LANDCARE RESEARCH
MANAAKI WHENUA

NVS Annual Report for the 2016/17 year

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Contents

1 Number of new records archived in NVS

A total of 32 new projects[1] were added electronically to NVS in 2016/17 (year to 30 June 2017; Figure 1 & Appendix 1) with a total of 1525 plots added. Of these, 769 were new plots; the remainder were remeasurements of pre-existing plots. This brings the total number of projects in NVS to 1620, comprising 105,001 individual plots. Data additions since 2007/08 are shown in Figure 1, broken down by major provider.

Again this year, data deposited into the NVS database have come from a wide variety of environments and geographic areas. Examples include a dataset from the third, and final, year of monitoring of the Tasman River Delta habitat of a nationally vulnerable sedge, *Isolepis basilaris*. In 2016 a network of 107 plots was surveyed, in the Warawara Forest, Northland, by teams consisting of people from the local iwi, Te Rarawa, Manaaki Whenua Landcare Research, Northland Regional Council, and DOC. The Warawara Forest is 5,000 ha of rugged hill country native forest north of the Hokianga Harbour. Rated second in Northland in the biodiversity rankings, it is home to many threatened and endangered species. The vegetation of the forest was last surveyed during the National Forest Survey of the 1940s to 1960s. The objective of the survey was to measure the current state of vegetation and bird communities as a basis for ongoing management and restoration. Further notable data came in from the Southland Wetland Assessment and Monitoring project. The objective of this project is to quantify wetland vegetation composition and link this to data from sediment cores collected and analysed for pollen, ancient DNA, and environmental DNA.

Updated NVS Express software facilitated the addition of data for three projects (210 plots) to NVS during 2016/17, a smaller number of projects, but a greater number of plots compared to last year.

This year we focussed on migrating historic datasets from a range of formats into the main NVS database. We completed this migration for 16 projects comprising 771 plot observations.

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

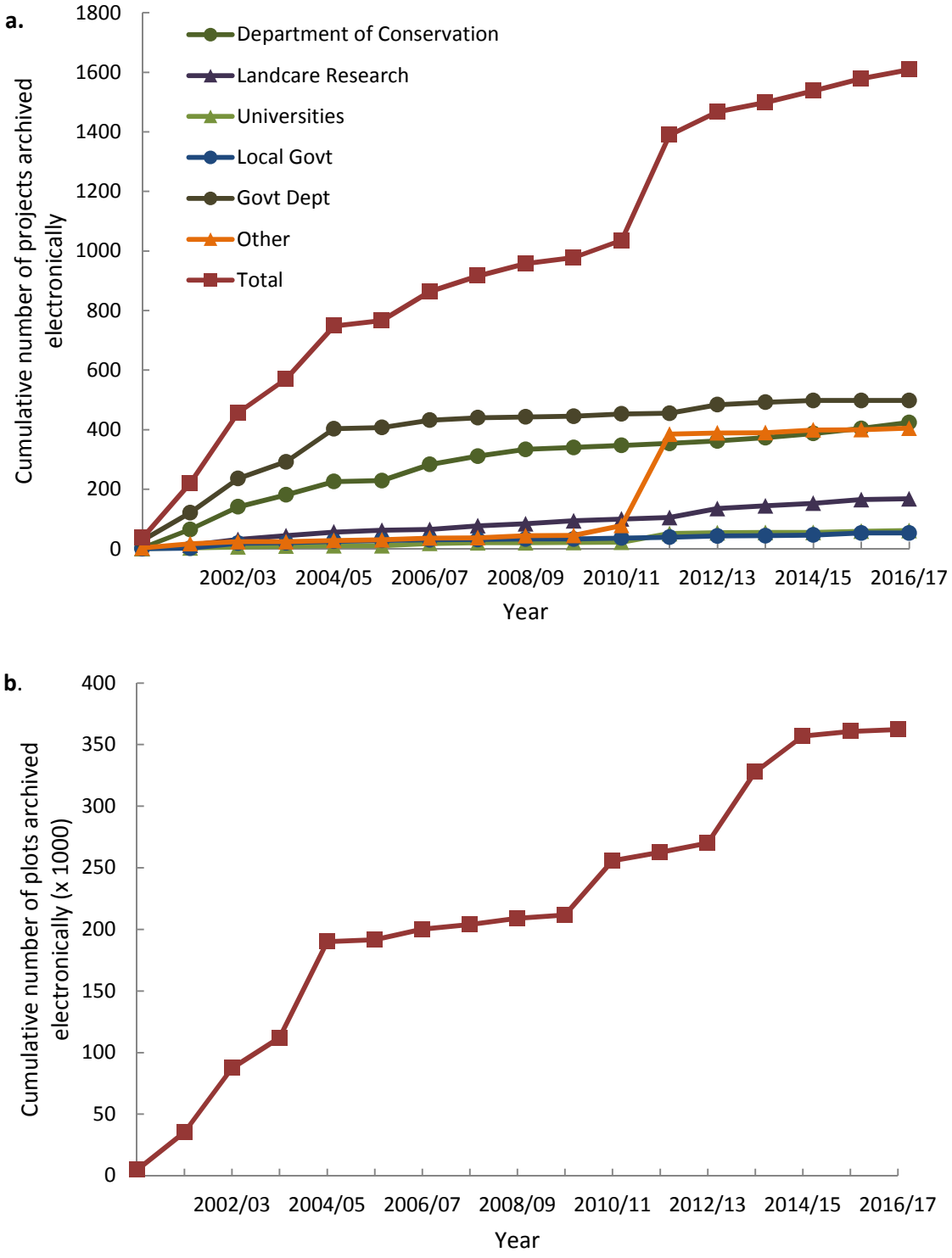

Figure 1. a. Cumulative number of projects archived in the National Vegetation Survey databank, total and from five major contributors, per financial year since the SQL relational database was developed in 2000. These figures include projects migrated over time from 'legacy' data management systems in use in previous years. The sharp increase in 2011/12 was the product of the incorporation (funded by the Terrestrial and Freshwater Biodiversity Information System (TFBIS)) of the large DTZ vegetation monitoring dataset collection (see the NVS annual report for 2011/12). b. Cumulative number of plots archived in the National Vegetation Survey databank per financial year since the SQL relational database was developed in 2000. These figures include projects migrated over time from 'legacy' data management systems (e.g. data stored as text files compatible with FORTRAN-based analytical tools) in use in previous years

2 Database development and integration

On-going support and maintenance activities were carried out during the year.

Specific improvements have been made to the NVS, including the module developed for the DOC Tier One monitoring programme, Analyses of requirements for new fields to store cultivated status to a site description. These will be incorporated in the next version release of the NVS data entry tool

- Development of new calculations for Chatham Island coordinate conversions. These will be added to the core NVS validation checks in future versions of the NVS data entry tool
- Creation of a "beta" version for the new web-based metadata and dataset entry process to support online NVS dataset upload. This new capability is undergoing final changes before being released for public use. The new capability will reduce the time required for NVS curators to manage data deposits and creates a semi-automated pipeline of data upload into the NVS data bank
- Development of new import routines to ingest the web-entered metadata content into the metadata management system. This reduced double-handling of content while allowing the NSV data manager to augment content provided by users that may be incomplete.

Developments were made to NVS Express to repair bugs, including:

- an error message received by some users when saving the site description
- tier heights defaulting to values of '0'

Developments were made to the NVS database to repair bugs, including:

- ensuring that correct dates are stored in audit information

3 Significant revisions of data

This year we continued to devote resources to addressing much needed data corrections and revisions across historic data held in the NVS databank. Consistency and high-quality data are especially important when we engage with international data synthesis efforts. Corrections and revisions included:

Metadata

- Metadata and plot records for datasets that had been inappropriately merged were divided (Paparoa exclosures projects)

Temporal consistency in long-term datasets

- Inconsistencies in whether permanent plots had an experimental treatment associated with them and the nature of that treatment were resolved

- Inconsistencies in the placement (e.g. objective, subjective, random) for permanent plots were resolved

Plot locations

- Plot records that appeared to be located in the sea were checked against original plot sheets and corrected where possible (39 plots)

Plot attributes and site data

- Assumed duplicate plots were investigated and resolved (Rotorua Lakes project)
- Georeferences, altitude, slope and other site data were added to plot records where they had been recorded but never digitised (Mt Titiroa, Lookout Range)
- Project dates corrected (Pukeamaru PNA survey)
- Descriptions of height tiers were completed for "Recce" plots where they were missing (142 projects)
- Status added to trees that died between measurements on permanent plots (Eastern Prince mts)
- Plot sizes added where previously listed as unknown (158 permanent plots from Paparoa forest)

Plant names

- Spelling of names changed in NVS master list to match the NZ Plant Names Database (http://nzflora.landcareresearch.co.nz/).

Plant attributes

- Inconsistent species names, diameters, tags, etc., were corrected in permanent forest plots (Fiordland Nth)
- Species recorded in the wrong height tier were corrected (Harper/Avoca, Silver beech single tree harvest, Titiroa Granite Fellfields, Birdlings Flat Gravel beech
- Tree tags on repeated measures of the same plot that could not be linked were corrected and linked
- Trees that were tagged twice were identified and a primary tag identified.

4 Increasing end-user awareness and capability

4.1 Training workshop in NVS Express

Susan Wiser and Hamish Maule ran a 1-day workshop for NVS Express at the start of the New Zealand Ecological Society Conference at the University of Waikato. Nine participants attended from various universities, councils, and consulting firms.

4.2 Presentations and workshops for end users

Landcare Research staff associated with the NVS databank periodically deliver presentations to disseminate information to end users and other government agencies about the NVS databank.

This year members of the NVS team participated in a hui with the Wakatū Incorporation so that we could learn about their needs regarding biodiversity and environmental information and for them to learn about our capabilities and information resources. The Wakatū Incorporation is based in Nelson and has approximately 4,000 shareholders who descend from the original Māori land owners of the Nelson, Tasman, and Golden Bay Regions.

We also held an educational and information gathering meeting for senior DOC staff (the Director, Planning and Support, Science and Policy Group and the Chief Architect, Manager ICT Strategy and Architecture Services). The overall purpose was to improve their understanding of the NVS databank, highlight the challenges that NVS faces in addressing the, sometimes conflicting needs of different stakeholders and identify areas of potential collaboration. Topics covered included the history of the NVS databank, DOC's current use of NVS and engagement in development, the proposed LUCAS – NVS interoperability project, the Informatics team and work being done, the user interface for NVS used by DOC, and the process by which DOC data are requested from NVS.

4.3 Increasing access and end-user capability

Resolution of several small user interface corrections to support DOC Tier One and MFE LUCAS data management were undertaken. Improvements to the data entry sequence of field plot data are one example.

We have undertaken resolution of a data loss issue occurring between remote data entry connections (DOC) and the central NVS Database. New network protocols increased the time required for data to travel between the DOC and the NVS Database giving rise to the failure to save some data correctly. This issue and the resulting missing data have now been resolved.

A new reusable data export pipeline was created to provide the MFE LUCAS database with annual data from DOC Tier One dataset. The pipeline included extensive validations and formatting to meet MFE's requirements. The pipeline outputs were extensively tested with MFE and DOC to ensure a very high-level of confidence over exported data was achieved.

4.4 New NVS users

There are currently a total of 383 registered NVS users, with 43 new users registering between June 2016 and July 2017.

5 Data-sharing agreements, data exchange, journal repositories

5.1 Use of NVS data through the GBIF Portal

An updated set of 1,509,458 species occurrence records for NVS public domain (Open Access) data were uploaded to the GBIF Portal in June 2017. These can be viewed here http://www.gbif.org/dataset/788439f0-3b56-11dc-8c19-b8a03c50a862. NVS provides a refreshed dataset to GBIF every month. Between 1 July 2016 and 30 June 2017 there were 2,172 downloads of species occurrence data, incorporating 782,282,176 records, accessed via the GBIF website (Fig. 2). The 2014/15 year showed an order of magnitude increase in the rate of species occurrence downloads and this trend has continued since then.

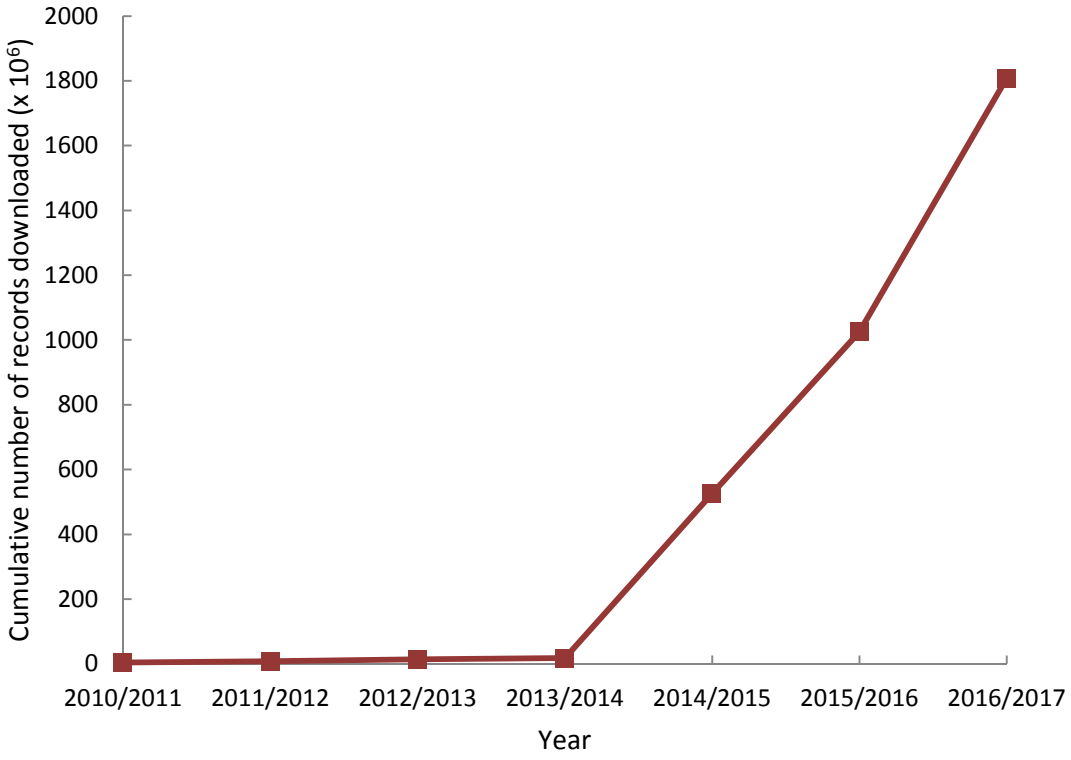

Figure 2. Cumulative number of species occurrence records supplied by the NVS databank that have been downloaded from the GBIF Portal since 2010.

5.2 NVS collaboration with sPlot

Data from grassland transects were provided by NVS to the sPlot consortium in 2014. We are now collaborating with other members of the sPlot consortium on ten different research projects using these data.

5.3 Use of NVS data via the Landcare Research NZ DataStore

Users can access data sourced from NVS that supports publications via the NVS collection in the Landcare Research DataStore. Over the last year, the 'Waitutu SORTIE-NZ 2001-2008' dataset page continued to be the most highly visited, in part because of use of these data for an NCEA assessment. Other popular datasets included 'New Zealand Forest Plot data in Global Forest Biodiversity dataset', 'Allometric power laws in NZ mountain beech forests' and 'Multimodal size distributions in spatially structured populations'. We continue to hope for progress in the ability to track literature citations to the DOIs (digitial object identifiers) associated with these datasets. DataCite, the leading provider of DOIs for research data, is still developing the creation of citation metrics for data objects

6 International collaborations

Susan Wiser was one of a team of scholars from 90 institutions around the world who consolidated field-based forest inventory data from 777,126 permanent sample plots in 44 countries (including forest plot data from the NVS databank) containing more than 30 million trees and discovered that conserving diverse forests not only retains a species rich environment, but also maintains the forests' output and services for future generations (see Liang et al. (2016) in publications list). The team found that when the number of tree species increases, so does the amount of timber that the forest produces. They also found the opposite to be true – a decline in tree diversity would result in an accelerating decline in wood production. The global study calculated that the amount of loss in productivity that is associated with the loss of tree species richness would have an economic value of up to a $500 billion per year across the world. That amounts to more than double what it would cost to implement effective protection and management of the Earth's terrestrial sites of global conservation importance. This finding highlights the need for a worldwide re-assessment of forest management strategies and conservation priorities and also the need to explore the influence of tree species diversity on other values, such as food production and persistence of native biota.

Sarah Richardson was part of a team who assembled 21 datasets worldwide, spanning tropical to temperate biomes and consisting of 313 plant communities representing different growth forms to investigate the relationship between functional niche occupancy and species richness at the global scale (see Li et al. (2017) in publications list). They found that as species richness increased, communities were more functionally diverse. At the same time, within communities, species overlapped more in their function rather than becoming narrower in their function. Their results provided evidence for habitat filtering (i.e. characteristics of the environment preclude certain species from occurring at a location), but not for limiting similarity (i.e. competition with other species is the primary process preventing a species from occurring in a location), as a process driving the pattern whereby species occupy a functional niche. Their results also indicate that including intraspecific trait variability will contribute to a better understanding of the processes driving patterns of functional niche occupancy.

Susan Wiser continues to serve as a scientific advisor to the New South Wales Office of Environment and Heritage Vegetation Information and Mapping Programme and on the

Steering Committee of the International Association for Vegetation Science Working Group for Ecoinformatics. She was invited to serve in these positions in recognition of her expertise with the NVS databank and other scientific expertise.

7 Web statistics

From 1 July 2016 to 30 June 2017, the NVS website was visited 4,083 times, up 15% from the 2015/16 year (3,545 visits), and there were 15,781 page views. There were 1,909 unique visitors to the site over this period. 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 (6%), Australia (2%) and Germany (2%). The website was also visited by people from another 86 countries. The data discovery and request component of the website continues to prove popular, with 26% of page views, and the data search tool attracting around half of those. The Index page received 20% of all page views and resources (downloadable content of NVS codes for plant names, field techniques, manuals, and field forms) were also popular (14% of page visits). The distribution of visits across different pages was similar to last year.

Access via search engines remains the most frequent pathway to the NVS website (35%): 42% of the navigation to the NVS website was direct traffic, indicating that frequent users bookmark the NVS website. On average, 23% of page views resulted from referrals from other sites. The NVS website receives the most referrals from the NZPCN (NZ Plant Conservation Network) and MfE (Ministry for the Environment) websites. Other common sources of referrals are links arising from publications that have used NVS data (e.g. New Zealand Journal of Ecology, Oikos, Journal of Ecology, Research Gate, Landcare Research DataStore), from large-scale data synthesis project websites with which we collaborate (e.g. the Botanical Information and Ecology Network and the Global Biodiversity Information Facility (GBIF)), and registers of data repositories (e.g. the IAVS Ecoinformatics working group, the Global Index of Vegetation Databases, the Registry of Research Data Repositories).

8 NVS data requests

A total of 43 requests for NVS data and metadata were made during 2016/17 and 2,092 datasets supplied (Fig. 3a & b). Twenty-five requests were made via the NVS website, and 18 were custom requests with data manually extracted from NVS.

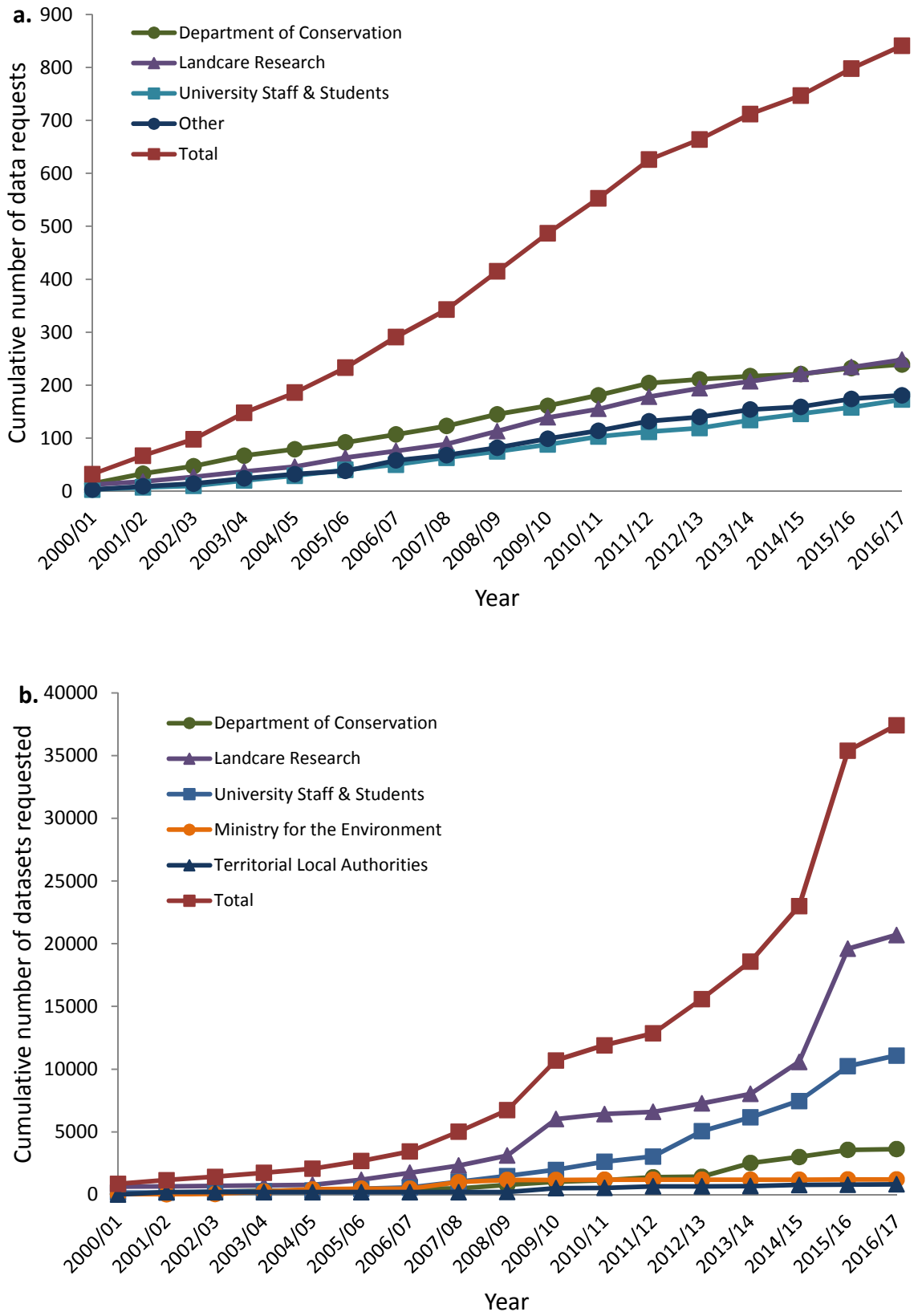

Figure 3. Requests for data from the National Vegetation Survey Databank per financial year since 2000: a. cumulative number of requests, total and broken down by three major data users; b. cumulative number of datasets supplied, total and broken down by five major data users.

Some examples of intended uses of these data are provided below.

- A student in the US was looking for ground-truthing data to help in a remote sensing study of forest composition in the Catlins.
- A PhD student from Lincoln University is using data of seedling establishment and survival and sapling recruitment from surveys of wilding pines to examine density dependence in pine invasion.
- A researcher from the University of NSW was provided species lists for vascular plants along with basic site information e.g. location and elevation, for as many sites as possible in native mixed broadleaf forest in a study of species' co-occurrence patterns to ask questions about competition and facilitation.
- A PhD student from the University of Naples Federico II was provided NZ beech species occurrence data to help in mapping treelines composed of the different beech species.
- A researcher from Landcare Research was provided tree demography data (tree growth rates & mortality) from permanent plots with similar species composition to a Northland native forest for which the owner would like to develop a sustainable management plan.
- A Masters student from Lincoln University was provided location data for four plant species in the Selwyn & Waimakariri districts. The student was proposing to examine the immediate environment of each plant to inform work on using irrigation dams as a novel habitat for rare and threatened plants.
- A researcher from DOC required distribution and dominance data over the geographical range of three different groups of related NZ beech species in the investigation of a method to predict mast seeding events. Data on local dominance of each species will inform where mast seeding is likely to have ecological impact.
- A researcher from Landcare Research required cover, diameter & stem density data of N-fixing plants in NZ natural ecosystems as part of a global analysis studying the drivers of abundance and occupancy of N-fixing plants.
- Permanent plot data was sought by a researcher from Cambridge University as part of a study comparing regeneration in forest plots within the Orokonui Ecosanctuary to the surrounding landscape to assess any benefits of pest control.

9 Publications directly associated with the NVS Databank

Refereed publications

The following 34 2016/17 publications used data archived in the NVS Databank. This list includes earlier publications that were not reported in previous annual reports).

Aguilar GD, Blanchon DJ, Foote H, Pollonais CW, Mosee AN 2017. A performance based consensus approach for predicting spatial extent of the Chinese windmill palm

(*Trachycarpus fortunei*) in New Zealand under climate change. Ecological Informatics. 39: 130–9.

Allen R, Tahi B 2016. Tawa timber – an updated perspective on opportunities and issues. Indigena: 9–11.

Bokhorst S, Kardol P, Bellingham PJ, Kooyman RM, Richardson SJ, Schmidt S, Wardle DA 2017. Responses of communities of soil organisms and plants to soil aging at two contrasting long-term chronosequences. Soil Biology and Biochemistry 106: 69–79.

Boucher FC, Lavergne S, Basile M, Choler P, Aubert S 2016. Evolution and biogeography of the cushion life form in angiosperms. Perspectives in Plant Ecology, Evolution and Systematics 20: 22–31 [Data accessed via GBIF]

Brandt AJ, Tanentzap AJ, Leopold DR, Heenan PB, Fukami T, Lee WG 2016. Precipitation alters the strength of evolutionary priority effects in forest community assembly of pteridophytes and angiosperms. Journal of Ecology 104(6): 1673–81.

Carey MP, Sethi SA, Larsen SJ, Rich CF 2016. A primer on potential impacts, management priorities, and future directions for Elodea. Hydrobiologia 777: 1–9. [Data accessed via GBIF]

Cruz J, Thomson C, Parkes JP, Gruner I, Forsyth DM 2017. Long-term impacts of an introduced ungulate in native grasslands: Himalayan tahr (Hemitragus jemlahicus) in New Zealand's Southern Alps. Biological Invasions 19(1): 339–349.

Dickie IA, Wakelin A, Martinez-Garcia L, Richardson SJ, Makiola A, Tylianakis JM 2016. Plant root pathogens over 120,000 years of temperate rainforest ecosystem development. bioRxiv.: 042341.

Garrity FD, Lusk CH 2017. Independent contrasts reveal climatic relationships of divaricate plants in New Zealand. New Zealand Journal of Botany 10: 1–6.

Gillard M, Thiébaut G, Deleu C, Leroy B 2017. Present and future distribution of three aquatic plants taxa across the world: decrease in native and increase in invasive ranges. Biological Invasions 19(7): 2159–70. [Data accessed via GBIF]

Glick HB, Bettigole C, Maynard DS, Covey KR, Smith JR, Crowther TW 2016. Spatially-explicit models of global tree density. Scientific Data: 3.

Gray LJ, Renner MA 2016. Botany, GIS and archives combine to assess the provenance of historical Kakapo study-skins stuffed with New Zealand bryophytes. Emu 116(4): 452–60.

Grossenbacher DL, Brandvain Y, Auld JR, Burd M, Cheptou PO, Conner JK, Grant AG, Hovick SM, Pannell JR, Pauw A, Petanidou T 2017. Self-compatibility is over-represented on islands. New Phytologist 215: 469–478. [Data accessed via GBIF]

Harris RMB, Kriticos DJ, Remenyi T, Bindoff N 2017. Unusual suspects in the usual places: a phylo-climatic framework to identify potential future invasive species. Biological Invasions 19: 577–96. [Data accessed via GBIF]

Holdaway RJ, Easdale TA, Carswell FE, Richardson SJ, Peltzer DA, Mason NW, Brandon AM, Coomes DA 2016. Nationally representative plot network reveals contrasting drivers of net biomass change in secondary and old-growth forests. Ecosystems: 1–6.

Howell CJ, Terry JA 2016. The creation of a New Zealand weed atlas. Science for Conservation 328. Wellington, Department of Conservation, Wellington. 21 p.

Kunstler G, Falster D, Coomes DA, Hui F, Kooyman RM, Laughlin DC, Poorter L, Vanderwel M, Vieilledent G, Wright SJ, Aiba M et al. 2016. Plant functional traits have globally consistent effects on competition. Nature 529(7585): 204–7.

Liang J, Crowther TW, Picard N, Wiser S, Zhou M, Alberti G, Schulze ED, McGuire AD, Bozzato F, Pretzsch H, de-Miguel S et al. 2016. Positive biodiversity-productivity relationship predominant in global forests. Science 354(6309): aaf8957.

McGlone MS, Buitenwerf R, Richardson SJ 2016. The formation of the oceanic temperate rainforests of New Zealand. New Zealand Journal of Botany 54: 128–155.

McGlone MS, Buitenwerf R, Richardson SJ 2017. Oceanic Temperate Forest versus Warm Temperate Forest: a reply to Grubb et al. (2017). New Zealand Journal of Botany 55: 1–8.

Peltzer DA, Wardle DA 2016. Soil fertility effects on tree seedling performance are light-dependent: evidence from a long-term soil chronosequence. Oikos 125(8): 1121–33.

Pertierra LR., Aragón P, Shaw JD, Bergstrom DM, Terauds A, Olalla-Tárraga MÁ 2017. Global thermal niche models of two European grasses show high invasion risks in Antarctica. Global Change Biology 23: 2863–2873. doi:10.1111/gcb.13596 [Data accessed via GBIF]

Prebble JG, Reichgelt T, Mildenhall DC, Greenwood DR, Raine JI, Kennedy EM, Seebeck HC 2017. Terrestrial climate evolution in the Southwest Pacific over the past 30 million years. Earth and Planetary Science Letters 459: 136–44.

Qin Z, Zhang JE, DiTommaso A, Wang RL, Liang KM 2016. Predicting the potential distribution of Lantana camara L. under RCP scenarios using ISI-MIP models. Climatic Change 134(1–2): 193–208. [Data accessed via GBIF]

Quiroga MP, Mathiasen P, Iglesias A, Mill RR, Premoli AC 2016. Molecular and fossil evidence disentangle the biogeographical history of Podocarpus, a key genus in plant geography. Journal of Biogeography 43(2): 372–383. [Data accessed via GBIF]

Smale MC, Coomes DA, Parfitt RL, Peltzer DA, Mason NW, Fitzgerald NB 2016. Post-volcanic forest succession on New Zealand's North Island: an appraisal from long-term plot data. New Zealand Journal of Botany 54(1): 11–29.

Smale MC, Wiser SK, Bergin MJ, Fitzgerald NB 2017. A classification of the geothermal vegetation of the Taupō Volcanic Zone, New Zealand. Journal of the Royal Society of New Zealand 7: 1–8.

Tindall ML, Thomson FJ, Laffan SW, Moles AT 2016. Is there a latitudinal gradient in the proportion of species with spinescence? Journal of Plant Ecology 10(2): 294–300.

Walker GA, Gaertner M, Robertson MP, Richardson DM 2017. The prognosis for Ailanthus altissima (Simaroubaceae; tree of heaven) as an invasive species in South Africa; insights from its performance elsewhere in the world. South African Journal of Botany 112: 283–289. [Data accessed via GBIF]

Walker S, Comrie J, Head N, Ladley KJ, Clarke D 2016. Hawkweed invasion does not prevent indigenous non-forest vegetation recovery following grazing removal. New Zealand Journal of Ecology 40(1): 1.

Wan JZ, Wang CJ, Yu FH 2016. Risk hotspots for terrestrial plant invaders under climate change at the global scale. Environmental Earth Sciences 75(12): 1–8. [Data accessed via GBIF]

Wang Y, Xu Z 2016. Where are the alien species? Predictions of global plant species invasions under current environmental conditions and the human footprint. Polish Journal of Environmental Studies,25(4): 1729–1738. [Data accessed via GBIF]

Wyse SV, Dickie JB 2017. Predicting the global incidence of seed desiccation sensitivity. Journal of Ecology 105: 1082–1093. [Data accessed via GBIF]

Young LM, Norton DA, Lambert MT 2016. One hundred years of vegetation change at Cass, eastern South Island high country. New Zealand Journal of Ecology40(3): 289–301.

Contract reports

The following twelve 2016/17 contract reports used data archived in the NVS Databank.

Allen RB, Tahi B 2016. Tawa timber product-market strategy. Report prepared for the Tūhoe Tuawhenua Trust. 19 p.

Bellingham PJ, Overton JM, Thomson FJ, MacLeod CJ, Holdaway RJ, Wiser SK, Brown M, Gormley AM, Collins D, Latham DM, Bishop C, Rutledge D, Innes J, Warburton B 2016.Standardised terrestrial biodiversity indicators for use by regional councils. Landcare Research Contract Report LC2109.

Bellingham P, Richardson S, Gormley A, Monks A, Wiser S 2016. Department of Conservation biodiversity indicators: 2016 fact sheets. Landcare Research Contract Report LC2973 for the Department of Conservation.

Brownstein GE. 2016. Isolepis basilaris on the Tasman River delta, Lake Pukaki monitoring report: year three, summer 2016. Landcare Research Contract Report LC2644 for Meridian Energy New Zealand Limited.

Brownstein GE, Lee WG. 2017. Mt Ida Syndicate Pastoral Occupation Lease – Biodiversity Monitoring Report 2. Landcare Research Contract Report LC2804 for the Department of Conservation.

Easdale TA, Richardson SJ, Bellingham PJ 2016. Growth rates and bark allometry of pukatea (Laurelia novae-zelandiae). Landcare Research Contract Report LC2656 for Forest of Ruru Limited.

Easdale T 2017. Identification of most frequent vascular plants in New Zealand for the Department of Conservation. Informal Landcare Research Report for the Department of Conservation.

Easdale T 2016. Carbon accounting implications of shrubland methods. Landcare Research Report LC2558.

Holdaway RJ 2017. Design of New Zealand's 8-km grid-based plot network : static master data. Landcare Research contract report LC2527 for Ministry for the Environment.

Monks A, Burrows L 2017. Effects on terrestrial vegetation of Enhanced southern lakes hydrology scenarios. Landcare Research Contract Report LC2781 for Meridian Energy New Zealand Limited, Christchurch. 67 p.

Newsome P, Lynn I, Scheele S, Fenemor A, Vale S, Bellingham P, Arnst E, Sutherland A, Newton M, Young R 2017. Te Awa Tupua scoping study. Landcare Research Contract Report LC2721. 266 p.

Wiser SK 2016. Vegetation classification of all measurements of the LUCAS natural forest plots. Wellington, Ministry for the Environment.

Conference presentations

The following two 2016/17 conference presentations (or earlier conferences not reported) used data archived in the NVS Databank.

De Cáceres M, Allen RB, Wiser SK, Martín-Alcón S, Coll L 2017. On the use of structural and compositional dissimilarity measures for the analysis of forest structure and dynamics. 60th International Association for Vegetation Science Symposium, 20–2 June, 2017, Palermo, Italy.

Wiser SK, Allen RB, Bellingham PJ, MacKenzie DI, Arnst E, Hurst JM 2017. Distance-decay in tree demographic responses to an earthquake: Natural disturbance and conservation management. 60th International Association for Vegetation Science Symposium, 20–24 June, 2017, Palermo, Italy.

Theses

The following two 2016/17 theses used data archived in the NVS Databank.

Popovic G 2017. Covariance modeling and inference for multivariate discrete data in ecology. PhD thesis from UNSW Sydney, School of Mathematics and Statistics.

Viljoen JA 2016. Ecological influences in the biogeography of the Austral sedges. Doctoral dissertation, University of Cape Town. [Data accessed via GBIF]

Appendix 1 – New electronic datasets in NVS 2015/16

COLD CREEK 2001

COLD CREEK 2005

COLD CREEK 2010

EBEX AUDIT - KAKARIKI 2007

FIORDLAND NTH FOREST 2008

FIORDLAND NTH FOREST 2008

GLENMORE DOWNS 2005

HAUHUNGATAHI 2008

KAIMANAWA MTN BEECH EXCLOSURES 1999

KAPITI ISLAND KOHEKOHE 1996

KAWARAU GORGE 1983

LAKE ROTOMAHANA MANAGEMENT AREA (PATITI ISLAND) 2014

MAHARAHARA EXCLOSURES 2003

MARLBOROUGH EXCLOSURES 2008

MOEATOA EXCLOSURES 2006

Moutohora (Whale Island) Forest 1991

Moutohora (Whale Island) Forest 1993

Moutohora (Whale Island) Forest 2003

Moutohora (Whale Island) Forest 2009

Moutohora (Whale Island) Grassland 1992

Moutohora (Whale Island) Grassland 1993

PUKETI FOREST SEEDLING PLOTS 2009

PUKETI FOREST SEEDLING PLOTS 2012

SOUTHLAND WETLAND ASSESSMENT AND MONITORING 2017

ULVA ISLAND 1991

ULVA ISLAND 1993

ULVA ISLAND 1994

ULVA ISLAND 2004

WARAWARA FOREST 2016

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

LAKE PUKAKI ISOLEPIS MONITORING 2016

HAKARIMATA SCENIC RESERVE 2016

TARARUA 2016

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

CANTERBURY BRAIDED RIVERBEDS 2013

COLD CREEK 2001

GLENMORE DOWNS 2005

HAKARIMATA SCENIC RESERVE 2016

HUNUA 1963

HUNUA INDIGENOUS WORKING CIRCLE 1964-65

HUNUA RANGES FOREST SURVEY 1975-77

KAWEKA WILDING PINES 2014

LAKE PUKAKI ISOLEPIS MONITORING 2016

LAKE ROTOMAHANA MANAGEMENT AREA (PATITI ISLAND) 2014

MANGANUI-O-HOU MONITORING 2004

MT BARKER WILDING PINES 2013

MT BRUCE KAMAHI 2005

NELSON NATURE: Main 2015-2016

NELSON NATURE: Restricted 2015-2016

NIUE- HUVALU FOREST CONSERVATION AREA 2015

POULTER FOREST 1984

PUKETI FOREST SEEDLING PLOTS 2012

PUREORA GRASSLAND 1982-83

PUREORA WETLAND 1982-83

RAUKUMARA MONITORING 2005

RUAKITURI MONITORING 2004

ULVA ISLAND 2004

WAIKARE FOREST MONITORING 2005

WARAWARA FOREST 2016

CENTRAL OTAGO- ALPINE INDIGENOUS TUSSOCK GRASSLAND 1970-1978

EXTENSIVE POSSUM CONTROL HAAST 2004

SOUTHLAND WETLAND ASSESSMENT and MONITORING 2017