

**Before the Expert Panel appointed
under the Fast-track Approvals Act 2024**

Under

the Fast-track Approvals Act
2024 (**Act**)

And

In the Matter of

an application for approvals by
Matakanui Gold Limited to
establish, operate, rehabilitate
and ultimately close an open pit
and underground gold mining
operation known as the Bendigo-
Ophir Gold Project

**Statement of Evidence of
David Andrew Norton on behalf of
Matakanui Gold Limited in response to
Section 53 Feedback**

Terrestrial Ecology

Dated: 17 April 2026

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INTRODUCTION

1. My name is David Andrew Norton.

Qualifications and Experience

2. I have nearly 50 years' experience in ecology and conservation of native biodiversity across public and private land in Aotearoa New Zealand, holding B.Sc. Hons and PhD degrees in botany. I worked at the University of Canterbury from 1985-2022, and was awarded the title of Emeritus Professor on retirement in recognition of my research contribution.
3. My research, teaching and consultancy experience includes ecology of native forests, shrublands and grasslands; conservation and management of threatened plants; mistletoe biology; ecology of remnant habitats and restoration ecology; threat classification and significance assessment; managing native biodiversity within pastoral farming systems; and climate change impacts. I have published over 150 scientific publications, including co-authoring books on New Zealand's threatened plants¹ and biodiversity conservation in farming landscapes².
4. Over the last 30 years I have appeared as an expert witness before numerous council resource consent and Environment Court hearings on a range of projects. My evidence has usually focused on the native biodiversity values present and the implementation of ecological restoration as part of project development.
5. The specific experience I bring to the application by Matakanui Gold Ltd (**MGL**) is in restoration ecology and the distribution and management of native biodiversity within farming systems, especially sheep and beef farms. In particular:
 - (a) I have written restoration plans for several projects on public and private land. I have been closely involved with all aspects of restoration projects at Tiromoana Bush (part of the Kate Valley regional landfill, North Canterbury) and at Oceana Gold's Globe Progress mine, Reefton. I have helped develop and promote the national-scale restoration initiative Recloaking Papatūānuku.
 - (b) I have worked extensively with farmers, the farming community and farming sector groups to promote biodiversity conservation and find ways to build this into farm management through farm planning, biodiversity monitoring and biodiversity management. Through research and consultancy work I

¹de Lange, P., Heenan, P., Norton, D., Rolfe, J & Sawyer, J. 2010. *Threatened Plants of New Zealand*. Canterbury University Press, Christchurch. 471 pp.

² Norton, D. & Reid, N. 2013. *Nature and Farming. Sustaining Native Biodiversity in Agricultural Landscapes*. CSIRO Publishing, Melbourne. 294 pp.

have a good understanding of the interaction between pastoral farming practices and native biodiversity with a particular focus on high country environments.

Scope of Evidence

6. This statement is given as part of MGL's response to comments on the Bendigo-Ophir Gold Project (**BOGP**) made under Section 53 of the Fast Track Approval Act 2024 (**FTAA**). This statement responds to specific comments raised by:
 - (a) Mike Harding, independent consultant representing Central Otago District Council (**CODC**), Statement of Evidence *Terrestrial Ecology* 10 April 2026.
 - (b) Rebecca Teale, E3 Scientific representing Otago Regional Council (**ORC**), Technical Review *Terrestrial Ecology* 18 March 2026.
 - (c) Max Crowe, independent consultant representing Department of Conservation (**DOC**), Statement of Evidence *Vegetation and Flora* 10 March 2026.
 - (d) Dr Justyna Giejsztowt, Wildlands representing DOC, Statement of Evidence *Biodiversity and Monitoring* 9 April 2026.
 - (e) Nick Head, independent consultant representing Environmental Defence Society (**EDS**), Statement of Evidence *Terrestrial Ecology* 10 April 2026.
 - (f) Geoffrey Rogers, independent consultant representing Sustainable Tarras, Statement of Evidence *Terrestrial Ecology* 2 April 2026.
 - (g) Jade Watkin, independent consultant representing Kāi Tahu, Statement of Evidence *Ecology and Kāi Tahu Cultural Values*, 10 April 2026.

7. My original findings are provided in full in the following report:
 - (a) Ardour Restoration Area Management Plan (Substantive Application, Part G Management Plans, G.08).

8. I also assisted with preparation of the Vegetation Values Assessment report prepared by RMA Ecology (Substantive Application, Part B Technical Reports, B.13A), where I wrote Section 3.1.2 Central Otago Vegetation and I comment below on matters relating to this.

9. In this Statement of Evidence I respond to comments that relate to the two reports cited in Paras 7 and 8 above. I have prepared this statement in the limited time available for MGL to respond to comments under the FTAA. Due to time constraints, I have focused my response on the issues I consider most material. The absence of comment on other matters should not be taken as agreement or acceptance. If the

Panel requires elaboration on any of the matters raised in this statement, I am available to provide further information on request.

10. Although this is not an Environment Court proceeding my confirmation of compliance with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2023 is included in Substantive Application Document A0.2B. Unless I state otherwise, this advice is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

EVIDENCE SUMMARY

11. In this Statement of Evidence, I respond to comments made by technical experts on behalf of government agencies, environmental groups and Kāi Tahu that relate to areas that I have provided advice to MGL on in regard to the BOGP, principally in relation to management of the Ardour Restoration Area. I have also commented on the assertion that native biodiversity is in decline within the Ecological Study Area (**ESA**).
12. My goal in preparing the Ardour Restoration Area Management Plan (**ARAMP**) is that the Ardour Restoration Area will, as a result of active biodiversity management, become the preeminent site for thriving native biodiversity in this part of the Dunstan Ecological District, including many plant and animal species that are currently absent.
13. I found the statements of evidence from technical experts with respect to the ARAMP and discussions that occurred during site visits and workshops on 18-20 February 2026 and again on 13 March 2026 helpful. While there were some areas of disagreement, I believe that these issues can be resolved in a workshop situation.
14. In particular I endorse the suggestions for both a Biodiversity Advisory Group and a financial mechanism to provide certainty for the in-perpetuity management of the Ardour Restoration Area.
15. Biodiversity change is dependent on the temporal and spatial scales, and the vegetation types, being considered. While some plant communities and/or species may be considered stable or even expanding at small temporal and/or spatial scales (e.g. some shrublands and cushionfields), the general trend has been for decline in native biodiversity within the study area, across the Dunstan Ecological District and more generally throughout Aotearoa New Zealand. With increasing weed pressures and in the face of climate change, **and in the absence of active biodiversity management**, there is no reason to expect this general trend of decline to change even in these dryland ecosystems. The restorative management proposed in the

ARAMP for the Ardgour Restoration Area will reverse the declining trend in biodiversity for this area.

RESPONSE TO COMMENTS

16. In the following sections I provide responses to comments made in the various Statements of Evidence referred to above (paragraph 6). I provide these comments as clarification for the panel members on these issues. I have not gone into detail on every comment, and note that in paragraph 26 below I recommend that a workshop is used to finalise both the ARAMP and the other management plans that it intersects with.
17. In my evidence I summarise the approach I took to preparing the ARAMP and what I see that plan delivering. I do this because several of the experts providing statements of evidence on behalf of agencies, most notably Mike Harding for CODC, Max Crowe for DOC, Rebecca Teele for ORC and Nick Head for EDS, question the quantum of biodiversity gain from the restorative management proposed across the different management plans. This assertion is based on their assessment that the management proposed will not deliver the outcomes claimed and that native biodiversity is not in decline. I disagree with their position on both of these points and the following evidence provides justification for this.

Approach Taken to Preparing Ardgour Restoration Area Management Plan

18. In preparing the ARAMP, my aim was to achieve the best outcome for native biodiversity in this area within the constraints that the site's history and geographical location impose. I was particularly mindful of the climate that this area experiences and the impacts of the long history of pastoral management that has occurred here. My goal is that in 35-years' time the Ardgour Restoration Area will be a regionally significant and substantial (approximately 1263 ha) area of thriving native biodiversity appropriate to its location in the Dunstan Ecological District, including many plant and animal species that are currently absent. Implicit in this goal is that native biodiversity will be in a much better condition than it is today, or that it would have been in, in the absence of the restorative management proposed in the ARAMP.
19. I note that the Ardgour Restoration Area, at approximately 1263 ha, will become the largest area of protected land at a comparable attitude (500-800 m elevation) in the ca, 88,500 ha Dunstan Ecological District, and it will be the only area that is subject to active biodiversity management. The only comparable areas in the Dunstan Ecological District are Bendigo Scenic Reserve (627 ha), Cluden Creek Conservation Area (420 ha) and Dry Creek Conservation Area (220 ha), and none of these are subject to active biodiversity management.

20. To achieve the biodiversity outcomes discussed in paragraph 18 above, I have used the adaptive management principle to guide restoration management.³ I have deliberately only outlined management actions that will be implemented in the first five years of management in the ARAMP, leaving future management periods to be developed adaptively based on the results of outcome monitoring.
21. I state in Section 5.2 of the ARAMP that review of the five-year management plan will be based “*primarily on outcome monitoring*”. I believe that such an adaptive approach is essential – there is no point sticking to one approach when experience shows you it is not working. An example of this might be choice of species for planting or the time of year plantings are undertaken – an adaptive approach to management means that we can learn from early successes and failures and use this to guide future management.
22. Outcome monitoring, photo-monitoring and monitoring of the success of individual management actions such as planting survival are essential to guide adaptive management. Outcome monitoring and photo-monitoring are discussed in Section 3.12 and 3.13 of the ARAMP and outcome monitoring in the *G.12 Biodiversity Outcome Monitoring Plan* (Part G of the Substantive Application), while monitoring of the success of individual management actions will occur through the annual review process described in Section 5.2 of the ARAMP.
23. While I suggested in the ARAMP that the five-yearly review of the ARAMP be undertaken by a suitably qualified expert, I concur with the suggestions of Mike Harding (for CODC para 29, 100-103), Max Crowe (for DOC para 108), Justyna Giejsztowt (for DOC page 6) and Nick Head (for EDS para 116-117) that a Biodiversity Advisory Group might be better for doing this. I also agree with the suggestion of Jade Watkin (for Kāi Tahu para 31-32) that this group needs to include Kāi Tahu representation. I can see considerable merit in establishing a Biodiversity Advisory Group and believe that it would be of considerable assistance to the MGL staff implementing the ARAMP.
24. Taking an adaptive approach to restoration management does not, however, negate the need for having clearly defined 35-year outcomes for the Ardour Restoration Area. These outcomes are clearly stated in Section 2.3 of the ARAMP and are included in Condition 94 of *D-01 Central Otago District Council Land Use Consent and Conditions*.

³ See Sabine E. et al. 2004. Adaptive management: a synthesis of current understanding and effective application. *Ecological Management and Restoration* 5, 177-182.

Specific Issues Raised About the Ardgour Restoration Area Management Plan

25. Several of the experts providing statements of evidence on behalf of agencies, most notably Mike Harding for CODC, Max Crowe for DOC and Rebecca Teele for ORC, have made comments on particular issues relating to the ARAMP, and to how other management plans intersect with the ARAMP. Issues discussed include, but are not limited to: management of fire risk; dealing with future climate change; timing and nature of animal pest control; weed control in cushionfields, timing of restoration planting; specific location of fencing; grazing management; definition of 35-year outcomes. During the site visits and workshops on 18-20 February 2026 and again on 13 March 2026 we discussed these issues in some detail and I believe that most of the points raised were helpful and will strengthen the ARAMP.
26. Rather than replying to each of these issues in this statement of evidence, in my opinion the best way to address them is through a workshop that focuses on all of the terrestrial ecology management plans. While I disagree with some of the issues, this usually comes from a misunderstanding about what is intended in the ARAMP which I believe the workshop can readily resolve. Several I agree with (e.g. including autumn as well as spring planting), and these issues can be included in the ARAMP through the workshop. This workshop needs to involve both the terrestrial ecologists assisting MGL and those providing evidence on behalf of the agencies who will ultimately certify the management plans (CODC, ORC, DOC) if the Fast Track Panel chooses not to. I also agree with Jade Watkin (for Kāi Tahu para 34) that Kāi Tahu technical experts should be involved in the management plan workshop.
27. In the following paragraphs (28-33) I do, however, address some specific issues raised by agency experts in their Statements of Evidence that relate to the ARAMP.
28. The scale at which vegetation mapping was undertaken was commented on in several of the submissions and is addressed further in the Statement of Evidence of Zac Milner.⁴ In terms of the ARAMP this is of particular relevance for the area of cushionfields which contain nationally threatened and at-risk plant species including spring annuals. I agree with the comments that more accurate mapping of cushionfields is required and this is the intent of the *Applied Research Plan for Conservation Management, Rehabilitation and Expansion of Cushionfield* prepared by Manaaki Whenua Landcare Research (B.16 of the Substantive Application) and the associated conditions relating to the potential mining of the CIT Pit (refer to Condition 111 of *D-01 Central Otago District Council Land Use Consent and Conditions*).

⁴ Paragraphs 31-37.

29. I also agree with the concerns expressed by Mike Harding (for CODC para 53) and Max Crowe (for DOC para 29) that survey of threatened spring annuals is incomplete within the Ardgour Restoration Area. This gap in survey effort occurred because of access restrictions during lambing. I note that for 2026, and in subsequent years should the BOGP be approved, that there will be no access restrictions to these areas⁵ which will allow for a complete survey of threatened spring annuals. I understand that this survey has been scheduled and will help provide further clarification around spring annual abundance in the Ardgour Restoration Area. The spring annual survey issue is addressed further in the Statement of Evidence of Zac Milner⁶.
30. In preparing the ARAMP I have included both cushionfields and exotic pasture (within which the cushionfields are embedded) in Land Management Unit (LMU) 5 and applied the same management regime to the whole area. This was done as a precautionary approach recognising that the actual area of cushionfield may be greater than mapped. I also acknowledge that there are significant areas of cushionfield within other LMUs (e.g. 35 ha in LMU 3) but felt there was little value in excising these areas at this stage because (i) the whole of LMU 3 will be managed in the same manner for the next five-years (ongoing sheep grazing) and (ii) more accurate surveys will be required to better classify these areas (paragraph 28 above) in preparation for the second iteration of the five-year management planning cycle of the ARAMP.
31. The potential influence of climate change and the risk of fire setting back restoration progress is raised by Max Crowe (for DOC, para 72). I agree that both of these are significant risks and have addressed them in the ARAMP. Appendix 1 of the ARAMP provides a general discussion of these risks, while they are addressed more specifically in Sections 3.5 and 3.11. With respect to fire, ongoing grazing of much of the Ardgour Restoration Area is a key tool that will be used to reduce fire risk. Fire risk is also addressed in the Statement of Evidence of Robyn Simcock⁷.
32. Notwithstanding the potential for restoration set-backs to occur as a result of fire or climate change, it is my understanding that the consent conditions for the BOGP focus on the biodiversity outcomes achieved rather than the quantum of management effort that is undertaken – see conditions 92-99 of *D-01 Central Otago District Council Land Use Consent and Conditions*.
33. In the evidence of Rebecca Teele (for ORC, section 3.2.5) and in discussions during the 13 March 2026 site visit with Mike Harding (for CODC) and Max Crowe (for

⁵ Based on discussions between MGL and the owners of Cloudy Peak Station who graze Ardgour Station, discussions that I was part of.

⁶ Paragraphs 21-26.

⁷ Paragraphs 20-21.

DOC), more clarity on proposed fencing was requested. In Section 3.2 of the ARAMP, fencing is proposed to exclude livestock from areas where restoration planting is going to be undertaken. While indicative new fencing is included in Figure 3 of the ARAMP, this plan states that final fencing location will be determined in consultation with the grazier and fencing contractor. I agree that it is essential to minimise impacts of new fencing and propose that this be done prior to certification of the ARAMP and involves a suitably qualified expert working with the grazier and fencing contractor to GPS proposed fencelines.

Providing Certainty for the Ardgour Restoration Area Management Plan Biodiversity Outcomes

34. The ARAMP covers the 35-year period that MGL are seeking consent to operate the BOGP. The proposed consent conditions require MGL to fund this work over this period. However, the biodiversity gains achieved in the Ardgour Restoration Area and in other parts of the project (e.g. lizard sanctuaries) will eventually be lost if management ceases after 35 years. This will occur because the factors that threaten native biodiversity (e.g. invasive plants and animals) are still present in the wider landscape and will reinvade these areas. While an in-perpetuity covenant is proposed for the Ardgour Restoration Area, I consider more clarity could be provided that this also carries requirements for ongoing management (which I understand is the intent).
35. This issue has been raised by Mike Harding (for CODC para 31, 106), Max Crowe (for DOC para 108), Justyna Giejsztowt (for DOC page 5, 22), Nick Head (for EDS para 101), Rebecca Teele (for ORC para 3.2.5), and Jade Watkin (for Kāi Tahu para 37, 44). Their view is that some form of financial mechanism is required to provide the certainty that the biodiversity gains achieved in the Ardgour Restoration Area, and in other ecological components of the project (e.g. lizard sanctuaries and the mine regeneration zones), are sustained into the future.
36. I agree with the invited party technical experts on the need for some form of certainty with regard to management beyond 35-years. I signalled the need for this in Appendix 1 of the ARAMP where I suggested that a non-wasting endowment fund might be used⁸.
37. I note that the Mine Closure Plan required under conditions 115 and 116 of *D-01 Central Otago District Council Land Use Consent and Conditions* states that this plan “must ensure that the rehabilitation and closure activities for the BOGP are undertaken so that the following objectives / closure outcomes are achieved”.

⁸ Norton DA, Warburton B 2015. The potential for biodiversity offsetting to fund effective invasive species control. *Conservation Biology* 29: 5-11.

Condition 116 lists “closure implementation, including ongoing responsibilities (including financial responsibility) for the environmental outcomes” as one of the objectives that the closure plan must achieve. Condition 122 also requires ongoing maintenance of the landscape and ecological values within the covenanted areas post mining. These conditions and the condition requiring an in-perpetuity legal covenant are helpful but I believe that further discussion and work around the framing of this condition package would assist in increasing certainty and clarity that the 35-year outcomes in the ARAMP are maintained into the future.

Biodiversity Decline

38. Mike Harding (for CODC para 12, 659-72, 90, 111), Max Crowe (for DOC para 64-68), Justyna Giejsztowt (for DOC page 6) and Rebecca Teele (for ORC para 3.2.5) question the assertion made in some of the technical reports prepared as part of the Substantive Application that indigenous (native) biodiversity is generally in decline within the application area.
39. For example, the *Assessment of Ecological Effects: Terrestrial Ecology* (prepared by Alliance Ecology, B.08 of the Substantive Application) states: “*Nevertheless, with the exception of woody vegetation cover, indigenous biodiversity within the landscape is generally in decline due to ongoing habitat loss and degradation through stock browsing, topdressing and aerial oversowing with non-native pasture species, spread of competing non-native plants (including weeds), invasive browsers and grazers (especially rabbits and deer), and predation by introduced mammals. Without intervention, most native species will continue to decline, and several Threatened or At Risk species are likely to become locally extinct over time.*”⁹
40. The question of whether native biodiversity is in decline or not is important. The biodiversity offset model included as Appendix 3 in the *Assessment of Ecological Effects: Terrestrial Ecology* is based on the assumption that native biodiversity will not improve in its condition without the active management proposed in the different management plans.
41. I now comment on the concerns raised by the agency ecologists and provide evidence supporting my position that indigenous biodiversity is at best stable or more commonly in decline, focusing primarily on vegetation and associated flora, but include some additional comments on fauna at the end.
42. Any consideration of trends in indigenous vegetation needs to be viewed at different timescales, across different spatial scales and for different vegetation types. At the

⁹ Page 14.

timescale of human settlement of Central Otago, both Māori and initial European settlement, decline was dramatic. Both the original native vegetation and then the vegetation induced after impacts associated with Māori settlement, has declined substantially in extent and abundance. These changes are reviewed in Section 3.1 of the *Vegetation Values Assessment* (RMA Ecology, B.13 of the Substantive Application, and references therein). Similar declines in fauna have also been widely documented.

43. The changes in vegetation and flora in more recent decades (especially the last 50-80 years) are more complex and are again reviewed in Section 3.1 of the *Vegetation Values Assessment* (and references therein). Change in vegetation and flora is driven by a range of factors including farm management (livestock browsing, aerial oversowing of pasture species and topdressing with fertiliser, and vegetation clearance by fire, herbicide and root raking/ploughing [in accessible areas]), spread of competing non-native plants, impacts of invasive browsers and grazers, and predation by introduced mammals (on fauna). In addition, changing land use, such as conversion of pastoral farmland to horticulture/viticulture, results in substantial native biodiversity decline¹⁰. The impacts of these factors are not unique to the study area or to Central Otago and are widely regarded by ecologists as key drivers of decline and extinction across most plant and animal groups in New Zealand as highlighted in every threat assessment published by DOC.¹¹
44. Although not considered in detail in the ecological reports associated with this Project, climate change is also likely to be impacting native vegetation and flora (and fauna) negatively. Climate change can have both direct effects (e.g. drought or unseasonal frosts) as well as working synergistically with other factors such as invasive species (changing climates facilitating invasion of new exotic species that displace native species). Our understanding of these effects is currently limited.
45. It is important to recognise that most plant communities present in the study area today are novel¹² in that they were not present in the pre-human landscape, having developed because of the factors listed above. Furthermore, their future extent and composition will be dependent on the future impacts of farm management, invasive species and climate change.
46. Under pastoral management, exotic pasture may expand and/or thicken depending on the approach to oversowing and topdressing and how grazing is applied (stock type, duration and timing). Tussock is particularly vulnerable to livestock grazing,

¹⁰ Harding, M.A. 2022. Otago Region: analysis of recent changes to terrestrial indigenous ecosystems. Unpublished Contract Report. Otago Regional Council. 30p.

¹¹ See New Zealand threat Classification System (<https://nztcs.org.nz/home>)

¹² See Hobbs RJ et al. 2006. Novel ecosystems: theoretical and management aspects of the new ecological world order. *Global Ecology and Biogeography* 15, 1-7, for a detailed discussion of novel ecosystems including a New Zealand example.

especially in dry years, when grazing pressure is high or where cattle are grazed. Grazing pressure, even light grazing, also reduces the establishment of native woody species into grassland as well as understorey recruitment in shrubland areas, especially of palatable native species. Grazing by rabbits and sheep also removes palatable leaves within browse height leaving open understoreys that are more prone to water stress or frost damage. Protective leaf-litter layers are compacted and/or or displaced by livestock, exacerbating water deficits¹³. As well as grazing, cattle also impact shrublands, riparian areas and wetlands through physically breaking vegetation, damaging soil and pugging the ground.

47. Feral ungulates (deer and pigs in this area) are rapidly increasing on both public and private land across New Zealand.¹⁴ These species are having marked impacts on vegetation and, in the case of pigs, soil, even when at low densities. Reinvasion from adjacent land can be rapid after local control because they tend to occur at larger spatial scales than individual management units like farms. Increasing woody vegetation cover can also provide more cover for these species allowing them to more easily evade control.
48. Most farm-initiated weed control focuses on species like European broom, gorse and willows, with some recent and effective control of wilding pines in nearby subdivisions. There are, however, several weeds that are present in low densities or in very localised areas that are unlikely to be controlled under current pastoral management, and so highly likely to spread. In addition, a number of weed species in the wider landscape have the potential to disperse into the area (especially noting the proliferation of upwind urban intensification – Luggate, Wānaka, Hāwea).
49. In cushionfields, weeds which can smother/outcompete native species include stonecrop, thyme, sweet briar, hemlock, mullein, Californian poppy and thistles amongst others. In scrubland, smothering weeds present or likely to arrive from nearby seed sources include bird-dispersed shrub weeds such as elderberry, hawthorn, boxthorn, cotoneaster, wild plum, cherry and flowering currant, as well as vines (e.g. Chinese clematis and Chilean glory vine), wilding conifers and ground covers like male fern. Some species, such as wilding conifers, change soil biology and chemistry, thereby enhancing recolonisation of their seedlings and reducing the ability for native species to recolonise.
50. An added complexity to the weed invasion issue is that ongoing grazing by livestock (sheep and cattle) can limit the spread of some invasive exotic plants such as sweet

¹³ See Yates CJ, Norton DA. & Hobbs RJ 2000. Grazing effects on soil and microclimate in fragmented woodlands in south western Australia: implications for restoration. *Austral Ecology* 25: 36-47. for an Australian example that is relevant to the dryland environment in the Ardour Restoration Area.

¹⁴ See Norton DA, Bellingham PJ & Richardson SJ. 2026. Deer in the headlights: sleepwalking our way to a native forest catastrophe. *New Zealand Journal of Ecology* in press.

briar and wilding conifers.¹⁵ Removal of livestock grazing may actually speed up invasion processes for these species.

51. Notwithstanding the historic and current general decline in indigenous biodiversity within the BOGP study area, a diverse native flora (at least 176 native species including at least 58 nationally and regionally at-risk and threatened species) is present. This is despite ongoing farm management but acknowledging that management inputs such as cultivation (largely lacking) and vegetation clearance have not been as intensive within the area under consideration here as in other places (e.g. alluvial terraces along the Lindis and Clutha/Mata Au Rivers).¹⁶ Because management inputs have not been high, stocking rates have also not been high. While some native species are clearly in decline (e.g. native brooms and kōwhai), others have been able to hold their own, and some may have become more abundant in recent decades.
52. Three elements of the vegetation in the BOGP study area and wider landscape have expanded or at least held their own in recent decades. Shrubland has expanded either because of removal of farming inputs (e.g. in the Bendigo Scenic Reserve or Dry Creek Conservation Area) or changes in farm management practices (e.g. no burning or herbicide application). In the latter case, the expansion of native woody vegetation (especially 'grey scrub') is often facilitated by a history of aerial fertiliser application increasing soil fertility. However, these novel native woody communities are usually dominated by a subset of relatively common native woody species (in the study area primarily kānuka, matagouri, mingimingi and scented tree daisy) and lack elements that might be considered typical of pre-human woody vegetation (e.g. kōwhai or thin-bark tōtara) as seed sources are scarce or more often, absent. In addition, plant community structures are simple, with most areas lacking lianes. Ongoing herbivory by both domestic livestock and feral ungulates, possums and lagomorphs (rabbits and hares) also limit the ability of any palatable species to establish and allow for succession to a more species and structurally diverse state in these woody communities.
53. Furthermore, cyclical clearance of regenerating native shrubland is common on hill and high country farms in Central Otago and more widely in the South Island high country. Shrubland clearance has been used as a farm management tool in this area for many years and is undertaken using aerial herbicide, cattle and cutting/crushing. Fire does not appear to have been used in recent decades in this

¹⁵ Sage, D.J.M., Norton, D.A. & Espie, P.R. 2009. Effect of grazing exclusion on the woody weed *Rosa rubiginosa* in high country short tussock grasslands. *New Zealand Journal of Agricultural Research* 52: 123-128. Ledgard, N.J. & Norton, D.A. 2008. The impact of browsing on wilding conifers in the South Island high country. *New Zealand Journal of Forestry* 52(4): 29-34.

¹⁶ Harding, M.A. 2022. Otago Region: analysis of recent changes to terrestrial indigenous ecosystems. Unpublished Contract Report. Otago Regional Council. 30p.

area but is used elsewhere. Woody vegetation clearance is needed because plants like matagouri respond rapidly to fertiliser addition and can form dense impenetrable thickets that limit both the growth of pasture species and stock access.¹⁷ On some parts of Ardgour Station, sub-catchments leading into Dry Creek have been aerial sprayed in recent years and dieback of woody vegetation across valley floors and sides is evident. While woody vegetation has spread over several decades at a catchment scale, periodic control can re-set the foundation vegetation communities back to exotic grassland and reverse succession to exotic and native woody vegetation by many decades. The Central Otago District Plan is reasonably permissive with regards vegetation clearance, with matagouri exempt from the vegetation clearance rule in this plan. Because of this, many of these woody communities have little guarantee of permanence within farming systems.

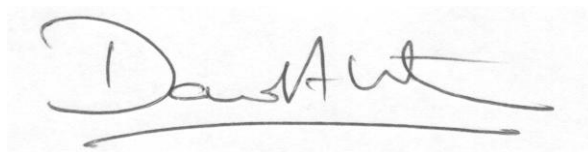
54. The second native vegetation type that appears to have held its own within the study area, even with farming, is cushionfield (and its constituent threatened plants including spring annual herbs). This vegetation type appears to have been originally induced through overgrazing by sheep and rabbits¹⁸ and is likely maintained by ongoing browsing and grazing and the absence of pasture improvement (mainly because it occurs in sites with very high evapotranspiration where exotic pasture species fail to establish). Geoffrey Rogers (for Sustainable Tarras, para 24c) provides a good description of the processes that have led to the development of cushionfields. However, at a wider scale (Dunstan Ecological District and wider), this vegetation type and its constituent species is in decline because of land use change (especially conversion to horticulture/viticulture and lifestyle blocks) and invasive plant species like thyme and sweet briar which shade out the low growing native species.
55. Native vegetation associated with rock outcrops may be a third example of a native plant community that is reasonably stable, at least at the time scale of a few decades (e.g. ferns and herbs at lower elevations and snow tussocks at higher elevations). These habitats are usually not threatened by farm management, although are prone to dieback from misapplied herbicide application.¹⁹ However, invasive plants like thyme and stonecrop, both of which are abundant further south in the Dunstan Ecological District, are known to invade these habitats, and together with the bird-dispersed woody plants and lianes, could lead to decline.

¹⁷ Day NJ 2021. The biology and ecology of matagouri (*Discaria toumatou*, Rhamnaceae) and its distribution across New Zealand. Unpublished report prepared for LINZ.

¹⁸ Cockayne L. 1919. An economic investigation of the montane tussock-grassland of New Zealand III. Notes on depletion of the grassland. *New Zealand Journal of Agriculture* 19, 129-138.

¹⁹ Norton, D.A. & Molloy, B.P.J. 2009. *Heliohebe maccaskillii* (Plantaginaceae) – a new rank for a threatened limestone endemic, North Canterbury, New Zealand. *New Zealand Journal of Botany* 47: 405-409.

56. In summary, while there is evidence of an improvement or at least maintenance of some elements of native plant biodiversity under current farm management over recent decades, other elements are in decline.
57. The challenge with discerning decline is the need to take account the timeframes and spatial scale over which this is occurring and the vagaries between vegetation types. Even in cases where decline does not currently appear to be happening (some shrublands and perhaps cushionfields and rocky outcrops), there is no guarantee that these vegetation types will persist into the future under current or potential future farm management practices, especially in the context of an increasing diversity and cover of non-native weeds invasive animals and climate change.
58. Predation and habitat loss (including loss of host plant species) are known to be key drivers of decline in fauna nationally. There is no reason to expect that the situation is any different in the area under consideration here. Certainly, the absence of large-bodied reptiles and many native birds and the rarity of many invertebrates suggests that decline has been substantial and is likely to be ongoing.
59. It is my opinion that the management actions proposed in the ARAMP will result in a significant enhancement in native biodiversity in the Ardgour Restoration Area. Without this management, I believe that native biodiversity will continue to decline, or at best, some modified elements like low-diversity shrubland might persist in their current state. The management proposed in the ARAMP will result in thriving native biodiversity, making the Ardgour Restoration Area an outstanding native biodiversity site in the Dunstan Ecological District.

A handwritten signature in black ink, appearing to read 'David Andrew Norton', with a horizontal line underneath.

David Andrew Norton

17 April 2026