Plan Overview

A Data Management Plan created using DMPonline

Title: Trinity College Botanic Garden long-term monitoring program

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Template: DCC Template

Project abstract:

Botanic gardens hold large, documented, and accessible collections of living plants. These represent unique subsets of taxa from different biogeographical regions growing under common environmental conditions, connecting people to global plant research and conservation efforts while offering a place beneficial for human health and wellbeing. Despite Botanic Gardens being an ideal setting for climate change research, their potential for comparative, long-term studies and outreach in the field is still underutilised. As part of its ten year strategy, Trinity College Botanic Garden (TCBG) aims to tap this potential and establish a programme for long-term (>30 years) monitoring of key physiological performances in its living woody plant collection. The programme will also assess particulate pollution (PM10 and PM2.5) interception by the same trees, pairing climate change and urban green research. Importantly, the project will include the design of a transferable protocol, produce vouchered herbarium specimens as a future historical archive and as a pedagogical tool , and support the garden outreach strategy, so as to nurture its link with both Trinity College Dublin and local communities, ensuring the garden’s legacy into the future.

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Trinity College Botanic Garden long-term monitoring program

Data Collection

What data will you collect or create?

Data	Data type	Data format	Data volume
Stomatal conductance	Raw data	.csv	0-1 GB (per monitoring season)
Elemental analysis/ Water use efficiency	Raw data	.csv	0-1 GB (per monitoring season)
Particulate matter	Raw data, Images	.csv, .tiff/.tif	0-1 GB (per monitoring season)
Herbarium specimens	Physical samples	Physical herbarium sheets	1 physical sheet per sample (per monitoring season)

.csv format will be preferred as they are non-proprietary formats

.tiff format for particulate matter will be preferred to avoid loss of information due to compression of the image

How will the data be collected or created?

Data	Data collection	Equipment/ software	Quality assurance
Stomatal conductance	Field measurements (porometry)	SC-1 Leaf Porormeter; Leaf porometer Utility software	Replication: measurement of x3 leaf specimens per tree specimen; Published standardised protocol; Calibration of the equipment
Elemental analysis/ Water use efficiency	Collection of samples; Lab analysis (radiocarbon isotopes) from collected and field-measured leaves samples	Plant press for drying *or* Oven	Collection of 3 leaves per tree specimen; Published standardised protocol
Particulate matter	Collection of samples; Electron scanning microscopy (SEM) imaging, Energy dispersive spectrometry (EDS) with Back-scattered electron (BSE), Elemental mapping, Feature analyses	Plant press for drying; Velin tissues for minimising contamination of the samples; TESCAN MIRA3 TIGER Electron Scanning Microscope; Aztec Software	Collection of 3 leaves per tree specimen; Standardised protocol
Herbarium specimens	Collected and dried leaves	Plant press for drying; Herbarium sheets; Printed herbarium labels	Standardised protocol

Consistent formats will be used for each data file.

Digital files and folders will be organised hierarchically, describing the project, file contents, location, date, resetials aarcher’s inind version.

Documentation and Metadata

What documentation and metadata will accompany the data?

Data	Metadata
Stomatal conductance	On the same sheet - Time and date, coordinates of the specimen, temperature at every specimen, relative humidity at each specimen, photosynthetically active radiation at the leaf level, sensor serial number, sensor calibration number, relative humidity at the leaf sensor, relative humidity at the filter sensor, leaf orientation, exposure to sun, leaf health, additional notes on the monitoring conditions (e.g. weather changes)
Elemental analysis/ Water use efficiency	*tbc*
Particulate matter	On the same sheet - coordinates of the tree specimen, additional notes on leaf health
Herbarium specimens	On the sheet label - collector, herbarium code, date of collection, coordinates of the specimen, branch height, notes on location
Extra	On a separate sheet - weather data from station at the garden, reporting day of year (doy), date, time, relative humidity (rh), temperature, pressure, net radiation, photosynthetically active radiation, wind speed, wind direction, precipitation

Further than that:

1. Files will be accompanied by a README file stating

- Names and descriptions for variables
- Definitions of acronyms or specialist terminology
- Reasons for missing values
- Derived data created from the raw file, including method used to create them

2. Project details will be stored on the platform protocols.io under doi versioning, reporting

- The project aim, objectives and hypotheses
- Data collection methods, including details of instrumentation and environmental conditions during collection, copies of collection instructions if applicable
- Data standards used
- Data structure and organisation of files
- Software used to prepare and read the data
- Procedures used for data processing, including quality control and versioning and the dates these were carried out

Ethics and Legal Compliance

How will you manage any ethical issues?

No ethical aspects exist with the research data to be generated as no personal data will be collected and no sex/gender relevant data will be generated

How will you manage copyright and Intellectual Property Rights (IPR) issues?

Once uploaded in the database Dryad, all data will be released into the public domain under the terms of a Creative Commons Zero (CC0) waiver

Storage and Backup

How will the data be stored and backed up during the research?

During the monitoring period, data will be stored on a TCD networked workstation/pc and at least on one backup hard drive, and one online secure storage system

At the end of every monitoring season, data will be uploaded on the Dryad database, providing doi versioning

Herbarium sheets will be retained and curated at the herbarium in the Botany Department at Trinity College Dublin

How will you manage access and security?

During the monitoring period, data will be maintained and backed up by the staff dedicated to the collection process. Later, data will be stored by the Dryad database and publicly accessible

Selection and Preservation

Which data are of long-term value and should be retained, shared, and/or preserved?

All data generated in every monitoring season have a long-term value and will be retained and preserved. Data may be reused for research purposes, and shared accordingly

What is the long-term preservation plan for the dataset?

The monitoring will occur yearly, and the data generated will be preserved with no time constraint by dedicated staff of Trinity College Botanic Garden

Data Sharing

How will you share the data?

Raw data will be openly accessible from the Dryad database

A summary of the data gathered each year will be visible on a dedicated page on the Trinity College Botanic Garden website

Are any restrictions on data sharing required?

No restrictions on data sharing are required

Responsibilities and Resources

Who will be responsible for data management?

Principal investigator (Prof. Jennifer McElwain) and dedicated Trinity College Botanic Garden staff members will be responsible for implementing the yearly monitoring, processing, data quality assurance, storage, backup, and upload of data. The management and maintenance of the storage system will be provided by the Dryad database. The principal researcher and data manager will be in control of required policies and agreements.

What resources will you require to deliver your plan?

All equipment and facilities will be provided by the Trinity College Botanic Garden, the Botany Department in Trinity College Dublin and the Centre for Microscopy and Analysis in Trinity College Dublin

All additional software programs are free of charge

A charge of 150 USD will be applied by Dryad, for each upload of new files. Any other related fee will be charged according to Dryad policies