



UK FLORA SEED COLLECTING
ON BEHALF OF THE
MILLENNIUM SEED BANK PARTNERSHIP,
ROYAL BOTANIC GARDENS, KEW

PROTOCOL FOR SEED COLLECTION

This Protocol has been compiled to provide information and advice for botanists proposing to participate in the Millennium Seed Bank Partnership UK collecting, including collections made for the UK Native Seed Hub at RBG Kew.

1. AIM OF SEED COLLECTING

The aim is to conserve verified and well documented wild species seed collections, each of which comprises a significant representation of the genetic variation within a sampled population. The collections are a basis for off-site conservation and, where appropriate, for introduction or recovery programmes. Material will also be available for research into seed biology, germination behaviour and other aspects of biological study and more generally used to further RBG Kew's charitable and statutory purposes.

By working with partners and volunteer collectors across the UK, RBG Kew intends to collect and maintain viable seed samples from at least one population of each UK native plant species that regularly sets storable seed. RBG Kew also aims to store samples from across the natural UK range of our native species to support a wider range of future uses. These include restoration of native plant communities through the work of the UK Native Seed Hub (UKNSH), described in Annex 3.

2. AUTHORISATION AND TRANSFER OF MATERIAL TO KEW

- **You must ensure that you have prior permission of the landowner or occupier to access and collect seed from their land.** It is important that landowners are aware of and agree with the potential use of seed so please ensure that they are supplied with a copy of the Landowner Consent & Information sheet (Annex 3), that consent is given and that you or the landowner complete the relevant boxes and sign the field data sheet (Annex 1).
- Collection from species included in Schedule 8 of the Wildlife and Countryside Act, 1981² (listed at Annex 2) requires a licence from the relevant statutory conservation agencies. Please contact RBG Kew for advice³
- Collecting within Sites of Special Scientific Interest (England, Scotland, Wales) or Areas of Special Scientific Interest (Northern Ireland) require approval from the statutory conservation agencies. RBG Kew has general consent with conditions for England, Wales and Scotland. **Landowner permission and liaison with agency manager(s) remains a requirement.** Please contact RBG Kew for advice and a copy of relevant Assent Letter³

² For Northern Ireland: Schedule 8 of the Wildlife (Northern Ireland) Order, 1985

³ See end of document for RBG Kew contact details

3. TARGETING POPULATIONS FOR COLLECTION

A preliminary visit to the site will usually be required to assess the population(s), to confirm the identification whilst the plants are in flower, and to estimate the likely harvesting date and potential seed production.

Please consider the following points before harvesting takes place:

1. Collectors should ensure that the population is of wild origin, and neither planted nor cultivated.
2. Small populations (less than 50 individuals) or those that will yield less than 1000 viable seeds should only be targeted when larger, more productive populations are not easily available. An 'ideal' collection will be from a large number of individuals and will contain between 10,000 and 20,000 seeds. Depending on the species, these quantities can be achieved in less than two 'collector-hours'. However, this is only a guide and it may not be possible to harvest these numbers, especially from threatened or scarce species.
3. It is recommended that seed maturation is monitored if possible. Seeds should be harvested as close to natural dispersal as possible to achieve maximum longevity in storage. Levels of insect or other damage within the seeds can be checked prior to collection. A cut test is the best way to assess this (see 5. Seed Collecting Methodology).

4. IDENTIFICATION

Please identify to infra-specific level where appropriate. When there is any doubt about the field identification please supply the following:

- A close-up (and ideally scaled) photograph illustrating clearly the key identification features e.g. number of stamens, leaf venation, stipule shape, etc.
- Comprehensive identification notes, entered on the field data form, with information about the presence of closely related species.
- A representative herbarium specimen (NB. not for threatened/Schedule 8 species). Ideally including flower, fruiting structure and vegetative parts. This specimen will be accessioned into the collection at RBG Kew's Herbarium. Please contact us if you need advice.

Quality photographs illustrating the plant and its habitat will be welcomed by RBG Kew as valuable reference material. Copyright is retained by the photographer (or the photographer's employer) and material will not be used in publications without permission. Please indicate whether permission is granted if photographs are sent.

Confirmation of the field identification will usually be carried out by either RBG Kew or the BSBI Referee, and nomenclature will follow the *New Flora of the British Isles Third Edition (Stace 2010)*. All material should be sent to RBG Kew in the first instance.

5. SEED COLLECTING

METHODOLOGY

RATIONALE

<p>1. If there are >1000 seeds available for collection, and seeds are large enough in size, carefully cut test a small sample (5-20) of randomly selected seeds by examining a cross section of each seed using small clippers & a hand-lens. (The small clippers on Swiss Army knives are good).</p>	<p>To estimate the frequency of empty or damaged seeds, and confirm that the majority of seeds are fully formed and mature.</p>
<p>2. Estimate the seed production per fruit or capsule, per individual, and per population.</p>	<p>To record additional information about the plant's seed biology, to better assess the seed numbers available and the influence of the collecting operation on the population.</p>
<p>3. Collect mature, dry seeds into either cloth or brown paper bags (the latter well secured with tape). Large collections can be made using plastic buckets and then transferred to bags.</p>	<p>To allow moisture to escape from the bag as seeds dry. This will ensure the highest possible post-harvest quality and will maximise the potential storage life of the collection in the seed bank.</p>
<p>4. Collect entire seed heads of awned or similar species into paper bags. Seed cleaning should be left to Seed Bank staff.</p>	<p>To enable easy removal from bag. To make maximum use of available field time and allow cleaning & preparation of material in controlled laboratory conditions.</p>
<p>5. Fleshy fruits should be collected directly into plastic bags and allowed to aerate. Contact RBG Kew as soon as possible for specific advice.</p>	<p>Fleshy fruits can decompose rapidly and delayed dispatch to the seed bank can exacerbate this problem.</p>
<p>6. Sample equally and randomly from as many plants as possible across the extent of the population, noting the number of individuals sampled (>50 individuals if available; ideally 200+).</p>	<p>To capture the widest possible genetic diversity from the plant population sampled.</p>
<p>7. Collect no more than 20% of the viable seed available on the day of collection for populations of >20 seeding individuals. Reduce sampling to less than 10% for populations of less than 20 seeding individuals (threatened taxa)</p>	<p>To ensure that the sampled population is not damaged by the seed collecting.</p>
<p>8. For non-threatened taxa with large populations - ideally collect 10-20,000 viable seeds <i>Collections of between 1000 and 5000 seeds are valuable, although distribution opportunities will be limited.</i> <i>Collections of less than 1000 seeds, made using the above methods, are valuable only when more productive populations are not available for sampling.</i></p>	<p>To enable maximum use of the collection, ensuring: i) sufficient seed is available for initial germination and viability testing ii) viability monitoring can be undertaken for many decades iii) a substantial sample can be conserved as a long-term safeguard against loss of the wild population, and as a resource for ecological, genetic, botanical study or restoration.</p>
<p>9. Where a population is very small (less than 20 seeding individuals) seed from each mother plant should be put in separate envelopes and labelled separately (e.g. <i>SM 3a, 3b, etc.</i>) and please indicate on the field data form.</p>	<p>To ensure that the full genetic diversity of particularly vulnerable plant populations can be successfully released at a later date.</p>
<p>10. You may be requested to carry out individual harvesting (described at 9 above) in addition to random and even sampling from across the whole population, particularly for rare, Schedule 8 or nationally scarce species.</p>	<p>To ensure (in addition to the benefits of general sampling): i) that the full genetic diversity of the populations can be successfully released at a later date ii) that material is available for studies of genetic variation between individuals of the same species.</p>

6. FIELD DOCUMENTATION

Record information for each collection using the field data form at Annex 1. The data fields in bold text are the priority for completion, and further data make the collection more valuable for conservation and subsequent use. Please assign collection numbers, using your initials and a number (consecutive for separate collections) and label your collection, herbarium specimen and any associated material with this number.

Please sketch the location of particularly elusive populations and attach to the field data form. This will assist in locating the populations in the future.

In the case of rare, Schedule 8 or nationally scarce species, RBG Kew will ensure that a copy of the form is also made available to the statutory conservation agencies.

7. COLLECTIONS FROM REGENERATED PLANTS

If collections are made from cultivated populations of native species, ie. from an ex-situ collection or garden, please complete the details for the progeny on the reverse of the field data form and provide as much information about the original *wild* population as you can on the front of the sheet.

8. CARE OF SEED COLLECTIONS AFTER HARVESTING

It is critical to the successful conservation of the seed that it is dispatched to the seed bank within a few days of collection, together with the completed field data forms, using the Freepost address below. Voucher specimens, photos and any other additional information may be sent at the same time or at a later date quoting the collector's name and the number given to the seed collection.

In general, keep the seed collections in a cool, dry place prior to dispatch but please do not refrigerate or freeze them. RBG Kew processing staff will be responsible for cleaning the collections on arrival at the seed bank.

Damp collections should, as soon as possible after harvest, be spread out on newspaper to dry naturally, either outside in the shade or in a well-ventilated room, before dispatch.

Fleshy fruits may require careful handling, partial cleaning and rapid dispatch to the seed bank: contact the MSB as soon as possible for advice.

Seed bags should be clearly labelled with the collection number and species name and then securely packaged for posting to RBG Kew. **Please contact the UK Coordinator (details below) for supplies** of bags, data sheets, envelopes etc. Some delicate seed collections may need protection by a layer of cardboard or 'bubble plastic' to avoid the possibility of damage in transit.

9. CONTACT DETAILS:

For enquiries, correspondence & collecting supplies:

Stephanie Miles
UK Collections Coordinator
Millennium Seed Bank Partnership
Royal Botanic Gardens, Kew
Wakehurst Place, Ardingly,
West Sussex
RH17 6TN

Tel: (01444) 894129

Fax: (01444) 894110

Email: s.miles@kew.org

To dispatch seed collections, herbarium specimens, photos:

Freepost RSUS-AZAL-JSUH
Millennium Seed Bank Partnership
Wakehurst Place
Selsfield Road
Ardingly
HAYWARDS HEATH
RH17 6TN
For the Attn of S.Miles

ANNEXES TO PROTOCOL

- | | |
|---------|---|
| Annex 1 | UK Field Data Form |
| Annex 2 | Plants included in Schedule 8 of the Wildlife & Countryside Act, 1981 and the Wildlife (Northern Ireland) Order 1985 (<i>correct at March 2012</i>) |
| Annex 3 | Landowner Consent & Information sheet |
| Annex 4 | Health & Safety advice |

MSB UK FIELD DATA FORM

(**Bold type = minimum information required**)

Date Collected	<input type="text"/>	Collection no.	<input type="text"/>
Collector(s) Incl. organisation	<input type="text"/>		

Material Collected SEED TISSUE SAMPLE HERBARIUM SPECIMEN

SITE DATA
County
Local Situation

Latitude	<input type="text"/>	<input type="text"/>	<input type="text"/>
Longitude	<input type="text"/>		
Altitude (m)	<input type="text"/>	<i>Please circle: GPS/Google Earth/map used?</i>	

Landowner Name and contact details (if not provided on consent form):

HAS THE LANDOWNER/OCCUPIER RECEIVED THE CONSENT & INFORMATION SHEET? YES

HOW HAS CONSENT BEEN PROVIDED BY LANDOWNER/OCCUPIER? (please tick):
 VERBAL BY EMAIL OR OTHER WRITTEN RECORD

HABITAT DATA
Habitat description & associated species (NVC if known)

Modifying Factors ~~ss~~, grazing, burnt:

Land form	<input type="text"/>	Slope° & Aspect	<input type="text"/>
Land use	<input type="text"/>	Soil texture, pH	<input type="text"/>
Geology	<input type="text"/>	Drainage	<input type="text"/>

IDENTIFICATION DATA

Family	<input type="text"/>
Genus	<input type="text"/>
Species	<input type="text"/>
Infra-specific	<input type="text"/>
Identified by & Organisation	<input type="text"/>
Material identified & Date	<i>Wild living plant/herbarium specimen</i>

Schedule 8 species? Y N If yes, in whose name is the licence held

SAMPLING DATA

No. of Plants Sampled

Area sampled (sq.m):

No. of Plants Found:

% population producing seed:

Seed harvesting: (early, mid, late season)/ Seeds Collected from (plants, ground, both)/ State of seeds (moist, dry, both)

DESCRIPTION

Plant Habit: Tree

Shrub

Erect herb

Creeping herb

Climbing herb

Plant Height (m)

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Other descriptors (ie. characteristics used to ID the plant & details that may be lost on a herbarium specimen, aroma, flower colour, etc):

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I, the seed collector, hereby donate this material and associated data to Kew. I confirm this plant material was collected in accordance with all applicable law, including securing consent from the landowner or occupier for collections to be used as outlined in the Landowner Consent & Information Sheet.

Signed:

Print Name:

Date:

Please complete for REGENERATED MATERIAL:

Progeny Collection No:	
Date first harvested:	
Date last harvested:	
Progeny collector & Organisation:	
Donor Organisation (if different from above):	
Where regenerated:	
Progeny habitat/conditions:	
Isolation technique (if any):	
Relation to wild population (ie. generation1)	
Number of plants regenerated:	
Number of plants harvested:	

ANNEX 2

Plants included in Schedule 8 of the Wildlife & Countryside Act 1981 (JNCC October 2011)

Ajuga chamaepitys	Gentianella ciliata	Saxifraga cernua
Alisma gramineum	Gentianella uliginosa	Saxifraga cespitosa
Allium sphaerocephalon	Gladiolus illyricus	Saxifraga hirculus
Althaea hirsuta	Gnaphalium luteoalbum	Schoenoplectus triqueteter
Alyssum alyssoides	Hieracium attenuatifolium	Scleranthus perennis
Apium repens	Hieracium northroense	Scorzonera humilis
Arabis alpina	Hieracium zetlandicum	Selinum carvifolia
Arabis scabra	Himantoglossum hircinum	Senecio paludosus
Arenaria norvegica	Homogyne alpina	Stachys alpina
Artemisia campestris	Hyacinthoides non-scripta	Stachys germanica
Atriplex pedunculata	Lactuca saligna	Tephrosia integrifolia subsp. maritima
Bupleurum baldense	Leersia oryzoides	Teucrium botrys
Bupleurum falcatum	Limosella australis	Teucrium scordium
Carex depauperata	Liparis loeselii	Veronica spicata
Centaurium tenuiflorum	Lloydia serotina	Veronica triphylos
Cephalanthera rubra	Luronium natans	Viola persicifolia
Chenopodium vulvaria	Lychnis alpina	
Cicerbita alpina	Lythrum hyssopifolia	
Clinopodium menthifolium	Melampyrum arvense	
Coincya wrightii	Mentha pulegium	
Corrigiola litoralis	Microthlaspi perfoliatum	
Cotoneaster cambricus	Minuartia stricta	
Crassula aquatica	Najas flexilis	
Crepis foetida	Najas marina	
Cynoglossum germanicum	Ononis reclinata	
Cyperus fuscus	Ophrys fuciflora	
Cypripedium calceolus	Ophrys sphegodes	
Dactylorhiza traunsteinerioides subsp.	Orchis militaris	
Damasonium alisma	Orchis simia	
Dianthus armeria	Orobanche caryophyllacea	
Dianthus gratianopolitanus	Orobanche picridis	
Diapensia lapponica	Orobanche reticulata	
Eleocharis parvula	Petrorhagia nanteuillii	
Epipactis youngiana	Phyllodoce caerulea	
Epipogium aphyllum	Phyteuma spicatum	
Erigeron borealis	Polygonatum verticillatum	
Eriophorum gracile	Polygonum maritimum	
Eryngium campestre	Potentilla rupestris	
Filago lutescens	Pulicaria vulgaris	
Filago pyramidata	Pyrus cordata	
Fumaria reuteri	Ranunculus ophioglossifolius	
Gagea bohémica	Rhinanthus angustifolius	
Gentiana nivalis	Romulea columnae	
Gentiana verna	Rumex rupestris	
Gentianella anglica	Salvia pratensis	

Plants included in Schedule 8 of the Wildlife (Northern Ireland) Order 1985 (JNCC October 2011)

Adoxa moschatellina	Stachys officinalis
Ajuga pyramidalis	Teesdalia nudicaulis
Andromeda polifolia	Trollius europaeus
Calamagrostis stricta	Viola persicifolia
Carex magellanica	
Carex pauciflora	
Centaurium littorale	
Cirsium heterophyllum	
Dactylorhiza traunsteinerioides	
Dryas octopetala	
Elatine hydropiper	
Eleocharis parvula	
Epipactis palustris	
Epipactis phyllanthes	
Erica vagans	
Erigeron acer	
Frangula alnus	
Geranium sylvaticum	
Hammarbya paludosa	
Hierochloe odorata	
Hordelymus europaeus	
Hottonia palustris	
Hypochaeris glabra	
Lathyrus palustris	
Limonium binervosum	
Limosella aquatica	
Melampyrum sylvaticum	
Mentha pulegium	
Mertensia maritima	
Monotropa hypopitys	
Neottia nidus-avis	
Ophrys apifera	
Orchis morio	
Orobanche hederæ	
Orthilia secunda	
Primula veris	
Primula vulgaris	
Pseudorchis albida	
Ranunculus fluitans	
Rubus chamaemorus	
Saussurea alpina	
Saxifraga aizoides	
Saxifraga oppositifolia	
Silene acaulis	
Sisyrinchium bermudiana	
Spiranthes romanzoffiana	

ANNEX 3



UK LANDOWNER'S/OCCUPIER'S CONSENT TO THE COLLECTION AND USE OF PLANT MATERIAL BY THE ROYAL BOTANIC GARDENS, KEW

The Royal Botanic Gardens, Kew is seeking your permission to enter land in order to collect seed and other related plant material (including data and images).

This document explains the uses that may be made of such plant material. If the landowner does not place any express restrictions on these uses, then access to the plant material shall have been granted on the basis that Kew may use it as set out below.

Plant material shall be accessioned into the Kew collections at ~~Wakehurst Place, Ardingly~~, West Sussex, or at Kew, Richmond Surrey, as appropriate.

Kew shall use the plant material in furtherance of its charitable purposes. Plant material may be:

- (a) Made available for scientific study to Kew staff and authorised visitors; and/or
- (b) Used for the common good in the areas of education, conservation and public display; and/or
- (c) Sampled for pollen, spores, DNA, anatomical or cytological preparations and/or chemicals for scientific research purposes; and/or
- (d) Sent on loan, supplied, or further distributed for the purposes of scientific research, conservation or horticulture; and/or
- (e) Digitally imaged and published in botanical databases freely available on the internet.

For further information please see overleaf.

CONSENT

I consent to the collection of plant material from the site specified and its transfer to the Royal Botanic Gardens, Kew for use/supply as outlined above.

I have the authority to give this consent, being either the owner/occupier or person authorised on their behalf.

Signed..... Date.....

Name.....

Site name and address:

Organisation (if appropriate).....

Contact details.....

.....

Information for Landowners and Occupiers

Use of Plant Material by the Royal Botanic Gardens, Kew

Species rich habitats in the UK have been destroyed, degraded and fragmented at an alarming rate. Many also now face pressures from climate change and invasive pest and diseases. In response, the government and conservation agencies plan to work together to expand and link surviving habitats, into a resilient ecological network. Achieving this vision will depend on the availability of a diverse range of high quality, UK native-origin seed for research and conservation activities.

With the co-operation and support of landowners and volunteers, the Royal Botanic Gardens, Kew is working to increase the diversity of UK native plant species that are collected, seed banked and made available for wider use. This is currently achieved through our UK Flora Project, the UK National Tree Seed Project, and the UK Native Seed Hub. Seed is collected both by Kew's own staff and by partner organisations. It is then processed and stored at Kew's Millennium Seed Bank (MSB), which already stores seed from over 30,000 plant species from across the globe.

This priceless collection will serve as a back-up in case these species are lost in the landscape. But it will also provide seed material for current research needs such as testing for disease resistance increasing our understanding of the biology and ecology of UK plant species.

In the case of our most rare and threatened flora, we work closely with government agencies and carefully selected, appropriate partners on *bona fide* conservation and re-introduction projects.

In other cases, by using our seed collections and associated seed production beds at the Millennium Seed Bank at Wakehurst Place, our UK Native Seed Hub can provide seed and plants to appropriate, responsible, partners wishing to grow and use native species. The aim is to make an effective and genuine contribution to the conservation and restoration of biodiversity in the UK. Material is supplied under licence on a cost recovery basis, with use restricted to sites where there is a high probability that the material will be able to form sustainable reintroduced populations whilst posing minimal risks to local habitats, species or ecotypes.

Our expertise in collecting, storage, germination and propagation of the UK native flora is shared through publications, partnership working and training events.

In order to complete such ambitious work, Kew welcomes and acknowledges the support of landowners in providing access to collection sites and plant material.

Kew is incorporated in the United Kingdom by the National Heritage Act 1983 and is an exempt charity whose scientific vision is to document and understand global plant and fungal diversity and its uses, bringing authoritative expertise to bear on the critical challenges facing humanity today. Kew is supported by the United Kingdom Department for Environment, Food and Rural Affairs ("Defra"), which is ultimately responsible to Parliament for Kew's key aims and activities.

Further information is available from UK Programme Co-ordinator, Clare Trivedi c.trivedi@kew.org

On the web via www.kew.org



ANNEX 4



Health and Safety Guidance notes for MSB field work in the UK

Most people undertaking seed collecting work for the Millennium Seed Bank Partnership will be familiar with the hazards of working outdoors, many of which can be avoided through common sense. It is, however, perhaps worth highlighting the following potential problems which may affect seed collectors.

Always make sure that you wear appropriate clothing (including suitable footwear for the terrain, water-proofs and a hat). Maps, a GPS receiver (incl. spare batteries), compass and altimeter can help you navigate safely in your collecting area.

Take a mobile phone (in areas without signal a two-way radio), appropriate first aid kit, sun protection, insect repellent, water bottles (for cold locations a hot water flask) and where applicable a spare set of vehicle keys with you.

During the planning of your collecting trip, check whether you have comprehensive insurance cover and what the local conditions are likely to be (weather forecast – e.g. floods, thunderstorms). Is the terrain likely to cause any potential problems (e.g., walking on steep slopes or along cliff edges)?

If you are going as a group, it is advisable to check whether any of the group members has got any underlying health issues (such as a history of angina, severe allergies, or diabetes) and whether any of the group members is a trained first aider.

Phytophotodermatitis

Many species of plant, particularly umbellifers, contain sap which can be irritating to the skin. If you are particularly prone to skin problems, or if you are unsure about the effects of a particular species, it is advisable to wear gloves when collecting.

Lyme Disease

<http://www.nhs.uk/conditions/lyme-disease/pages/introduction.aspx>

This infection can be transmitted to humans by the bite of a female tick. Although the majority of tick bites will be completely harmless, it is worth taking precautions in areas where the disease is known to occur. To prevent bites wear long trousers tucked into socks or wellingtons, and shirts or jackets with long sleeves and cuffs.

Leptospirosis (Weil's Disease)

<http://www.nhs.uk/conditions/Leptospirosis/Pages/Introduction.aspx>

This disease is spread in the urine of rats and cattle and therefore is most common in areas where these animals are found. The infection enters the body through cuts and abrasions or through the mucus membranes of the nose and mouth. It is common in rivers, ditches, canals and on farms. The risk of infection can be greatly reduced by covering all skin abrasions, taking particular care to wash the hands with soap and water, and avoiding touching the eyes, nose or mouth.

Lone Working

Lone working in the field is highly inadvisable. If this cannot be avoided, take a mobile phone with you and be sure to let someone know exactly where you are going and when you expect to be back.

Please note: RBG Kew does not provide insurance cover for any of the activities of non-staff or volunteers and RBG Kew is not and shall not be responsible or liable for any injury or damage to property arising out of or in connection with collecting-related activities.