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NVS Annual Report for the 2014/15 year

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Contents

1 Number of new records archived in NVS

A total of 24 new projects[1] were added electronically to NVS in 2014/15 (year to 30 June 2015; Figure 1 & Appendix 1) with a total of 795 plots added, 367 of which were new plots, not remeasurements of existing plots. Major providers of data and types of data since 2006/07 are shown in Figure 1.

Major sources of new data this year include the ongoing plot measurement to support the Tier 1 programme undertaken by the Department of Conservation (DOC); eight years of remeasurements of vegetation data from two transects on Mt Thomas, Canterbury from 1981 to 2014; the 2014 Whirinaki and Tuawhenua Forest indicator projects (30 and 24 plots, respectively), which were set up by the Tūhoe Tuawhenua Trust, Te Rūnanga o Ngāti Whare and Landcare Research staff to develop community-led monitoring of two forests with contrasting pest control; and the Whangamarino Wetland Monitoring project (2011, 2013), which was set up by DOC Taupo/Turangi with help from Wildland Consultants to monitor the ecological integrity of the Whangamarino Wetlands.

Development and use of NVS Express software is greatly facilitating the addition of data into NVS; six projects (109 plots) deposited into NVS in 2014/15 were via NVS Express, down from nine last year; however, there are another eight projects (28 plots) awaiting final confirmation.

We devoted significant periods of time to processing paper records housed in the NVS archive that comprise the NVS 'backlog'. To streamline this process, we wrote and adopted an accession policy that includes clear criteria to guide decisions regarding whether the materials fit within the scope of the NVS databank or not. Material from 96 new projects was incorporated into the NVS databank (Appendix 1).

[1] A project is a defined sampling event undertaken over a specific period. A project may have many methods and many plot observations (visits).

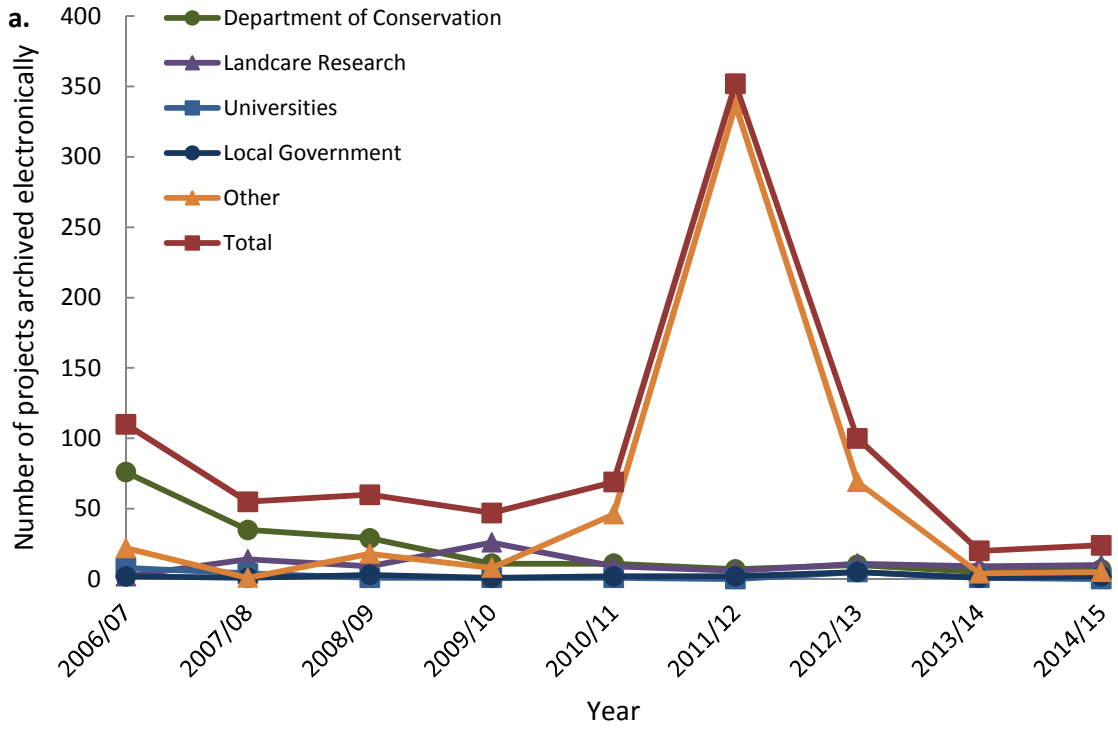

Figure 1 Number of projects archived in the National Vegetation Survey databank, total and from four major contributors, per financial year since 2006/7. The spike in 2011/12 was the product of the incorporation (funded by the Terrestrial and Freshwater Biodiversity Information System (TFBIS)) of the large DTZ vegetation monitoring dataset collection (see the NVS annual report for 2011/12).

2 Database development and integration

We have released several new updates to the primary NVS data entry and management tool over the past year. This tool now serves internal and external data entry and management capability for Landcare Research NVS staff as well as select members of the Indigenous Vegetation team for Tier One monitoring within DOC. Key enhancements have been improved usability for end users working with the tool; additional capability to capture several new data types including data unique to wetlands, such as standing water depth; and additions to the range of data validation workflows that can be run.

We have improved the efficiency and accuracy of our data processing and management. For example:

- The NVS administrator can now create large custom requests and use our web-based request service to automate the approval process where permission to use these data is required. For large requests, approval may be required from many data owners, so streamlining the process was important to increase efficiency.
- There is more flexibility for linking data collected using a specific method (e.g. diameter data) to plots and merging methods and plots as required.

- A function has been created to add missed species to a Recce observation (e.g. when the species was recorded as a tree or sapling on the plot).
- There are new administrator queries to validate data and manage data requests, taxon codes and documentation for different types of data collection methods.

We have extended the range of data types and services that the NVS databank can accommodate, for example:

- We can now import data from a wider range of original electronic formats.
- Site factors, such as altitude, slope, aspect and ground cover, can now be captured at the subplot scale.
- People can be associated with specific roles for specific data collection methods associated with a plot measurement (e.g. data recorder for the Recce, but not for the diameter data).

We have updated and added new supporting information to the NVS data to increase the value of these data to end users. For example:

- Definitions have been written for all NVS databank tables and their component fields. A document containing all relevant definitions accompanies the data provided for all requests.
- The currently accepted taxonomic name is now provided for all species occurrence records.
- Data can be provided in cross-tabulated formats to better equate to original data sheets.

We also released a new version of NVS Express (version 1.3.0) that is available for downloading from the NVS website and for use via the DOC intranet.

3 NVS Website developments

We have upgraded the NVS website by making significant improvements to the search interface as well as minor enhancements and bug fixes. Ongoing improvements to the website, and in particular the search interface, make the NVS website more intuitive to users, as well as making the NVS data more easily accessible. The automated request processing service is now more reliable for large requests. We have also introduced compulsory fields on the request page for email address and the purpose for the data request. This improves our ability to report on data use and to ensure that users are getting the appropriate data for their intended use.

4 Significant revisions of data

This year we devoted substantial resources to addressing much needed data corrections and revisions. We were assisted by Christina Götz, an intern from the Department of Geography, Ruprecht-Karls University, Heidleberg, Germany, who was solely dedicated to NVS for 6 weeks. Corrections and revisions included:

- using a semi-automated processes to increase the accuracy of designation of plot permanence (from 13 957 to 20 242 plots, an increase of 45%)
- correction of species codes where taxa were recorded outside known range
- revisions/improvements of metadata records (e.g. DTZ)
- ensuring correct access levels are assigned to datasets
- merging diameter methods in a project where there were separate methods for live and dead stems
- assigning subplots to stem records where subplots were missing, but had been recorded in previous or subsequent measurements
- correcting how plot areas were expressed for non-circular plots that were previously expressed as radii
- improved designations of plots as exclosures in selected grassland projects
- extensive corrections on permanent plot data from Egmont National Park to resolve inconsistencies between measurements in tree tag numbers and species recorded and correcting trees incorrectly designated as 'alive'
- linking tree diameter tags across all measurements for multiple projects.

5 Increasing end-user awareness and capability

5.1 Training workshop in NVS Express

Elise Arnst ran a 1-day workshop for NVS Express in concert with the New Zealand Ecological Society Conference at Massey University. Nine participants attended from the University of Otago, Massey University, Bay of Plenty Regional Council, and Trondheim City Council (Norway). This workshop included a brief review of how data in the NVS databank supports practical conservation and what kind of data the NVS databank contains. It then focussed on the mechanics of how to use NVS Express to enter data into NVS, with an explanation of how NVS is organised to help participants understand why NVS Express works the way it does. Participants then worked through typical workflows for summarising and analysing common data types using the NVS–Analysis module.

As a result Dr Jill Rapson, ecology lecturer at Massey University, is now planning to teach NVS Express to her postgraduate students. This has prompted the NVS team to actively promote future workshops to students, particularly those from the host university.

5.2 Presentations and workshops for end users

Landcare Research staff associated with the NVS databank delivered several presentations throughout the year to disseminate information to end users and other government agencies. For example, in October 2014, Susan Wiser gave a tour of the NVS databank to Ben Parker from the NZ Treasury working with Vote MfE, and described a number of aspects of NVS including a) history and content; b) how NVS supports research (both within and external to Landcare Research); c) how NVS data is provided to data accumulators (Global Biodiversity Information Facility (GBIF), New Zealand Plant Conservation Network (NZPCN)); d) how NVS supports operational needs of government agencies; and e) how NVS is funded from MBIE. The group discussed the research/cultural values of NVS and their value to New Zealand Inc. Mr. Parker was particularly interested in the NVS-LUCAS-MfE connection.

5.3 Increasing access and end-user capability

We improved data access capability for key stakeholders by working with our counterparts in MfE and DoC to establish a new secure remote data access connection. This allows them to directly access and view specific datasets that underpin the LUCAS and DOC Tier One monitoring programmes. In so doing they can assess data quality and the status of key datasets in a secured network framework as the datasets move through the data entry and validation processes.

6 Data-sharing agreements, data exchange, journal repositories

Increasingly, scientific journals are requiring data supporting publications to be made available in a publically accessible archive. Some of our Nationally Significant Databases, such as NVS, which may have provided the data to the researcher originally, are 'living databases' where data are subject to error correction and other amendments over time. To support journal publication, a 'snapshot' of the data used in the paper is required. Further, authors may have incorporated ancillary data from other sources for their research. To solve these problems, the NVS databank has joined forces with the Landcare Datastore to provide a means for users of data archived in NVS to make the version of the data used for a publication fully documented, readily available and locatable using a DOI. The Datastore provides a means to archive data snapshots and ancillary data, while retaining the link to the NVS databank. Retaining the link to NVS is critical to ensure that the NVS team can continue to document ongoing use of these data and ensure that potential users can obtain the version of the data that will best meet their needs. Using the Datastore also overcomes the issues posed by the use of data repositories, such as DRYAD, of offshore data storage and licensing that is contrary to NZ government policy. An example of how this capacity has been used can be seen by going to http://datastore.landcareresearch.co.nz/, going to 'Organisations' and selecting the box for the NVS databank. The datasets linked to NVS can be viewed here. To view one of these datasets by using a DOI, this example can be examined http://dx.doi.org/10.7931/V11593 (Figure 2).

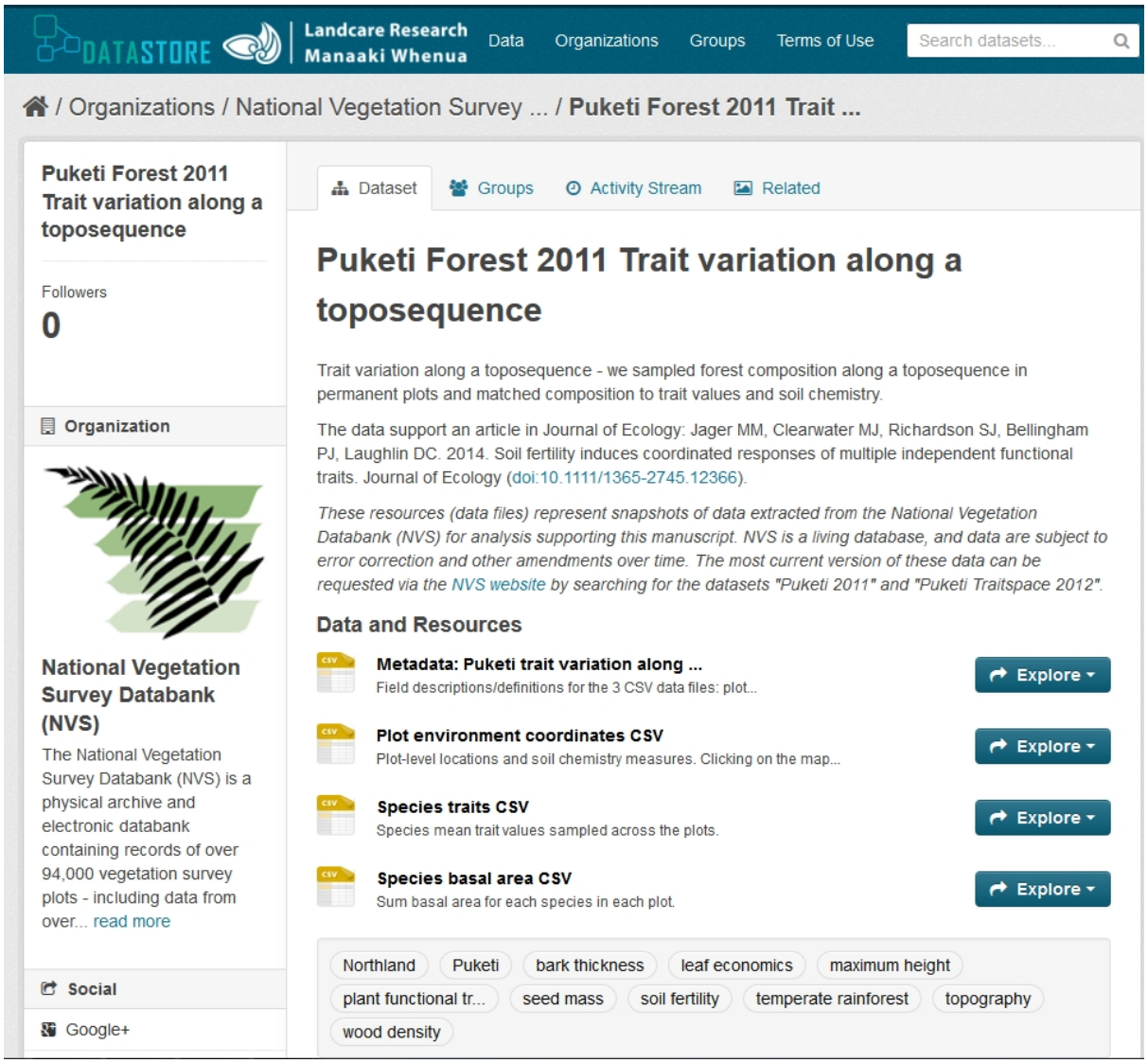

Figure 2 A screenshot illustrating the archive of a dataset in the NVS area of the Landcare Datastore.

NVS has entered into an initial agreement to contribute data to sPlot, the first global-scale effort to synthesise vegetation plot and trait data. Such an agreement presents new challenges to NVS because of conflicts with our current data use policies. As a trial, data from 1946 permanent grassland transects collected by the former NZ Forest Service have been supplied. To date, sPlot has imported >1.1 million vegetation plot records from around the world (Figure 3).

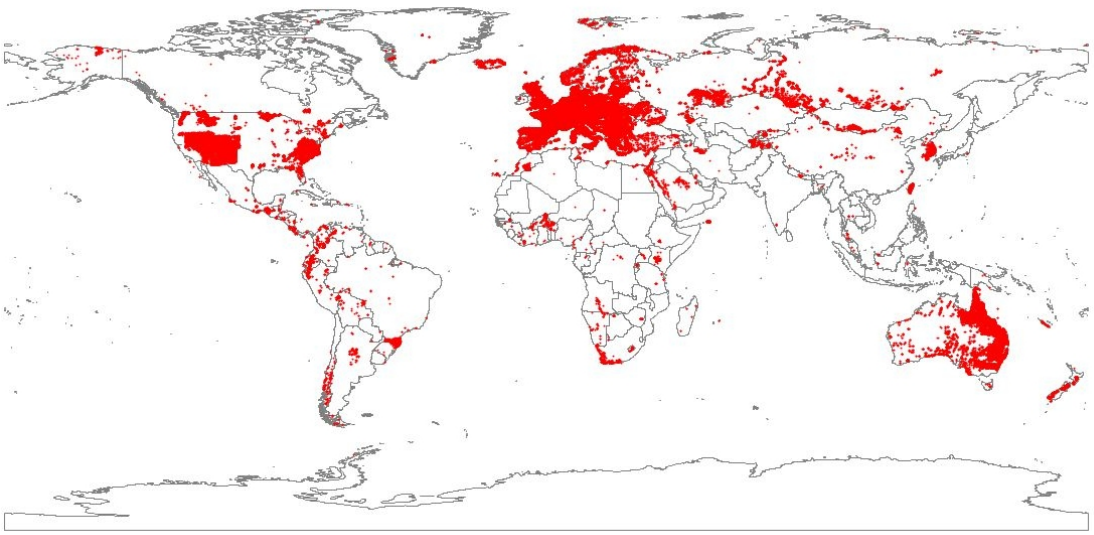

Figure 3 Distribution of > 1.1 million vegetation plot records incorporated into the sPlot initiative as of July 2015. Map provided by Stephan Hennekens.

6.1 Use of NVS data through the GBIF Portal

The GBIF portal currently carries 1 267 498 records of species data supplied by NVS. Between 1 July 2014 and 30 June 2015 there were 1185 downloads of species occurrence data, incorporating 507 892 612 records, accessed via the GBIF website.

6.2 Use of NVS data through the NZPCN Website

NVS plant distribution records can be viewed and downloaded from the NZPCN website. Between 1 July 2014 and 30 June 2015, 3,734,085 NVS plant distribution records were viewed as map points on Google maps embedded in the NZPCN website, 65 % of all distribution records viewed. This is nearly double the number of NVS plant distribution records viewed in the previous year.

Further, the NZPCN website now provides the six-letter species codes sanctioned by the NVS database in concert with their listings for species. This enables users who are measuring plots and using the NZPCN facilities to aid plant identification to readily link their identified specimen to both the correct plant name and the correct code for that name.

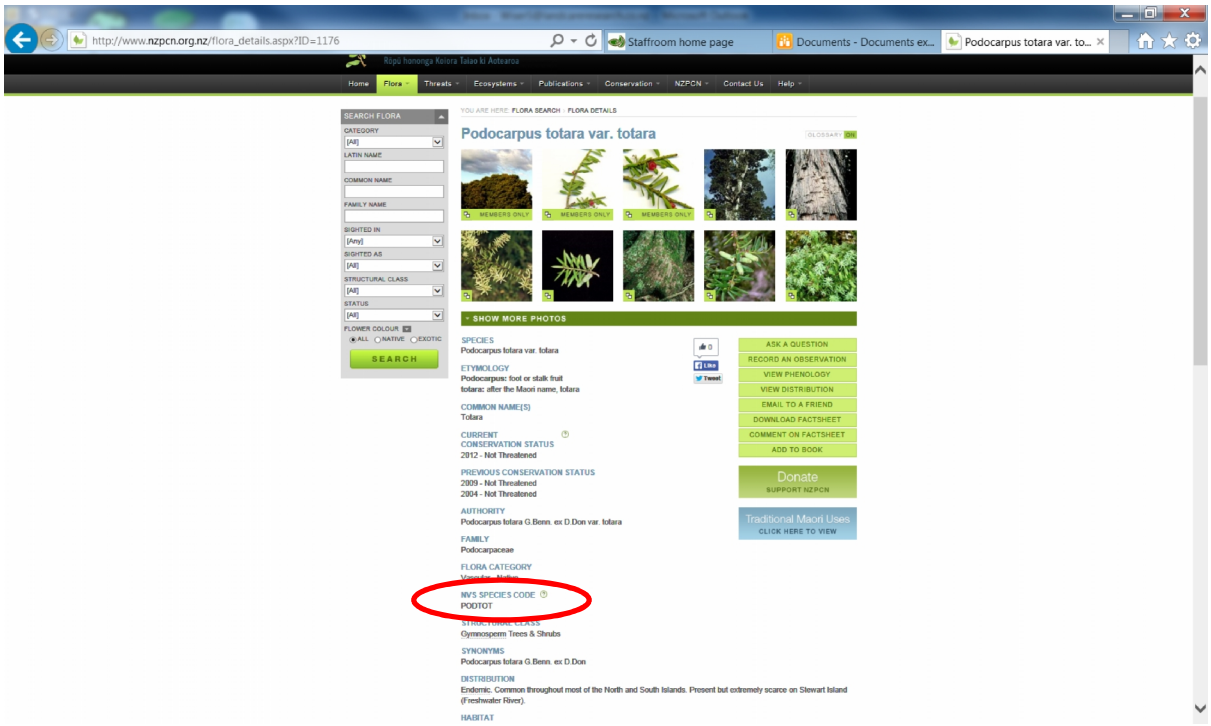

Figure 4 Screenshot of a species page on the NZPCN website indicating NVS species code that applies.

7 International collaborations

Recently, there has been a renewed interest in vegetation classification worldwide and efforts have been made at national and international levels to develop new classification systems using standardised procedures. This interest is echoed in New Zealand, as evidenced by recent classifications produced by constructing large datasets using plots from the NVS databank. There is growing interest in harmonising approaches worldwide and standardising the information content of classifications that serve similar purposes. This interest is motivated by the need to both increase the usefulness of vegetation typologies and to enhance the acceptance of their scientific underpinnings. In order to advance toward classification practices that enjoy broad international acceptance, Susan Wiser joined a global collaboration of leading vegetation classification experts to develop a general framework in which the concepts and criteria of different classification approaches can be appropriately described and compared. This framework will be useful to those trying to integrate existing classifications and to those initiating new vegetation classification projects.

The Botanical Information and Ecology Network (BIEN) is a network of ecologists, botanists, conservation scientists and other researchers (including Susan Wiser and Nick Spencer) interested in global patterns of plant diversity, function and distribution. (See previous NVS annual reports for more detail about this group). We have continued to provide our technical expertise to support publication efforts by this group, resulting in a 2015

publication in Ecography [see publications list below] led by Irena Simova. This paper was selected as the editor's choice by the journal for July 2015. The authors point out that when hearing the term 'biodiversity', most people imagine the number of species, which is indeed in central focus of nature conservation; however, the variability of organismal traits is another aspect of biodiversity that has been largely overlooked until recently. It is thus important to keep in mind that these two biodiversity aspects could be independent of each other, as was demonstrated in the paper.

The research examined the pattern that the number of species of most of the higher taxa steeply decreases from the equator towards the poles. Although this pattern has been thoroughly described, it has not yet been satisfactorily explained. One approach to understanding the mechanism behind the latitudinal diversity gradient focuses on another biodiversity aspect, the number and variation of functional traits. A classical hypothesis proposes that warm, humid and climatically stable environments allow coexistence of more ecological strategies, either due to the higher number of available resources or longer time for species evolution. The greater space for viable ecological strategies could consequently allow the coexistence of more species. We addressed this by focusing on the species richness of North American trees per 100 × 100 km grid cells and on the surrogates of the variation of their ecological strategies – the variance in the values of functional traits. Contrary to our expectation, different regions varied only weakly in their trait diversity and this variation differed for particular traits. Moreover, spatial trends of trait variation were neither associated with warm, wet or stable climate nor with the number of species. Instead, we found strong evidence for the shifts in assemblage trait means, largely driven by climate. This means that stressful environmental conditions select for different optimum strategies rather than constraining their variability.

Susan Wiser continues to serve as a scientific advisor to the New South Wales Office of Environment and Heritage: Vegetation Information and Mapping Programme. In Australia, accurate spatial depiction of plant community types underpins evidence-based land-use planning to satisfy legislative requirements to protect threatened ecosystems. (See NVS Annual Report 2012/13 for more detail about this appointment.) We provide expertise on the best use of plot-based data to construct robust vegetation classification and provide the basis for mapping and map validation. At the same time, we benefit from learning about the sophisticated approaches being used to map vegetation types in New South Wales. Susan attended two Vegetation and Mapping Programme meetings in 2014/15: November 2014 and May 2015.

Susan Wiser also continues to serve on the Steering Committee of the International Association for Vegetation Science Working group on Ecoinformatics.

8 Web statistics

Over recent years an increasing number of organisations are providing links to the NVS website as a resource for vegetation data, as a provider of information on vegetation monitoring, and as a New Zealand Government conservation resource. On average, 28% of page views resulted from referrals from other sites, whereas access via search engines remains the most frequent pathway to the NVS website (40%). The remainder (32%) was direct traffic, indicating that frequent users bookmark the website.

There are some new and interesting links to the NVS website and database, for example:

- The New Zealand Ecological Society has created a 'Resources' page to connect users with more New Zealand ecology on the web, and links to NVS under the topic 'Monitoring nature'. Click here for the link.
- A link to the NZ plot manuals on the NVS website was provided to answer a general question on Research Gate about assessing ecological restoration. Click here for the link.
- The Kereru Awhina Project provides a link to the NVS website as a general conservation resource. Click here for the link.

From 1 July 2014 to 30 June 2015, the NVS website was visited 3993 times, a 14% increase from the 2013/14 year (3507 visits), and there were 16 356 page views. There were 1914 visitors to the site. Of the current year's hits that could be traced to origin, the majority of visits were from New Zealand (80%), followed by the USA/Canada (5%), UK (3%) and Australia (2%). The website was also visited by people from another 77 countries. The data access aspect of the new website is proving popular with 32% of page views, with the data search tool attracting nearly half of those. The Index page received 20% of all page views and details about field techniques, manuals, and field forms were also popular (17% of page visits).

9 NVS data requests

A total of 35 individuals made requests for NVS data and metadata during 2014/15 and 5208 datasets were supplied (Figure 2a, b), a decrease of 10 requesters and an increase of 1529 datasets over the 2013/14 year. This may reflect the trend for modelling using large amounts of data. The principal agencies requesting data and number of datasets supplied since 2005 are shown in Figure 2b. Two of the major agencies requesting data (DOC and Landcare Research), have made similar numbers of requests over recent years; however, the increase in the number of datasets supplied to DOC staff over the past two years can be mostly attributed to requests for data for pre-printed plotsheets for the following field season's Tier 1 survey. Most data requests this year have been made directly through the website's data request tool, which is proving popular and which frees up NVS data administrative staff to perform other tasks. However, more complex and unusual data requests are still handled manually.

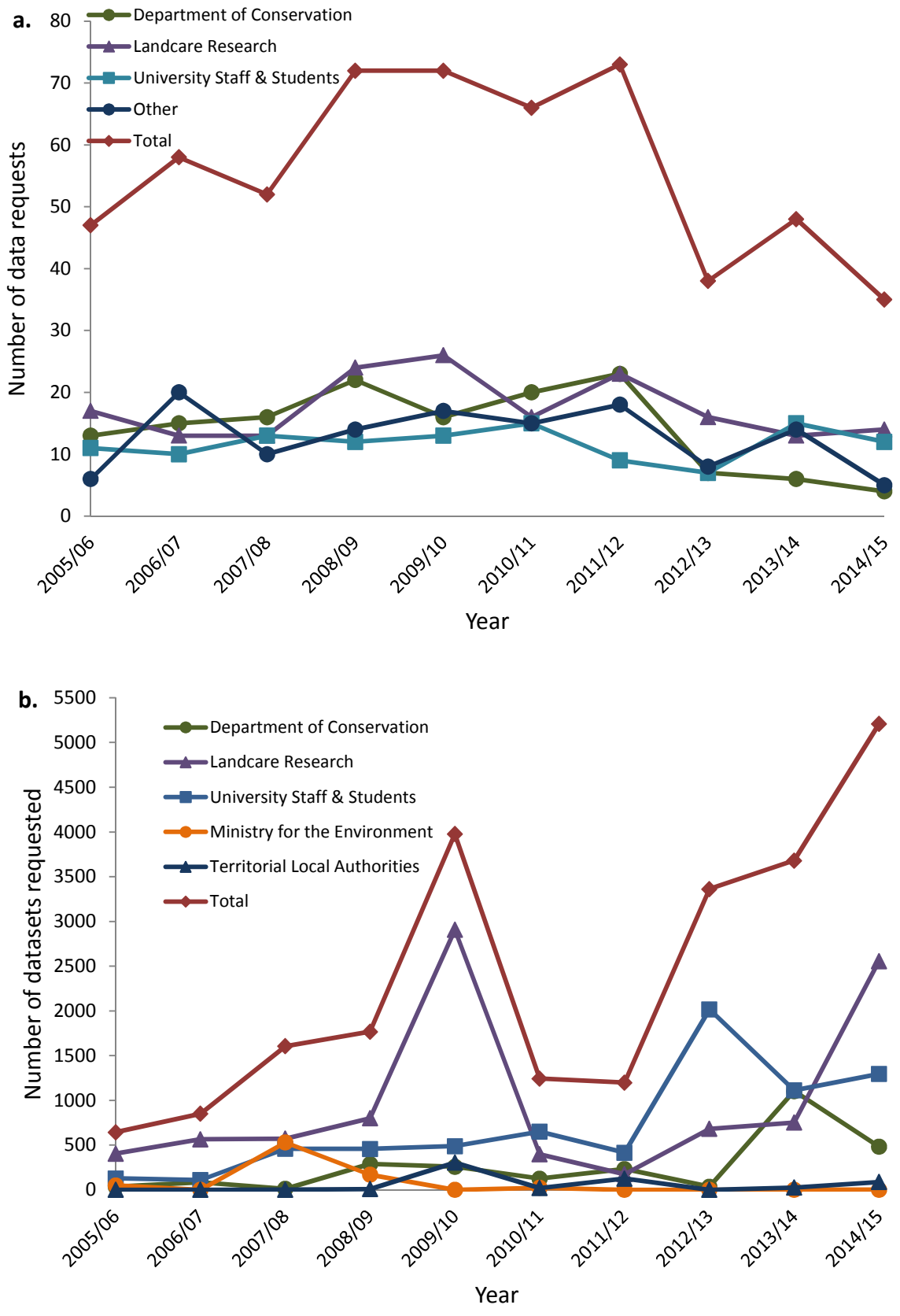

Figure 5 Requests for data from the National Vegetation Survey Databank per financial year since 2005: (a) total number of requests and from three major data-users and (b) number of datasets requested, total and from five major data-users.

The intended uses of these data are wide-ranging and include:

- reconstructing palaeoclimates from c. 4 million years ago from fossil pollen assemblages from the Australian Nullarbor Plain. These assemblages include *Geniostoma* (Loganiaceae), which is rare in Australian rainforests, but widely distributed in NZ
- a proposal for a PhD on Kauri dieback disease
- the analysis of mistletoe distributions within NZ beech forests
- an analysis combining plot data with herbarium records to identify areas of species richness and endemism in the NZ flora through application of the Australian software package *Biodiverse*.

10 Publications directly associated with the NVS Databank

Publications and conference presentations funded, at least in part, by the NVS program (4 total)

De Cáceres M, Chytrý M, Agrillo E, Attorre F, Botta Dukát Z, Capelo J, Czúcz B, Dengler J, Ewald J, Faber Langendoen D, Feoli E, Franklin SB, Gavilán R, Gillet F, Jansen F, Jiménez Alfaro B, Krestov P, Landucci F, Lengyel A, Loidi J, Mucina L, Peet RK, Roberts DW, Roleček J, Schaminée JHJ, Schmidtlein S, Theurillat J P, Tichý L, Walker DA, Wildi O, Willner W, Wiser SK 2015. A comparative framework for broad-scale plot-based vegetation classification. Applied Vegetation Science [early view online]. http://doi.org/10.1111/avsc.12179

Peet RK, Enquist B, Boyle B, Svenning JC, McGill B, Jørgensen PM, Theirs B, Wiser SK, Violle C, Morueta-Holme N, Schildhauer M 2014. Big data meets Darwin's "entangled bank": the macroecology of botanical diversity. 57th annual symposium of the International Association for Vegetation Science, Perth, Western Australia. September 1–5.

Simova I, Violle C, Kraft N, Storch D, Svenning J, Boyle B, Donoghue J, Jorgensen PM, McGill BJ, Morureta-Holme N, Peet RK, Wiser SK, Piel W, Regetz J, Schildhauer M, Thiers B, Enquist B 2015 Shifts in trait means and variances in North American tree assemblages: species richness patterns are loosely related to the functional space. Ecography 38: 649–658.

Wiser SK, Spencer N, Burrows L, Allen R 2014. How should data access policies reflect the changing data-sharing landscape: a case study with New Zealand's National Vegetation Survey Databank. 57th annual symposium of the International Association for Vegetation Science, Perth, Western Australia. September 1–5.

Refereed publications

The following 26 2014/15 publications used data archived in the NVS Databank.

Aubert S, Boucher F, Lavergne S, Renaud J, Choler P 2014. 1914–2014: A revised worldwide catalogue of cushion plants 100 years after Hauri and Schröter. Alpine botany 124(1): 59–70 [Data sourced from GBIF]

Bernard-Verdier M, Hulme PE 2015. Alien and native plant species play different roles in plant community structure. Journal of Ecology 103: 143–152.

Brummitt N, Bachman SP, Aletrari E, Chadburn H, Griffiths-Lee J, Lutz M, Moat J, Rivers MC, Syfert MM, Lughadha EMN 2015. The Sampled Red List Index for Plants, phase II: ground-truthing specimen-based conservation assessments. Philosophical Transactions of the Royal Society of London B: Biological Sciences 370(1662): 20140015.

Burrows L, Cieraad E, Head N 2015. Scotch broom facilitates indigenous tree and shrub germination and establishment in dryland New Zealand. New Zealand Journal of Ecology 39(1): 61–70.

Cale JA, Teale SA, West JL, Zhang LI, Castello DR, Devlin P, Castello JD 2014. A quantitative index of forest structural sustainability. Forests 5(7): 1618–1634. DOI:10.3390/f5071618

Carswell FE, Mason NWH, Overton J McC, Price R, Burrows LE, Allen RB 2015. Restricting new forests to conservation lands severely constrains carbon and biodiversity gains in New Zealand. Biological Conservation 181: 206–218.

Castello JD, Teale SA, Cale JA 2011. How Do We Do It, and What Does It Mean? Forest Health. Case Studies. In: Castello JD, Teale SA eds. An Integrated Perspective : Cambridge, UK, Cambridge University Press. Pp. 50–78 [not reported in 2011].

Cieraad E, Burrows L, Monks A, Walker S 2015. Woody native and exotic species respond differently to New Zealand dryland soil nutrient and moisture gradients. New Zealand Journal of Ecology 39(2): 198–207.

Dickie IA, St John MG, Yeates GW, Morse CW, Bonner KI, Orwin K, Peltzer DA 2014. Belowground legacies of *Pinus contorta* invasion and removal result in multiple mechanisms of invasional meltdown. AoB plants 6. 10.1093/aobpla/plu056

Fernández M, Hamilton H 2015. Ecological niche transferability using invasive species as a case study. Plos One 10(3): e0119891 [Data sourced from GBIF]

Forsyth DM, Wilson DJ, Easdale TA, Kunstler G, Canham CD, Ruscoe WA, Wright EF, Murphy L, Gormley AM, Gaxiola A, Coomes DA 2015. Century-scale effects of invasive deer and rodents on the dynamics of forests growing on soils of contrasting fertility. Ecological Monographs 85(2): 157–180. http://doi.org/10.1890/14-0389.1

Greer AL, Gajdon GK, Nelson XJ 2015. Intraspecific variation in the foraging ecology of kea, the world's only mountain-and rainforest-dwelling parrot. New Zealand Journal of Ecology 39(2): 262–272.

Higgins S I, Richardson DM 2014. Invasive plants have broader physiological niches. Proceedings of the National Academy of Sciences 111(29): 10610–10614 [Data for global distribution of Eucalyptus sourced from GBIF]

Holdaway R J, Rose AB, Newell CL, Carswell FE 2014. Demographic drivers of biomass carbon recovery in degraded perennial tussock grassland, with and without domestic grazing. New Zealand Journal of Ecology 38.2: 201–212.

Jager MM, S.J. Richardson SJ, Bellingham PJ, Clearwater MJ, Laughlin DC 2015. Soil fertility induces coordinated responses of multiple independent functional traits. Journal of Ecology 103(2): 374–385. DOI: 10.1111/1365-2745.12366

Lamoureaux S, Bourdôt G 2014. The potential distribution of yellow bristle grass (*Setaria pumila*) in New Zealand. New Zealand Plant Protection 67: 226–230. [data sourced from GBIF]

Laughlin DC, Joshi C, Mason NWH, Richardson SJ, Peltzer DA, Wardle DA 2014. Quantifying multimodal trait distributions improves trait-based predictions of species abundances and functional diversity. Journal of Vegetation Science 26: 46–57. DOI: 10.1111/jvs.12219

Laughlin DC, Richardson SJ, Wright EF, Bellingham PJ 2015. Environmental filtering and positive plant litter feedback simultaneously explain correlations between leaf traits and soil fertility. Ecosystems: 1–12.

Litsios G, Wüest RO, Kostikova A, Forest F, Lexer C, Linder HP, Pearman PB, Zimmermann NE, Salamin N 2014. Effects of a fire response trait on diversification in replicated radiations. Evolution 68(2): 453–465 [NZ Restionaceae records sourced from GBIF]

Monks A, Burrows L 2014. Are threatened plant species specialists, or just more vulnerable to disturbance? Journal of Applied Ecology 51(5): 1228–1235. DOI: 10.1111/1365-2664.12318

Peltzer DA, Allen RB, Bellingham PJ, Richardson SJ, Wright EF, Knightbridge PI, Mason NW 2014. Disentangling drivers of tree population size distributions. Forest Ecology and Management 331: 165–179.

Richardson DM, Le Roux JJ, Wilson JR 2015. Australian acacias as invasive species: lessons to be learnt from regions with long planting histories. Southern Forests: a Journal of Forest Science 77(1): 31–39 [Data sourced from GBIF].

Richardson SJ, Holdaway RJ, Carswell FE 2014. Evidence for arrested successional processes after fire in the Waikare River catchment, Te Urewera. New Zealand Journal of Ecology 38: 221–228.

Schwery O, Onstein RE, Bouchenak-Khelladi Y, Xing Y, Carter RJ, Linder HP 2014. As old as the mountains: the radiations of the Ericaceae. New Phytologist 207(2): 355–367 [Data sourced from GBIF].

Smale MC, Richardson SJ, Hurst JM, Allen RB, Griffiths AD 2014. Diameter growth rates of tawa (*Beilschmiedia tawa*) across the middle North Island - implications for sustainable forest management. New Zealand Journal of Forestry Science 44(1): 1–6. DOI:10.1186/s40490-014-0020-9.

Tanentzap AJ, Brandt AJ, Smissen RD, Heenan PB, Fukami T, Lee WG 2015. When do plant radiations influence community assembly? The importance of historical contingency in the race for niche space. New Phytologist 207: 468–479 [Data sourced from GBIF]

Contract reports

The following eight 2014/15 reports used data archived in the NVS Databank.

Bellingham PJ, Richardson SJ, Gormley AM, Husheer SW, Monks A 2014. Department of Conservation biodiversity indicators: 2014 assessment. Landcare Research Contract Report prepared for the Department of Conservation. Landcare Research, Christchurch.

Burrows L, Brownstein G, Monks A, Hayman E, Johnson P, Ford K, Meurk C 2015. Monitoring of Shoreline Vegetation at Lakes Manapouri, Te Anau and Hauroko 2015. Landcare Research Contract Report LC 2304 prepared for Meridian Energy New Zealand Limited. Landcare Research, Christchurch. 70p.

Easdale T, Carswell F, Burrows L, Karl B, Pearce G, Scott M 2015. Improved allometric functions for Scotch broom and tauhinu: Final Report. Landcare Research Contract Report LC2133 for the Ministry for Primary Industries.

Hurst JM, Smale MC, Burrows LE, Richardson SJ 2015. Tree growth, stand structure and volume increment in Tūhoe Tuawhenua Trust tawa-podocarp forests. Landcare Research contract report prepared for the Sustainable Farming Fund, Ministry for Primary Industries.

Mason NWH, Holdaway RJ, Richardson SJ 2015. Quantifying uncertainty in biodiversity data for monitoring and reporting indicators. Landcare Research Contract Report LC2190 prepared for the Department of Conservation.

Richardson SJ, Easdale TE, Wiser SK 2015. Optimal plot size for vascular plant biodiversity monitoring. Landcare Research Contract Report LC2154 prepared for the Department of Conservation.

Wiser SK, Vickers S 2015. Maximising use of permanent plots in design of DOC's Tier 2 monitoring. Landcare Research Contract Report LC2199 prepared for the Department of Conservation.

Wiser SK, De Cáceres M 2015. Sensitivity of a NZ woody classification to specific analytical choices. Landcare Research Contract Report LC2249 prepared for the Department of Conservation.

Conference presentations

The following two 2014/15 conference presentations used data archived in the NVS Databank.

Allen RB 2015. New Zealand's indigenous forests - their status and drivers of change. Presented at the LakesWater Quality Society Symposium Lake 2015. Weed and Wallabies - their role and control in the ecology of the Rotorua Lakes. Rotorua, New Zealand.

Gormley A, Richardson S, Bellingham P, MacLeod C, Wright E, MacKay M 2015. Combining monitoring data: towards a reliable and trustworthy aggregated index. Statistics in Ecology and Environmental Monitoring (SEEM) Conference, 22–26 June 2015, Queenstown, New Zealand.

Theses

The following 2014/15 thesis used data archived in the NVS Databank.

Ure G.A 2014. An investigation into the habitat requirements, invasiveness and potential extent of male fern, *Dryopteris filix-mas* (L.) Schott, in Canterbury, New Zealand. Masters in Forestry Science, University of Canterbury, Christchurch.

Appendix 1 – New electronic datasets in NVS 2014/15

Listing of new *electronic datasets* incorporated into NVS, July 2014 – June 2015

CANTERBURY FOOTHILLS – MT THOMAS BURN 1981

CANTERBURY FOOTHILLS – MT THOMAS BURN 1982

CANTERBURY FOOTHILLS – MT THOMAS BURN 1984

CANTERBURY FOOTHILLS – MT THOMAS BURN 1986

CANTERBURY FOOTHILLS – MT THOMAS BURN 1990

CANTERBURY FOOTHILLS – MT THOMAS BURN 1995

CANTERBURY FOOTHILLS – MT THOMAS BURN 2006

CANTERBURY FOOTHILLS – MT THOMAS BURN 2014

CRAIGIEBURN WILDING PINES 2013

HARPER/AVOCA FOREST 2015

LAKE PUKAKI ISOLEPIS MONITORING 2015

MAUNGATAUTIRI, MOUNT 2014

MOLESWORTH BROOM 2014

National Biodiversity Monitoring and Reporting System 2011-2012

National Biodiversity Monitoring and Reporting System 2012-2013

OHAU CANOPY GAPS AND EXCLOSURES 2006-2007

TUAWHENUA FOREST INDICATORS 2014

WHIRINAKI FOREST INDICATORS 2014

In addition, the following datasets have been entered using *NVS Express* and incorporated into the NVS Databank GREATER WELLINGTON STATE OF THE ENVIRONMENT MONITORING 2015

TE UREWERA-LAKE WAIKAREITI-SMALL ISLANDS 2011

TE UREWERA-LAKE WAIKAREITI-LARGE ISLANDS 2011

WHAKATANE RIVER – TAIARAHIA 2013

Whangamarino Wetland Monitoring 2011

Whangamarino Wetland Monitoring 2013

Hard-copy plotsheets of these projects are either archived or in the process of being archived.

Listing of new hard-copy datasets added to NVS

AHAURA WD218 1975-84

Bay of Plenty - Te Tumu Kaituna 14 Trust 2014

Beech Thinning Trials 1946 to 1986

Black Forest grasslands (Ross Stream) 1993

CANTERBURY FOOTHILLS - MT THOMAS BURN 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1990, 1995, 2006 & 2014

CENTRAL NORTH ISLAND SECONDARY VEGETATION 1990-91

CRAIGIEBURN WILDING PINES 2013

DTZ BIRCHWOOD TRANSECTS 1993

DTZ EARNSCLEUGH PLOTS 1986, 1987, 1989, 1990, 1991, 1992, 1994, 1995 & 1996

DTZ EARNSCLEUGH TRANSECTS 1983, 1984, 1985 & 1986

DTZ FRASER BASIN PLOTS 1990

DTZ GALLOWAY PLOTS 1986, 1987, 1989, 1990, 1991, 1992, 1994, 1995 & 1996

DTZ GALLOWAY TRANSECTS 1983, 1984, 1985 & 1986

DTZ MAVORA PLOTS 1986, 1987, 1988 & 1989

DTZ MAVORA TRANSECTS 1986

DTZ MOTATAPU TRANSECTS 1986

EASTERN RUAHINE EXCLOSURES - BIG HILL STREAM 1999

EASTERN RUAHINE EXCLOSURES - HOLLOW BACK RIDGE 1996 & 1999

EASTERN RUAHINE EXCLOSURES - HOLMES RIDGE 1999

ERUA STATE FOREST 1975

FIORDLAND - WAITUTU TREE MORTALITY 2006

GISBORNE PHOTOPOINTS 1963-76

HARPER/AVOCA FOREST 2015

INDIGENOUS FOREST RESOURCE 1977

KAWARAU GORGE 1983-84

KUMARA 1996

MANGAHARURU PNA SURVEY 1994-1995

MAUNGATAUTIRI, MOUNT 2014

MOLESWORTH BROOM 2014

NGARURORO (KAIMANAWA) 1980

NZ ADAPTIVE MANAGEMENT OF DEER 2010-11

OHAU CANOPY GAPS AND EXCLOSURES 2006-2007

OHAU DOWNS OUTWASH PLAIN SURVEY 2012

Pūtauaki Permanent Plots 2013-15

PAPAROA EXCLOSURES GRASSLAND 1997

PUANGIANGI ISLAND 2014

ROTOITI NATURE RECOVERY PROJECT REMEASUREMENT 1998-99 & 2002

RUAHINE EXCLOSURES - HOLMES RIDGE 1999

STATION CREEK - PINHOLE 1998

TE UREWERA-LAKE WAIKAREITI-LARGE ISLANDS 2011

TE UREWERA-LAKE WAIKAREITI-SMALL ISLANDS 2011

TE UREWERA-LAKE WAIKAREMOANA-PUKETUKUTUKU PENINSULA 2014

TUTAEKURI (KAWEKAS) 1982

TUTAEKURI (KAWEKAS) FOREST 1982

TUAWHENUA FOREST INDICATORS 2014

UPPER CLUTHA CHARCOAL RECORDS 1993-94

UREWERA POST-FIRE SUCCESSION STUDY 1981

UREWERA - RUATĀHUNA TREE GROWTH RATES 2014

WAITUTU SORTIE - NEW ZEALAND 2001-2008

WANGANUI - IANTHE 1999-2000

WHAKATANE PHOTOPOINTS 1960-80

Whangamarino Wetland Monitoring 2011 & 2013

WHATAROA - SALTWATER - FOREST DISTURBANCE 1993

WHENUAKITE KAURI TRIAL 1971, 1976 & 1986

WHIRINAKI FOREST INDICATORS 2014