NVS ANNUAL REPORT FOR THE 2010/11 YEAR

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

1. Number of new records archived in NVS

A total of 17 new datasets were added electronically to NVS in 2010/11 (year to 30 June 2011; Fig. 1a & Appendix 1) with a total of 1188[1] plots added (Fig. 1b). In addition, hardcopies of plot data sheets were archived for 16 datasets (Appendix 1). Major providers of data and types of data since 2000 are shown in Fig. 1. The level of new data archived in NVS in the past year was the lowest since 2002/03. During the 2010/11 year 15% of new data incorporated into NVS were deposited by the Department of Conservation (DOC), down from 70% last year. However, 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 software is also facilitating the addition of data into NVS.

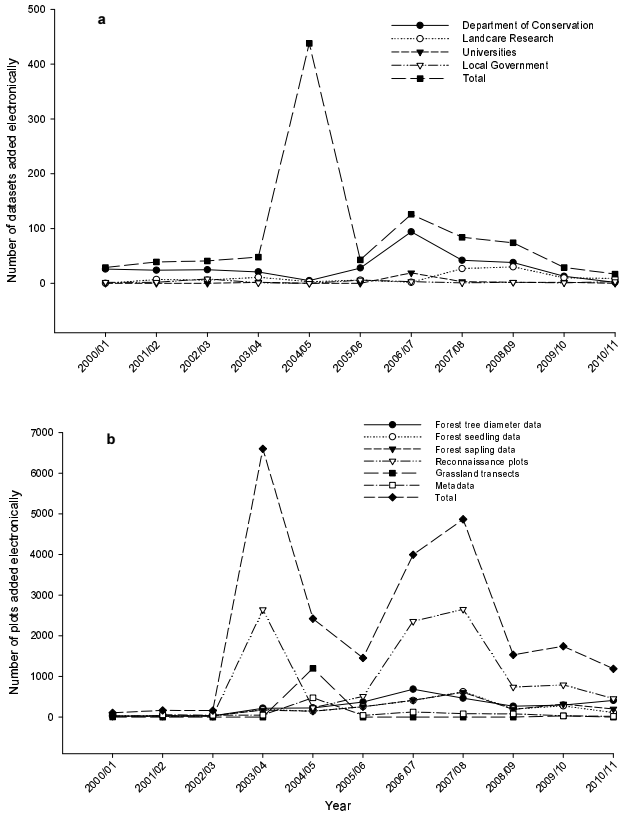

Fig. 1 Number of electronic deposits in the National Vegetation Survey Databank per financial year since 2000. (a) Datasets, total and from four major data-depositors and (b) Vegetation plots, total and six major data types. Note that this does not include data entered using NVS Express that are currently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

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

There are multiple potential reasons for the downturn in data being deposited by DOC. These include:

- The cyclical nature of plot measurement. Sometimes there are periods or seasons when there is reduced effort in plot surveys undertaken, i.e. 'natural' ebbs and flows in the work programme.
- Continued reduction in the number of DOC Threatened Species staff, who are the primary drivers for plot remeasurement and data entry within Conservancies.
- Some aspects of DOC's Natural Heritage Management System that may also have influenced the reduced number of plots being entered into NVS are:
    - Staff are still waiting to know where DOC will prioritise site management for through Ecosystem Optimisation (i.e. Tier 2 outcome monitoring).
    - Implementation of Tier 1 this summer has been a priority for affected Conservancies to support.
    - Implementation of 'Threatened Species Optimisation' in affected Conservancies resulted in no additional resources and had to be funded to the potential detriment of other monitoring work
- General difficulty to get DOC staff to enter their plot data into NVS, despite the SOP.

Looking forward, NVS could cautiously expect more plot data to come into NVS because of DOC's commitment to Tier 1 and Tier 2 monitoring and reporting programmes. The results of restructuring at DOC are also going to have substantial impacts on staff resourcing to support data quality and follow-up.

NVS staff will continue to assist and support DOC staff to enter data via NVS Express.

2. 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.

Work started this year on identifying cover-class and tier methods used in data migrated from the previous database system. Cover-class methods have been checked for 79 of 847 surveys; there appear to be 14 cover-class systems that depart from those previously identified. Tier methods have been checked for 93 of 852 surveys; so far 15 different tier systems have been identified and documented.

Many plots that are either exclosures or their controls are not currently indicated as such in the database. We have checked and ensured that that information is captured in the database for 790 of 1048 candidate plots. The remaining 258 will be checked in the coming year.

All species codes and names have been checked for the most recent measurements of Recce datasets in forest and shrublands and for some non-woody vegetation datasets. Consistency of plant names is critical to ensure that datasets can be validly combined for a single analysis. As a first step, all names are converted to 'preferred' names by the NVS linkage with the Plant Names database. Then, all remaining names are checked for their validity and current status. Through this process we have associated

formal names with some tag names and identified preferred names that are not included in the Plant Names database, where LSID identifiers are incorrect, where species have been identified to genus but as the genus is monospecific in New Zealand the species can be assumed, where names have been changed and a new code needs to be created in the NVS master species code table, and where names have been misapplied. An important next step is to work with the plant taxonomists to develop a mechanism to cope with changing taxonomic concepts.

3. Database development and integration

Migration of legacy datasets

Five major legacy databases that were stored in relatively inaccessible proprietary database formats were migrated into the NVS SQL-Server database system. These are:

- Hugh Wilson's Banks Peninsula, Stewart Island and Mt Cook surveys (3277 plot records)
- The National Forest Survey records (15 609 plot records)
- The Forest Service Wraight-method grassland transects (2339 plot records)
- North Island Ecological Transects (152 plot records)
- LUCAS system (1519 plot records)

This now makes the data from 22 896 plot records much more accessible to end-users than they have been in the past.

Migration of text files

Additional interpretative information about specific projects has been captured to date in free-form text files. We developed a procedure to tag these text files and store the information as 'notes' associated with the relevant data in the database. A total of 588 text files were so migrated. Now notes about retagged trees, for example, are stored with the actual tree data. This makes the information much more available and useful to those analysing these data.

Enhancements to NVS Express

We continue to enhance NVS Express to increase its usefulness to end-users. Enhancements include:

- Summaries of species biostatus (e.g. exotic vs native) are now available.
- Special-case plot templates can be provided to end-users for data entry.
- Projects can be created with pre-loaded tag numbers for remeasurements.
- Authority data (e.g. species lists, various coded lists)have been updated.
- A new validation compares tier cover with maximum cover per species in that tier.
- A new validation is included for Topo50 full coordinates.
- The method of plot placement (e.g. random, subjective) can now be captured.

- The measurer and recorder can be entered at the plot/method level, rather than at only the project level.

Technological developments

The utility of the NVS warehouse has been markedly expanded such that:

- All NVS Databank tables are now included.
- Column names have been standardised so that exports from NVS, NVS Express and Warehouse use the same columns.
- Related data are now included, such as mappings to old NVS surveys, related taxon data (family, etc.), extracted metadata.
- Full NZMG, TM and WG84 coordinates are now calculated for NVS plots within the Warehouse (using the GeoData tool), so they don't have be recalculated for each use of the data.
- After each Warehouse refresh a Warehouse Report summarises the contents of the database, e.g. number of projects, plots etc.
- Statistics are calculated and stored for each dataset (e.g. average diameter).
- Summary tables are now calculated, which are useful for requests.

New database administrator tools have been developed including:

- Functions to match plots and tags between existing projects
- Function to switch the code set used for a dataset, such as how cover classes are coded
- More flexibility to create non-standard sub-plots and to create projects with non-standard methods, which can be downloaded into NVS Express
- Function to generate diameter tag records in a new project that is a remeasure

There are many datasets that are archived in NVS but which are stored in an electronic format unique to that dataset, often in Excel spreadsheets. A general import tool has been developed so these datasets can be loaded into the NVS SQL-Server database. Features include:

- Ad hoc datasets from various sources (Access, Excel or CSV file, ODBC) can be transformed into the NVS data structure then migrated
- Validation against NVS authority data (methods, categories, species)
- Transformations are stored (in XML file) for reuse with other files using same format

4. Increasing end-user awareness and capability

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:

Wiser SK, Spencer N, Broadbent H. 'The NVS Databank management system: is this an appropriate platform for the DOC Natural Heritage Management System

(NHMS)' Workshop for DOC individuals that are the key developers of the programme, 21 December 2010, Lincoln.

The outcome of the meeting was that the infrastructure of NVS is suitably advanced that a further enhancement of NVS-Express would be highly appropriate to satisfy the reporting needs of NHMS

Wiser SK, Broadbent H. 'The NVS Databank archive and data management.' Presentations and tours to Russell Dale (CEO of Future Forests Research Ltd), December 2010, and Chanel Partridge (TFBIS fund advisor), 10 February 2011.

Future Forests Research services a wide range of indigenous forest owners who may benefit from the vegetation monitoring approaches and information infrastructure provide by NVS to satisfy the needs of certification programmes (e.g. FSC) and carbon accounting, and the implementation of National Environmental Standards for forestry. The Terrestrial and Freshwater Biodiversity Information System (TFBIS) has been a major funder of NVS database development.

Wiser S. 'The National Vegetation Survey Databank'. Lecture given to degree course: ERST 611 Advanced Environmental Monitoring, Lincoln University, 10 May 2011.

NVS Express Workshops & Presentations

The NVS Express team hit the road this year with a series of one-day workshops run up and down the country. Until recently, data could only be captured for storage in NVS by the NVS team. Furthermore NVS data were generally only analysed by those with sufficient computer expertise to run sophisticated and difficult software packages. This limited both the archiving of data into NVS and the potential of the data stored in NVS to be more widely recognised. In 2006 in recognition of this need the TFBIS programme funded a 3-year project to develop stand-alone software to enable any end-user to capture data for archival in NVS and to check, summarise, analyse and export data stored in NVS. The development of the package 'NVS-Express' was completed in early 2010 and it is freely available for download from the NVS webpage. The package is installed on the DOC intranet and is in use by individuals at some councils and universities as well as by private consultants. TFBIS-funded training workshops on NVS Express data entry and analysis software were held at Landcare Research, Lincoln, and the DOC offices of Invercargill, Nelson, Wellington, Whanganui, Rotorua and Auckland. Hazel Broadbent and Anna Marburg, with occasional assistance from Elise Arnst and Hamish Maule, took around 50 workshop participants through both the process of entering data, using the NVS Express data entry system, and the analysis of that data, using the NVS Express data summary and analysis software. Feedback from the participants showed that the workshops were well received and useful. Suggestions for improvements and modifications were noted and many included in the new version of NVS Express, which was released in June 2011. This year, nine projects entered via NVS Express have been incorporated into the NVS Databank. As well as providing all but one of the venues, DOC also provided use of their training lap-top computers.

Further workshops will be held annually, most probably at Landcare Research, Lincoln, depending on sufficient interest.

Materials used in the workshops, such as the Data Entry and Summary & Analysis Software manuals, the example plot-sheet used in the workshop and example work-flow instructions, can be downloaded from the NVS website (under NVS Express workshop resources at http://nvs.landcareresearch.co.nz/html/NVSLite.aspx#WorkshopResources). Also available for download are three PowerPoint presentations: two narrated introductions and one introduction to the data entry process.

To further advertise NVS Express we presented a poster at the New Zealand Ecological Society Conference (Ecol Soc):

Vickers S, Hurst J, Broadbent H, Wiser S 2010. NVS Express: A data-entry, validation and analysis tool for Recce description and permanent 20 × 20 m data. Poster presentation at Ecol Soc, 22–25 November 2010, Dunedin, New Zealand. http://www.nzesconference.org.nz/includes/Biodiversity%202010%20and%20beyond%20Programme%20and%20Abstracts.pdf

There are now 181 registered NVS-Express users. In addition there are 70 users within DOC so that totals 250 registered NVS-Express users all up.

5. Data security

Earthquakes

The NVS archive, purpose-built in 2006 to house the physical component of the NVS Databank (originals and copies of plot-sheets, maps, aerial photographs, slides, etc.) survived unscathed through the Canterbury earthquakes. There was some movement of boxes on shelves but the trepidation of having to sort out boxes of plot sheets strewn across the floor did not eventuate.

Insurance for the NVS archive

In 2010 Landcare Research carried out a risk-and-threat assessment of all national collections/databases it houses.

Currently NVS has a vulnerable risk profile with severe or catastrophic potential risk if it were accidently lost or destroyed, as NVS underpins numerous research and work programmes in research organisations and government departments. At the same time there is relatively low likelihood of it being affected by any threat due to its processes and up-to-date standards for handling and archival storage of paper records (see effect of earthquake described above).

To improve the risk profile of NVS records and avoid an ongoing large insurance cost is a reasonably straightforward exercise. Appropriate digital image scanning of all physical paper records (field sheets of various types, annotated maps, annotated aerial photos and stereo slides) would reduce the risk profile and need for commercial

insurance to almost zero. Landcare Research and(NVS) is investigating the processes and resources needed to complete scanning of all records.

Landcare Research backup systems

This year we have needed to test the adequacy of the Landcare Research file backup system to restore data in the NVS Databank.

- 9 March 2011. A bug in a stored procedure had set all coordinates to the same plot! There was a backup from 7 March that was quickly restored and the data was able to be corrected.
- 25 May 2011. We inadvertently deleted the preferred-species overrides. There was a backup from 23 May but this was not early enough and there was nothing earlier. This necessitated using a spreadsheet we had previously created, but this only produced 24 records when we know there were originally 30. Although this is a relatively minor problem, it points to the inadequacy of the backup systems. The computer support staff have changed their backup schedule to have only a month-old backup. We believe that for NVS they should also be keeping backups older than a month and are pursuing this.

6. Data-sharing agreements and data exchange

Global Index of Vegetation-Plot Databases (GIVD)

This year NVS joined the Global Index of Vegetation-Plot Databases (GIVD). GIVD (http://www.givd.info/) is a global metadatabase of publicly available vegetation data. It was established in 2010 following the 9th international Meeting on Vegetation Databases, held in Germany. As a metadatabase, it contains data about and links to these vegetation-plot databases, but not the data themselves.

Our NVS Databank (http://nvs.landcareresearch.co.nz) is one of 131 vegetation plot databases currently registered in GIVD, and with records from 77 000 independent plots, NVS represents the 6th largest registered vegetation plot database in the world. Joining GIVD should raise the profile of the NVS Databank both nationally and internationally and encourage reuse of these data – valuable and underestimated sources of biodiversity information.

Use of NVS data through the GBIF Portal

Between 1 July 2010 and 30 June 2011 there were 44 751 searches for species occurrence data in NVS (access to 13 217 871 records) and 841 downloads of species occurrence data (for 4 578 720 records in NVS) using the GBIF website.

7. International collaborations

BIEN network

Nick Spencer and Susan Wiser were invited participants of the 3rd meeting of the National Center for Ecological Analysis and Synthesis (NCEAS) Botanical

Information and Ecology Network (BIEN) working group. Nick delivered the presentation: 'Veg X – An exchange standard for vegetation co-occurrence data'.

Our collaboration with BIEN 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. This was progressed by Matt Wheeler, a statistics PhD student who worked with one of the BIEN PIs, Mark Shildauer (NCEAS). His progress motivated the IPLANT consortium to fund a software developer position to further advance this effort. The final meeting of the BIEN working group will be in October 2011.

World index of plot-based vegetation databases

Nick Spencer was invited to become a member of the Steering Committee for the online Global Index of Vegetation-Plot Databases (GIVD).

Committee members have produced two publications presenting and analysing the contained metadata resource. The first publications is a research article in the AVS Special Issue (2011/1) on 'Ecoinformatics and global change' reporting on the GIVD and presenting meta-analyses about the contained data (see citation below) and the second is a Special Volume of 'Biodiversity and Ecology' (also due in early 2011), which will consist of a print version of the GIVD as it was on 15 October 2010.

Extending and updating classifications

Susan Wiser and Miquel De Cáceres (Biodiversity and Landscape Ecology Laboratory, Forest Science Center of Catalonia, Solsona, Spain) spent February and March collaborating to answer the question: How can existing vegetation classifications be modified or extended when new plot data are collected? There is an ongoing need to summarise and represent the structure and composition of vegetation, at a range of scales, as a basis for resource description, land use planning, management and reporting. Classifications of vegetation are dynamic entities, in that the acquisition of new data can lead to their extension, modification or refinement. Most numerical classification methods, however, do not easily accommodate the dynamic nature of vegetation classifications. Miquel recently provided a framework to deal with numerical classifications in a dynamic way; but had yet to apply it to a 'real-world' situation. In their collaboration, they extended the existing classification of New Zealand's forests and shrublands recently made for MAF and DOC using 1177 systematically located LUCAS plots, by incorporating data from 11 943 pre-existing plots from the NVS Databank. This work has resulted in two conference presentations (see below), one manuscript submission, and one manuscript in preparation.

8. Conservation and management outcomes

Data from NVS on reference level carbon stocks and consequent predicted sequestration rates for New Zealand's indigenous forest and shrubland underpinned a report commissioned by MAF International Policy to clarify New Zealand's position for international negotiations around carbon emissions and indigenous forests. The work has shown that the MfE assumption that indigenous forests and shrublands are in a steady-state is not valid. Implementation of low-intensity changes in management

across approximately one million hectares of existing forest and shrubland could result in an additional 55.7 Mt of carbon being sequestered between 2010 and 2022. Typical management activities would include progressive removal of stock, and cessation of clearing and burning activities within areas of regenerating indigenous forest and shrubland. These results, combined with the increasing prominence given to natural forests in international negotiations, suggest that changes in land use management and research to understand the consequences are likely to receive ongoing support.

The forests that make up the Whareorino-Moeatoa reserves contain some of the most diverse vegetation in the Waikato. Sustained goat control has been carried out in the area on a 2–3 year return cycle since 1996. Remeasurement of permanent plots (data sourced from and stored in NVS) has resulted in a number of operational management decisions to (a) continue the sustained hunting regime with an emphasis on controlling goats in surrounding private lands and buffer areas to address the issue of reinvasion; (b) control goats on a biennial as opposed to a 2-3 year cycle in order to achieve conservation objectives; and (c) continue to target red deer when encountered to prevent the establishment of a resident population.

During 2008/09, permanent vegetation plots (data sourced from and stored in NVS) in the Karioi and Pirongia blocks of Pirongia Forest Park were remeasured, principally to assess long-term changes in the forests and report on changes in the understorey after the past decade of goat control in the Pirongia Block. The plots were established in 1979, and had previously been remeasured in 1987 and 1999. As a result, there is now a plan to improve goat control in the Pirongia Block by targeting goat populations on private land as well as increasing efforts within the forest park.

As part of the DOC-funded Wild Animal Control for Emissions Management (WACEM) research programme Marburg et al. used permanent plot data from NVS to determine the sampling intensity required to show an impact of wild animal control on carbon storage. The analysis was conducted for a broadleaved–hardwood forest on the Coromandel Peninsula that is undergoing extensive herbivore control for multiple purposes including flood protection and biodiversity restoration. We focused on the partitioning of carbon stocks between pools (such as soil, leaf litter and growing trees) because we expect the removal of wild animals to most strongly impact on where carbon is held in the system rather than the overall amount. We found that the likely impact of animal control on carbon will be undetectable in most standard experimental designs.

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. As of 30 June 2011 there were 566 links to NVS webpages from referring pages. On average 35% of page views resulted from referrals from other sites, whereas access via search engines marginally remains the most frequent pathway to the NVS website (36%). The remainder (29%) was direct traffic, indicating that frequent users bookmark the website.

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

- data.govt.nz – a directory of publicly available, non-personal New Zealand Government held datasets
- opengovt.org.nz – an open, independent catalogue of government and local body datasets
- geodata.govt.nz – New Zealand's catalogue of publicly funded environmental and geospatial data
- The small community-group 'Kereru Awhina (Care) Project' hopes to enrich the pigeon's food supply and habitat by encouraging the planting of fruiting native trees such as puriri, nīkau, pigeonwood and kōwhai. Their website provides links to conservation resources.
- www.docstoc.com provides links to resources for small business and professionals. The website provides a link to the NVS plot sampling manuals.
- The Ecological Research as Education network http://erenweb.org/project/rcn-project/ provides links to the NVS plot sampling manuals.

From 1 July 2010 to 30 June 2011, the NVS website was hit 14 129 times, an 8% decrease from the 2009/10 year (15 441 hits). There were 2357 unique visitors to the site, 53% 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 (78%), followed by the USA/Canada (5%), UK (3%) and Australia (2%). The website was also visited by people from another 38 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 (16% of page visits). (Note that frequent users of NVS usually contact the database administrator directly.) Items associated with the new NVS Express tool were introduced in January and have become increasingly popular, with 33 page views in January and 160 in June. Various documents are available to download from the NVS website and during 2010/11 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	161
Reconnaissance plot manual*	160
Forest permanent plot manual*	112
Reconnaissance plot – pro forma data sheet	99
FBI manual, plot-sheets and folia cover scale	92
Forest tree diameter – pro forma data sheet	52
Forest seedling plot – pro forma data sheet	47
NVS Annual Report 2009/10	30

Field guide to the use of GPS	24
Grassland survey manual	17

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

The most popular items downloaded from the website were those associated with the new NVS Express tool. They include the NVS Express manual (which accounted for 126 downloads), narrated PowerPoint presentations, workshop example instructions and example plot sheets.

10. NVS data requests

A total of 66 requests for NVS data and metadata were made during 2009/10 and a total of 1243 datasets were supplied (Fig. 2a & b), a 69% decrease in dataset requests over 2009/10. 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.

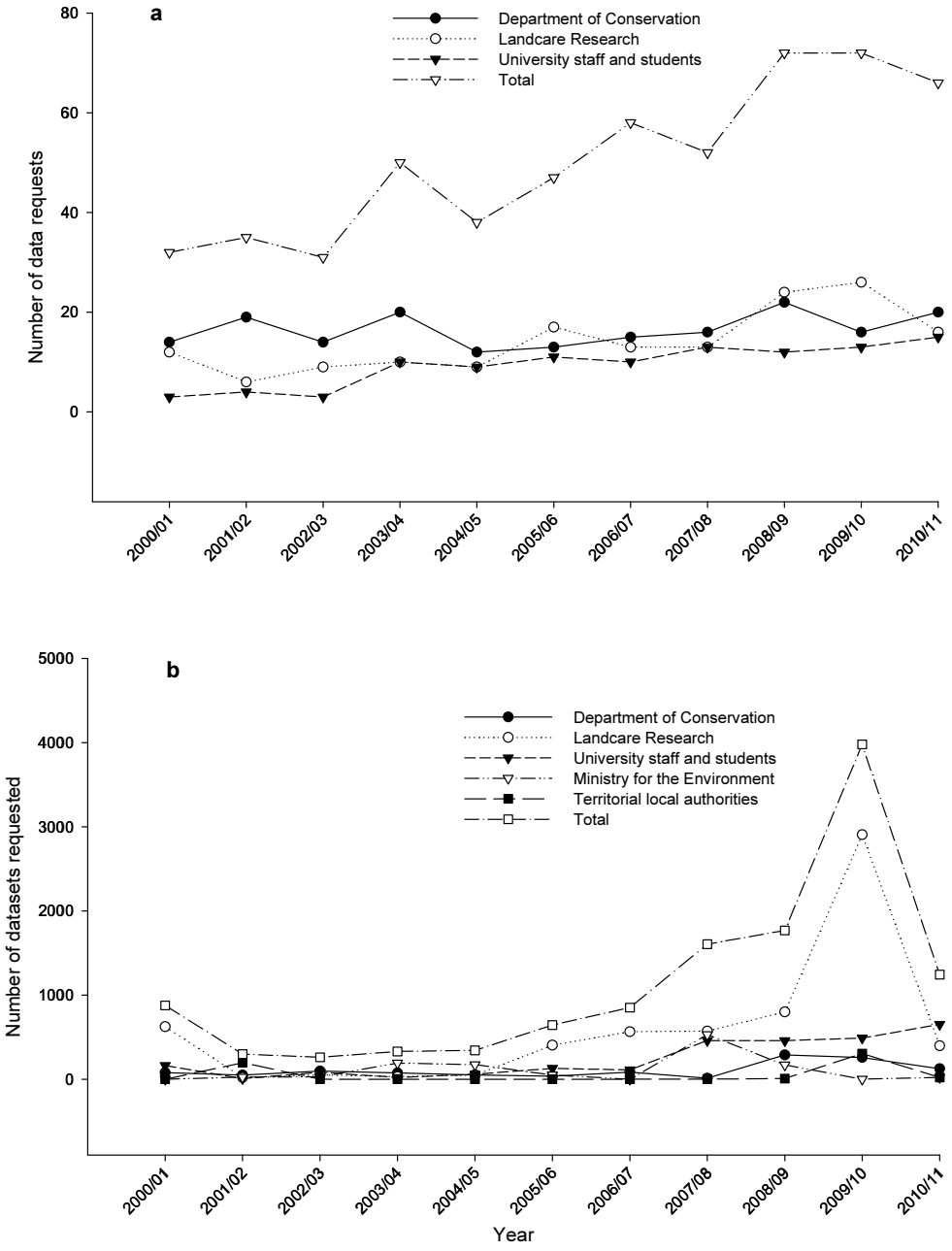

Fig. 2 Requests for data from the National Vegetation Survey Databank per financial year since 2000. (a) Total number of requests and from three major data-users and (b) Number of datasets requested, total and from five major data-users.

Novel data requests over the last year included species occurrence requests made by Scot Waring (Lincoln University) investigating *Senecio* distribution in New Zealand, Andrew Chen (Harvard University) investigating distribution of *Myoporum laetum* and *M. insulare* in New Zealand, Fiona Clarkson (University of Waikato) conducting distribution mapping and climatic modelling for *Pittosporum cornifolium*, and Carol Jensen and Alice Shanks, contracted to DOC, using NVS data to determine the threat

classification rank of the Data Deficient species *Rytidosperma thompsonii* and *R. merum*.

David Glenny, plant taxonomist, and Jane Cruickshank, technical assistant, both at the Allan Herbarium, Landcare Research, Lincoln, and Jeremy Rolfe, botanical photographer working for the Department of Conservation in Wellington, have used data acquired from the NVS Databank to help create an interactive key to the genus *Coprosma*. This Lucid 3 interactive key allows users to identify any of the 53 species of *Coprosma* currently recognised in New Zealand. The key is illustrated with 500 images of species and the features used to identify them, and has a factsheet for each species that provides a list of distinct features, comparisons with similar species, description, habitat and distribution details, and references to literature. The data from NVS were used in concert with collections data to describe the habitat, distribution and co-occurring species.

A request was filled for John Wardle of a list of New Zealand trees whose names have changed, so he can ensure names are correct in his upcoming book.

11. Publications directly associated with the NVS Databank

Refereed publications and conference presentations funded by the NVS program

De Cáceres M, Wiser SK 2011. Classification of vegetation: some concepts and pitfalls. 54th Symposium of the International Association for Vegetation Science, 20–24 June 2011, Lyon, France. [published abstract]

Dengler J, Jansen F, Glöckler F, Peet RK, Cáceres M, Chytrý M, Ewald J, Oldeland J, Lopez-Gonzalez G, Finckh M, Mucina L, Rodwell JS, Schaminée JHJ, Spencer N 2011. The Global Index of Vegetation-Plot Databases (GIVD): a new resource for vegetation science. Journal of Vegetation Science 22: 582–597.

Spence LA, Ross JV, Wiser SK, Allen RB, Coomes DA 2011. Disturbance affects short-term facilitation, but not long-term saturation, of exotic plant invasion in a New Zealand forest. Proceedings of the Royal Society B - Biological Sciences 278: 1457–1466.

Vickers S, Hurst J, Broadbent H, Wiser S 2010. NVS Express: A data-entry, validation and analysis tool for Recce description and permanent 20×20m data. Poster presentation at New Zealand Ecological Society Conference, 22–25 November 2010, Dunedin, New Zealand.

Wiser SK, De Cáceres M 2011. Extending and updating classifications: An example with New Zealand's woody vegetation. 54th Symposium of the International Association for Vegetation Science, 20–24 June 2011, Lyon, France. [published abstract]

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.

Refereed publications

The following 2010/11 publications used data derived from the NVS Databank.

Bee JN, Tanentzap AJ, Lee WG, Lavers RB, Mark AF, Mills JA, Coomes DA 2011. Influence of foliar traits on forage selection by introduced red deer in New Zealand. Basic and Applied Ecology 12: 56–63. http://www.sciencedirect.com/science/article/pii/S1439179110001271

Beaumont LJ, Gallagher RV, Downey PO, Thuiller W, Leishman MR, Hughes L 2009. Modelling the impact of Hieracium spp. on protected areas in Australia under future climates. Ecography 32: 757–764. [NVS data sourced from GBIF]

Beaumont LJ, Gallagher RV, Thuiller W, Downey PO, Leishman MR, Hughes L 2009. Different climatic envelopes among invasive populations may lead to underestimations of current and future biological invasions. Diversity and Distributions 15: 409–420. [NVS data sourced from GBIF]

Bourdôt GW, Lamoureaux SL, Watt MS, Manning LK, Kriticos DJ 2010. The potential global distribution of the invasive weed *Nassella neesiana* under current and future climates. Biological Invasions. Published online DOI: 10.1007/s10530-010-9905-6. [NVS data sourced from GBIF]

Bystriakova N, Bader M, Coomes DA 2011. Long-term tree fern dynamics linked to disturbance and shade tolerance. Journal of Vegetation Science 22: 72–84.

Bystriakova N, Schneider H, Coomes D 2011. Evolution of the climatic niche in scaly tree ferns (Cyatheaceae, Polypodiopsida). Botanical Journal of the Linnean Society 165: 1–19. [NVS data sourced from GBIF]

Clarkson BR, Smale MC, Williams PA, Wiser SK, Buxton RP 2011. Vegetation ecology of gumland heaths in northern New Zealand. New Zealand Journal of Ecology 35: 96–113.

Coomes DA, Lines ER, Allen RB 2011. Moving on from Metabolic Scaling Theory: hierarchical models of tree growth and asymmetric competition for light. Journal of Ecology 99: 748–756.

Day NJ, Buckley HL 2011. Invasion patterns across multiple scales by *Hieracium* species over 25 years in tussock grasslands of New Zealand's South Island. Austral Ecology 36: 559–570.

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.

Gross NP, Duncan R, Hulme PE 2011. Predicting invasion success: a basic framework using plant functional traits. In: Zydenbos SM ed. Proceedings of the 17th Australasian Weeds Conference. New Zealand Plant Protection Society. Pp. 162–165.

Heads M 2010. Biogeographical affinities of the New Caledonian biota: a puzzle with 24 pieces. Journal of Biogeography 37: 1179–1201. [NVS data sourced from GBIF]

Hilton RG, Meunier P, Hovius N, Bellingham PJ, Galy A 2011. Landslide impact on organic carbon cycling in a temperate montane forest. Earth Surface Processes and Landforms. Published online 22 July 2011. DOI: 10.1002/esp.2191.

Kean JM 2009. Potential distribution of hawthorn in New Zealand. New Zealand Plant Protection 62: 387–392. [NVS data sourced from GBIF]

Mason NWH, Peltzer DP, Richardson SJ, Bellingham PJ, Allen RB. 2010. Stand development moderates effects of ungulate exclusion on foliar traits in the forests of New Zealand. Journal of Ecology 98: 1422–1433.

Nuñez MA, Medley KA 2011. Pine invasions: climate predicts invasion success; something else predicts failure. Diversity and Distributions 17: 703–713. [NVS data sourced from GBIF]

Pitt JPW, Kriticos DJ, Dodd MB 2011. Temporal limits to simulating the future spread pattern of invasive species: *Buddleja davidii* in Europe and New Zealand. Ecological Modelling 222: 1880–1887.

Poczai P, Hyvönen J, Symon D 2011. Phylogeny of kangaroo apples. Molecular Biology Reports (22 January): 1–17. DOI:10.1007/s11033-011-0675-8. [NVS data sourced from GBIF]

Richardson SJ, Hurst JM, Easdale TA, Wiser SK, Griffiths AD, Allen RB. 2011. Diameter growth rates of beech (*Nothofagus*) trees around New Zealand. New Zealand Journal of Forestry 56: 3–11.

Smaill SJ, Clinton PW, Allen RB, Davis MR 2011. Climate cues and resources interact to determine seed production by a masting species. Journal of Ecology 99: 870–877.

Smale MC, Fitzgerald, NB, Richardson SJ. Resilience to fire of *Dracophyllum subulatum* (Ericaceae) frost flat heathland, a rare ecosystem in central North Island, New Zealand. New Zealand Journal of Botany 49: 231–241.

Tomasetto F, Duncan R, Hulme P 2010. How do propagule pressure, climate and land use interact to determine weed abundance and distribution on Banks Peninsula? In: Zydenbos SM ed. Proceedings of the 17th Australasian Weeds Conference. New Zealand Plant Protection Society. Pp. 464–465.

Zanne AE, Westoby M, Falster DS, Ackerly DD, Loarie SR, Arnold SEJ, Coomes DA 2010. Angiosperm wood structure: Global patterns in vessel anatomy and their relation to wood density and potential conductivity. American Journal of Botany 97: 207–215. [NVS data sourced from GBIF]

Reports

Gansell O 2009. Whareorino and Moeatoa forest condition report. Unpublished report for the Department of Conservation, Hamilton, New Zealand. DOCDM-318231

Gansell O 2010. Changes in the forests of Pirongia Forest Park 1979–2009. An assessment of ungulate impacts in Pirongia Forest Park, Waikato Basin. Unpublished report for the Department of Conservation, Hamilton, New Zealand. DOCDM-531482.

Holdaway RJ, Mason NWH, Carswell FE, Allen RB 2010. Reference level carbon stocks and predicted sequestration rates for New Zealand's indigenous forest and shrubland. Unpublished contract report for MAF Policy (Contract No. MAF POL 0910-11919).

Marburg AE, Carswell FE, St. John MG, Holdaway RJ, Rose AB, Jacobs I 2011. Implications of experimental design on detection of herbivore impacts on

carbon stocks in a broadleaved–hardwood forest. Unpublished Landcare Research Contract Report LC0910/074, for the Department of Conservation.

Wildlands Consultants Ltd 2011. Remeasurement of four 20 × 20 permanent vegetation plots in December 2010 in Rotorua Conservation Area. Unpublished Contract Report No. 2593a, for the Department of Conservation, Rotorua Lakes, New Zealand.

Conference papers

Clarkson FM, Bryan CL 2011. Science snapshot: epiphyte ecology. Association for Women in Science (AWIS) Waikato Branch conference, 6 April 2011, AgResearch, Hamilton.

Clarkson FM, Bryan CL 2010. Epiphytes in New Zealand: restoration and conservation. Puke Ariki Public seminar series, 25 November 2010, Puke Ariki, New Plymouth.

Holdaway RJ, Allen RB, Carswell FE 2011. Modelling forest dynamics in order to predict carbon sequestration during natural succession. British Ecological Society Annual Symposium: Forests and Global Change, 28–30 March 2011, UK.

Wyse SV, Burns BR, Wright SD 2010. Alternate Stable State theory in kauri forest: kauri as an ecosystem engineer? New Zealand Ecological Society Conference, 22–25 November 2010, Dunedin, New Zealand.

Wyse SV, Burns BR, Wright SD 2011. Alternate Stable State theory in kauri forest: kauri as an ecosystem engineer? IBC 2011: XVIII International Botanical Congress, July 2011, Melbourne, Australia.

Theses

Clarkson FM 2011. Population genetics and autecology of the endemic shrub epiphyte *Pittosporum cornifolium*. Unpublished MSc thesis, University of Waikato, Hamilton New Zealand.

Other

Glenny D, Cruickshank J, Rolfe J 2010. Key to *Coprosma* species of New Zealand. Published online July 2011. Available at: www.landcareresearch.co.nz/research/biosystematics/plants/coprosmakey/

Appendix 1 New electronic datasets in NVS 2010/11

Listing of new ***electronic datasets*** incorporated into NVS, July 2010 – June 2011.

Moutohora 2009-10 (an additional 4 plots added)
WACEM 2009
FIORDLAND EXCLOSURES 1981-82
NHMS INVENTORY AND MONITORING FRAMEWORK PILOT STUDY 2008-2009
MANAGING FOR MULTIPLE ECOSYSTEM SERVICES 2010
TONGARIRO HEATHER IMPACTS 2009
KOKATAHI PERMANENT FOREST PLOTS 2010
EXTENSIVE POSSUM CONTROL HAAST 2009 - 2010
EXTENSIVE POSSUM CONTROL NTH UREWERA 2010
TARANAKI REGIONAL COUNCIL GOAT EXCLOSURES 2010
Fiordland Nth 2008

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

EAST HARBOUR 2010
PORT HILLS 2008
MOKIHINUI CARBON MONITORING 2009 - 2010
KORAPUKI, MERCURY ISLANDS 2010
Rock Eating Fungi 2010-2011
Lambies Stream Wetlands 2011
Mokihinui Hydro Proposal 2011

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

COLD CREEK PLOT 2010
WAIPORI 2007-10
Moehau Range 2009
WAIHAHA SURVEY 2009
HUNTER VALLEY EXCLOSURES 1976
HUNTER VALLEY EXCLOSURES 1983
HUNTER VALLEY EXCLOSURES 1983
CHATHAM ISLANDS 2009
HARPER/AVOCA 1955-56[#]
HARPER/AVOCA 1959-60[#]
HARPER/AVOCA 1965-66[#]
HARPER/AVOCA EXCLOSURE 1955-60
SFF HIERACIUM BIOCONTROL HARPER AVOCA 2003
SFF HIERACIUM BIOCONTROL HARPER AVOCA 2005
SFF HIERACIUM BIOCONTROL HARPER AVOCA 2008
GENOMICS FOR ECOSYSTEM CONSERVATION 2010-2011