

Plant Listing at the National Trust for Scotland (PLANTS) – a large-scale plant collection inventory project

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Abstract

The Plant Listing at the National Trust for Scotland (PLANTS) project was a three-year plant collections inventory project that ran from 2022 to 2025 and spanned 35 gardens across Scotland. The project was conceived to deal with a plant-recording backlog and aimed to create an accurate set of plant records held in a centralised database. The gardens were inventoried during the summer months and the data collected input into the National Trust for Scotland plant records database and matched with any existing records over winter. At the end of the project the number of accession records held by the organisation totalled 150,000, representing 77,000 living accessions and 86,000 living collection items.

Introduction

Heritage horticultural institutions and botanic gardens maintain detailed records of their plant collections. These records are vital collection management tools, assisting with compliance with plant health requirements, evidencing the legal and ethical sourcing of plants, supporting conservation activities, informing strategic planning for collection development and resilience, providing a repository for heritage and historical information, and acting as a gateway for visitor engagement (Gratzfeld, 2016; RHS & NCCPG, 2007).

The National Trust for Scotland (NTS) holds one of Scotland's largest plant collections across its 35 gardens and designed landscapes. Each garden maintains a unique set of plants particular to the history and spirit of the property. These include endangered species, historic wild-collected

material, heritage cultivars, plants linked to important people and events, and plants selected for their contributions to the garden's design and aesthetic.

Many of the plant records held for NTS gardens pre-date NTS custodianship. Branklyn Garden in Perth, for example, maintains in its archive the accession book kept by the garden's creators, Dorothy and John Renton (NTS, 1922–c. 1940). Between 2005 and 2019 the NTS used Demeter, a specialist plant records software package, to maintain centralised electronic plant records (NCCPG/Plant Heritage & Aldex Software Ltd, 2017). From the mid-2010s, Demeter was no longer supported, consequently becoming unusable, and so, with the loss of a centralised records repository, each garden reverted to maintaining local plant records. Lack of centralised data management meant that the standard format in which the records

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were held now varied, and pressures from other property operations led to a reduced emphasis on record-keeping as an activity.

Lack of high-quality, up-to-date and accessible records put the NTS's plant collections at risk (Badley *et al.*, 2004). Analysing the significance of plants in the collections became challenging, as did planning for the future of the collection and ensuring its resilience to the threats of climate change and new pests and diseases. In addition, the ability to communicate the collections effectively to visitors was limited. In response to these challenges, the Plant Listing at the National Trust for Scotland project (PLANTS) was initiated. A three-year project to inventory and update the records of the NTS plant collections, this was one of the major initiatives of the first phase (Recovery and Planning) of the NTS 'Nature, Beauty and Heritage for Everyone' strategy (NTS, 2021). The aim of the project was to create an accurate set of plant records held in a centralised database accessible to all NTS garden staff that can be used as a baseline for the management, research and development of NTS collections.

Methods

Staffing requirements

A specialist PLANTS project team was recruited to provide the capacity required to complete the project in the three-year time frame. The project team, totalling 11 staff, comprised a project manager, an administrator, a data manager who oversaw the plant collections database, and three regionally based inventory teams. The West Team covered Dumfries and Galloway, through Glasgow and out to Argyll and Bute. The East Team covered the Scottish Borders up through Edinburgh and the Lothians, and into Fife and Perthshire. The North Team

covered the Highlands and Islands, Moray, Aberdeenshire and Angus.

Pre-inventory tasks

After acquiring the IrisBG plant records database (Rustan, 1996–2026), data held in the previous database was mapped over and transferred to the new system using IrisBG's inhouse expertise.

Garden bed locations

Garden bed location names which had been transferred from the previous database were checked to ensure they accurately reflected what was on the ground. Any new bed areas were added and any changes to bed layout were updated.

Onsite inventories

Each garden was visited three times during the project. The longest inventory visit was made in the middle of summer, and two shorter seasonal visits were made, one in spring and the other in autumn. The main visit varied in length according to the size of the property and the size of the plant collection. Most inventory visits took two to three weeks, although Inverewe Garden in Poolewe took fourteen weeks due to the size and complexity of the garden. The seasonal visits were shorter in length, taking around one week each, and were timed to attempt to catch seasonal bulbs and any planting that may not have been apparent in the main summer visit.

Every bed location within each garden was audited to create a list of plants present in each bed. The beds were surveyed in a systematic order, linear beds from front to back moving left to right, and irregular beds from the edge to the centre point, starting on the south-west edge and moving in an anti-clockwise direction (Fig. 1).

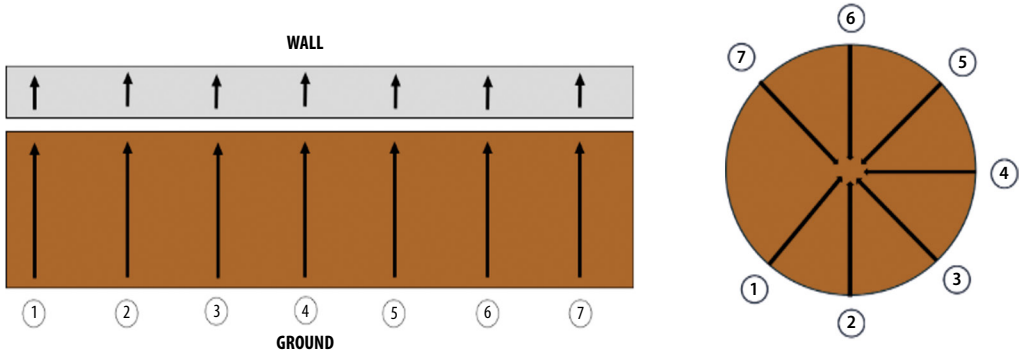


Fig. 1 Diagram showing the audit direction of linear and irregular shaped beds. Diagram drawn by Anna Florence.

Plants were identified down to the lowest taxonomic level possible. Identification was carried out using a number of resources including the project and garden staff's specialist knowledge, comparison with possible options found in existing plant records, specialist reference texts and descriptions in the Trees and Shrubs Online database (IDS, 2025). For the genera *Malus* and *Rhododendron* expert external verification was used. The Pl@ntNet app (Pl@ntNet, 2025) was able to give an approximate indication in some cases but due to the specialist nature of many of the plant

collections it was used with a critical eye, and cross-references with other sources were made.

The maps for properties varied in the detail shown and the project time constraints did not allow for mapping the collections, so a location referencing system was imposed on the plants listed in each bed. Each plant was allocated a reference number; these increased at intervals of five which allowed space for any future plant additions, enabling bed lists to be produced in a systematic order on completion of the project (Fig. 2).

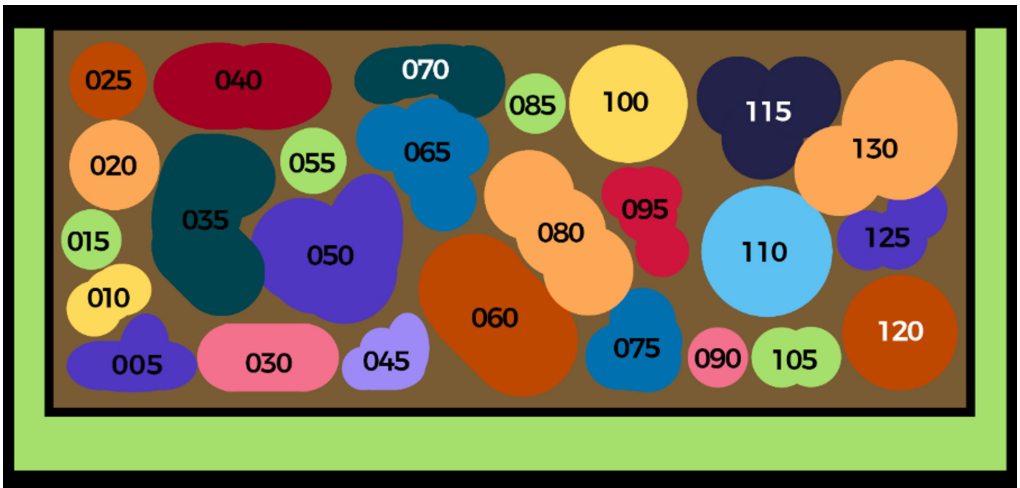


Fig. 2 Diagram showing the location referencing system in a bed. Diagram drawn by Colin MacDowell, NTS.

Data processing

A data standard was drawn up prior to data processing to ensure consistency. The minimum requirement for an accession record was set out as taxon, source, provenance and garden location, and extra fields were defined and approved for additional information to be included where it existed, such as collectors' information, verification source, memorial planting information and tag number.

Plants recorded during the audit were cross-referenced with existing records and, where matches were found, location references and inspection dates were added along with any additional information captured during audit. Where no existing record was found, a new accession was created in line with the data standard.

In some cases, potential matches to existing records were identified but could not be verified due to seasonality or lack of information. Where information in the existing records was deemed worth retaining, such as cultivar names or collectors' codes, a process for recording queries was implemented. New records were created for the plants seen during audit, with a status indicating that they were potential duplicates. Location references and, where applicable, any reference numbers on tags attached to the plant were added to the new records. The existing records were flagged as potential matches using the status field, and the relevant location references were cross-referenced.

The remaining existing records that had not been matched to a plant during the audit were then assessed. Plants not seen due to seasonality, for example spring bulbs during a summer audit, were given the status 'Not found – Seasonal' as a temporary measure. Other plants not seen during the audit were marked as dead.

The taxonomy database underpinning names across all properties was also checked and updated. The Royal Horticultural Society Find a Plant service (RHS, 2025) was used as the authority for cultivar names and Plants of the World Online (RBG Kew, 2025) for species.

Results

The inventory resulted in an increase of 48,000 accession records, bringing the total number of records in the NTS IrisBG database to 150,000 (Table 1). This reflects 77,000 living accessions in the garden and 73,000 historic accessions for plants that once grew in the gardens but were not found alive during the audit.

Table 1 Summary of accession records held within NTS plant records database at project completion.

Total accessions held in database	150,000
Total increase in accessions during project	48,000
Total number of accessions with living items (at end March 2025)	77,000
Total number of living items (at end March 2025)	86,000

The 77,000 living accessions were made up of 15,000 taxa. They include 1,539 genera and 8,000 horticultural cultivars. The largest genus represented in the NTS collections is *Rhododendron*, with 10,662 living items representing 1,171 taxa (Table 2). The next three largest genera in NTS collections are *Narcissus*, *Malus* and *Rosa*, and these are primarily cultivars (Table 2).

There are 9,036 taxa that are only represented at a single garden, of which 5,671 are cultivars. An example of this is *Narcissus* 'Elgin' (Fig. 3), which is only grown at Brodie Castle in Moray. This daffodil was bred by Major Ian Brodie, the 24th laird of Brodie, and is part of the National Collection

Table 2 Summary of accession and taxa numbers for the four most common taxa in NTS gardens.

Genus	Number of living items	Number of taxa	Number of species	Number of registered cultivars
<i>Rhododendron</i>	10,662	1,171	437	555
<i>Narcissus</i>	4,865	704	21	683
<i>Rosa</i>	2,313	445	43	402
<i>Malus</i>	2,310	322	17	305

**Fig. 3** *Narcissus* 'Elgin' at Brodie Castle. Photo: Nicola Douglas for the NTS.

of Brodie daffodils which is held at the castle. It received the Royal Horticultural Society Award of Merit in 1940 although was registered before 1927. Its significant link to Brodie Castle and the family that lived there, coupled with the fact that it is only held within one collection, means that it is a priority to ensure that the cultivar is introduced to one of the other NTS gardens to act as a backup.

The gardens managed by the NTS vary in size and complexity, and their individual

designs means that they also vary in plant selection. The gardens with the largest numbers of living accessions were Inverewe, Threave and Arduaine (Table 3).

The inventory has identified two species which are classified by the IUCN as Extinct in the Wild in *Brugmansia suaveolens* and *B. sanguinea*, and twenty-two species, excluding rhododendrons, which are Critically Endangered. Of the IUCN-listed accessions some are of known wild origin and some will require additional research to determine their source. The degree to which this information is known varied between properties. For example, the Rentons, as the creators of Branklyn Garden, kept records of the plants added to their collection alongside the sources (NTS, 1922–c. 1940), whereas a fire before NTS ownership meant that a section of the historic Crarae Garden records have sadly been lost. As the most widely planted genus in NTS gardens, *Rhododendron* was cross-referenced against the 2011 Red

Table 3 Properties with the largest number of living accessions, and the number of genera represented.

Property	Number of living items	Number of genera represented
Inverewe	8,423	827
Threave	6,346	754
Arduaine	5,646	459

List of Rhododendrons (Gibbs *et al.*, 2011). This process identified 119 species in the collections that are Critically Endangered, Endangered and Vulnerable. These include *Rhododendron amesiae* at Arduaine, which is Critically Endangered, and *R. makinoi* at Branklyn Garden which is Vulnerable (Fig. 4).

A number of specimens were confirmed as wild-collected material, and original introductions by plant collectors including Frank Kingdon-Ward, George Forrest and Reginald Farrer were inventoried as still present within the NTS collections. The inventory identified cultivars named for the NTS gardens, including *Prunus serrula* 'Branklyn' (Fig. 5) and has allowed analysis of the spread of these cultivars across NTS sites, flagging where a plant is represented in only one place, such as *Fagus sylvatica* 'Crataegus' (Fig. 6).

Other interesting plants were discovered or confirmed as part of the NTS collections,

including large collections focused on one genus. Two examples of these are the 180 cultivars of *Galanthus* at Branklyn Garden, including *Galanthus* 'Wasp' (Fig. 7), and the collection of 18th-century shrub roses at Malleny Garden that includes *Rosa* 'Duchesse de Montebello' (Fig. 8). The project uncovered original plants brought to the gardens during their design, such as the *Cedrus atlantica* 'Aurea' at Branklyn Garden, which is also a Girth and Height County Champion Tree (Fig. 9), and *Wisteria sinensis* growing over the central path at Broughton House (Fig. 10). Plants in memory of significant people and events were also discovered, including an *Acer pseudoplatanus* 'Worley', which was planted by Queen Elizabeth The Queen Mother in 1981 to celebrate the NTS's Golden Jubilee.

Discussion

The methodology presented provides a template for tackling large-scale plant



Fig. 4 *Rhododendron makinoi* at Branklyn Garden. Photo: Colin Wren.



Fig. 5 Close-up of the bark of *Prunus serrula* 'Branklyn' at Branklyn Garden. Photo: John Sinclair..



Fig. 6 *Fagus sylvatica* 'Crarae' at Crarae Garden. Photo: NTS.



Fig. 7 *Galanthus* 'Wasp' at Branklyn Garden. Photo: Charlotte Bottone for the NTS.



Fig. 8 *Rosa* 'Duchesse de Montebello' at Malleny Garden. Photo: NTS.



Fig. 9 *Cedrus atlantica* 'Aurea' at Branklyn Garden. Photo: John Sinclair for the NTS.

record issues under complex geographical and seasonal constraints. It allows for rapid on-the-ground inventory and later data processing whilst reconciling multiple formats of existing records with minimal information loss.

The main drawback to the above approach was individual gardens' previous lack of record-keeping, and the project highlighted the importance of maintaining continuity in plant records. Gaps invariably cause information to be lost, reduce the accuracy of the data that can be retrieved and make record-keeping less visible as a

priority activity when there are competing demands on staff time. Failure to maintain continuous plant recording as an activity at the NTS has negatively impacted the standard of the records that the project was able to produce.

Identification of the plants proved challenging, particularly that of cultivars where knowledge of the name was not retained locally, meaning that many plants could only be identified to genus level and will require specialist verification in the future. An example of this is *Narcissus*; there are many hundreds of Class 1 Yellow-Yellow daffodils

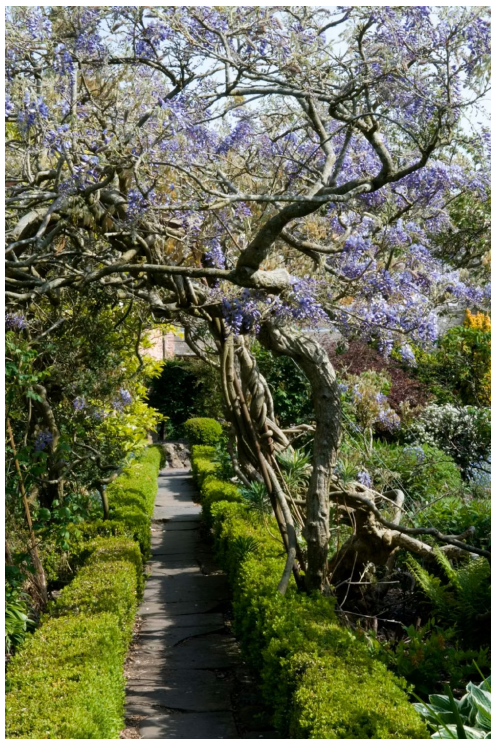


Fig. 10 *Wisteria sinensis* at Broughton House. Photo: NTS.

(RHS, 1991) and working out which of these matches a plant in the garden is incredibly challenging without a smaller list of possible matches. A second example of difficulty in identification were the *Rhododendron* collections across NTS properties which required expert consultants to assist. This will be an ongoing task after the completion of the project. A lower data standard makes these records less useful when included in analysis of the significance of the collections (NTS, 2025), and loss of this information means that certain specimens will no longer have the provenance required to be of use in conservation efforts (Badley, 2004).

There are important benefits to having carried out the collection inventory despite the gap in recording. Analysis of the dataset greatly assists collection management, allowing propagation activities to be

prioritised. This ensures the persistence of endangered species in the collections and that highly significant taxa are represented at more than one geographical location across the NTS sites, safeguarding against natural disaster and pest or disease outbreaks. The dataset will guide the direction of collection development, providing an understanding of how the gardens have changed over time and allowing the identification of plants that contribute to each garden's unique feel and spirit. It will also allow the NTS to study how threats such as climate change could affect the plant collections. The dataset can be run through tools such as the Climate Assessment Tool (CCABG, 2025) to assess species' suitability for future climate scenarios. The NTS will now be able to share data with conservation schemes such as the National Plant Collections and the International Conifer Conservation Programme (Plant Heritage, 2025; RBGE, 2025) to engage in conservation work and to understand the significance of their collections in a national context.

Maintenance of the dataset has been built into NTS policy and lies with the garden teams. Gardeners are tasked with adding accession records for any new plantings and updating accession status and location. Regular training in IrisBG operation, and monitoring of activity and data quality is being provided by the Gardens Data Manager. Demonstrating the importance of the dataset to the garden teams through regular communication on outputs, for example enabling involvement and reporting to conservation schemes such as the International Conifer Conservation Programme (RBGE, 2025), or allowing the sharing of important plant material between sites, is key to encouraging the upkeep of the data.

The dataset will demonstrate its usefulness in management of the gardens by enabling the tracking of pest and disease outbreaks back to source and assisting in understanding the scale of the threat to nearby planting. It will also provide a resource to understand where a species has been tried multiple times before and failed. As the dataset is enriched with more detailed information on plant sources, life history and taxonomic detail, its impact will increase both within the NTS and in understanding the significance of its collections in a national and international context.

Conclusion

The PLANTS inventory project has increased the number of accession records held by the NTS by 48,000, creating an accurate picture of the plant collections found across its gardens and providing a tool for the care of the collections. Now that a baseline of data has been created, the database has become a living record of the plant collections at the NTS. A programme of continuing maintenance of the dataset, adding new accession records and updating the life status of plants is now embedded in NTS gardens' operations, and work to verify the taxonomic identity of significant collections, such as the specimens of *Rhododendron*, will take place.

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