NVS Annual Report for the 2011/12 year

Landcare Research
Manaaki Whenua

NVS Annual Report for the 2011/12 year

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Contents

1 Number of new records archived in NVS

A total of 352 new projects[1] were added electronically to NVS in 2011/12 (year to 30 June 2012; Figure 1 & Appendix 1) with a total of 3033 plots added. Major providers of data and types of data since 2004/05 are shown in Figure 1.

A major source of new data was the archiving of the plots and transects data of the 'DTZ vegetation monitoring dataset collection'. This dataset began life as a series of projects and monitoring sites established by the Range Management group of The Department of Lands and Survey in the tussock grasslands of the South Island high country in the early to mid-1980s. By 1993, this dataset comprised 145 survey sites from Marlborough to Southland with the bulk being in the Otago region. Responsibility for those datasets then progressed through several organisations including Landcorp, Knight Frank, and finally DTZ. The monitoring programme effectively wound up in the late 1990s. However, between 2005 and 2007, 125 transects were remeasured as part of a postgrad study by a student at Lincoln University. The electronic data in the NVS database consists of 88 survey sites of transect and plot data with multiple remeasures. The data comprises rank sum and transect frequency data and associated metadata collated for the datasets. Physical archives include raw transect data sheets, field notes, location photos (print and slides), background information and reports, field books, vegetation sample books (stick-books), assorted maps, and a series of photographic slides taken by Geoff Holgate and Harry Sievwright. We are very lucky to have the physical archives as they were part of only a small amount of material able to be retrieved from the earthquake damaged building that housed the Christchurch office of DTZ (NZ) Ltd before the building was deemed unsafe to enter and subsequently demolished. Caroline Mason facilitated transfer of this vast array of data.

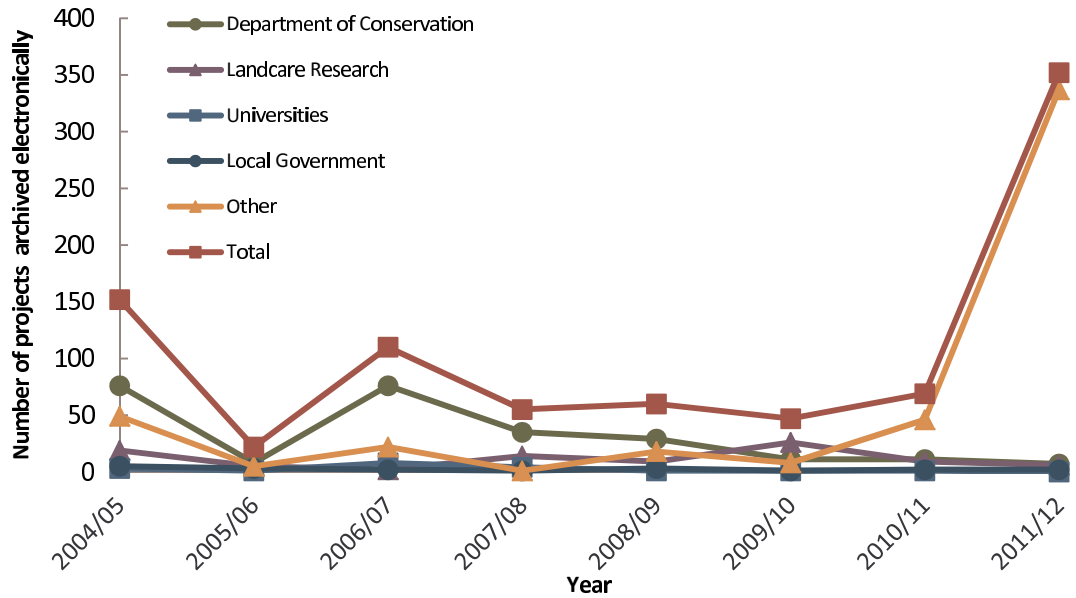

Figure 1 Number of projects archived in the National Vegetation Survey databank, total and from four major contributors, per financial year since 2004/5.

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

The quantity of new data archived in NVS increased greatly in the past year (Figure 1) largely due to the archiving of the DTZ and Dr Henry Connor's South Island Lowland Tussock Grasslands data collected from 1960-65.

Development and use of NVS Express software is greatly facilitating the addition of data into NVS; 16 projects (426 plots) deposited into NVS in 2011/12 were via NVS Express.

2 Significant revisions of data

We have continued to identify and correct errors in the recording of tree tags, species and tree diameters and to add subplot information to forest permanent-plot data.

Work continued this year on identifying the different cover-class (a ranking of the share of space a particular species occupies within a particular height tier) and tier (fixed-height 'zones' in the vertical plane between the ground and the canopy top) methods used in data transferred from the previous database system. To aid transfer of the large amount of data from the previous system, the range of cover-class and tier methods used were 'shoehorned' into the few known method systems. Cover-class methods have been checked for 79 of 847 project remeasurements; so far there appear to be 14 cover-class systems that depart from those previously identified. Tier methods have been checked for 162 of 852 project remeasurements; so far 17 different tier systems have been identified and documented.

Last year, 790 out of 1048 plots that were identified as part of exclosure/control pairs were documented as such in the database. The bulk of the plots were located in forest. This year, the remaining 258 were checked and paired up (associated). Extra information, such as the latest known state of the exclosure fences, was also captured.

We were also able to improve data quality by running internal validations on the database. These included:

- Work on the species list, including removal of authors from species names, inclusion of threatened species status, addition of NVS codes for taxonomic name changes
- Correction to tree tag linking over time, after identifying cases of extreme changes in diameter
- Addition of 'Not measured, found next census' tree stem measurements for cases where a stem was alive in projects before and after a given project
- Correction to plot coordinates, after identifying cases of multiple coordinate remeasures for the same plots through time
- Further linking of plots and tree tags over time, after identifying possible instances where plots and tags of remeasured projects have not been linked

3 Database development and integration

We have undertaken a number of technological developments this year.

- The general import function developed last year has been used to import two large historical surveys (monitoring data from Crown leasehold lands and Henry Connor's South Island Lowland Tussock Grasslands survey). The import function has been enhanced so it can now import either into the NVS Databank or into a NVS Express project. If the latter option is chosen the user can check and validate their data before uploading it into the NVS Databank.
- The usefulness of the NVS Warehouse has been extended. The NVS Warehouse is a database that stores a copy of NVS data plus related data in a structure that provides easier and quicker data retrieval than the NVS database itself. It can now access the NVS Metadata database so that metadata can be 'automatically' included with requested NVS plot data. The NVS Warehouse also now provides summary statistics, metadata, and searchable plot data for the new NVS website.
- The latest version of the renovated NVS website is close to completion. The website will allow users to better search, map, and display contents of datasets. In addition, the new site further automates dataset access for end-users by allowing dataset owners to approve requests for their data online. This will lessen the time NVS staff and data owners spend handling such requests. The new site will also allow NVS staff to directly manage website content, improving their ability to keep the content up-to-date.

We have also further enhanced NVS Express, our stand-alone data entry and analysis software.

- Creation and selection of parties (people and organisations associated with datasets or projects) is easier.
- Access constraints can be set by users before their data are uploaded.
- A short-cut to the project validation step encourages users to validate their data before they upload them.
- The new version is compatible with Windows 7.

4 Increasing end-user awareness and capability

4.1 Presentations 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:

In May, Susan Wiser gave a lecture on the National Vegetation Survey Databank to a Lincoln University degree course, ERST611 Advanced Environmental Monitoring.

As part of a series of road-show visits by the Informatics team to four Landcare Research sites, NVS was showcased as an example of how, by employing a well-thought-out science database infrastructure, we were able to meet multiple end-user needs and repurpose data and

services for both web and desktop management tools, including those targeted at offsite users (NVS Express).

4.2 NVS used in courses and training

Our management of the NVS Databank was chosen to provide a case study in preservation of scientific and technological data for the undergraduate course INF 382R Scientific and Technical Data Collections at the University of Texas School of Information. This course examines scientific data, appraises scientific datasets, explores the Semantic Web and the growing network of Linked Data, and examines the issues of long-term management of, and access to, scientific data. The instructor of the course, Dr William Anderson, provided us this feedback: 'Your paper[2] has been one that I find informative every time I read it. What is most valuable in this particular paper is the grounded description of work practices, system requirements (both for the system and the people), key issues of how to manage long-term preservation and usefulness of datasets, and little nuggets like this one: "In contrast to business data, scientific data are often less structured and less formally organized, and the needs of the users less predictable." (Amen.)'.

5 Data-sharing agreements and data exchange

We have developed a mechanism to provide regular updates of NVS plant spatial location data to GBIF (Global Biodiversity Information Facility, www.gbif.org). These data had not been updated since our first data upload to GBIF in 2004. We are now providing 1 684 751 records; an increase of over 400 000 records from what were previously provided. We also now have a mechanism to provide threatened species data with sufficiently coarse spatial resolution to prevent populations being located on the ground.

5.1 Use of NVS data through the GBIF Portal

Between 1 July 2011 and 30 June 2012 there were 36 367 searches for species occurrence data in NVS (access to 11 592 927 records) and 856 downloads of species occurrence data (for 3 431 189 records in NVS) that were accessed via the GBIF website.

6 International collaborations

Veg-X is the draft international exchange standard for plot-based vegetation data (Wiser et al. 2011). Landcare Research (Susan Wiser, Nick Spencer) procured the funding and led the international collaborative effort that produced this standard. Establishment of exchange standards, followed by development of ecoinformatics tools built around those standards, should allow scientists to efficiently combine plot data over extensive spatial and temporal

[2] Wiser, S.K.; Bellingham, P.J.; Burrows, L.E. 2001. Managing biodiversity information: development of New Zealand's National Vegetation Survey databank. *New Zealand Journal of Ecology* 25(2):1-17

gradients in order to perform analyses and make predictions of vegetation change and dynamics at local and global scales.

This year a major international collaborative effort implemented Veg-X. 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. The general import function described earlier is the basis of a tool developed to create Veg-X files. We have also provided advice to the BIEN group pertaining to data mapping. By the end of 2012 BIEN will have produced a single resource giving species names, locations, and often abundances, for about 25 million species occurrence records worldwide.

BIEN has been using Veg-X mostly as an intermediate data schema, to facilitate mapping of plots data to a common schema before importing it into VegBIEN. BIEN has also received Veg-X exports from a data provider (CTFS), but has found that the XML format means that large Veg-X files exceed the available memory. To enhance Veg-X, the group will switch to a CSV representation of Veg-X to fix this problem and facilitate both the export and import of Veg-X data. Finally, BIEN has used Veg-X to expand our VegBank-based database schema to include additional plot elements. These developments move BIEN closer to the ultimate goal of uniting an ever-growing international pool of plant distributional data with information on plant co-occurrence, ecology, traits and phylogeny.

Dr Henrique Pereira (Portugal) visited New Zealand and NVS in the first week of June. Dr Pereira heads the terrestrial monitoring part of GEO-BON (see http://earthobservations.org/geobon.shtml) , a portal-based system to enable access to ecological data for direct use in various assessment processes (e.g. Convention on Biological Diversity Strategic Plan targets and indicators and the newly established Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services). New Zealand is a signatory to both these arrangements and Henrique's visit provided an opportunity for New Zealand data and analyses to be better connected with global data management systems. We discussed the data holdings of NVS, how the database functions, how it is linked with DOC's Natural Heritage Management System (Inventory and Monitoring/Reporting Programme), and how it is linked with research and application more generally. This interaction should help pave the way for our domestic biodiversity status and trend data to contribute to a global understanding of biodiversity condition.

Stakeholders require a robust classification of current vegetation types for reporting on ecological indicators and defining management units. Although remote sensing has been used for some applications, it cannot provide the information required to depict total vegetation composition. To meet this need, DOC has been funding a project to derive a quantitative classification based on vegetation plot data. In 2010/11, the first stage of this new classification and description of New Zealand's forests and shrublands was completed using a nationally representative plot network (Wiser et al. 2011). The objective, area-proportional sampling design had the advantage of not being affected by the preconceptions of the nature of the drivers of vegetation composition that may be inherent in environmentally stratified

sampling or the biases against sampling anthropogenically-disturbed vegetation often found in preferential sampling. One of the well-known drawbacks of area-proportional sampling, however, is that rare vegetation types may not be sampled with enough plots to allow them to be defined. Indeed the classification failed to distinguish some known, iconic rare forest types, such as kauri forest. Moreover, because the classification was based on only 1177 plots, alliances could not be partitioned as finely as some existing regional classifications, i.e. to the association level. Susan Wiser and Miquel De Cáceres (Forest Science Center of Catalonia, Spain) collaborated to apply a recently-derived analytical technique to update the classification by using 12 374 additional plot records from New Zealand's National Vegetation Survey Databank (NVS) and thus provide consistency with the earlier effort (De Cáceres & Wiser 2012). This allowed us to define 12 new alliances; all had extents smaller than 125 000 ha nationally, and as such were more narrowly distributed than any of the initial alliance. We were also able to define 80 associations, including an association dominated by kauri. Our result also identified portions of compositional and geographic gradients that are poorly documented, in particular lower altitudes and successional shrublands are poorly represented by existing data. This points to an urgent need to better document vegetation patterns in these areas.

7 Conservation and management outcomes

During 2011/12 vegetation community data from NVS were used to inform an assessment of succession from shrubland to forest at two locations on DOC Conservation land – Seaward (Kaikoura) and St James Station. Shrubland and forest communities were mapped according to Kyoto definitions of forest and their potential for carbon sequestration quantified to aid policy decisions by DOC/MfE/MPI. A large area of land at St James has the potential to revert to forest but has limitations due to climate and low diversity of tree species, while Seaward is tree-species-rich, has a more benign climate, and is reverting rapidly.

Woodscape Gardens is a private landscaping company that designs, builds and renovates gardens around Dunedin (http://woodscapegardens.blogspot.co.nz/). They have been developing a web-based list of native plant species that grow naturally south of Mt Cook. The data in NVS have served as a major resource for this effort.

Contractor Alice Shanks was supplied location data for *Rytidosperma merum* as a background check of areas she may have missed using only herbarium records in a field survey for the data-deficient grass commissioned by the DOC Canterbury Conservancy. Alice noted, 'At that time I was sceptical of *R. merum* records that were not corroborated with deposited specimens. However, since that survey I have turned it up in places outside those represented by herbarium records so I am more interested in the NVS records now!'

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. As of 30 June 2012 there were 1166 links to NVS webpages from referring pages. On average 32% of page views resulted from referrals from other sites, whereas access via search engines marginally remains the most frequent pathway to the NVS website (43%). The remainder (25%) was direct traffic, indicating that frequent users bookmark the website.

Some new and interesting links to the NVS website and database include those from:

- New Zealand Forest Surveys who post job advertisements for botanical fieldworks on New Zealand Conservation Jobs (www.conjobs.co.nz). After the statement 'Field workers measure native forest and shrubland using a standard protocol' a link is provided to the plot-sampling manuals on the NVS website.
- The International Association for Vegetation Science (IAVS) is a worldwide union of scientists and others interested in theoretical and practical studies of vegetation: its composition and structure, history, classification, distribution, ecology, dynamics, management and uses in the landscape. The main goals of the IAVS are to facilitate personal contacts among vegetation scientists all over the world and to promote research in all aspects of vegetation science and its applications. The IAVS website (www.iavs.org) provides a link to vegetation databases worldwide (including NVS) under its resources tab.

- The Sanctuaries of New Zealand is an informal network of biodiversity sanctuaries that share common goals and approaches in their efforts to restore New Zealand's special biodiversity. Their website (www.sanctuariesnz.org) aims to provide current, relevant and best-practice information to those engaged in managing biodiversity sanctuaries in New Zealand and to promote these sanctuaries to those interested in learning how they are contributing to New Zealand biodiversity restoration, or who may wish to visit them. As such they provide information on vegetation monitoring and link to the NVS website, in particular the vegetation survey manuals and plot sheets.
- NVS is listed on Wikipedia's list of national vegetation classification systems. This article is within the scope of WikiProject Plants, a collaborative effort to improve the coverage of plants and botany on Wikipedia.

From 1 July 2011 to 30 June 2012, the NVS website was visited 3696 times, a 9% increase from the 2010/11 year (3382 visits) and there were 13 839 pageviews. There were 2357 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 (78%), followed by the USA/Canada (5%), UK (3%) and Australia (2%). The website was also visited by people from another 77 countries. Unsurprisingly the index page to the site was viewed frequently (26% of all page visits). Detail about field techniques, manuals, and field forms were also popular (12% of page visits). (Note that frequent users of NVS usually contact the database administrator directly.) Various documents are available to download from the NVS website and during 2011/12 over 1000 documents were downloaded, the most popular of which are listed in Table 1.

Table 1 Number of document downloads from the NVS website during 2010/11 (compiled using Google Analytics)

Document	Number of downloads (Google Analytics)
NVS Express associated items	288
Reconnaissance plot manual*	160
Forest permanent plot manual*	151
FBI manual, plot-sheets and foliar cover scale	108
Reconnaissance plot – pro forma data sheets	106
Forest tree diameter – pro forma data sheet	50
Grassland survey manual and pro forma data sheet	47
Forest seedling plot – pro forma data sheet	39
Field guide to the use of GPS	32
NVS Annual Report 2010/11	17

*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.

9 NVS data requests

A total of 73 requests for NVS data and metadata were made during 2011/12 and 1198 datasets were supplied (Figure 2a, b), an 11% increase in requests over 2010/11. The principal agencies requesting data and number of datasets supplied since 2000 are shown in Figure 2b. The major agencies requesting data (DOC, Landcare Research, and university staff and students) have made similar numbers of requests over recent years.

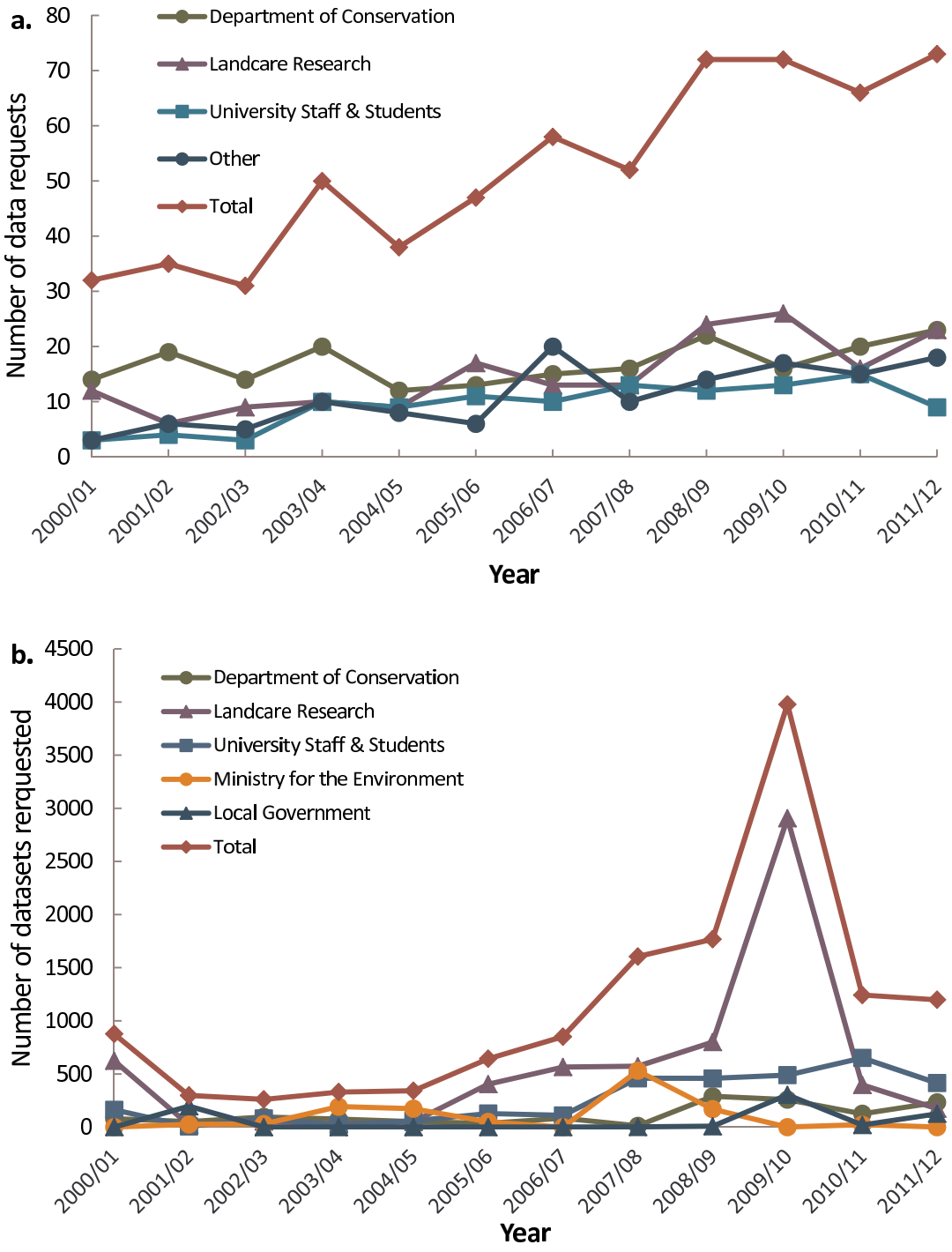

Figure 2 Requests for data from the National Vegetation Survey Databank per financial year since 2000: (a) total number of requests and from three major data-users and (b) number of datasets requested, total and from five major data-users.

10 Publications directly associated with the NVS Databank

Publications and conference presentations funded by the NVS program

Wiser S, Burrows L 2011. The National Vegetation Survey databank: A resource for managing vegetation plot data. Indigena. November.

Wiser SK, De Cáceres M 2012. Updating vegetation classifications: an example with New Zealand's woody vegetation. Journal of Vegetation Science: Online early doi: 10.1111/j.1654-1103.2012.01450.x

Refereed publications

The following 2011/12 publications used data derived from the NVS Databank.

Antonelli A, Humphreys AM, Lee WG, Linder HP 2011. Absence of mammals and the evolution of New Zealand grasses. Proceedings of the Royal Society B: Biological Sciences 278 (1706): 695–701. [NVS data sourced from GBIF]

Biffin E, Brodribb TJ, Hill RS, Thomas P, Lowe AJ 2012. Leaf evolution in Southern Hemisphere conifers tracks the angiosperm ecological radiation. Proceedings of the Royal Society B: Biological Sciences 279 (1727): 341–348. [NVS data sourced from GBIF]

Carswell FE, Doherty JE, Allen RB, Brignall-Theyer ME, Richardson SJ, Wiser SK 2012. Effects of above- and below-ground competition on seedlings in a New Zealand conifer-angiosperm forest. Forest Ecology and Management 269: 188–196.

Clarkson FM, Clarkson BD, Gemmill CEC 2012. Biological flora of New Zealand 13. Pittosporum cornifolium, tāwhiri karo, cornel-leaved pittosporum. New Zealand Journal of Botany 50: 185–201.

Coomes DA, Holdaway RJ, Allen RB, Kobe RK, Lines E 2012. A general integrative framework for modelling woody biomass production and carbon sequestration rates in forests. Journal of Ecology 100: 42–64.

Easdale TA, Allen RB, Peltzer DA, Hurst JM 2012. Size-dependent growth responses to competition and environment in *Nothofagus menziesii*. Forest Ecology and Management 270: 223–231.

Gallien L, Douzet R, Pratte S, Zimmermann NE, Thuiller W 2012. Invasive species distribution models – how violating the equilibrium assumption can create new insights. Global Ecology and Biogeography: Online early doi: 10.1111/j.1466-8238.2012.00768.x. [NVS data sourced from GBIF]

Hijmans RJ 2012. Cross-validation of species distribution models: removing spatial sorting bias and calibration with a null model. Ecology 93: 679–688. http://dx.doi.org/10.1890/11-0826.1

Hurst JM, Allen RB, Coomes DA, Duncan RP 2011. Size-specific tree mortality varies with neighbourhood crowding and disturbance in a montane *Nothofagus* forest. Plos ONE 6(10): e26670.

Mason NWH, Carswell FE, Overton JMcC, Briggs CM, Hall GMJ 2012. Estimation of current and potential carbon stocks and Kyoto-compliant carbon gain on conservation land. Science for Conservation 317. Wellington, Department of Conservation.

Michel P, Overton JM, Mason N, Hurst JM, Lee W 2011. Species–environment relationships of mosses in New Zealand indigenous forest and shrubland ecosystems. Plant Ecology 212: 353–367.

Monks A, Cieraad E, Burrows L, Walker S. 2012. Higher relative performance at low soil nitrogen and moisture predicts field distribution of nitrogen-fixing plants. Plant and Soil: Online early doi: 10.1007/s11104-012-1170-2

O'Donnell J, Gallagher RV, Wilson PD, Downey PO, Hughes L, Leishman MR 2012. Invasion hotspots for non-native plants in Australia under current and future climates. Global Change Biology 18: 617–629. [NVS data sourced from GBIF]

Ramsey DSL, Forsyth DM, Veltman CJ, Nicol SJ, Todd CR, Allen RB, Allen WJ, Bellingham PJ, Richardson SJ, Jacobson CL, Barker RJ 2012. An approximate Bayesian algorithm for training fuzzy cognitive map models of forest responses to deer control in a New Zealand adaptive management experiment. Ecological Modelling 240: 93–104.

Richardson SJ, Williams PA, Mason NWH, Buxton RP, Courtney SP, Rance BD, Clarkson BR, Hoare RJB, St. John MG, Wiser SK 2012. Rare species drive local trait diversity in two geographically disjunct examples of a naturally rare alpine ecosystem in New Zealand. Journal of Vegetation Science 23: 626–639.

Smale MC, Bergin DO, Steward GA 2012. The New Zealand beeches: establishment, growth and management. New Zealand Indigenous Tree Bulletin No. 6. Rotorua, Scion. 64 p.

Stopps G, White S, Clements D, Upadhyaya M 2011. The biology of Canadian weeds. 149. *Rumex acetosella* L. Canadian Journal of Plant Science 91: 1037–1052. [NVS data sourced from GBIF]

Taylor S, Kumar L, Reid N 2012. Impacts of climate change and land-use on the potential distribution of an invasive weed: a case study of *Lantana camara* in Australia. Weed Research: Online early doi: 10.1111/j.1365-3180.2012.00930.x [NVS data sourced from GBIF]

Taylor S, Kumar L, Reid N, Kriticos DJ 2012. Climate change and the potential distribution of an invasive shrub, *Lantana camara* L. PLoS ONE 7(4): e35565. doi:10.1371/journal.pone.0035565 [NVS data sourced from GBIF]

Taylor SH, Franks PJ, Hulme SP, Spriggs E, Christin PA, Edwards EJ, Woodward FI, Osborne CP 2012. Photosynthetic pathway and ecological adaptation explain stomatal trait diversity amongst grasses. New Phytologist 193: 387–396. [NVS data sourced from GBIF]

Wiser SK, Hurst JM, Allen RB, Wright EF 2011. New Zealand's forest and shrubland communities: a classification based on national sampling of an 8 km grid. Applied Vegetation Science 14: 506–523.

Wiser SK, Spencer N, De Cáceras M, Kleikamp M, Peet Rk 2011. Veg-X – An exchange standard for plot-based vegetation data. Journal of Vegetation Science 22: 598–609.

Wright DM, Tanentzap AJ, Flores O, Husheer SW, Duncan RP, Wiser SK, Coomes DA 2012. Impacts of culling and exclusion of browsers on vegetation recovery across New Zealand forests. Biological Conservation 153: 64–71.

Reports

Kunstler G, Allen RB, Coomes DA, Canham CD, Wright EF 2011. SORTIE/NZ model development. Lincoln, Landcare Research.

Mitchell Partnerships 2012. Strongman Mine Offset Proposal: Habitat restoration in the Roaring Meg Ecological Area. Unpublished report prepared for Solid Energy New Zealand by Mitchell Partnerships, Takapuna. 46 p. + appendices

Mitchell R, Thomson M, Pelvin B 2010. Dunedin District Ecosystem Mapping Project. A report prepared for the Dunedin City Council planning team by Kunzea Consultants.

Smale MC, Fitzgerald NB 2012. Monitoring condition of frost flat heathlands, a rare ecosystem in central North Island. Landcare Research Contract Report LC996.

Conference presentations

Robertson H 2011. Progress and challenges in wetland restoration: Insights from the Arawai Kakariki programme. New Zealand Ecological Society conference, Rotorua.

Wiser SK 2011. New Zealand's forest and shrubland communities: a quantitative classification based on a nationally representative plot network. Invited presentation at Expanding the Market for Sustainably Managed NZ Beech Workshop, University of Canterbury, Christchurch, 25 October.

Wiser SK 2012. Conservation priorities for shingle beaches in New Zealand. Forest & Bird: South Canterbury Branch - March Meeting, Timaru.

Wyse S 2011. Kauri, the ecosystem engineer. New Zealand Ecological Society conference, Rotorua.

Theses

Waring SM 2010. Apparent competition between native and exotic plants mediated by a native insect herbivore. Unpublished PhD thesis, Lincoln University, Canterbury, New Zealand.

Zhang J 2012. Prediction of potential survival areas of smooth cordgrass (*Spartina alterniflora*) in China. Unpublished MSc thesis, Uppsala University, Sweden. [NVS data sourced from GBIF]

Other

Payton IJ 2011. Mokihinui Hydro Proposal: terrestrial vegetation. Statement of evidence of Ian John Payton for Meridian Energy Ltd. 85 p.

Wiser S. 'The National Vegetation Survey Databank'. Lecture given to degree course: ERST 611 Advanced Environmental Monitoring, Lincoln University, 10 May 2012.

Appendix 1 – New electronic datasets in NVS 2011/12

Listing of new *electronic datasets* incorporated into NVS, July 2011 – June 2012

DTZ Projects 1980-2007 #
Eastern Volcanic Plateau 2012 #
Harper-Avoca 2009-10 #
Hartree Forest 1997
Hartree Forest 2003
Kaweka Wilding Pines 2008-09 #
Kokatahi Permanent Forest Plots 2010
Moawhitu CNPS carbon sequestration site D'Urville Island 2008
Mt Barker Wilding Pines 2008-2010 #
Nikau Valley 2012 #
Oxford CNPS carbon sequestration site 2008-09
Pukaki Rosa 2009 #
Puketi Forest 2011 #
Raoul Island West Big 1996
Ruahine Exclosures - Maropea Forks 2009 #
Ruahine Exclosures - Mid Pohangina 2006 #
South Island Short Tussock Grasslands 1960-1965 #
Waikare Kanuka Successions 2010 #
Waipapa 1995
Waitaki Grassland 1985-86 #

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

Egmont, Mount 2011 #
Fescue Tussock Survey 2011 #
Ketetahi 2011 #
Lambies stream wetlands 2012
Ohope Forest Scenic Reserve Forest Health Assessment (FHA) 2011 #
Otago Peninsula Biodiversity Survey 2011
Peggioh 2012 #
Pukepoto Forest 2011 #
Puketi Forest 2011 #
Riversdale 2011 #
Rotoehu 2010 #
Thar Impact Site - Arbor Rift 2012
Thar Impact Site - North Branch 2011
Thar Impact Site - Whymper 2011
Thar Impact Site - Zora 2012
Tyrell biodiversity management 2011 #

Hard-copy plotsheets of these projects were archived.