NVS ANNUAL REPORT FOR THE 2009/10 YEAR

Compiled by Hamish Maule, Susan Wiser, Hazel Broadbent, Nick Spencer, Sarah Richardson & Larry Burrows, Landcare Research, Lincoln

1. Backbone funding heralds a new era of stability

The Backbone Research and Science Scheme is a new mechanism for disbursing Vote RS&T funds on a longer-term and non-contestable basis. The scheme aims to support essential RS&T infrastructure and activities. This includes nationally significant databases and collections, long-term datasets, and functions related to national and international obligations.

Initially the Backbone Research and Science Scheme is being applied to the existing 26 Nationally Significant Databases (NSDs). These have previously been supported by a wide variety of contestable contracts.

As one of the NSDs, the NVS Databank has been granted backbone funding, with the 10-year contract finalised in late June. The funding level was based on funding provided under the Ecosystem Resilience OBI and Landcare Research Capability funding. NVS will be subject to review at regular intervals throughout its contract to assess whether it should continue to receive backbone funding, but will no longer need to apply for funding from a contestable pool. This puts the NVS team in a much stronger position to plan strategically for the long-term maintenance and development efforts that are critical to ensure that NVS remains a world-class resource.

2. Number of new records archived in NVS

A total of 29 new datasets were added electronically to NVS in 2009/10 (year to 30 June 2010; Fig. 1a & Appendix 1) with a total of 1741[1] plots added (Fig. 1b). In addition, hardcopies of plot data sheets were archived for 36 datasets (Appendix 1). Major providers of data and types of data since 2000 are shown in Fig. 1. This level of new data archived in NVS is a marginal increase over last year but down on the previous two years. During the 2009/10 year 70% of new data incorporated into NVS were deposited by the Department of Conservation (DOC). It continues to be standard operating procedure in DOC for NVS to be the repository for all standard permanent plot and Recce vegetation data collected by the Department. The development and use of NVS Express (formerly NVS Lite) software is also facilitating the addition of data into NVS.

[1] Including data entered using NVS Express that are currently being validated, see Appendix 1.

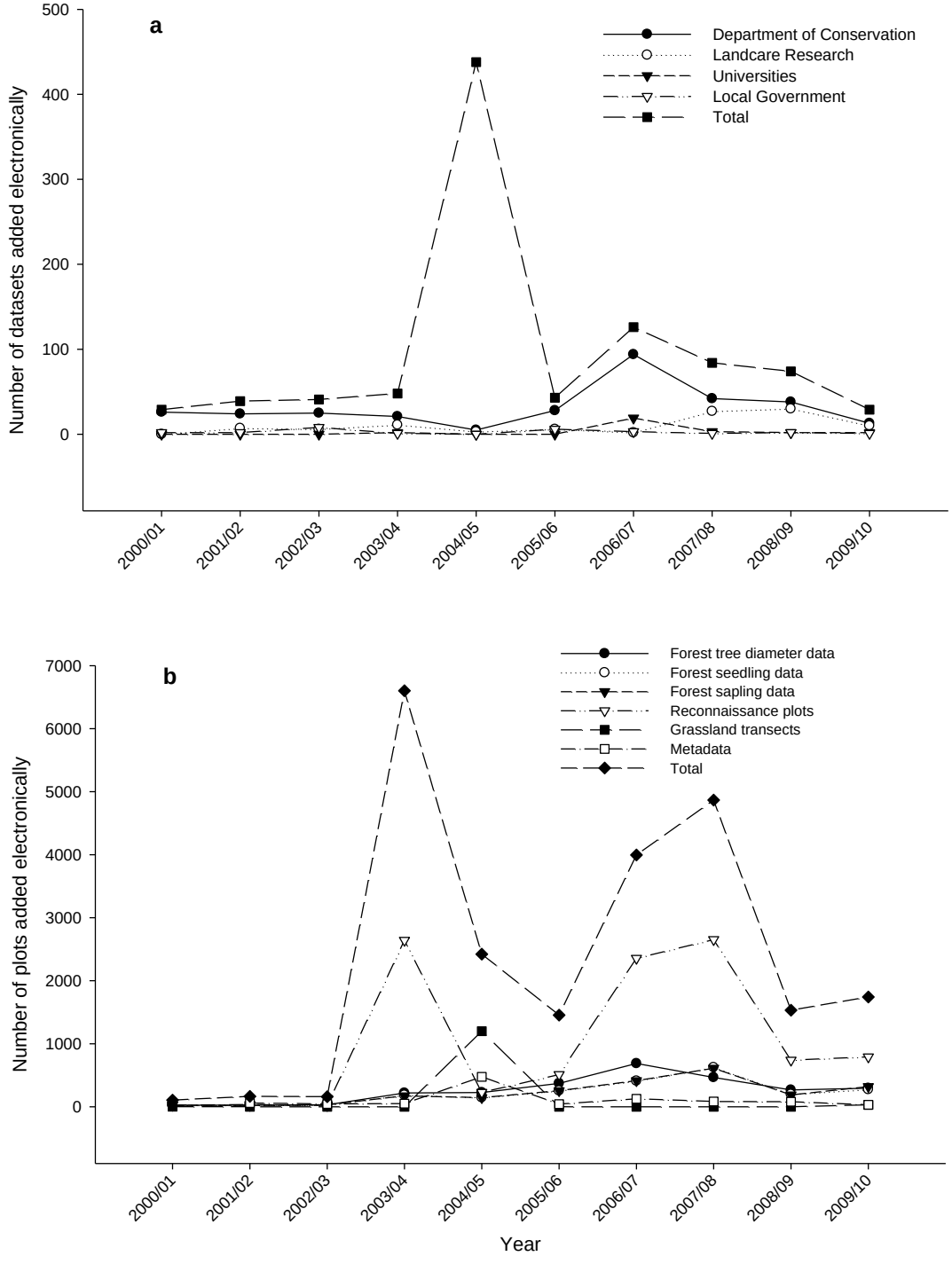

Fig. 1. Number of electronic deposits in the National Vegetation Survey Databank per financial year since 2000. (a) Datasets, total and from four major data-depositors and (b) Vegetation plots, total and six major data types. Note that this does not include data entered using NVS Express that are currently being validated.

3. Significant revisions of data

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

A series of validation checks, additions and corrections were carried out on the NVS names and species codes data table and the corresponding LSID (Life Science Identifer) connections to the Landcare Research New Zealand Plants Names database. These corrections allowed a new taxonomic update function 'Preferred Names' to be developed. Checks were also run on the RECCE cover class methods in usage throughout the database.

The LUCAS system both remeasured existing NVS plots and established new ones. Linkages were established between plots stored as part of the LUCAS project and the NVS plots that had been remeasured. This was the first time that plots from one individual project were linked to plots from many original projects. This demonstrates one of the advantages of the flexibility of the data management system that NVS now uses.

4. Database development and integration

Completion of NVS Express software

After a number of years in preparation, we have completed development of the software package 'NVS Express'. The package and accompanying manuals (Vickers et al. 2010) are now freely available for anyone to download from the NVS website http://nvs.landcareresearch.co.nz.

Pre-existing software that was specifically designed to provide summaries and analysis of the range of plot data stored in NVS was written in DOS (i.e. PC-RECCE (Hall 1992), PC-DIAM (Hall 1994a), PC-USTOREY (Hall 1994b) and PC-TRANSECT (Hall 1996) hereafter referred to collectively as 'PC packages'). These packages, based on now-obsolete technology, made the software difficult for most practitioners to use, particularly as DOS was not supported by most agencies. DOC staff, in particular, have found this an impediment to their work. Moreover, there was a recognised need to conduct synthetic analyses across multiple datasets; this was not possible with the existing software. In 2004/05 TFBIS funded Landcare Research to survey the data analysis skills of end-users and review the data analysis tools available to them. Based on the recommendations made in that report (Richardson et al. 2005) we obtained TFBIS and FRST funding to produce stand-alone software to provide data entry facilities, consistent data validation facilities, and summary and basic analysis tools.

The target audience for NVS Express is conservation practitioners (e.g. DOC or regional council staff), resource management and biodiversity consultants, policymakers, and any others who measure and monitor vegetation using standard plot-based methods. NVS Express will help these people summarise and better understand their data, without having to use advanced statistical packages. The data capture module of NVS Express has been in use by DOC staff, private consultants, and some city and regional councils for the past year.

NVS Express contains functions to enter, validate, summarise, and analyse data stored in the standard NVS formats. The associated analytical program, NVS Analysis, can also convert both raw and processed data into a range of different formats for export to other software packages. Data summaries are produced in tabular and graphical form. Basic temporal trend and multivariate classification analyses can be performed.

By empowering end-users to enter, validate and analyse their own data, they will be able to more directly interpret and understand the status and trend of plant biodiversity and vegetation composition and structure in their geographic area. This will allow them to make better informed conservation and management decisions. It will also result in them 'raising their game' in terms of data quality, as it is only by having a complete understanding of the entire process, from data collection to interpretation, that the consequences of uneven data quality become apparent.

Development of the ability to cascade nomenclatural changes through to primary plot data

We developed a link with NZ Plant Names that allows us to replace the name associated with a species on a plot in the NVS Databank with the current preferred name. This is an effective solution for updating nomenclature where a single new name replaces a single old name and is essential when datasets containing plots measured at different times are combined. This functionality is incorporated into NVS Express.

We are exploring methods to map taxonomic concepts. This would accommodate situations where the usage of names has changed, for example when a taxon is 'split'. An example of an implementation of mapping taxonomic concepts is provided by the Flora of the Southeastern United States project
http://www.herbarium.unc.edu/seflora/firstviewer.htm

Progress on development of a plant traits module

We have now developed a schema for categorising species in growth forms, and applied this to all the plant species that occur in NVS. Our schema builds on those used overseas and starts by dividing the flora into woody, semi-woody and herbaceous species, and then further divides each of those three groups into groups of species that are functionally equivalent. For example, woody species are divided into trees (i.e. species that can reach at least 6 m in height) and shrubs (i.e. species that don't reach 6 m) as per McGlone et al. 2010[2]). Where possible, we have also ascribed palatability classes to the common forest species. Alongside information on biostatus, these data allow users to summarise and compare plot-based vegetation data using a functional language.

The master NVS species code list is now linked via NZ Plant Names to 'Biostatus' (as per Ngā Tipu Aotearoa – New Zealand Plants http://nzflora.landcareresearch.co.nz), 'Palatability' (to ungulates as per Forsyth et al. 2002[3]) and 'Growth Form'

[2] McGlone MS, Richardson SJ, Jordan GJ 2010. Comparative biogeography of New Zealand trees: species richness, height, leaf traits and range sizes. New Zealand Journal of Ecology 34: 137–151.

[3] Forsyth DM, Coomes DA, Nugent G, Hall GMJ 2002. Diet and diet preferences of introduced ungulates (Order: Artiodactyla) in New Zealand. New Zealand Journal of Zoology 29: 323–343.

(preliminary list as compiled by NVS staff and as per McGlone et al. 2010[2]). This allows users of NVS Express to summarise their data based on species traits in addition to species names.

5. Data-sharing agreements and data exchange

International exchange standard for plot-based vegetation data

The adoption of Veg-X, the draft international standard for vegetation plot data, continues and our role in supporting this progress continues to be significant.

To continue to promote Veg-X we delivered the following presentations:

De Cáceres M, Spencer N, Wiser SK, Peet RK, Kleikamp M, Boyle B 2010. Veg-X - An exchange standard for plot-based vegetation data. 9th meeting on vegetation databases – Vegetation Databases and Climate Change, Hamburg, Germany, 23–27 February.

Wiser SK, Spencer N, Kleikamp M, Peet R, De Cárceres M, Boyle B 2009. [Abstract] Veg-X – an exchange standard for plot-based vegetation data. Proceedings: 10th INTECOL International Congress of Ecology, Brisbane, 16–21 August, 2009. http://www.intecol10.org/abstracts/pdf/0908015Abstract00427.pdf

Our collaboration via the National Center for Ecological Analysis and Synthesis (NCEAS) Botanical Information and Ecology Network (BIEN) working group has revolved primarily around helping this group adopt Veg-X as their means to develop an integrated botanical information network to investigate the ecological impacts of global climate change on plant biodiversity. After a slow start, this effort has been advanced by the dedicated involvement of Matt Wheeler, a statistics PhD student who is working with one of the BIEN PIs, Mark Shildauer (NCEAS). Matt comes from a software engineering background and so has the requisite skills to write the scripts to translate the myriad BIEN source datasets into a common platform.

We (Susan Wiser) were also invited to attend a related meeting of the IPlant Global Diversity working group in May 2010. This working group focused on the design and features of a discovery environment that would promote integration and analysis of data on plant diversity, including ecological, phylogenetic and functional components. A key output of this group was to urge the IPlant Collaborative (funded by US NSF) to sponsor development of generic software tools that will allow users to translate their own data into current standards, such as Veg-X and Darwin Core.

Finally, a manuscript describing Veg-X, submitted 14 June 2010 in response to an invitation to do so, has been accepted for a special issue of *Applied Vegetation Science* (Wiser SK, Spencer N, De Cáceras M, Kleikamp M, Peet RK. Veg-X – An exchange standard for plot-based vegetation data).

The GMBA/GBIF Mountain Biodiversity Portal

A major point of entry for obtaining information and data stored in NVS is by means of the GBIF (Global Biodiversity Information Facility http://www.gbif.org) website.

In particular, this portal allows users to obtain information on the spatial occurrence of taxa. In a recent development, GBIF's Mountain Biodiversity data can be explored via the GMBA (Global Mountain Biodiversity Assessment)/GBIF Mountain Biodiversity Portal. This portal allows one to explore and download data for the mountains of the world and search mountainous areas from region to globe, or select by mountain life zones (such as the treeless alpine zone) on an interactive map. Between 1 July 2009 and 30 June 2010, there were 23 074 searches for species occurrence data in NVS (access to 7 500 901 records) and 850 downloads of species occurrence data (for 6 694 430 records in NVS) using the GBIF website. In the same period, there were 296 uses of interactive map sites of NVS data (species occurrences within plot-based records) through the GBIF website.

6. Remeasurement of critical plot networks

Harper/Avoca survey

Over the summer of 2009/10 the now 5-yearly survey of the Harper/Avoca plots was undertaken. This year's survey was led by Laura Spence, who was a volunteer worker in the 2004/05 survey, and involved c.15 Landcare Research staff and volunteers on and off throughout the survey. The Harper/Avoca plots were set up in the mountain beech forests of the Avoca, Harper and Broken River catchments in the mid-1950s and early '70s by the then New Zealand Forest Service. The plots have been remeasured numerous times, as an 'entire set' of c. 250 plots 11 times including this year's remeasure, with some plots remeasured up to 18 times. As a result, this is the largest and most intensively remeasured permanent plot dataset in NVS and has led to a number of publications and theses that have made notable contributions to forest ecology:

Allen RB, Bellingham PJ, Wiser SK 1999. Immediate damage by an earthquake to a temperate montane forest. Ecology 80: 708–714.

Coomes DA, Allen RB 2007. Mortality and tree-size distributions in natural mixed-age forests. Journal of Ecology 95: 27–41.

Harcombe PA, Allen RB, Wardle JA, Platt KH 1998. Spatial and temporal patterns in stand structure, biomass, growth and mortality in a monospecific *Nothofagus solandri* var. *cliffortioides* (Hook. f.) Poole forest in New Zealand. Journal of Sustainable Forestry 6: 313–345.

Hurst JM 2006. Temporal and spatial patterns of tree mortality in a montane New Zealand mountain beech forest. MSc thesis, Lincoln University, Canterbury.

Spence LA 2009. Exotic plant invasion in New Zealand forest understorey over 34 years: the roles of natural disturbance events, species richness, and mycorrhizal fungi. PhD Thesis, Department of Plant Sciences, University of Cambridge, UK.

Wiser SK, Allen RB, Clinton PW, Platt KH 1998. Community structure and forest invasion by an exotic herb over 23 years. Ecology 79: 2071–2081.

Legacies of goat grazing

In 1946 goats were eradicated from Great Island in the Three Kings Islands in northern New Zealand, where they had been liberated as food for castaways. The island was regenerating after past clearance and the goats severely reduced populations of some trees. The NVS team, Canterbury Museum, Auckland War

Memorial Museum and DOC collaborated to conduct a remeasurement, 57 years later, of plots set up just after goats were eradicated. The remeasurement showed that expectations of a rapid and widespread recovery of a diverse forest on the island have been only partly realised. Grazing by goats left a legacy of unpalatable vegetation in the understorey through which many plants have been unable to regenerate. Other trees reliant on native pigeons to disperse their seed have only been recruited as seedlings away from parents after the arrival of pigeons on the island in the last decade. Goat eradications are now taking place worldwide (e.g. Galápagos, Mexico) with expectations of rapid restoration of original vegetation. A key lesson of this study for island restoration is that either patience is required or that some active interventions may be needed after goat eradication to manipulate successions. (Bellingham PJ, Wiser SK, Wright AE, Cameron EK, Forester LJ 2010. Disperser communities and legacies of goat grazing determine forest succession on the remote Three Kings Islands, New Zealand. Biological Conservation 143: 926–938).

7. Keeping end-users informed about NVS

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

Broadbent H 2010. The National Vegetation Survey and NVS Express. 2010 Dataversity National Workshop: Biodata Management in the Real World, Wellington, 18–19 March.

Vickers S, Hurst J, Broadbent H, Wiser S 2010. NVS Express: A data-entry, validation and analysis tool for Recce description and permanent 20x20m data. Poster presentation. 2010 Dataversity National Workshop: Biodata Management in the Real World, Wellington, 18–19 March.

Landcare Research staff associated with the NVS Databank conducted tours of the NVS vault and demonstrated the NVS website and tools to the Honourable Kate Wilkinson (Minister of Conservation); Felicity Caird, Sector Manager, Auditor-General's office; and two new members of the Landcare Research Board – Peter Schuyt and Vicky Taylor.

The completion of NVS Express, combined with the consistent support for NVS from the TFBIS programme over the years, motivated TFBIS to provide $80,000 of funding for 2010/11 for Landcare Research to run a series of workshops to raise awareness of the NVS Databank and train end-users to get the most out of NVS Express.

8. Outcomes

Conservation outcomes

Research programmes funded by DOC over the 2009/10 year continue to make strong use of data archived in NVS:

In a paper written for DOC through the CDRP (Cross Departmental Research Pool) programme, Peltzer et al.[4] used permanent plot data and ungulate exclosure data from a number of NVS datasets to evaluate the effects of 10 drivers of indigenous tree population structure in New Zealand forest ecosystems. Analyses of the variation in size class distributions for plant species and palatability groups were carried out on 986 permanent forest plots and 88 paired ungulate exclosure–control plots. The results showed that the effects of ungulate browsers on changes in tree population structure can be distinguished from other drivers, such as disturbance and successional stage. However, these browsing effects have been overstated in exclosure studies as they are not representative of effects at a national scale. Changes in tree-size distribution were ultimately linked to community composition and ecosystem properties and processes. The authors concluded that disentangling the effects of various disturbances is critical for understanding how biological invaders and their management alter forest ecosystem functioning.

In March 2010, MAF was contacted by a landowner whose trees had been felled without his authority. At MAF's request, we provided statistics of basal area by species for nearby forests, using GIS and the National Forest Survey Data (held in NVS). This allowed the extent of the felling to be determined and the value of necessary compensation to be estimated.

Information from NVS has been used to guide studies that in themselves have resulted in practical outcomes. For example, Delmiglio et al.[5] used species occurrence data from NVS to guide site selection in a study on New Zealand native grasses that provides evidence for frequent and multiple invasions by exotic cereal and pasture viruses. The authors point out that biosecurity in New Zealand is mainly focused on border control, rather than the effect of pathogen movement from cultivated to native plants. The view of biosecurity needs to be expanded because potential adverse effects on natural systems are not only ecological, but may also have economic, cultural, legal and social repercussions.

NVS data are one source of information used by DOC in their Environmental Weeds Presence–Absence project. The primary goal of this project is to quantify the range of the full list of environmental weeds at a national scale. This project will be used in state of the nation reporting to support finer detail for selected species, to support good decision making for weed-led programmes, and to provide reliable distribution data for weeds research (Jon Terry, DOC, pers. comm.).

Rob Allen presented a plan for implementing an Inventory and Monitoring Programme for DOC's NHMS to Senior DOC Staff in Wellington. The Inventory and Monitoring Programme would have a reporting, prioritisation, management effectiveness, and warning system role. Some Regional Councils are looking at adopting the approach

[4] Peltzer DA, Allen RB, Bellingham PJ, Wright EF, Knightbridge P, Mason NWH. Disentangling drivers of tree population size class distributions. In review with DOC.
[5] Delmiglio C, Pearson MN, Lister RA, Guy PL 2010. Incidence of cereal and pasture viruses in New Zealand's native grasses. Annals of Applied Biology 157: 25–36.

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 34% of page views were the result of referrals from other sites, whereas access via search engines marginally remains the most frequent pathway to the NVS website (38%). The remainder (28%) was direct traffic, indicating that frequent users bookmark the website.

New links to the NVS website and database include those from the Open Data Catalogue (http://cat.open.org.nz), Lincoln University Library (http://library.lincoln.ac.nz) and the Dataversity community (http://dataversity.org.nz).

From 1 July 2009 to 30 June 2010, the NVS website was hit 15 441 times, a 20% decrease from the 2008/09 year (19 299 hits). There were 2769 unique visitors to the site, 49% of whom were new visitors to the website. 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 28 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 (18% 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 2009/10 over 1200 documents were downloaded, the most popular of which are listed in Table 1.

Table 1 Number of document downloads from the NVS website during 2009/10 (compiled using Google Analytics).

Document	Number of downloads (Google Analytics)
Forest permanent plot manual*	181
Reconnaissance plot – pro forma data sheet	181
Reconnaissance plot manual*	131
FBI manual, plot-sheets and foliar cover scale	98
NVS Annual Report 2008/09	81
Forest tree diameter – pro forma data sheet	73
Field guide to use of GPS	62
Forest seedling plot – pro forma data sheet	60
NVS Express manual	21
Grassland survey manual	17

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

10. NVS data requests

A total of 72 requests for NVS data and metadata were made during 2009/10 and a total of 3978 datasets were supplied (Fig. 2a & b), a 44% increase in dataset requests over 2008/09. The principal agencies from which there were requests for data and number of datasets supplied since 2000 are shown in Fig. 2b. The major agencies requesting data (DOC, Landcare Research, and university staff and students) have made similar numbers of requests over recent years, but the number of datasets requested has been gradually increasing because it is common for a large number of datasets to be requested at one time for synthetic studies. Indeed, bulk data requests continue to be a feature of NVS data use, with 13 requests over the 2009/10 year comprising ≥100 datasets per request.

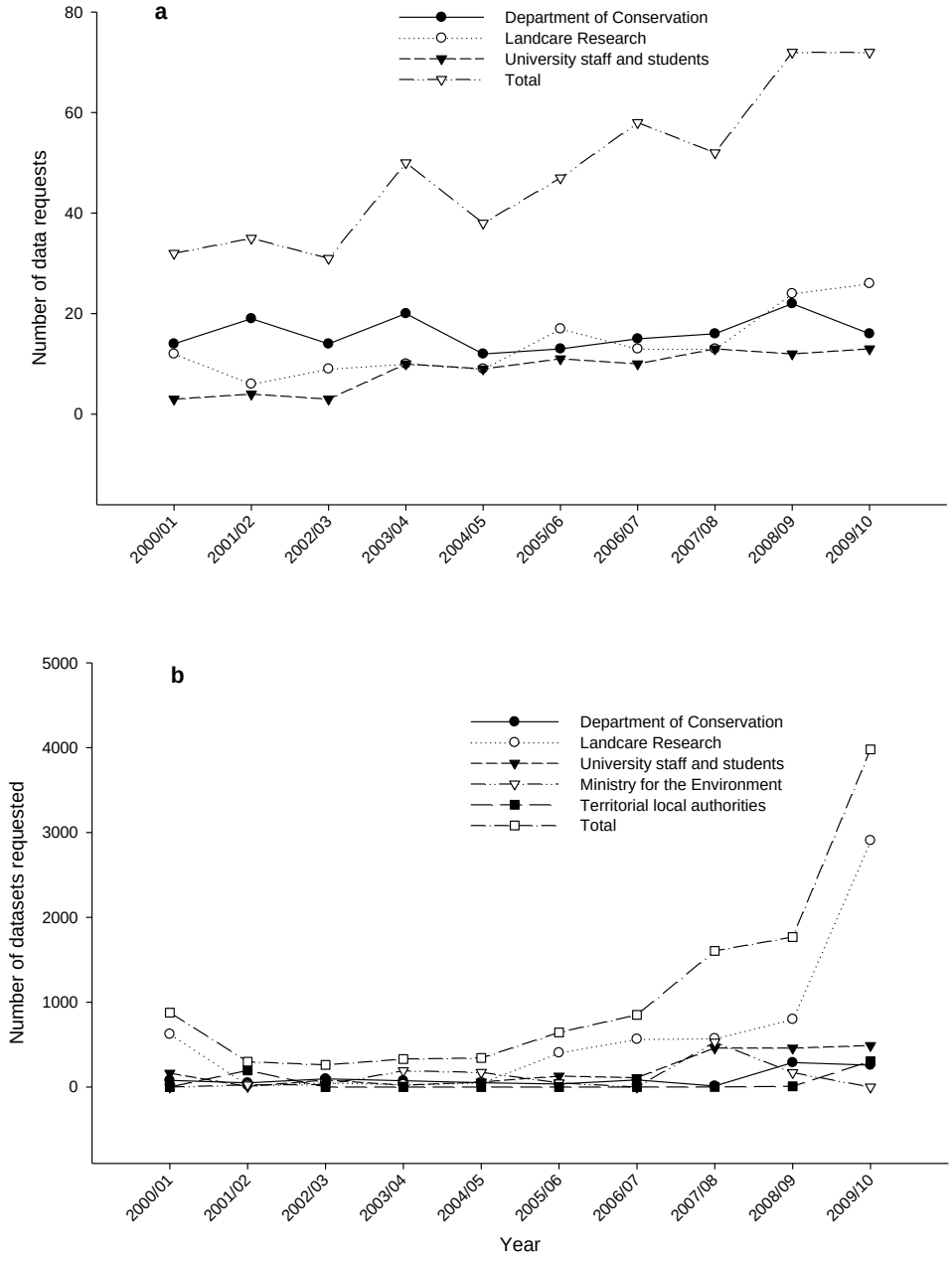

Fig. 2 Requests for data from the National Vegetation Survey Databank per financial year since 2000. (a) Total number of requests and from three major data-users and (b) Number of datasets requested, total and from five major data-users.

Large data requests over the last year included a number of requests from regional councils interested in permanent vegetation plots in their areas with a view to establishing their own vegetation monitoring strategies: Susan Wiser's (Landcare Research) New Zealand's non-forested vegetation communities DOC contract; species occurrence requests including Nathan Swenson (Michigan State University) investigating *Coprosma* distribution, Scot Waring (Lincoln University) investigating *Senecio* distribution and Norm Mason's (Landcare Research) designing of a nation-wide inventory and monitoring programme of key biodiversity assets and pest plants and animals for the DOC.

11. Publications directly associated with the NVS Databank

Refereed publications

The following 2009/10 publications used data derived from the NVS Databank.

Allen RB 2009. Indigenous Forestry Research – a new programme. Indigena (November): 1–4.

Bellingham PJ, Wiser SK, Wright AE, Cameron EK, Forester LJ 2010. Disperser communities and legacies of goat grazing determine forest succession on the remote Three Kings Islands, New Zealand. Biological Conservation 143: 926–938.

Coomes DA, Allen RB 2009. Testing the Metabolic Scaling Theory of tree growth. Journal of Ecology 97: 1369–1373.

Diez J, Dickie I, Edwards G, Hulme PE, Sullivan JJ, Duncan RP 2010. Negative soil feedbacks accumulate over time for non-native plant species. Ecology Letters 13: 803–809.

Easdale T, Burrows L, Allen RB 2010. Thinning boosts merchantable timber yields of silver beech. Indigena (May): 3–4.

Forsyth DM, Wilmshurst JM, Allen RB, Coomes DA 2010. Impacts of introduced deer and extinct moa on New Zealand ecosystems. New Zealand Journal of Ecology 34: 48–65.

Hawcroft A, Husheer S 2009. Vegetation monitoring in Whanganui National Park. DOC Research and Development Series 315. Wellington, Department of Conservation.

Kelly D, Ladley JJ, Robertson AW, Anderson SH, Wotton D, Wiser SK 2010. Mutualisms with the wreckage of an avifauna: the status of bird pollination and fruit-dispersal in New Zealand. New Zealand Journal of Ecology 34: 66–85.

Lafortezza R, Coomes DA, Kapos V, Ewers RM 2010. Assessing the impacts of fragmentation on plant communities in New Zealand: scaling from survey plots to landscapes. Global Ecology and Biogeography Published Online: doi: 10.1111/j.1466-8238.2010.00542.x.

Phillips SJ, Elith J 2010. POC-plots: Calibrating species distribution models using presence-only data. Ecology: in press.

Phillips SJ, Dudík M, Elith J, Graham CH, Lehmann A, Leathwick J, Ferrier S 2009. Sample selection bias and presence-only distribution models: implications for background and pseudo-absence data. Ecological Applications 19: 181–197.

Richardson SJ, Peltzer DA, Hurst JM, Allen RB, Bellingham PJ, Carswell FE, Clinton PW, Griffiths AD, Wiser SK, Wright EF 2009. Deadwood in New Zealand's

indigenous forests. Forest Ecology and Management 258: 2456–2466.
Richardson SJ, Smale MC, Hurst JM, Fitzgerald NB, Peltzer DA, Allen RB, Bellingham PJ, McKelvey PJ 2009. Large-tree growth and mortality rates in forests of the central North Island, New Zealand. New Zealand Journal of Ecology 33: 208–215.
Rogers GM, Wiser SK 2010. Environment, composition, and conservation of coastal turfs of mainland New Zealand. New Zealand Journal of Botany 48: 1–14.
Russo SE, Jenkins KL, Wiser SK, Uriarte M, Duncan RP, Coomes DA 2010. Interspecific relationships among growth, mortality, and xylem traits of 59 woody species from New Zealand. Functional Ecology 24: 253–262.
Wiser SK, Buxton RP, Clarkson BR, Richardson SJ, Rogers GM, Smale MC, Williams PA 2010. Climate, landscape, and microenvironments interact to determine plant composition in naturally discrete gravel beach communities. Journal of Vegetation Science 21: 657–671.

Reports

The following list of reports and conference papers may not be exhaustive, but is based on responses from users of NVS data.

Allen RB, Bellingham PJ, Forsyth DM, MacLeod CJ, Wright EF 2009. Implementing an Inventory and Monitoring Programme for the Department of Conservation's Natural Heritage Management System. Landcare Research Contract Report LC0809/154, prepared for the Department of Conservation, Wellington, New Zealand.
Allen RB, Wright EF, MacLeod CJ, Bellingham PJ, Forsyth DM, Mason NWH, Gormley AM, Marburg AE, MacKenzie DI, McKay M 2009. Designing an Inventory and Monitoring Programme for the Department of Conservation's Natural Heritage Management System. Landcare Research Contract Report LC0809/153, prepared for Department of Conservation, Wellington, New Zealand.
Beets PN, Kimberley MO, Goulding CJ, Garrett LG, Oliver GR, Paul TSH 2009. Natural forest plot data analysis: Carbon stock analyses and re-measurement strategy. Unpublished report, Department of Conservation.
Carswell FE, Burrows LE, Mason NWH 2009. Above-ground carbon sequestration by early-successional woody vegetation: a preliminary analysis. Science for Conservation 297. Wellington, Department of Conservation.
Day N, Buckley H 2009. Colonisation and spread of *Hieracium* spp in the South Island high country over 25 years. Report prepared for Land Information New Zealand.
Dickie IA, Richardson SJ, Allen RB 2009. Summary of brief reports examining (i) the effect of DBH and height measurement and (ii) a change in method assessment from shrub to forest, on carbon estimation. Unpublished report prepared for E.F. Wright, Department of Conservation.
Dudik M, Phillips SJ 2009. Generative and discriminative learning with unknown labelling bias. Advances in Neural Information Processing Systems 21: 1–8.
Duncan RP, Ruscoe WA, Holland EP 2010. Changes in forest vegetation on Stewart Island over the last 30years and the influence of white-tailed deer (*Odocoileus virginianus*). Landcare Research Contract Report LC0910/103, prepared for the Director-General, Stewart Island Field Centre, Stewart Island.

Kirschbaum M, Mason N, Ausseil AG, Watt M, Palmer D, Tait A 2010. Carbon sequestration through indigenous and exotic afforestation: national scale predictive models. Landcare Research–Scion–NIWA contract report for MAF. *Due 30 June 2010.*

Marburg A, Allen R 2010. Background to the Department of Conservation's business case for implementing an inventory and monitoring programme. Landcare Research Internal Report LC0910/125.

Mason NWH, Carswell FE, Overton JMcC, Briggs CM, Hall GMJ 2010. Estimation of potential Kyoto-compliant carbon gain on conservation lands. Landcare Research Contract Report LC0809/159, prepared for the Department of Conservation.

Mitchell Partnerships Ltd 2009. Terrestrial ecology of the proposed Fiordland monorail route. Unpublished Mitchell Partnerships (Takapuna) report for Riverstone Holdings. 111 pp + appendices.

Richardson SJ, Bellingham PJ, Allen RB, Veltman C 2010. Initial vegetation conditions in study sites of the 'Forests Affected by Deer' Project. Landcare Research Internal Report LC0910/082.

Vickers S, Wiser S, Spencer N, Maule H, Broadbent H, Marburg A, Richardson S, Hall G 2010. Landcare Research Contract Report prepared for the Terrestrial Freshwater and Biodiversity Information Systems (TFBIS) Program.

Wiser SK, Hurst JM 2010. Composition and structure of 24 New Zealand forest and shrubland vegetation communities. Landcare Research Contract Report LC0910/073, prepared for the Department of Conservation and the Sustainable Management Fund of the Ministry of Agriculture and Forestry.

Conference papers

Diez J, Dickie I, Edwards G, Hulme PE, Sullivan JJ, Duncan RP 2009. You can run but you can't hide: enemy-release attenuates over time. INTECOL meeting, Brisbane, Australia, August 2009.

Duncan RP, Ruscoe WA 2010. Changes in forest vegetation on Stewart Island over the last 30 years and the influence of white-tailed deer (*Odocoileus virginianus*). Presentation at the Annual Stewart Island/Rakiura Pest Liaison Group. Oban, Stewart Island. 13 May 2010.

Ewers RM 2009. Quantifying the ecological value of modified landscapes. Keynote address at EURECO-GFOE, Liepzig, Germany.

Forgie S, St. John M, Wiser S 2010. Drivers of plant and belowground invertebrate community composition on New Zealand shingle beaches: a threatened rare ecosystem. 6th Southern Connections Congress, Bariloche, Argentina. 15–19 February 2010.

Kapos V 2009a. Developing meaningful measures of trends in forest fragmentation - scaling from survey plots to landscapes. World Forestry Congress, Buenos Aires, Argentina, October 2009.

Kapos V 2009b. Forest fragmentation as degradation from a biodiversity perspective. The FAO/UNREDD Technical Meeting on Forest Degradation, Rome.

Kelly, D, Anderson, SH, Ladley JJ, Robertson, AW, Wotton, DM, Wiser, SK 2010. Ecosystem services with a depleted avifauna: bird pollination and dispersal in New Zealand. Annual Meeting of the American Ornithological Society, San Diego. 6-11 February 2010.

Vickers S, Hurst J, Broadbent H, Wiser S 2010. NVS Express: A data-entry, validation and analysis tool for Recce description and permanent 20x20m data.

Poster presentation. 2010 Dataversity National Workshop: Biodata Management in the Real World. Wellington, 18–19 March 2010.

Wiser SK 2010. An overview of shingle beaches in New Zealand. Dune Restoration Trust of New Zealand 2010 National Conference. Timaru, 3–5 March 2010.

Wiser SK, Earl R, Hurst J, Marburg A, Wright E 2010. Using Boosted Regression Trees to map a quantitative classification of New Zealand forests. 53rd Annual Conference of the International Association of Vegetation Science, Ensenada, Mexico, 19–23 April 2010.

Appendix 1 New electronic datasets in NVS 2009/10

Listing of new ***electronic datasets*** incorporated into NVS, July 2009 – June 2010.

AWATERE AND ACHERON EXCLOSURES 1992–2009
Craigieburn Wilding Pines 2007
DOC WACEM C AND HERBIVORES 2 2009
ENVIROLINK MT PEEL SYCAMORE 2009
EXTENSIVE POSSUM CONTROL COROMANDEL 2004
EXTENSIVE POSSUM CONTROL NTH UREWERA 2006
HINEWAI KANUKA SUCCESSION 2005–2010
MOUTOHORA 2009
MT BRUCE KAMAHI 2005
NHMS INVENTORY AND MONITORING FRAMEWORK PILOT STUDY 2009
SILVER BEECH SINGLE TREE HARVEST 2009
UREWERA, EAST 1983–84

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

CDRP EARNCLEUGH STATION 2008
"CMS" DOC RD&I SHRUBLAND REMEASURE 2008
IPIPIRI PERMANENT VEGETATION PLOTS 2009
KARIOI 2007–2008
LANDSBOROUGH 2008
Moawhitu CNPS carbon sequestration site D'Urville Island 2008
Moehau Remeasure 2009
Mokihinui Carbon Monitoring 2008
Oxford CNPS carbon sequestration site 2008–09
PAPAROA EXCLOSURES 2008
PAPAROA NATIONAL PARK 2007–08
PIHANGA 20X20 PLOTS 2006–2009
PIRONGIA UNDERSTOREY SURVEY 2004–05
RETIRED LANDS SURVEY 2008
STEWART ISLAND NORTH (STEWRT) 2008–2009
STEWART ISLAND SOUTH Port Pegasus 2008
Whitcombe Vegetation Monitoring 2009

Plotsheets or other ancillary data were provided for the following datasets.
[#] Indicates that electronic data for the survey was already in NVS.

AORANGI – PARARAKI EXCL 1980
AORANGI FOREST PARK 1980
HIERACIUM CONTROL – RUATANIWHA STN 1975–82
HIERACIUM CONTROL – SAWDON STN 1975–82
MAUNGAHAUMI FOREST 2009
Moutohora (Whale Island) Vegetation Plots 2009

PAHOKA 2004#
PUKEPOTO 2004#
SILNA (SOUTH ISLAND LANDLESS NATIVES ACT (1906) LANDS) 1991–92
TONGARIRO EX KAIMANAWA 2004#
TONGARIRO EX TONGARIRO 2004#

DTZ grassland transects – Digitised photos and slides of 32 sites.