BA	Condon View BA
Protection of the BA under a legally binding conservation covenant	X	X	X	X
Protect and improve the ecological quality of CHVEFW at Wandewoi, Mitchelhill and Hook BAs	X	X	X	
Improve the CHVEFW derived grassland areas so they attain the key characteristics of CHVEFW	X	X	X	
Increased condition and extent of suitable habitats for the Regent Honeyeater and Swift Parrot within protected reserves at Wandewoi, Mitchelhill, Hook and Condon View BAs	X	X	X	X
Enhanced landscape connectivity with the surrounding landscape	X	X	X	X
Improved fauna movement and flora dispersal opportunities with the surrounding landscape	X	X	X	X
Enhanced network of protected vegetation within the Hunter Valley	X	X	X	X

The management plan lists the conservation values, key performance indicators, and completion criteria identified for the offset areas. Key performance indicators and completion criteria for foraging habitat and habitat connectivity and condition are being realised through this monitoring program and management response.

The landscape monitoring requires an interpretation of aerial photo images of the BAs over time and is not considered in this compliance report. This report provides a summary of investigations and activities undertaken to address both the ecological and management requirements of HVO's BAs.

Offset monitoring has been ongoing according to the schedule in Table 5.3 since the EPBC approval in 2016 and the subsequent consultation and acceptance of the draft Biodiversity Areas Management Plan with the then DoEE.

During the 2021 reporting year, favourable environmental conditions enabled monitoring events in addition to the schedule in Table 5.3 to be undertaken. The additional opportunistic monitoring is reported in this annual compliance report.

Table 5.3. Monitoring schedule proposed in Biodiversity Areas Management Plan and implemented in all BAs.

Monitoring method	2018	2019	2020	2021	2022	2023	2024-2028
Landscape							
Aerial photo interpretation	X						X
Ecological							
Condition Assessment	Spring	Spring		Spring		Spring	If required
Bird Assemblage	Winter	Winter		Winter		Winter	If required
GGBF – monitoring	Sept – March			Sept - March			Every 4th year
GGBF – habitat assessment	Spring	Spring		Spring		Spring	Biennial
Management							
Rapid Condition Assessment		Spring	Spring	Spring	Spring	Spring	If required
Property Inspection	Biannual						
Mosquito Fish	Biannual			Annual			If required

6 Management Activities - 2021

Various conservation, monitoring, management and maintenance activities were undertaken within the BAs throughout the reporting period between 1 January 2021 and 31 December 2021. An overview of the various activities that occurred is presented in Table 6.1.

Table 6.1. Overview of activities undertaken within the HVO EPBC 2016/7640 BAs during the reporting period.

Site	Activities undertaken during the reporting period
Condon View	Property inspections, condition assessment monitoring, bird assemblage monitoring, photo reference monitoring, weed control, vertebrate pest management and bushfire assessment.
Crescent Head	Slashing of boundary firebreaks and internal access tracks, track management, weed control, pig trapping, condition assessment monitoring, frog monitoring, mosquito fish monitoring, photo reference monitoring, property inspections and bushfire assessment. GGBF key habitat mapping occurred across a 43,000 ha study area that included the Crescent Head North biodiversity area.
Hook	Track repair, condition assessment monitoring, bird assemblage monitoring, photo reference monitoring, property inspections, African Olive mapping, control and mulching, other species weed management, vertebrate pest management, scrap metal removal, slashing of boundary firebreaks and internal access tracks and bushfire assessment.
Mitchelhill	Property inspections, weed management and treatment of of planted areas, condition assessment monitoring, bird assemblage monitoring, photo reference monitoring, vertebrate pest management, repair and slashing of boundary firebreaks and internal access tracks and bushfire assessment. Activities specific to the eastern BA: internal fence removal. Activities specific to the western BA: Scrap metal and machinery removal.
Wandewoi	Slashing of boundary firebreaks and internal access tracks, boundary fence repair, track management, property inspections, condition assessment monitoring, bird assemblage monitoring, photo reference monitoring, weed control, vertebrate pest management and bushfire assessment.

6.1 Residual Compensatory Measures

On the 25th November 2019, the Department of the Environment and Energy (now Department of Agriculture, Water and the Environment) approved HVO's estimates that the residual offset liability identified in the approved Offset Strategy was \$24,510. It was also agreed that the proposed projects would be appropriate activities on which to spend the required money.

In 2020, HVO entered an agreement with the Biodiversity & Conservation Division of the NSW Department of Planning, Infrastructure and Environment to contribute these funds towards a fine-scale wetland mapping project around the Crescent Head area, and a GGBF habitat mapping within the identified study area. The wetland mapping occurred in 2020 and was provided with the 2020 compliance report.

The habitat mapping occurred during 2021. The report for the GGBF habitat mapping project is attached in Appendix A.

The finalisation of this habitat mapping report concludes HVO's commitment for the residual offset liability.

6.2 Property Inspections and Activities

Property inspections were undertaken regularly across all the BAs during the reporting period and provided critical advice regarding works that needed to be prioritised. A summary of the condition of each BA based on the property inspection reports is as follows:

Condon View

As per previous years, Condon View has few serious management issues and does not appear to have issues with illegal access. Despite being logged at some point many years ago, the site is well vegetated, has minimal weeds that are primarily located around an old dam, and recruitment of various native species has been observed. During 2021, track clearing, slashing and weed control occurred across the BA.

Localised areas of erosion along the access tracks will require monitoring to ensure access is not impeded. These will be repaired should it be noted that they are becoming larger and not stabilising. The presence of wild dogs were noted, as were prints and sightings of various native species: long necked turtle, wombats and the typical kangaroos, wallabies and various native bird species.

During 2021, the draft Bushfire Management Plan was updated for the offset. The Bushfire Management Plan will be finalised during 2022 following review by the NSW Rural Fire Brigade.



Figure 6.1. Possum and wombat tracks within the Condon View BA.

Crescent Head

The Crescent Head BAs are well vegetated and the rainfall experienced during 2021 has enabled the dams to be at capacity (Figure 6.2). The tracks were slashed to facilitate safe access. Aside from trees falling on fences, no new damage to vegetation was recorded. A trespasser did gain access via cutting the locks on the gate and exiting via cutting through a fence. The trespasser stole a HogEye field camera, battery and solar panel that was associated with the remote pig trapping activities. This incident was reported to the police, however, due to the remote location, it is unlikely that the culprit will be caught. The fence was repaired and the missing chain and padlocks replaced.

As per previous years, no dog baiting occurred at the Crescent Head offsets due to discussions with the Ranger of the adjacent National Parks indicating that a pure population of dingos exist in the Park that assist to manage the pig population. Should evidence of the dingos potentially impacting the GGBF become available, a dog baiting programme will be implemented within the Crescent Head BAs.

Crescent Head North is in good condition but does have some minor weed issues at the exposed edges of vegetation in particular. As it is liable to flooding events, weed incursion and feral aquatic pests have been recorded within low lying areas and aquatic habitats. The weeds are being managed and during 2021, the main weeds targeted in the northern BA were Bitou bush (*Chrysanthemoides monilifera subsp rotundata*), Lantana (*Lantana camara*), Mickey mouse plant (*Ochna serrulata*) and Small leaf privet (*Ligstrum sinense*).

Management issues include ongoing weed management, track vegetation regrowth maintenance and fallen vegetation impacting fencelines. The Biosecurity Undertaking with the Kempsey Shire Council to ensure the removal of the Tropical Soda Apple is ongoing and is due to be completed on 1 April 2022.

The few existing internal fencelines will be retained to contain any potential stray cattle from adjacent properties. A small number of stacked roofing tiles can be found near Pond 1 at Crescent Head North. Being inert, these are being retained in situ as additional habitat for frogs such as the GGBF.

During the inspections, the constructed frog ponds and associated water tanks were reported to be in good condition, with the pond having tadpoles of unknown species (Figure 6.3) and no fish being observed. Various native fauna were sighted during the inspections and included red brow finches, babbler, willy wag tails, galahs, straw necked ibis, whip birds, lace monitors and red bellied black snakes.

Crescent Head South is also in good condition but requires grass biomass management in areas to reduce the risk of bushfire. The dominant management issues include maintaining integrity of the fenceline from fallen debris and slashing regrowth to maintain movement corridors for frogs.

The dominant weed targeted in the southern BA during 2021 was the Groundsel bush (*Baccharis halmifolia*).

Tadpoles of an unknown species were also observed within the artificial frog ponds at the Crescent Head South BA (Figure 6.4). While no GGBF have been sighted within this BA, native fauna sighted during the inspections included various frog species, wallabies, quails, New Holland Honeyeater, grass parrots, rosellas, brown snake, and a bandicoot.



Figure 6.2. Ponds at high capacity in the Crescent Head North BA (left) and the South BA (right).

Some minor pig activity has been observed within both BAs at Crescent Head during 2021 and a pig trapping programme was undertaken. No pigs were caught despite the free-feed period, potentially indicating that the pigs were transient and not resident within the BA.

The observations from both BAs indicate that the constructed frog ponds are performing as intended. Breeding habitat for frogs has been provided and, to date, the mosquito fish has been unable to colonise the elevated habitat. Should mosquito fish be observed in the ponds during future monitoring events, the ponds will be drained through a sieve, flushed with fresh water from the adjoining water tanks to remove any fish and fingerlings, with any tadpoles caught in the sieve being returned to the cleaned pond.

The ponds will continue to be managed in accordance with the Best Practice Guidelines Green and Golden Bell Frog Habitat (2008) Department of Environment and Climate Change NSW.



Figure 6.3. Tadpoles observed in the constructed frog pond at the Crescent Head North BA during two separate inspections.



Figure 6.4. Tadpoles observed in the constructed frog pond at the Crescent Head South BA.

Hook

The primary management issues within the Hook property is the removal of African Olive (*Olea europaea subspecies cuspidate*) and, to a lesser degree, Lantana, to enable the recruitment of native species consistent with the Central Hunter Valley Eucalypt Forest and Woodland ecological community. With the exception of the African olive and Lantana, exotic weeds are primarily concentrated within the grassland areas. A diverse suite of native species is recruiting across all areas of the site but active management of the exotic grasslands are required and planned for 2022.

During the reporting period, no damage to vegetation or illegal trespass was recorded. Tracks were slashed and extensive weed control and vertebrate pest management occurred.

In February 2021, the Hook property was surveyed to record the locations of all African olive individuals in accordance with the Hook BA Intensive Weed Management Plan. Weed management services undertaken twice in July and again in September primarily targeted the less dense infestations using the cut and paint method.

Where the olive vegetation is more dense, the cut and paint method is ineffective due to difficulty accessing the stems, and the cut olives not being able to fall away due to the proximity of adjacent vegetation. As such, a 24 tonne excavator with a mulching head attachment was used across 3 days in September with the stumps being sprayed immediately following the mulching. This proved to be extremely effective and African olive was able to be removed from larger areas in a shorter amount of time. The mulched biomass enabled light to reach the ground in these areas, which, with the increased rainfall experienced, has proven beneficial for native species regrowth.

In the HVO EPBC variation proposal that was submitted to the Delegate, HVO has made a commitment to reduce the extent of African olives on the Hook BA by 30% annually. The effectiveness of the mulching programme to enable HVO to meet the 30% reduction in African olive commitment was encouraging. During 2021, HVO was able to achieve this commitment and a follow up survey of the Hook BA recording the locations of African olive individuals and groups is planned for February 2022. More information on the African olive removal activities can be found in Section 6.4.

Until a decision has been made by the Delegate regarding the proposed EPBC variation, the Hook property will continue to be managed and monitored according to the HVO Biodiversity Areas Management Plan, which includes the activities committed to under the Hook BA Intensive Weed Management Plan.



Figure 6.5. Prior to mulching African Olive, September 2021.



Figure 6.6. Post-mulching African Olive, September 2021.





Figure 6.7. Areas of dense African olive infestations mulched with the use of an excavator and the stump sprayed. Note dead eucalypt stags have been left *in situ* as habitat.

Mitchelhill

The Mitchelhill West BA is in good condition. During the reporting period, no damage to vegetation or illegal trespass were recorded. The tracks are in fair condition. Natural recruitment is occurring across the BA and the planted tubestock in the riplines have established well. As expected, weeds are present within the planted riplines with fleabane (*Erigeron bonariensis*), fireweed (*Senecio madagascariensis*) and purple top (*Verbena bonariensis*) being the dominant weeds. These will be managed across 2022. Prickly pear, creeping pear, tiger pear (*Opuntia spp*) and the St John's Wort (*Hypericum perforatum*) were the major weeds targeted during the reporting period.

The Mitchelhill East BA is primarily steep country which is why it is predominately vegetated with few cleared areas. The weeds present on the BA are typical of those within agricultural environments and, while these can be found in scattered dense infestations, the majority are located within the lines ripped to facilitate the planted tubestock. Natural regeneration is occurring within the BA extending into the cleared grassland areas. Management of this regrowth and weed competition within the ripped lines will continue throughout 2022.

Assessments undertaken during the property inspections determined that the groundcover exceeded 70% and the sward height exceeded 10cm across the majority of the offset, and is thus compliant with the management plan.

Scrap metal was collected from Mitchelhill West BA and removed along with 250m of redundant internal fencing that was taken from the Mitchelhill East BA during the reporting period.

The identified Aboriginal cultural heritage PAD area fencing is intact and remains in good condition. An assessment of survival within the planted tubestock is being undertaken in February 2022 and will be reported in the next compliance report.

Wandewoi

During 2021, Wandewoi was subject to several trespassing events by illegal pig hunters following the Hunter River. Extensive effort by HVO is being undertaken to minimise access by trespassers, including increasing security patrols and discussions with the Police. The cut fences and locks have been repaired and access is again restricted.

With the increased rainfall experienced across the region, weed growth is the major issue at the Wandewoi BA. The majority of the weed proliferation was in the cleared, previous agricultural areas, although weed growth did occur within the gullies and protected areas. The weed growth experienced during 2021 was to a lesser degree than had occurred in 2020. Slashing of the tracks and open areas assisted in managing weed establishment where possible with careful planning to avoid areas of native regrowth.

Cultural heritage barriers are being maintained and vertebrate pests (pigs and wild dogs) are routinely managed during trapping and baiting programmes along the Hunter River in the western portion of the BA. Widespread recruitment of native species has been observed within the woodland along the ridgeline.

6.3 Vertebrate Pest Management

Vertebrate pest management has been undertaken within all of HVOs EPBC biodiversity areas in conjunction with the Local Land Services (LLS), NSW National Parks and Wildlife Services (NPWS) and surrounding landholders. During 2021, HVO participated in a 1080 baiting programme that targeted dogs and foxes, and pig trapping and baiting across the HVO lands and biodiversity offset areas.

The wild dog baiting programme occurred across the Mitchelhill (East and West), Hook, Wandewoi and Condon View BAs. While no dog baiting programmes occurred at the Crescent Head BA, a pig trapping programme was undertaken during 2021 based on evidence of a small number of pigs traversing the property. The property inspection reports at Crescent Head have not indicated a need to undertake wild dog and fox control to manage predation on the GGBF. Discussions around regional dog baiting programmes have occurred with the Kempsey NPWS due to the Crescent Head BAs adjoining the Limeburners Creek and Hat Head National Parks. To date, NPWS officers have indicated a reluctance to bait for dingos due to a 'pure' population of dingos occurring within Limeburners Creek National Park (pers comm.).

1080 Baiting Programme

Wild dog baiting programmes within the BAs occurred during May and October 2021. Ten-eighty (1080) bait stations are selected based on previous baiting station locations, motion camera results from previous programs and sightings of wild dogs and foxes, biodiversity concerns and the location of tracks and trails within the offsets. Stations were either established as Ejector Bait Sites or baited with fresh meat containing sodium fluoroacetate (1080) at a concentration that targeted wild dogs and foxes.

The ground baiting method used aligns with the *Humane pest animal control: Code of Practice* and Standard Operating Procedures produced by NSW Department of Primary Industry (DPI) and amended in September 2019.

The location of the baits within each BA for the spring 2021 programme are shown in figures 6.8 to 6.12.

The spring 2021 vertebrate pest management programme represented the eighth baiting programme undertaken at the Mitchelhill, Hook and Wandewoi BAs, and the tenth undertaken at the Condon View BA. Some of the fauna recorded on the motion sensor cameras during the baiting programmes are shown in Section 9.

A summary of the baiting programmes undertaken at the BAs is outlined in Table 6.2. The final column entitled 'Baiting efficiency excluding 'other'' removes the non-target species from the calculation and gives a more accurate representation of the efficiency for the target species.

The results at all sites indicate a clear dominance of dogs taking the baits as oppose to foxes or other non-target species. Based on tracks and photographic evidence, the main non-target species consuming the baits appear to be the lace monitor (*Varanus varius*) and occasionally wild pigs.

This outcome is welcomed as although research shows that Australian native fauna are naturally resistant to 1080, and concentrations in the meat bait need to be substantially higher to adversely affect the animals, any native species take is an undesirable outcome for baiting results

A comparison of the baiting results across all sites between 2018 and 2021 indicates that the baiting programme does not ensure a linear decline in vertebrate pests the following year despite efforts and expenditure. This emphasises the importance of a centralised coordination (LLS in this case) to ensure adjacent landholders participate in the scheme to minimise other properties becoming a source from where recolonisation can occur. The vertebrate pest management programme will continue during 2022.

Table 6.2. Comparison of Results of all 1080 Vertebrate Pest Management Programmes for HVO Biodiversity Areas.

Baiting Program	No. of Baiting Sites	Baiting opportunities	Baits taken by Dogs	Dog (%)	Baits taken by Foxes	Fox (%)	Baits taken by other (non-target) species	Other (%)	Total No. of Baits Taken	No. Sites where baits taken at least once	Represented as Percentage (%)	No. sites with baits taken on all occasions	No. sites with no baits taken	No. baits Disturbed Not Taken	No. baits taken alternatively by Dog or Fox	Baiting Efficiency %	Baiting efficiency (excl 'other')
Jun 18 LBEL	11	22	7	88%	1	13%	0	0%	8	8	73%	0	3	1	0	36%	36%
Sep 18 LBEL	11	22	7	100%	0	0%	0	0%	7	5	45%	2	6	3	0	32%	32%
May 19 LBEL	11	21	2	67%	1	33%	0	0%	3	3	27%	0	8	0	0	14%	14%
Oct 19 LBEL	11	22	13	65%	5	25%	2	0%	20	9	82%	7	2	0	5	91%	82%
May 20 LBEL	11	22	9	100%	0	0%	0	0%	9	8	73%	1	3	1	0	41%	41%
Oct 20 LBEL	11	22	8	47%	6	35%	3	18%	17	10	91%	8	1	2	2	77%	64%
May 21 LBEL	11	22	9	90%	1	10%	0	0%	10	6	55%	3	5	1	0	45%	45%
May 21 LBEL	13	26	11	79%	3	21%	0	0%	14	10	77%	4	3	0	2	54%	54%
Jun 18 MITE	6	12	2	50%	2	50%	0	0%	4	4	67%	0	2	0	0	33%	33%
Sep 18 MITE	6	11	1	50%	1	50%	0	0%	2	1	17%	1	5	1	1	18%	18%

Baiting Program	No. of Baiting Sites	Baiting opportunities	Baits taken by Dogs	Dog (%)	Baits taken by Foxes	Fox (%)	Baits taken by other (non-target) species	Other (%)	Total No. of Baits Taken	No. Sites where baits taken at least once	Represented as Percentage (%)	No. sites with baits taken on all occasions	No. sites with no baits taken	No. baits Disturbed Not Taken	No. baits taken alternatively by Dog or Fox	Baiting Efficiency %	Baiting efficiency (excl 'other')
May 19 MITE	6	12	2	100%	0	0%	0	0%	2	2	33%	0	4	0	0	17%	17%
Oct 19 MITE	6	12	0	0%	2	100%	0	0%	2	2	33%	0	4	5	0	17%	17%
May 20 MITE	6	12	2	100%	0	0%	0	0%	2	2	33%	0	4	2	0	17%	17%
May 20 MITE	6	12	0	0%	1	100%	0	0%	1	1	17%	0	5	0	0	8%	8%
May 21 MITE	7	14	5	100%	0	0%	0	0%	5	4	57%	1	3	2	0	36%	36%
Oct 21 MITE	5	10	5	63%	1	13%	2	25%	8	5	100%	3	0	0	0	80%	60%
Jun 18 MITW	11	22	7	78%	2	22%	0	0%	9	6	55%	3	5	0	0	41%	41%
Sep 18 MITW	11	22	9	64%	1	7%	4	29%	14	9	82%	5	2	0	1	64%	45%
May 19 MITW	11	22	8	67%	4	33%	0	0%	12	9	82%	3	2	3	1	55%	55%
Oct 19 MITW	11	22	15	75%	4	20%	1	5%	20	11	100%	9	0	1	2	91%	86%

Baiting Program	No. of Baiting Sites	Baiting opportunities	Baits taken by Dogs	Dog (%)	Baits taken by Foxes	Fox (%)	Baits taken by other (non-target) species	Other (%)	Total No. of Baits Taken	No. Sites where baits taken at least once	Represented as Percentage (%)	No. sites with baits taken on all occasions	No. sites with no baits taken	No. baits Disturbed Not Taken	No. baits taken alternatively by Dog or Fox	Baiting Efficiency %	Baiting efficiency (excl 'other')
May 20 MIT W	10	20	7	70%	3	30%	0	0%	10	8	80%	2	2	2	2	50%	50%
Oct 20 MIT W	11	22	11	55%	7	35%	2	10%	20	10	91%	10	1	0	5	91%	82%
May 21 MIT W	15	27	17	100%	0	0%	0	0%	17	13	87%	4	2	6	0	63%	63%
Oct 21 MIT W	11	22	10	50%	4	20%	6	30%	20	11	100%	9	0	0	3	91%	64%
Jun 18 WAN	6	12	7	88%	1	12%	0	0%	8	6	67%	1	2	2	1	67%	67%
Sep 18 WAN	6	12	9	100%	0	0%	0	0%	9	6	100%	3	0	0	0	75%	75%
May 19 WAN	6	12	5	83%	1	17%	0	0%	6	4	67%	2	2	0	1	50%	50%
Oct 19 WAN	6	12	7	88%	0	0%	1	13%	8	5	83%	3	1	2	0	67%	67%
May 20 WAN	6	12	5	71%	2	29%	0	0%	7	4	67%	3	2	1	0	58%	58%
Oct 20 WAN	6	12	6	86%	1	14%	0	0%	7	5	83%	5	1	0	1	58%	58%

Baiting Program	No. of Baiting Sites	Baiting opportunities	Baits taken by Dogs	Dog (%)	Baits taken by Foxes	Fox (%)	Baits taken by other (non-target) species	Other (%)	Total No. of Baits Taken	No. Sites where baits taken at least once	Represented as Percentage (%)	No. sites with baits taken on all occasions	No. sites with no baits taken	No. baits Disturbed Not Taken	No. baits taken alternatively by Dog or Fox	Baiting Efficiency %	Baiting efficiency (excl 'other')
May 21 WAN	6	12	8	73%	2	18%	1	9%	11	6	100%	4	0	0	0	92%	83%
Oct 21 WAN	6	12	3	33%	2	22%	4	44%	9	6	100%	3	0	0	1	75%	42%
May 2017 CON	11	22	11	100%	0	0%	0	0%	11	8	73%	3	3	1	0	50%	50%
Sep 2017 CON	11	22	10	56%	1	5%	7	39%	18	11	100%	7	0	0	0	81%	50%
Jun 2018 CON	11	22	8	89%	1	11%	0	0%	9	8	73%	1	3	0	0	41%	41%
Sep 18 CON	11	21	9	56%	1	6%	6	38%	16	8	73%	8	3	0	1	76%	48%
May 19 CON	11	21	5	71%	2	29%	0	0%	7	4	36%	3	7	1	2	33%	33%

Baiting Program	No. of Baiting Sites	Baiting opportunities	Baits taken by Dogs	Dog (%)	Baits taken by Foxes	Fox (%)	Baits taken by other (non-target) species	Other (%)	Total No. of Baits Taken	No. Sites where baits taken at least once	Represented as Percentage (%)	No. sites with baits taken on all occasions	No. sites with no baits taken	No. baits Disturbed Not Taken	No. baits taken alternatively by Dog or Fox	Baiting Efficiency %	Baiting efficiency (excl 'other')
Oct 19 CON	12	24	13	65%	5	25%	2	10%	20	10	83%	10	2	1	4	83%	75%
May 20 CON	15	27	9	56%	7	44%	0	0%	16	11	73%	6	4	0	5	59%	59%
Oct 20 CON	15	30	12	50%	2	8%	10	42%	24	14	93%	10	1	0	1	80%	47%
May 21 CON	17	34	13	100%	0	0%	0	0%	13	10	59%	3	7	1	0	38%	38%
Oct 21 CON	18	30	13	45%	9	31%	7	24%	29	18	100%	9	0	1	4	97%	73%

Note:

MITE = Mitchelhill East BA WAN = Wandewoi BA LBEL = Lower Belford (Hook)
 MITW = Mitchelhill West BA CON = Condon View BA

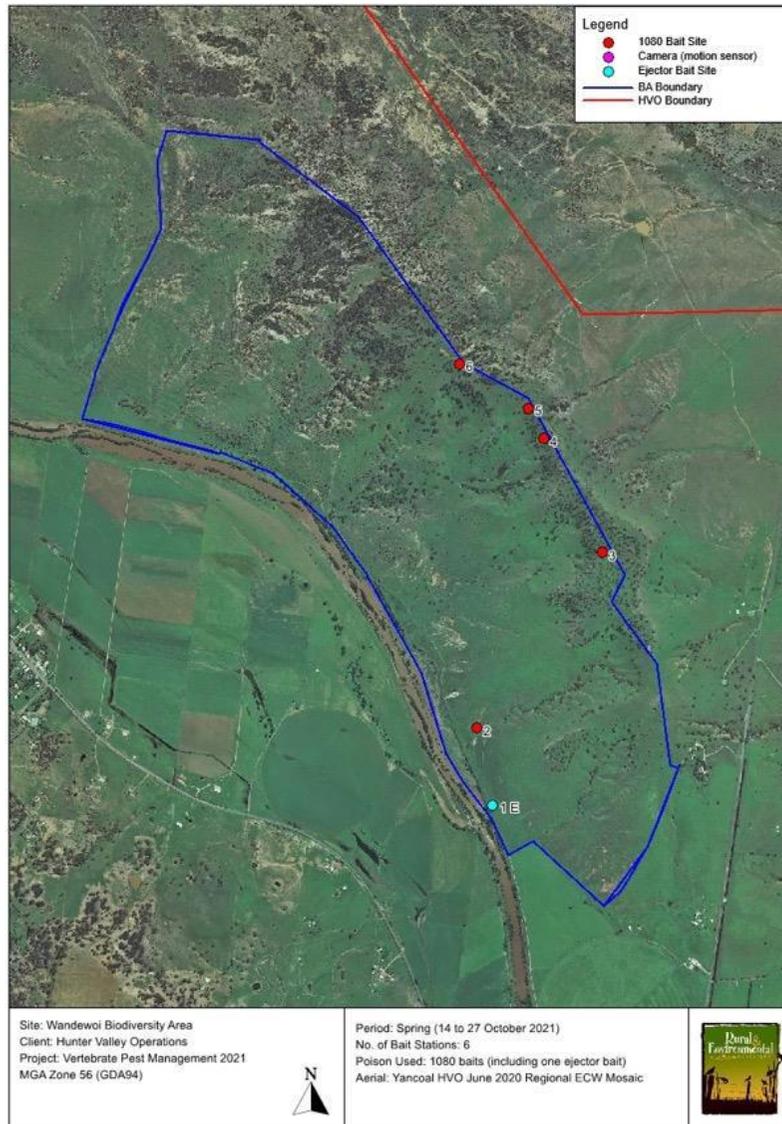


Figure 6.8. Wandewoi BA vertebrate pest management results for the Autumn 2021 Program.

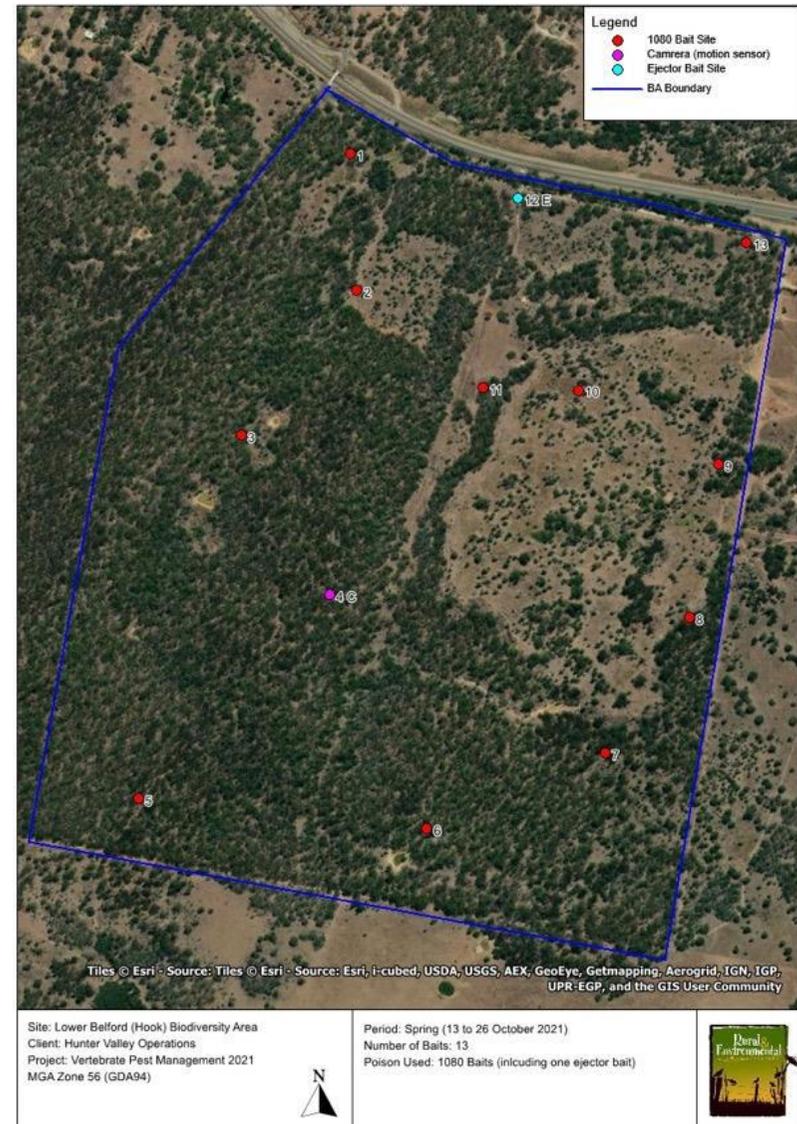


Figure 6.9. Hook property vertebrate pest management results for the Spring 2021 Program.



Figure 6.10. Mitchelhill East BA vertebrate pest management results for the Spring 2021 Program.

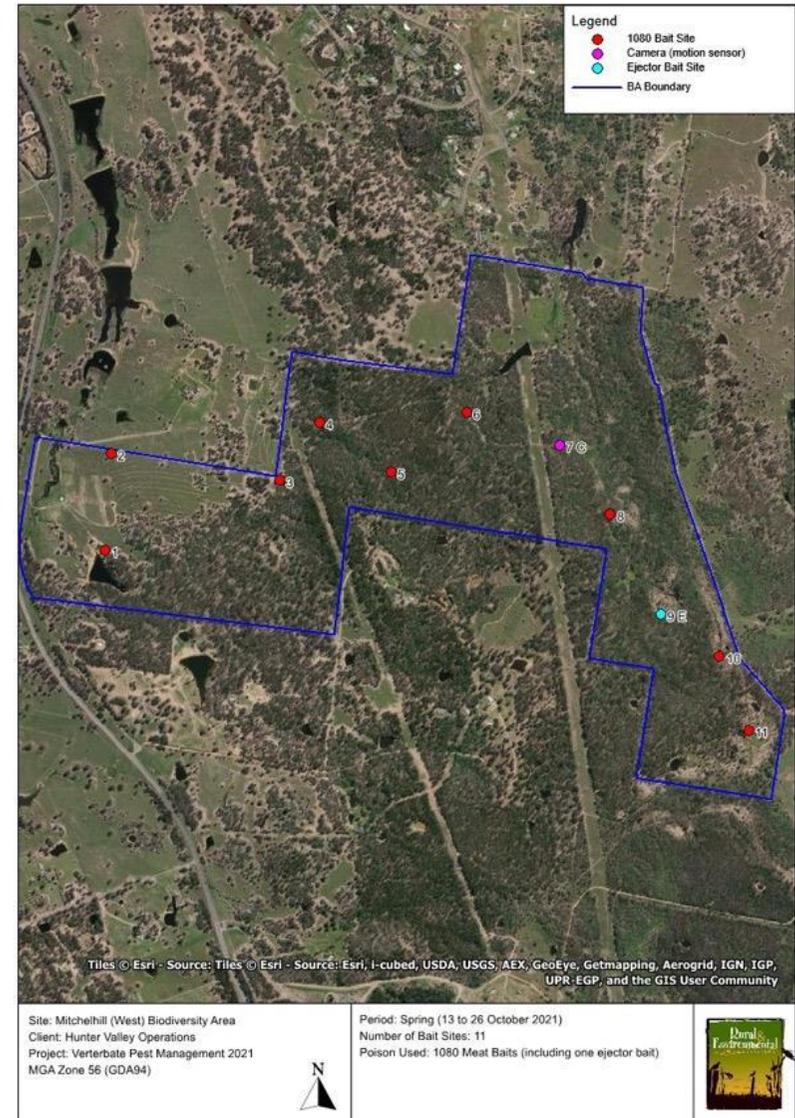


Figure 6.11. Mitchelhill West BA vertebrate pest management results for the Spring 2021 Program.

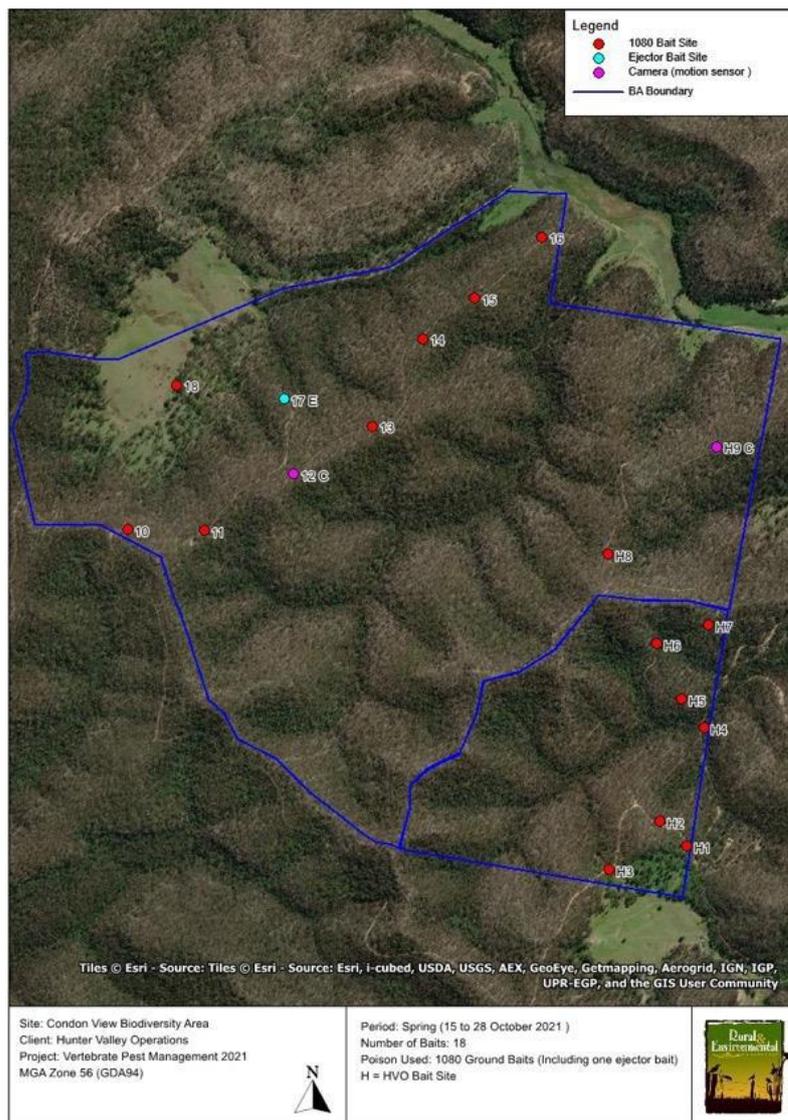


Figure 6.12. Condon View BA vertebrate pest management results for the Spring 2021 Program.

Note: this figure also includes the adjoining State offset for Yancoal's Mount Thorley Warkworth mine. The area applicable to EPBC 2016/7640 include the nine bait stations along the eastern boundary.

2021 Pig Trapping Programme

HVO undertook pig baiting and trapping programmes at HVO and the Crescent Head BA in July then again across October and November. The programmes were in response to monitoring results and observations that reported pigs traversing the Hunter River and accessing water bodies at the Crescent Head BA.

Baits or traps were established at various locations along the Hunter River, including sites within the Wandewoi BA, and three locations at the Crescent Head BAs. The locations of the control sites can be seen in figures 6.13 to 6.16. Free feed stations were initially provided to encourage visitation by the pigs. For the sites that were baited, the free feed stations were swapped for the bait stations once visitation was determined. Sodium nitrate baits were used as studies have found that the sodium nitrate is immediately effective against the pigs but has little impact on non-target species.

Each trap was baited and monitored with either a live stream HogEye Camera trap system or standard motion sensor camera system. This system allows for remote activation of the trap and aligns with the Code of Practise and Standard Operation Procedures.

Each station was checked daily using the live web based system and visited if required to restock food or access the trap.

The locations, time periods and pigs caught can be seen in Tables 6.3 and 6.4 below.

No pig carcasses were recorded in the Wandewoi or Crescent Head BAs during the 2021 programme which may indicate that the pigs are transient rather than resident within the areas.

Pig trapping occurs twice a year at HVO which will include the Wandewoi BA again in 2022. A repeat trapping programme will also occur at the Crescent Head BAs should monitoring results indicate that the pigs still traverse the area.

Table 6.3. HVO 2021 Pig Control Summary and Results.

Trap Reference	Time period	Pigs Controlled
Autumn:		
Archerfield Trap Site	3 months and 3 weeks	55
Hoggone Site 1	2.5 weeks	0
Hoggone Site 2	2.5 weeks	0
Hoggone Site 3	2.5 weeks	0
Hoggone Site 4	2.5 weeks	0
Hoggone Site 5	2.5 weeks	0
Hoggone Site 6	2.5 weeks	0
Spring:		
Observation Site 1	5 weeks	12
Observation Site 2	4 weeks	0
Observation Site 3	4 weeks	0
Observation Site 4	4 weeks	0
Observation Site 5	4 weeks	0
Observation Site 6	4 weeks	0
Observation Site 7	4 weeks	0
Observation Site 8	4 weeks	0
Observation Site 9	4 weeks	0
Observation Site 10	4 weeks	0
Observation Site 11	4 weeks	0
Observation Site 12	4 weeks	0
Observation Site 13	4 weeks	8
Observation Site 14	4 weeks	0
Observation Site 15	4 weeks	0
Observation Site 16	4 weeks	0
Observation Site 17	5 weeks	8
Observation Site 18	4 weeks	0

Note: Hoggone Site 2 and Observation Site 10 are located within the Wandewoi BA. If pigs visited during the 4 weeks, baits were laid in the fifth week.

Table 6.4. Crescent Head 2021 Pig Trapping Summary and Results.

Trap Reference	Time period (days)	Pigs Controlled
Pest Trap 1	31	0
Pest Trap 2	37	0
Pest Trap 3	37	0



Figure 6.13. Pig trap locations along the Hunter River at HVO during the winter 2021 programme.

Note: Hoggone Site 2 is located within the Wandewoi BA.



Figure 6.14. Pig trap locations along the Hunter River and Wollemi Brook at HVO during the Spring 2021 programme.

Note: Observation Site 10 is located within the Wandewoi BA.

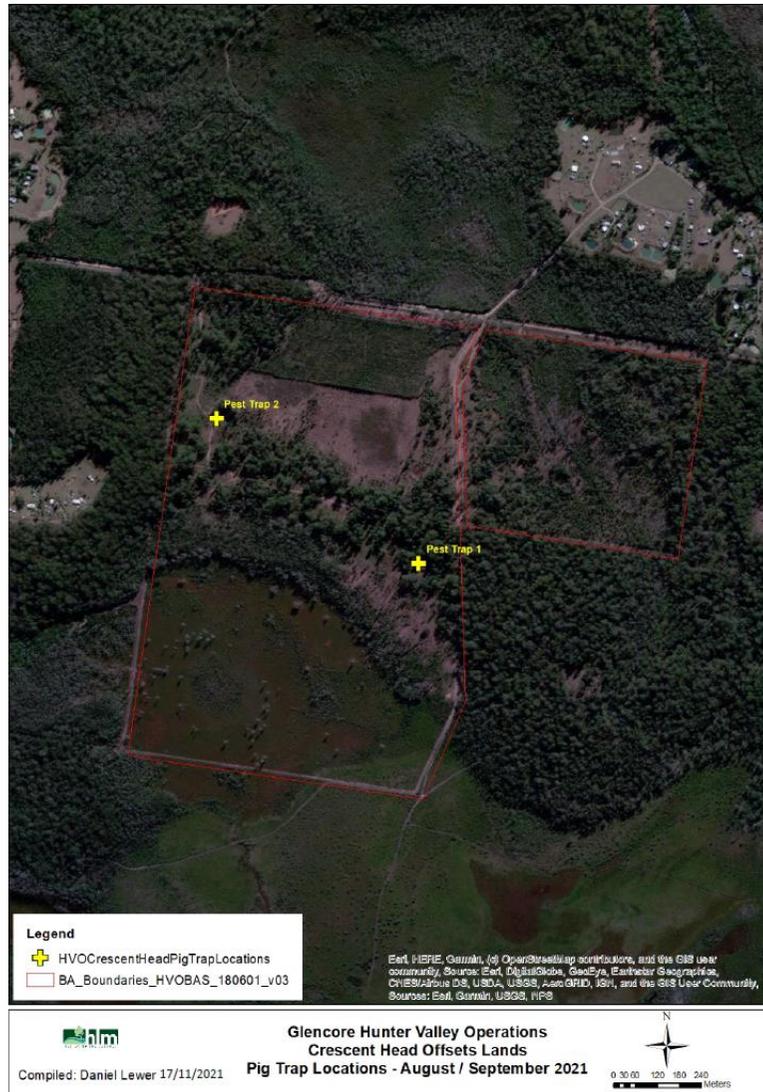


Figure 6.15. Pig trap locations 1 and 2 at Crescent Head South BA during the spring 2021 programme.

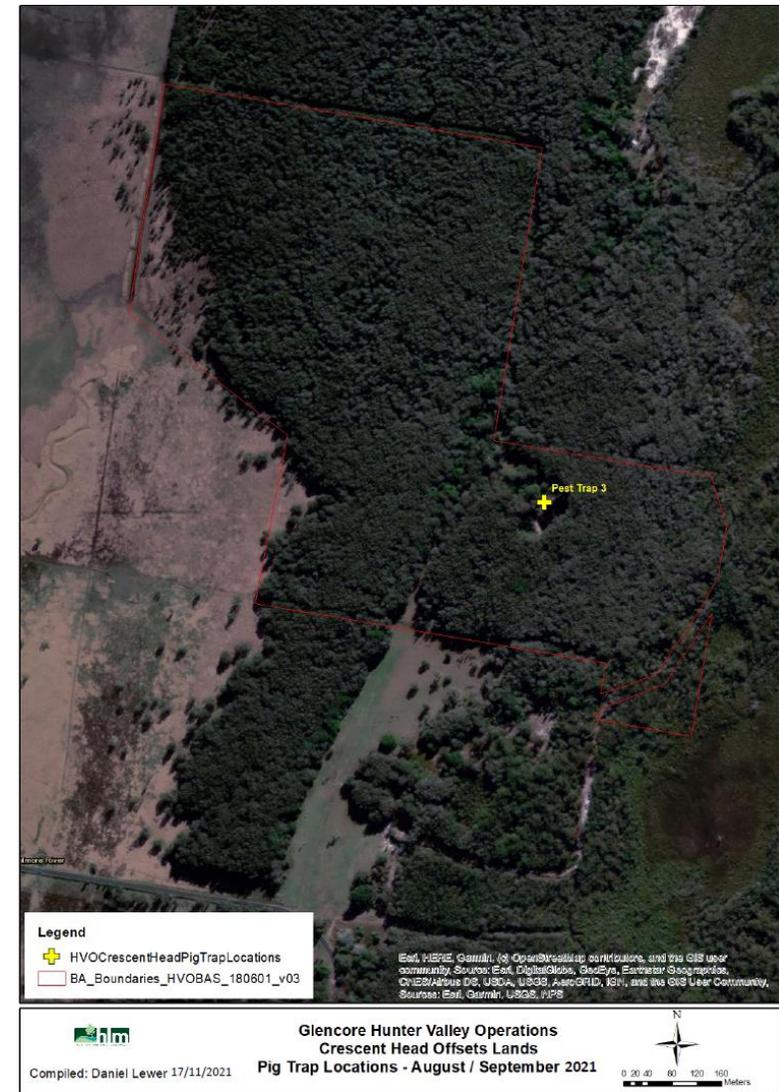


Figure 6.16. Pig trap location 3 at the waterhole within the Crescent Head North BA during the spring 2021 programme.

6.4 Hook BA Intensive Weed Management Plan

The Intensive Weed Management Plan for the Hook BA was implemented to reduce the extent of the African olive (*Olea europaea subsp. cuspidata*) population within the Hook BA and, to a lesser extent, Lantana (*Lantana camara*) and prickly pear (*Opuntia species*). The Hook BA Intensive Weed Management Plan was submitted to DAWE for approval with the EPBC variation as part of the HVO Biodiversity Areas Management Plan.

Under the *Biosecurity Act 2015*, all landowners have a responsibility to control noxious weeds on their property, known as a General Biosecurity Duty. Landowners or land managers have a “General Biosecurity Duty” to prevent, eliminate or minimise the biosecurity risk posed or likely to be posed by priority weeds. African olive is listed as a priority weed for the Hunter region.

In the Plan, HVO has committed to reducing the extent of African olive within the Hook BA by 30% per year. This exceeds the 20% reduction recommended by the Upper Hunter Weeds Authority General Biosecurity Control Duty Guidelines.

The Plan states that in February each year, the Hook BA will be surveyed to determine the extent and location of African olive individuals.

The second African olive survey was undertaken on the BA during 2021; the first being in February 2020. Results from this year’s survey will be included for comparison with the previous survey, however it is important to note that only the western portion of the offset was surveyed in 2021 as the majority of weed treatment was carried out in this area during the past year. The entire offset will be re-surveyed during the next reporting period and future surveys will depend on where weed treatment occurred during the year.

Data was collected and mapped according to the following:

- Large plants (individual)
- Medium plants (individual)
- Small plants (individual)
- Seedling (individual)
- Medium to large patch
- Seedling to small patch
- Previously treated areas

Plant size was determined according to the following heights:

- Seedling: up to 12cm
- Small: 12cm to 100cm (1m)
- Medium: Approximately 1m to 3m in height
- Large: Greater than 3m in height

During the survey, individual Lantana and prickly pear plants on the western portion of the offset are recorded as these weed species are also considered priority for control at Lower Belford BA. There was no discerning between plant sizes for either Lantana or prickly pear,

The results from the eastern portion of the 2020 survey have been added to the current survey of the western portion to calculate an estimated total for the current year. These results were then overlaid with the current 2021 results from the western portion to create a complete survey of the BA. The results are outlined in Table 6.5 and Figures 6.17 and 6.18.

Olive removal activities have targeted the more dense areas and areas containing the large mature seeding individuals to reduce the volume of seed being produced within the property. The additional time prior to a targeted effort on the smaller individuals will allow the identified seedlings to grow taller to enable them to be readily identified and removed prior to reaching maturity. The areas targeted during 2021 can be seen in Figure 6.18.

Using the combined data the number of individual large trees on the western portion has decreased by 138 between 2020 and 2021 and the number of medium trees has decreased by 205. Small individual African olives decreased by 141 and seedlings have increased by 22. Overall, the population of individuals decreased by 11.1%.

When comparing larger, denser continuous infestations of African olives between 2020 and 2021 there was a 2.39 ha reduction in medium to large patches and a 0.59 ha reduction in seedlings to small patches. There was a decrease in previously treated areas of 3.52 ha. Overall, the area covered by the dense stands decreased by 21.21%, which, when combined with the decrease in individuals, resulted in a 32.31% reduction in African olive cover within the Hook BA. Thus HVO was able to meet the stated commitment of 30% as outlined in the draft Biodiversity Areas Management Plan.

The decrease can be attributed to the weed control work carried out during 2020 and 2021 which involved cutting and painting of large and medium trees targeting the north and western quadrant of the BA where bushland outside the BA boundaries occur. Smaller trees and seedlings in those areas were sprayed with glyphosate. As outlined in Section 6.2, a 24 tonne excavator with a mulching head attachment was used to remove the denser patches of large African olive individuals. This was shown to be very effective and cost efficient.

It is evident there has been only minimal regrowth from the trees that were cut and painted and almost negligible seedlings sprouting due to abundant native regeneration and pasture growth from substantial rainfall and favorable weather conditions during the majority of 2020 and early 2021.

Table 6.5. Summary of results from the 2021 African olive survey against the results from the 2020 survey.

Categories	2020		2021	
	East	Total (East + West)	West	Total (2021 East + 2020 West)
		No Individuals		No Individuals
Large (over 3m)	291	578	149	440
Medium (1-3m)	485	967	277	762
Small (12cm-1m)	1432	2209	636	2068
Seedling (≤12cm)	321	416	117	438
Total	2529	4170	1179	3708
Patch description		Patch size (ha)		Patch size (ha)
Medium-large	2.36	20.44	15.69	18.05
Small- seedling	0.18	0.88	0.11	0.29
Previously treated	2.66	9.32	3.14	5.80
Total	5.20	30.64	18.94	24.14

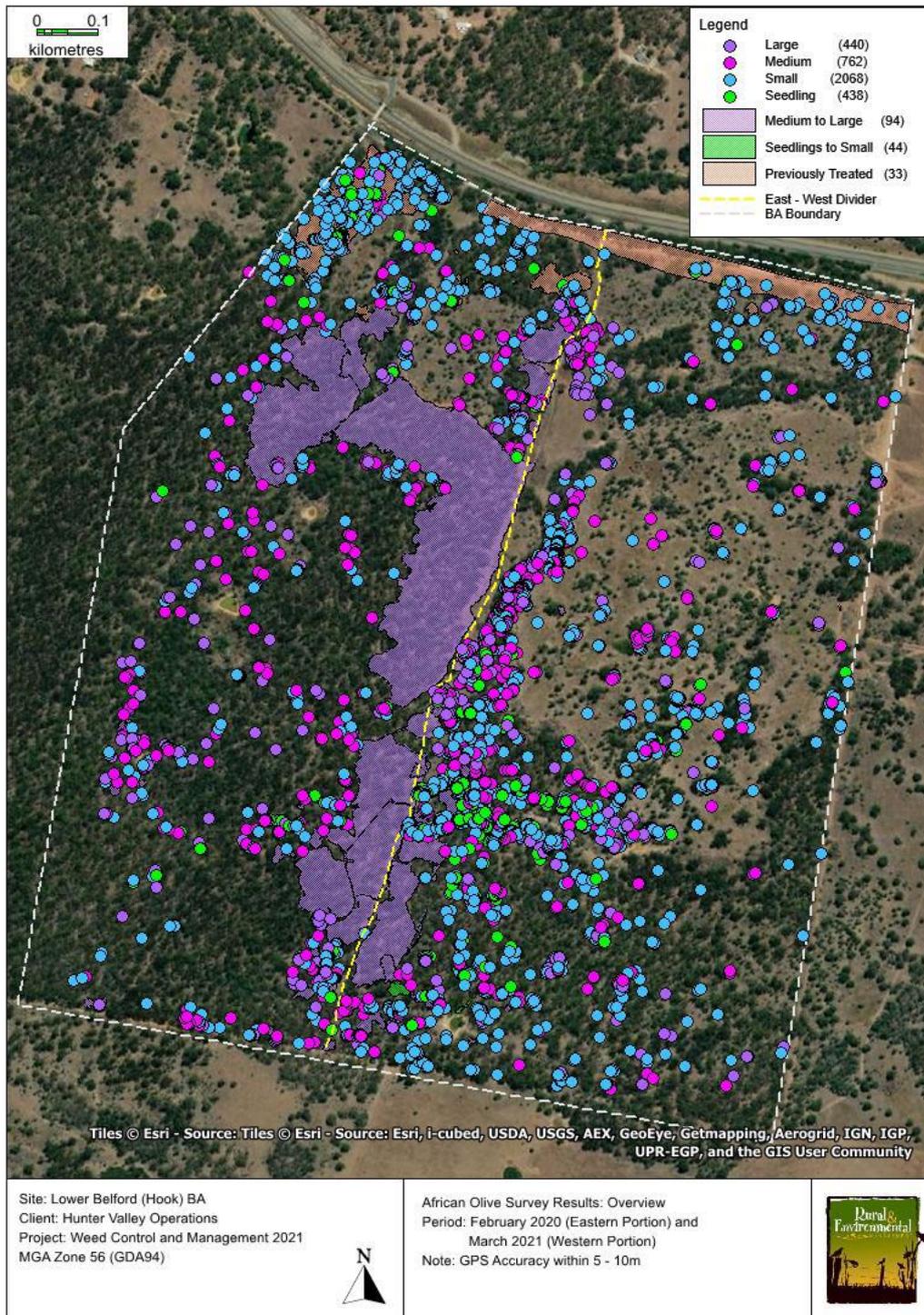


Figure 6.17. African olive survey results using 2020 data (eastern portion) and 2021 data (western portion) at the Hook BA.



Figure 6.18. Weed control overview within the Hook BA from July to Dec 2021.

7 Ecological Monitoring

Ecological monitoring has been undertaken at each of the BAs as per the monitoring schedule outlined in Table 5.3. The objectives of monitoring is to confirm that the approved management plan is being effectively implemented and conservation objectives are being achieved.

The management plan lists the conservation values, key performance indicators, and completion criteria identified for the offset areas. Key performance indicators and completion criteria for foraging habitat and habitat connectivity and condition are being realised through the monitoring program and management response.

7.1 Ecological Monitoring

The following table provides a summary of the ecological monitoring activities undertaken across the various BAs as outlined in the management plan.

The locations of each of the monitoring points and detailed description of each monitoring methodology can be seen in Chapter 6 of the HVO Biodiversity Areas Management Plan (2021) and in figures 7.1 to 7.7 below.

Table 7.1. Ecological monitoring activities completed during the reporting year.

Monitoring event	Site	Months
Condition assessment	Condon View	Completed – Section 7.1.2
	Hook, Mitchelhill, Wandewoi	Completed – Section 7.1.2
	Crescent Head	Completed – Section 7.1.2
Bird assemblage	Condon View, Hook, Mitchelhill, Wandewoi	Completed – Section 7.1.3
GGBF monitoring	Crescent Head	Completed – Section 7.1.4
Mosquito Fish monitoring	Crescent Head	Completed – Section 7.1.5
Rapid condition assessment	Condon View Crescent Head Hook Mitchelhill Wandewoi	Completed – Section 7.1.1 and Appendix B
Property inspections	Wandewoi	March, April, June, Aug, Sept, Nov, Dec.
	Mitchelhill	March, April, June, Aug, Sept, Nov, Dec.
	Hook	March, April, June, Aug, Sept, Nov, Dec.
	Condon View	March, April, June, Aug, Nov, Dec.
	Crescent Head	April, June, Aug, Nov.

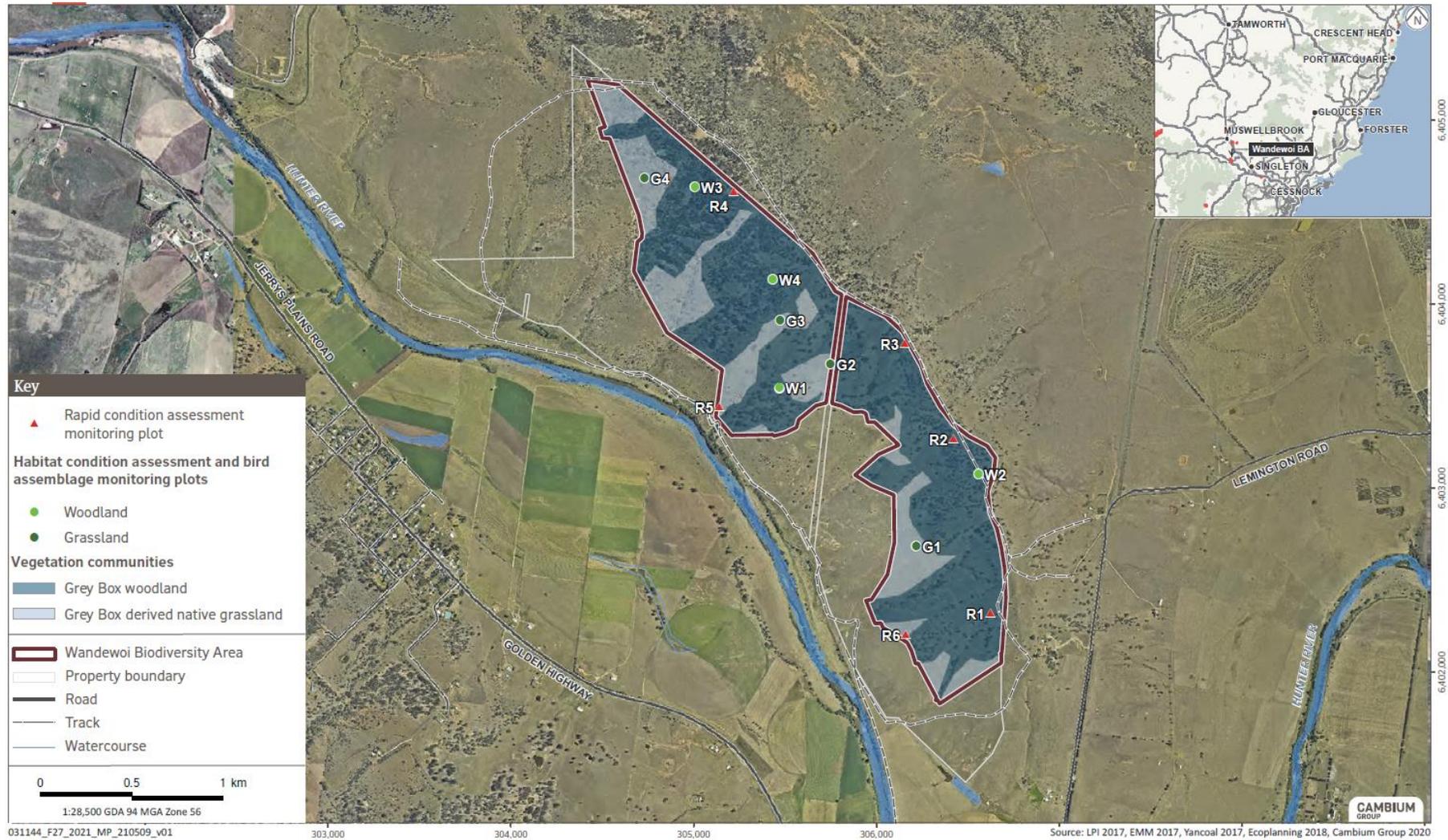


Figure 7.1. Rapid condition assessment, habitat condition assessment and bird assemblage monitoring locations at the Wandewoi Biodiversity Area.

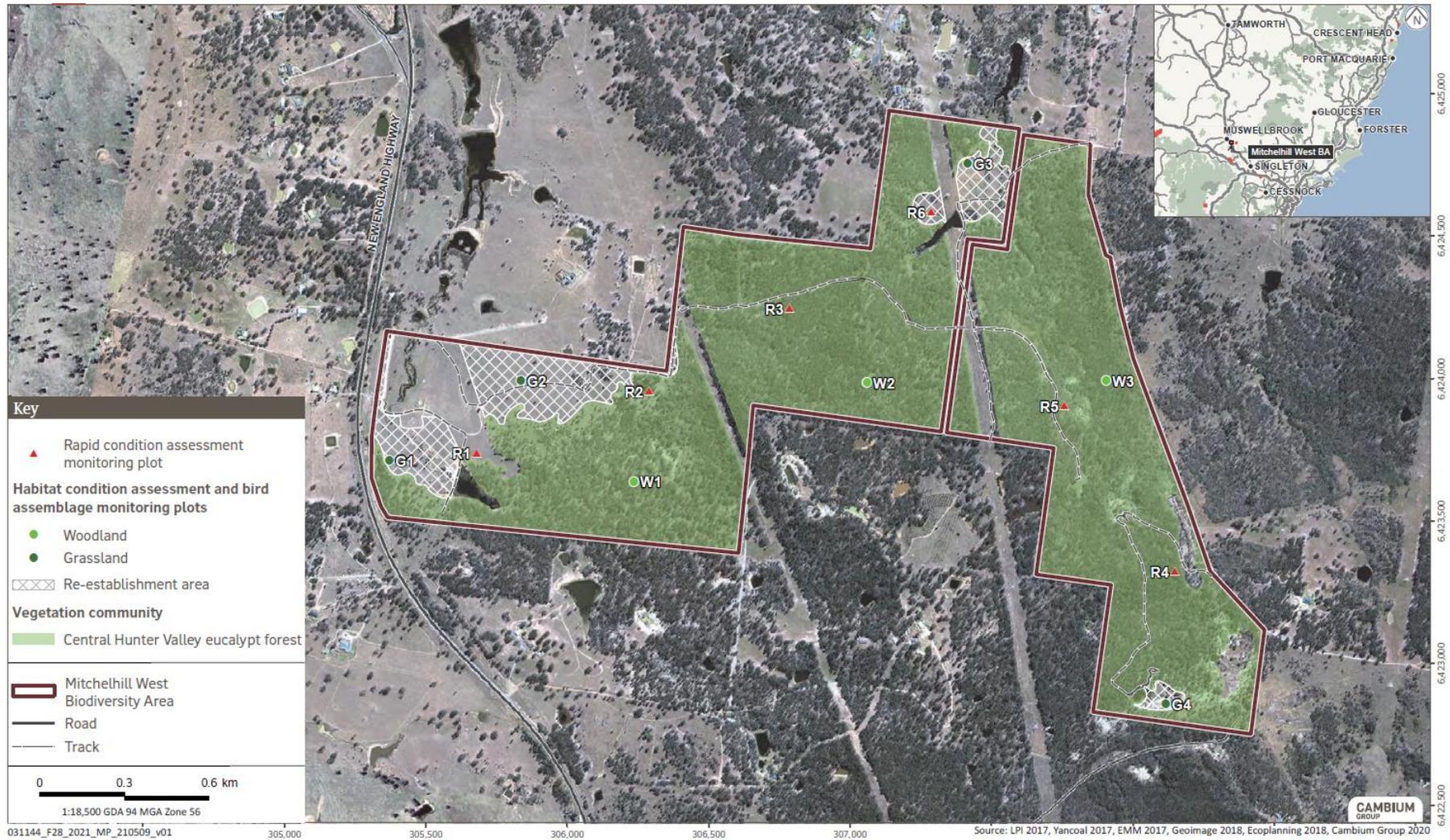


Figure 7.2. Rapid condition assessment, habitat condition assessment and bird assemblage monitoring locations at the Mitchelhill (West) Biodiversity Area.



Figure 7.3. Rapid condition assessment, habitat condition assessment and bird assemblage monitoring locations at the Mitchelhill (East) Biodiversity Area.



Figure 7.4. Rapid condition assessment, habitat condition assessment and bird assemblage monitoring locations at the Hook Biodiversity Area.

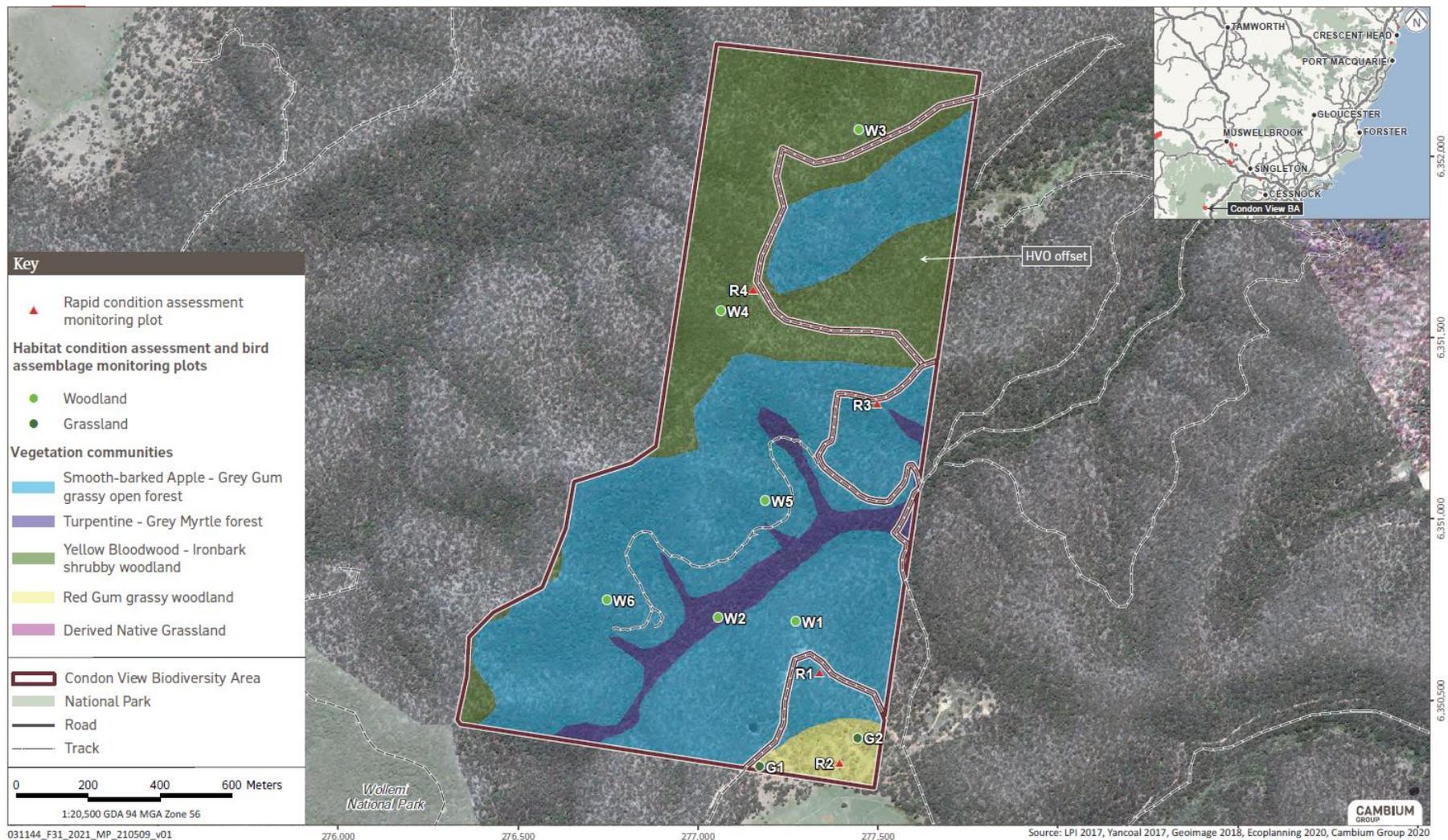


Figure 7.5. Rapid condition assessment, habitat condition assessment and bird assemblage monitoring locations at the Condon View Biodiversity Area.



Figure 7.6. Rapid condition assessment, habitat condition assessment and bird assemblage monitoring locations at the Crescent Head (North) Biodiversity Area.



Figure 7.7. Rapid condition assessment, habitat condition assessment and bird assemblage monitoring locations at the Crescent Head (South) Biodiversity Area.

7.1.1 Rapid Condition Assessments

The rapid condition assessments are presented in Appendix B and the locations can be seen in figures 7.1 to 7.7. The results from the 2020 and 2021 RCE are presented with the exception of Wandewoi, where no change was recorded between the two assessment periods. As such, only the 2021 results are presented in Appendix B for the Wandewoi BA.

A summary of the changes occurring between the 2020 and 2021 assessments for each of the BAs are below.

Mitchelhill West: Site R2 had a low abundance of weeds during the 2021 assessment compared to 2020, while native shrubs were recorded within R4 during 2021.

Mitchelhill East: Site R3 had a low abundance of weeds during the 2021 assessment compared to 2020, and fallen timber left on the ground was noted within R5 during 2021.

Hook: During 2021, improvements were recorded with Site R1 having a low abundance of weeds and fallen timber being recorded within R1, however, dieback was noted to have occurred.

Crescent Head: The presence of fallen timber was noted within the R1 and R2 plots at Crescent Head South. No change occurred between the two assessment periods for the northern BA.

As no logging or timber removal occurred during 2021 in any of the BAs, the presence of fallen timber is attributed to either natural falls or fallen biomass that was overlooked during the previous assessment. Timber falling at the Crescent Head South BA is a frequent occurrence, especially in areas of shallow soils or high water table, particularly since the fire in 2017.

The presence of dieback within the Hook BA monitoring point R1 will be examined again during 2022.

7.1.2 Condition Assessment

The objectives of the condition assessment monitoring are to demonstrate that:

- Changes in vegetation community composition, structure, and habitat features in the Grassland (transition) sites are towards the Woodland (reference) sites,
- Changes in vegetation community composition, structure, and habitat features are towards the community type benchmarks and CHVEFW key diagnostic characteristics, and
- Ensure the recruitment of canopy species by transitioning to older age classes (as measured by tree diameter at breast height [DBH]).

The monitoring in 2021 was the fourth monitoring event at the Condon View grassland (transition) plots, the third monitoring event at Mitchelhill, Wandewoi and Hook woodland and grassland plots and the second monitoring event at Condon View woodland plots. An explanation for these variations was provided during the previous compliance report and was largely to the transition from a shared ownership model with the Condon View BA to being wholly managed by HVO. The monitoring locations were revised to supplement the monitoring that had previously occurred.

Note there are minor differences between the monitoring method presented in the management plan and the initial monitoring method applied in 2018-2020. Therefore, for consistency, the method applied in 2021 followed previous monitoring events. The details and methodology are outlined in the Ecoplanning 2022 condition assessment monitoring report that is available in the HVO Portal or on request.

Various plot data was compared to Commonwealth condition thresholds and State benchmarks (BAM) for equivalent Plant Community Types. The Conservation Advice for CHVEFW lists key diagnostic characteristics and condition categories by which data will be compared. A traffic light colour coding system has been used to indicate whether an attribute measured was within or outside the current benchmark. Using the Biobanking Assessment Method (BBAM), deviation from a benchmark was converted to a site attribute score which inferred condition. Using the traffic light symbology, green values represent optimal conditions, amber values represent moderate condition, red values represent low condition and grey values represent very low condition.

Note that Condon View does not contain any patches of CHVEFW, and thus only habitat monitoring for Swift Parrot and the Regent Honeyeater is required.

A total of 35 plots were sampled during the monitoring period, which was composed of 20 woodland plots and 15 grassland plots. Surveys identified a total 452 flora species which includes 341 native species. Several species could only be identified to genera given the lack of suitable reproductive material to confirm full identification.

All woodland plots at Wandewoi (except W1), Mitchelhill and Hook, and grassland plot G1 at Hook satisfied the key diagnostic characteristics and condition thresholds for threatened ecological community CHVEFW. Some grassland plots have sufficient native species diversity but lack a canopy to be considered part of the community. Replanting will help to restore a canopy consistent with the threatened ecological community.

An assessment of relative condition of plots showed that 60% of woodland plots improved in condition since the previous monitoring period, and 15% remained in a stable condition.

Similarly, 66.7% of grassland plots improved in condition while 13.3% remained in a stable condition. Given the favourable conditions for plant growth, a decline in condition will be closely monitored to ensure that when favourable conditions pass, a rapid decline in plots is not recorded. Hook and Condon View had the most number of woodland sites in which a decline in relative condition was recorded (3 and 2, respectively). At these sites, cover was generally well below benchmark values.

The photo reference points and the list of flora species recorded during the condition assessments are available to regulators from the HVO Biodiversity Portal on request.

Monitoring will continue in 2022. Following approval of the EPBC variation by the Delegate, it is proposed that the new fenceline defining the extent of the Wandewoi BA will be established in 2022. This will enable active management to focus on the required areas of grassland to be rehabilitated. The weeds that have grown at Mitchelhill within the planted rip lines are scheduled to be managed in February 2022.

A summary of specific monitoring information for each of the BAs are outlined below.

Wandewoi

Across the eight monitoring plots (Figure 7.1), 178 flora species were recorded, 119 native, 58 exotic and one unknown. No threatened flora species listed under the BC Act or EPBC Act were identified during the survey period.

Several priority weeds, weeds of national significance and high threat exotics were identified that will be targeted during the 2022 management activities. These included:

<i>Opuntia stricta</i>	<i>Bidens pilosa</i>
<i>Opuntia aurantiaca</i>	<i>Galenia pubescens</i>
<i>Senecio madagascariensis</i>	<i>Malvastrum americanum</i>
<i>Marrubium vulgare</i>	

The total percentage weed cover has remained relatively stable from 2019 to 2021, with a noticeable decrease at W4 and increase at G4.

With regards to relative condition scores, plots W4, G2, G3 and G4 showed no change, Plot G1 and W1 decreased in relative condition between 2019 and 2021, while W2 and W3 increased in relative condition (Table 7.2). Overall, there was a general increase in the understorey richness and cover across all plots. Since 2018, plots have shown a general decrease in relative condition score, except for W1 and G1 (Table 7.3).

Table 7.2. Assessable characteristics to be assessed for a patch of potential CHVEFW to have its condition ranked, including the ratio of native to exotic species (excluding trees), and number of native species.

“Green” cells meet CHVEFW requirements at Wandewoi.

Plot ID	Canopy >10%	Native:Exotic ratio	No Native spp	Condition
G1	0	21.3	30	
G2	0	37.6	33	
G3	0	53.7	32	
G4	0.3	84.8	37	
W1	5.5	14.6	20	
W2	15.2	42.3	23	A
W3	35.1	72.6	52	A
W4	30.2	109.8	46	A

Table 7.3. Summary of plot data collected at Wandewoi and an assessment of relative conditions in comparison to benchmark data.

Community benchmarks	1691	Wandewoi							
		W1	W2	W3	W4	G1	G2	G3	G4
Native species richness									
Tree richness	5	2	^ 2	3	4	0	0	0	1
Shrub richness	8	2 v	4 v	^ 2	^ 7	2	0	2	2 v
Grass and grass-like richness	12	4 v	^ 9	^ 12	14	^ 8	^ 10	^ 12	^ 14
Forb richness	14	^ 11	^ 7	^ 27	^ 16	^ 16	^ 18	^ 11	^ 17
Fern richness	2	0	1	2	1	^ 2	2	^ 3	2
Other richness	5	1	0	^ 6	^ 4	^ 2	^ 3	^ 1	^ 2
Native foliage cover (%)									
Tree cover	53	5.5 v	^ 15.2	^ 35.1	^ 30.2	0	0	0	^ 0.3
Shrub cover	16	^ 5.1	2.3 v	3 v	^ 20.7	0.2	0	0.2	0.4
Grass or grass-like cover	58	1.3 v	24.8	^ 22.7	^ 31.3	^ 18.7	^ 34.8	^ 41.7	^ 80.4
Forb cover	9	^ 3	^ 0.8	^ 11.3	^ 27.2	^ 1.6	^ 2.3	^ 11.1	^ 2.5
Fern cover	1	0	0.1	0.6 v	0.1	^ 0.2	0.2	^ 0.3	1 v
Other cover	4	0.1 v	0	0.8 v	^ 0.4	^ 0.6	0.3	^ 0.1	^ 0.2
Other									
Total length of fallen logs	40	^ 10.2	^ 6	^ 21	25 v	0	0	0	0
Litter cover	40	18	9.5 v	12.5 v	32.5 v	7.5 v	5.75 v	6.75 v	0.5
Number of large trees	3	2	^ 3	0	0	0	0	0	0
Sum of score /45		14 v	^ 18	^ 28	^ 25	^ 15	^ 15	^ 17	18 v

Note: An increase in relative conditions since 2019 is indicated by “^”, and a decrease in relative condition is indicated by “v”.

Mitchelhill

Across the two Mitchelhill sites (east and west) a total of 251 flora species were identified; 179 identified as native, 71 as exotic and one was of unknown origin.

Common priority weeds, WoNS, and/or high threat exotic species across both offset areas included:

<i>Opuntia stricta</i>	<i>Bidens pilosa</i>	<i>Senecio madagascariensis</i>
<i>Opuntia aurantiaca</i>	<i>Briza subaristata</i>	
<i>Heliotropium amplexicaule</i>	<i>Paspalum dilatatum</i>	

The total percentage weed cover has increased at all sites from 2019 to 2021, with significant increases W2, G1, G2 and G3. The increase in weed cover within the grass monitoring sites can be explained by the weed growth being stimulated by the ripping of the planted rehabilitation lines in combination with the above average rainfall. These weeds are being targeted in February 2022.

The relative condition score for plots at Mitchelhill east, scored slightly higher values than 2019. The total relative scores were higher in woodland plots. All native cover scores remained low across both woodland and grassland plots, except for grass cover in W2, W6 and G3. Since 2018, all plots have maintained stable relative condition scores, or slightly increased.

Similar results were observed at Mitchelhill west offset area, with relative condition scores remaining similar or slightly higher. Only Plot G2 decreased in relative condition from 2019 to 2021.

All woodland plots scored a condition of Class A, with respect to the CHVEFW conditioning. All grassland plots, given they lack a canopy, did not meet CHVEFW key diagnostic characteristics. These areas, however, have been planted and should classify as CHVEFW once the plantings are tall enough to meet the criteria.

Most attributes in the relative condition score calculations remained relatively stable or slightly increased across the Mitchelhill offset areas.

Table 7.4. Assessable characteristics to be assessed for a patch of potential CHVEFW to have its condition ranked, including the ratio of native to exotic species (excluding trees), and number of native species.
“Green” cells meet requirements at Mitchelhill.

Plot ID	Canopy >10%	Native:Exotic ratio	No Native spp	Condition
G1	0.1	5.2	15	
G2	0	86.7	22	
G3	0.1	73.2	30	
G4	6	10.4	32	
G5	0.1	11.4	26	
W1	26	77.1	46	A
W2	30.3	108.6	54	A
W3	26.5	63.1	53	A
W4	18.2	35.6	57	A
W5	11.6	31.7	48	A
W6	10.9	67.6	66	A

Table 7.5. Summary of plot data collected at Mitchelhill East and an assessment of relative conditions in comparison to benchmark data.

Community benchmarks	PCT 1604	Mitchelhill East			
		W4	W5	W6	G5
Native species richness					
Tree richness	5	^ 4	^ 5	^ 5	^ 1
Shrub richness	8	12	8 v	^ 7	1
Grass and grass-like richness	12	21	10	^ 23	13 v
Forb richness	14	^ 13	^ 18	^ 21	^ 8
Fern richness	2	1	^ 2	2	1
Other richness	5	^ 6	5	^ 8	^ 2
Native foliage cover (%)					
Tree cover	53	18.2 v	11.6 v	^ 10.9	^ 0.1
Shrub cover	16	^ 12.1	10 v	^ 6.3	0.1
Grass or grass-like cover	56	^ 3.9	7.5 v	^ 46.9	6.9 v
Forb cover	9	^ 1.5	^ 2.3	^ 2.7	^ 4
Fern cover	1	0.1	^ 0.2	0.2	0.1
Other cover	4	^ 0.7	^ 0.6	^ 0.8	^ 0.2
Other					
Total length of fallen logs	40	32 v	^ 8	4 v	0
Litter cover	40	^ 28.8	26.3 v	19.4 v	18.8 v
Number of large trees	3	2 v	0	0	0
Sum of score /45		^ 27	27	^ 28	^ 15

Note: An increase in relative conditions since 2019 is indicated by “^”, and a decrease in relative condition is indicated by “v”.

Table 7.6. Summary of plot data collected at Mitchelhill West and an assessment of relative conditions in comparison to benchmark data

Community Benchmark	PCT 1601	Mitchelhill West						
		W1	W2	W3	G1	G2	G3	G4
Native Species Richness								
Tree richness	5	4 v	4 v	4 v	1	0	^ 1	2 v
Shrub richness	12	0 v	6 v	6	1	1 v	^ 2	^ 7
Grass and grass-like richness	11	15	^ 18	^ 17	^ 9	^ 9	^ 13	^ 9
Forb richness	11	^ 20	^ 20	^ 23	4	8	^ 12	^ 11
Fern richness	2	1	1	1	0	1	1	^ 1
Other richness	5	^ 4	2	1	0	2	0	^ 1
Native foliage cover (%)								
Tree cover	56	^ 26	^ 30.1	26.5 v	^ 0.1	0	0.1	6 v
Shrub cover	34	0 v	1 v	0.8 v	0.1	0.1 v	0.1	1.8 v
Grass or grass-like cover	66	^ 47	^ 51.4	^ 27.2	^ 4.2	^ 85.4	^ 67.9	^ 1.9
Forb cover	8	^ 3.8	^ 5.8	^ 8.1	^ 0.8	0.8 v	^ 1.9	^ 1.2
Fern cover	1	0.1	0.1	0.1	0	0.1	0.1	^ 0.1
Other cover	4	^ 0.4	0.2	^ 1.1	0	^ 0.3	0	^ 0.2
Other								
Total length of fallen logs	45	^ 14.4	^ 20.7	24.5 v	0	0	0	^ 14.5
Litter cover	65	50 v	30.25 v	41.3 v	7.5 v	1.25 v	0 v	15 v
Number of large trees	3	1 v	2	0	0	0	0	0
Sum of score /45		^ 23	^ 26	25	5	9 v	^ 14	^ 15

Note: An increase in relative conditions since 2019 is indicated by “^”, and a decrease in relative condition is indicated by “v”.

Hook

Across the eight monitoring plots in the Hook BA (four grassland and four woodland), 168 flora species were recorded, 126 being native and 42 being exotic. No threatened flora species (listed under the BC Act or EPBC Act) were identified in during the current survey period.

Several priority weeds, weeds of national significance and high threat exotics were identified during the current surveys. Common priority weeds and/or WoNS recorded included:

Common priority weeds, WoNS, and/or high threat exotic species across both offset areas included:

Opuntia stricta
Olea europaea subsp. cuspidata
Senecio madagascariensis

All woodland plots, apart from W3, decreased in their relative condition score. All grassland plots increased their relative condition score, apart from G2 which did not change.

There has been a general improvement in relative condition in grassland plots over time, while woodland plots has varied with a decrease in relative condition of W2 and W4 and general increase in relative condition for plots W1 and W3.

All woodland plots in the Hook BA retained their CHVEFW condition of "Class A", while only plot G1 from the grasslands attained a CHVEFW threshold, being categorised as "Class A". In 2019, plot G1 was the only grassland plot (from all offset sites) to meet condition thresholds of CHVEFW. In 2021 plot G1 did not meet condition thresholds, due to its canopy cover being <10%, however, if rounded to the nearest whole number, it would again meet condition threshold. Plot 2 was the only plot to meet condition threshold, being "Class A".

Table 7.7. Summary of ALL plots that meet EPBC Act CHVEFW condition criteria, by showing their respective percent of native perennial understorey species and number of native understorey species at Hook BA.

Plot ID	Canopy >10%	Native:Exotic ratio	No Native spp	Condition
G1	15.6	67.0	36	A
G2	3	13.2	33	
G3	4	68.5	32	
G4	5.1	50.1	38	
W1	23.2	28.9	49	A
W2	30	53.8	43	A
W3	20	54.8	39	A
W4	17	35.3	52	A

Table 7.8. Summary of plot data collected at Hook and an assessment of relative conditions in comparison to benchmark data.

Community benchmarks	PCT 1601	Hook							
		W1	W2	W3	W4	G1	G2	G3	G4
Native species richness									
Tree richness	5	4 v	2 v	2	4 v	^ 5	1	2	^ 3
Shrub richness	12	5 v	^ 8	4 v	^ 8	^ 4	^ 6	2 v	5
Grass and grass-like richness	11	9 v	8	8 v	9 v	13 v	9	^ 14	^ 11
Forb richness	11	^ 9	^ 10	11	^ 15	12 v	^ 13	^ 10	^ 17
Fern richness	2	1	^ 1	1	1	1	1	^ 1	0
Other richness	5	^ 3	^ 2	1	^ 4	1	3	3 v	2
Native foliage cover (%)									
Tree cover	56	23.1 v	29 v	20	17 v	15.6 v	3 v	4 v	5.1 v
Shrub cover	34	1.3 v	^ 3.8	1	^ 6.3	2.2 v	1 v	0.3 v	0.8
Grass or grass-like cover	66	2.5 v	3.6 v	^ 23.1	7.5 v	^ 15.9	^ 7.2	^ 62.1	^ 39
Forb cover	8	^ 2.2	^ 11.8	^ 4.3	3.4 v	^ 2.5	1.7 v	^ 1.4	^ 5.1
Fern cover	1	0.1	^ 0.1	0.1	0.1	^ 1	0.1	^ 0.1	0
Other cover	4	^ 0.3	0.3	0.1	^ 0.4	0.1	^ 0.4	0.6	^ 0.2
Other									
Total length of fallen logs	45	19 v	29 v	18 v	11	3	0	0	0
Litter cover	65	38 v	86.3 v	65.5 v	18.5 v	^ 35	17.5 v	26.5 v	28.75 v
Number of large trees	3	1 v	0	0	4 v	0	0	0	0
Sum of score/45		18 v	19 v	^ 20	23 v	^ 21	15	^ 18	^ 16

Note: An increase in relative conditions since 2019 is indicated by “^” and a decrease in relative condition is indicated by “v”.

Condon View

Within the Condon View offset area, 182 flora species were recorded within all eight plots, 162 being native and 20 being exotic species. No threatened flora species were recorded at the Condon View BA.

Priority weeds and/or WoNS were not frequently recorded with only *Senecio madagascariensis* and *Rubus fruticosus* recorded in grassland plots.

The total percentage weed cover remained relatively stable across all sites from 2019 to 2021.

Changes in relative condition were not consistent across habitat type (grassland and woodland) at Condon View. However, all plots have remained in a similar range of scores being between 20 and 30 points. This mixed overall relative condition is mirrored in the attributes that contribute to relative condition scores, with a high level of variability in increases and decreases in species richness and cover.

Table 7.9. Cover of native species (compared to exotic species) and total number of native species found within grassland (G) and woodland (W) plots at Condon View BA.

Plot ID	Canopy >10%	Native:Exotic ratio	No Native spp
G1	15.6	67.0	36
G2	3	13.2	33
G3	4	68.5	32
G4	5.1	50.1	38
W1	23.2	28.9	49
W2	30	53.8	43
W3	20	54.8	39
W4	17	35.3	52

Table 7.10. Summary of plot data collected at Condon View and an assessment of relative conditions in comparison to benchmark data.

	PCT 1386			PCT 1385			PCT 1327			PCT 1282		
	BM	G1	G2	BM	W1	W5	W6	BM	W3	W4	BM	W2
Native species richness												
Tree richness	4	2	3	7	5	^ 7	8	6	4 v	4 v	9	5
Shrub richness	8	^ 5	0	13	^ 9	^ 13	10	22	13 v	13 v	15	^ 15
Grass and grass-like richness	8	12	9	9	^ 14	10 v	^ 14	9	8	9 v	6	^ 7
Forb richness	8	15	14	12	9 v	11 v	13 v	9	11	9 v	8	14 v
Fern richness	2	0 v	0	3	0	1	0 v	2	0	0	5	1 v
Other richness	4	3	3	9	0	^ 3	3 v	4	2	^ 1	12	3 v
Native foliage cover (%)												
Tree cover	22	8	1.5	63	19 v	^ 49.1	^ 47.1	60	35.1 v	37 v	69	23.5 v
Shrub cover	22	^ 0.5	0	30	^ 3.8	1.6	^ 10	56	^ 18.1	^ 4.8	51	52.2 v
Grass or grass-like cover	70	^ 48.9	36.6	39	^ 17.3	^ 14.7	^ 17.1	23	^ 13	^ 17.7	7	36.4 v
Forb cover	3	2.7	^ 11.7	8	^ 1.8	1.1 v	^ 3.1	6	^ 1.7	0.9 v	4	2.7 v
Fern cover	1	0 v	0	2	0	0.1	0 v	0	0	0	15	0.3 v
Other cover	1	^ 0.6	0.3 v	9	0	^ 0.3	^ 0.5	3	0.2	^ 0.1	21	0.4
Other												
Total length of fallen logs	12	13.5 v	38 v	80	42 v	116	78 v	45	^ 52	^ 17	15	145 v
Litter cover	40	^ 38.8	11 v	61	50.5 v	70 v	81.3 v	75	42.5 v	33 v	72	8 v
Number of large trees	1	4	^ 2	1	1 v	^ 6	2	3	3 v	3	3	^ 4
Sum of score/45		30	20		22	28	27		28	28		26

Note: An increase in relative conditions since 2019 is indicated by “^” and a decrease in relative condition is indicated by “v”.

Condition summary

In summary, the data collected during the 2021 condition surveys is likely to be the product of an increase in previous rainfall. In the survey years before 2021 (2018 and 2019), the vegetation patterns were the result of drought conditions. It would be expected that a break in drought conditions, beginning in late 2020 and continuing through to the time of the survey, would have facilitated a flush of vegetative covering in all survey plots for both native and exotic species. Plots that recorded a reduction in native vegetation covering in 2021 could have been influenced by the growth of winter annuals or pioneering exotic species inhibiting the growth of native flora. This pattern would be particularly evident in plots which had a high exotic cover during drought conditions.

However, despite the potential flush of exotic flora, all woodland plots across at Mitchelhill and Hook offset areas, W2 to W4 at Wandewoi and G1 at Hook satisfied CHVEFW key diagnostic characteristics and condition threshold "Class A" ranking, with only plots W1 from Wandewoi not meeting condition thresholds due to a lack of canopy. A key factor for grassland plots not being classified as CHVEFW is a lack of a canopy with a cover >10%. Ripping and planting has occurred at several grassland plots in the Mitchelhill and Wandewoi offset areas. While this is likely to increase canopy cover over time, the disturbance caused by ripping has created an opportunity for weeds to colonise. While some of these weeds are annual species, there is potential for them to out-compete native species resulting in a decreased relative condition score, and hence these areas will receive additional attention during 2022 to reduce the weed load.

Table 7.11: Summary of change in condition in plots monitored.

Offset area	Woodland			Grassland		
	Improve	Decline	Stable	Improve	Decline	Stable
Wandewoi	3	1	0	3	1	
Mitchelhill	4	0	2	3	1	1
Hook	1	3	0	3	0	1
Condon View	4	1	1	1	1	0
TOTAL	12	5	3	10	3	2

Management actions and completion criteria relevant to condition assessment monitoring are shown in Table 7.12, following sections 5.3 (weed control), 5.4 (fire for conservation), and 5.6 (revegetation of regrowth and remnant native vegetation) of the biodiversity areas management plan.

The progress towards the performance and completion criteria relevant to the conservation objectives are outlined in Table 7.13. The monitoring periods for the re-establishment of BAs (Wandewoi, Mitchelhill, and Hook) are presented in Table 7.14.

Table 7.12: Progress towards performance and completion criteria relevant to management actions relating to weed control and fire for conservation in the offset areas. Red text indicates progress to date.

Actions	Years 1 to 4	Years 5 to 10	Completion criteria
Weed Control			
Weed control	At least one control event per year with additional events as required for species listed in Table 16 or Appendix E1 that are identified as needing control, and any other weeds needing control recording from monitoring activities. All actions to be recorded in the Annual Report. Weeds are recorded during monitoring and property inspections. Weed management occurs regularly and is outlined in Chapter 6.	At least one weed control event each year for species listed in Table 16 or Appendix E1 that are identified as needing control, and any other weeds needing control as recorded from monitoring activities. All actions to be recorded in the Annual Report. Weeds are recorded during monitoring and property inspections. Weed management occurs regularly and is outlined in Chapter 6.	Ecological monitoring data indicates a trajectory for reduction in weed plant cover over three consecutive years. Condition assessment completed as required. Olive (<i>Olea europaea</i>) control was evident in parts of Hook. Most sites remained relative stable from 2019 to 2021, however, all sites at Mitchelhill recorded an increase in exotic cover, including significant increases at some sites.
Monitoring	Complete condition assessment monitoring (6.4.1), rapid condition assessment (6.5.11), and property inspections (6.5.21). Complete condition assessment monitoring (6.4.11) and property inspections (6.5.21).	Complete condition assessment monitoring (6.4.11), rapid condition assessment (6.5.11), and property inspections (6.5.21). Complete condition assessment monitoring (6.4.11) and property inspections (6.5.21).	Monitoring is completed. Monitoring has been completed as per the schedule.
Fire for conservation			
Monitoring	Complete condition assessment monitoring (6.4.1) and property inspections (6.5.2). Condition assessment completed as required.	Complete condition assessment monitoring (6.4.1) and property inspections (6.5.2). Condition assessment completed as required.	Monitoring has been completed as per the schedule. Condition assessment completed as required.

¹ Section from submitted management plan (HVO 2021).

Table 7.13: Progress towards performance and competition criteria relevant to the conservation objectives. Red text indicates progress to date.

Conservation value	Key performance indicator	Completion criteria
Central Hunter Valley Eucalypt Forest and Woodland		
CHVEFW	Wandewoi: improved condition of 175.8 ha. Condition assessment completed. Mitchelhill: improved condition of 183.4 ha. Condition assessment completed.	Observed and measured increase in condition through monitoring in woodland. Condition assessment completed. An assessment of relative condition of plots showed that 60% of woodland plots improved in condition since the previous monitoring period, and 15% remained in a stable condition.

	<p>Hook: improved condition of 78.6 ha of woodland and 28.3 ha of regenerating woodland. Condition assessment completed.</p>	<p>Given the favourable conditions for plant growth, a decline in condition needs to be closely monitored to ensure that when favourable conditions pass, a rapid decline in plots is not recorded</p>
DNG	<p>Wandewoi: transition of 59.8 ha of grassland to woodland. Condition assessment completed.</p> <p>Mitchelhill: transition of 31.5 ha of grassland to woodland.</p> <p>Hook: transition of 2.6 ha of grassland to woodland. Condition assessment completed.</p>	<p>Observed and measured trajectory towards and/or attainment of the key characteristics of CHVEFW or reference site attributes in DNG (measured biannually). Condition assessment completed.</p> <p>An assessment of relative condition of plots showed that 66.7% of grassland plots improved in condition while 13.3% remained in a stable condition.</p> <p>Given the favourable conditions for plant growth, a decline in condition needs to be closely monitored to ensure that when favourable conditions pass, a rapid decline in plots is not recorded.</p>
Bird Habitat		
Swift Parrot Habitat	<p>Wandewoi: improved condition of 175.8 ha of woodland habitats. Condition assessment completed.</p> <p>Mitchelhill: improved condition of 113 ha of woodland habitats. Condition assessment completed.</p> <p>Hook: improved condition of 122 ha of woodland habitats. Condition assessment completed.</p>	<p>Observed and measured increase in or maintained condition through monitoring in woodland. Condition assessment completed.</p> <p>An assessment of relative condition of plots showed that 60% of woodland plots improved in condition since the previous monitoring period, and 15% remained in a stable condition.</p> <p>Given the favourable conditions for plant growth, a decline in condition needs to be closely monitored to ensure that when favourable conditions pass, a rapid decline in plots is not recorded.</p> <p>Observed and measured trajectory towards and/or attainment of the key characteristics of CHVEFW or reference site attributes in DNG (measured biannually). Condition assessment completed.</p> <p>An assessment of relative condition of plots showed that 66.7% of grassland plots improved in condition while 13.3% remained in a stable condition.</p> <p>Given the favourable conditions for plant growth, a decline in condition needs to be closely monitored to ensure that when favourable conditions pass, a rapid decline in plots is not recorded.</p>
Regent Honeyeater Habitat	<p>Mitchelhill: improved condition of 245 ha of woodland habitats. Condition assessment completed.</p> <p>Condon View: improved condition of 168 ha of woodland habitats. Condition assessment completed.</p>	<p>Observed and measured increase in or maintained condition through monitoring in woodland. Condition assessment complete.</p> <p>An assessment of relative condition of plots showed that 60% of woodland plots improved in condition since the previous monitoring period, and 15% remained in a stable condition.</p> <p>Given the favourable conditions for plant growth, a decline in condition needs to be closely monitored to ensure that when favourable conditions pass, a rapid decline in plots is not recorded.</p>

		<p>Observed and measured trajectory towards and/or attainment of the key characteristics of CHVEFW or reference site attributes in DNG (measured biannually).</p> <p>Condition assessment completed.</p> <p>An assessment of relative condition of plots showed that 66.7% of grassland plots improved in condition while 13.3% remained in a stable condition.</p> <p>Given the favourable conditions for plant growth, a decline in condition needs to be closely monitored to ensure that when favourable conditions pass, a rapid decline in plots is not recorded.</p>
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Table 7.14: Progress towards performance and completion criteria relevant to specific management actions. Red text indicates progress to date.

Actions	Years 1 to 4	Years 5 to 10	Completion criteria
	Weed Control		
Weed control	<p>At least one control event per year with additional events as required for species listed in Table 16 or Appendix E (HVO 2021) that are identified as needing control, and any other weeds needing control recording from monitoring activities. All actions to be recorded in the Annual Report.</p> <p>Weeds recorded during monitoring are available on request.</p>	<p>At least one weed control event each year for species listed in Table 16 or Appendix E₁ that are identified as needing control, and any other weeds needing control as recorded from monitoring activities. All actions to be recorded in the Annual Report.</p> <p>Weeds recorded during monitoring are available on request.</p>	<p>Ecological monitoring data indicates a trajectory for reduction in weed plant cover over three consecutive years.</p> <p>Condition assessment completed as required. Olive (<i>Olea europaea</i>) control was evident in parts of Hook. Most sites remained relative stable from 2019 to 2021, however, all sites at Mitchelhill recorded an increase in exotic cover, including significant increases at some sites.</p>
Monitoring	<p>Complete condition assessment monitoring (6.4.1), rapid condition assessment (6.5.1), and property inspections (6.5.2).</p> <p>Condition assessment completed as required.</p>	<p>Complete condition assessment monitoring (6.4.1), rapid condition assessment (6.5.1), and property inspections (6.5.2).</p> <p>Condition assessment completed as required.</p>	<p>Monitoring is completed as per the monitoring schedule.</p> <p>Condition assessment completed as required.</p>
Fire for conservation			
Monitoring	<p>Complete condition assessment monitoring (6.4.1) and property inspections (6.5.2).</p> <p>Condition assessment completed as required.</p>	<p>Complete condition assessment monitoring (6.4.1) and property inspections (6.5.2).</p> <p>Condition assessment completed as required.</p>	<p>Monitoring has been completed as per the schedule.</p> <p>Condition assessment completed as required.</p>

7.1.3 Bird assemblage monitoring

This monitoring period is the third year of monitoring for Wandewoi, Hook and Mitchelhill BAs and the second year of monitoring for Condon View BA (due to changes in management necessitating a review of the monitoring plots within the HVO-portion vegetation communities). This report presents data averaged for each habitat across the BA to determine if any trends or changes have occurred within each habitat. With the subdivision of the HVO portion of the Condon View BA from the larger adjacent Yancoala BA for the Mount Thorley Warkworth Mine, the habitat data points for locations within the now HVO BA were not replicated sufficiently for these results to stand alone in this report.

As the survey effort has been increased within the HVO portion and earlier monitoring efforts did not provide sufficient replication to enable sufficient changes within the various habitats to be determined, data will be compared to 2018 and 2019 data for Wandewoi, Hook and Mitchelhill BAs, with Condon View data compared to data collected in 2020.

Bird assemblage monitoring is undertaken to:

- Demonstrate ongoing habitat usage by woodland birds and a decrease in the relative abundance of bird species typical of forest margins and grasslands, and
- Assess the presence of Swift Parrot and Regent Honeyeater within the applicable offset areas and collect information regarding their movement and habitat use.

The surveys were undertaken around photo point locations at Wandewoi, Mitchelhill, Hook and Condon View offset areas. As per previous bird monitoring events, the bird surveys occurred in the morning during August 2021. Each survey was conducted in a 2 ha area for 20 minutes performed by two observers with the photo point at each site marking (approximately) the centre of the search area. Birds seen, heard, observed or whose presence was evidenced by other means within and outside of the search area were recorded (Table 7.15).

At the completion of the bird assemblage monitoring survey at each site, targeted survey for Regent Honeyeater and Swift Parrot was conducted. Regent Honeyeater and Swift Parrot calls were broadcast for approximately 30 seconds from the star picket followed by a period of listening and observing for a response for 1 minute. This was repeated up to five times or until the species was detected.

Few trees were in flower during the survey. *Eucalyptus crebra* was observed in flower more than other species. At sites in the Gunnedah basin, honeyeaters were observed to prefer eucalypts with larger flowers than *Eucalyptus crebra*. These species included *Eucalyptus sideroxylon*, *Eucalyptus albens*, and a *Eucalyptus albens* X. These species were not recorded within the offset area. Two species that were recorded in the biodiversity areas, *Corymbia maculata* and *Eucalyptus fibrosa* do have larger flowers, however, these were not flowering during the survey.

Some larger and more aggressive honeyeaters were recorded during the survey. While Musk Lorikeet (*Glossopsitta concinna*), Noisy Friarbird (*Philemon corniculatus*) and the Red Wattlebird (*Anthochaera carunculata*) are aggressive, they have a positive correlation with the occurrence of Swift Parrot (Saunders and Heinsohn 2008). Including the above three birds, the Noisy Miner was the only species out of the four to be recorded in all BAs. Noisy Miner is a species common in modified open woodlands, farmland and ecotones between grassland and woodland, particularly where the shrub layer has been removed. The aggressive exclusion of birds from habitat by Noisy Miners is recognised as a key threatening process under the BC Act (NSW Scientific Committee 2013).

A total of 35 sites were sampled during this monitoring period, which included 20 woodland (reference) sites and 15 grassland/regenerating woodland (transition) sites. A total of 72 bird species were identified. Of these species, 48 are considered woodland species, ten are grassland/farmland specialists and 14 are generalists species. In the data collected to date, visible differences can be seen between woodland and grassland/regenerating woodland sites, with species diversity highest at woodland sites, generally. Fluctuations in bird species diversity at the offset areas illustrates the complexity in landscape scale dispersal of birds and the resources on which they depend.

The survey did not record Swift Parrot or Regent Honeyeater on site. There were no records of either species in the central Hunter Valley (Eremaea Birdlines NSW) during the survey month (August).

Four threatened species under the BC Act - *Callocephalon fimbriatum* (Gang Gang Cockatoo), *Chthonicola sagittate* (Speckled Warbler), *Glossopsitta pusilla* (Little Lorikeet) and *Pomatostomus temporalis temporalis* (Grey-crowned Babbler), listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), were observed.

The completion criteria for woodland birds requires that the assemblage of species increases or is maintained at the offset areas. The assemblage of woodland birds (excluding other birds observed) has varied across the offset areas over the monitoring period (Figure 7.8). To achieve the performance criteria, the trajectory for woodland and grassland sites should improve or remain consistent.

Monitoring of habitat is conducted as part of the vegetation monitoring. As vegetation monitoring report has been prepared for all offset areas in 2021. In summary, 55% of woodland plots and 53% of grassland plots increased in relative condition. However, 30% of woodland plots and 20% of grassland plots decrease in relative condition.

Management efforts in 2022 will examine the vegetation within the areas where the woodland bird assemblage experienced a decline.

Progress against the performance and completion criteria for the bird assemblage monitoring is outlined in Table 7.16.



Figure 7.8: Change in woodland bird assemblage richness over the monitoring period at each offset area

Table 7.15. Summary of the number of birds recorded within and outside the survey area, and the habitat preferences of birds recorded in the survey area during 2021.

Site	Birds recorded inside survey area				Total birds recorded outside survey area
	Woodland birds	Grassland birds	Generalist birds	Total	
Wandewoi BA					
W1	4	2	4	10	4
W2	3	0	0	3	8
W3	6	0	0	6	5
W4	9	0	0	9	5
Avg W	5.5	0.5	1	7	5.5
G1	1	1	2	4	7
G2	4	2	1	7	8
G3	2	1	1	7	12
G4	6	2	1	9	6
Avg G	3.25	1.5	1.25	6	8.5
Mitchelhill BA					
W1	5	0	1	6	2
W2	4	0	0	4	5
W3	4	0	1	5	4
W4	10	0	1	11	3
W5	5	0	1	6	5
W6	12	0	1	13	5
Avg W	6.67	0	0.83	7.5	4
G1	4	0	2	6	6
G2	0	0	1	1	9
G3	5	0	3	8	5
G4	10	0	1	11	5
G5	2	0	3	5	5
Avg G	4.2	0	2	6.2	6
Hook BA					
W1	0	0	0	0	8
W2	0	0	1	1	8
W3	2	0	1	3	4
W4	3	0	0	3	4
Avg W	1.25	0	0.5	1.75	6
G1	5	0	1	6	6
G2	4	0	0	4	4
G3	0	0	0	0	8
G4	4	0	0	4	7
Avg G	3.25	0	0.25	3.5	6.25
Condon View BA					
W1	12	0	0	12	7
W2	4	0	0	4	5
W3	5	0	0	5	7
W4	7	0	0	7	6
W5	9	0	0	9	5
W6	4	0	0	4	6
Avg W	6.83	0	0	6.83	6
G1	4	0	0	4	10
G2	2	0	1	3	15
Avg G	3	0	0.5	3.5	12.5

Table 7.16: Progress towards performance and competition criteria relevant to the conservation objectives.
Red text indicates progress to date.

Conservation value	Key performance indicator	Completion criteria
Bird habitat	Bird usage over 10 years at the offset areas Bird assemblage monitoring completed	Observed increase or maintained species richness and usage by woodland birds over 10 years Bird monitoring completed Bird species richness variable with some sites increasing and others decreasing.
Wandewoi BA		
Swift Parrot habitat	Improve the condition of 175.8 ha of woodland habitats over 10 years. Transition 40 ha of grassland to woodland over 10 years. Condition assessment monitoring completed	Observed and measured increase in condition through monitoring over 10 years in woodland. Observed and measured trajectory towards and/or attainment of the key characteristics of CHVEFW or reference site attributes in DNG over 10 years (measured biennially). Condition assessment monitoring completed 75% of woodland plots and 25% of grassland plots showed an increase in relative condition from 2019 to 2021. Woodland plots W2, W3 and W4 satisfied CHVEFW criteria
Mitchelhill BA		
Swift Parrot habitat	Improved condition of 113 ha of woodland habitat over 10 years. Transition 31.5 ha of disturbed land to CHVEF. Condition assessment monitoring completed	Observed and measured increase in condition through monitoring over 10 years in woodland. Observed and measured trajectory towards and/or attainment of the key characteristics of CHVEFW or reference site attributes in DNG over 10 years. Condition assessment monitoring completed 60% of woodland and grassland plots monitored showed an increase in relative condition from 2019 to 2021 All woodland plots satisfied CHVEFW criteria

<p>Regent Honeyeater habitat</p>	<p>Improved condition of 245 ha of woodland habitat over 10 years. Condition assessment monitoring competed</p>	<p>Observed and measured increase in condition through monitoring over 10 years in woodland. Observed and measured trajectory towards and/or attainment of the key characteristics of CHVEFW or reference site attributes in DNG over 10 years. Condition assessment monitoring completed 60% of woodland and grassland plots monitored showed an increase in relative condition from 2019 to 2021 All woodland plots satisfied CHVEFW criteria</p>
<p>Hook BA</p>		
<p>Swift Parrot habitat</p>	<p>Improved condition of 122 ha of woodland habitats over 10 years Condition assessment monitoring competed</p>	<p>Observed and measured increase in condition through monitoring over 10 years in woodland. Observed and measured trajectory towards and/or attainment of the key characteristics of CHVEFW or reference site attributes in DNG over 10 years (measured biennially). Condition assessment monitoring competed 25% of woodland and 75% of grassland plots monitored showed an increase in relative condition from 2019 to 2021 All woodland plots and grassland plot G1 satisfied CHVEFW criteria</p>
<p>Condon View BA</p>		
<p>Regent Honeyeater habitat</p>	<p>Improved or maintained condition of 168 ha of woodland habitat over 10 years. Condition assessment monitoring competed</p>	<p>Observed and measures increase in or maintained condition through monitoring over 10 years in woodland. Observed and measured trajectory towards and/or attainment of the key characteristics of CHVEFW or reference site attributes in DNG over 10 years. Condition assessment monitoring completed 50% of woodland and grassland plots monitored showed an increase in relative condition from 2019 to 2021</p>

7.1.4 Green and Golden Bell Frog Habitat Assessment

The management plan includes the objectives of habitat monitoring, which are to determine if:

- Breeding habitat structure is maintained within permanent ponds (i.e. aquatic vegetation does not exceed 80% cover within each pond), and
- Movement corridors and foraging habitats are maintained on access tracks and fence boundaries (i.e. tree and shrub saplings are periodically removed to maintain open grassed structure).

Data collected constitutes the third year of data collection for the monitoring program. The three ponds, dispersal corridors and sampling points selected at Crescent Head North and at Crescent Head South during baseline monitoring were returned to in the current monitoring program. However, transect T3 at Crescent Head South was relocated after it was evident from the recently installed boundary fence that the original location of the transect was just outside the boundary of the BA.

Photo monitoring points have been established for each of the locations in accordance with the management plan. Due to the size of this document, the photos have not been included in this report but can be provided on request.

Ponds

The estimated cover of aquatic vegetation for each existing pond and offline pond shown in figures 7.6 and figure 7.7 is in Table 7.17. However, note that Pond 2 and Pond 3 at Crescent Head North were dry during monitoring. During the survey, accumulations of litter were noted floating on the water surface at some ponds. As this reduces the area of open water at each, the cover of litter was also estimated when present.

Table 7.17. Estimated percent cover of aquatic vegetation (and litter) at ponds in the Crescent Head Biodiversity Area

Pond	1 st Qtr	2 nd Qtr	3 rd Qtr	4 th Qtr	Average
Crescent Head North					
Pond 1	4(0)	1(0)	2(0)	3(0)	2.5 (0)
Pond 2	Dry	Dry	Dry	Dry	N/A
Pond 3	Dry	Dry	Dry	Dry	N/A
Offline Pond	0	0	0	0	0
Crescent Head South					
Pond 1	20(20)	25(40)	15(5)	10(5)	17.5(17.5)
Pond 2	40(20)	20(20)	10(5)	20(5)	22.5(12.5)
Pond 3	3(2)	35(10)	25(10)	20(10)	20.75(8)
Offline Pond	0	0	0	0	0

Vegetative cover has decreased at Crescent Head North Pond 1 and Crescent Head South Pond 3 since monitoring commenced in 2018, and has remained relatively constant at Crescent Head South Pond 1 and increased at Crescent Head South Pond 2 over the same period. This excludes Ponds 2 and 3 at Crescent Head North that are predominantly dry.

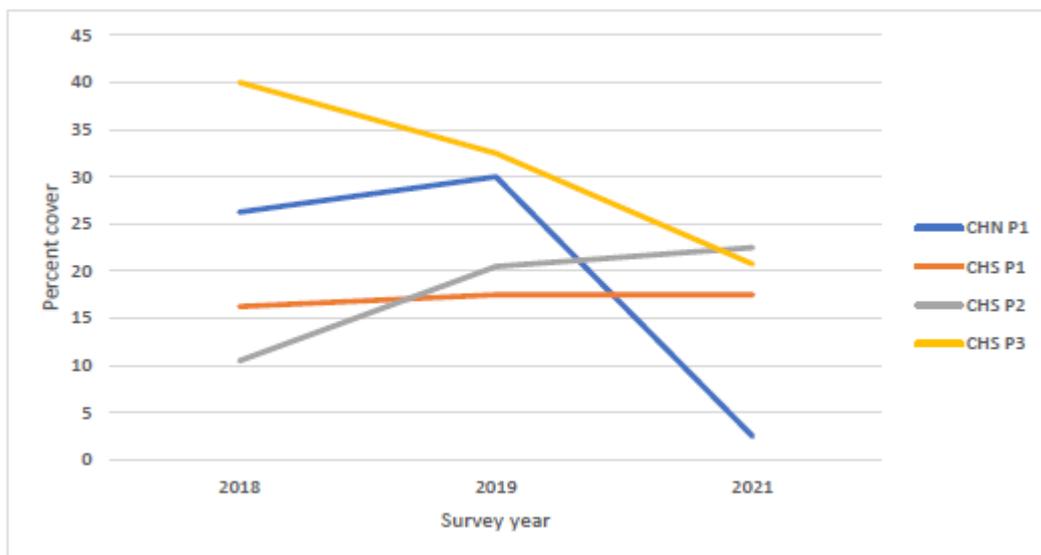


Figure 7.9: Change in the percentage pond vegetation cover over the monitoring period.

Movement Corridors

The survey of plots in movement corridors identified 168 species across the Crescent Head Biodiversity Area, which included 128 native species, 37 exotic species and three unknowns. In accordance with the growth forms in OEH (2017), ten native trees, 29 native shrubs, one exotic tree and three exotic shrubs were recorded in the plots that, left unattended over time, could alter the structure of the movement corridors from grassland to shrubland, woodland or forest. Most of these species were low growing following recent slashing of the movement corridors, and some were overhanging the plot from adjacent vegetation. Periodic slashing is effective at reducing woody biomass along tracks. Most of the vegetation recorded was very low growing (i.e. approx. < 20 cm in height).

The cover of exotic species recorded in plots along dispersal pathways has decreased over time, except for T3 at Crescent Head North. T3 at Crescent Head North is in proximity to grazing land and was likely subject to grazing prior to the establishment of the Biodiversity Area. It is likely that the cover of pasture weeds and native species will fluctuate with varying climatic conditions. T3 at Crescent Head South has recorded no weeds in the last 2 monitoring periods.

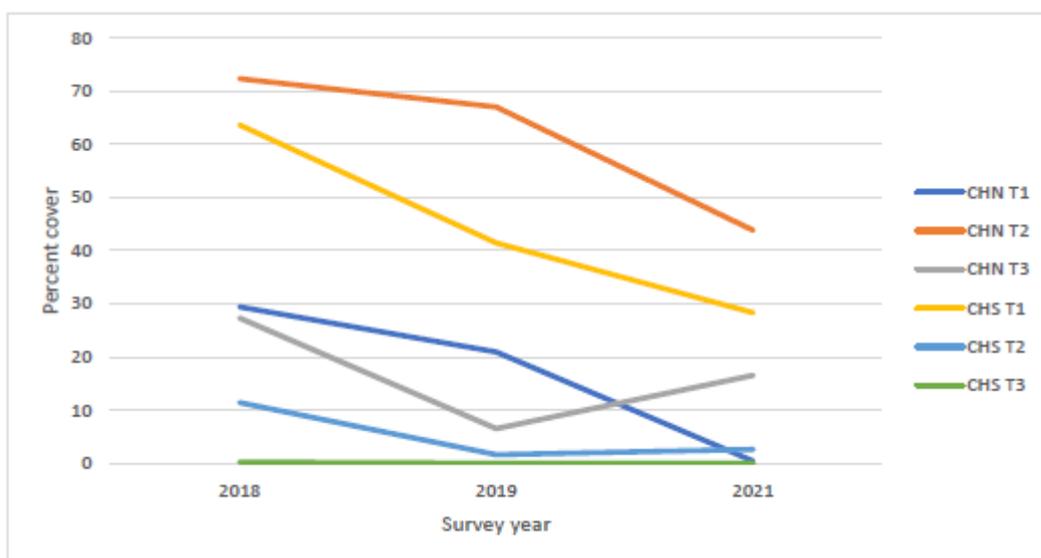


Figure 7.10: Change in the cover of exotic flora species in plots along dispersal corridors over time.

Water has only been observed in Pond 3 at Crescent Head North in autumn 2021 and baseline data is yet to be collected. While this habitat has the potential to provide useful ephemeral habitat, it appears to require significant rainfall events to fill.

While the vegetative cover decreased in 2021, there is a general stability in species composition and water security during the monitoring period. While Ponds 2 and 3 at Crescent Head North are predominantly dry, the remaining ponds always contain water and a vegetative cover. While the region experienced relatively good rainfall, GGBF have now been recorded at Crescent Head North or in the vicinity in the last few years. Tadpoles have yet to be identified at Crescent Head North which may reflect that the site is used as a refuge rather than a breeding site.

Habitat at both Crescent Head North and South appears to be relatively stable. Vegetative cover and species composition fluctuates to a minor extent as seasons vary. This is likely to provide a reliable water source to a range of amphibians. Permanent water is not ideal breeding habitat for the GGBF, but ephemeral pools in the offset areas may provide potential breeding habitat. Green and Golden Bell Frog tadpoles have not been recorded the biodiversity areas.

Tracks and dispersal pathways have been subject to ongoing management. While woody vegetation is present, it predominantly occurs as regrowth or resprouting vegetation. The heath communities adjacent to Limeburners National Park have a high abundance of woody regrowth, given the nature of the vegetation type. Ongoing maintenance (slashing) has been successful in maintaining the open nature of these corridors and avoid them from becoming shaded and closed. The GGBF has been recorded in vegetation adjacent to the track that leads into Crescent Head North. This area also contained several ponds and hence provides a dual benefit of a dispersal pathway and refuge habitat.

The cover of exotic vegetation has decreased over time in plots situated along dispersal pathways, except for Plot T3 at Crescent Head North.

The offline ponds installed lack any vegetative cover; given the lack of an earth substrate, only floating aquatic vegetation has the potential to occur in the short term. Despite this, the offline ponds were observed to be used by the GGBF at Crescent Head North, and other frogs at Crescent Head South. These structures will be maintained to determine their long term value.

All ponds that contained water had extensive areas of open water which is preferred by GGBF.

The management plan provides key performance criteria and completion criteria related to the conservations objectives as well as criteria related to specific conservation management actions. The criteria relevant to this habitat assessment are addressed below.

Table 7.18. Progress towards performance and completion criteria for habitat values.

Habitat value	Key performance indicator	Completion criteria
Green and Golden Bell Frog habitat	Improved condition of 189.5 ha of Green and Golden Bell Frog habitat over 10 years Pond condition has remained relatively stable over time. 2021 observed a decrease in vegetative cover on Pond 1 Crescent Head North and Ponds 1, 2 and 3 at Crescent Head South. There was no vegetative cover on the offline ponds.	Observed and measured increase in or maintained condition through monitoring over 10 years Data suggests that the condition of ponds was maintained during the survey period
Existing breeding habitat	Reduction in the Mosquito Fish population in the ponds where control methods are possible Refer to the Mosquito Fish and Green and Golden Bell Frog monitoring report	Mosquito Fish control trials are completed and their success is evaluated by analysis of monitoring results Refer to the Mosquito Fish and Green and Golden Bell Frog monitoring report
Supplementary breeding habitat	Provision of suitable supplementary breeding habitat Offline ponds have been installed at Crescent Head North and South. Green and Golden Bell Frog have been observed at the offline pond at Crescent Head North.	Offline ponds are designed with consideration of breeding habitat principles outlined in <i>Best Practice Guidelines for Green and Golden Bell Frog Habitat</i> (DECC 2008). Offline ponds have been installed at Crescent Head North and South
Foraging habitat	Maintenance of existing foraging habitat quality Foraging habitat has been maintained at Crescent Head Biodiversity Areas	Foraging habitat is managed with consideration of the principles outlined in <i>Best Practice Guidelines for Green and Golden Bell Frog Habitat</i> (DECC 2008) Habitat has been managed consistent with the guidelines. This includes weed control and monitoring
Habitat connectivity	Maintenance of connectivity between GGBF habitat components Dispersal pathways have been maintained to reduce the cover and height of woody vegetation and other vegetation at Crescent Head North and South	Open vegetation structure is maintained on existing tracks and fence lines Maintained during the monitoring period

Table 7.19. Progress towards performance and completion criteria for managing vegetation in GGBF habitat

Performance criteria	Year 1 to Year 10	Completion criteria
Management of regrowth and remnant vegetation		
Maintenance of aquatic vegetation (i.e. breeding habitat structure in ponds) <i>All ponds have >20% open water or were dry</i>	Complete annual inspection and manage aquatic vegetation such that 20% of open water is maintained in permanent ponds <i>Monitoring survey complete. All ponds have >20% open water or were dry.</i>	Annual inspection and aquatic vegetation maintenance are completed <i>Monitoring completed. Continue to monitor vegetation cover.</i>
Maintenance of movement corridors (i.e. existing open grassed areas along access tracks and lot boundaries). <i>Maintenance of movement corridors undertaken. Ongoing maintenance of movement corridors required where woody plants have resprouted.</i>	Complete annual inspection and remove tree and shrub saplings as necessary. <i>Monitoring survey complete. Groundcover maintenance completed as required in 2021. Note that saplings and regrowth have cut rather than removed.</i>	Annual inspection and groundcover maintenance are completed. <i>Monitoring and ground cover maintenance completed as required in 2021. Ongoing annual inspection and groundcover maintenance required.</i>
Weed control		
Control weeds to maintain a suitable habitat structure in breeding, foraging and dispersal habitat. <i>Weed control has included slashing tracks and the removal of weed species from across the northern and southern BA. The main species targeted include: Bitou bush, <i>Chrysanthemoides monilifera subsp rotundata</i> Groundsel bush, <i>Baccharis halimifolia</i> Lantana, <i>Lantana camara</i> Mickey Mouse plant, <i>Ochna serrulata</i> and Small leaf privet, <i>Ligustrum sinense</i>.</i>	Complete weed assessments during habitat monitoring and property inspections. <i>Annual habitat monitoring completed which recorded 38 exotic species.</i>	Habitat monitoring data indicates a trajectory for reduction in cover over three consecutive assessments. <i>Third year of monitoring completed. Most plots situated along dispersal pathways recorded a reduction in weed cover over 3 monitoring periods, except for T3 at Crescent Head North. T3 at Crescent Head South recorded no weeds in the last two monitoring suveys</i>
Bushfire management		
Prepare and implement a bushfire management plan. <i>The draft bushfire management plan for the BA has been prepared and will be submitted to the Rural Fire Brigade for approval in 2022.</i>	Complete habitat monitoring and property inspections. <i>Annual habitat monitoring completed.</i>	Habitat monitoring and property inspections have been conducted annually. <i>Third year of monitoring completed. Property inspections undertaken regularly as indicated in Table 7.1.</i>

7.1.5 Green and Golden Bell Frog Surveys

The frequency at which GGBF are monitored is set out in the draft management plan. During the third year of monitoring (which extends from spring 2020 to autumn 2021) there was no scheduled monitoring of the GGBF at the Crescent Head BAs. February 2021 experienced very high rainfall, which created ideal conditions for frog surveys. As such, one night of survey was included in the monitoring schedule targeting GGBF. As the GGBF has previously been recorded at Crescent Head North (and reported in previous compliance reports), the GGBF survey was only performed at Crescent Head South, where no sightings of GGBF have been recorded as part of the monitoring programme.

The rainfall leading up to the survey and other weather conditions were monitored closely so that the survey could be conducted during optimal weather conditions and within the survey period as outlined in DEWHA (2010).

The survey methods used to detect GGBF were call detection, call playback, call imitation, spotlighting of banks and emergent vegetation and dip-netting for tadpoles (as part of Mosquito Fish monitoring).

Offline ponds were installed at Crescent Head North and Crescent Head South shortly before the October 2020 monitoring period. During October, no life forms were recorded in either offline pond. However, during March 2021, macroinvertebrates and hundreds of recently hatched tadpoles (evidenced by the presence of small egg sacks on each tadpole) that were too small to identify, were present in both offline ponds. The offline pond at Crescent Head South also had very high numbers of recently hatched tadpoles and macroinvertebrates present indicating that the offline ponds are providing suitable habitat for various frog species.

Whilst performing surveys for *Gambusia holbrooki* (Mosquito Fish) at Crescent Head North, one mature GGBF was observed on the edge of the Offline Pond. No further GGBF were located at either Crescent Head North or South. No GGBF were recorded at Crescent Head South during the March 2021 nocturnal target surveys. The species of frog recorded at Crescent Head South can be seen in Table 6.7. Few frogs were recorded in the ponds, with most frogs being heard in overland flow in proximity to the ponds.

The reference site near Ryan's Cut contained large amounts of water and was in good condition. Night survey was not conducted here as was done in the previous year of monitoring (Ecoplanning 2020).

The preliminary results of the fourth year of monitoring that occurs from Sept 2021 to March 2022 is presented in the table below, but will be discussed in full in the next compliance report.



Figure 7.11: GGBF recorded on the constructed offline pond at Crescent Head North in March 2021.

Table 7.20 Frog species recorded during the GGBF monitoring surveys.

Scientific name	Common name	Crescent Head North								
		Pond 1			Pond 2			Pond 3		
		Oct-18	Mar-19	Oct-21	Oct-18	Mar-19 ¹	Oct-21 ¹	Oct-18	Mar-19 ¹	Oct-21 ¹
<i>Crinia signifera</i>	Common Eastern Froglet							X+		
<i>Crinia tinnula</i>	Wallum Froglet							X		
<i>Limnodynastes dumerilii</i>	Eastern Banjo Frog									
<i>Limnodynastes peronii</i>	Striped Marsh Frog	X		X	X			X+		
<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog									
<i>Litoria aurea</i>	Green and Golden Bell Frog		2	X						
<i>Litoria dentata</i>	Bleating Tree Frog							+		
<i>Litoria caerulea</i>	Green Tree Frog			X						
<i>Litoria fallax</i>	Eastern Dwarf Tree Frog	X	X	X				X		
<i>Litoria gracilentata</i>	Dainty Green Tree Frog									
<i>Litoria latopalmata</i>	Boad-palmed Rocket Frog				S			X		
<i>Litoria nasuta</i>	Striped Rocket Frog		X							
<i>Litoria peronii</i>	Brown Tree Frog	X+								
<i>Litoria tyleri</i>	Tyler's Tree Frog							X		
<i>Uperoleia fusca</i>	Dusky Toadlet				X			X		
<i>Uperoleia laevigata</i>	Smooth Toadlet			X						

Note: X = recorded (heard and/or observed), S = captured with sweep net, + = denotes species heard calling at a distance from the monitoring pond, ¹ = denotes dry ephemeral pond/swamp at time of survey.

Scientific name	Common name	Crescent Head South														
		Pond 1					Pond 2					Pond 3				
		Oct-18	Mar-19	Feb-20	Oct-21	Nov-21	Oct-18	Mar-19	Feb-20	Oct-21	Nov-21	Oct-18	Mar-19	Feb-20	Oct-21	Nov-21
<i>Crinia signifera</i>	Common Eastern Froglet			X+											X+	
<i>Crinia tinnula</i>	Wallum Froglet														X	
<i>Limnodynastes dumerilii</i>	Eastern Banjo Frog				X										X	
<i>Limnodynastes peronii</i>	Striped Marsh Frog	X		X+	X						X+	X	X+	X	X+	
<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog	X+														
<i>Litoria aurea</i>	Green and Golden Bell Frog															
<i>Litoria dentata</i>	Bleating Tree Frog				X	X+										
<i>Litoria caerulea</i>	Green Tree Frog			X+	X+			X+								
<i>Litoria fallax</i>	Eastern Dwarf Tree Frog	X	X,S	X+	X	X+	X	X		X	X	X		X	X	
<i>Litoria gracilentata</i>	Dainty Green Tree Frog			X+	X	X+				X	X				XX	
<i>Litoria latopalmata</i>	Boad-palmed Rocket Frog											X+				
<i>Litoria nasuta</i>	Striped Rocket Frog	X		X+	X	X				X	X			X+	X	
<i>Litoria peronii</i>	Brown Tree Frog				X	X+				X					X	
<i>Litoria tyleri</i>	Tyler's Tree Frog													X		
<i>Uperoleia fusca</i>	Dusky Toadlet			X+		X+				X+				X+		
<i>Uperoleia laevigata</i>	Smooth Toadlet									X						

Note: X = recorded (heard and/or observed), S = captured with sweep net, + = denotes species heard calling at a distance from the monitoring pond, ₁ = denotes dry ephemeral pond/swamp at time of survey.

Scientific name	Common name	North Offline Pond		South Offline Pond	
		Oct 20	Mar 21	Oct 20	Mar 21
<i>Litoria aurea</i>	Green and Golden Bell Frog		X		

Note: X = recorded (heard and/or observed).

7.1.6 Mosquito Fish Monitoring

This section documents Mosquito Fish monitoring for the Crescent Head Biodiversity Area over the 2021 monitoring period (which extends from spring 2021 to autumn 2022). This is the fourth year that monitoring of the mosquito fish within the ponds has occurred. Three inground ponds are being monitored at both sites along with the constructed pond at each site. This data has been compared to baseline information from monitoring in 2018 and previous data collected in 2019/20 and 2020/21.

Prior to the spring 2021, Mosquito Fish surveys were undertaken biannually (in spring and autumn), with a single survey being undertaken during each sampling period. However, from spring 2021, survey will be conducted annually, with a single survey undertaken.

All ponds contained water during the survey, except for Pond 3 at Crescent Head North in the October 2020 survey. The survey period of March 2021 was the first instance Pond 3 at Crescent Head North has held water since commencement of these surveys.

The offline ponds at both sites did not contain any fish species.

Mosquito Fish were detected at Crescent Head North at Pond 1 and at all ponds at Crescent Head South. The numbers of Mosquito Fish have changed considerably across four samples in year 1, 2 and 3 yet the factors that affect these changes have not been identified in the literature (MDBA 2011). The complete drying of a pond is likely to be the most effective method of removing the species from a pond without applying chemicals. Pond 1 at Crescent Head North is fed by groundwater, so the use of a periodic drying cycle to remove the Mosquito Fish is unlikely to be achievable.

Mosquito Fish were present in all ponds that were sampled with water in them except for Ponds 2 and 3 at Crescent Head North in March 2021. Mosquito Fish abundance increased at all ponds except for Pond 1 at Crescent Head South. Mosquito Fish abundance peaked at Pond 1 at Crescent Head South in October 2020 (1,743 individuals) but decreased in March 2021 (282 individuals) (Table 7.21). It is possible that a higher number of fish were caught at this pond in October 2020 because dissolved oxygen levels in the water column were low resulting in a higher number of fish close to the surface where oxygen levels are generally higher (Pyke 2005).

The abundance of Mosquito Fish shifts markedly between seasons and years with similar survey effort. While this phenomenon is acknowledged in the literature, the factors that affect change in abundance remain poorly understood (MDBA 2011).

There are native fish present that may also have an effect on tadpole survival. The native species Firetail Gudgeon, recorded at all Ponds apart from Ponds 2 and 3 at Crescent Head North, is a known predator of GGBF tadpoles (Pyke and White 2000). Another species, the Striped Gudgeon, is known to predate on Mosquito Fish and other invertebrates, but it is not known if it predate on tadpoles. Striped Gudgeon was not recorded during the October 2020 to March 2021 survey period but has previously been found at both Pond 1 and Pond 2 at Crescent Head South. Numbers of these species are relatively low but will be monitored over the survey period.

Monitoring in accordance with the current program in the management plan will continue. The management actions will be flexible enough to adapt to new findings as monitoring and management is undertaken. Changes in species composition following any control measure will be closely evaluated to better inform future active management of Mosquito Fish.

Given the presence of native fish within the ponds, draining of the ponds to rid the Mosquito Fish may present a challenge to regulators. This will be investigated in 2022 along with potential alternate options to provide breeding and forage habitat for GGBF tadpoles within the existing standing water resources.

The management plan provides key performance criteria and completion criteria related to the conservation objectives as well as criteria related to specific conservation management actions. The criteria relevant to Mosquito Fish monitoring are addressed in Table 7.22 and Table 7.23 for the conservation objectives and specific management actions, respectively.

Table 7.21. Cumulative Mosquito Fish Results from the monitoring to date.

Scientific name	Common name	Crescent Head North																				
		Pond 1							Pond 2							Pond 3						
		Oct 18	Mar 19	Oct 19	Feb 20	Oct 20	Mar 21	Oct 21	Oct 18	Mar 19 ¹	Oct 19 ¹	Feb 20	Oct 20	Mar 21	Oct 21	Oct 18 ¹	Mar 19 ¹	Oct 19 ¹	Feb 20 ¹	Oct 20 ¹	Mar 21	Oct 21
<i>Gambusia holbrooki</i>	Mosquito Fish	10	67	97	261	304	491	166	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Gobiomorphus australis</i>	Striped Gudgeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Gobiomorphus coxii</i>	Cox's Gudgeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hypseleotris galii</i>	Firetail Gudgeon	-	108	18	17	-	12	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hypseleotris compressa</i>	Empire Gudgeon	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Paratya sp.</i>	Freshwater Shrimp	P	-	P	P	P	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixed	Tadpole	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Crustaceans	-	-	-	-	P	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-

¹ = denotes dry ephemeral pond/swamp at time of survey, P = present

Scientific name	Common name	Crescent Head South																				
		Pond 1							Pond 2							Pond 3						
		Oct 18	Mar 19	Oct 19	Feb 20	Oct 20	Mar 21	Oct 21	Oct 18	Mar 19 ¹	Oct 19 ¹	Feb 20	Oct 20	Mar 21	Oct 21	Oct 18 ¹	Mar 19 ¹	Oct 19 ¹	Feb 20 ¹	Oct 20 ¹	Mar 21	Oct 21
<i>Gambusia holbrooki</i>	Mosquito Fish	43	30	69	315	1743	282	120	25	36	129	67	101	245	56	24	49	48	30	167	300	217
<i>Gobiomorphus australis</i>	Striped Gudgeon	-	1	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
<i>Gobiomorphus coxii</i>	Cox's Gudgeon	1	-	-	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hypseleotris galii</i>	Firetail Gudgeon	3	19	7	3	1	-	9	5	4	3	1	4	9	18	-	2	1	-	1	-	-
<i>Paratya sp.</i>	Freshwater Shrimp	P	-	P	P	P	-	P	P	-	P	P	-	P	P	P	-	-	-	-	-	-
Mixed	Tadpole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = incidental record, P = present

Scientific name	Common name	Crescent Head North Offline Pond	Crescent Head South Offline Pond	Crescent Head South Offline Pond
		Oct 21	Oct 21	Nov 21
<i>Gambusia holbrooki</i>	Mosquito Fish	-	-	-
<i>Litoria aurea</i>	Green and Golden Bell Frog	-	-	-
Mixed	Tadpole	-	-	-

Table 7.22. Progress towards performance and completion criteria relevant to the conservation objectives.

Habitat value	Key performance indicator	Completion criteria
Existing breeding habitat	Reduction in the Mosquito Fish population in the ponds where control methods are possible. No substantial change to Mosquito Fish populations at Pond 1 at Crescent Head North and Ponds 1 to 3 at Crescent Head South	Mosquito Fish control trials are completed and their success is evaluated by analysis of monitoring results Not yet commenced

Table 7.23. Progress towards performance and completion criteria relevant to pond management.

Performance criteria	Year 1 to year 10	Completion criteria
Pond management		
Offline ponds	Complete drainage survey. Prepare plan for construction. Construct ponds and water capture to fill ponds. Review success. Drainage survey completed, construction of ponds completed GGBF detected at the offline pond at Crescent Head North.	Drainage survey completed. Ponds have been constructed in accordance with design. Ponds constructed at Crescent Head North and South
Pond A to F	Complete drainage survey. Prepare plan for pond refurbishment. Implement plan. Conduct Mosquito Fish control. Review success. Drainage survey completed, refurbishment not yet commenced	Drainage survey completed. Ponds refurbished in accordance with plan. Mosquito Fish control completed in suitable ponds in accordance with approved methods. Not yet commenced
Monitoring	Monitor number of Mosquito Fish following initial control. Monitor for the presences of Green and Golden Bell Frogs. Follow-up monitoring and control of Mosquito Fish. Monitor for the presence of Green and Golden Bell Frogs. Monitoring completed as required in 2021	Mosquito Fish numbers have declined in Pond A to F where suitable. Mosquito Fish are absent from offline ponds. Suitable frog habitat has been established within managed areas. Fourth monitoring period completed for all permanent ponds Mosquito fish populations consistently present in Pond 1 at Crescent Head North and Ponds 1- 3 at Crescent Head South. Offline ponds have been created and Mosquito Fish have not been recorded in these ponds.

8 Vegetation Clearance Plan

The Vegetation Clearance Plan (VCP) was implemented following the Minister’s approval of the Plan on 24 October 2016. The VCP provides for the effective implementation of measures to manage CHVEF, Regent Honeyeater, Swift Parrot and Green and Golden Bell Frog during the vegetation clearance for the approved action and was prepared to meet conditions 1, 2, 21 and 22 of EPBC 2016-7640.

Condition 1 of EPBC 2016/7640 states that HVO must not clear more than 54.4 ha of CHVEF from within the Riverview Pit EPBC boundary and 6.6 ha of CHVEF from within the West Pit EPBC boundary.

HVO has, in total, cleared 37.5 ha of CHVEF from Riverview Pit and 5.7 ha of CHVEF from West Pit. All vegetation clearing was restricted to within the State and Commonwealth approved project boundaries.

The VCP is initially managed through HVO’s Ground Disturbance Permit process whereby pre-clearance checks and conditions are applied prior to any disturbance or on-ground works. Conditional approvals are applied to each permit which include specific requirements to comply with the surveys and processes outlined in the VCP.

No surveys have recorded the Regent Honeyeater, Swift Parrot or the Green and Golden Bell Frog (adults, metamorphs or tadpoles) as residing or traversing across the EPBC area since the approval was obtained.

More details are outlined in the compliance table in Section 2.

9 Fauna Captured on Camera



Figure 9.1. Pack of five wild dogs photographed during the Spring Vertebrate Pest Baiting program at the Hook BA.



Figure 9.2. A fox photographed during the baiting program at the Hook BA.



Figure 9.3. Short-beaked echidna, *Tachyglossus aculeatus*, at the Condon View BA.



Figure 9.4. Lace monitor, *Varanus varius*, taking the replacement meat bait at Mitchelhill West BA.



Figure 9.5. Spotted quail thrush, *Cinlosoma punctatum*, at the Condon View BA.



Figure 9.6: Long nosed bandicoot, *Perameles nasuta*, at the Mitchelhill East BA.

10 References

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Appendix A - Residual Impact: Green and Gold Bell Frog Habitat Mapping Project Report



Enhua Lee
Conservation Assessment Officer
Department of Planning, Industry and Environment
4 Parramatta Square, 12 Darcy Street
Parramatta NSW 2150
Supplied by email

30 August 2021

Re: Green and Golden Bell Frog Habitat Mapping, Crescent Head, NSW

Dear Enhua,

Ecoplanning Pty Ltd (Ecoplanning) was commissioned by the NSW Department of Planning, Industry and Environment (DPIE) to conduct desktop mapping to identify key habitat areas of the Green and Golden Bell Frog (GGBF) in an area north of Crescent Head. The study area is approximately 43,000 ha in size (Figure 1). It stretches between South West Rocks in the north and Crescent Head in the south, and is bound by the coast in the east, and the Macleay River in the west. The project aims to produce a single GGBF habitat mapping layer that identifies the extent of important habitat and can be used to inform management actions and strategic planning in the area.

Ecoplanning created the habitat mapping layer based on existing spatial information (e.g. fine-scale wetland, native vegetation, and stream mapping), by considering known GGBF presence at wetlands from NSW Government monitoring, and by applying factors known to influence GGBF occupancy at wetlands (i.e. connectivity to other wetlands supporting GGBF, and the extent and availability of ephemeral wetlands near permanent wetlands). A subjective scoring system was used to signify the relative importance or influence of individual spatial inputs or considerations.

Details of the spatial layers, the score-based system used to create the GGBF habitat map, and the resulting habitat map are provided below.



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Input datasets

Input datasets were either sourced directly from DPIE or are available for public download.

A list of layers used in the creation of the GGBF habitat layer is provided in **Table 1**.

Table 1: List of input datasets

Data Input	Source	Data definitions used
Fine-scale wetland mapping	North Coast Aerial Mapping (NCAM) 2020. <i>Green and Golden Bell Frog Wetland Mapping at the Crescent Head Study Area</i> . Supplied by DPIE.	
SOS monitored wetlands	Supplied by DPIE.	
GGBF BioNet Atlas records	Downloaded from the BioNet Atlas of NSW Wildlife (DPIE 2021) (http://www.bionet.nsw.gov.au/)	Records since January 2001 to January 2021
Roads	The NSW Digital Topographic Database (DTDB), downloaded from (https://maps.six.nsw.gov.au/clipnship.html)	Road = 'PrimaryRoad', 'ArterialRoad', 'SubArterialRoad' and 'LocalRoad'
Vegetation	Supplied by DPIE.	High quality wetland vegetation = 'Freshwater Wetlands'
		Other wetland/floodplain influenced vegetation = 'Forested Wetlands', 'Saline Wetlands'
		Other native vegetation = 'Dry Sclerophyll Forests', 'Wet Sclerophyll Forests', 'Heathlands', 'Grasslands', 'Rainforests'
		Cleared = 'Not native vegetation'
Landuse	NSW Landuse 2013 download from Sharing and Enabling Environmental Data (SEED) in NSW (https://datasets.seed.nsw.gov.au/dataset/nsw-landuse-2013)	Permeable surfaces = Conservation and Natural Environments, Production from Relatively Natural Environments, Production from Agriculture and Plantations, Marsh/wetland.
		Impermeable surfaces = Intensive Uses (including Shed and yards, Buildings/infrastructure, Urban residential) and Water (excluding Marsh/wetland).
Creeks	The NSW Digital Topographic Database (DTDB), downloaded from (https://maps.six.nsw.gov.au/clipnship.html)	Assigned a category based on Strahler Stream Order (1,2,3 or 4+). Canals assigned a Strahler or of 4+.

Scoring system

Scores were assigned to each input layer subjectively to reflect different levels of importance of categories within the layers (Table 2). Higher scores were assigned to categories that were considered to have higher importance to GGBF. Categories referring to 'wetlands' used the fine-scale wetland mapping supplied by DPIE.

Two versions of the scoring system were created. Version 1 used the proximity and connectivity of habitat to known locations (Input layers 1 and 2 in Table 2), to inform the matrix. Version 2 excluded these layers to investigate the distribution of potential habitat and other abiotic factors, rather than important habitat.



Table 2: Scoring system for data input layers

Input Layer	Data Input Description	Category	Score V1	Score V2
1	Proximity to known GGBF locations Known GGBF presence at wetlands from Saving Our Species (SoS) monitoring surveys (buffered by 100 m) OR Known locations of GGBF from Atlas Records (buffered by 100 m)	Freshwater wetlands within 100 m of occupied wetlands/ Freshwater wetlands within 100 m of a BioNet Atlas record since 2016 (0-5 years)	8	N/A
		Freshwater wetlands within 100 m of a BioNet Atlas record between 2011 and 2015 (6-10 years)	6	
		Freshwater wetlands within 100 m of a BioNet Atlas record between 2001 and 2010 (11-20 years)	4	
		Unmonitored freshwater wetlands/ Freshwater wetlands without BioNet Atlas records in last 20 years	2	
		Unoccupied freshwater wetlands	1	
		Any other areas (including saltwater wetlands)	0	
2	Connectivity to known GGBF locations Known GGBF presence at wetlands from SoS monitoring surveys OR Known locations of GGBF from BioNet Atlas records	Freshwater wetlands within 1 km of occupied wetlands/ Freshwater wetlands with 1 km of a BioNet Atlas record since 2001	6	N/A
		Freshwater wetlands within 1.5 km of occupied wetlands/ Freshwater wetlands with 1.5 km of a BioNet Atlas record since 2001	4	
		Any other areas (including saltwater wetlands)	0	
3	Ephemeral wetlands near permanent, freshwater wetlands	Ephemeral, freshwater wetlands within 1 km of permanent, freshwater wetlands	5	
		Ephemeral, freshwater wetlands within 1.5 km of permanent, freshwater wetlands	4	
		Other ephemeral, freshwater wetlands	3	
		Any other areas (including permanent, freshwater wetlands and saltwater wetlands)	0	

Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

Input Layer	Data Input Description	Category	Score V1	Score V2
4	Extent of wetland habitat* (% cover) within 1 km of permanent, freshwater wetlands	Wetland habitat forms >75% cover	6	
		Wetland habitat forms 50-75% cover	4	
		Wetland habitat forms 25-50% cover	3	
		Wetland habitat forms >0-25% cover	1	
		Any other areas	0	
5	Habitat connectivity Proximity to roads	High (roads are >1 km away)	2	
		Moderate (there are roads between 0.1 and 1 km)	1	
		Low (there are roads between 0 and 0.1 km)	0	
6	Habitat connectivity Vegetation type	High quality wetland vegetation e.g. freshwater wetland	4	
		Intact riparian, mangrove, saltmarsh, or floodplain-influenced vegetation	3	
		Other native vegetation	2	
		Cleared	0	
7	Habitat connectivity Land use	Agricultural or forested land (permeable surface)	1	
		Urban areas/impermeable surfaces/roads	0	
8	Creeks and tributaries	First and second order Strahler streams (100 m buffer)	3	
		Third order Strahler streams (75 m buffer)	2	
		Fourth order and greater Strahler streams (50 m buffer) and canals	1	
		All other areas	0	

* Wetland habitat includes ephemeral and permanent freshwater wetlands



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Method and results

Using the scoring systems presented in **Table 2**, the features in each input layer were tagged with their corresponding category and score. The input layers were then 'unioned' into a single habitat layer (one for each Version) and the individual scores for each input summed to produce an overall score signifying the relative importance of habitat.

The final scores for Version 1 ranged from 0 to 32, where the higher the value, the greater the importance to GGBF (**Figure 2**). The scores for Version 2 ranged from 0 to 21 (**Figure 3**), where higher values identified habitat of greater potential habitat suitability for GGBF. The fine-scale wetland mapping (NCAM 2020) and BioNet Atlas records (DPIE 2021) are displayed in **Figure 4** and **Figure 5** respectively. Maps of each input layer are also provided (**Figure 6** to **Figure 13**).

Limitations

The GGBF habitat layer has been created via a desktop process. No field validation has been undertaken apart from those performed during the creation of the SoS monitored wetlands layer.

Independent monitoring by Ecoplanning and knowledge of GGBF and its habitat in the vicinity of Crescent Head affirmed the scoring of habitat in version 1. However, while version 2 did not score highly some areas where GGBF are known to occur, it may prove to be a useful tool in targeting areas worthy of further investigation.

Decision makers and managers should be conscious of the maps limitations when using the GGBF habitat layer.

Please contact me if you would like to discuss anything further.

Yours sincerely,

Jo Daly

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BEnvSc (Hons)
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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

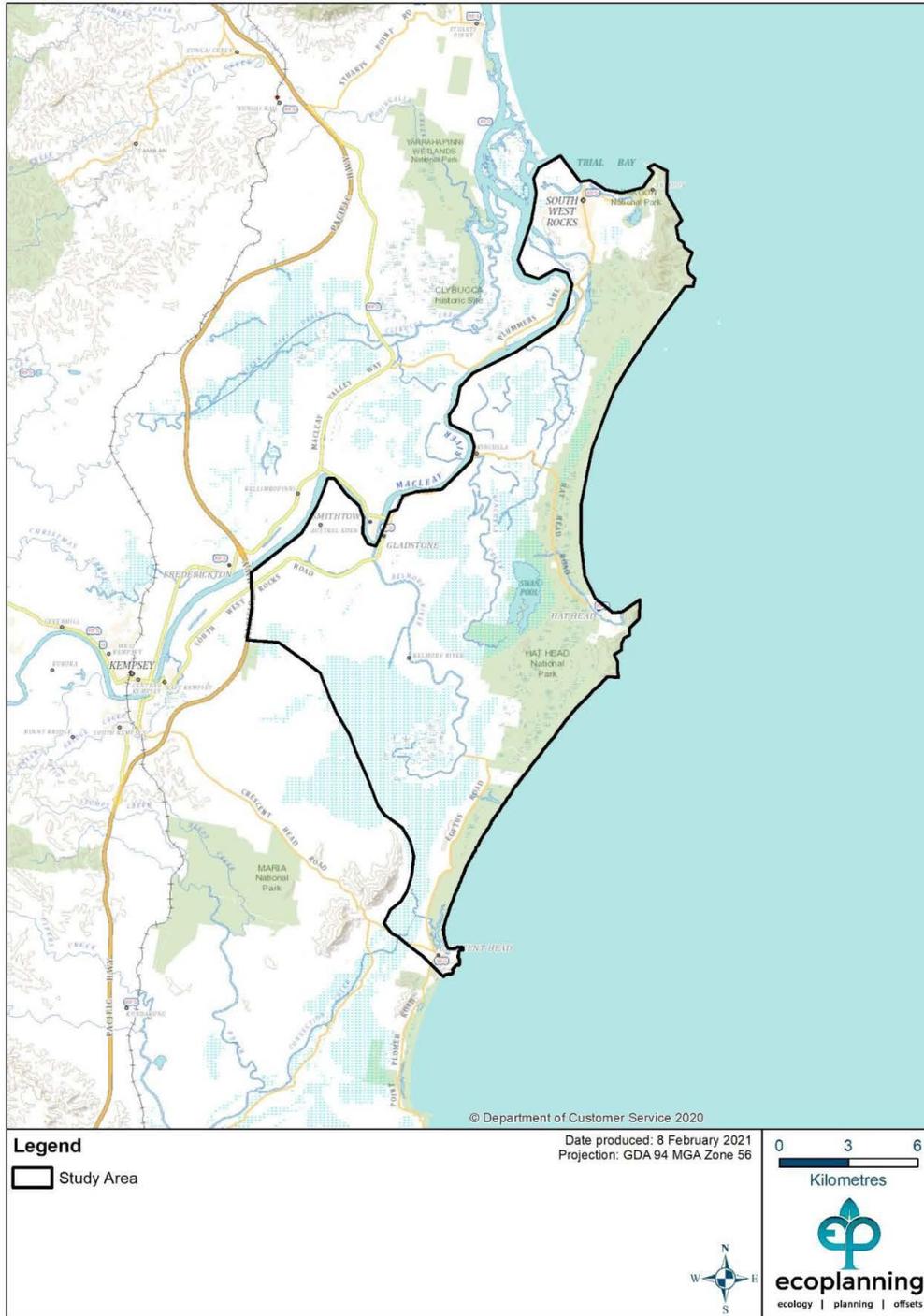


Figure 1: The Study Area



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

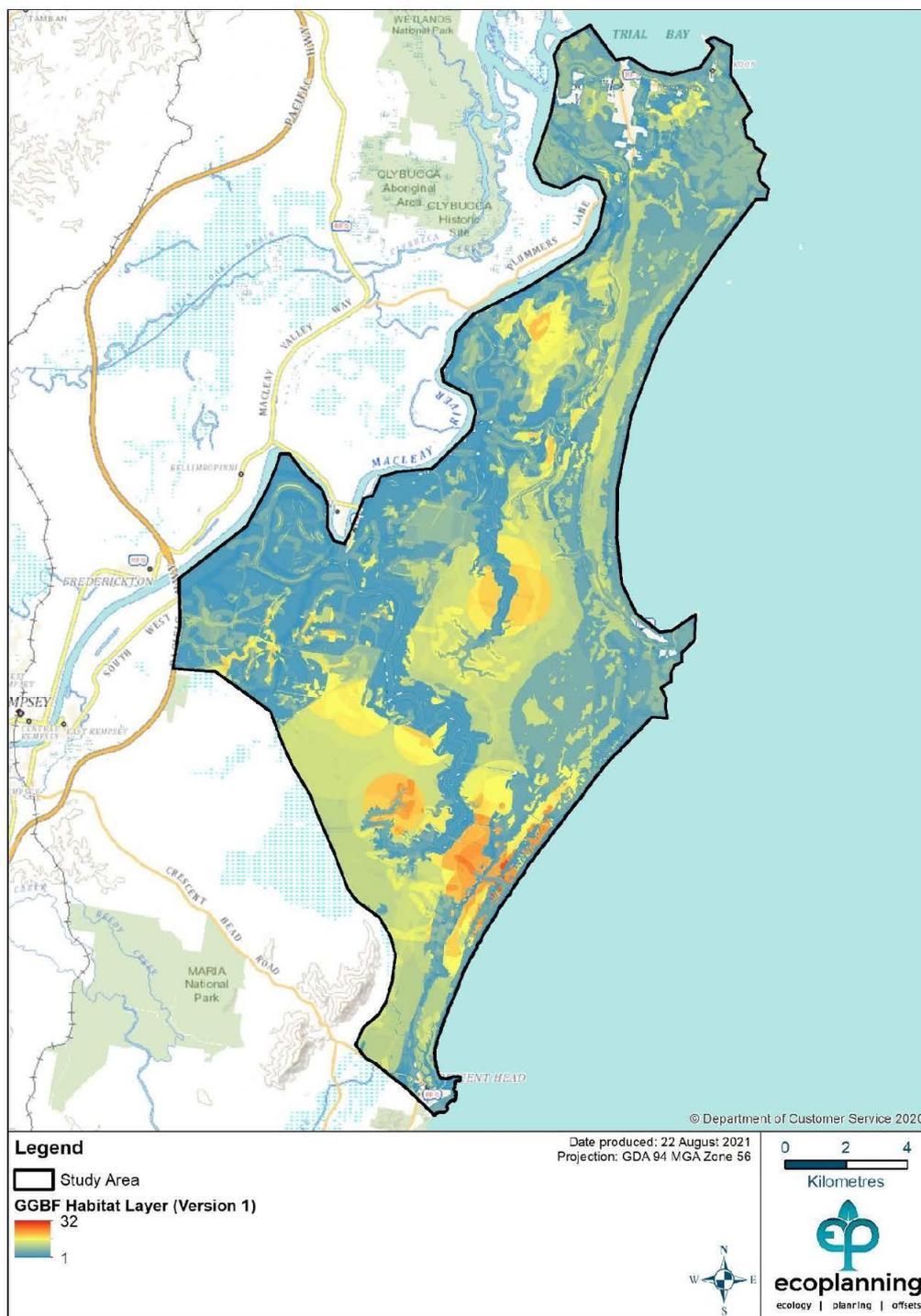


Figure 2: Green and Golden Bell Frog habitat layer (Version 1 – Important habitat)



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

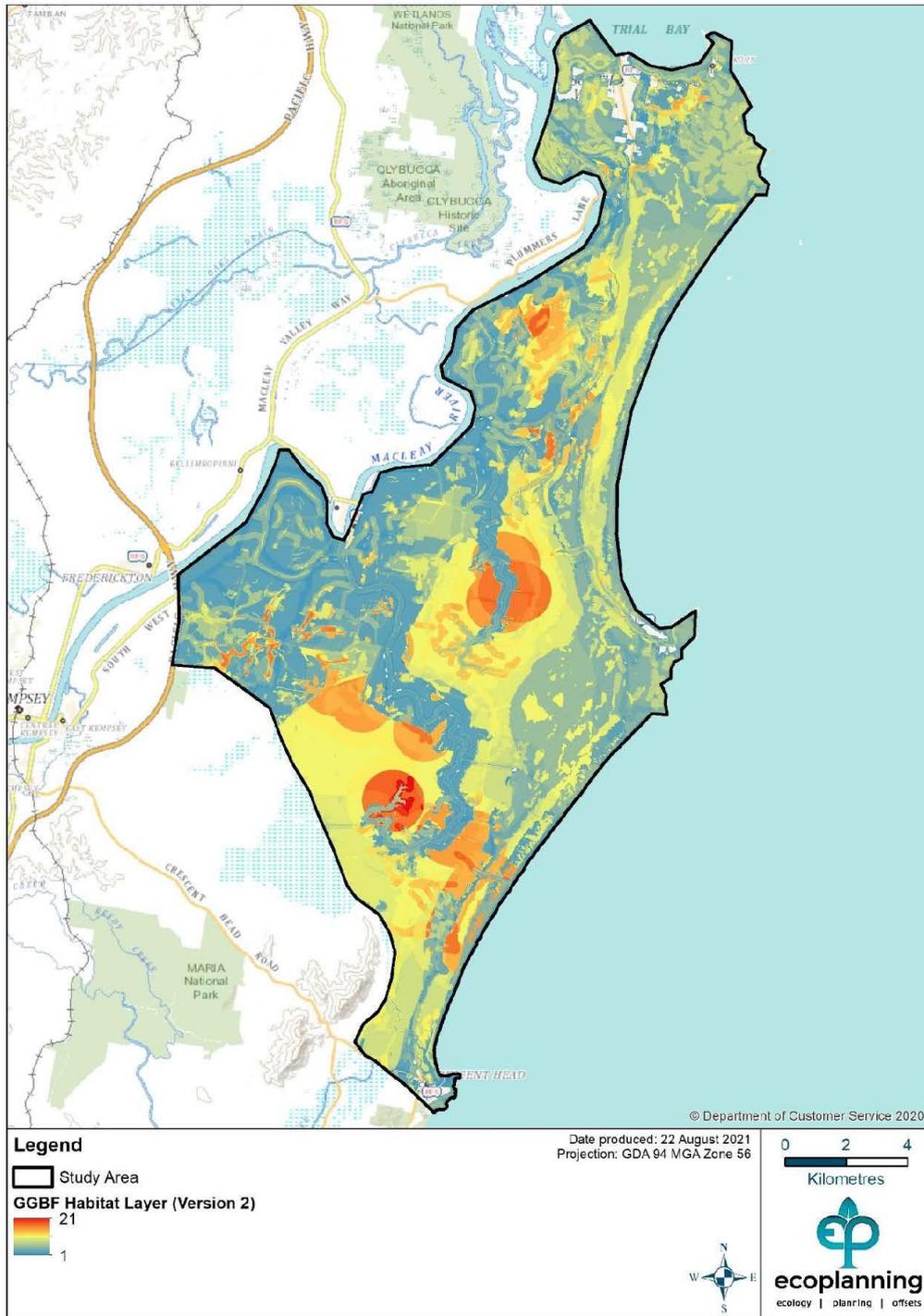


Figure 3: Green and Golden Bell Frog habitat layer (Version 2 – Potential habitat)

Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

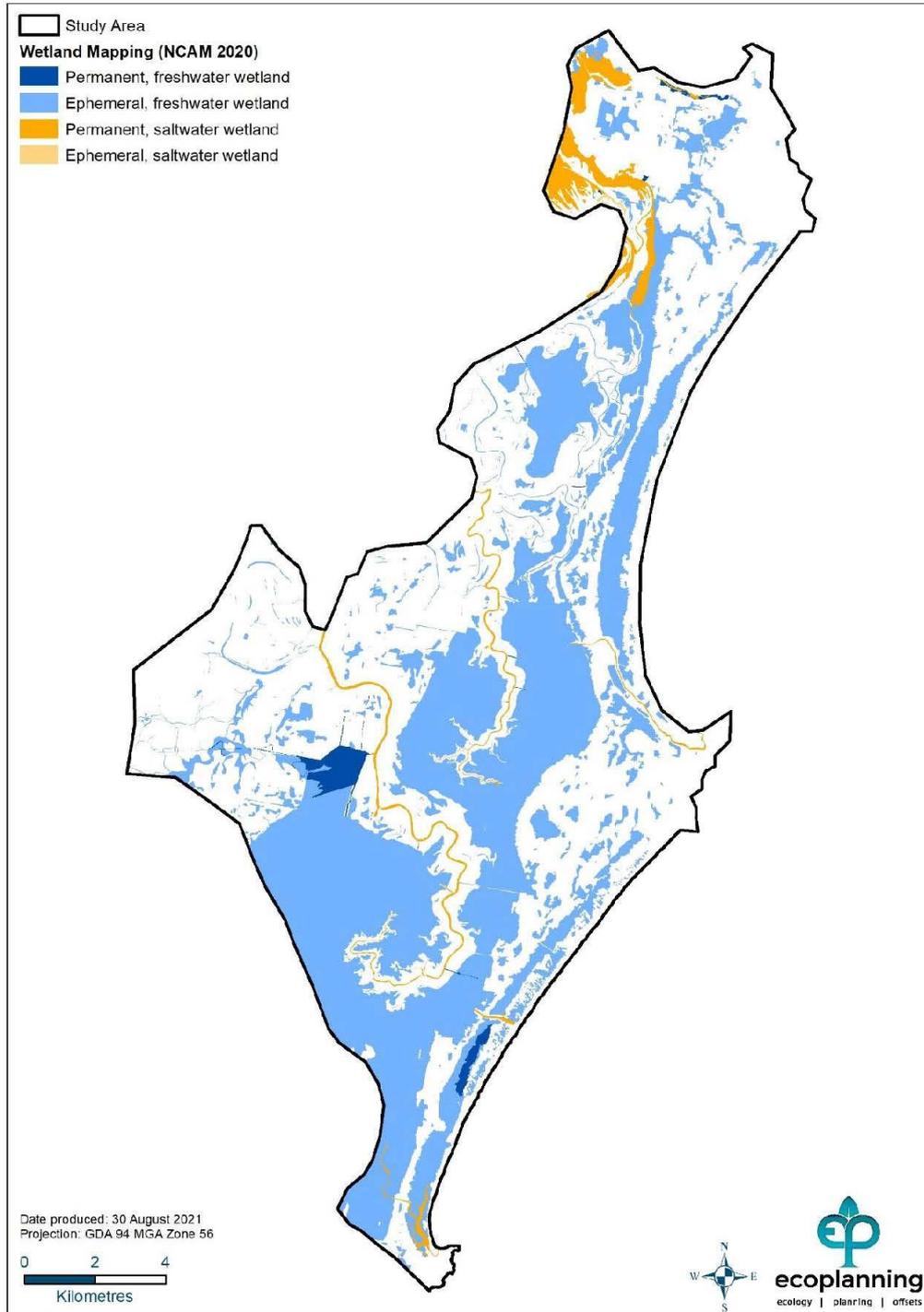


Figure 4: Fine-scale wetland mapping (NCAM 2020)



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW



Figure 5: Green and Golden Bell Frog records (DPIE 2021)



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

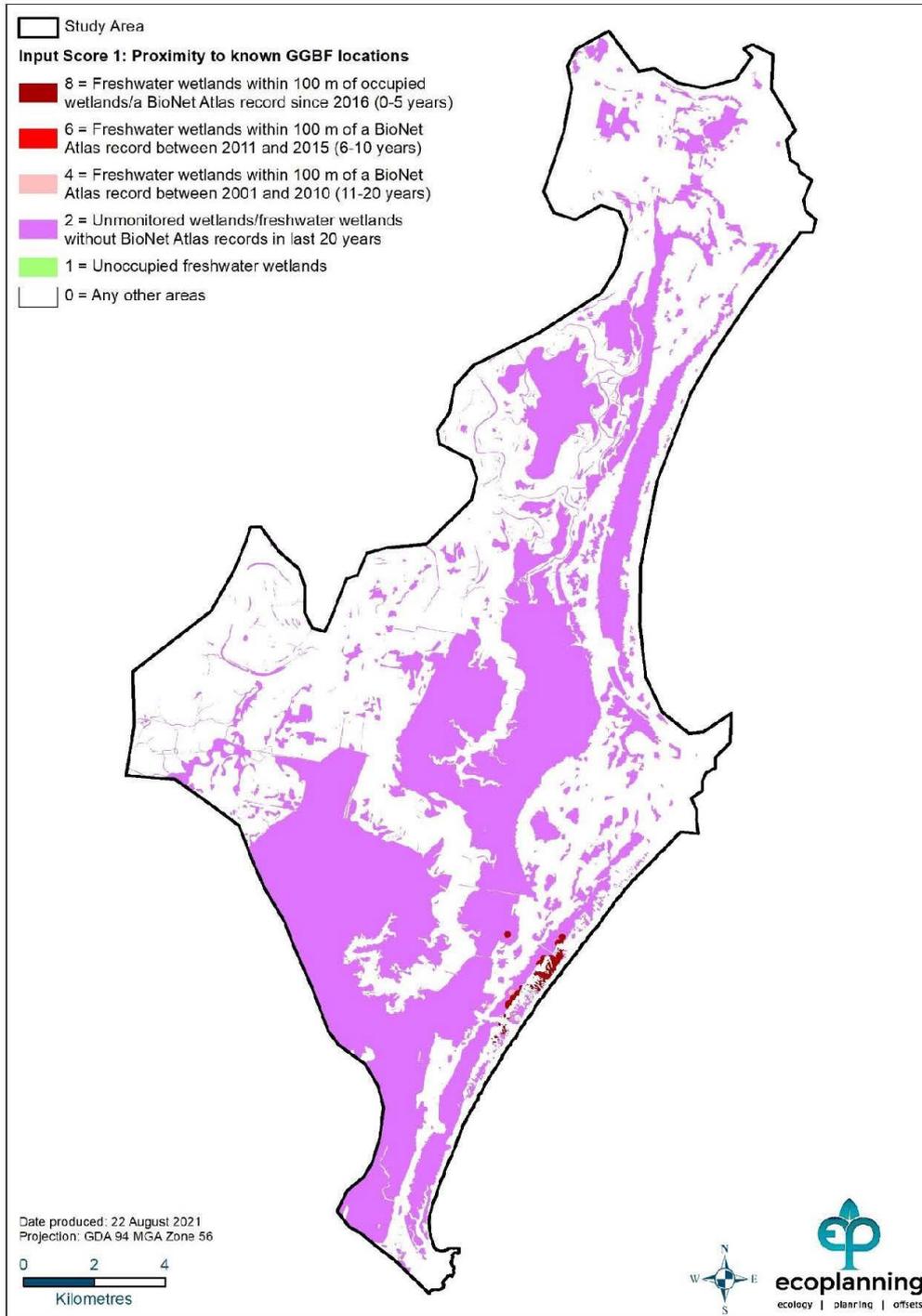


Figure 6: Input Layer 1 – Proximity to known GGBF locations



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW



Figure 7: Input Layer 2 – Connectivity to known GGBF locations



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

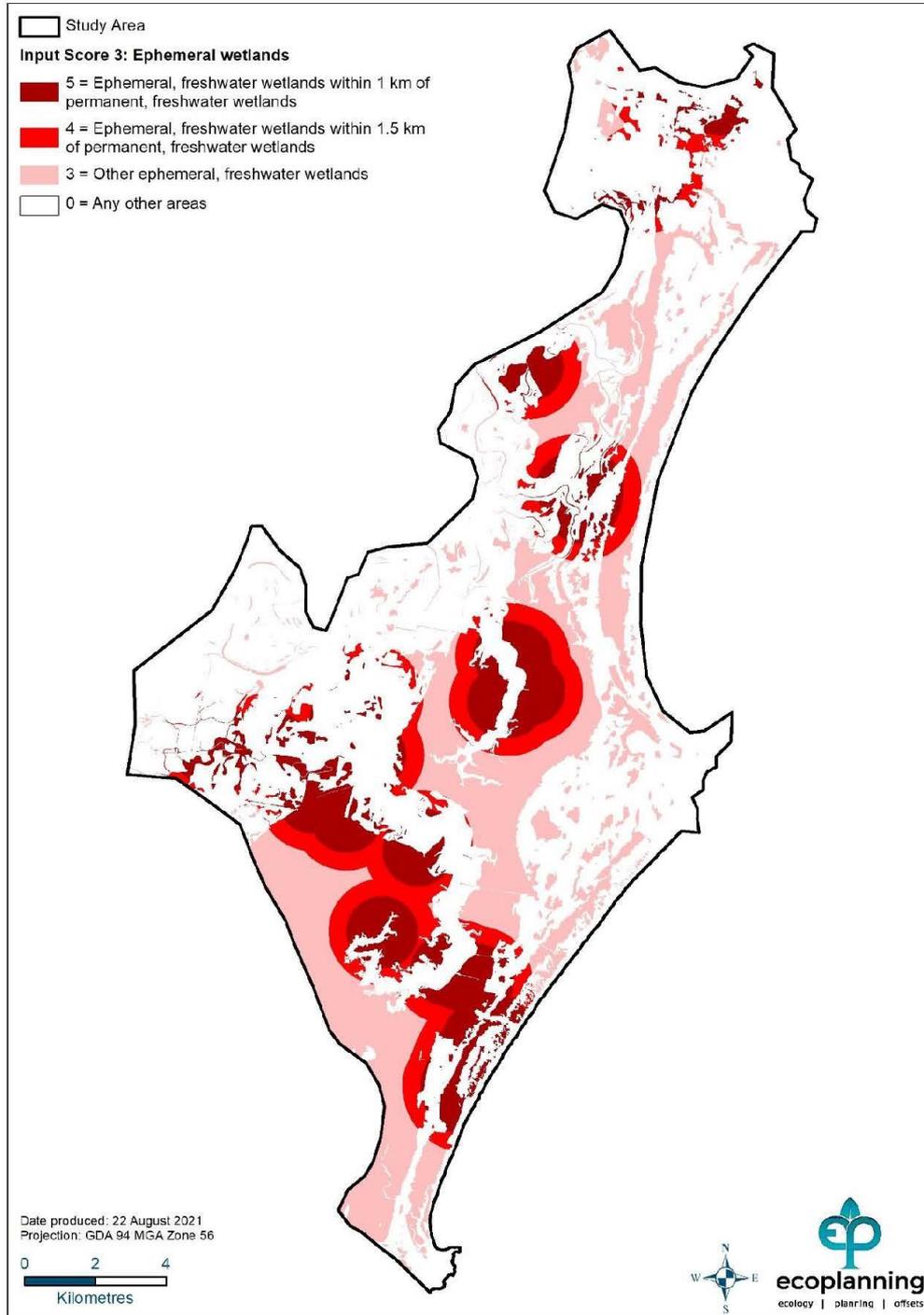


Figure 8: Input Layer 3 – Ephemeral wetlands



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

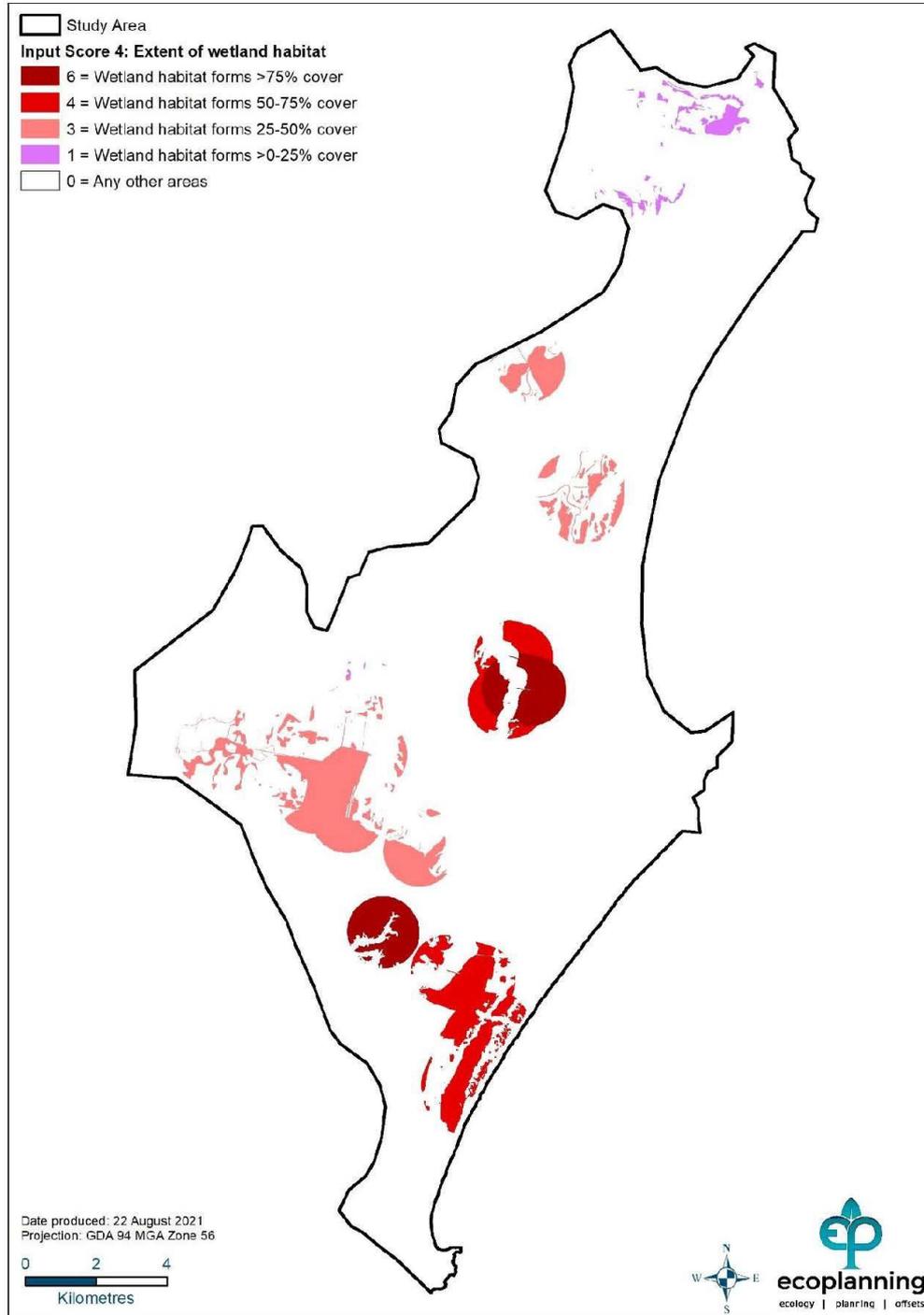


Figure 9: Input Layer 4 – Extent of wetland habitat



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

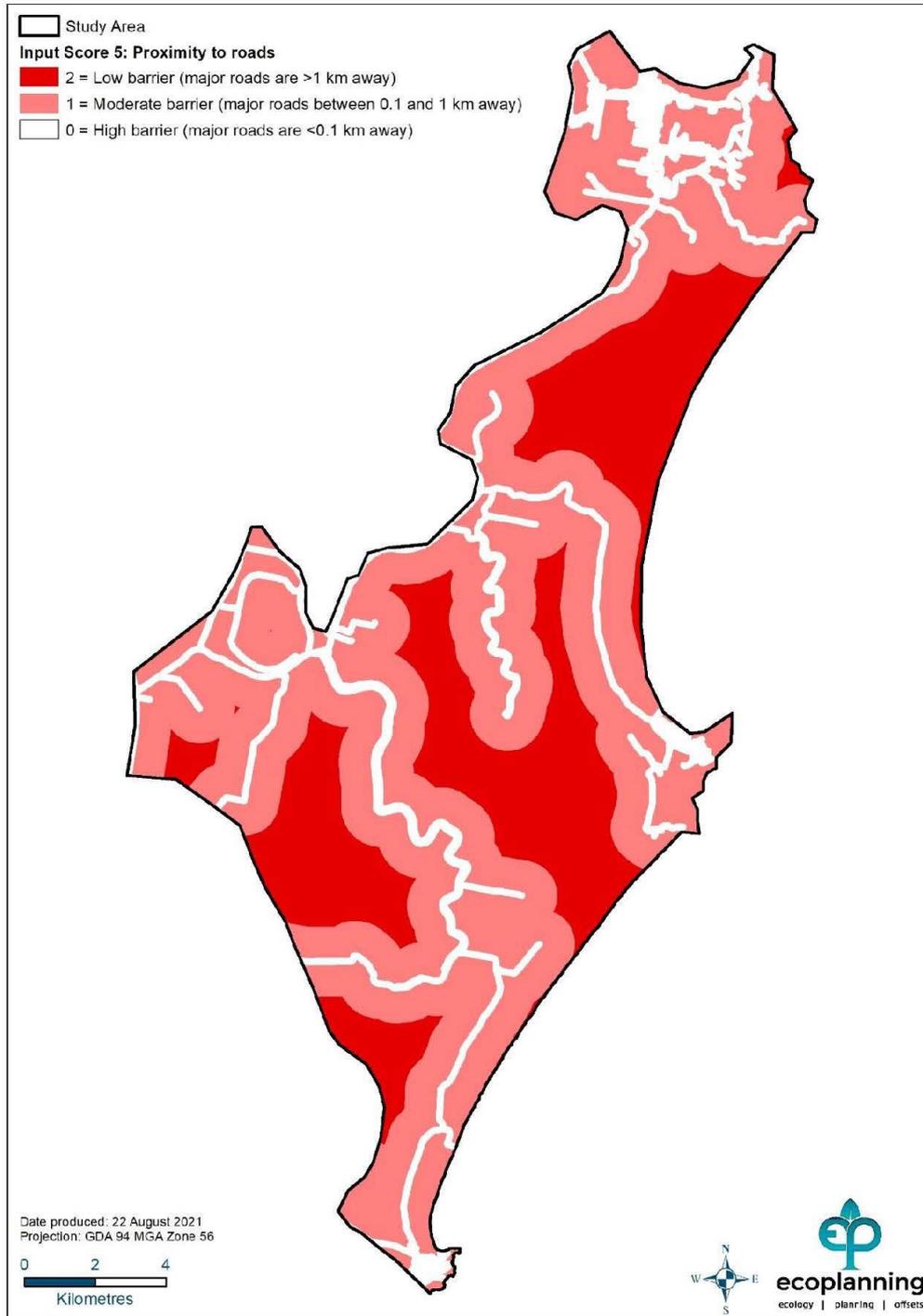


Figure 10: Input Layer 5 – Proximity to roads



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

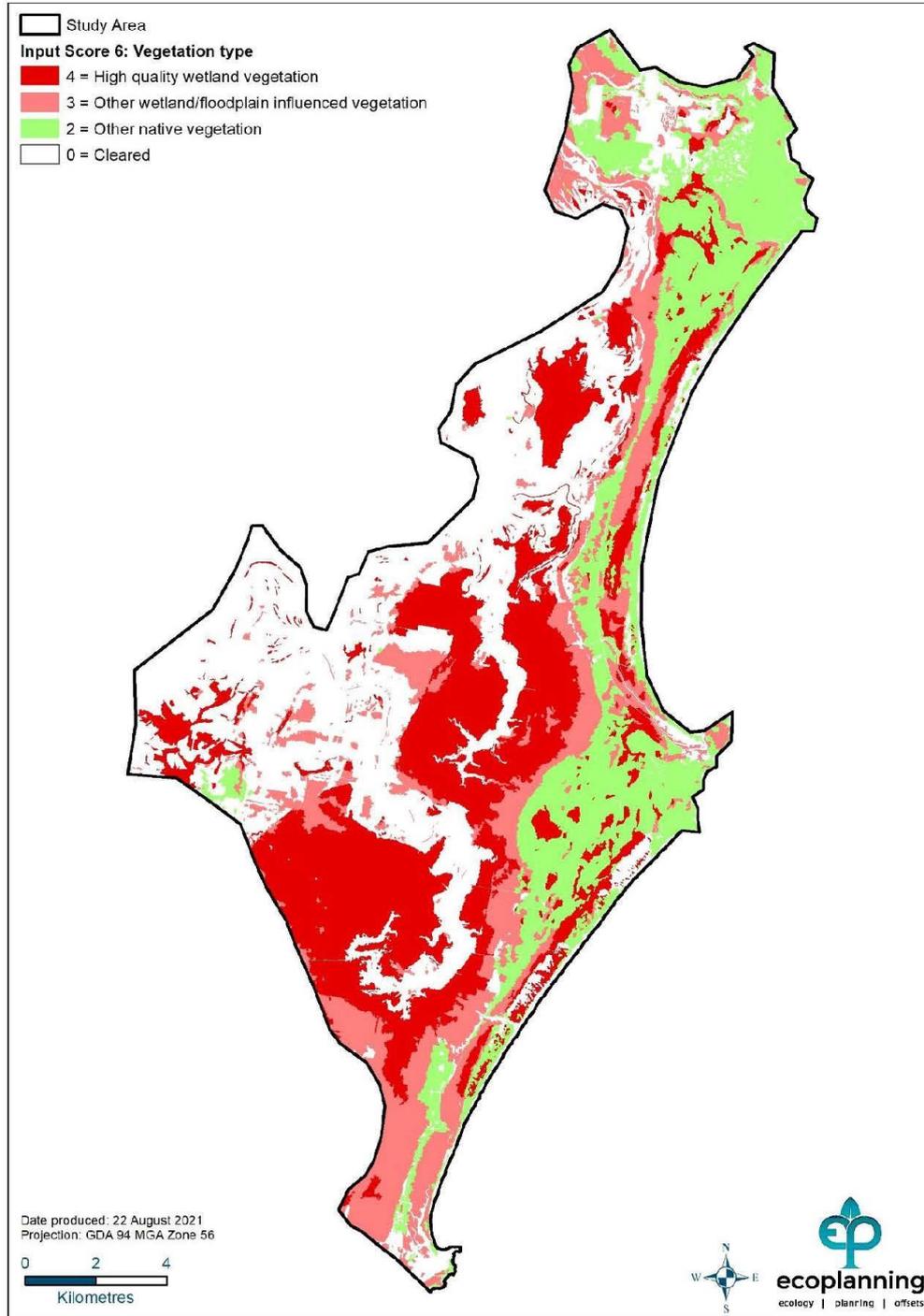


Figure 11: Input Layer 6 – Vegetation type



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

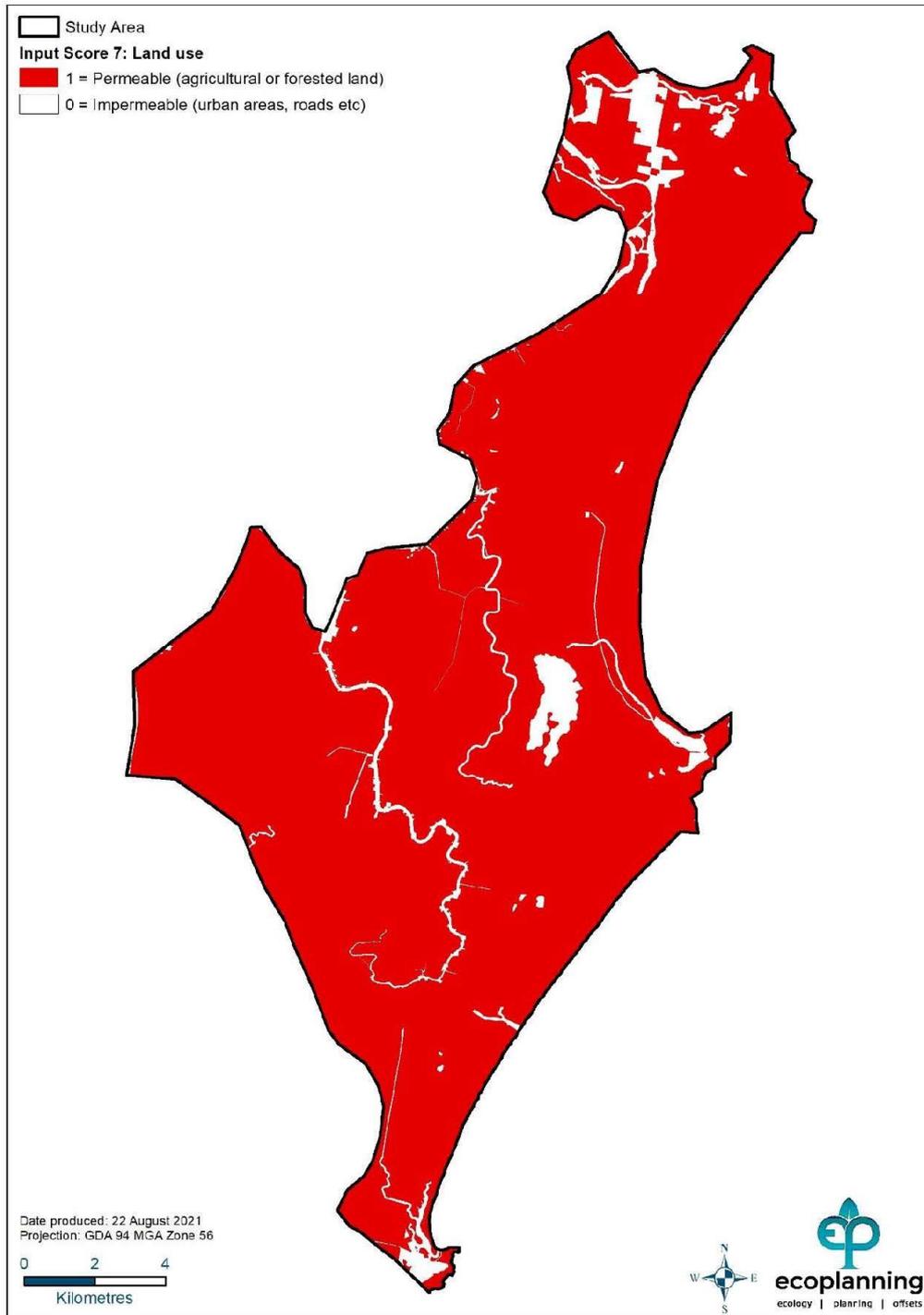


Figure 12: Input Layer 7 – Land use



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Green and Golden Bell Frog Habitat Mapping
Crescent Head, NSW

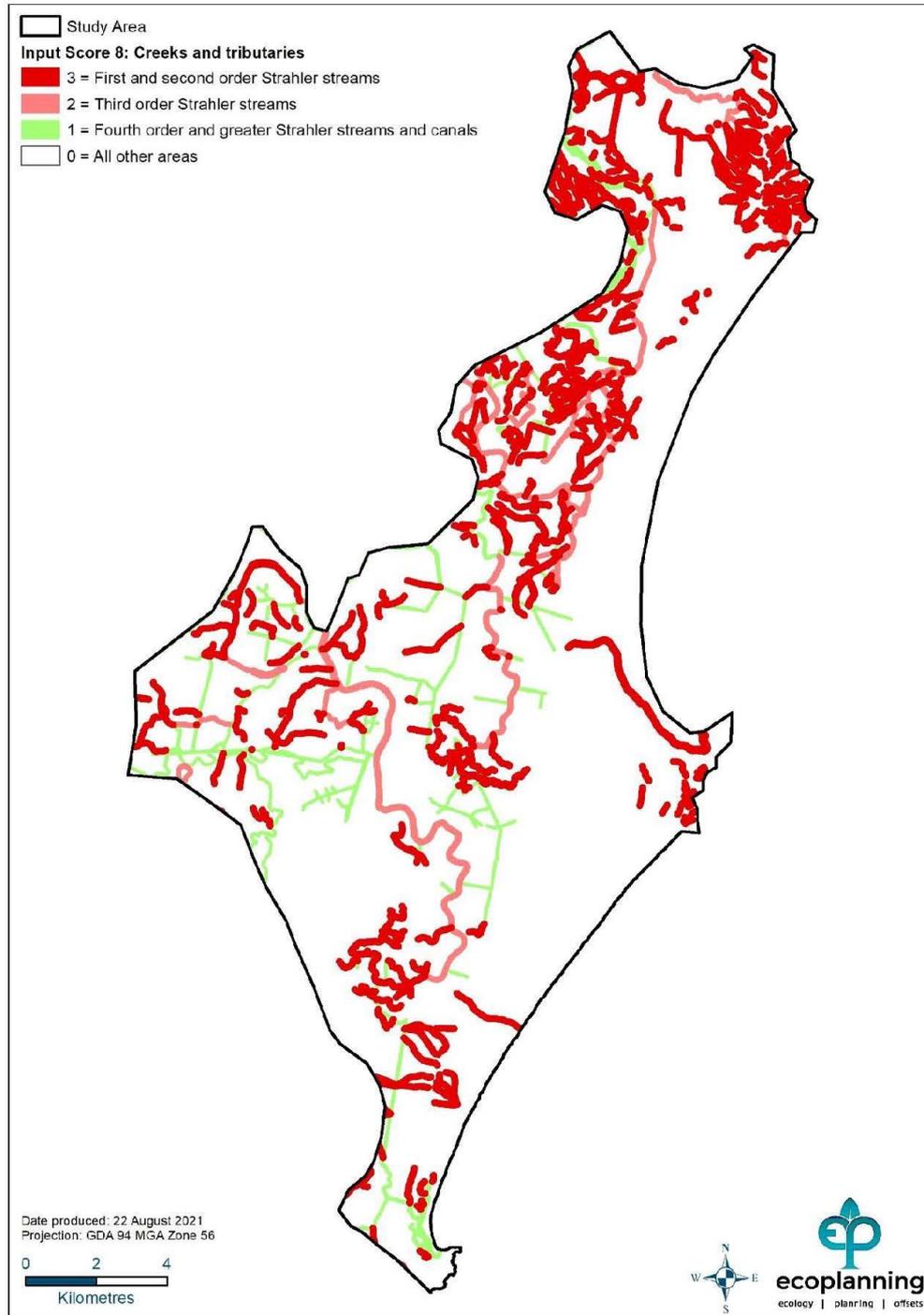


Figure 13: Input Layer 8 – Creeks and tributaries



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Appendix B -Rapid Condition Assessment: Tables

Rapid Condition Assessment - Woodland

Wandewoi Biodiversity Area

November 2021

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Hunter Valley Operations

Site ID	WAN R1	WAN R2	WAN R3	WAN R4	WAN R5	WAN R6
Low grazing intensity - never farmed	0	0	0	0	Grassland	Grassland
Tree and shrub regeneration present (<2m)	0	1	1	1		
Infrequent fire regime (<5year intervals)	1	1	1	1		
Healthy mature trees (no dieback)	1	0	1	1		
Little to no evidence of rabbits	1	1	1	1		
Little to no evidence of foxes/cats	1	1	1	1		
Low abundance of weeds (most remnants contain some weeds)	0	0	0	1		
No evidence of firewood collection	1	1	1	1		
No obvious signs of erosion or salinity	1	1	1	1		
Not susceptible to fertiliser application, herbicide or pesticide drift	1	1	1	1		
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	1	1	1	1		
Few tracks, trails or fence lines	1	1	1	1		
Presence of native shrubs	0	1	1	1		
Presence of large, old growth trees with hollows	1	0	1	1		
Dead timber is left standing	1	1	1	1		
Fallen timber and logs are left on the ground	1	1	1	1		
Abundance of native ground flora	0	0	0	1		
Presence of litter, cryptogams, cracks and rocks	1	1	1	1		
Remnant is large (> 5ha is optimum)	1	1	1	1		
Connected to or in close proximity to other remnant vegetation	1	1	1	1		
Health Rating	15	15	17	19		

Rapid Condition Assessment - Woodland

Mitchelhill (West) Biodiversity Area

November 2020

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Hunter Valley Operations

Site ID	MIT-W R1	MIT-W R2	MIT-W R3	MIT-W R4	MIT-W R5	MIT-W R6
Low grazing intensity - never farmed	Grassland	1	1	1	1	Grassland
Tree and shrub regeneration present (<2m)		1	1	1	1	
Infrequent fire regime (<5year intervals)		1	1	1	1	
Healthy mature trees (no dieback)		1	1	1	1	
Little to no evidence of rabbits		1	1	1	1	
Little to no evidence of foxes/cats		1	1	1	1	
Low abundance of weeds (most remnants contain some weeds)		0	1	1	1	
No evidence of firewood collection		1	1	1	1	
No obvious signs of erosion or salinity		1	1	1	1	
Not susceptible to fertiliser application, herbicide or pesticide drift		1	1	1	1	
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)		1	1	1	1	
Few tracks, trails or fence lines		1	1	1	1	
Presence of native shrubs		0	1	0	1	
Presence of large, old growth trees with hollows		0	1	1	1	
Dead timber is left standing		1	1	1	1	
Fallen timber and logs are left on the ground		1	1	1	1	
Abundance of native ground flora		1	1	1	1	
Presence of litter, cryptogams, cracks and rocks		1	1	1	1	
Remnant is large (> 5ha is optimum)		1	1	1	1	
Connected to or in close proximity to other remnant vegetation		1	1	1	1	

Health Rating

	17	20	19	20	
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Rapid Condition Assessment - Woodland

Mitchelhill (West) Biodiversity Area

November 2021

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Hunter Valley Operations

Site ID	MIT-W R1	MIT-W R2	MIT-W R3	MIT-W R4	MIT-W R5	MIT-W R6
Low grazing intensity - never farmed	Grassland	1	1	1	1	Grassland
Tree and shrub regeneration present (<2m)		1	1	1	1	
Infrequent fire regime (<5year intervals)		1	1	1	1	
Healthy mature trees (no dieback)		1	1	1	1	
Little to no evidence of rabbits		1	1	1	1	
Little to no evidence of foxes/cats		1	1	1	1	
Low abundance of weeds (most remnants contain some weeds)		1	1	1	1	
No evidence of firewood collection		1	1	1	1	
No obvious signs of erosion or salinity		1	1	1	1	
Not susceptible to fertiliser application, herbicide or pesticide drift		1	1	1	1	
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)		1	1	1	1	
Few tracks, trails or fence lines		1	1	1	1	
Presence of native shrubs		0	1	1	1	
Presence of large, old growth trees with hollows		0	1	1	1	
Dead timber is left standing		1	1	1	1	
Fallen timber and logs are left on the ground		1	1	1	1	
Abundance of native ground flora		1	1	1	1	
Presence of litter, cryptogams, cracks and rocks		1	1	1	1	
Remnant is large (> 5ha is optimum)		1	1	1	1	
Connected to or in close proximity to other remnant vegetation		1	1	1	1	

Health Rating

	18	20	20	20	
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Rapid Condition Assessment - Woodland

Mitchelhill (East) Biodiversity Area

November 2020

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Hunter Valley Operations

Site ID	MIT-E R1	MIT-E R2	MIT-E R3	MIT-E R4	MIT-E R5	MIT-E R6
Low grazing intensity - never farmed	Grassland	1	0	Grassland	0	0
Tree and shrub regeneration present (<2m)		1	1		1	1
Infrequent fire regime (<5year intervals)		1	1		1	1
Healthy mature trees (no dieback)		1	1		1	1
Little to no evidence of rabbits		1	1		1	1
Little to no evidence of foxes/cats		1	1		1	1
Low abundance of weeds (most remnants contain some weeds)		1	0		0	0
No evidence of firewood collection		1	1		1	1
No obvious signs of erosion or salinity		1	1		1	1
Not susceptible to fertiliser application, herbicide or pesticide drift		1	1		1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)		1	1		1	1
Few tracks, trails or fence lines		1	1		1	1
Presence of native shrubs		1	1		1	1
Presence of large, old growth trees with hollows		0	0		0	1
Dead timber is left standing		1	1		1	1
Fallen timber and logs are left on the ground		1	1		0	1
Abundance of native ground flora		1	1		1	1
Presence of litter, cryptogams, cracks and rocks		1	1		0	0
Remnant is large (> 5ha is optimum)		1	1		1	1
Connected to or in close proximity to other remnant vegetation		1	1		1	1

Health Rating

	19	17		15	17
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Rapid Condition Assessment - Woodland

Mitchelhill (East) Biodiversity Area

November 2021

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Hunter Valley Operations

Site ID	MIT-E R1	MIT-E R2	MIT-E R3	MIT-E R4	MIT-E R5	MIT-E R6
Low grazing intensity - never farmed	Grassland	1	0	Grassland	0	0
Tree and shrub regeneration present (<2m)		1	1		1	1
Infrequent fire regime (<5year intervals)		1	1		1	1
Healthy mature trees (no dieback)		1	1		1	1
Little to no evidence of rabbits		1	1		1	1
Little to no evidence of foxes/cats		1	1		1	1
Low abundance of weeds (most remnants contain some weeds)		1	1		0	0
No evidence of firewood collection		1	1		1	1
No obvious signs of erosion or salinity		1	1		1	1
Not susceptible to fertiliser application, herbicide or pesticide drift		1	1		1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)		1	1		1	1
Few tracks, trails or fence lines		1	1		1	1
Presence of native shrubs		1	1		1	1
Presence of large, old growth trees with hollows		0	0		0	1
Dead timber is left standing		1	1		1	1
Fallen timber and logs are left on the ground		1	1		1	1
Abundance of native ground flora		1	1		1	1
Presence of litter, cryptogams, cracks and rocks		1	1		0	0
Remnant is large (> 5ha is optimum)		1	1		1	1
Connected to or in close proximity to other remnant vegetation		1	1		1	1

Health Rating

	19	18		16	17
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Rapid Condition Assessment - Woodland

Hook Biodiversity Area

November 2020

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Hunter Valley Operations

Site ID	HOO R1	HOO R2	HOO R3	HOO R4	HOO R5	HOO R6
Low grazing intensity - never farmed	0	1	1	1	1	1
Tree and shrub regeneration present (<2m)	1	1	1	1	1	1
Infrequent fire regime (<5year intervals)	1	1	1	1	1	1
Healthy mature trees (no dieback)	1	1	1	1	1	1
Little to no evidence of rabbits	1	1	1	1	1	1
Little to no evidence of foxes/cats	1	1	1	1	1	1
Low abundance of weeds (most remnants contain some weeds)	0	1	0	1	1	1
No evidence of firewood collection	1	1	1	1	1	1
No obvious signs of erosion or salinity	1	1	1	1	1	1
Not susceptible to fertiliser application, herbicide or pesticide drift	1	1	1	1	1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	1	1	1	1	1	1
Few tracks, trails or fence lines	1	1	1	1	1	1
Presence of native shrubs	1	1	1	1	1	1
Presence of large, old growth trees with hollows	0	0	0	0	1	1
Dead timber is left standing	1	1	1	1	1	1
Fallen timber and logs are left on the ground	0	1	1	1	1	1
Abundance of native ground flora	1	1	1	1	1	1
Presence of litter, cryptogams, cracks and rocks	1	1	1	1	1	1
Remnant is large (> 5ha is optimum)	1	1	1	1	1	1
Connected to or in close proximity to other remnant vegetation	1	1	1	1	1	1

Health Rating

16	19	18	19	20	20
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Rapid Condition Assessment - Woodland

Hunter Valley Operations

Hook Biodiversity Area

November 2021

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Site ID	HOO R1	HOO R2	HOO R3	HOO R4	HOO R5	HOO R6
Low grazing intensity - never farmed	0	1	1	1	1	1
Tree and shrub regeneration present (<2m)	1	1	1	1	1	1
Infrequent fire regime (<5year intervals)	1	1	1	1	1	1
Healthy mature trees (no dieback)	0	1	1	1	1	1
Little to no evidence of rabbits	1	1	1	1	1	1
Little to no evidence of foxes/cats	1	1	1	1	1	1
Low abundance of weeds (most remnants contain some weeds)	1	1	0	1	1	1
No evidence of firewood collection	1	1	1	1	1	1
No obvious signs of erosion or salinity	1	1	1	1	1	1
Not susceptible to fertiliser application, herbicide or pesticide drift	1	1	1	1	1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	1	1	1	1	1	1
Few tracks, trails or fence lines	1	1	1	1	1	1
Presence of native shrubs	1	1	1	1	1	1
Presence of large, old growth trees with hollows	0	0	0	0	1	1
Dead timber is left standing	1	1	1	1	1	1
Fallen timber and logs are left on the ground	1	1	1	1	1	1
Abundance of native ground flora	1	1	1	1	1	1
Presence of litter, cryptogams, cracks and rocks	1	1	1	1	1	1
Remnant is large (> 5ha is optimum)	1	1	1	1	1	1
Connected to or in close proximity to other remnant vegetation	1	1	1	1	1	1
Health Rating	17	19	18	19	20	20

Rapid Condition Assessment - Woodland

Crescent Head Biodiversity Area

October 2020

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Hunter Valley Operations

Site ID	CRE-S R1	CRE-S R2	CRE-S R3	CRE-S R4	CRE-N R1	CRE-N R2	CRE-N R3	CRE-N R4
Low grazing intensity - never farmed	1	1	1	1	1	1	1	1
Tree and shrub regeneration present (<2m)	1	1	1	1	1	1	1	1
Infrequent fire regime (<5year intervals)	1	1	1	1	1	1	1	1
Healthy mature trees (no dieback)	1	1	1	1	1	1	1	1
Little to no evidence of rabbits	1	1	1	1	1	1	1	1
Little to no evidence of foxes/cats	1	1	1	1	1	1	1	1
Low abundance of weeds (most remnants contain some weeds)	1	1	1	1	1	1	1	1
No evidence of firewood collection	1	1	1	1	1	1	1	1
No obvious signs of erosion or salinity	1	1	1	1	1	1	1	1
Not susceptible to fertiliser application, herbicide or pesticide drift	1	1	1	1	1	1	1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	1	1	1	1	1	1	1	1
Few tracks, trails or fence lines	1	1	1	1	1	1	1	1
Presence of native shrubs	1	1	1	1	1	1	1	1
Presence of large, old growth trees with hollows	0	0	0	0	0	0	0	1
Dead timber is left standing	1	1	1	1	1	1	1	1
Fallen timber and logs are left on the ground	0	0	1	1	1	1	1	1
Abundance of native ground flora	1	1	1	1	1	1	1	1
Presence of litter, cryptogams, cracks and rocks	1	1	1	1	1	1	1	1
Remnant is large (> 5ha is optimum)	1	1	1	1	1	1	1	1
Connected to or in close proximity to other remnant vegetation	1	1	1	1	1	1	1	1

Health Rating

18	18	19	19	19	19	19	20
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Rapid Condition Assessment - Woodland

Hunter Valley Operations

Crescent Head Biodiversity Area

October 2021

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Site ID	CRE-S R1	CRE-S R2	CRE-S R3	CRE-S R4	CRE-N R1	CRE-N R2	CRE-N R3	CRE-N R4
Low grazing intensity - never farmed	1	1	1	1	1	1	1	1
Tree and shrub regeneration present (<2m)	1	1	1	1	1	1	1	1
Infrequent fire regime (<5year intervals)	1	1	1	1	1	1	1	1
Healthy mature trees (no dieback)	1	1	1	1	1	1	1	1
Little to no evidence of rabbits	1	1	1	1	1	1	1	1
Little to no evidence of foxes/cats	1	1	1	1	1	1	1	1
Low abundance of weeds (most remnants contain some weeds)	1	1	1	1	1	1	1	1
No evidence of firewood collection	1	1	1	1	1	1	1	1
No obvious signs of erosion or salinity	1	1	1	1	1	1	1	1
Not susceptible to fertiliser application, herbicide or pesticide drift	1	1	1	1	1	1	1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	1	1	1	1	1	1	1	1
Few tracks, trails or fence lines	1	1	1	1	1	1	1	1
Presence of native shrubs	1	1	1	1	1	1	1	1
Presence of large, old growth trees with hollows	0	0	0	0	0	0	0	1
Dead timber is left standing	1	1	1	1	1	1	1	1
Fallen timber and logs are left on the ground	1	1	1	1	1	1	1	1
Abundance of native ground flora	1	1	1	1	1	1	1	1
Presence of litter, cryptogams, cracks and rocks	1	1	1	1	1	1	1	1
Remnant is large (> 5ha is optimum)	1	1	1	1	1	1	1	1
Connected to or in close proximity to other remnant vegetation	1	1	1	1	1	1	1	1

Health Rating

19	19	19	19	19	19	19	20
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Rapid Condition Assessment - Woodland

Hunter Valley Operations

Condon View Biodiversity Area

November 2020

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Site ID*	CON R1	CON R2	CON R3	CON R4
Low grazing intensity - never farmed	1	0	1	1
Tree and shrub regeneration present (<2m)	1	1	1	1
Infrequent fire regime (<5year intervals)	1	1	1	1
Healthy mature trees (no dieback)	1	1	1	1
Little to no evidence of rabbits	1	1	1	1
Little to no evidence of foxes/cats	1	1	1	1
Low abundance of weeds (most remnants contain some weeds)	1	0	1	1
No evidence of firewood collection	1	1	1	1
No obvious signs of erosion or salinity	1	1	1	1
Not susceptible to fertiliser application, herbicide or pesticide drift	1	1	1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	1	1	1	1
Few tracks, trails or fence lines	1	1	1	1
Presence of native shrubs	1	0	1	1
Presence of large, old growth trees with hollows	1	0	0	1
Dead timber is left standing	1	1	1	1
Fallen timber and logs are left on the ground	1	1	1	1
Abundance of native ground flora	1	0	1	1
Presence of litter, cryptogams, cracks and rocks	1	1	1	1
Remnant is large (> 5ha is optimum)	1	1	1	1
Connected to or in close proximity to other remnant vegetation	1	1	1	1

Health Rating

20	15	19	20
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*R1 (HVO) = R1 (Yancoal), R2 = new site, R3 (HVO) = R5 (Yancoal), R4 (HVO) = R6 (Yancoal)

Rapid Condition Assessment - Woodland

Hunter Valley Operations

Condon View Biodiversity Area

November 2021

Auditor: Cambium Group (Emilie Mascarenhas)

Note: True = 1, False = 0

Site ID*	CON R1	CON R2	CON R3	CON R4
Low grazing intensity - never farmed	1	0	1	1
Tree and shrub regeneration present (<2m)	1	1	1	1
Infrequent fire regime (<5year intervals)	1	1	1	1
Healthy mature trees (no dieback)	1	1	1	1
Little to no evidence of rabbits	1	1	1	1
Little to no evidence of foxes/cats	1	1	1	1
Low abundance of weeds (most remnants contain some weeds)	1	0	1	1
No evidence of firewood collection	1	1	1	1
No obvious signs of erosion or salinity	1	1	1	1
Not susceptible to fertiliser application, herbicide or pesticide drift	1	1	1	1
Less than 20% trees with Mistletoe (NB some mistletoe is healthy)	1	1	1	1
Few tracks, trails or fence lines	1	1	1	1
Presence of native shrubs	1	0	1	1
Presence of large, old growth trees with hollows	1	0	0	1
Dead timber is left standing	1	1	1	1
Fallen timber and logs are left on the ground	1	1	1	1
Abundance of native ground flora	1	0	1	1
Presence of litter, cryptogams, cracks and rocks	1	1	1	1
Remnant is large (> 5ha is optimum)	1	1	1	1
Connected to or in close proximity to other remnant vegetation	1	1	1	1

Health Rating

20	15	19	20
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*R1 (HVO) = R1 (Yancoal), R2 = new site, R3 (HVO) = R5 (Yancoal), R4 (HVO) = R6 (Yancoal)