

BOTANIC GARDEN  
CREATION AND MANAGEMENT:  
THE FEASIBILITY AND DESIGN OF  
NEW BRITISH COLLECTIONS  
[On-line Edition]

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PhD Thesis  
University of Reading  
School of Plant Sciences  
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June 2005

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Abstract

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# BOTANICAL COLLECTIONS SURVEY

James Furse-Roberts Dip. Hort. Kew, MSc  
Akeley Wood Farmhouse, Lillingstone Dayrell, Buckingham, MK18 5AW  
jfurseroberts@botanics.org.uk

«Title» «Initials» «Surname»  
«Position»  
«Company»  
«Address»  
«Postcode»

Monday 28<sup>th</sup> July 2003

Dear «Title» «Surname»,

## **PhD research in conjunction with the University of Reading**

I am writing to you because, as «Position» of a botanical collection, you can help me with my research work – **the aim of which is to gain a better understanding of the different roles of botanical collections, their structure and how they are managed.**

I would be very grateful if you could spare 15 minutes to complete the enclosed survey form, I have also included a SAE with which to return it when completed. Obviously I would prefer accurate answers but if this is not possible then an approximation is preferable to not answering the question at all. If for any reason you would like any part of this survey to remain confidential then please circle the relevant question numbers.

This survey is being sent to only 80 botanical collections throughout Britain and Ireland, therefore, in order for me to obtain meaningful results, it is important that as many completed surveys as possible are returned.

I look forward to receiving your responses.

Yours sincerely,

James Furse-Roberts

# BOTANICAL COLLECTIONS SURVEY

James Furse-Roberts Dip. Hort. Kew, MSc  
Akeley Wood Farmhouse, Lillingstone Dayrell, Buckingham, MK18 5AW  
jfurseroberts@botanics.org.uk

Mr P. Baxter  
Curator  
Younger Botanic Garden,  
Benmore  
Dunoon  
Argyll  
PA23 8QU

Monday 11<sup>th</sup> August 2003

Dear Mr Baxter,

## **PhD research in conjunction with the University of Reading**

A couple of weeks ago I sent you a survey because, as Curator of a botanical collection, I was hoping you could help me with my research work – **the aim of which is to gain a better understanding of the different roles of botanical collections, their structure and how they are managed.**

I understand that it is a busy time of year but I would be very grateful if you could spare 15 minutes to complete the enclosed survey form, as a reply from Younger Botanic Garden, Benmore would really help me. If you have recently completed and returned the previous copy I sent you then please accept my thanks and disregard this letter.

This survey is being sent to only 80 botanical collections throughout Britain and Ireland, therefore, in order for me to obtain meaningful results, it is important that as many completed surveys as possible are returned.

I look forward to receiving your response.

Yours sincerely,

James Furse-Roberts

Dear «Title» «Surname»,

Thank you for taking the time to complete and return the botanical collections survey that I recently sent you. The responses so far have been very interesting and, once I have collated the data, I hope to publish some of the results for all to share.

Many thanks,

James Furse-Roberts  
[jfurseroberts@botanics.org.uk](mailto:jfurseroberts@botanics.org.uk)

# BOTANICAL COLLECTIONS SURVEY

## About You

Your Name

Your Position

Your E-mail Address

## About Your Garden

Your Gardens Name

Address

Postcode

1 What is the total area of your garden?

\_\_\_\_\_ Acres **or** \_\_\_\_\_ Hectares **or** \_\_\_\_\_ m<sup>2</sup>

2 What size are the following areas within your garden?

Arboretum                    \_\_\_\_\_ Acres **or** \_\_\_\_\_ Hectares **or** \_\_\_\_\_ m<sup>2</sup> **or** \_\_\_\_\_ %

Nursery/Service Area    \_\_\_\_\_ Acres **or** \_\_\_\_\_ Hectares **or** \_\_\_\_\_ m<sup>2</sup> **or** \_\_\_\_\_ %

Public Glass Houses      \_\_\_\_\_ Acres **or** \_\_\_\_\_ Hectares **or** \_\_\_\_\_ m<sup>2</sup> **or** \_\_\_\_\_ %

Conservation Area        \_\_\_\_\_ Acres **or** \_\_\_\_\_ Hectares **or** \_\_\_\_\_ m<sup>2</sup> **or** \_\_\_\_\_ %

Lakes/Ponds                \_\_\_\_\_ Acres **or** \_\_\_\_\_ Hectares **or** \_\_\_\_\_ m<sup>2</sup> **or** \_\_\_\_\_ %

Systematic Order Beds    \_\_\_\_\_ Acres **or** \_\_\_\_\_ Hectares **or** \_\_\_\_\_ m<sup>2</sup> **or** \_\_\_\_\_ %

Other Outside Collections \_\_\_\_\_ Acres **or** \_\_\_\_\_ Hectares **or** \_\_\_\_\_ m<sup>2</sup> **or** \_\_\_\_\_ %

3 In your *living* collection what is the... (please give answers for both)

Total number of species you hold

Total number of accessions you hold

4 Roughly, what percentage of the plants in your garden have records associated with them, i.e. are accessioned?

\_\_\_\_\_ % of the plants are accessioned

5 How much of your living collection is presently being used for research?

No. of species  
or percentage %

6 How much of your living collection is presently part of a conservation programme?

No. of species  
or percentage %

7 How much of your living collection is wild collected?

No. of species  
or percentage %

8 Approximately how many British native species do you hold?

No. of species  
No. of accessions

9 What is the purpose of your garden?

10 Which of the following activities is your garden involved in?

- |                                  |                          |
|----------------------------------|--------------------------|
| Recreation                       | <input type="checkbox"/> |
| Private Functions                | <input type="checkbox"/> |
| As a Genetic Reserve             | <input type="checkbox"/> |
| Ex-situ Conservation             | <input type="checkbox"/> |
| In-situ Conservation             | <input type="checkbox"/> |
| Education of school children     | <input type="checkbox"/> |
| Education of university students | <input type="checkbox"/> |
| Education of the general public  | <input type="checkbox"/> |
| Research                         | <input type="checkbox"/> |
| Supply of Plant Material         | <input type="checkbox"/> |
| Horticultural Trials             | <input type="checkbox"/> |
| Other (Please state)             |                          |

11 If you stated that education is one of your gardens aims, what messages are you trying to get across?

12 Which of the following techniques does your garden use to put across its educational message to visitors? Please tick as many boxes as are appropriate.

Guidebook   
Information Leaflets   
Plant Labels

Display Boards   
Video/Film   
Audio Tours

Guided Tours   
Computer Information Terminals   
Interactive Displays

Educational Staff   
Dedicated Laboratory/Workspace   
Educational Website   
Other (Please specify)

13 Which of the following groups of people use your collection?

General Public   
School Groups   
University Students   
Your own research staff   
Research staff from other organisations

14 Approximately how many people visit your garden each *year*?  
Total visitors/year

15 Approximately what is the maximum number of visitors your garden could accommodate?

About Your Staff

**16** How many staff do you employ in each of the following areas?

- Horticultural Staff
- Visitor Services (Cafes, shops etc.)
- Research (Herbariums/laboratories etc.)
- Education
- Guides
- Administration
- Other (please state)

Of your Horticultural staff how many work in the following areas?

- Arboretum
- Public Glass Houses
- Conservation
- Nurseries
- Please tick here if your staff are not split in to departments

**17** If your garden uses guides to show visitors around how many of your visitors take a guided tour?

No. of Visitors per year

**18** Does your garden make use of volunteers?      Yes/No

If Yes, how many man hours per week do they contribute to your garden?

Man hrs per week

**19** In which of the following areas do your volunteers work?

- |                      |                          |                                |                          |
|----------------------|--------------------------|--------------------------------|--------------------------|
| Ticket Sales         | <input type="checkbox"/> | Herbarium/Library Management   | <input type="checkbox"/> |
| Retail Outlet        | <input type="checkbox"/> | Research Work                  | <input type="checkbox"/> |
| Catering             | <input type="checkbox"/> | Administration                 | <input type="checkbox"/> |
| Garden Tours         | <input type="checkbox"/> | Fund Raising                   | <input type="checkbox"/> |
| Teaching             | <input type="checkbox"/> | Legal Services                 | <input type="checkbox"/> |
| Seed Cleaning        | <input type="checkbox"/> | Accountancy                    | <input type="checkbox"/> |
| Seed Collection      | <input type="checkbox"/> | Editing gardens publications   | <input type="checkbox"/> |
| Horticultural Duties | <input type="checkbox"/> | Publicity and Public Relations | <input type="checkbox"/> |
| Plant Record Keeping | <input type="checkbox"/> | Other (Please state)           |                          |

About the management of your garden

20 What is the annual budget for your garden? £ \_\_\_\_\_

How is your annual budget divided amongst the following areas? (£ or %)

Staff Salaries

Horticulture

Glass Houses

Arboretum

Outside collections

Conservation Areas

Education

Research

Advertising/PR

Visitor Services

Other

21 Where does your garden get the majority of its funding?

22 How much income does your garden get from the following areas? (£ or %)

Government Funding \_\_\_\_\_

Town Council \_\_\_\_\_

Entrance Charges \_\_\_\_\_

Friends Groups \_\_\_\_\_

State Funding \_\_\_\_\_

Research Grants \_\_\_\_\_

Endowment Fund \_\_\_\_\_

Private Sponsorship \_\_\_\_\_

Corporate Sponsorship \_\_\_\_\_

Lottery Funding \_\_\_\_\_

Product Sales \_\_\_\_\_

Event Hosting \_\_\_\_\_

Funding from an Affiliated Organisation \_\_\_\_\_

If you get funding from an affiliated organisation, such as a university if you are a university botanic garden, what does that organisation do?

Why do they support your garden?

- 23 Which method of plant display in your garden requires the **least** amount of resources e.g. man-hours or annual budget?
- 24 Which method of plant display in your garden requires the **most** amount of resources e.g. man-hours or annual budget?

### About Botanical Collections in General

- 25 Which of the following statements do you think the best describes the condition of botanical collections in Britain–
- Declining Rapidly
- Declining Slowly
- Stable
- Improving Slowly
- Improving Rapidly

What do you think are the reasons for this?

# Thank You

Thank you for taking the time to complete this survey. I look forward to receiving your answers.



James Furse-Roberts  
Akeley Wood Farmhouse, Lillingstone Dayrell  
Buckingham, Mk18 5AW

[jfuseroberts@botanics.org.uk](mailto:jfuseroberts@botanics.org.uk)

## Appendix 1.2

### Headteacher Survey Questionnaires and Correspondence

- Cover letter
- Follow-up postcard
- Survey

## Cover Letter Sent with Headteacher Survey

«Title» «Initials» «Surname»  
«Position»  
«Company»  
«Address»  
«Postcode»

4<sup>th</sup> November

Dear «Title» «Surname»

On a landfill site just outside Castle Cary, Carymoor Environmental Centre and The University of Reading are working together to create a Somerset plant collection. During the last century only a small number of plant collections have been created, the result of this is that the majority are trying to offer 21<sup>st</sup> century educational services from gardens designed during the 19<sup>th</sup> century. As our collection and garden will be built from scratch we have the wonderful opportunity to design it to meet your needs.

To help me establish what you would want and expect from a plant collection I have decided to seek the opinion of a select few schools within our area. As a «Position» of one of these schools I would greatly value your comments on this topic. To make this easier for you I have compiled a few questions that I would appreciate your feedback on (Entitled: Headteachers Views on Educational Trips). In addition to this I have enclosed three other forms (Entitled: Teachers Views on Plants in the Classroom), I would be grateful if you could pass these on to primarily members of your staff who use plant material for education or, if there are none, staff who are involved with organising school trips. A stamped addressed envelope accompanies each form to aid their swift return when completed.

I would like to assure you that although your name and the address of your school is requested this is only to aid my interpretation of the results and to keep you informed of the developments of this project if you desire. This part of the data will not be available to any third party.

I would be more than happy to answer any questions you might have and would like to thank you in advance for your time and assistance.

Yours sincerely,



James Furse-Roberts

## Follow-up Postcard Sent to Headteachers

Last week I sent you a questionnaire seeking your views on educational trips and a number of surveys to be distributed to your staff.

If you have completed and returned these questionnaires then please accept my sincere thanks for your time and effort. If you have not yet returned it please do so today. These questionnaires have only been sent to a select number of schools and as result I need as many of the questionnaires returned as possible.

If by some chance you did not receive the questionnaire please call 01963 350143 and I will send you another one.

Yours sincerely,

A handwritten signature in black ink that reads "James Furse-Roberts". The signature is written in a cursive style with a large initial 'J'.

James Furse-Roberts  
Carymoor Environmental Center

# HEADTEACHERS' VIEWS on EDUCATIONAL TRIPS

In Partnership With



**The University of Reading**





2

On average, how many times a year does a student at your school get taken on an educational day trip?

\_\_\_\_\_ times per year

3

Would you like to increase the average number of educational trips each student in your school goes on? (*Delete as appropriate*)

Yes / No

If Yes, which of the following statements summarise what is preventing you from increasing the number of visits? (*Please tick as many as you feel are applicable*)

Due to the pressures of completing the curriculum there is not enough time.

The curriculum is structured in such a way as to make it difficult to include trips within it.

Your school can't spare enough staff to take the trip.

The people who would be taking the trip feel that they wouldn't know enough about the place being visited to make the trip worthwhile.

You have not been approached by staff wanting to take trips.

Within your area there are no locations for your students to visit.

Those locations that are within your area are not suitable because they can't cope with the number of students you would want to take.

The locations are not suitable because they lack certain essential facilities. *Please state what is lacking*

They are not suitable because they do not cover the right topics.   
Please state which topics are not covered

Financial reasons-

Entrance charge in to place of visit is too high.

Transport costs are too high.

Cost of providing the required staff is too high.

Other (*Please state*)

4

On what days of the week do you prefer that educational trips be held?  
*Please tick as many boxes as are appropriate.*

- |           |                          |
|-----------|--------------------------|
| Monday    | <input type="checkbox"/> |
| Tuesday   | <input type="checkbox"/> |
| Wednesday | <input type="checkbox"/> |
| Thursday  | <input type="checkbox"/> |
| Friday    | <input type="checkbox"/> |
| Saturday  | <input type="checkbox"/> |
| Sunday    | <input type="checkbox"/> |

5

What times of year do you prefer educational trips to be held?  
*Please tick as many boxes as are applicable.*

- |          |                          |           |                          |
|----------|--------------------------|-----------|--------------------------|
| January  | <input type="checkbox"/> | July      | <input type="checkbox"/> |
| February | <input type="checkbox"/> | August    | <input type="checkbox"/> |
| March    | <input type="checkbox"/> | September | <input type="checkbox"/> |
| April    | <input type="checkbox"/> | October   | <input type="checkbox"/> |
| May      | <input type="checkbox"/> | November  | <input type="checkbox"/> |
| June     | <input type="checkbox"/> | December  | <input type="checkbox"/> |

6

Do you think that a Botanic Garden could play a valid role in the education of students at your school?

Yes / No

Do you think that a nature reserve could play a valid role in the education of students at your school?

Yes / No

7

How often does a student at your school get taken on trip to a Botanic Garden?

- |                       |                          |
|-----------------------|--------------------------|
| Never                 | <input type="checkbox"/> |
| Less than once a Year | <input type="checkbox"/> |
| Once a Year           | <input type="checkbox"/> |
| Twice a Year          | <input type="checkbox"/> |
| Once a Term           | <input type="checkbox"/> |
| More than once a Term | <input type="checkbox"/> |

Would you like to increase the average number of trips to a Botanic Garden each student in your school goes on? (*Delete as appropriate*)

Yes / No

If Yes, which of the following statements summarise what is preventing you from increasing the number of trips to a Botanic Garden? (*Please tick as many as you feel are applicable*)

The curriculum is structured in such a way as to make it difficult to include a trip to a Botanic Garden.

The people who would be taking the trip feel that they wouldn't know enough about the Botanic Garden being visited to make the trip worthwhile.

You have not been approached by staff wanting to take a trip to a Botanic Garden.

There is not a Botanic Garden close enough to visit.

Botanic Gardens within your area are not suitable because they can't cope with the number of students you would want to take.

Botanic Gardens within your area are not suitable because they lack certain essential facilities. *Please state what is lacking*

The Botanic Gardens within your area are not suitable because they do not cover the right topics. *Please state which topics are not covered*

Entrance charge to the Botanic Garden is too high.

Other (*Please state*)

Thank you very much for taking the time to fill in this questionnaire.  
If you have any comments you wish to make please feel free to write them  
below. Once you have completed the form please return it to me as soon as  
possible in the envelope provided.

Thank You

James Furse-Roberts  
Carymoor Environmental Centre  
Dimmer Lane  
Castle Cary  
Somerset  
BA7 7NR  
Tel & Fax: 01963 350143  
E-mail: [enquiries@Carymoor.org.uk](mailto:enquiries@Carymoor.org.uk)

## Appendix 1.3

### Teacher Survey Questionnaires and Correspondence

- Cover letter
- Survey

## Cover Letter Sent with Teacher Survey

On a landfill site just outside Castle Cary, Carymoor Environmental Centre and The University of Reading are working together to create a Somerset plant collection. During the last century only a small number of plant collections have been created, the result of this is that the majority are trying to offer 21<sup>st</sup> century educational services from gardens designed during the 19<sup>th</sup> century. As our collection and garden will be built from scratch we have the wonderful opportunity to design it to meet your needs.

Your headmaster is helping me establish what your school would want and expect from a plant collection. To do this your headmaster has completed a questionnaire and selected you to help me by filling in the form marked "Teachers' View on Plants in the Classroom". A stamped addressed envelope accompanies each form to aid their swift return when completed.

I would like to assure you that although your name and the address of your school is requested this is only to aid my interpretation of the results and to keep you informed of the developments of this project if you desire. This part of the data will not be available to any third party.

I would be more than happy to answer any questions you might have and would like to thank you in advance for your time and assistance.

Yours sincerely,

A handwritten signature in black ink that reads "James Furse-Roberts". The signature is written in a cursive style with a large initial 'J' and a long horizontal stroke for the 's' in 'Furse'.

James Furse-Roberts

TEACHERS' VIEWS  
on  
PLANTS IN THE CLASSROOM

In Partnership With



**The University of Reading**



Title	First Name	Surname
Your Position		
School Name		
Address		
Postcode		
Tel	E-mail Address	

1

At what level or levels of education do you teach?

*Please tick as many as are appropriate.*

- |                            |                          |
|----------------------------|--------------------------|
| Key Stage 1- ages 5 to 7   | <input type="checkbox"/> |
| Key Stage 2- ages 7 to 11  | <input type="checkbox"/> |
| Key Stage 3- ages 11 to 14 | <input type="checkbox"/> |
| Key Stage 4- ages 14 to 16 | <input type="checkbox"/> |
| GCSE Students              | <input type="checkbox"/> |
| A-Level Students           | <input type="checkbox"/> |
| Degree Students            | <input type="checkbox"/> |
| Professionals              | <input type="checkbox"/> |
| Adult Education            | <input type="checkbox"/> |

What subjects do you teach?

- |   |                          |
|---|--------------------------|
| Biology                                   | <input type="checkbox"/> |
| Chemistry                                 | <input type="checkbox"/> |
| Physics                                   | <input type="checkbox"/> |
| Geology                                   | <input type="checkbox"/> |
| English                                   | <input type="checkbox"/> |
| Languages (e.g. French)                   | <input type="checkbox"/> |
| Maths                                     | <input type="checkbox"/> |
| Geography                                 | <input type="checkbox"/> |
| History                                   | <input type="checkbox"/> |
| Art                                       | <input type="checkbox"/> |
| Design & Technology (C.D.T. / D.T.)       | <input type="checkbox"/> |
| Information Technology (I.T. / Computing) | <input type="checkbox"/> |
| Religious Studies                         | <input type="checkbox"/> |
| Other (Please state)                      | <input type="checkbox"/> |
-

2

Do you use plant material for education?

Yes / No

If Yes, which of the following types of material do you use-  
*Please tick as many boxes as are appropriate.*

- Living plants that are kept alive for an educational purpose  
(e.g. A Cactus for demonstrating adaptation)
- Living plants that are destroyed for an educational purpose  
(e.g. Whole Lettuce dehydrated to measure water content)
- Parts of plants removed without killing plant  
(e.g. Leaves removed to test for starch)
- Dried plants and plant parts  
(e.g. Seeds, Cones, Herbarium specimens)

3

If your school uses plant material for education which of the following sources  
does your school use to obtain its plant material?

*Please tick as many boxes as are appropriate.*

- School uses its own facilities to grow the plant material
- Plant material sourced from school grounds
- Plant material bought from a florist
- Plant material bought from a garden centre
- Plant material bought from another source
- Please state
  
- Plant material sourced from elsewhere
- Please state

Which of the following do you or your colleagues use for educational  
purposes?

- Nature Reserve
- Living Plant Collection  
(e.g. Botanic Garden)
- Herbarium
- Spirit Collection
- Seed Library
- Plant Image Library

5

How often do you visit a botanic garden to use their facilities as part of your work?

- Never
- Less than once a Year
- Once a Year
- Twice a Year
- Once a Term
- More than once a Term

6

Do you think that a Botanic Garden could play a valid role in the education of students at your school?

Yes / No

Do you think that a Nature Reserve could play a valid role in the education of students at your school?

Yes / No

7

If you were to use a Botanic Garden for educating your students which **three** of the following methods of displaying plants would be of most use to you. *Please tick only 1 box from each column.*

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
Plants grouped according to plant families	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plants grouped by the habitats they are found in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of plants with medicinal uses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of edible plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of how British plants have been used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays showing the genetic variation within plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays showing the adaptation & evolution of plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of associations between plants & animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bedding displays	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plants of conservation importance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of how British plants can be used in gardens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (Please specify).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\_\_\_\_\_

8

If a Botanic Garden displayed plants in the ways you have identified in the previous question would you use such a facility for educating you students?

Yes / No

If Yes, which of the following statements best describes the way you would want to use the garden?

I would prefer to attend a teacher-training day before taking the students the students around myself

I am happy to take the students around the garden myself without having attended a teacher-training day at the garden

I would prefer to have a trained member of the garden staff run a course for the students

9

How long would you be prepared to spend travelling in order to visit such a facility?

10mins or less

11-30mins

$\frac{1}{2}$ hr - 1hr

1hr - 1 $\frac{1}{2}$ hrs

1 $\frac{1}{2}$ hrs - 2hrs

2hrs - 3hrs

More than 3hrs

If an organisation offering the facilities and services you have indicated above was located at Castle Cary, Somerset, would you travel to use them?

Yes / No

10

What times of year would you prefer to use such a facility?

*Please tick as many boxes as are applicable.*

January

February

March

April

May

June

July

August

September

October

November

December

Thank you very much for taking the time to fill in this questionnaire.  
If you have any comments you wish to make please feel free to write them  
below. Once you have completed the form please return it to me as soon as  
possible in the envelope provided.

Thank You

James Furse-Roberts  
Carymoor Environmental Centre  
Dimmer Lane  
Castle Cary  
Somerset  
BA7 7NR  
Tel & Fax: 01963 350143  
E-mail: [enquiries@Carymoor.org.uk](mailto:enquiries@Carymoor.org.uk)

## Appendix 1.4

### Industry Survey Questionnaires and Correspondence

- Cover letter
- Follow-up postcard
- Survey

## Cover Letter Sent with Industry Survey

«Title» «Initials» «Surname»  
«Position»  
«Company»  
«Address»  
«Postcode»

4<sup>th</sup> November

Dear «Title» «Surname»,

On a landfill site just outside Castle Cary, Carymoor Environmental Centre and The University of Reading are working together to create a Somerset plant collection. During the last century only a small number of plant collections have been created, the result of this is that the majority are trying to offer 21<sup>st</sup> century services from gardens designed during the 19<sup>th</sup> century. As our collection and garden will be built from scratch we have the wonderful opportunity to design it to meet your needs.

To help me establish what you would want and expect from a plant collection I have decided to seek the opinion of a select few organisations that are involved with the British flora. As a key member of one of these organisations I would greatly value your comments on this topic. To make this easier for you I have compiled a few questions that I would appreciate your feedback on. I have enclosed a stamped addressed envelope to aid their swift return of the form when completed.

I would like to assure you that although your name and the address of your organisation is requested this is only to aid my interpretation of the results and to keep you informed of the developments of this project if you desire. This part of the data will not be available to any third party.

I would be more than happy to answer any questions you might have and would like to thank you in advance for your time and assistance.

Yours sincerely,

A handwritten signature in black ink that reads "James Furse-Roberts". The signature is written in a cursive, slightly slanted style.

James Furse-Roberts

## Follow-up Postcard Sent to Industry

Last week I sent you a questionnaire seeking your views on “Professionals and Plant Identification”.

If you have completed and returned this questionnaire then please accept my sincere thanks for your time and effort. If you have not yet returned it please do so today. These questionnaires have only been sent to a select number of people like yourself and as a result I need as many returned as possible.

If by some chance you did not receive the questionnaire please call 01963 350 143 and I will send you another one.

Yours sincerely

James Furse-Roberts  
Carymoor Environmental Centre

# PROFESSIONALS and PLANT IDENTIFICATION

In Partnership With



**The University of Reading**





2

If your company conducts **habitat surveys** which of the following techniques are used?

- Phase 1 Habitat Survey (JNCC)
- NVC (National Vegetation Classification)
- Others (Please State)

3

Which of the following do your employees need to be able to identify to carry out their work?

- Fungi
- Lichen
- Mosses
- Trees
- Grasses
- Other Plants

4

For which of the following does your company provide identification training?

- Fungi
- Lichen
- Mosses
- Trees
- Grasses
- Other Plants

5

On average, how often does an employee of your company attend a plant identification course?

- Never
- Once every 5 years
- Once every 3 years
- Every other year
- Once a year
- Twice a year
- More than twice a year

6

Which of the following training methods does your organisation use?

*Please tick as many boxes as are appropriate.*

In-house (i.e. employees are used to train others)

External (i.e. employees sent away on courses run by another organisation)

If you ticked the last box, which external organisations do you use?

7

Are you satisfied with the results of these training methods?

Yes / No

8

Which of the following statements describe why the staff at your organisation do not attend more plant identification courses?

Your staff have not requested further training

Your company can't afford the loss of time incurred with training

Your company can't afford the cost of sending staff on training courses

Your staff don't need any further training

There are no training courses in your area

Nobody is offering training in the topics you require

*Please state below which topics.*

9

If your staff were to attend a plant identification course, what is the longest you would you be prepared for such a course to last?

- ½ day
- Full day
- 2 days
- 3 days
- 1 week

If an organisation offering plant identification courses was located at Castle Cary, Somerset, would you consider using them to train your staff?

Yes / No

10

What times of year would you prefer to send your staff on training courses?  
*Please tick as many boxes as are applicable.*

- |          |                          |           |                          |
|----------|--------------------------|-----------|--------------------------|
| January  | <input type="checkbox"/> | July      | <input type="checkbox"/> |
| February | <input type="checkbox"/> | August    | <input type="checkbox"/> |
| March    | <input type="checkbox"/> | September | <input type="checkbox"/> |
| April    | <input type="checkbox"/> | October   | <input type="checkbox"/> |
| May      | <input type="checkbox"/> | November  | <input type="checkbox"/> |
| June     | <input type="checkbox"/> | December  | <input type="checkbox"/> |

11

Has your company employed or considered employing a university graduate in the last 3 years?

No / Yes



**If Yes,** were you satisfied with their plant identification knowledge?

Yes / No

**If No,** was your reason for not employing this graduate because of a lack of plant identification skills?

Yes / No

Thank You

Thank you very much for taking the time to fill in this questionnaire.  
If you have any comments you wish to make please feel free to write them below. Once you have completed the form please return it to me as soon as possible in the envelope provided.

Thank You

James Furse-Roberts  
Carymoor Environmental Centre  
Dimmer Lane  
Castle Cary  
Somerset  
BA7 7NR  
Tel & Fax: 01963 350143  
E-mail: [enquiries@Carymoor.org.uk](mailto:enquiries@Carymoor.org.uk)

## Appendix 1.5

### University Survey Questionnaires and Correspondence

- Cover letter
- Follow-up postcard
- Survey

## Cover Letter Sent with University Survey

«Title» «Initials» «Surname»  
«Position»  
«Address»  
«Postcode»

4<sup>th</sup> November

Dear «Title» «Surname»

On a landfill site just outside Castle Cary, Somerset, Carymoor Environmental Centre and The University of Reading are working together to create a Somerset plant collection. During the last century only a small number of plant collections have been created, the result of this is that the majority are trying to offer 21<sup>st</sup> century educational services from gardens designed during the 19<sup>th</sup> century. As our collection and garden will be built from scratch we have the wonderful opportunity to design it to meet your needs.

To help me establish what you would want and expect from a plant collection I have decided to seek the opinion of key university staff. As one of these people I would greatly value your comments on this topic. To make this easier for you I have compiled a few questions that I would appreciate your feedback on (Entitled: Lecturers' views on Plants and Education). A stamped addressed envelope accompanies each form to aid their swift return when completed.

I would like to assure you that although your name and the address of your university is requested this is only to aid my interpretation of the results and to keep you informed of the developments of this project if you desire. This part of the data will not be available to any third party.

I would be more than happy to answer any questions you might have and would like to thank you in advance for your time and assistance.

Yours sincerely,



James Furse-Roberts

## Follow-up Postcard Sent to Universities

Last week I sent you a questionnaire seeking your views on "Plants and Education".

If you have completed and returned these questionnaires then please accept my sincere thanks for your time and effort. If you have not yet returned it please do so today. This questionnaire has only been sent to a select number of people involved with Universities and as a result I need as many returned as possible.

If by some chance you did not receive the questionnaire please call 01963 350 143 and I will send you another one.

Yours sincerely

James Furse-Roberts  
Carymoor Environmental Centre

UNIVERSITY  
LECTURERS' VIEWS  
on  
PLANTS AND EDUCATION

In Partnership With



**The University of Reading**



Title (*Please circle*) Mr / Mrs / Ms / Miss / Dr / Prof Other \_\_\_\_\_

First Name Surname

Position

University

Address

Postcode

E-mail Address:

Telephone No.

1

At which of the following levels do you lecture?

*Please tick as many boxes as are applicable.*

- |                             |                          |
|-----------------------------|--------------------------|
| Diploma (e.g. ND, HND etc.) | <input type="checkbox"/> |
| First Degree                | <input type="checkbox"/> |
| Post-graduate Degree        | <input type="checkbox"/> |
| Adult Education             | <input type="checkbox"/> |
| Other (Please state)        | <input type="checkbox"/> |

On what topics do your lecture?

2

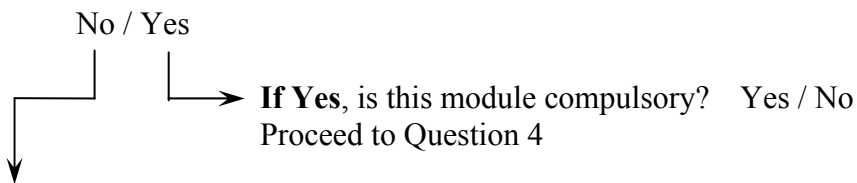
Which of the following types of material are used for courses you lecture on?

Please tick all categories that are applicable.

- |  |                          |
|--|--------------------------|
| Living plants that are kept alive for an educational purpose | <input type="checkbox"/> |
| Living plants that are destroyed for an educational purpose  | <input type="checkbox"/> |
| Parts of plants removed without killing plant                | <input type="checkbox"/> |
| Dried plants and plant parts                                 | <input type="checkbox"/> |
| No plant material is used.                                   | <input type="checkbox"/> |

3

Do the courses you lecture on have a formal plant identification module within them?



**If No** (i.e. the module is optional) how would you rank the number of students signing up for this module?

- Fewer students sign up for the module
- About the correct number of students sign up for the module
- More students than would be expected sign up for the module

If you ticked either of the last two boxes what do you think is the reason for the attendance not being higher?

- Students intimidated by thought of plant identification
- Students feel that it is not an interesting subject
- Students feel that it is not a skill they
- There is a more interesting module running at the same time
- Other (Please state)

4

Do you believe that plant identification is a skill that graduates of your courses should have?

Yes / No

5

Which of the following does your University have?

- Nature Reserve
- Botanic Garden (Garden with labelled plants)
- Collection of Living Plants (i.e. not laid out aesthetically)
- Herbarium
- Spirit Collection
- Seed Library
- Plant Image Library

6

Which of the following facilities are used for courses you lecture on?

- Nature Reserve
- Botanic Garden (Garden with labelled plants)
- Collection of Living Plants (i.e. not laid out aesthetically)
- Herbarium
- Spirit Collection
- Seed Library
- Plant Image Library

7

If you **do not** use a Botanic Garden which of the following statements describe why not?

- There is not a Botanic Garden close enough to visit.
- Botanic Gardens within your area are not suitable because they can't cope with the number of students you would want to take.
- Botanic Gardens within your area are not suitable because they lack certain essential facilities. *Please state what is lacking*
  
- The Botanic Gardens within your area are not suitable because they do not cover the right topics. *Please state which topics are not covered*
  
- The cost of transport to the Botanic Garden is too high
- Entrance charge to the Botanic Garden is too high.
- Other (*Please state*)

8

If you **were** to use a Botanic Garden for educating your students which **three** of the following methods of displaying plants would be of most use to you.  
*Please tick only 1 box from each column.*

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
Plants grouped according to plant families	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plants grouped by the habitats they are found in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of plants with medicinal uses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of edible plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of how British plants have been used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays showing the genetic variation within plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays showing the adaptation & evolution of plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of associations between plants & animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bedding displays	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plants of conservation importance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of how British plants can be used in gardens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (Please specify).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9

If a Botanic Garden displayed plants in the ways you have identified in the previous question would you use such a facility for educating you students?

Yes / No

If Yes, which of the following statements best describes the way you would want to use the garden?

- I would prefer to attend a teacher-training day before taking the students the students around myself
- I am happy to take the students around the garden myself without having attended a teacher-training day at the garden
- I would prefer to have a trained member of the garden staff run a course for the students
- I would prefer to allow the students to use the facilities to conduct their own studies

10

How long would you be prepared to spend travelling in order to visit such a facility?

- |                            |                          |
|----------------------------|--------------------------|
| 10mins or less             | <input type="checkbox"/> |
| 11-30mins                  | <input type="checkbox"/> |
| $\frac{1}{2}$ hr - 1hr     | <input type="checkbox"/> |
| 1hr - 1 $\frac{1}{2}$ hrs  | <input type="checkbox"/> |
| 1 $\frac{1}{2}$ hrs - 2hrs | <input type="checkbox"/> |
| 2hrs - 3hrs                | <input type="checkbox"/> |
| More than 3hrs             | <input type="checkbox"/> |

If an organisation offering the facilities and services you have indicated above was located at Castle Cary, Somerset, would you travel to use them?

Yes / No

11

What times of year would you prefer to use such a facility?  
*Please tick as many boxes as are applicable.*

- |          |                          |           |                          |
|----------|--------------------------|-----------|--------------------------|
| January  | <input type="checkbox"/> | July      | <input type="checkbox"/> |
| February | <input type="checkbox"/> | August    | <input type="checkbox"/> |
| March    | <input type="checkbox"/> | September | <input type="checkbox"/> |
| April    | <input type="checkbox"/> | October   | <input type="checkbox"/> |
| May      | <input type="checkbox"/> | November  | <input type="checkbox"/> |
| June     | <input type="checkbox"/> | December  | <input type="checkbox"/> |

Thank You

Thank you very much for taking the time to fill in this questionnaire. If you have any comments you wish to make please feel free to write them in the blank space on the back of this sheet. Once you have completed the form please return it to me as soon as possible in the envelope provided.

Thank You

James Furse-Roberts  
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Appendix  
1.6

Public Survey Questionnaires

# SURVEY OF POTENTIAL GARDEN

## USERS

Please Print Clearly

Title:	First Name:	Surname:
Profession:		
Address:		
Postcode:		
Telephone Number:		
E-mail Address:		

1	How often do you visit gardens?	
	Less than once a year	<input type="checkbox"/>
	1 a year	<input type="checkbox"/>
	2-5 times a year	<input type="checkbox"/>
	6-11 times a year	<input type="checkbox"/>
	Once a month	<input type="checkbox"/>
	Once a week	<input type="checkbox"/>

2	What did you enjoy most about your last visit to a garden?
---	--

3

Have you ever visited a *Botanical Garden* before?

Yes / No

If Yes, approximately when was your last visit?

Month \_\_\_\_\_ Year \_\_\_\_\_

Which Botanic Gardens have you visit?

---

---

---

4

Which of the following courses would you be interested in attending?

Which of the following courses have you attended?

Botany	<input type="checkbox"/>	<input type="checkbox"/>
Conservation	<input type="checkbox"/>	<input type="checkbox"/>
Ecology	<input type="checkbox"/>	<input type="checkbox"/>
Garden History	<input type="checkbox"/>	<input type="checkbox"/>
Botanical Illustration	<input type="checkbox"/>	<input type="checkbox"/>
Watercolour Painting	<input type="checkbox"/>	<input type="checkbox"/>
Photography	<input type="checkbox"/>	<input type="checkbox"/>
Basket Weaving	<input type="checkbox"/>	<input type="checkbox"/>
Flower Arranging	<input type="checkbox"/>	<input type="checkbox"/>
Organic Gardening	<input type="checkbox"/>	<input type="checkbox"/>
Using Wildflowers in the Garden	<input type="checkbox"/>	<input type="checkbox"/>
Garden Design	<input type="checkbox"/>	<input type="checkbox"/>
Plant Identification		
Garden Plants	<input type="checkbox"/>	<input type="checkbox"/>
British Flowering Plants	<input type="checkbox"/>	<input type="checkbox"/>
Grasses	<input type="checkbox"/>	<input type="checkbox"/>
Ferns	<input type="checkbox"/>	<input type="checkbox"/>
Mosses	<input type="checkbox"/>	<input type="checkbox"/>
Lichens	<input type="checkbox"/>	<input type="checkbox"/>

5

From the list below pick the **three** services that you think would be of the greatest use to you starting with the one you would make the most use of. *Please tick only 1 box from each column.*

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
Facilities for Private Functions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Restaurant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plants for Sale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Garden Equipment for Sale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Books for Sale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Art for Sale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Souvenirs for Sale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6

Select the 3 methods of displaying plants that you would like to be used on a collection of British plants. *Please tick only 1 box from each column.*

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
Plants grouped according to plant families	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plants grouped as they are found growing in the wild	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of plants with medicinal uses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of edible plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of how British plants have been used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays showing the genetic variation within plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays showing the adaptation & evolution of plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of associations between plants & animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bedding displays	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plants of conservation importance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Displays of how British plants can be used in gardens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (Please specify). _____			

7

How long would you be prepared to spend travelling in order to visit a botanical garden?

- 10mins or less
- 11-30mins
- $\frac{1}{2}$ hr - 1hr
- 1hr - 1 $\frac{1}{2}$ hrs
- 1 $\frac{1}{2}$ hrs - 2hrs
- 2hrs - 3hrs
- More than 3hrs

If there was a botanical garden located at Castle Cary, Somerset, would you travel to use them?

Yes / No

8

Bearing in mind that the up keep of plant collections takes a lot of money what sort of admission charge do you think there should be.

- No admission charge for anybody
- A voluntary admission charge
- An admission charge only for non-educational visits
- An admission charge for everybody

In your opinion what is a fair admission charge?    £ \_\_\_\_\_

9

Would you be interested in volunteering at a botanical garden in Castle Cary?

Yes / No

If you were to volunteer which of the following would you be interested in doing? Please tick as many boxes as are appropriate.

- Gardening
- Administration
- Sales
- Taking Guided Tours
- Seed Cleaning
- Seed Collection from the Wild

Thank you very much for taking the time to fill in this questionnaire. If you have any comments or suggestions you would like to make please write them here.

## Spearman's *rho* Calculations

Workings for the Spearman's rho calculations on the effect of location on the size and number of visitors to botanic gardens discussed in chapter four.

All of the following calculations were based on a sample of 11 botanic gardens and therefore n=11.

	Location	Visitors per Acre per Year	Ra	Rb	D	D <sup>2</sup>
RBG, Kew	100	2975.7	1	8	7	49
Chelsea Physic Garden	95.5	5263.2	2	7	5	25
Wakehurst Place	79.9	680.0	3	10	7	49
Birmingham	76.1	13333.3	4	4	0	0
Bath	68.7	10526.3	5	6	1	1
Glasgow	61.7	16666.7	6	3	-3	9
RBG, Edinburgh	60.9	2537.9	7	9	2	4
Liverpool	59.9	80940	8	1	-7	49
Ventnor	33.8	11363.6	9	5	-4	16
National Botanic Garden of Wales	27	308.1	10	11	1	1
Eden Project	13.7	40470	11	2	-9	81

**Spearman's rho correlation between the population percentage and the average number of visitors per acre per year**

$$\begin{aligned} \text{Total } D^2 &= 284 \\ \times 6 &= 1704 \\ 6D^2/n^3 - n &= 1.2909 \\ \text{rho} &= -0.2909 \end{aligned}$$

	Location	Size (acres)	Ra	Rb	D	D <sup>2</sup>
RBG, Kew	100	336.1	1	3	2	4
Chelsea Physic Garden	95.5	3.8	2	11	9	81
Wakehurst Place	79.9	500.0	3	2	-1	1
Birmingham	76.1	15.0	4	8	4	16
Bath	68.7	9.5	5	9	4	16
Glasgow	61.7	27.0	6	6	0	0
RBG, Edinburgh	60.9	291.6	7	4	-3	9
Liverpool	59.9	6.2	8	10	2	4
Ventnor	33.8	22.0	9	7	-2	4
National Botanic Garden of Wales	27	568	10	1	-9	81
Eden Project	13.7	49.4	11	5	-6	36

**Spearman's rho correlation between the population percentage and the size of the garden in acres**

$$\begin{aligned} \text{Total } D^2 &= 252 \\ \times 6 &= 1512 \\ 6D^2/n^3 - n &= 1.1455 \\ \text{rho} &= -0.1455 \end{aligned}$$

	Location	Total Visitors	Ra	Rb	D	D2
RBG, Kew	100	1,000,000	1	2	1	1
Chelsea Physic Garden	95.5	20,000	2	11	9	81
Wakehurst Place	79.9	340,000	3	6	3	9
Birmingham	76.1	200,000	4	8	4	16
Bath	68.7	100,000	5	10	5	25
Glasgow	61.7	450,000	6	5	-1	1
RBG, Edinburgh	60.9	740,000	7	3	-4	16
Liverpool	59.9	500,000	8	4	-4	16
Ventnor	33.8	250,000	9	7	-2	4
National Botanic Garden of Wales	27	175,000	10	9	-1	1
Eden Project	13.7	2,000,000	11	1	-10	100

**Spearman's rho correlation between the population percentage and the total number of visitors per year**

$$\begin{aligned} \text{Total } D^2 &= 270 \\ \times 6 &= 1620 \\ 6D^2/n^3 - n &= 1.2272 \\ \text{rho} &= -0.2272 \end{aligned}$$

Appendix  
3.0

Ideas for a Handheld Information Unit

Ideas for a Handheld Information Unit



By

James Furse-Roberts

28<sup>th</sup> August 2002

## **What is the problem?**

The Eden Project, by its very nature wants to attract people with a wide range of ages, educational levels, cultural backgrounds, and first languages in order to spread its message as far as possible. Unfortunately this aim makes the delivery of this message even harder because it means trying to explain this to people who are viewing your message from a myriad of different starting points. This is not a problem that is unique to the Eden Project but is experienced by museums and botanic gardens all over the world.

## **How do museums/gardens approach this?**

### Tour guides

Tour guides are an excellent way of conveying a message to the visitors because there is an important element of feedback, i.e. you can ask questions, but for them to work well they have to know the answers to those questions and that requires a lot of training. No museum/garden has a 1:1 relationship between visitor and guide and because of this some of the visitors on a guided tour may find the topic of the tour going one way when their personal interests may prefer it to go another.

### Written displays

Almost universally the written word is the primary method of distributing information/knowledge in museums and botanic gardens. Two of the most popular forms are guidebooks and information boards. Traditionally these were wordy tomes that inevitably didn't get read. With the advancement of publishing techniques this is now less likely to be the case, both are now usually augmented with photographs, illustrations and graphics. Multiple languages usually not attempted in these formats because of the space (one exception to this is the National Garden of Wales where Welsh and English are both used on signs). However well these are done they will still make access to the information difficult for the young and hard of reading.

### Audio

For a while some attempts have been made at using pre-recorded tours or interactive audio tour. The interactive tours present the same options to everyone and are usually based around one fixed tour with only limited possibilities of exploring related issues in more detail. They are quite good at pacing people around an exhibit but do nothing towards persuading them to see objects other than those on the prescribed tour. This method excludes the hard of hearing.

## **How could these be improved?**

The three main methods of imparting knowledge, described above, have their good and bad points. These occur because in general only one media is being used, if a multi-media approach were taken there is a greater chance that the visitor will find a method that suits them. So what is needed is a system that contains a large amount of information stored in a variety of medias such as audio, written text, video clips and still images. Access to this information is needed at number of intellectual levels and languages. Once you have this data, there needs to be a method of delivering to each

visitor in the way they want. Giving each visitor their own handheld unit that, in addition to having earphones for listening to audio commentary, has a screen for viewing text, video, and pictures could do this.

## **What would the different user groups experience?**

### Recreational Visitors

Having decided that they want to take a handheld guide around with them the visitor will go to one of the distribution points. Here a member of staff will explain what the units are capable of doing, ask the visitor a few questions about their age group, the language they want, and their general interests. The unit is then primed for that visitor. The distribution point has a few plants labelled with barcodes and labels so that the visitors can practice using the unit, but because the design of the software used on the unit is similar to the internet “navigation” will be second nature to most of the visitors. The visitor then either sets off on one of the many themed tours led by the unit or explores the site by themselves using the unit to gain more knowledge on plants or displays that take their interest. For example a visitor may be wondering around the humid biome when he spies a vanilla orchid. This captures his interest so he scans the barcode for that bed and enters the number on the label of the plant (Fig. 1). The screen changes bringing up a small picture of the vanilla flower and identifies the plant as “Common name - Vanilla, Latin name - *Vanilla planifolia*. Source of vanilla pods and vanilla essence.” Under this there are a number of icons each representing the type of additional information available (Fig. 2). Our visitor clicks on icon of a camera and is presented with a new page of thumbnail pictures (Fig. 3). He selects one of a flower to get a bigger view, as the ones on the real plant too high up for him to see (Fig. 4). Next he selects the knife and fork icon (Fig. 5) and reads “Vanilla comes from the seed pod. The world consumption of vanilla beans is estimated at over 5.5 million tonnes a year. 1 hectare (2.5 acres) gives a yield of 500-800 cured pods a year.” (Fig. 6). At the bottom of the page there is a prompt asking him whether he would like to find out more about the process of producing vanilla or whether he would like to return to the previous screen. Our visitor chooses to find out more about the production so selects that option. The page that comes up seems to have a lot of text on it so our visitor selects the headphone button; whilst he looks at the plant growing up the tree in front of him the text on the page is read to him (Fig. 7).

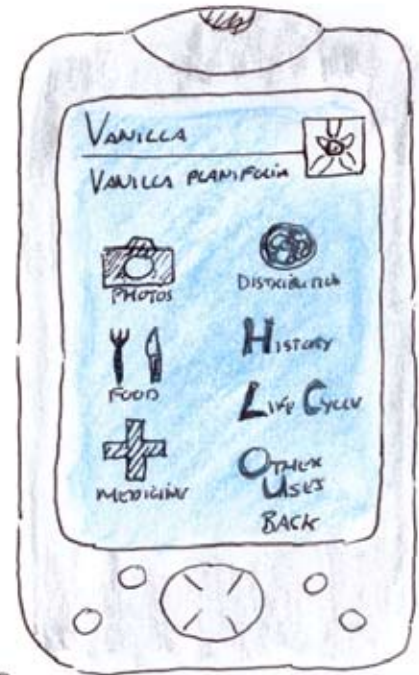
Once he has found out all he wants about Vanilla our visitor has the option to continue looking around by himself or, because he showed interest in the edible properties of vanilla, to take a computer guided tour of the edible plants.

Throughout his exploration of Eden our visitor has had the option to save certain bits of information in his virtual notebook. When our visitor returns the handset at the end of his visit the notes he’s made are e-mailed to him (Fig. 8). Along with all his notes the e-mail he receives also contains an invitation to receive further information about the Eden Project.

I am not entirely sure that the described method of identifying a plant is the best. Some thought would need to be given to finding a quick and simple solution to this problem that allows visitors to identify plants at the back of beds without leaving the path.



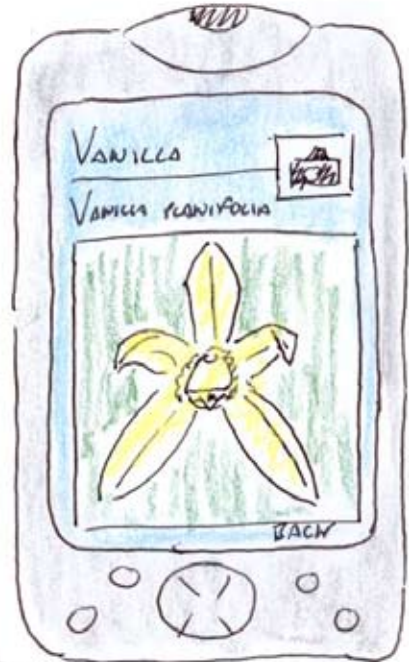
① Select a plant



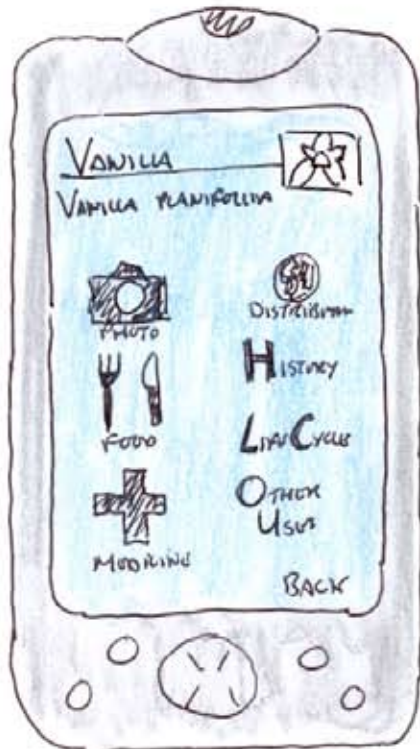
② Photos option selected



③ One of the thumbnails selected



④ View enlarged photo



⑤ Back to main menu. Food selected.



⑥ Info on Vanilla production



⑦ Listening to audio version of Vanilla production text.



⑧ E-mail waiting at home with notes from the visit.

## Schools

The school arrives and meets a member of the education team. The school party splits into groups of two or three students; each group is given a handheld unit with enough headphones for each member. Prior to the arrival of the group the units have been primed for the age of the class and the particular topic they are there to study this means that after a short time showing the students how the units work, and perhaps a introduction to the topic, they are ready to go out into the garden and start learning. The units could be primed to keep to a rigid tour concentrating on one topic or allow any amount of research into related topics. An animated cartoon character acts as a guide to the younger students. The unit can be used a bit like an activity book where the unit asks questions and the students have to search for the answer or perhaps they are given a task to do like measuring leaf size in which case the gathered data is entered. As the students work their way through the tour their handheld unit gives them information aimed at their age group. When the students have completed their tasks they return to the classroom where all the data from the class members has been instantly taken from the units and is now projected on the classroom white board. The member of the Eden education team can now talk to the students about what they have seen and done. During their next lesson at school, one week after the visit, the teacher can use the data from the trip because it has been e-mailed to the school or is accessible via that schools section on Edens website.

## Horticultural staff and Volunteers

PDA's (Personal Digital Assistants) allow cordless real-time access to computer systems, this makes them an ideal tool for the horticultural staff that often want to query or update the plant database whilst "in the field". Rather than accessing the information database used by the visitors, staff could use the units to do a most of the administration tasks encountered whilst keeping a collection. For example; stock check a bed, create propagation requests, request replacement labels, dead-off plants, add newly planted material to the database, they could even e-mail other staff from anywhere in the garden. As all these tasks are being done straight on to the main computer rather than noted on paper and then transferring to the computer, no time is wasted or errors made.

The ease by which these units can be used, and the fact that the database is updated directly without the need of a specially trained member of staff inputting the data, means that non-specialist staff or perhaps volunteers could be used to gather information that until now has not been gathered in botanic gardens because of the staff time it would take. One such example of this is the weekly recording of flowering and fruiting status of all the plants on site. This could be easily gathered by volunteers walking around the site logging the data into the handheld units, many of the volunteers who are perhaps less able to do physical work would be delighted with this task as it gives them a chance to get involved in an important task.

Having an up to date record of the plants that are flowering that week will enable the handheld units to direct visitors to the nearest flowering plant that is relevant to there chosen topic. If this data was collected over a number of years it could prove to be of great interest to horticultural and research staff looking for changes in patterns and their causes.

## **How could this be done?**

This system comprises of five major elements, a central computer, a database, a user interface, the users hardware, and a method of communication between the central computer and the users hardware.

The Central Computer – a server capable of supporting the number of units planned for use on site.

The Database – this is the heart of the system that holds all the pieces of data about all the plants and displays in such a way that when a request is made from a handheld unit the correct bit of information at the correct level and in the proper language can be sent. This data will be in a number of formats such as text, sound files, still photographs, video clips, animations, and educational games.

A User Interface – this a software program, with a similar appearance to an internet page, that allows the user to communicate with the database in a way that is simple to use and displays the information in an intelligible way. If a standard webpage construction were used the job of maintaining and creating new pages would be complex. If instead there were a second database structure that was responsible for determining how the data were displayed, the job of inputting the data would be a less specialised task, as new pages would automatically be created and old ones updated. This approach would also insure that a house style was maintained throughout the pages and could be altered very simply.

The Users Hardware – the physical “box of tricks” that the visitor is given and runs the user interface. An off-the-shelf PDA could be used as the basis for this unit as they provide small colour screens with audio outputs that are capable of running windows based software, effectively the equivalent to carrying around a PC. The unit would also have a barcode scanner so that an exhibit or flower bed can be identified by scanning its label

The Method of Communication - PDAs at the moment do not have the memory of processor power to hold a copy of the database on them so they would be reliant on communication with a central computer that holds the large database. To do this a wireless networking system would need to be installed throughout the site. This could be a system such as Bluetooth that allows enabled hardware to communicate using radio waves, (many PDAs are available with this built in) or one of the other large systems such as WiFi. Further research is needed to find the best solution.

Figure 9 below shows how these components are linked together and work.

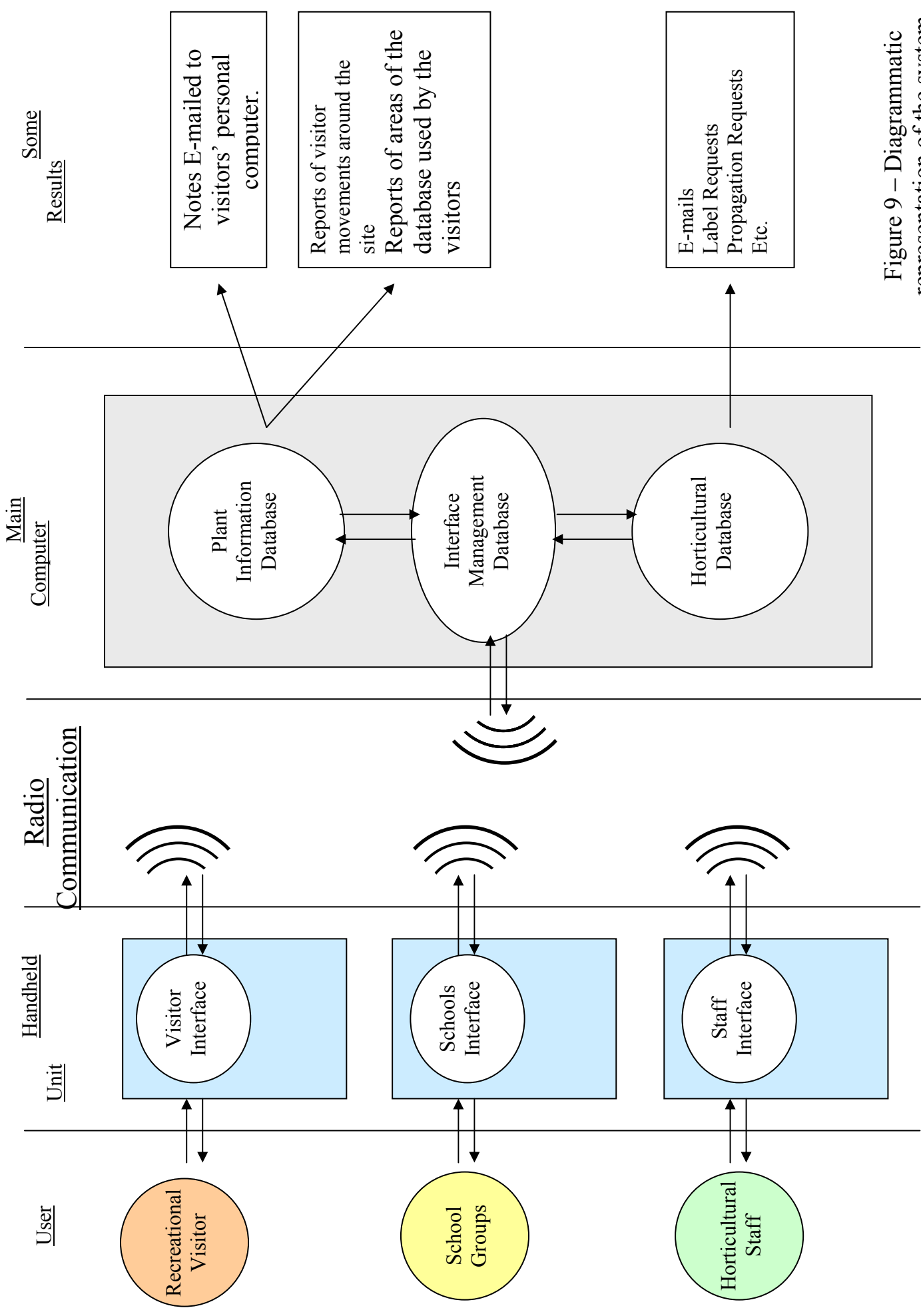


Figure 9 – Diagrammatic representation of the system

### **Benefits over display boards**

Updating a “display” is cheap because the information exists only in cyber-space there are no printing costs and the whole process can, in theory, be done by one person sat at a computer, the results being immediately seen by visitors. There would be none of the down time experienced when a conventional text board display is being refurbished.

### **Benefits over tour guides**

As the fluidity of this design allows the user to drop in and out of themed tours and explore certain topics in detail at their own pace it means that everyone at Eden could be following a different tour, something not possible with groups tours.

### **Benefits over audio tours**

An audio tour can only talk about an object but the proposed units have the advantage that they can talk and illustrate a subject with photographs, video and animation giving a fully multimedia experience.

### **Is this a Replacement for guides?**

No. The human interaction and theatre that the Eden guides bring to their tours is a very important communication tool that will not be replaceable by the handheld units. There will probably always be people who, for what ever reason, do not want to use a handheld unit, and for them the tour guides will be the best alternative.

### **Ways this can be used to assess and monitor visitors**

Another exciting aspect to this system is the possibility of obtaining very detailed data on which areas/plants in Eden are being visited and by whom, done in a way that doesn't interfere with visitors experience or requires hours of staff time in reviewing surveillance tapes or shadowing visitors. By logging the information that is requested by a visitor, along with their profile (age, country of origin, interests etc.) it would be possible to build up profiles of the type of visitors that Eden is getting, what they are interested in, and the time spent visiting each section. If they used the computer tour facility it would be possible to see whether it was followed through to the end, if not did they stop at the same point as other people. This may suggest the tour needs redesigning to encourage people to continue.

### **How realistic is this idea?**

All the hardware to do this already exists and is designed to work together, although some development may be needed to make them suitable for public use as opposed home use. For example theft proofing, screen protection and, as the available PDAs are modular, a way stopping people taking them apart.

There are several commercially available software packages, such as Microsoft Access, DB2, or SQL Server, which could be used to build the database. With regard the user interface software, I imagine it would be constructed using a web-style format for which there are a number of options.

The major development time will probably be spent in three areas; developing a suitable database structure, developing the user interface software, and researching and inputting the data. Data research and inputting may seem a daunting task but once it is done the regular updates and expansion should not be a drain on personnel.

### **Possible problems with this system**

Techno-phobia, especially amongst the older age groups, may lead the units be ignored.

A poor user interface will make the unit difficult to use and result in the units not being used.

The small size of the units and their relatively high price could lead to thefts if there is not an adequate system in place to prevent this.

### **Websites of Interest**

#### PDA's

Compaq iPAQ

[www.compaq.com/products/handhelds/pocketpc/index.html](http://www.compaq.com/products/handhelds/pocketpc/index.html)

Hewlett-Packard Jornada <http://products.hp-at-home.com/home/home.php>

#### Communication

Bluetooth [www.bluetooth.com](http://www.bluetooth.com)

WiFi [www.wirelessethernet.com](http://www.wirelessethernet.com)

#### Database Controlled Websites

UnionSys Ltd [www.unionsys.com](http://www.unionsys.com)

## Appendix 4.0

### Full Text of Replies to Selected Survey Questions

- Question 2 Professionals Survey
- Question 2 Public Survey
- Additional comments from all surveys

## Question 2 Professionals Survey

Surveys offered by respondents to the professionals survey.

Ditch Surveys, Canal surveys

EA River Corridor

Enhanced Phase 1 (i.e. exhaustive list of species for homogenous stands)

General walkover - ecological appraisal

HEGS, Hedgerow Regulations, Lowland pond survey

HEGS, RCS, RHS

HIS (Integrated Habitat Classification - developed by SERC and in use for E. Natures Pilot M\*\*\*\*\* Inventory Project)

In-house technique for surveying canal corridors

Monitoring studies

Phase 2

Phase 2 type survey with plant spp lists + notes on habitat structure & microhabitats; provides better information than the above.

Phase2

Project specific methods

RCS

RCS

RCS, RHS, HEGS

RCS, RHS, Macrophyte Survey

RHS River Corridor

River Corridor Surveys (EA), Canals (British Waterways)

River Corridor, HEGS

River Corridor, HEGS, Holmes River, Kirby Woodland, Arboricultural, Seasearch

River habitat/corridor

Taylor made surveys

Tree Surveys, Species specific surveys

## Question 2 Public Survey

Answers given to the public survey question asking respondents what they enjoyed most about their last visit to a garden.

Information on planting schemes

Tranquillity

The walks. The flowers & trees. Birdsong. The ice creams!!

Plants, Ideas

Everything

Variety of plants

Model railway running amongst the plants/landscape

Variety of plants/flowers and getting ideas for my own garden.

Looking at plants

Planting schemes, Colours, Variety and Ingenuity

Visual experience, Drama, Landscape, Water

The restoration & the wild bits

# Additional Comments From All Surveys

Many respondents added additional comments to the surveys, these were recorded along with the answers to the questions and are included here.

## Botanical Collections Survey Comments

Q8 - depends what your definition of British native is  
Q10 - Hort trials "display new varieties"  
Q12 - Computer Information Terminals "garden staff & researchers only"  
Q16 - Café sub contracted to Redcliffe catering, education - includes 1 teacher provided buy LEA  
Q17 - tours by prior arrangement and for a fee only  
Q20 - membership and audit - £21,893. Support costs - £98,427. Fund raising - £49,624

Q10 - Ex-situ conservation, edu of university students and the general public, as well as supply of plant material are given as the main areas of activity.  
Q17 - Approx 25 groups of 20 persons = 500

Q5/6 - Example given but no sp. No. or %. So estimated at 1% each  
Q15 - 700/1000 at any one time, we have had 3,000 in one day  
Q19 - Our volunteers organised a Fair in June which raised £25,000 in one day. They did all the publicity and PR, but they don't do this for the everyday running of the charity.  
Q20 - £9,000+ donations

In an effort to ensure a return I have guessed a number of items.  
Q16 - "note shared with animal dept."  
Q20a - on gardens alone  
Q20b - not possible as much is shared

"I do not think I can be of much help to you - we have not had a National Collection for several years. The garden is open April - Sept and I sell mainly herbaceous perennials, do not supply anyone and certainly have no lottery funding! Sorry. Better luck with your other responses."

Q12 - Computer terminals and interactive displays coming in 2005.

Q2 - Glasshouses - 4 of them large  
Q18 - When they are here a full working week up to 6 people [Estimate of hours calculated based on 3x40hr week

Q15 - "or 50 at one time"  
Q16 Visitor Services - "3 part-time"

Q2 - much of the arboretum is managed as a conservation area  
Q10 - we do not currently run a conservation program but hold a number of endangered species  
Q16 - 12 volunteer guides

Q17 - No way of monitoring this at the moment  
Q18 - man hrs per week "Fluctuates"  
Q20 - Confidential

### Botanical Collections Survey Comments

Q15 - 1,000 visitors at one time in garden [...?...] is maximum before visitor experience starts to become unpleasant.

Q22 - Members subscription 50%

Q6 - Several are of conservation importance.

Q14 - we have 9 gates open everyday and no tickets

Q16 - 9 under glass (Difficult topic, grounds are maintained under CCT and run by another area. 5 or 6 outside plus another 3 on projects plus apprentices

Letter - "I have filled in your sheets the best I can quickly and realise that there are a few grey areas so if you need to get in touch do and we can fill in any gaps that you may want explaining."

This is not applicable to us.

Q15 - "A lot more than we actually get"

Q20 - "As the arboretum is run as part of a complex science centre jointly then questions are impossible to answer."

Q22 - actual answers given as "most, some, some, some" and translated to 70% and 3x10% by me

Q3 - figures given include the botanic garden

Q17 - 500 adults 1500 children

Q20 - annual budget includes the botanic garden. "our budget is not divided into these categories.

Q22 - these figures include the botanic garden. Money from private and corporate sponsorship varies, as does lottery funding and event hosting.

Q23/24 - Difficult to say given that development work varies year to year

Q25 - Not possible to group botanic gardens together in this way as some are developing and improving whilst others are not.

Q3 - not surveyed

Q8 - not surveyed

Q16 - Hort = 4 regular, 2 seasonal

Visitor Services = 20 seasonal

Guides = 30 volunteers

Q17 - Guided tours by request only

Q17 - 2 volunteer guides per weekend 40 people during spring summer and autumn months. 1 staff guide monthly [?] throughout year 50 people per guided walk

Q18 - "very occasionally 10hrs per year"

Q25 - "a guess on my part"

Q15 - If more visitors came in autumn and winter

Please note - Isabella Plantation is an ornamental woodland garden within Richmond Park (a SSSI and NNR) It is not a botanical garden, although it holds important collections of Rhododendrons and Camellias.

Dear James Furse-Roberts, I hope the enclosed is useful. We usually provide information to research projects on the understanding that we receive a copy of the results. We would be grateful if you could provide us with at least an extract from your thesis. Best wishes,  
Yours sincerely, Jane C. Braham

Q15 - The most we have had to date is 1,500 at one time. We could absorb several thousand but car parking would be a problem over 1,500.

### Botanical Collections Survey Comments

Q16 Guides are part-time, and the administration is done as part of the college admin.  
Q20 Education comes out of the Academic budget and advertising/PR and visitors services come from the general college budget.

Q3 - genera - 666

Q6 - NCCPG

Q15 - Gardens are remote and car-parking limited

Q16/18 - No Employees - All volunteer from membership, individual hours are highly variable, ranging from 3-20hrs per week

Q20 - Don't have one

Q23/24 - Don't have one

Q16 - 100 volunteer guides

Q3 - taxa not species

Q12 - includes monthly notes

Q18 - have used volunteers in the past and might in the future

Q15 - At visitor limit at moment with regard car parking toilets etc. with improved visitor facilities 750,000 people

Q17 - 8,000 guided visitors includes 3,500 school children in groups.

Q20 - Education on a separate budget

Q1 - "60 acres of conservation area owned by our parent trust (Whitley Wildlife Conservation Trust)."

Q8 - "We have native flora areas where flora is allowed to germinate and grow naturally. Not accessioned c.150 species have been recorded."

"N.B. Some of the questions that refer to the organisation will be skewed because we are a combined zoo and bot. Garden."

Your survey has been passed to me by Mr Vague who is Pencarrow's head gardener. I am sorry but we are not in a position to contribute to your survey. The gardens are cared for by three gardeners and the amount of information you require is just not available nor do we have the staff to assemble it. I wish you every success with your PhD but suggest you replace us with an established garden that is resourced to deal with research questions.

Yours sincerely

James Reynolds, Administrator

Dear sir, Most of the questions on your survey form do not apply to Queenswood.

Increased interest in, and value of, botanical collections.

Also botanic gardens are "seeing" their role more clearly than they were 20 years ago.

Q2 - Wakehurst Place 202ha

Q8 - The site includes many British natives but these are mostly not part of the collections.

Q12 - Audio, computer terminals and interactive displays only in Museum No. 1, dedicated workspace for schools only

Q15 - 15,000 per day

Q18 - Scheme in infancy but growing fast

Q22 - includes Wakehurst

Q17 - Unknown

Q20 - Education on a separate budget

## Botanical Collections Survey Comments

Q22 - not my dept.

Most of the information you require we do not have.

[No name or address given, deduced that it was Durham from Tyneside postmark and reference to being a University garden]

Q10 - As a genetic reserve - "Field Cow Wheat project is very important"

Q12 - We are very poorly labelled due to lack of funds

Q16 - 12 volunteer guides not on the payroll

Q22 - This is highly variable and is largely new project focused e.g. £900k from Millennium Commission for visitor centre.

Details refer only to Wakehurst Place as a garden and does not include the Seedbank

Q3 - 15,200 taxa, 850 genera, 214 families

Q15 - based on 2,000 a day. Limited by car park capacity

Q16 - Education = 1.5 (7 support teachers) + 30 volunteers

Q3 - Sorry can't give figure due to lack of computerization, time to add all up etc.

Q4 - All plantings since 1960's

Q25 - Unknown

I hope this of some use to you

Q4 - No botanical records have ever been kept. We now have nursery origin for the latest acquisitions, but nothing more detailed.

We do not fit very well into your categories as we have integrated working between landlife, the national wildflower centre and landlife wildflowers. The site is more than a visitor centre. Whilst we have many plants on display and store hundreds of kilos of wildflower seed of around 100 species; we are not a botanical collection in the normal sense. We operate "living seed banks" by creating new habitats.

## University Survey Comments

Dear James

Please accept my apologies for the delay in my reply - I have been away.

I hope the enclosed reply is still useful to you.

Yours sincerely

Anita Diaz

Q4 - If they are to pursue certain types of careers, not applicable to all our students (definitely need such units available)

Q5/6 - included the use of a computerised key.  
Info sheet on Computerised Key included with reply.

Sorry - only just received as I moved to being Senior Tutor at Trinity College Oxford. No teaching and no research now.  
Trudy Watt

Q10 - if more could be offered than we can presently offer ourselves.  
Q11 - Visits in winter depends on whether all weather facilities are provided.  
Do get back to me if you wish to discuss.

Q10 - If part of a longer trip e.g Field Course would be happy to travel for more than 3hrs.

Q10 - The really important thing is to have good size, well equipped teaching room/semi-lab

Q10 - Unlikely too far

Plant identification (sadly!) is a small component of our course:- undergrad we use common species available locally then apply the skills at fieldwork. Post-grad students are taught an intensive fieldwork weeks.

Q10 No because of "Funding problems!"  
You should contact Prof. Mick Crawley (m.crawley@ic.ac.uk) he is interested in this kind of thing.

Q10 - I would have to consider taking students to Kew Gardens, instead.  
I realise this is not a very encouraging response for you. I work in a department where teaching is largely concerned about molecular and cellular aspects. The plant identification taught uses common plants grown or locally collected. The plant identification required for ecology is taught on visits to local reserves.

Q10 - would have to be down there for something else as well - otherwise use Kew or Birmingham - maybe need to devise a "day" - add more?

Missing back page!!

Q3 - Students are taught principles of plant classification in a compulsory 1st year module by Dr. James Cresswell - formal plant identification is not carried out.

Q4 - I used to but the nature of our course leaves no opportunity and few students are interested.

Q8 - Not all relevant to my teaching - please await response from Dr Cresswell as well.

Q9-11 - In general there is unlikely to be enough time in our timetable to take students as

### University Survey Comments

far as Castle Cary, although in principle a facility with good interpretative displays & staff could be attractive.

From a plant ecological perspective seeing plants in their natural habitats (woodland glade, stream margins, etc.) and assemblages created by management are instructive to students. Collections of plants species are less interesting for teaching community ecology. However, there is increasing interest in creating wildflower meadows, etc, and the only commercial seed stockists provide material, which is not derived in the SW. It would be great if you could start producing seeds or wildflower plants for educational and garden purposes. I regret that this scheme does not match the need of ecology course at Exeter but it is a great idea - good luck & every success.

Q10 - Depends on aims of visit and timetabling issues. Finance pending.

## Headteacher Survey Comments

We are trying to e\*\*\*\* links with Dimmer Dump. A couple of staff have visited and been impressed. We hope to do a year project week with you. Contact person - Deryk Lemon - Head of Year 9.

The questionnaire does not reflect the reality of school. We already have many trips - if we had more others would have to go. I'm sure that a Botanic Garden might be of great interest to teachers, but they would have to weigh up the whole picture. It's not as simple as Yes or No.

Q8 - This would have to be answered by our Head of Biology

Q4/5 - Visits need to be spread out so as to hit the right part of the curriculum. Very interested in this work. Good Luck.

As headteacher it is difficult for me to make specific judgements about what visits my teacher feel able, appropriate, relevant to make. I am generally supportive of your initiative for mine and other schools. Two of my teachers have agreed to respond. I am returning the spare envelope for you to reuse. Good luck with your venture.

The Eden Project shows there is great potential in this area - but you will need a large enough collection with some excellent environmental education material to have an instant impact on school students. Good Luck.

Due to the high interest and activity in horticulture at our school, we have strong and active links with Kew Gardens and I am sure that any similar thing that Carymoor could offer would be taken advantage of in the same way!

Flower structure, flower reproduction not part of KS3 or KS4 syllabus = Botanic Garden no longer relevant.

As the Headteacher I have completed this form to save my colleagues the time & effort. I have returned your letters & envelopes + add that I was surprised that your letter to staff used the word headmaster rather than the non-gender specific Headteacher! Good Luck

Q6 - uncertain - sounds very specialised for young children 4-11's

Q1 - Primary based subjects Q8 - I suggest a trip such as this may be more appropriate for older pupils who have a more sophisticated understanding of plant life.

We are an isolated rural primary school. Due to high transport costs we are forced to limit our trips. We do welcome visitors and have a good conservation area, which is developing. Specialist visitors may be the best way forward for us. I only handed out 1 form so enclose left over envelopes.

Q4 - Any afternoon

The reply questionnaires are later arriving due to the lack of a stamp on the original letter to the school

Dear James, I can see the benefit of having a well-resourced environmental garden/nature reserve and I would encourage my staff to visit. I'm not sure whether we would visit a "flower" garden.

### **Headteacher Survey Comments**

An excellent idea. I sincerely hope your venture is successful.

The idea of a plant collection/botanic garden locally especially if arranged in habitats is wonderful and would be invaluable as a study aid to any school in the area. It's a terrific project, well done.

Q3 - High transport costs prohibit further trips

## Teacher Survey Comments

I would only visit a facility if it could offer wheelchair access and disabled facilities such as ramps, specially adapted toilets/changing room etc. Also, because some of our children are delicate I would need to be sure of an indoor school room or similar for lunch-time to shelter from extreme weather.

As we are relatively near I believe we would want & be able to use whatever you offer in the end.

I don't wish to appear negative, but school visits are very restricted now due to having to fund for supply cover for teachers on visits. This has put almost all educational visits over budget for pupils - we do hardly any now.

Q8 - Would like to attend a teacher-training day but school resources would make this difficult.

You should contact Universities with PGCE students and train them about plants - than they'll bring their kiddies when they start their teaching jobs.

Q9 - Very difficult to answer with current classes at 30+, little money and poor behaviour of pupils. I would love to think that my pupils would enjoy and learn from studying plants in the field. Many pupils could not be trusted to behave appropriately. Only a select group could attend. \*Could you supply us with dried plants/leaves/seeds from different habitats?

As our school is a special school for children aged 4-16 years we would be able/would like to use such a facility in a variety of ways. A "hands on" practical approach is always best for us, obviously adapted to the age range visiting at the time. I would consider this to be a useful resource for all ages in our school.

Good Luck!

Our A-level Biology fieldwork is based around a residential week, visiting & investigating succession in sand dunes (Braunton Burvows), rocky shore ecology (Lee Bay), & freshwater streams (on Exmoor). It is difficult to fit this lot into any of your categories in q3.

Q4 - visit Kew

Q4 - Woodland Nature Reserve

Q8/9 - Yes if Time & Finance permitting.

It would be a wonderful resource for the area, which I would use.

Good idea

Q10 - Visits to fit in with the curriculum. As I work in a primary school I would be interested in anything aimed at a fairly basic level of knowledge and understanding. I also run a gardening club and have been talking to Julia + Sarah at Carymoor about visits etc. Bringing a club rather than a class to any centre has two distinct advantages, smaller groups and we are not limited by the curriculum!

Given me ideas! Sorry hurt my hand!

## Teacher Survey Comments

We would be happy to receive a visit from someone who could bring a selection of plants into school when science work on plants is being taught.

As an Art 7 Design dept we draw plant forms - pot plants, seed heads etc. we do visit places such as Barrington Court for drawing and painting, and this year we're taking the whole of Yr9 (250) to Eden Project linking into Science KS3. I am interested to hear of local facilities that have potential for Art & Design.

Fairmead is a school for pupils with special needs. Our Key Stage 3 & 4 pupils are following non-GCSE courses with a vocational or life-skills bias to them. They derive most benefit from a "hands-on" experience, such as a facility like Carymoor could offer them.

Q6/8 - Syllabus constraints mean probably can't spare the time. As a teacher of environmental science I am disappointed that I rarely venture outside the school due to syllabus time constraints. I would love to use "plants in action", talking about it does not bring botany "alive" to students.

It is important that facilities like these are available for the "rural deprived". However, depending on the standard of the facility, I would envisage (of absolute maximum) a visit from a KS3, KS4, KS5 group once a year.

Q8 - teacher training is too time consuming. Would want a printed info sheet before teacher takes students around

Wonderful project! Q7 most relevant to me really - would be useful to show mature species, how they differ, why they differ, where they "should" naturally be found. Good Luck.

I'm quite keen on bringing my year 3's to Carymoor for recycling etc. Could you send me some info. Many thanks.

Q8 - as long as they could be pitch it at special needs levels.

I think that it is important to link local habitats / environment with global. E.g. some rare plants in Britain are actually very common in normal range such as southern Europe. Plants with labels are brilliant because it allows anyone seeing it to access information about the plant.

Q9 - The location is fine - I'm just not sure how I would use this facility. We do monthly days of practical conservation work. We use some plants for extraction of aspirin and dyes but we grow these plants ourselves.

In KS2 we tend to grow - from seed to fruition. Discovering the How, Where, Why's of growth. Currently sunflowers, Runner Beans, cress using school facilities, which are less than perfect. Have also tried potatoes unsuccessfully!!

Q10 - various according to needs of the curriculum that is on a 2yr programme.

Information for students would need to be kept very simple as our pupils have learning difficulties. Written information would need to be in symbol form. I would like to point out that we have a headmistress at this school not a headmaster. I believe it's quite common!!

Q7 - Display of edible plants = Yr9 National Curriculum

## Professionals Survey Comments

Q4 - Don't run a formal training scheme but all our staff have trained at various levels & institutions over the years and maintain their skills in practice.

Q11 - The general lack of ID skills and training in UK FE is a huge complaint of mine!

-

As you know, I have been involved in the Natural History Museum IDQ scheme but it has been rather patchy in its uptake so far. Are you going to collaborate with this? Speak to Roger Lincoln 01719389261

V. few University courses offer good botanical training and I don't think students realise how important plant/habitat survey work will be to their future careers, and it isn't portrayed as important until post-graduate courses (in my experience) and wetland groups in particular are ignored in favour of grassland/woodland.

Have employed graduates but mostly for data handling so I.D. not so important.

Q11 - Graduate not employed to do ID work.

Will not employ a graduate in the future because of lack of I.D. skills

Q11 - Definitely

I would welcome courses on particular groups e.g. lower plants, & habitat groups e.g. aquatic plants.

Don't pitch prices too high. For the cost of the course, and travel costs & overnight expenses.

Q4 - Aquatic macrophytes

I would be interested in the results of the survey - we have variable take-up on macrophyte courses.

If you are interested in external trainers for Potamogeton, Callitriche, Batrachian Ranunculus & Charophytes I would be interested in running more courses.

Self employed so many not applicable

Re Q11 - We employ recently qualified graduates as trainees we train them so that they have the skills we require. We have not used them as field staff since we usually employ people that have developed those skills elsewhere. With regard to botanical training we currently employ 3 experienced botanists who attend the courses that meet that particular training needs as and when they find a suitable course.

Q10 - In general, people coming for interviews to do botanical field surveys have very poor plant ID skills.

Nice to hear from you - you have obviously found a nice job - well done.

Plant ID is a key problem with staff - finding new ones with good ID skills is hard. Any cost effective training would be good, but it has to be regionalised to be environmentally cost effective.

More and more we contract out ecological surveys

Our Warden staff attend training courses which are ecology based to keep their hand in and to stimulate interest.

The more interesting courses would be based around folklore, uses and locatio, when I sat "interesting" I mean relevant to the role of our staff in leading school groups and events.

## Professionals Survey Comments

Q1 - In 2002 we are going to survey our reserves for all these species as baseline data

Q4 - Some internal training is provided as and when needed depending on staff competence to lead it

Q5/8 - As and when they feel they need it (high staff turnover)

Q11 - Most of our employees are University graduates. Generally not satisfied with their plant identification knowledge.

Q11 - I expect to have to train graduates in ID skills. This is been one of my biggest gripes at Unis over the past 10 years.

Q10 - Depends on subject!

There is an excellent set of identification courses set up by Uni of Birmingham and Field Studies Centre - it sounds as if you are prepared to duplicate/replicate courses.

Dear James,

We are so far away from you that I don't think my answers - which I could make either as a University educator or as an ecological consultant - would be much help to you. But my best wishes for you initiative.

I am an individual, not a company + rarely am I involved with British flora. However, I wish you luck.

Adam has left this practice (about 18 months ago) and we no longer have an ecology department so cannot be of help. Sorry!

Thank you for taking an interest in my business. Unfortunately I have not been much help to you because I do not have any permanent employees. My business can tackle most requests for ecological work because I can call upon the services of experts in a number of fields. In theory an identification course would be more appropriate in the areas, which we are working. Ninety percent of my work tends to be North of England + S. Scotland.

I have passed your letter and questionnaire to one of my colleagues who is in a much better position than myself to be able to answer the questions which you have asked.

Q3 - depends, specialist staff with skills in different areas

Q5 - varies widely, some staff more than others

Q10 - Preferred time of year but realise not practical

Q11 - Plant identification skills not learned at Univ - all have developed it in their own time.

Wildlife Trusts do not often have their own in-house survey teams yet we do encourage survey by others. So we need skills in teaching survey techniques more than detailed knowledge of sp. Groups. Nevertheless, the normal work of a Trust (reserve management, conservation policy, education, information management) benefit from good background skills in species groups & particularly an understanding of habitat types.

Q8 - Work is extremely varied + difficult to justify time on identification courses.

Difficult to fill in - my background is as a Botanist but in my current job I also cover transport recreation + sustainable tourism. It is therefore difficult to keep up to date on all these areas at a detailed level.

Q8 - Training is carried out where required, generally further training is not necessary. Our staff are also usually already suitably qualified as regards field surveys.

Q10 - obvious conflict between optimal times for courses.

## Professionals Survey Comments

### Public Survey Comments

Season ticket option

Botanical garden is a good idea - I wish you the best of luck!

Q11 - We run our own graduate training scheme teaching graduates to be competent botanical surveyors. Having trained approx. 200 graduates in 8 yrs I can confirm that even the more competent botanists leaving University do not have sufficient plant identification skills without further training.

There's a need for more ID courses - especially ones that steadily build skills i.e. have basic to advanced modules available.

Some of the questions are a bit vague and it is unclear if you are really interested in our whole organisation (National Museum of Wales), our dept or my vascular plant section (most relevant)

We also run courses on identification, and do some lecturing at the University next door. I've thought for many years it is worthwhile getting live collections together so people can see the different species side by side (e.g. Rosa) and am doing this for some critical groups such as Limonium and Hieracium at National Botanic Garden of Wales. I think there is huge potential to do this, so best of luck!

Thank you for inviting me to complete your questionnaire. Unfortunately I was away from the office just before Christmas & so was unable to respond. Having reviewed the questionnaire now I do not feel that I am well suited to answer the questions & to contribute effectively to your research because we rarely employ surveyors. I hope your research goes well.

Q11 - graduates tend to become more employable with ID experience.

I know my own limitations and work within these, if I need a specialist I employ one on sub-contract especially if they are IEEM members.  
Please note the cost of IEEM workshops (on form enclosed). These represent good training @ very fair prices.

Very difficult to fill this form in sensibly. We employ a large number of people in a large number of roles, some of them requiring botanical experience, others not. On the whole our staff acquire the necessary expertise through on the job training + experience and through going out with EN botanical specialists like myself. Occasionally we send staff on organised training courses, while many staff maintain their level of expertise through involvement with local or national botanical or natural history groups, attending BSBI field meetings, etc. Although many staff would say they were very "rusty", generally their knowledge + expertise is adequate for the job they do. Much of our botanical survey and monitoring work is contracted out, with our own staff overseeing the surveys and involving specialists like myself as the need arises.

All answers responded to as a staff member of the WWT Centre - most of these questions appear largely targeted at ecological consultancy firms employees. Many thanks for sending the questionnaire. Hope this helps.

## Elements of the National Curriculum that could be included in a Botanic Garden

- Elements Summary
- Physiology details
- Evolution details
- Biodiversity details
- Plant Ecology details
- General Ecology details
- Ethnobotany details

## Elements of the national curriculum fit into the six sections as follows

### **Physiology**

8 Signs of life

#### **Green Plants as Organisms**

Plant Parts

Nutrition

Photosynthesis

Water Transportation

Sexual Reproduction/Pollination

Seed Dispersal

### **Evolution**

**Variation, Classification, Inheritance & Evolution**

**Ideas and Evidence in Science**

### **Biodiversity**

**Variation, Classification, Inheritance & Evolution**

Characteristics of Kingdom phylum etc.

### **Plant Ecology**

**Living Things in Their Environment**

Adaptation (Niches)

Competition (Habitats)

**Knowledge and Understanding of Places**

Why places are like they are

### **General Ecology**

**Living Things in Their Environment**

Predation

Food Chains & Webs

Dependence on Others (Symbiosis, Plant/Animal Interactions)

### **Ethnobotany**

**Living Things in Their Environment**

Impact of Humans on the Environment

Sustainable Development

Genetics

**Communication, Health & Safety, Ideas and Evidence in Science** and **Investigative Skills** will be covered throughout the Carymoor site

**Red** = Science Curriculum Key Stages 1-4

**Blue** = Geography Curriculum Key Stages 1-3

## Physiology

### **National Curriculum Objectives**

Signs of life  
Plant Parts  
Nutrition  
Photosynthesis  
Water Transportation  
Sexual Reproduction/Pollination  
Seed Dispersal

### **Main Learning Outcomes**

#### Basic Plant Parts

Flower  
Leaves  
Stem  
Roots

#### Advanced Plant Parts

Parts of insect pollinated and wind-pollinated flowers

Petals  
Sepals  
Anther, Filament, Pollen  
Stigma, Style, Ovary, Seed

Stem

Phloem  
Xylem

Leaf

Cuticle  
Upper epidermis  
Palisade layer  
Spongy mesophyll layer  
Lower epidermis layer  
Cuticle  
Midrib  
Xylem/Phloem bundle  
Stoma

Root

Root Hairs  
Root Cap

### **Exhibits**

#### Basic Plant Parts

Large model of a typical plant with labelled parts that can be fitted together. Surrounded by beds of plants with obviously identifiable plant parts.

#### Advanced Plant Parts

Insect Pollinated Flower Model  
Wind Pollinated Flower Model  
Root Hairs Model  
Stem Model  
Leaf Cross-section Model

### Function of Plant Parts

Sexual Reproduction  
    Pollination  
    Seed Dispersal  
Asexual Reproduction  
Support + Transport  
    Water Transportation  
    Root Pressure (up to 6.4m)  
    Transpiration (up to 10m)  
    Adhesion/Cohesion  
Food Production + Transport  
    Photosynthesis - Carbon Dioxide  
    + Water -> in the presence of  
    Sunlight + Chlorophyll = Sugar  
    + Oxygen  
Support + Nutrition

### Signs of life (8 Characteristics of Life)

Feed  
Respire  
Excrete  
Grow  
Cells  
Sensitive  
Move  
Reproduce

### Function of Plant Parts

Root Types  
Support Demo  
Capillary Action Demo  
Stomata Demo  
Transpiration Demo  
Photosynthesis Model  
Pollination Types  
Seed Dispersal Types

### 8 Signs of Life Exhibit

Illustrations of each of the eight signs of life

Feed  
Respire  
Excrete  
Grow – Stages of tree growth from seed to tree  
Cells – Onion + Microscope  
Sensitive – Pinguicular + Video of root sacs  
Move Stem – Time-lapse digital camera on stem  
    Leaves – Sundews closing around insects  
Reproduce

## Evolution

History  
Variation  
Inheritance & Evolution  
Ideas and Evidence in Science

### **Main Learning Outcomes**

#### History of Darwin

##### Evolution

Evolution is the change in organisms over time and can be explained using Darwin's theory of Natural Selection

##### Natural Selection

- More offspring produced than needed
- Only the those best suited to the present situation survive (Survival of the Fittest)
- Offspring resemble parents
- Offspring differ slightly from parents

##### Variation

Variation arises from genetic causes, such as mutation, and environmental causes, such as population isolation, and a combination of both.

### **Exhibits**

##### Evolution

Plants and their ancestral fossils side by side to show major and minor changes over time.

##### Natural Selection Exhibit

- Calculation of time taken for Poppies to cover the earth
- Possibly time-lapse video of seeds growing/dying in a tray
- Display of *Taraxacum officinale* to demonstrate the variation among offspring but similarity to species

##### Variation

Collection of forms of species illustrating variety among populations, e.g. Junipers from Somerset and other counties.

## Biodiversity

Variation  
Classification  
Ideas and Evidence in Science

### **Main Learning Outcomes**

#### Variation

#### Classification

Kingdom, Phylum, Class, Order,  
Family, Genus, Species  
Binomial System

#### Use of Keys for Identification

### **Exhibits**

#### Variation

Enlarged models of a typical plant for  
each major family

#### Classification

## Ecology

Adaptation (Niches)  
Competition (Habitats)  
Why places are like they are  
Predation  
Food Chains & Webs  
Dependence on Others (Symbiosis, Plant/Animal Interactions)  
Ideas and Evidence in Science  
Investigative Skills  
Living things in the environment

### **Main Learning Outcomes**

#### Key Words

Habitat – The place where an organism lives

Population – A group of organisms of the same species

Community – A group of different species that live together

Ecosystem – A place and all its species

Niche – The role within the ecosystem played by a species

#### Living things in the environment

Identify similarities and differences between local environments and ways in which these affect animals and plants that are found there

#### Energy Movement in Ecosystems

Food Chains

Food Webs

#### Nutrient Cycles

Carbon Cycle

Nitrogen Cycle

### **Exhibits**

#### Living things in the environment

Somerset Habitat Display

Shingle Beach

Tidal Mudflats

Cliff Face

Levels

Agricultural Field

Heathland

Cheddar Gorge

Chalk Grassland

Neutral Pasture

Acid Grassland

#### Energy Movement in Ecosystems

-Interactive using batteries to

demonstrate energy flow

-Rubber-band food web interactive

Factors affecting Distribution of Organisms

Biotic – Relationships with other living species  
Abiotic – Chemical and Physical influences  
Oxygen  
Light  
Water  
Nutrients  
Soil pH

Habitat Sampling

Abundance  
Species Richness  
Quadrat Sampling  
Transect Sampling

Factors affecting Distribution of Organisms

Sand Dunes Succession Bed  
Wetland Succession Bed  
Disturbance demos  
Shade/No Shade  
Water/No Water

Habitat Sampling

Habitat and Successional Beds

## Ethnobotany

Impact of humans on the environment  
How we use plants

### Main Learning Outcomes

Impact of humans on the environment  
Waste management problems  
Pollution  
Removal of Primary Habitat  
Nitrification of land and water-ways

### How we use plants

Food  
Health  
Materials  
Dyes

### Exhibits

### How we use plants

Food  
Health  
Historical – Examples of local uses of plants for medicine such as Henry Lyte or possible records from Glastonbury Abbey  
Modern – Digitoxin for heart disease from Foxgloves, Taxol for the treatment of cancer from Yew, Hyoscine hydrobromide from Henbane used in Kwells seasickness pills.  
Materials - Seed heads of Fullers Teasel (*Dipsacus sativus*) used in the carding of woollen cloth  
Dyes  
Blue -Woad (*Isatis tinctoria*)  
Yellow -Weld (*Reseda luteola*)  
Green -Woad and Weld mixed  
Pink -Wild Madder (*Rubia peregrina*)  
Red -Lady's Bedstraw (*Gallium verum*)  
Magenta -Dandelion (*Taraxacum sp.*)  
Black -Yellow Flag Iris (*Iris pseudocorus*)

## Genetics

Historical manipulation of plants by man  
GM Crops

### **Main Learning Outcomes**

Historical manipulation by man

Modern manipulation (GM Crops)

### **Exhibits**

Historical manipulation by man

Wheat – Emmer etc. tie in with Bronze Age round house  
*Brassica oleracea* –Display showing the original species and a selection of man-made offspring such as sprouts cabbage cauliflower etc.

Modern manipulation (GM Crops)

Discussion of the pros and cons of GM Crops perhaps delivered through role-play or interactive game.