NVS Annual Report for the 2012/13 year

Landcare Research
Manaaki Whenua

NVS Annual Report for the 2012/13 year

Susan Wiser, Hamish Maule, Nick Spencer, Shirley Vickers

Compilers, Landcare Research

Prepared for:

Landcare Research Internal Report

November 2013

Landcare Research, Gerald Street, PO Box 69040, Lincoln 7640, New Zealand,
Ph +64 3 321 9999, Fax +64 3 321 9998, www.landcareresearch.co.nz

Reviewed by:	*Approved for release by:*
Larry Burrows Senior Technician Landcare Research	Peter Bellingham Portfolio Leader Measuring Biodiversity Change

Landcare Research Contract Report:	LC1630

TELARC SAI registered

ISO 14001

Contents

1 Number of new records archived in NVS

A total of 100 new projects[1] were added electronically to the National Vegetation Survey Databank (NVS) in 2012/13 (year to 30 June 2012; Figure 1 & Appendix 1) with a total of 4860 plots added. Major providers of data and types of data since 2004/05 are shown in Figure 1. Major sources of new data this year include the ongoing plot measurement to support LUCAS (the Land Use and Carbon Analysis System), funded by the Ministry for the Environment and undertaken by the Department of Conservation (DOC); South Island Short Tussock Grassland data collected by Henry Connor in the 1960s; the results of a Geothermal Vegetation Classification survey conducted by Mark Smale of Landcare Research; and this year's remeasurement of a number of EBEX21 (Emission & Biodiversity Exchange) surveys, conducted by Landcare Research, commissioned by the Ministry for Primary Industries.

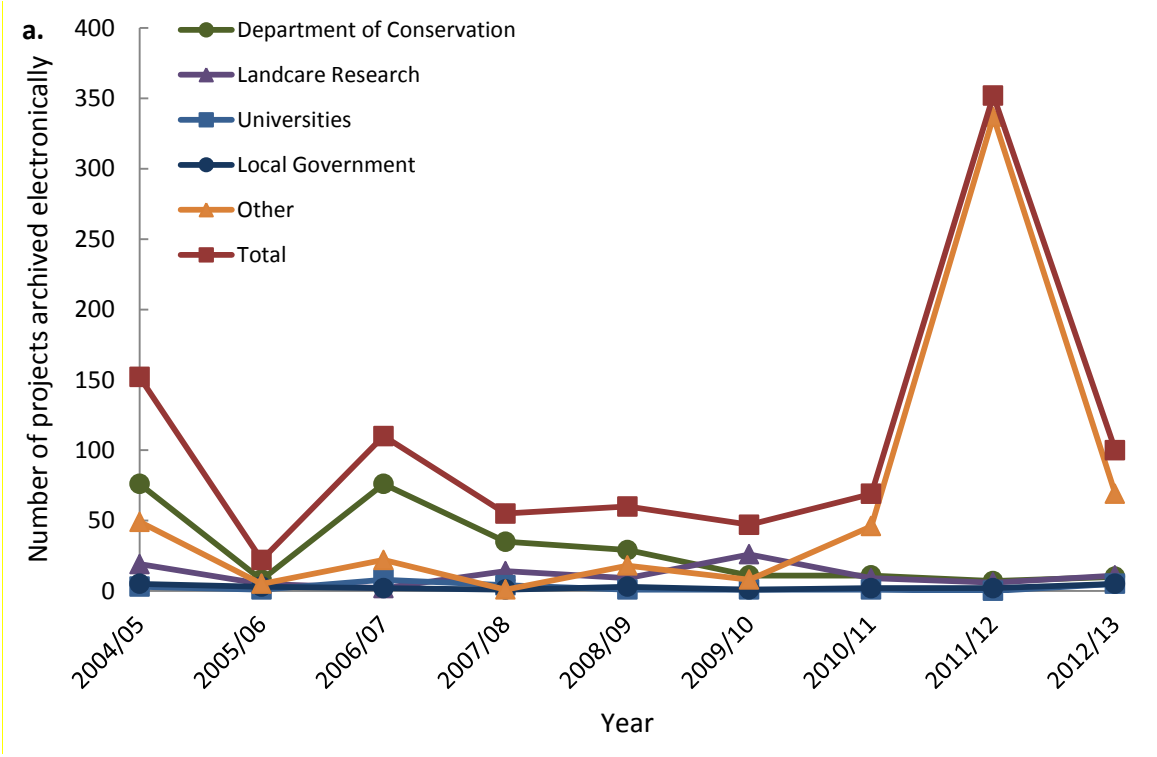

Figure 1 Number of projects archived in the National Vegetation Survey Databank, total and from four major contributors, per financial year since 2004/05.

Last year's great increase in archived projects was mostly due to the archiving of the very large group of DTZ grasslands projects. Although this year's count is down from that 'blip', it is the second highest since 2007/08.

Development and use of NVS Express software is greatly facilitating the addition of data into NVS; 14 projects (734 plots) deposited into NVS in 2012/13 were via NVS Express.

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

2 New NVS website launched

The NVS website was completely redeveloped this year. As well as a fresh new look, we have introduced several new features, such as improved search, new location maps, and the capability to approve data requests and download data online. Changes include:

- *Cleaner look:* The site now boasts a fresh new look with clean lines and plenty of white space, making the site easier to work with and the content more legible. The site also uses a selection of plant and landscape images to introduce colour and lift the pages visually.
- *Improved navigation:* The new site has a much improved layout with easier navigation. We have simplified the design and introduced a straightforward menu system. Colourful landing pages tell users just enough to help them decide what each option does. The new home page offers a number of quick links to popular options.
- *Easy-to-access background information:* We have rewritten the About pages and background information for NVS, and updated the help to cover the new features of the site.
- *Powerful data search and discovery:* One of the biggest changes can be found in the new search features of the website. The new search is easier to use, yet more powerful. Users can now search more deeply into the data within datasets and for the first time can fine-tune search criteria using filter options to narrow down results. Search results are displayed in a combined set showing plot locations, dataset lists, and species present, making it easy to identify data of interest.
- *Map plot locations:* In addition to the improved search, users can now view selected plots on an interactive map. This will help users locate the datasets needed and further fine-tune results. Aside from visualising plot locations, the map view allows users to subset plots based on DOC conservancy boundaries or by using the handy Filter by Location option. The filter box option allows users to resize a selection box placed on the map to really fine-tune their result set.
- *Browse data and see data summaries:* For the first time users can now see more of the data within a dataset online. One can drill in to the underlying data, look at a more detailed map of plots, view summary information, and view the species list for each dataset. This improved access to the content will make it easier to decide whether a dataset will help in the intended analysis or future vegetation sampling work.
- *Online data requests and downloads:* NVS now boasts the ability for users to download datasets directly online. One of the primary goals of NVS is to make data available for reuse, so one of our main aims with the new site was to improve support for this important activity by removing barriers to data access. Open-access datasets are available immediately through the website, while those requiring permission can be downloaded once agreement from the data owner has been received. The major advance is that it all happens electronically. This should mean quicker access to data for people making requests and provide a more straightforward process for data owners and approvers when agreeing to these requests. This will benefit the whole NVS community: end-users, data contributors and the NVS team alike.
- *Users can monitor their data online:* Finally, registered users can access their own personal area on the site called My NVS. My NVS is where users can track data they

own that is archived in NVS, monitor the progress of data they have requested, view data from past downloads, edit their profile, and change their password. This is just the beginning – in the future, new features will be added enabling users to manage their data held by NVS, upload new datasets, edit metadata, and see a dashboard summarising their activities.

3 Database development and integration

We have undertaken a number of technological developments this year.

- Historical records of the distribution of NVS data (provision of data in response to requests) have been migrated into the database and are displayed for each project and method having data archived in NVS. New distributions are easy for the administrator to record while exporting data. (Downloads from the new website will automatically be recorded as distributions.)
- The NVS data warehouse provides views of different parts of the NVS database that are simpler and faster to query than the core set of related data tables. Performance of the warehouse has been improved by moving to a faster server and refreshing it from a local copy of the NVS database. There is a separate copy of the warehouse so that each time the views it contains are refreshed (i.e. recreated from the core data tables) current users, including the website, are not interrupted. The warehouse has also been reorganised to allow for the needs of different types of users to be accommodated.
- Party data (people and organisations associated with NVS projects) have been synchronised between NVS database, NVS metadata, and historical distributions. Party data migrated from multiple sources has been tidied to some extent, especially the merging of duplicate names. Parties are now identified by GUIDs (Globally Unique Identifiers), to allow future exchanging of party data between NVS DB and NVS Express users.
- The NVS program now allows the administrator to extend measurements that can be entered, such as new categories, precision, and units of measurement.
- Groups of queries in the Admin section of the NVS program allow the administrator to obtain standard statistics and lists (such as species lists) or perform administrative checks (such as datasets without an access level recorded).
- To improve usability, the Projects section of the NVS program now shows methods vertically below their project, and data types horizontally on separate tabs. This change has not yet been released in NVS Express.
- Usability improvements have been made to the general import function and ability to import tab-delimited files.

A series of enhancements were predicated by the need for the NVS system to be used for the DOC Tier 1 monitoring system. Enhancements include:

- Data Entry Tracking – the progress of data entry can be tracked for each method in a project, in terms of which plots have been started, completed, validated etc., in order to provide information to the administrator.

- Issue Tracking – issues can be created at various levels in a project, down to individual measurements, then managed by an administrator through to resolution.
- Metadata – groups and categories were created to correspond with Tier 1 metadata sheets. Metadata notes can be entered then searched and analysed.
- Audits – groups and categories/units were created to correspond with Tier 1 time allocations. Data can be entered then searched and analysed.
- Individual plot export format provides a spreadsheet showing all data types for a plot, as it appears within the NVS program – useful for off-site checking.

4 Significant revisions of data

We have continued to identify and correct errors in a range of data types.

- Before the new website was released with its semi-automated data request system, it was necessary to get as complete and accurate up-to-date details as possible of people (parties) involved with each project/survey; this was especially so for those who give permission to use restricted-access datasets. Party records that were incomplete were extracted from the database and updated, where possible, by various means including Internet searches and email enquiries. In addition the party list, accumulated from many sources, has had duplicate names merged and some correction of contact email addresses and relationships with organisations.
- Emphasis was put on adding/correcting plot spatial location data:
    - The coordinate system was corrected for a number of plot coordinates that were numerically correct but were recorded using the incorrect coordinate system.
    - Grid references were added or corrected for a number of plots.
- NVS plant names list corrections:
    - Genus-only names were removed for genera with only one species in New Zealand.
    - A number of logic problems in the NVS names list were corrected: NVS codes that no longer linked because they are not in the Plant Kingdom; not all deprecated NVS codes (i.e. codes no longer valid) have a current code; NVS codes where the preferred name does not have a NVS code (because of recent taxonomic changes); NVS codes where the species-level name does not have a NVS code (because of recent taxonomic changes); NVS codes linked to suppressed (invalid) names; etc.
- We have continued to identify and correct errors in subplot names and sizes, and tree-tag matching, over time.

We have extended the validations run on datasets and the output produced to further improve data quality. These included:

- Extension of the species list to include species recorded by new surveys, especially non-vascular species recorded in the DOC Tier 1 monitoring and LUCAS systems

- New validations include comparison of tier heights with tier category heights, extraction of Collected Species notes, any increase in size of dead stems/CWD pieces, count vs presence consistent with tier and whether woody, LUCAS-specific validation of decay class
- Ability to list all validation definitions
- Ability to export the data type and precision of all measures in a specific project, which are used to validate data values.

Key validations have been run against all existing projects, to determine which projects have excessive validations (which identified a number of problems) and to provide an estimated validity score for every project.

5 Increasing end-user awareness and capability

An Envirolink Tools project has supported the development of ecological indicators that can be readily implemented by regional councils. One of these indicators concerns vegetation structure and composition and a plot-based method that has been recommended to provide the required data. NVS has been recommended as the best storage facility for the vegetation data that would be collected.

The Department of Conservation engaged Landcare Research to enhance the NVS Express tool to allow all the Tier 1 vegetation monitoring data to be entered, validated and exported. This tool and sophisticated validations upon the data enable the DOC team to more efficiently identify queries to field teams and resolve these in a timely manner. The exposure to NVS Express and the enhanced validations greatly improved the quality of DOC's data entry and understanding by field teams of data quality standards. Many of the lessons learned are now embedded in training, best practice documentation and field practices and are expected to improve the quality of field data collection, reduce time entering data, and result in higher quality results and cost saving to the Department.

5.1 Presentations for end-users

Landcare Research staff associated with NVS delivered several presentations throughout the year to disseminate information to end-users and other government agencies.

In August 2012, Nick Spencer, Jerry Cooper and Kevin Richards gave the talk 'Biodata systems at Landcare Research; NVS, NZOR, LRIS & OurEnvironment' at the Living Data Conference and Workshop organised by the Dataversity group. Dataversity was initiated with seed money from TFBIS and facilitates connections between biodiversity practitioners in regional councils, CRIs and government agencies. This talk focused on Landcare Research's contribution to taxonomic name services, data repositories such as NVS, and the visualisation of spatial data. Other participants included NIWA, and collaborative efforts between NIWA and Landcare Research toward biodata standards and Names services implementation were showcased.

In August 2012, Larry Burrows and Nick Spencer gave a presentation on NVS and a tour of the archive to Joanne Daly from CSIRO. Joanne is involved with the Global Biodiversity Information Facility (GBIF), the *Atlas of Living Australia* and the *Encyclopedia of Life*.

In November 2012, Hamish Maule gave the presentation 'Archiving vegetation plot data: the NVS experience' as part of a symposium on bio-data archiving and bio-monitoring at the New Zealand Ecological Society annual conference.

In May 2013, Susan Wiser gave a lecture on the National Vegetation Survey Databank to a Lincoln University degree course, ERST611 Advanced Environmental Monitoring. This has now become a standard component of the course and is delivered annually.

6 Data-sharing agreements and data exchange

A Memorandum of Understanding has been signed between Landcare Research and the New Zealand Plant Conservation Network (NZPCN) that covers the provision of species occurrence data from NVS to the NZPCN for display on its website (www.nzpcn.org.nz). The data provided will be the same set of data that NVS currently provides to GBIF comprising 1 723 086 records. This will substantially enlarge the species occurrence locations currently displayed by NZPCN and provide an important avenue for NVS data to be made available.

NVS continues to provide regular updates of NVS plant spatial location data to GBIF (the Global Biodiversity Information Facility, www.gbif.org). In our 2012/13 update we provided 1 723 086 records, an increase of 38 335 over last year.

6.1 Use of NVS data through the GBIF Portal

Between 1 July 2012 and 30 June 2013 there were 13 286 searches for species occurrence data in NVS (access to 1 259 718 records) and 1295 downloads of species occurrence data (incorporating 6 224 823 records) that were accessed via the GBIF website.

This year's GBIF annual award went to Nathan Swenson, who used New Zealand NVS–GBIF data for the project 'The distribution and diversity of woody plant function on continental scales'. A PowerPoint presentation that Dr Swenson delivered at the 2012 GBIF Science Symposium can be viewed at http://www.gbif.org/orc/?doc_id=4840.

7 Conservation and management outcomes

The Ministry for Primary Industries administers the Permanent Forest Sink Initiative (PFSI), which promotes the establishment of permanent forests on unforested land. PFSI offers landowners of permanent forests established after 1 January 1990 the opportunity to earn emission units for the carbon absorbed by their forests since 1 January 2008. Forest stand structural data from NVS provide the basis for one of the indicative figures of carbon sequestered by forest, in tonnes of CO_2 equivalents. See http://www.mpi.govt.nz/environment-natural-resources/funding-programmes/permanent-forest-sink-initiative/pfsi-carbon-sequestration-rates.

Statistics New Zealand produced its 2013 Environmental Domain Plan. The chapter 'Environment and Biodiversity' lists the questions about ecosystems and biodiversity that Statistics New Zealand believes should be addressed. The plan presents a summary of the analysis of the official data that addresses those questions and then outline the initiatives to address our ecosystems and biodiversity information needs. The overriding enduring question is: To what extent is the native (indigenous) biodiversity of New Zealand being protected and sustained? Related supplementary questions are then presented, e.g. How and where is the diversity and condition of indigenous species changing? The National Vegetation Survey Databank was one of the five national data sources rated as highly informing these questions. See http://www.stats.govt.nz/browse_for_stats/environment/natural_resources/environment-domain-plan/ecosys-biodiversity.aspx.

The Department of Conservation needs to report on threatened plant species, and wants confidence in new occurrences that are detected through its Biodiversity Monitoring and Reporting System. A new project – involving the Landcare Research Informatics team, NVS team and the 'Defining Land Biota' research team – is responding to this need by developing a tool to identify threatened plant species in vegetation plot data stored in NVS, which includes data from the Department's Biodiversity Monitoring and Reporting System. Challenges include matching taxonomic concepts, rather than names. Initial analyses suggest that the current approach of identifying taxa using a six-letter code or Taxon ID may overlook some candidate threatened plant species.

8 International collaborations in Ecoinformatics

New Zealand's expertise in measuring terrestrial biodiversity is recognised internationally. During October 2012, Susan Wiser visited Chile with funding from New Zealand's Ministry of Foreign Affairs and Trade (MFAT), and with support in Chile from the Instituto de Ecología y Biodiversidad (IEB), with which Landcare Research has a Memorandum of Understanding for research cooperation. During Susan's visit she gave a presentation on the development of NVS and its relevance for developing ecological information databases in Chile. This presentation was at a meeting on database standards and application in environmental sciences, convened by the New Zealand Embassy in Santiago, which provided a first opportunity for people from 10 Chilean agencies to learn about what each other is doing. The New Zealand Embassy provided suitable 'neutral ground' for positive interactions. Susan also gave a presentation about NVS at the annual meeting of the Sociedad de Ecología de Chile in Concepción.

Susan Wiser serves as a scientific advisor to the New South Wales Office of Environment and Heritage: Vegetation Information and Mapping Programme. Her role is to serve on a committee that provides ongoing quality-assured independent scientific advice to the Office to ensure that it maintains consistency with accepted standards, addresses the long-term strategic needs of the NSW Government and recognises specific user requirements when undertaking statewide, regional and local mapping projects.

Australian States are required to have means to classify, identify and depict native vegetation communities to comply with the regulations underpinning the Native Vegetation Act. Susan was invited because of her experience and publications around developing a plot-based quantitative classification of New Zealand vegetation and her high level of knowledge of vegetation classification, managing vegetation plot data and ecoinformatics, and rare and

threatened ecosystems. To date Susan has attended two meetings: December 2012, March 2013.

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. The central goal is to understand the determinants of the past and present plant distributions and abundance. This knowledge is essential for predicting how species, vegetation and agricultural crops will respond to future climate changes. The BIEN team is working to assemble a demonstration project that includes most of the premier plant biodiversity databases for the Americas. We have continued to provide our technical expertise to support this effort by participating in the annual workshop in Santa Barbara, California, USA, in December 2012 and being involved in technical discussions throughout the year.

The publication by Broadbent et al. (2012) [see publications list below] profiled NVS in an international compendium edited by scientists who are developing common international standards that enable global syntheses of data. Scientists who have developed the NVS database are at the forefront of exchange standards and international best practice in design and use of vegetation data.

The publication by Franklin et al. (2013) [see publications list below] included collaboration with Susan Wiser, of the NVS team. These analyses were only made possible by the largest compilation of plot data (338 plots) from West Polynesia made to date. One of the significant components was data that Landcare Research collected in Tonga (via an MFAT contract) in 1997–98; these data are archived in NVS. The main conclusions of this synthetic analysis were that well-established biogeographical patterns of dispersal limitation and speciation contribute to West Polynesian tree diversity at the community scale. Environmental filtering and competitive displacement further structure forest communities; the evidence from this study suggests that environmental filtering is more important at a landscape scale, while competitive displacement may be more important at a local scale, although their relative importance varies considerably among taxa.

9 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 (49%). The remainder (23%) was direct traffic, indicating that frequent users bookmark the website.

From 1 July 2012 to 30 June 2013, the NVS website was visited 3395 times, an 8% decrease from the 2011/12 year (3696 visits) and there were 11 203 pageviews. There were 2028 unique visitors to the site. Of the current year's hits that could be traced to origin, the majority of visits were from New Zealand (73%), followed by the USA/Canada (8%), UK (3%) and Australia (3%). The website was also visited by people from another 79 countries. Unsurprisingly the index page to the site was viewed frequently (28% of all page visits). Detail about field techniques, manuals, and field forms were also popular (9% of page visits).

Various documents are available to download from the NVS website and during 2012/13, 983 documents were downloaded, the most popular of which are listed in Table 1.

Table 1 Number of document downloads from the NVS website during 2012/13 (compiled using Google Analytics)

Document	Number of downloads (Google Analytics)
NVS Express associated items	155
Reconnaissance plot manual*	149
Forest permanent plot manual*	128
FBI manual, plot-sheets and foliar cover scale	78
Reconnaissance plot – pro forma data sheets	73
Forest tree diameter – pro forma data sheet	39
Grassland survey manual and pro forma data sheet	54
Forest seedling plot – pro forma data sheet	38
Field guide to the use of GPS	22
NVS Annual Report 2011/12	30

*Combined totals for previous and updated (2007) manuals.

As with last year, the most popular items downloaded from the website were those associated with the new NVS Express tool. The associated items included the NVS Express tool itself, manuals, narrated PowerPoint presentations, workshop example instructions, and example plot sheets.

10 NVS data requests

A total of 38 individual requests for NVS data and metadata were made during 2012/13 and 3362 datasets were supplied (Figure 2a, b). Although there was a downward trend in the number of requests, the number of datasets supplied was nearly twice that of 2011/12. The principal agencies requesting data and number of datasets supplied since 2004 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 while this year, university staff and students made greatly increased use of our data supply services.

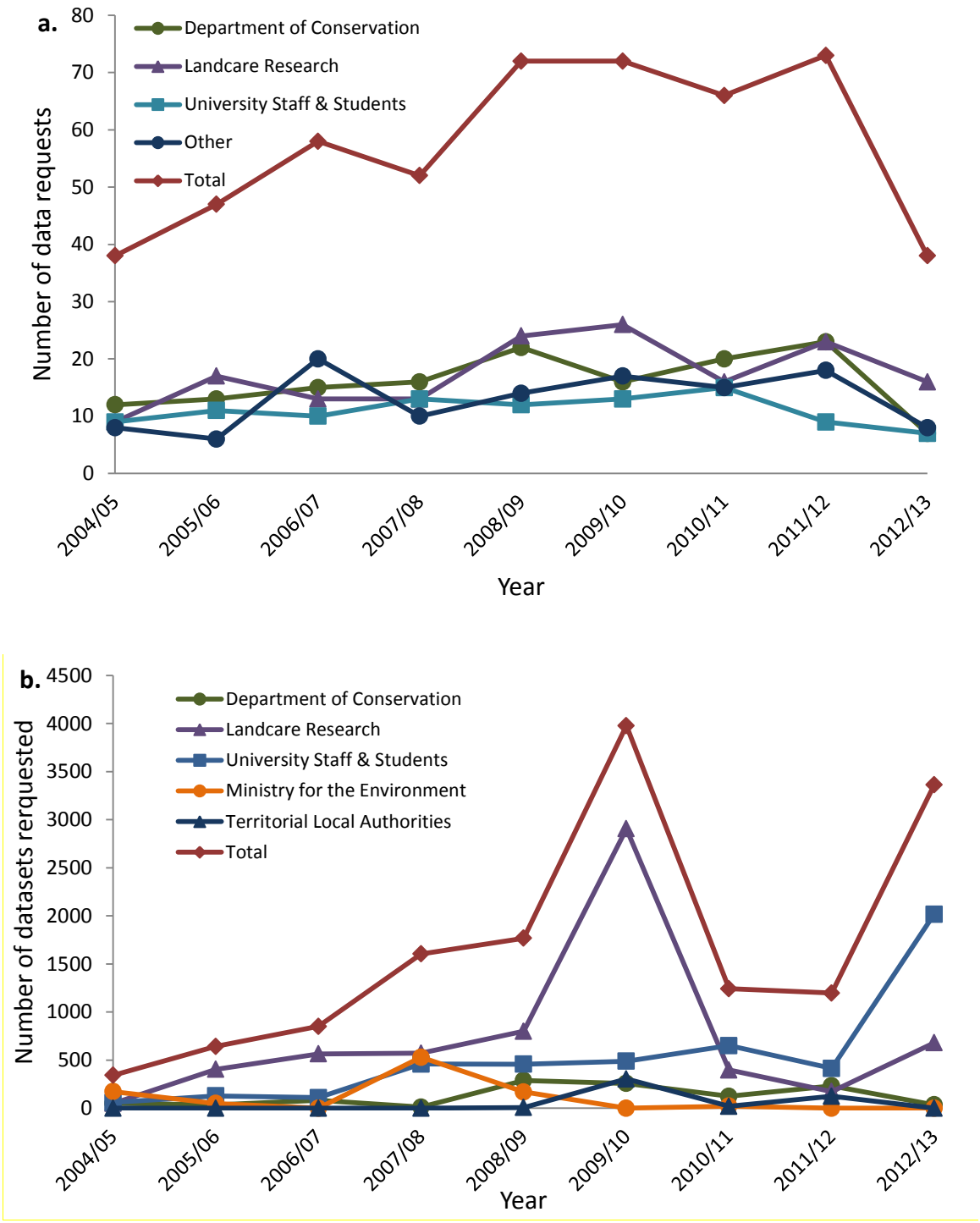

Figure 2 Requests for data from the National Vegetation Survey Databank per financial year since 2004: (a) total number of requests and from three major data-users and (b) number of datasets requested, total and from five major data-users.

11 Publications directly associated with NVS

11.1 Publications and conference presentations funded by the NVS programme (9 total)

Refereed publications (5)

Broadbent H, Spencer N, Wiser S 2012. New Zealand National Vegetation Databank. In: Dengler J, Oldeland J, Jansen F, Chytrý M, Ewald J, Finckh M, Glöckler F, Lopez Gonzalez G, Peet RK, Schaminée JHJ eds Vegetation databases for the 21st century. Biodiversity & Ecology 4: 318.

De Cáceres M, Legendre P, Wiser SK, Brotons L 2012a. Using species combinations in indicator value analyses. Methods in Ecology and Evolution 3: 973–982.

Franklin J, Keppel G, Webb EL, Seamon JO, Rey SJ, Steadman DW, Wiser SK, Drake DR 2013. Dispersal limitation, speciation, environmental filtering and niche differentiation influence forest tree communities in West Polynesia. Journal of Biogeography 40: 988–989.

Koele N, Dickie IA, Oleksyn J, Richardson SJ, Reich PB 2012. No globally consistent effect of ectomycorrhizal status on foliar traits. New Phytologist 196: 845–852. [funded by NVS in part]

Richardson SJ, Allen RB, Buxton RP, Easdale TA, Hurst JM, Morse CW, Smissen RD, Peltzer DA 2013. Intraspecific relationships among wood density, leaf structural traits and environment in four co-occurring species of *Nothofagus* in New Zealand. PloS ONE 8(3): e58878. doi:10.1371/journal.pone.0058878/.

Conference presentations (4)

De Cáceres M, Legendre P, Wiser SK, Brotons L 2012b. Using species combinations in indicator value analyses. Proceedings, The 55th Symposium of the International Association for Vegetation Science, Mokpo, Korea, 23–28 July.

Maule H, Burrows L, Wiser S 2012. Archiving vegetation plot data: the NVS experience. Symposium on bio-data archiving and bio-monitoring. New Zealand Ecological Society Conference, Lincoln University, 26–29 November.

Wiser SK 2012a. How can New Zealand's National Vegetation Survey Databank inform development of large ecological databases? Keynote speaker. Database Standards and Application in Environmental Sciences Workshop at El Santiago Instituto de Ecología y Biodiversidad, 4 October.

Wiser SK 2012b. How can New Zealand's National Vegetation Survey Databank inform development of large ecological databases? Invited symposium speaker. Annual Meeting of Sociedad de Ecología de Chile (Ecological Society of Chile) Concepción. 6–9 October.

11.2 Publications and conference presentations using NVS-derived data (26 total)

Refereed publications (17)

Beets PN, Kimberley MO, Oliver GR, Pearce SH, Graham JD, Brandon A 2012. Allometric equations for estimating carbon stocks in natural forest in New Zealand. Forests 3: 818–839.

Bourdôt GW, Lamoureaux SL, Watt MS, Kriticos DJ. 2013. The potential global distribution of tall buttercup (*Ranunculus acris* ssp. *acris*): opposing effects of irrigation and climate change. Weed Biology 61: 230–238. [NVS data sourced from GBIF]

Carswell FE, Burrows LE, Hall GMJ, Mason NWH, Allen RB 2012. Carbon and biodiversity gain during 200 years of woody succession in lowland New Zealand. New Zealand Journal of Ecology 36: 191–202.

Coomes D, Bentley W, Tanentzap A, Burrows L 2013. Soil drainage and phosphorus depletion contribute to retrogressive succession along a New Zealand chronosequence. Plant and Soil 367: 77–91.

Day NJ, Buckley HL 2013. Twenty-five years of plant community dynamics and invasion in New Zealand tussock grasslands. Austral Ecology 38: 688–699.

Dickie IA, Hurst JM, Bellingham PJ 2012. Comment on conspecific negative density dependence and forest diversity. Science 338: 469.

Dickie IA, Martínez-García LB, Koele N, Richardson SJ, Tylianakis J, Peltzer DP, Grelet G-A 2013. Mycorrhizas and mycorrhizal fungal communities throughout ecosystem development. Plant and Soil 367: 11–39.

Holdaway RJ, Burrows LE, Carswell FE, Marburg AE 2012. Potential for invasive mammalian herbivore control to result in measurable carbon gains. New Zealand Journal of Ecology 36: 252–264

Kunstler G, Allen RB, Coomes DA, Canham CD, Wright EF 2013. Sustainable management, earthquake disturbances and transient dynamics: modelling timber harvesting impacts in mixed-species forests. Annals of Forest Science 70: 287–298.

Linder HP, Antonelli A, Humphreys AM, Pirie MD, Wüest RO 2013. What determines biogeographical ranges? Historical wanderings and ecological constraints in the danthonioid grasses. Journal of Biogeography 40: 821–834. [NVS data sourced from GBIF]

Marburg AE, Carswell FE, St John MG, Holdaway RJ, Rose AB, Jacobs I 2013. Implications of experimental design on the detection of herbivore impacts on carbon stocks in a broadleaved-hardwood forest. DOC Research and Development Series 334. Wellington, Department of Conservation.

Mason NWH, Richardson SJ, Peltzer DA, de Bello F, Wardle DA, Allen RB 2012. Changes in co-existence mechanisms along a long-term soil chronosequence revealed by functional trait diversity. Journal of Ecology 100: 678–689.

Mason NWH, Bellingham PJ, Carswell FE, Peltzer DA, Holdaway RJ, Allen RB 2013. Wood decay resistance moderates the effects of tree mortality on carbon storage in the indigenous forests of New Zealand. Forest Ecology and Management 305: 177–188.

Ramsey DSL, Forsyth DM, Veltman CJ, Nicol SJ, Todd CR, Allen RB, Allen WJ, Bellingham PJ, Richardson SJ, Jacobson CL, Barker RJ 2012. Forest responses to deer control in a New Zealand adaptive management experiment: predictions from qualitative ecosystem models. Ecological Modelling 240*:* 93–104.

Steer MA, Norton DA 2013. Factors influencing abundance of invasive hawkweeds, *Hieracium* species, in tall tussock grasslands in the Canterbury high country. New Zealand Journal of Botany 51: 61–70.

Syfert MM, Smith MJ, Coomes DA 2013. The effects of sampling bias and model complexity on the predictive performance of MaxEnt species distribution models. PLoS ONE 8(2): e55158. doi:10.1371/journal.pone.0055158. [NVS data sourced from GBIF]

Taylor S, Kumar L 2012. Sensitivity analysis of CLIMEX parameters in modelling potential distribution of *Lantana camara* L. PLoS ONE 7(7): e40969. doi:10.1371/journal.pone.0040969. [NVS data sourced from GBIF]

Reports (3)

Easdale TA, Overton JM, Dymond JR, Mason NWH, Arnst E, Burrows LE, Ausseil AE, Herzig A, Daigneault A, Carswell FR, Peltzer DA 2012: Ecosystem services on St James Conservation Area: an initial stocktake. Landcare Research Contract Report LC1058, for the Department of Conservation. 45 p.

Holdaway RJ, Mason NWH, Easdale T, Dymond J, Betts H, Wakelin SJ, Moore JR 2013. Annual carbon emissions associated with natural disturbance in New Zealand's natural and planted forests. Landcare Research Contract Report LC1531, for the Ministry for Primary Industries.

MacLeod CJ, Affield K, Allen RB, Bellingham PJ, Forsyth DM, Gormley AM, Holdaway RJ, Richardson SJ, Wiser SK 2012. DOC Technical Report 2011/2012. Natural Heritage Indicators Part 2. Landcare Research Contract Report LC1102, for the Department of Conservation.

Conference presentations (4)

Dickie IA 2013. Mycorrhizas in changing ecosystems. Invited Keynote Address, 7th International Conference on Mycorrhizas, Delhi, India, January 2013.

Richardson SJ, Williams PA, Mason NWH, Wiser SK 2012. Rare species drive high local trait diversity in an uncommon alpine ecosystem. Poster presentation, The 55th

Symposium of the International Association for Vegetation Science, Mokpo, Korea, 23–28 July. P. 199.

Thomson FJ, Wiser SK, De Cáceres M 2012. Extending a quantitative classification to include New Zealand's non-woody plant communities. New Zealand Ecological Society Conference, Lincoln, New Zealand.

Wiser SK, Buxton RP, Helm A 2013. Using species complementarity to select sites for conservation management: which species are most important? The 56th Symposium of the International Association for Vegetation Science, Tartu, Estonia, 26–30 June.

Thesis

Myron KJ 2012. *Pittosporum kirkii:* Autecology of an endemic shrub epiphyte. Unpublished MSc thesis, The University of Waikato, Hamilton, New Zealand.

Other

Wiser S 2013. The National Vegetation Survey Databank. Lecture given to degree course: ERST 611 Advanced Environmental Monitoring, Lincoln University, 21 May 2013.

Appendix 1 – New electronic datasets in NVS 2012/13

Listing of new *electronic datasets* incorporated into NVS, July 2012 – June 2013

LUCAS Uncertainty 2012
Geothermal Vegetation Classification 2012
Stewart Island Permanent Plots 2002
Beech Thinning Trials 1946-1994
EBEX – Cape Jackson 2012
TUAWHENUA SEEDLING PLOTS 2011
Cape Jackson Regeneration 2012
Peggioh Regeneration 2012
EBEX - Kakahu Bush 2012
EBEX AUDIT – KURINUI 2012
Kurinui Regeneration 2012
CMS Tier 1 2012
EBEX AUDIT – KAKARIKI 2012
EBEX – Hinewai 2013
EBEX – Norsewood 2013
Puketi Traitspace 2012
EBEX AUDIT – Long Gully Station 2007
EBEX AUDIT – Long Gully Station 2013
EBEX AUDIT – LONG GULLY BUSH 2013
EBEX AUDIT – LONGSPUR 2007
EBEX AUDIT – LONGSPUR 2013
EBEX AUDIT – COATBRIDGE 2007
EBEX AUDIT – COATBRIDGE 2012
EBEX AUDIT – CONWAY 2012
Long Gully Station Regeneration 2013
Featherston Regeneration 2013
Glenthorne Regeneration 2013
Hawkswood Regeneration 2013
Tautoro (Kaikohe) Regeneration 2013
Turnbulls Bay Regeneration 2013
Long Spur Regeneration 2013
Coatbridge Regeneration 2013
ADAPTIVE MANAGEMENT OF DEER (DOC) 2013
Franz Josef Chronosequence 2013
FMA Coatbridge 2012
FMA Hinewai 2012

In addition, the following datasets have been entered using *NVS Express* and incorporated into the NVS Databank

Ngawha Springs Baumea complanata 2012
North Taranaki Exclosure Plots 2012
Lake Rotokare Vegetation Plots 2007
Moki-Makino Exclosure Plots 2009

Thornton Kanuka 2012
Sisam's Round Bush 2010
Manawahe Ecological Corridor 2006
Manawahe Ecological Corridor 2010
Pureora Forest 2011

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