Appendix E – Technological review vendor questionnaires

All questionnaires had the following introductory section:

Background

Information about habitat quality and extent is required for a wide-range of uses, including national statistics, estimating natural capital, for numerous conservation research and planning purposes and to inform local and national planning decisions. Such information can most cost-efficiently be derived across large areas from remotely sensed data. To promote the use of data and technology, Defra set up the Earth Observation Centre of Excellence. One of its goals has been to develop new land cover maps, with a special focus on priority semi-natural habitats. The first such "Living Map" has been developed for Norfolk, but there is a desire to apply this approach throughout the UK. Before this can be done, the Living Map requires robust validation to ensure the habitat classifications assigned from imagery match what is on the ground. The most effective way to do this is likely to be with the help of citizen scientists applying survey methods using technology solutions.

Process

The current phase is an evaluation of both the survey methodologies and the technology that may be used to support these. In order to achieve this, a number of technology providers have been approached to determine the fit between their existing products and the requirements of the Living Map validation. This information will be summarised and used to provide a suggested validation approach for the Norfolk Living Map to Defra in March 2016. Future phases will use the knowledge from the Norfolk prototype to evaluate the potential for applying the same approach throughout England. All responses must be provided by Friday 26th February 2016

Survey methods

A number of survey methodologies are currently being evaluated. We anticipate that it may be useful for more than one approach to be available for volunteers. The survey methodologies can be defined as either:-

- *Desk-based habitat validation*, where a volunteer can look at images to validate without the need to visit the area, or
- *Field-based habitat validation*, where the volunteer is required visit a location and to validate the habitat in the field.

Within both the desk-based and field-based approaches, two sampling approaches could be taken.

- *Unstructured approaches* where volunteers choose what to survey
- *Structured approaches* involving stratified random sampling designs, where parcels are assigned to a volunteer for survey. This would require an additional allocation or management module (as opposed to an unstructured approach).

With unstructured and structured approaches it may be necessary to include rules to prioritise validation of rarer habitat parcels in the sample, and potentially to allow more than one volunteer to validate the same habitat parcel or parcels. With a field-based survey, habitats could be assigned to volunteers before the start of the survey, and / or by notifying the volunteer to survey an area, when in a particular area (geo-fencing).

BTO response – BTO provided

Section 1 – Non-functional requirements

Licensing

For data entered into your system, please detail your policy on data ownership:

The current policy is that data is owned by the observer and used under license by the BTO and its partners.

For registered users how do you comply with UK data protection requirements:

We are registered under the Data protection act. Details of this can be found in our Privacy policy.

The data in this project would be expected to fall under the OGL requirements (http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/) Please comment on this:

The data collected in BTO projects is normally available under OGL BY-CC license but data in this project could be made available under the OGL agreement .

How flexible in terms of integration of additional modules by third parties:

Not addressed in current version, not in the roadmap for this product

Is some or all of the solution open source:

Some of the existing solution is based on open source product, and internally developed components could be provided as open source if required.

Scalability

Please comment on any restrictions that might be dependent on the number of on-line simultaneous users:

Users	**Effect**
0 – 50	None - Existing systems provide this level of support
51-100	None - Existing systems provide this level of support
101-500	Some additional load testing would be required
500+	Some additional load testing would be required

Data volume
Based on an import of the sample 1-km square OS Mastermap geometry data into a PostGres database the following figures have been obtained:

- 96149504 bytes (including 2 indexes)
- Number of rows 133003
- Giving 723 bytes per row

Scaling this number of parcels for the Norfolk map:

4,220,694 parcels at (approximately) 750 bytes per parcel gives 31.6 GB of data.
Norfolk is 5,573 km² and UK is 243,610 km². Assuming Norfolk has an average parcel density the estimate scales to 1.4 TB for the UK.

Please comment on your capacity to scale to these data volumes:

For Norfolk Fully addressed in version For UK Not addressed in current version high cost, minor impact/modifications will achieve required functionality (Additional disk space would be required)

Please comment on your disaster recovery procedures:

The PostGreSQL database has a nightly backup held locally for a quick restore. Off site and tape backups are also available. This would need to be reviewed for large data volumes e.g. UK scaling.

Please comment on your archive policies and procedures:

The PostGreSQL database has a nightly backup held locally for a quick restore. Off site and tape backups are also available. This would need to be reviewed for large data volumes e.g. UK scaling. Tapes are archived for up to 10 years.

Section 2 –Functional requirements

Any system will require a set of functional components to meet the requirements. This identifies these components, provides an overview of the purpose of each and a brief discussion of some of the technical options available.

Data storage

Data storage module encompasses the import and storage of data in a structured manner. The system must be capable of:

- Importing attributed vector data in ESRI shapefile format.
- Importing additional attributes datasets in vector format

Score	Supporting comments
10	ESRI shape files are currently used to import data directly into the tables for the Breeding waders of English Upland Farmland (BWEUF)

User management

The system must be capable of registering sufficient user information in order to:

- Relate data entered with a specific user
- Provide feedback information to a specific user
- Provide the ability to perform a structured survey with additional unstructured observations (casual observations, desk and field based etc)

Score	Supporting comments
8	The existing BWEUF system provides the ability to enter data at field level within specified Tetrads allocated to individual users. This could be modified to allow any user to enter data at the field level as well as allocating individual users to sets of fields.

The system should be able to

- Use existing registration system e.g. facebook
- Relate users to specific geographic areas
- Allow users to store preferences (type of habitat, distance from 'home' location)
- Allow users to be grouped in terms of their ability to identify specific habitat types
- Allow arbitrary groups of people to 'see' and interact with each other when using the system
- Allow an organiser to contact an individual user with a message
- Allow an organiser to contact an arbitrary group of users with a message

Score	Supporting comments
4	The existing systems require registration as a BTO user. A limited set of user preferences may be stored. An additional module would be required to support: ● Grouping of users either socially or by ability ● Communication between users within a group Existing systems do support in application notification and emails

Data entry

The system must be capable of:

- Presenting the user with a list of 'allocated' or 'target' areas for classification

- There should be a mechanism for allocating a higher weighting for areas so they appear more frequently when selecting from a list of areas to classify.
- Allowing a user to select a habitat and agree or disagree with an existing classification
- Allowing a user to select a habitat and record the habitat type from a set of 26 classes

Score	Supporting comments
8	The BWEUF system presents the user with a list of allocated tetrads. Other surveys provide a weighted list of areas to 'count' (NEWS) and record habitat from an existing list (WeBs, BBS, Wild Surveys)

The system should be capable of

- Allowing the user to enter notes and photographs for a given point / area
- Target areas offered should be selected based on a range of criteria e.g. random, higher weight for single visit areas, higher weight for different habitat, higher weight of unvisited, higher weight to achieve multiple visits. This should be capable of being dynamically modified.
- Providing reference images for different types of habitat
- Providing a facility to extend the habitat classes e.g. Deciduous woodland, coniferous woodland or mixed woodland.
- Presenting examples of different habitat classifications

Score	Supporting comments
4	A new module for this functionality would be required

Browser based

The system must be capable of:

- Allowing nominated users (organisers) to allocate or target habitat polygons for survey by other users.
- Organisers should be able to select and group parcels for allocation to users (By habitat, point and radius or grid square)
- Allow users to request areas to be allocated from an organiser
- Allow the presentation of parcels in a random order (possibly grouped by habitat type)

Score	Supporting comments
8	The existing 'Manage' application is used to allocate users to grid squares. Minor modifications would be required in order to allocate users to habitat polygons, and integrate a mechanism to present parcels in a random order for allocation.

The system should be capable of:

- Providing users with the ability to identify a maximum travel distance
- Enable the user to select any parcel and enter a classification
- Providing users with the ability to nominate target areas for classification

Score	Supporting comments
4	A new module would be required to support this function

Mobile based

This refers to a mobile based solution. Some consideration should be made to a paper-based field recording system.

The system must be capable of:

- Displaying a map showing the user's current location
- Entering a habitat for the user's current location
- Entering habitat for a user-selected location and store the user's location with precision
- Providing a list of possible habitat selections for the current / selected location
- Working in an offline manner and uploading results at suitable point.

Score	Supporting comments
4	The existing BirdTrack application could be used as a framework to allow users to enter habitat information at a specific location. The current application allows the presentation of maps showing the users location, and entering taxa data. This works both online and offline. Additional work would be required to extend this to collect habitat data for user allocated polygons.

The system should be capable of

- Downloading a list of ‘allocated’ or ‘target’ polygons
- Presenting a user with sufficient information to determine their proximity to a given (set of) habitat polygons.
- Requesting additional information based on the user's initial response and the existing habitat classification for a polygon

Score	Supporting comments
4	The existing BirdTrack application allows users to download a set of GeoJSON polygons that represent their own sites. This could be extended to download allocated sites for classification and determine the user's proximity to a given set of (downloaded) polygons.

Feedback

The system must be capable of:

- Displaying a map of user-validated polygons for all users
- Displaying a map of user-validated polygons for an individual user or arbitrary group of users
- Providing users with statistics on the individual vs overall match rate between computer-classified and human-classified habitat (by polygon, by area)
- Displaying progress towards target of surveyed polygons per user and per group

Score	Supporting comments
4	Existing surveys provide similar feedback to these requirements, but an additional module would be required to support this functionality

The system should be capable of:

- Providing organisers with the ability to identify users and polygons that have been allocated and classified
- Providing organisers with the ability to identify users and polygons that have been allocated and not classified
- Providing organisers with the ability to identify individual classification rates by habitat type

Score	Supporting comments
4	Existing surveys provide similar feedback to these requirements, but an additional module would be required to support this functionality

Verification

The system should be capable of:

- Presenting mechanisms for verifying a user's ability to classify a specific habitat type
- Presenting mechanisms for verifying the user's ability to navigate to and orient themselves with relation to a given polygon
- Storing a user's 'score' for habitat classifications
- Presenting a user's classification 'scores' to an organiser when allocating polygons

Score	Supporting comments
4	Existing surveys provide similar feedback to these requirements, but an additional module would be required to support this functionality

Data export

The system must be capable of:

- Providing print facilities for an individual area showing a map and target polygons for classification. This should optionally include the current classification.

- Exporting a comma-delimited list of all records, filtered by date range, geography, habitat and entry method.

Score	Supporting comments
8	Existing systems provide the ability to print and export the data in the appropriate formats.

Gap analysis

Existing solution
Please comment on how closely your existing system could support all of the requirements in the previous section:

Loosely coupled Hybrid
Please comment on how your existing system could be used in isolation as part of an overall solution. An example would be using a third party or bespoke plot allocation system and entering habitat observations in your existing system:

Tightly coupled hybrid
Please comment on how your existing system could be used as an integrated part of an overall solution. An example would be using a third party or bespoke plot allocation system and using web services in your existing system to present the user with appropriate areas for data entry:

Bespoke
Please comment on your capability to produce a bespoke system for the requirements as outlined in the Section 2:

We could produce both a desk top and a mobile solution to meet the requirements outlined. Either of these systems could be built to support web services to allow integration with other supplier's modules.

Preferred solution

Please comment on your preferred solution (out of the choices in the previous section) for this system:

Bespoke: a web application that allows users to classify habitats, and a management module that allows organisers to allocate areas for classification to volunteers. This will be supported by a mobile application that allows users to enter data in the field in an off-line mode. We would also build public access pages to show visualisations of the data and provide export facilities.

Costs

For a Norfolk Living Map please provide an estimate of lead time and an estimate of cost for your preferred solution identified in the previous section. (Note this is an outline estimate of cost and will be provided as supplementary information only):

Approx 6 months based on current understanding of requirements. Cost ~ £150K for all of the features outlined in these requirements. Mobile solution would be provided on both iOS and Android platforms. Ongoing annual maintenance ~£2000.

For a Norfolk Living Map please comment of how an increase in the number of users would affect ongoing maintenance costs:

Up to 150 simultaneous users, no extra cost. Above this we would have to re-evaluate based on load on our systems.

For a Norfolk Living Map please comment on any costs that may be incurred for data import or data extraction for your system:

No extra costs

For a Norfolk Living Map please comment of how an increase in data volume would affect ongoing maintenance costs:

Increase in data volume would increase costs in line with the annual maintenance costs.

For a UK-wide solution please provide an estimate of additional development required to scale the solution from the Norfolk Living map implementation:

No additional development would be required to scale to the UK

For a UK-wide solution what additional costs would be incurred e.g. data storage, number of online simultaneous users:

There would be additional data storage costs and there would be some additional costs to load the UK wide data. Up to 150 simultaneous users would incur no additional costs.

COBWEB response – COBWEB provided

Section 1 – Non-functional requirements

Licensing

For data entered into your system, please detail your policy on data ownership:

https://dyfi.cobwebproject.eu/docs/COBWEB-EULA.pdf

For registered users, how do you comply with UK data protection requirements:

EU Privacy policies are addressed within COBWEB

The data in this project would be expected to fall under the OGL requirements (http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/) Please comment on this:

The end user data licence requirements are defined by the survey co-ordinator. Other licences are only considered, if conflation has taken place on these data.

How flexible in terms of integration of additional modules by third parties:

Dependent on module and implementation strategy. Support for WMS/WFS/WPS.
The data collected using the COBWEB framework will be exposed as SWE4CS, which is a profile of SWE, and OGC standard.

Is some or all of the solution open source:

Some.

Scalability

Please comment on any restrictions that might be dependent on the number of on-line simultaneous users:

Users	**Effect**
0 - 50	Due to the system being in development, performance under differing user loads

	not yet ascertained.
51-100	
101-500	
500+	

Data volume

Based on an import of the sample 1-km square OS Mastermap geometry data into a PostGres database the following figures have been obtained:

96149504 bytes (including 2 indexes)
Number of rows 133003
Giving 723 bytes per row

Scaling this number of parcels for the Norfolk map:

4,220,694 parcels at (approximately) 750 bytes per parcel gives 31.6 GB of data.
Norfolk is 5,573 km² and UK is 243,610 km². Assuming Norfolk has an average parcel density the estimate scales to 1.4 TB for the UK.

Please comment on your capacity to scale to these data volumes:

Large datasets are currently untested within COBWEB software but the hardware allows for easy expansion of disk space, and additional RAM

Please comment on your disaster recovery procedures:

Raided hard disks for single disk failure and daily backups of databases and system images to a fire safe, The entire system is on a virtualised environment so once suitable replacement hardware is sourced system recovery is relatively fast

Please comment on your archive policies and procedures:

There are currently no archive policies and procedures due to the nature of the COBWEB project being a research project.

Section 2 –Functional requirements

Any system will require a set of functional components to meet the requirements. This identifies these components, provides an overview of the purpose of each and a brief discussion of some of the technical options available.

Data storage

Data storage module encompasses the import and storage of data in a structured manner. The system must be capable of:

Importing attributed vector data in ESRI shapefile format.
Importing additional attributes datasets in vector format

Score	Supporting comments
8	The COBWEB Portal allows users to upload vector data (e.g. ESRI shapefile) that then appears within the map of the COBWEB app.

User management

The system must be capable of registering sufficient user information in order to:

Relate data entered with a specific user
Provide feedback information to a specific user
Provide the ability to perform a structured survey with additional unstructured observations (casual observations, desk and field based etc)

Score	Supporting comments
8	**Relate data entered with a specific user** Users who register with the COBWEB Portal are given a unique user ID that identifies them while also maintaining their personal privacy.
8	**Provide feedback information to a specific user** Currently possible to provide feedback to all users participating in a survey. Modifications would be required to achieve 'specific user' functionality.
8	**Provide the ability to perform a structured survey with additional unstructured observations**

	Can create two separate surveys that both appear (are available) to users.

The system should be able to

Use existing registration system e.g. Facebook

Relate users to specific geographic areas

Allow users to store preferences (type of habitat, distance from 'home' location)

Allow users to be grouped in terms of their ability to identify specific habitat types

Allow arbitrary groups of people to 'see' and interact with each other when using the system

Allow an organiser to contact an individual user with a message

Allow an organiser to contact an arbitrary group of users with a message

Score	**Supporting comments**
10	**Use existing registration system e.g. Facebook** Fully addressed.
8	**Relate users to specific geographic areas** Development ongoing
4	**Allow users to store preferences (type of habitat, distance from 'home' location)** Not within our current use cases, therefore the requirement has not been addressed.
4	**Allow users to be grouped in terms of their ability to identify specific habitat types** Not within our current use cases, therefore the requirement has not been addressed.
4	**Allow arbitrary groups of people to 'see' and interact with each other when using the system** Not within our current use cases, therefore the requirement has not been addressed.
8	**Allow an organiser to contact an individual user with a message**
10	**Allow an organiser to contact an arbitrary group of users with a message** Fully addressed.

Data entry

The system must be capable of:

Presenting the user with a list of ‘allocated’ or ‘target’ areas for classification

There should be a mechanism for allocating a higher weighting for areas so they appear more frequently when selecting from a list of areas to classify.

Allowing a user to select a habitat and agree or disagree with an existing classification

Allowing a user to select a habitat and record the habitat type from a set of 26 classes

Score	Supporting comments
4	**Presenting the user with a list of ‘allocated’ or ‘target’ areas for classification**
2	**There should be a mechanism for allocating a higher weighting for areas so they appear more frequently when selecting from a list of areas to classify.**
8	**Allowing a user to select a habitat and agree or disagree with an existing classification**
10	**Allowing a user to select a habitat and record the habitat type from a set of 26 classes** Fully addressed

The system should be capable of

Allowing the user to enter notes and photographs for a given point / area

Target areas offered should be selected based on a range of criteria e.g. random, higher weight for single visit areas, higher weight for different habitat, higher weight of unvisited, higher weight to achieve multiple visits. This should be capable of being dynamically modified.

Providing reference images for different types of habitat

Providing a facility to extend the habitat classes e.g. Deciduous woodland, coniferous woodland or mixed woodland.

Presenting examples of different habitat classifications

Score	Supporting comments
10	**Allowing the user to enter notes and photographs for a given point/area** Fully addressed.
2	**Target areas offered should be selected based on a range of criteria**
10	**Providing reference images for different types of habitat** Fully addressed.
10	**Providing a facility to extend the habitat classes e.g. Deciduous woodland, coniferous woodland or mixed woodland** COBWEB offers skip logic
10	**Presenting examples of different habitat classifications** Fully addressed

Browser based

The system must be capable of:

Allowing nominated users (organisers) to allocate or target habitat polygons for survey by other users.

Organisers should be able to select and group parcels for allocation to users (By habitat, point and radius or grid square)

Allow users to request areas to be allocated from an organiser

Allow the presentation of parcels in a random order (possibly grouped by habitat type)

Score	Supporting comments
2	**Allowing nominated users (organisers) to allocate or target habitat polygons for survey by other users**
2	**Organisers should be able to select and group parcels for allocation to users (By**

	habitat, point and radius or grid square)
2	**Allow users to request areas to be allocated from an organiser**
2	**Allow the presentation of parcels in a random order (possibly grouped by habitat type)**

The system should be capable of:

Providing users with the ability to identify a maximum travel distance
Enable the user to select any parcel and enter a classification
Providing users with the ability to nominate target areas for classification

Score	Supporting comments
2	**Providing users with the ability to identify a maximum travel distance**
4	**Enable the user to select any parcel and enter a classification**
4	**Providing users with the ability to nominate target areas for classification**

Mobile based

This refers to a mobile based solution. Some consideration should be made to a paper-based field recording system.

The system must be capable of:

Displaying a map showing the user's current location
Entering a habitat for the user's current location
Entering habitat for a user-selected location and store the user's location with precision

Providing a list of possible habitat selections for the current / selected location

Working in an offline manner and uploading results at suitable point.

Score	Supporting comments
10	**Displaying a map showing the user's current location** Fully addressed.
10	**Entering a habitat for the user's current location** Fully addressed.
10	**Entering habitat for a user-selected location and store the user's location with precision** Fully addressed.
10	**Providing a list of possible habitat selections for the current / selected location** Fully addressed. [Incorporation of images to aid identification possible too]
10	**Working in an offline manner and uploading results at suitable point** Fully addressed. Relies upon the user manually uploading results on returning to connectivity.

The system should be capable of

Downloading a list of 'allocated' or 'target' polygons

Presenting a user with sufficient information to determine their proximity to a given (set of) habitat polygons.

Requesting additional information based on the user's initial response and the existing habitat classification for a polygon

Score	Supporting comments
8	**Downloading a list of 'allocated' or 'target' polygons**
2	**Presenting a user with sufficient information to determine their proximity to a given (set of) habitat polygons**

10	**Requesting additional information based on the user's initial response and the existing habitat classification for a polygon** Decision tree/skip logic proven.

Feedback

The system must be capable of:

Displaying a map of user-validated polygons for all users
Displaying a map of user-validated polygons for an individual user or arbitrary group of users
Providing users with statistics on the individual vs overall match rate between computer-classified and human-classified habitat (by polygon, by area)
Displaying progress towards target of surveyed polygons per user and per group

Score	Supporting comments
4	**Displaying a map of user-validated polygons for all users**

2	**Displaying a map of user-validated polygons for an individual user or arbitrary group of users**
2	**Providing users with statistics on the individual vs overall match rate between computer-classified and human-classified habitat (by polygon, by area)**
2	**Displaying progress towards target of surveyed polygons per user and per group**

The system should be capable of:

Providing organisers with the ability to identify users and polygons that have been allocated and classified

Providing organisers with the ability to identify users and polygons that have been allocated and not classified

Providing organisers with the ability to identify individual classification rates by habitat type

Score	Supporting comments
8	**Providing organisers with the ability to identify users and polygons that have been allocated and classified**
8	**Providing organisers with the ability to identify users and polygons that have been allocated and not classified**
2	**Providing organisers with the ability to identify individual classification rates by habitat type**

Verification

The system should be capable of:

Presenting mechanisms for verifying a user's ability to classify a specific habitat type

Presenting mechanisms for verifying the user's ability to navigate to and orient themselves with relation to a given polygon

Storing a user's 'score' for habitat classifications

Presenting a user's classification 'scores' to an organiser when allocating polygons

Score	Supporting comments
4-8	**Presenting mechanisms for verifying a user's ability to classify a specific habitat type** COBWEB has an automated QA system, which is configurable, however this is still under development.
8	**Presenting mechanisms for verifying the user's ability to navigate to and**

	orient themselves with relation to a given polygon
4	**Storing a user's 'score' for habitat classifications**
2	**Presenting a user's classification 'scores' to an organiser when allocating polygons**

Data export

The system must be capable of:

Providing print facilities for an individual area showing a map and target polygons for classification. This should optionally include the current classification.

Exporting a comma-delimited list of all records, filtered by date range, geography, habitat and entry method.

Score	Supporting comments
8/10	**Providing print facilities for an individual area showing a map and target polygons for classification. This should optionally include the current classification** Able to print a desired extent using the COBWEB portal.
10	**Exporting a comma-delimited list of all records, filtered by date range, geography, habitat and entry method** Fully addressed.

Gap analysis

Existing solution

Please comment on how closely your existing system could support all of the requirements in the previous section:

Loosely coupled Hybrid

Please comment on how your existing system could be used in isolation as part of an overall solution. An example would be using a third party or bespoke plot allocation system and entering habitat observations in your existing system:

Aspects of the COBWEB framework (such as QA) can be used with other solutions. Open standards would be required.

Tightly coupled hybrid

Please comment on how your existing system could be used as an integrated part of an overall solution. An example would be using a third party or bespoke plot allocation system and using web services in your existing system to present the user with appropriate areas for data entry:

Not suitable at present.

Bespoke

Please comment on your capability to produce a bespoke system for the requirements as outlined in the Section 2:

The COBWEB framework has been designed to be customisable by a project co-ordinator, of a Cit Sci project.

Preferred solution

Please comment on your preferred solution (out of the choices in the previous section) for this system:

Firstly, bespoke, secondly loosely coupled.

Costs

For a Norfolk Living Map please provide an estimate of lead time and an estimate of cost for your preferred solution identified in the previous section. (Note this is an outline estimate of cost and will be provided as supplementary information only):

This will depend on when the solution is required, and how closely your final requirements match our existing technology. Please contact me directly of a discussion.

For a Norfolk Living Map please comment of how an increase in the number of users would affect on going maintenance costs:

COBWEB has been designed to be scalable.

For a Norfolk Living Map please comment on any costs that may be incurred for data import or data extraction for your system:

This would depend on whether the user uploads their own data, or if it is pre configured.

For a Norfolk Living Map please comment of how an increase in data volume would affect on going maintenance costs:

Maintenance can be adjusted accordingly to storage costs.

For a UK-wide solution please provide an estimate of additional development required to scale the solution from the Norfolk Living map implementation:

The cost is more dependent on international boarders rather than national geographical coverage.

For a UK-wide solution what additional costs would be incurred e.g. data storage, number of online simultaneous users:

This would need to be discussed, when exact requirements are listed.

E-Smart response – ESMART provided

Section 1 – Non-functional requirements

Licensing

For data entered into your system, please detail your policy on data ownership:

Data ownership is dependent on the project specifications and licence agreements, and can be adapted for specific requirements.

For registered users how do you comply with UK data protection requirements:

Kitemark BSI standards are applied and upheld.

The data in this project would be expected to fall under the OGL requirements (http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/) Please comment on this:

This is a familiar set of requirements to us and something that could be adhered to without difficulty.

How flexible in terms of integration of additional modules by third parties:

Not particularly flexible unless specifically designed to be so; this would require major design changes.

Is some or all of the solution open source:

No.

Scalability

Please comment on any restrictions that might be dependent on the number of on-line simultaneous users:

Users	**Effect**
0 - 50	None

51-100	None
101-500	None
500+	None

Data volume

Based on an import of the sample 1-km square OS Mastermap geometry data into a PostGres database the following figures have been obtained:

96149504 bytes (including 2 indexes)
Number of rows 133003
Giving 723 bytes per row

Scaling this number of parcels for the Norfolk map:

4,220,694 parcels at (approximately) 750 bytes per parcel gives 31.6 GB of data.
Norfolk is 5,573 km² and UK is 243,610 km². Assuming Norfolk has an average parcel density the estimate scales to 1.4 TB for the UK.

Please comment on your capacity to scale to these data volumes:

The James Hutton Institute server capacity runs at somewhat higher than 200 TB currently, and is going to be adapted to increase this capacity in the coming year.

Please comment on your disaster recovery procedures:

In addition to backup design outlined below, we have on-site electrical supply in case of failure, and off-site recovery of data.

Please comment on your archive policies and procedures:

Tape storage and off-site backup are carried out routinely for all server data, on a weekly basis.

Section 2 – Functional requirements

Any system will require a set of functional components to meet the requirements. This identifies these components, provides an overview of the purpose of each and a brief discussion of some of the technical options available.

Data storage

Data storage module encompasses the import and storage of data in a structured manner. The system must be capable of:

Importing attributed vector data in ESRI shapefile format.

Importing additional attributes datasets in vector format

Score	Supporting comments
8	Current citizen science app can handle upload of data linked to coordinates; currently a different format is used but this could be changed.

User management

The system must be capable of registering sufficient user information in order to:

Relate data entered with a specific user

Provide feedback information to a specific user

Provide the ability to perform a structured survey with additional unstructured observations (casual observations, desk and field based etc)

Score	Supporting comments
8	Data and feedback can be linked to a specific user; structured survey etc. could be implemented relatively easily.

The system should be able to

Use existing registration system e.g. facebook

Relate users to specific geographic areas

Allow users to store preferences (type of habitat, distance from 'home' location)

Allow users to be grouped in terms of their ability to identify specific habitat types

Allow arbitrary groups of people to 'see' and interact with each other when using the system

Allow an organiser to contact an individual user with a message

Allow an organiser to contact an arbitrary group of users with a message

Score	Supporting comments
2	The above requirements are not addressed in the current system

Data entry

The system must be capable of:

Presenting the user with a list of ‘allocated’ or ‘target’ areas for classification

There should be a mechanism for allocating a higher weighting for areas so they appear more frequently when selecting from a list of areas to classify.

Allowing a user to select a habitat and agree or disagree with an existing classification

Allowing a user to select a habitat and record the habitat type from a set of 26 classes

Score	Supporting comments
6	This could be implemented but would require new work

The system should be capable of

Allowing the user to enter notes and photographs for a given point / area

Target areas offered should be selected based on a range of criteria e.g. random, higher weight for single visit areas, higher weight for different habitat, higher weight of unvisited, higher weight to achieve multiple visits. This should be capable of being dynamically modified.

Providing reference images for different types of habitat

Providing a facility to extend the habitat classes e.g. Deciduous woodland, coniferous woodland or mixed woodland.

Presenting examples of different habitat classifications

Score	Supporting comments
6	Could be implemented relatively easily, would require some development

Browser based

The system must be capable of:

Allowing nominated users (organisers) to allocate or target habitat polygons for survey by other users.

Organisers should be able to select and group parcels for allocation to users (By habitat, point and radius or grid square)

Allow users to request areas to be allocated from an organiser

Allow the presentation of parcels in a random order (possibly grouped by habitat type)

Score	Supporting comments
4	Not implemented, but functionality is possible

The system should be capable of:

Providing users with the ability to identify a maximum travel distance
Enable the user to select any parcel and enter a classification
Providing users with the ability to nominate target areas for classification

Score	Supporting comments
5	Again, not implemented but not particularly difficult to accomplish

Mobile based

This refers to a mobile based solution. Some consideration should be made to a paper-based field recording system.

The system must be capable of:

Displaying a map showing the user's current location
Entering a habitat for the user's current location
Entering habitat for a user-selected location and store the user's location with precision
Providing a list of possible habitat selections for the current / selected location
Working in an offline manner and uploading results at suitable point.

Score	Supporting comments
8	Current system is not dissimilar to this, would require modification

The system should be capable of

Downloading a list of ‘allocated’ or ‘target’ polygons
Presenting a user with sufficient information to determine their proximity to a given (set of) habitat polygons.
Requesting additional information based on the user's initial response and the existing habitat classification for a polygon

Score	Supporting comments
6	Relatively easy to implement given existing framework

Feedback

The system must be capable of:

- Displaying a map of user-validated polygons for all users
- Displaying a map of user-validated polygons for an individual user or arbitrary group of users
- Providing users with statistics on the individual vs overall match rate between computer-classified and human-classified habitat (by polygon, by area)
- Displaying progress towards target of surveyed polygons per user and per group

Score	Supporting comments
6	Relatively easy to implement given existing framework

The system should be capable of:

- Providing organisers with the ability to identify users and polygons that have been allocated and classified
- Providing organisers with the ability to identify users and polygons that have been allocated and not classified
- Providing organisers with the ability to identify individual classification rates by habitat type

Score	Supporting comments
8	Existing feedback statistics could be altered to include this

Verification

The system should be capable of:

- Presenting mechanisms for verifying a user's ability to classify a specific habitat type
- Presenting mechanisms for verifying the user's ability to navigate to and orient themselves with relation to a given polygon

Storing a user's 'score' for habitat classifications

Presenting a user's classification 'scores' to an organiser when allocating polygons

Score	Supporting comments
6	Not currently implemented and would require design and implementation

Data export

The system must be capable of:

Providing print facilities for an individual area showing a map and target polygons for classification. This should optionally include the current classification.

Exporting a comma-delimited list of all records, filtered by date range, geography, habitat and entry method.

Score	Supporting comments
6	Would require some implementation work

Gap analysis

Existing solution

Please comment on how closely your existing system could support all of the requirements in the previous section: Not closely, but the existing framework and system has existing elements that are similar in design, and the overall could be added to, to implement these requirements without radical design change.

Loosely coupled Hybrid

Please comment on how your existing system could be used in isolation as part of an overall solution. An example would be using a third party or bespoke plot allocation system and entering habitat observations in your existing system:

Existing system could be used to monitor some specific field information, but would not satisfy a lot of the requirements for providing information to the user or for validation.

Tightly coupled hybrid

Please comment on how your existing system could be used as an integrated part of an overall solution. An example would be using a third party or bespoke plot allocation system and using web services in your existing system to present the user with appropriate areas for data entry:

This could be done, but would require quite a lot of reworking of what already exists, plus some new implementation.

Bespoke

Please comment on your capability to produce a bespoke system for the requirements as outlined in the Section 2:

Our organisation could produce a bespoke system that would satisfy all of the requirements outlined. This would require detailed design and implementation work, but no new underlying capacity or skill enhancement.

Preferred solution

Please comment on your preferred solution (out of the choices in the previous section) for this system:

The bespoke solution would be preferred, as we do not currently have a system that

appropriately satisfies the requirements or that could be easily altered to do so; we do however have sufficient experience, skills and infrastructure to produce something specific to the requirements.

Costs

For a Norfolk Living Map please provide an estimate of lead time and an estimate of cost for your preferred solution identified in the previous section. (Note this is an outline estimate of cost and will be provided as supplementary information only):

400 person-days @ £500/day so approximately £200,000; this would involve 3 staff and could be accomplished in 1 year.

For a Norfolk Living Map please comment of how an increase in the number of users would affect ongoing maintenance costs:

The James Hutton Institute has sufficient capacity to handle large numbers of users; there might be some additional server purchase requirements at some point but this would cost thousands rather than tens of thousands of pounds.

For a Norfolk Living Map please comment on any costs that may be incurred for data import or data extraction for your system:

JHI is on JANET, the Joint Academic Network, and effectively operates as one of the hubs for this. Our import/extraction costs would be minimal. Costs for data download to mobile devices using 3G or 4G are beyond our control, however, and it is difficult to estimate how that would be handled.

For a Norfolk Living Map please comment of how an increase in data volume would affect on going maintenance costs:

The response to this is similar to that above – for the estimated upper limit, it would not be a problem.

For a UK-wide solution please provide an estimate of additional development required to scale the solution from the Norfolk Living map implementation:

The system design would remain the same, but would need to access further datasets to cover the whole UK. While this is scalable, there would no doubt be additional efforts required to integrate this additional data and user requirement specifics into the system. Provided the functionality of the system did not change, this sounds like a couple of months work.

For a UK-wide solution what additional costs would be incurred e.g. data storage, number of online simultaneous users:

Some data storage or data processing server costs; a dedicated server and additional backup would probably be required – estimated £30,000.

Geo-Wiki / Laco-Wiki – BTO assessment

Section 2 – Functional requirements

Any system will require a set of functional components to meet the requirements. This identifies these components, provides an overview of the purpose of each and a brief discussion of some of the technical options available.

Data storage

Data storage module encompasses the import and storage of data in a structured manner. The system must be capable of:

- Importing attributed vector data in ESRI shapefile format.
- Importing additional attributes datasets in vector format

Score	Supporting comments
10	Laco-wiki supports uploading Shapefile data

User management

The system must be capable of registering sufficient user information in order to:

- Relate data entered with a specific user
- Provide feedback information to a specific user
- Provide the ability to perform a structured survey with additional unstructured observations (casual observations, desk and field based etc)

Score	Supporting comments
8	Users are required to register basic information before they can log in. Some of the products present data in a structured manner, and some allow users to define areas for classification.

The system should be able to

- Use existing registration system e.g. facebook
- Relate users to specific geographic areas
- Allow users to store preferences (type of habitat, distance from 'home' location)
- Allow users to be grouped in terms of their ability to identify specific habitat types
- Allow arbitrary groups of people to 'see' and interact with each other when using the system
- Allow an organiser to contact an individual user with a message
- Allow an organiser to contact an arbitrary group of users with a message

Score	Supporting comments
4	This does not appear as a feature in any of the products so it is assumed that additional work would be required to support this.

Data entry

The system must be capable of:

- Presenting the user with a list of 'allocated' or 'target' areas for classification
- There should be a mechanism for allocating a higher weighting for areas so they appear more frequently when selecting from a list of areas to classify.
- Allowing a user to select a habitat and agree or disagree with an existing classification
- Allowing a user to select a habitat and record the habitat type from a set of 26 classes

Score	Supporting comments
4	The current implementation supports random point and random pixel generated samples. The comment on the product identifies that in future versions there will be support for

The system should be capable of

- Allowing the user to enter notes and photographs for a given point / area
- Target areas offered should be selected based on a range of criteria e.g. random, higher weight for single visit areas, higher weight for different habitat, higher weight of unvisited, higher weight to achieve multiple visits. This should be capable of being dynamically modified.
- Providing reference images for different types of habitat
- Providing a facility to extend the habitat classes e.g. Deciduous woodland, coniferous woodland or mixed woodland.
- Presenting examples of different habitat classifications

Score	Supporting comments
4	Some of the products allow users to enter notes for the classifications, and there are examples of users photographs within some of the datasets. There is no evidence for weighting of visits or the ability for the user to extend the classifications. See sample creation screen shot

Browser based

The system must be capable of:

- Allowing nominated users (organisers) to allocate or target habitat polygons for survey by other users.
- Organisers should be able to select and group parcels for allocation to users (By habitat, point and radius or grid square)
- Allow users to request areas to be allocated from an organiser
- Allow the presentation of parcels in a random order (possibly grouped by habitat type)

Score	**Supporting comments**
2	This does not appear to be a feature or proposed feature in the product

The system should be capable of:

- Providing users with the ability to identify a maximum travel distance
- Enable the user to select any parcel and enter a classification
- Providing users with the ability to nominate target areas for classification

Score	**Supporting comments**
4	This does support some level of targeting users 'home' location and allowing user defined locations to be entered. These are however points or pixels rather than existing polygons. See http://www.iiasa.ac.at/web/home/research/researchPrograms/EcosystemsServicesandManagement/Assessment-of-Land-Cover.en.html

Mobile based

This refers to a mobile based solution. Some consideration should be made to a paper-based field recording system.

The system must be capable of:

- Displaying a map showing the user's current location
- Entering a habitat for the user's current location
- Entering habitat for a user-selected location and store the user's location with precision
- Providing a list of possible habitat selections for the current / selected location
- Working in an offline manner and uploading results at suitable point.

Score	**Supporting comments**
4	Mobile solution is provided on multiple platforms. This allows the user to take photographs and enter a classification for the photograph.

The system should be capable of

- Downloading a list of ‘allocated’ or ‘target’ polygons
- Presenting a user with sufficient information to determine their proximity to a given (set of) habitat polygons.
- Requesting additional information based on the user's initial response and the existing habitat classification for a polygon

Score	Supporting comments
2	This does not appear to be a feature or proposed feature in the product

Feedback

The system must be capable of:

- Displaying a map of user-validated polygons for all users
- Displaying a map of user-validated polygons for an individual user or arbitrary group of users
- Providing users with statistics on the individual vs overall match rate between computer-classified and human-classified habitat (by polygon, by area)
- Displaying progress towards target of surveyed polygons per user and per group

Score	Supporting comments
4	A range of statistical reports are available (Although not all outputs are implemented) see reports screenshot. Additional work would be required in order to implement the reports identified.

The system should be capable of:

- Providing organisers with the ability to identify users and polygons that have been allocated and classified
- Providing organisers with the ability to identify users and polygons that have been allocated and not classified
- Providing organisers with the ability to identify individual classification rates by habitat type

Score	Supporting comments
4	A range of statistical reports are available (Although not all outputs are implemented) see reports screenshot. Additional work would be required in order to implement the reports identified.

Verification

The system should be capable of:

- Presenting mechanisms for verifying a user's ability to classify a specific habitat type
- Presenting mechanisms for verifying the user's ability to navigate to and orient themselves with relation to a given polygon

- Storing a user's 'score' for habitat classifications
- Presenting a user's classification 'scores' to an organiser when allocating polygons

Score	Supporting comments
4	A range of statistical reports are available (Although not all outputs are implemented) see reports screenshot. Additional work would be required in order to implement the reports identified.

Data export

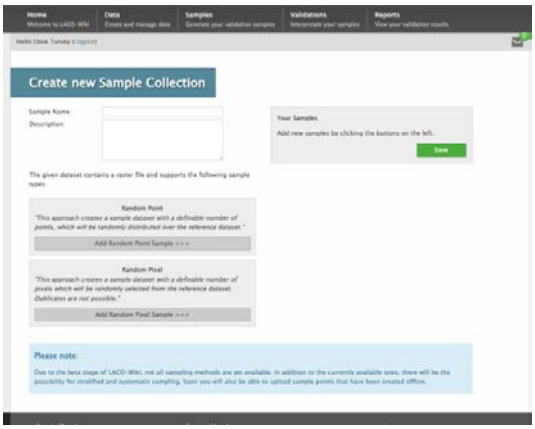
The system must be capable of:

- Providing print facilities for an individual area showing a map and target polygons for classification. This should optionally include the current classification.
- Exporting a comma-delimited list of all records, filtered by date range, geography, habitat and entry method.

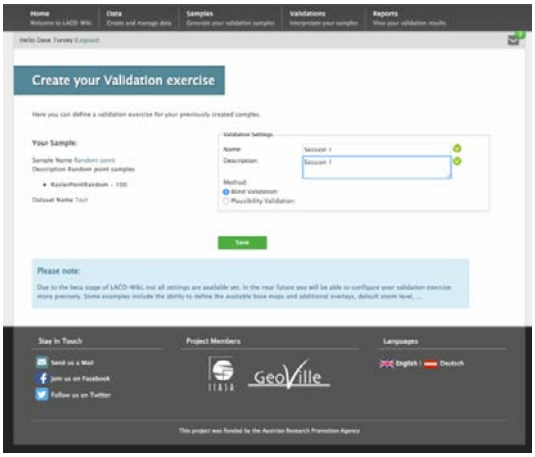
Score	Supporting comments
4	The user can screenshot the data directly from the screen and print this. A range of statistical reports are available (Although not all outputs are implemented) see reports screenshot. Additional work would be required in order to implement the reports identified.

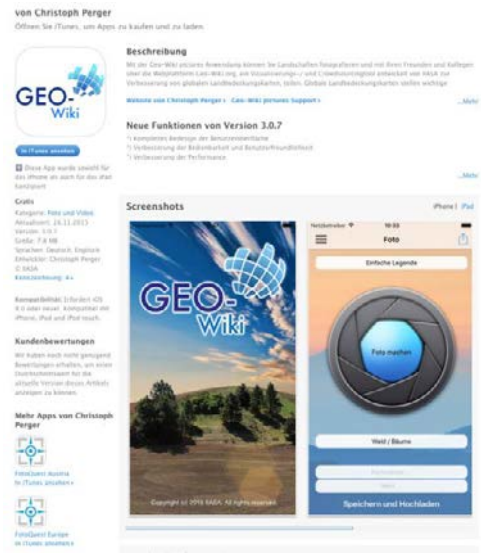
Laco-Wiki screenshots

Feature overview



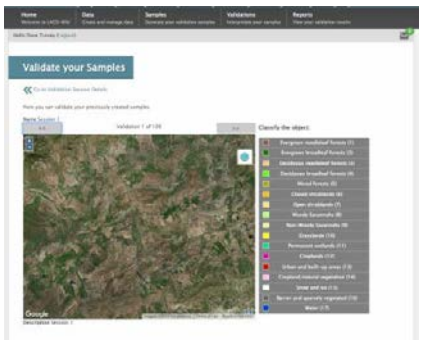
Sample collection





Validation session

Mobile solution for Apple devices
Mobile solution overview



Sample validation

Report outputs

Zooniverse – BTO assessment

Zooniverse provided the following response to the request for information:

We're not a vendor in the normal sense, but rather a grant-funded research group, and so it doesn't make much sense to fill in this form as part of a formal bid. I strongly suspect, however, that collaboration with the Zooniverse and the use of the codebase we have is the best solution for you, particularly for the desktop surveying use case you mention. Our platform is open, and our code completely open source.

I'd be happy to discuss options with you or with your chosen vendor when the time comes.

Zooniverse also provided the following additional information in a further e-mail on system scalability:

A typical project has ~25,000 users, and our most popular ones 250,000 or so. We're used to dealing with concurrent loads from 5000 or so users (the result of being featured on a prime-time BBC show)

Section 2 – Functional requirements

Any system will require a set of functional components to meet the requirements. This identifies these components, provides an overview of the purpose of each and a brief discussion of some of the technical options available.

Data storage

Data storage module encompasses the import and storage of data in a structured manner. The system must be capable of:

- Importing attributed vector data in ESRI shapefile format.
- Importing additional attributes datasets in vector format

Score	Supporting comments
2	The system works by importing a set of subject images that may be classified. The restriction is shown below: Subject images can be up to 600KB and any of: .jpg, .jpeg, .png, .gif, .svg and may not contain /, \, :, ,

User management

The system must be capable of registering sufficient user information in order to:

- Relate data entered with a specific user
- Provide feedback information to a specific user
- Provide the ability to perform a structured survey with additional unstructured observations (casual observations, desk and field based etc)

Score	Supporting comments
8	The underlying model provides the ability to relate the user to specific classifications and supports feedback to a specific user: https://github.com/zooniverse/Panoptes/wiki/DataModel The subject sets may be grouped and presented to users in a structured manner e.g. 1KM square groups, grouped by habitat etc. Additional workflows can support other unstructured observation entry by providing a complete coverage of the area and allowing users to identify the features themselves. It does not appear possible to allocate specific subject sets to specific users

The system should be able to

- Use existing registration system e.g. facebook
- Relate users to specific geographic areas
- Allow users to store preferences (type of habitat, distance from 'home' location)
- Allow users to be grouped in terms of their ability to identify specific habitat types
- Allow arbitrary groups of people to 'see' and interact with each other when using the system
- Allow an organiser to contact an individual user with a message
- Allow an organiser to contact an arbitrary group of users with a message

Score	Supporting comments
4	Hosted projects are by the zooniverse user id only. There are few options for supporting additional user preferences: https://github.com/zooniverse/Panoptes/wiki/DataModel Zooniverse does provide forums that allow interaction between users (and moderators) of the system: https://www.zooniverse.org/talk

Data entry

The system must be capable of:

- Presenting the user with a list of 'allocated' or 'target' areas for classification
- There should be a mechanism for allocating a higher weighting for areas so they appear more frequently when selecting from a list of areas to classify.
- Allowing a user to select a habitat and agree or disagree with an existing classification
- Allowing a user to select a habitat and record the habitat type from a set of 26 classes

Score	Supporting comments
4	The subject sets may be grouped and presented to users in a structured manner e.g. 1KM square groups, grouped by habitat etc. It does not appear possible to allocate individual users with allocated subject sets in the current version, however given the workflow approach and the schema only minor additional functionality would be required. There does not appear to be a mechanism to allocate or weight the presentation of the subjects.

The system should be capable of

- Allowing the user to enter notes and photographs for a given point / area
- Target areas offered should be selected based on a range of criteria e.g. random, higher weight for single visit areas, higher weight for different habitat, higher weight of unvisited, higher weight to achieve multiple visits. This should be capable of being dynamically modified.
- Providing reference images for different types of habitat
- Providing a facility to extend the habitat classes e.g. Deciduous woodland, coniferous woodland or mixed woodland.
- Presenting examples of different habitat classifications

Score	Supporting comments
2	There are limited extension points within the hosted system to support additional information or targeting methodologies. This would require an additional module and extensions to the current schema to support this functionality.

Browser based

The system must be capable of:

- Allowing nominated users (organisers) to allocate or target habitat polygons for survey by other users.
- Organisers should be able to select and group parcels for allocation to users (By habitat, point and radius or grid square)
- Allow users to request areas to be allocated from an organiser
- Allow the presentation of parcels in a random order (possibly grouped by habitat type)

Score	Supporting comments
2	The existing system does not have the concept of an allocation of subject sets or the tailoring of subject sets for individual users. The underlying concept of the system is to present the same set of subjects with individuals each classifying individual images. The system does support the presentation of parcels in a random order / grouped by

	habitat as each subject set may be appropriately grouped or randomised.

The system should be capable of:

- Providing users with the ability to identify a maximum travel distance
- Enable the user to select any parcel and enter a classification
- Providing users with the ability to nominate target areas for classification

Score	Supporting comments
2	This would require an additional module or alternative methodology

Mobile based

This refers to a mobile based solution. Some consideration should be made to a paper-based field recording system.

The system must be capable of:

- Displaying a map showing the user's current location
- Entering a habitat for the user's current location
- Entering habitat for a user-selected location and store the user's location with precision
- Providing a list of possible habitat selections for the current / selected location
- Working in an offline manner and uploading results at suitable point.

Score	Supporting comments
2	There is no mobile based solution for Zooniverse but the Panoptes API does provide support for serving and storing the data via RESTful web services API described at: http://docs.panoptes.apiary.io/#

The system should be capable of

- Downloading a list of ‘allocated’ or ‘target’ polygons
- Presenting a user with sufficient information to determine their proximity to a given (set of) habitat polygons.
- Requesting additional information based on the user's initial response and the existing habitat classification for a polygon

Score	Supporting comments
2	There is no mobile solution and the existing Panoptes API and underlying schema does not support this form of locational data

Feedback

The system must be capable of:

- Displaying a map of user-validated polygons for all users
- Displaying a map of user-validated polygons for an individual user or arbitrary group of users
- Providing users with statistics on the individual vs overall match rate between computer-classified and human-classified habitat (by polygon, by area)
- Displaying progress towards target of surveyed polygons per user and per group

Score	Supporting comments
2	The current system allows export of data for analysis by other systems (see data export screenshot in appendix A) On screen representations would require an additional module.

The system should be capable of:

- Providing organisers with the ability to identify users and polygons that have been allocated and classified
- Providing organisers with the ability to identify users and polygons that have been allocated and not classified
- Providing organisers with the ability to identify individual classification rates by habitat type

Score	Supporting comments
2	The current system allows export of data for analysis by other systems (see data export screenshot in appendix A) On screen representations would require an additional module.

Verification

The system should be capable of:

- Presenting mechanisms for verifying a user's ability to classify a specific habitat type
- Presenting mechanisms for verifying the user's ability to navigate to and orient themselves with relation to a given polygon
- Storing a user's 'score' for habitat classifications
- Presenting a user's classification 'scores' to an organiser when allocating polygons

Score	Supporting comments
4	The current system supports 'gold' standard validation. In this scenario the user's classification can be compared to an expert classification. In order to store a user's response against the gold standard either:

	A new module would be required within the system (or) Additional post processing using the exported would be required

Data export

The system must be capable of:

- Providing print facilities for an individual area showing a map and target polygons for classification. This should optionally include the current classification.
- Exporting a comma-delimited list of all records, filtered by date range, geography, habitat and entry method.

Score	**Supporting comments**
8	The user can print screen the data presented and a variety of exports are available.

Indicia – BTO assessment

Indicia provided no response to the request for information.

Section 2 – Functional requirements

Any system will require a set of functional components to meet the requirements. This identifies these components, provides an overview of the purpose of each and a brief discussion of some of the technical options available.

Data storage

Data storage module encompasses the import and storage of data in a structured manner. The system must be capable of:

- Importing attributed vector data in ESRI shapefile format.
- Importing additional attributes datasets in vector format

Score	Supporting comments
10	Users geoserver to present maps so the underlying use of shapefiles and database tables is supported.

User management

The system must be capable of registering sufficient user information in order to:

- Relate data entered with a specific user
- Provide feedback information to a specific user
- Provide the ability to perform a structured survey with additional unstructured observations (casual observations, desk and field based etc)

Score	Supporting comments
4	Sites can be built using the authentication modules provided. The user can report on their own records at any point in time.

The system should be able to

- Use existing registration system e.g. facebook
- Relate users to specific geographic areas
- Allow users to store preferences (type of habitat, distance from 'home' location)
- Allow users to be grouped in terms of their ability to identify specific habitat types
- Allow arbitrary groups of people to 'see' and interact with each other when using the system

- Allow an organiser to contact an individual user with a message
- Allow an organiser to contact an arbitrary group of users with a message

Score	Supporting comments
4	The system supports the concept of a single login for multiple sites on the same repository (easy login) The system does not appear to allow federated login or any means of group interaction using the pre-built form library

Data entry

The system must be capable of:

- Presenting the user with a list of 'allocated' or 'target' areas for classification
- There should be a mechanism for allocating a higher weighting for areas so they appear more frequently when selecting from a list of areas to classify.
- Allowing a user to select a habitat and agree or disagree with an existing classification
- Allowing a user to select a habitat and record the habitat type from a set of 26 classes

Score	Supporting comments
4	The system focus is on species recording rather than habitat recording. There does not appear to be a mechanism for presenting users with a list of parcels for habitat recording.

The system should be capable of

- Allowing the user to enter notes and photographs for a given point / area
- Target areas offered should be selected based on a range of criteria e.g. random, higher weight for single visit areas, higher weight for different habitat, higher weight of unvisited, higher weight to achieve multiple visits. This should be capable of being dynamically modified.
- Providing reference images for different types of habitat
- Providing a facility to extend the habitat classes e.g. Deciduous woodland, coniferous woodland or mixed woodland.
- Presenting examples of different habitat classifications

Score	Supporting comments
4	The system focus is on species recording rather than habitat recording. There does not appear to be a mechanism for presenting users with a list of parcels for habitat recording. The system is open source and these features could be developed but would require considerable development.

Browser based

The system must be capable of:

- Allowing nominated users (organisers) to allocate or target habitat polygons for survey by other users.
- Organisers should be able to select and group parcels for allocation to users (By habitat, point and radius or grid square)
- Allow users to request areas to be allocated from an organiser
- Allow the presentation of parcels in a random order (possibly grouped by habitat type)

Score	Supporting comments
2	The system focus is on species recording rather than habitat recording. There does not appear to be a mechanism for presenting users with a list of parcels for habitat recording.The system is open source and these features could be developed but would require considerable development.

The system should be capable of:

- Providing users with the ability to identify a maximum travel distance
- Enable the user to select any parcel and enter a classification
- Providing users with the ability to nominate target areas for classification

Score	Supporting comments
2	The system focus is on species recording rather than habitat recording. There does not appear to be a mechanism for presenting users with a list of parcels for habitat recording.The system is open source and these features could be developed but would require considerable development.

Mobile based

This refers to a mobile based solution. Some consideration should be made to a paper-based field recording system.

The system must be capable of:

- Displaying a map showing the user's current location
- Entering a habitat for the user's current location
- Entering habitat for a user-selected location and store the user's location with precision
- Providing a list of possible habitat selections for the current / selected location
- Working in an offline manner and uploading results at suitable point.

Score	Supporting comments

2	The system provides the ability to authenticate a mobile request using web services but there does not appear to be a pre-defined mobile application of any focus on this functional area.

The system should be capable of

- Downloading a list of ‘allocated’ or ‘target’ polygons
- Presenting a user with sufficient information to determine their proximity to a given (set of) habitat polygons.
- Requesting additional information based on the user's initial response and the existing habitat classification for a polygon

Score	**Supporting comments**
2	The system provides the ability to authenticate a mobile request using web services but there does not appear to be a pre-defined mobile application of any focus on this functional area.

Feedback

The system must be capable of:

- Displaying a map of user-validated polygons for all users
- Displaying a map of user-validated polygons for an individual user or arbitrary group of users
- Providing users with statistics on the individual vs overall match rate between computer-classified and human-classified habitat (by polygon, by area)
- Displaying progress towards target of surveyed polygons per user and per group

Score	**Supporting comments**
2	The system provides the ability to authenticate a mobile request using web services but there does not appear to be a pre-defined mobile application of any focus on this functional area.

The system should be capable of:

- Providing organisers with the ability to identify users and polygons that have been allocated and classified
- Providing organisers with the ability to identify users and polygons that have been allocated and not classified
- Providing organisers with the ability to identify individual classification rates by habitat type

Score	**Supporting comments**
2	The system provides the ability to authenticate a mobile request using web services but there does not appear to be a pre-defined mobile application of any focus on this functional area.

Verification

The system should be capable of:

- Presenting mechanisms for verifying a user's ability to classify a specific habitat type
- Presenting mechanisms for verifying the user's ability to navigate to and orient themselves with relation to a given polygon
- Storing a user's 'score' for habitat classifications
- Presenting a user's classification 'scores' to an organiser when allocating polygons

Score	Supporting comments
4	The system provides a plug-in architecture for data cleaning, but this must be tailored for the individual elements and is not designed for habitat classification.

Data export

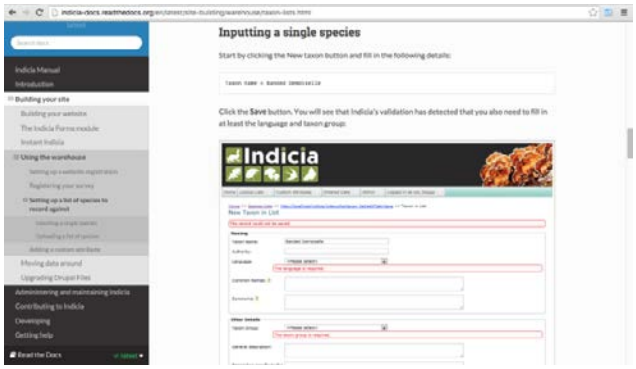
The system must be capable of:

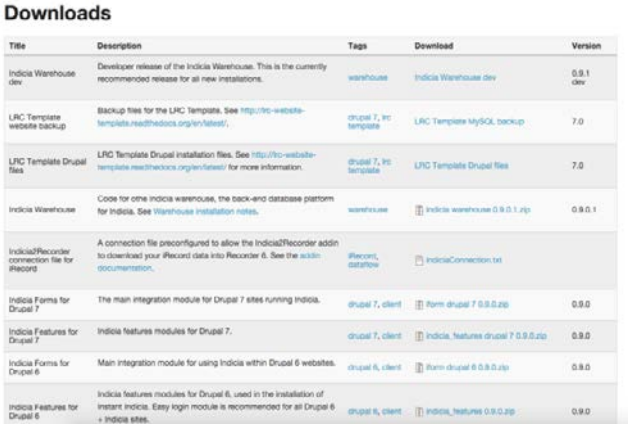
- Providing print facilities for an individual area showing a map and target polygons for classification. This should optionally include the current classification.
- Exporting a comma-delimited list of all records, filtered by date range, geography, habitat and entry method.

Score	Supporting comments
4	The system provides a reporting framework however this is designed for export of taxonomic observations and would require significant tailoring in order to export habitat classification data.

Screenshots

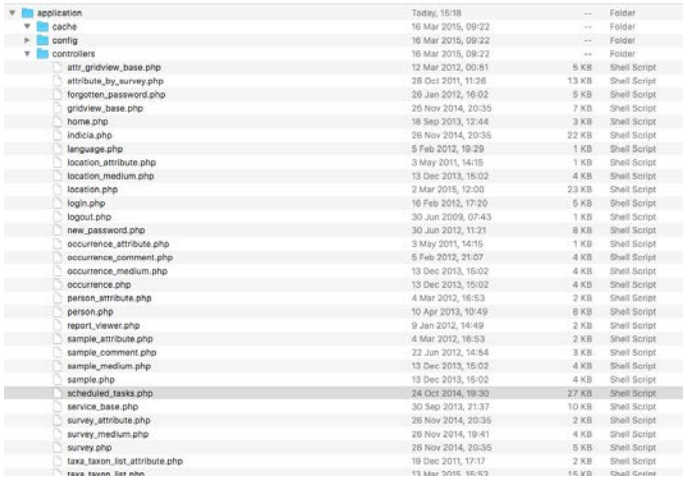
User configuration documentation



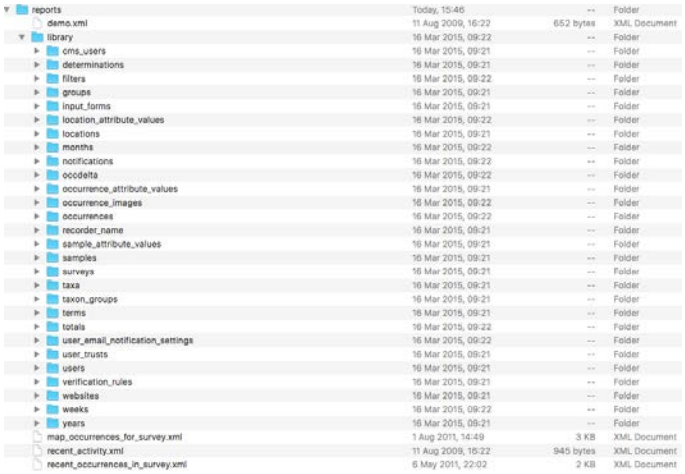


Documentation for species input forms

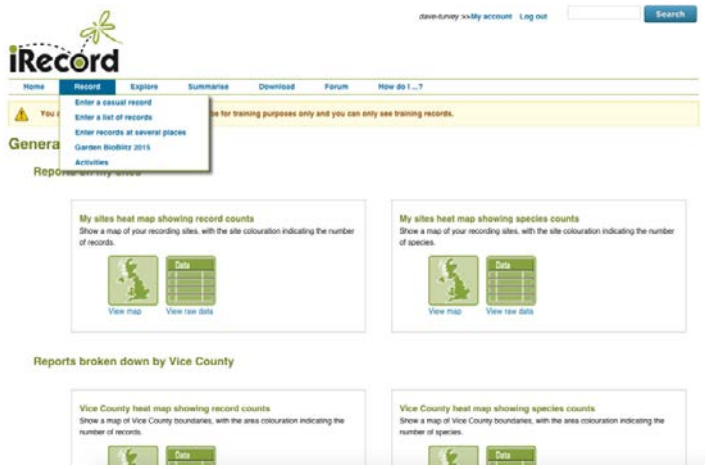
Source code availability http://www.indicia.org.uk/downloads



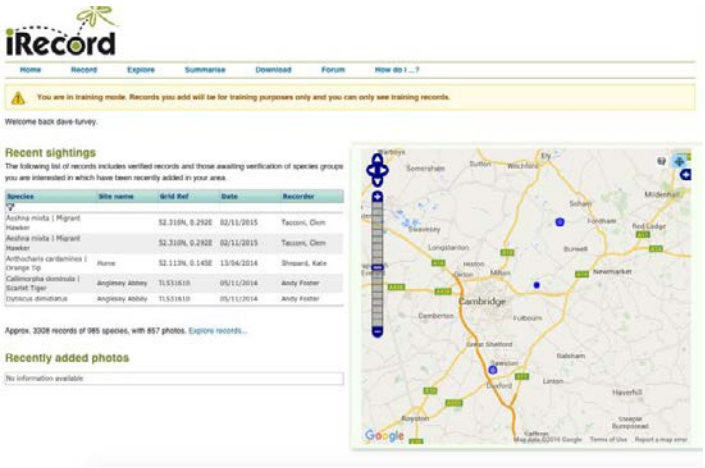
Warehouse controllers



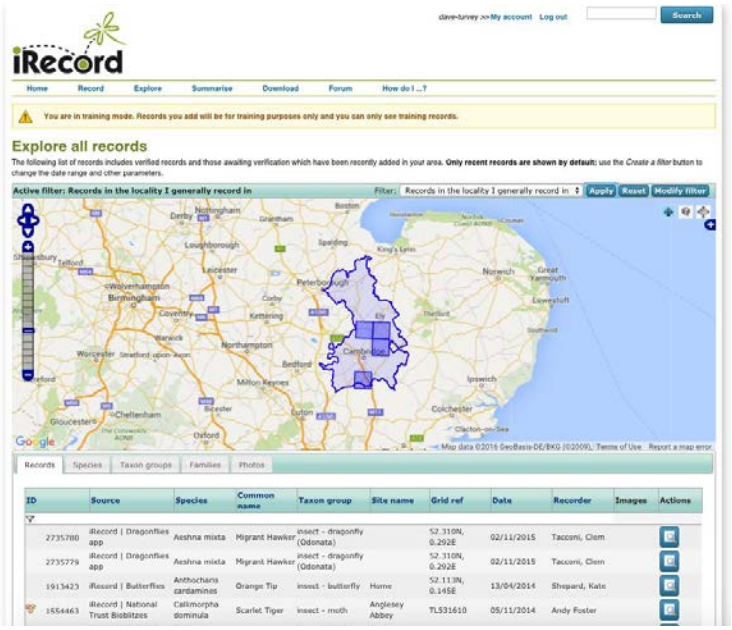
Reporting options



IRecord application using the indicia warehouse



Recent sightings



Record reporting