# Biodiversity context paper for Waipapa Taumata Rau's Sustainability Strategy Development

*"A healthy and fully functioning ecosystem is able to clean air and water, support a dynamic and viable soil, regulate the surrounding climate and thus enables humans and animals to live a healthy life and produce enough food for their communities. Ecosystems can recover and adapt when affected by pollution, climate change and negative human actions to a limited extent. Ecosystems consist out of various communities of organisms and non-living material that interact constantly with each other and as such all parts of ecosystems are equally important. It must also be noted that ecosystems are interdependent. Therefore, damaged or imbalanced ecosystems can thus fail due to this interdependency and this leads to environments that are not suitable to support life. All living organisms found within ecosystems constantly interact with each other through relationships like predation, cooperation, competition and symbiosis. Each of these organisms has a niche, which they occupy and use to sustain life. Any change in the ecosystem they occupy, such as the elimination or introduction of species or human interference can cause damage and changes throughout the entire ecosystem. One of the results of human interference is pollution, which currently poses a serious threat to the earth's ecosystems. Living on earth is not possible without healthy sustainable ecosystems."* Stanley Jones, Grounds and Precinct Manager, February 2022.

The **University's estate** is vast[1] both in its extension and in the types of land uses associated with the different activities that take place. In broad terms, it is comprised of two distinctive types of ecosystems namely urban and non-urban. The non-urban ecosystems present across the estate are in turn significantly different from one another depending on whether the land has been developed and the types of activities undertaken. As expected, the University's approach considers the urban/non-urban features of the estate and manages biodiversity within the context of existing national legislation of nineteen different Acts[2] and any corresponding regional and local regulatory policies. The complexity of the regulatory space can be seen, in many ways as a testament of the complexity that is intrinsic to biodiversity. There are two significant elements of the current state of University's biodiversity. The botanical collection and the reserves.

The university's **botanical collection[3]** includes 800 trees recorded across sectors 100, 200, 300, 400 and Epsom. A master survey sheet records each tree's key attributes including common and botanical name, height, girth, crown spread, general

[1] See Te Rautaki Tūāpapa - Estate Strategy 2021-2030 for a more comprehensive description of the estate

[2] Conservation Act 1987, Forests Act 1949, Fisheries Act 1996, Marine Reserves Act 1971, Marine and Coastal Area (Takutai Moana) Act 2011, Marine Mammals Protection Act 1934, National Parks Act 1980, Native Plants Protection Act 1934, Reserves Act 1977, Trade in Endangered Species Act 1989, Wildlife Act 1953, Sustainable management, Customary Fisheries Regulations, Resource Management Act 1991 (RMA), Wild Animal Control Act 1977, Biosecurity Act 1993, Crown Pastoral Land Act 1998, Dog Control Act 1996, Environment Act 1986, Hazardous Substances and New Organisms Act 1996 (HSNO), Te Ture Whenua Maori Act 1993

[3] A short history of the University of Auckland botanical collection - Sourced from Stanley Jones - Grounds and Precinct Manager - February 2022

condition, age, protection status, location and whether there is any management work required. **Current management** work practices of the gardens surrounding the collection include choosing plants that support birdlife, insects' life such as bees and butterflies, composting garden debris, extensive mulching, chipping all branches to place them back into the garden, controlling moisture levels and soil temperature as well as limiting pesticides and herbicides.

Trees are one of the most important components of any urban ecosystem and maintaining biodiversity around the built environment is no easy task. The balance between conservation and removal of trees to make way for buildings that help the University thrive is a permanent feature of biodiversity management. It has not always been possible to replant or replace trees at a rate that keeps up with development mostly due to space limitations.

The city campus has a unique advantage in Auckland for growing trees. Stanley Jones, the Grounds and Precinct Manager says the secret to the lush growth all over the campus is that there's been minimal soil disruption in the area.

"We have good soil because it has not been destroyed. In many parts of Auckland, they strip the topsoil and then you must buy it back. Hundreds of years of topsoil has been destroyed. That's why you see trees around the houses struggling. But here, the ground has never been disturbed."[4]

Beyond *number* of trees, it is important to understand their value in the broader sense. Data on biodiversity indicators such as bird corridor mapping and bird and insect counts that would facilitate decision making and planning is not readily available beyond the anecdotal.

One example is a ngaro huruhuru, native bee colony. The bee colony have been dwelling on the turf covered earth bank, at the rear of Old Government House where the hatching of two species of bees took place in early November 2021. Their nest site is protected by punga fern logs securing the turf bank. The Three Kings Titoki, Alectryon excelsus var. grandis is their favoured source of pollen and nectar, which is gathered from the mature male flowers. This year other solitary native bees of the Lecoproctus family were also observed foraging on the Lilly pilly, Syzygium smithii trees.  there are native bees inhabiting a patch of grassed area in front of Old Government House and not much is known about them other than they might be of a species native to New Zealand.

The University has cared for scientific **reserves** and conservation areas for many decades, there are currently six reserves under its management. These are in Anawhata, Ardmore, Huapai, Oratia, Swanson, and Leigh. In addition, the University was gifted land on Waiheke Island (Goldie's Estate) which includes a wetland surrounded by restored native vegetation. It is vital to maintain active presence in these properties and current priorities for their management and maintenance are the health and safety of the researchers and students that use them as well as maintenance of tracks, bridges, and

[4] https://www.auckland.ac.nz/en/news/2019/08/02/stanley-jones-head-gardener-University-of-Auckland.html

monitoring of wasp nests. Rubbish dumping and environmental weeds are monitored and addressed, as are fences and any tree falls. One very important task common to all sites is the essential work on prevention of Kauri Dieback spread, for which (SteriGene) stations are regularly maintained. Huapai is a forest reserve is 15 hectares of kauri, mature kanuka scrub, areas of puriri, taraire, ewarewa, and podocarps. Oratia reserve is 9.5-hectares of podocarp, broadleaf and kauri forest with regionally rare, ancient ferns, orchids, and pines. Both are research and teaching reserves that are frequented by undergraduate and postgraduate students, researchers and teaching staff.

**In New Zealand**, the most important developments are of recent years include the Amendment (2021) of the Resource Management Act and the proposed National Policy Statement for Indigenous Biodiversity which would sit under it and is currently under development. There have also been significant changes in the level of strategic commitment announced with the launching of Te Mana o Te Taiao Aotearoa New Zealand Biodiversity Strategy, centred around the principle of *restoring the biological species in our natural world, and ensuring their survival*.[5] It is also anticipated that climate related regulatory policy,[6] will directly influence biodiversity management in the very near future.

**Universities elsewhere** are gradually incorporating biodiversity policies and guidelines into their strategic plans in a trend that is consistent with Waipapa Taumata Rau's Taumata Teitei vision 2030 of *leading transition to sustainable ecosystems*. Although there are few recent comprehensive studies that assess biodiversity of university campuses in a systematic way[7], explicit commitments to improving data and reporting, engagement and education plans, indigenous planting, integration of indigenous knowledge, soil and waterways conservation and restoration, increasing canopy coverage, and partnerships are all common themes for the sector's strategic direction. Appendix A. includes a summary table of other approaches to biodiversity within the international university sector including objectives and actions proposed. This initial benchmarking sampled ten key universities in New Zealand, Australia and the United Kingdom.

The strategic direction of **Waipapa Taumata Rau** set by Taumata Teitei - Vision 2030 as well as Te Rautaki Tūāpapa Estate Strategy 2030) and the upcoming Net-Zero Carbon Strategy and Sustainability Strategy (2022) will have decisive influence on the **future of its biodiversity**. As well as protecting and enhancing biodiversity within our University Estate, we must also consider the impact that our supply chain and operations have on biodiversity and take appropriate action. For example, we should acknowledge that there is also the aspect of Contribution to Biodiversity Loss through purchasing materials (particularly in research) and consumption of products that are generated from raw materials requiring ongoing ecosystem disruption (e.g. mining, hydrocarbon processing, deforestation etc) or generate significant waste that impacts ecosystems on land and water. Comprehensive biodiversity inventories and surveys designed to assess biodiversity as a critical pillar of sustainability and the advancement of

[5] P. 6 Te Mana o Te Taiao Aotearoa New Zealand Biodiversity Strategy
[6] See. Context paper: climate and carbon
[7] Liu et al. 'University campuses as valuable resources for urban biodiversity research and conservation' in: Urban Forestry & Urban Greening, Volume 64, 2021,

the Sustainable Development Goals will be developed to inform implementation plans and provide substance to decision making processes. A key part of this work includes improving accessibility to and integration of the existing botanical collection as well as an update and review of the original study which assessed carbon sequestration potential of trees around sector 100 until the year 2031.[8] The work will have immediate relevance to the University's carbon reduction trajectory as well as all other strategies and plans developed under Taumata Teitei.

[8] Xu M., Mitchell M., Carbon sequestration by trees on the city campus. The University of Auckland, School of Environment, 2012.

**Appendix A. Approaches to biodiversity – other universities**

| University | Approach | Objectives, actions, commitments, and outcomes | Objectives, actions, commitments, and outcomes continued |
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| University of Bristol | • Refers to biodiversity as "The Living Estate"<br>• Connects the Living Estate to SDG 14 Life below water and SDG 15 Life on land<br>• Identifies the living estate's role as a civic space<br>• Identifies two important functions of biodiversity: Mental health and sustainable ecosystems | • Maintain habitats<br>• Maintain and improve tree canopy cover<br>• Develop rich flora and fauna<br>• Work with conservation organisations and local communities<br>• Map habitats and survey biodiversity | • Increase volunteering opportunities<br>• Recognition for high standards of estate management<br>• Improving mental health<br>• Supporting food supply chain<br>• Reduce Co2, reduce heat island effect, and remove pollutants<br>• Raise awareness of biodiversity |
| University of Oxford | • Recognition that biodiversity impact is caused across all priority areas<br>• Identified greatest impact on biodiversity is from operations and supply chain (direct and indirect impacts)<br>• Identifies climate change and biodiversity loss as separate but interacting issues<br>• Recognises history of University's role in systemic biodiversity loss (locally and internationally)<br>• Developed "Mitigation and Conservation Hierarchy" framework<br>• Established a Biodiversity Action Group | • Measure, report, and compensate for damaged caused by the University's operations and supply chain<br>• Enhance biodiversity for staff and student wellbeing<br>• Quantifiable biodiversity net gain targets | • Net biodiversity gain<br>• Biodiversity impact measured and assessed across all priority areas<br>• Engagement plans and events for wider community<br>• Conservation and restoration activities undertaken as a form of "Biodiversity offsetting" |
| University of Western Australia | • Acknowledges the University's physical location and connection to the environment<br>• Developing a holistic Biodiversity Management Plan, including a flora and fauna inventory, as part of the Landscape and Public Realm Strategy<br>• New vision of the campus as an urban forest | • Landscape design – microclimates, urban heat sinks, water sensitive design<br>• Protection of vegetation<br>• Carbon bio-sequestration potential | • Protection of animals<br>• Protection of soil<br>• Design and Construction Standards for new developments, flora and fauna inventory |

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| | | • Tree assessments and canopy replenishment | • Engagement – Cultural heritage, environmental regulators, teaching and research, community |
| AUT | • Acknowledges New Zealand's unique biodiversity, distinct character, sense of place, and diverse biological systems<br>• Connects biodiversity to SDG 15 Life on land<br>• Recognises student experience: connectedness to New Zealand biota and increased wellbeing<br>• Has a focus on native biodiversity<br>• Intended use for local and wider communities | • Establish baseline data for all campuses<br>• Increase biodiversity via campus specific planting plans<br>• All new planting to be indigenous (except for food plants)<br>• Pest management plan | • Review chemicals used in landscape<br>• Work with researchers to improve biodiversity management practices<br>• Include Mātauranga Māori into plans and actions |
| Lincoln University | • Connects water and biodiversity to the sustainable development goals<br>• Recognises the need for behaviour and culture change<br>• Conserving water and indigenous biodiversity will be a key design consideration on all our capital infrastructure projects. | • Identify opportunities to create, strengthen and connect areas of existing native planting<br>• Identify new wetland opportunities and sustainable drainage to filter runoff<br>• Improve water monitoring and management on major projects and operationally | • Adopt solutions for stormwater and rainwater harvesting<br>• The Landscape Masterplan and associated projects must include water conservation and biodiversity solutions to enhance native biodiversity<br>• Behaviour and culture change to drive decision making and user operation |

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| Monash University | • Acknowledges climate unpredictability and climate change risk<br>• Includes biodiversity as part of their "Urban Ecosystem"<br>• Acknowledges the unique Australian experience. Including the experience of "our people, the wider community and our wildlife"<br>• Connects Urban Ecosystems to SDG 2 zero hunger, SDG 6 Clean water and sanitation, SDG 9 Industry, innovation and infrastructure, SDG 11 Sustainable cities and communities, SDG 12 Responsible consumption and production, and SDG 15 Life on land | • Biodiversity and soil health: including habitats and productive gardens on campus.<br>• Urban forest/micro-climates<br>• Water sensitive urban design: Building a passive support network for our living assets and water ways<br>• Building a water bank for landscape health and resilience | • No net decrease in canopy cover 2015-2020, targeting 30 per cent coverage by 2030<br>• Increase ground permeability across campuses, year on year<br>• Fifty per cent of irrigation requirements met by non-potable water by 2020<br>• Increase water harvesting capacity by 50 per cent across campuses by 2020, compared to 2015 capacity. |
| University of Queensland | • Acknowledges physical footprint of campuses and the fauna and flora that exists in this area<br>• Has implemented a Biodiversity Management Program (BMP) under the University's Environmental Management System – The Sustainability Action Plan compliments the BMP<br>• Identifying strategies to understand, conserve, and enhance the University's nature landscapes<br>• Ensure research, education and promotion of natural assets is undertaken | • Compile Integrated Landscape Management Plans that identify habitat zones. Provide site-specific management practices that enhance biodiversity values within these zones<br>• Implement a native planting strategy<br>• Implement a strategy to enhance nesting habitat on campuses<br>• Implement a site-specific weed management plan | • Seek funding opportunities annually to support conservation and restoration objectives<br>• Implement a biodiversity awareness program. Media, online, events, projects, and volunteer tree planting<br>• Maintain and develop new partnerships with academics, community, and student conservation groups<br>• Create and facilitate project-based learning opportunities for students |

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| Deakin University | • Refers to biodiversity as part of the "Natural Environment"<br>• Acknowledges being the custodians of the land and the responsibility to manage and care for natural environment<br>• Strong focus on adapting to climate change, increasing resilience, and enhancing biodiversity value<br>• Connects the Natural Environment to SDG 13 Climate action, SDG 14 Life below water, and SDG 15 Life on land<br>• Splits overarching goals into five-year periods: 2020, 2025, and 2030<br>• Develop an overarching strategy relating to biodiversity and the natural environment to connect existing plans, assessments and initiatives<br>• Embed and prioritise key sustainability principles within campus master planning | • 2020 Complete a biodiversity management plan and embed biodiversity considerations into campus planning.<br>• 2025 Enhance the biodiversity on the campus' natural landscapes and waterways<br>• 2030 Biodiversity corridors have been established in priority locations allowing wildlife to thrive on campus<br>• Establish specific biodiversity zones within campus masterplanning. | • Biodiversity assessments and management plans<br>• Urban Tree Strategy and Arbor plan mapping<br>• Campus Landscape Environmental Design Standards<br>• Develop interpretive signage and an Indigenous cultural walk |

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| University of Worcester | • Developed a Biodiversity Strategy<br>• Has a Sustainability Policy commitment to "Enhance biodiversity and incorporate biodiversity in environmental management, creating new opportunities for wildlife on campus wherever possible"<br>• Intends to meet the "UN Sustainable Development Goal for biodiversity" SDG 15 Life on land<br>• Has a Strategic Biodiversity Management Group as part of the University's ISO14001 Environmental Management System?<br>• Part of a partnership that includes local government, statutory, voluntary, and public bodies<br>• Acknowledges ecosystem services provided by biodiversity<br>• Understands that communication is an important aspect of effective biodiversity management | • The EAUC Biodiversity Guide considers the following factors: Campus planning and development, legal compliance, reputation and image, financial, sustainability in the curriculum, healthy living and well-being, people and partnership, volunteering opportunities, and wider environmental benefits<br>• Reports the habitats and species that exist on the University campuses<br>• Protecting biodiversity is a priority<br>• Has a governance structure for biodiversity | • Undertaking surveys to ascertain the biodiversity value of each campus and site<br>• Capital Projects Team undertakes a project risk assessment including the assessment of biodiversity features<br>• Nationally or locally rate and protected habitats and species are given consideration<br>• Monitoring and data management systems in place<br>• Surveys trees, habitats, species<br>• Biodiversity areas on site are used as an educational resource |

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| Harvard University | • Refers to biodiversity under "Nature and Ecosystems".<br>• Recognises that the campuses are part of a larger, interconnected ecosystem<br>• Intends to protect and enhance ecosystems and green spaces the University owns, manages, or impacts, in order to enhance regional biodiversity and personal well-being.<br>• Committed to incorporating sustainability goals into facility, district, and campus planning | • Maintain at least 75% of the University's landscaped areas with an organic landscaping program by 2020.<br>• Design landscapes and choose plant species that are likely to be robust to future environmental change, ensure appropriate levels of biodiversity and green or open space, and support stormwater reduction and passive stormwater filtration.<br>• Switched from diesel trucks to electric cargo bikes to use on the grounds | • Prioritize conservation, research, and education at University-owned green spaces including the Harvard Forest and the Arnold Arboretum<br>• Creating vegetated green roofs across campus to promote biodiversity and prevent stormwater runoff and reduce energy consumption<br>• An Indoor Nature Program that increases plants and trees, organic elements like wood and stone, and living walls in buildings across campus |

| Key findings of approaches to Biodiversity | Common objectives, actions, commitments, and outcomes |
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| • A systemic or holistic approach towards biodiversity<br>• Integration of biodiversity considerations into decision making processes and planning<br>• Recognition and acknowledgement of Universities physical connection to the land. Including the historical context, the University and impacts on biodiversity in the past locally and globally<br>• Using biodiversity as an opportunity to showcase the uniqueness of indigenous fauna and flora and the unique experience offered to communities (particularly in New Zealand and Australia)<br>• Communication of the connection between biodiversity and relevant United Nations Sustainable Development Goals<br>• In addition to healthy ecosystems, Universities are connecting biodiversity to mental health, stakeholder experience, and campus identity<br>• Recognition of the need to increase education and engagement. Increasing awareness of why biodiversity is important and what is being done to support biodiversity | • Measuring and reporting biodiversity impact outcomes<br>• Focusing on maintaining and increasing tree canopy coverage to reduce the heat island effect and improve the on-campus experience<br>• Engagement and education plans, events, and collaborations<br>• A focus on planting being indigenous or plants that support access to food<br>• Ensuring protection for flora, fauna, soil health, and threatened species<br>• Integration of indigenous knowledge and ways of thinking<br>• Partnerships and collaboration across internal and external stakeholders and groups<br>• Pest management programs implemented where appropriate<br>• Volunteering and community building opportunities<br>• A focus on soil health and waterways where relevant<br>• Improved mental health of on-campus stakeholders |