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Open Countryside: the new legislation and the delivery role of GIS in Wales

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1 Introduction

The new Countryside and Rights of Way Act (CROW) which became law in England and Wales on 30th November 2000 creates a new legal right of access to approximately 4 million acres of mountain, moor, heath, down and common land in England and Wales. For more than 12 months the Countryside Council for Wales (CCW) and the Countryside Agency (CA) in England have been engaged in the major task of defining and mapping access land in readiness for the consultation process beginning later this year. This paper looks at the scope of the project, the tasks facing the Agencies and the key role that GIS is playing in delivering the government's target on access provision in Wales.

2 The CROW Act and what it says

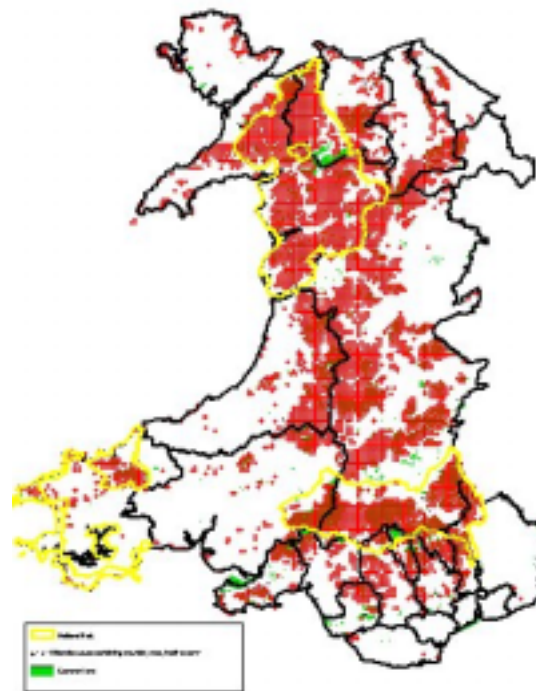
The CROW Act makes CCW and CA responsible for a number of tasks. Key amongst these are the need to define open countryside and produce Section 4 (S4) maps of open countryside and registered common land. In some areas the Act is very specific in relation to this task but in others it leaves it up to the agencies to decide how this will be done. For example the Act gives the Agencies no scope for correcting original errors made when the Common Land Registers were created at the time of the 1965 Commons Registration Act or for mapping areas where information is missing from the Registers. It requires the S4 maps to show all registered common land and open country after the removal of any excepted land and land with pre-existing rights. However it does not fully describe what is meant by mountain, moor, heath and downland (MMHD). Instead it gives two criteria:

1. Mountain includes land greater than 600m above sea level
2. MMHD does not include land consisting of improved or semi-improved grassland (e.g. through the use of artificial fertilisers)

The Act states that open country should be 'wholly or predominantly' MMHD as it appears to the Agencies and gives further discretion to CCW and CA in drawing the open country boundaries to coincide with physical boundaries and in omitting small areas of open country 'of no useful purpose'. Some further detail will be set out in secondary legislation (Regulations) due later this year, however the wording of the Act means that there is scope for interpretation. This has generated considerable discussion between CCW, CA and DETR and has taken time to finalise. It has also meant the need for a very clear audit trail of decision making at each stage in the project. The power of GIS is that in Wales CCW has been able to run 'what-if' scenarios against the constituent datasets to arrive at what it believes is closest to the wording of the legislation. This would not have been possible without GIS

Fig 1.

Map showing distribution of MMHD and Common Land in Wales by 1 Km grid square



2.1 Timescales and implementation

The new right applies to ‘access land’. Open countryside will become access land once CCW (and CA) issue the Conclusive S4 maps but not before. The timetable for this is:

CCW CROW Programme	Delivery by
Issue first S4 draft maps	November 2001
Start consultations	early 2002
Appeals	Spring 2002-late 2004
Last Conclusive maps	late 2004
New right of access	late 2004/early 2005

The new right of access will be brought in simultaneously across Wales.

3 The main tasks facing CCW

3.1 Defining open countryside and producing draft S4 maps

The process of defining what is, and what is not open countryside can be likened to a series of questions with answers generated from geographical data sets:

1. Is the area designated as registered common land? If yes, does it have exclusions? If there are no exclusions then it will be mapped as access land.
2. If the area is not common land then does it meet the definition of mountain, moor, heath or downland? If it does and does not have any exclusions such as for quarrying or military use then it will be mapped as access land.

The key datasets being used by CCW to identify access land are:

1. Digitised paper Registers of common land maintained by each Commons Registration Authority (CRA) in Wales (Unitary Authority)
2. Ordnance Survey 1:50,000 height data (for mountain)
3. Digitised Phase 1 habitat (lowland) scanned images and Upland Survey habitat paper maps held by CCW (for moor, heath, downland). These are a unique Wales-wide data source. Phase 1 is a habitats classification system developed by the Nature Conservancy Council (CCW's predecessor). Upland Survey is a separate habitats classification system using the Birks&Ratcliffe classification.

3.2 Managing the consultation process

CCW is required to issue a series of maps showing open country boundaries in order to consult with those who have an interest in the land: farmers, landowners, ramblers, local authorities etc. The maps are issued in three stages:

1. Draft S4 maps for consultation
2. Provisional S4 maps including changes following representations on the draft maps
3. Conclusive S4 maps following any appeals considered with the National Assembly for Wales.

Local Access Forums (LAFs) will play a key role during the consultation process. These are made up of individuals or representatives of groups with an interest in the land. Their role is to advise CCW and the relevant authorities on management and access to the countryside.

3.3 Publishing access land information

Access land will be published on the conclusive S4 maps as well as on the Web. Trials have also taken place using the Ordnance Survey's 1:25,000 scale Explorer map series which currently shows other existing types of access land such as National Trust land. Discussions have taken place on developing a National Countryside Access Database (NCAD) to record all access land in England and Wales. What is very clear is that land that is defined as access land must be described clearly and unambiguously in whichever way it is published. This also has important implications in the definition of the boundary on the ground.

3.4 Developing procedures for managing exclusions and restrictions

Access land may be subject to closure or restrictions for a number of reasons including: nature conservation, land management, health and safety.

Other duties that CCW is tasked with include: setting up LAFs across Wales; improving the access infrastructure with the local authorities; wardening and monitoring of access land.

4 The role of GIS in the mapping process

4.1 Feasibility study and Berwyn Pilot Project

In 1999 CCW commissioned Chris Blandford Associates to develop and test a methodology for defining open country in 4 test areas in Wales using Phase 1 and Upland Survey data. CBA recommended that CCW should:

1. Use the Phase 1 and Upland Survey habitat information
2. Review the Registers of common land
3. Publish access land at 1:25,000 scale
4. Adjust the open country boundaries to follow recognisable physical features on the ground.

Following the CBA study the Berwyn mountains in NE Wales were selected as the pilot area to refine the methodologies for the mapping and other tasks required by the legislation. In particular the pilot was used to assess the resources needed for two data capture options. Either to digitise pre-marked open country habitat 'clumps' from the Phase 1 and Upland Survey habitat maps or to digitise all the habitat polygons for

map sheets known to contain MMHD and use the GIS to select out those corresponding to the open country criteria. On the basis of this work the second option was adopted because of the wider benefits to CCW of holding this data as a complete vector dataset.

4.2 Main data capture phase

This comprised 2 main contracts:

1. Digitising the Registers of common land held by each of the 22 Unitary Authorities in Wales.
2. Digitising the Phase 1 habitat (lowland) and Upland Survey maps held by CCW.

The contracts were let in the late summer and autumn of 2000 following an EU tendering exercise for the habitats contract and extensive interviewing and selection procedures. £0.5 m was allocated for this stage of the project. The successful contractor in both cases was Landmark Information Group/RMSI. Two important factors in their selection were LIG's experience with local authority historic maps and RMSI's data capture resources needed to meet the timescales set by CCW. Delivery of both datasets was set for end February 2001.

4.3 Common Lands digitisation

Of the two data capture exercises the Common lands digitisation work was always expected to be the more difficult because of the logistics of collecting and validating the information from 22 local authorities spread across Wales. From the outset CCW sought to minimise potential problems by learning from Powys County Council who had already digitised their own Common Lands Registers and by working closely with the Commons Registration Officers (CROs) in each authority. This was achieved through working with Linda Ashton, Chair of the Common Lands Working Group who was seconded to CCW and through the Welsh Local Government Association (WLGA).

The scope of the contract was:

1. Digitise the historic paper maps of registered (and deregistered) common land in Wales to produce a seamless dataset using a specification developed with Peter Roberts at Powys C.C.
2. Create a query database of anomalies and an audit trail during data capture. Many such anomalies were known to exist.
3. Produce a folio of maps suitable for inspection alongside the original registers.

Outline technical specification:

Source information	1:10,560, 1:2,500 historic paper maps and paper registers
Base mapping	Ordnance Survey Land-Line
Data quality	Snapping to Land-Line where boundary follows defined features. Accuracy +/-0.2mm at scale of original mapping
Outputs	MapInfo tables of registered and deregistered common land polygons MS Access query database NGDF Discovery metadata

There are 1615 commons in Wales covering 9% of the area of Wales but their distribution is varied. For example Powys has 40% of the total area of commons but only 17% of the total number. Pembrokeshire has the same number of commons but they cover only 3% of the total area.

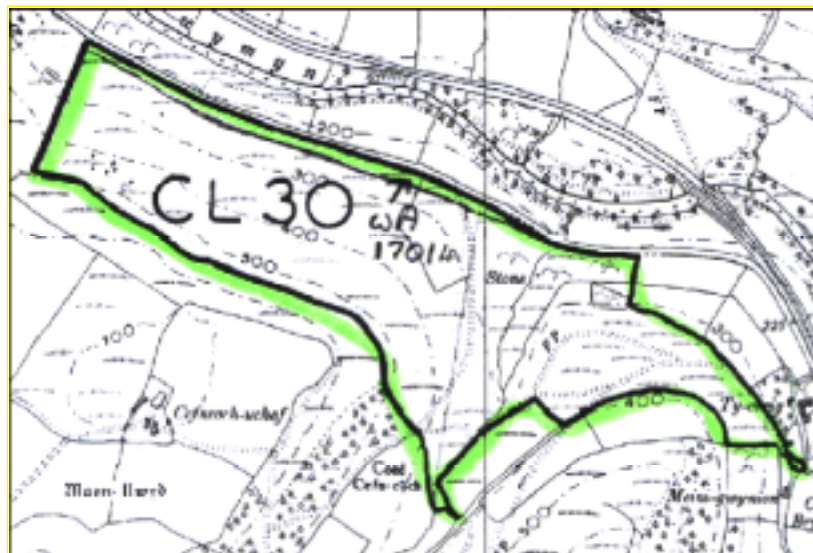
The contract posed a number of challenges to LIG/RMSI. The general problems were:

1. The information on the registers had to be collected from each authority with minimum disruption to the local authority's business. Because the Act does not specify or require the co-operation of the local authorities the exercise relied entirely on the goodwill and co-operation of the CROs. The information was collected by LIG through photocopying the maps and registers and digitising off-site.
2. Different standards adopted by different CRAs in holding the registers and significant variation in the quality, condition, colours and line thicknesses used on the legal source maps. The quality ranged from poor to excellent. In some cases the lack of investment in the maintenance of the registers meant that they were in appalling condition for legal documents available for public inspection.

Specific technical problems included:

1. Transferring common land boundaries on pre-1960s mapping to the modern OS base. Not all the features shown occur on both map series. Not all the features shown are in the same place. Not all the CL boundaries are defined by physical features. It was not always possible to determine if the boundary and physical feature were co-incident. For example some boundaries were drawn with very thick lines obscuring the underlying detail.
2. Edge-matching between commons that straddled two or more local authority boundaries. In some cases there was a mismatch in the position of the boundary on either side of the administrative boundary. Indeed due to changes in the position of the local authority boundaries since 1965 some maps indicated that the local authority was responsible for a common outside its own administrative area.

Fig 2. Typical map from a register



The key rule that governed the position of the digital boundary was that it should replicate the boundary as drawn on the legal source map 'warts and all'. This was a validation requirement by the CROs. No interpretation of the boundary position other than within the line thickness on the original map was acceptable. In many cases this was incompatible with the common sense approach required for defining access land in relation to physical features. During the validation process a detailed record of instructions given by the CROs was maintained. In some cases they authorised adjustment of the boundary position to follow the feature on the modern map base. Throughout the exercise the availability of LIG's archive of historic OS mapping was valuable in identifying the position of the boundary on the much used 1960's source maps.

In summary the two main lessons can be drawn from the common lands data capture exercise :

1. The size of the task for LIG/RMSI was a function of the number of local authorities not the number of commons. Christopher Roper from LIG has said that 75% or more of the work was liaison with the local authorities. Securing co-operation with the CROs was therefore vital. Even for an experienced company like LIG this was hard to estimate.
2. Time was saved by basing the requirements and specification for the work on those like Powys County Council who had been there and done it already. Why re-invent the wheel when tuning will do? In this particular case the need for a national dataset to a common standard meant that some work was repeated. However the value of the dataset is that it can be used by all CRAs across Wales as well as for other national initiatives such as NLIS and IACS compliance.

4.4 Phase 1 and Upland Survey digitising.

Although a much larger task in terms of resources this was more straightforward. The scope of the contract was to:

1. Digitise approximately 950 1:10,000 OS map sheets covering Wales which had been coloured or marked up according to the Phase 1 and Upland Survey habitats they contained. Approximately 630 of the sheets contained habitat synonymous with MMHD. The remaining sheets completed the national picture for Wales.
2. Identify preliminary boundaries for open countryside using GIS according to a rule base and set of technical procedures (see 4.5).

The Phase 1 classification system extends to some 115 categories. The Upland Survey system is similar. The scale of the task required a dedicated team within CCW preparing the source mapping for RMSI with a habitats expert continually available to answer queries. Most of the queries were handled by e-mail. Given that the work was carried out so far away (in India) it is a considerable achievement that the Indian RMSI team were able to understand and accurately capture the habitats described by an unfamiliar scientific system within the tight timescales set for the contract.

Outline technical specification:

Source information	Phase 1 Habitat Survey scanned and registered TIFF Images (256 colours); Upland Survey 1:10,000 scale paper maps
Base mapping	Ordnance Survey Land-Line
Data quality	Snapping to Land-Line where boundary follows defined features. Accuracy +/-0.2mm at scale of original mapping
Outputs	MapInfo tables. 1 polygon and 2 point layers for each classification system. Approx. 1Gb in total volume NGDF Discovery metadata

The interpretation and transcription of the source material into GIS data was less problematic than expected. Some habitat categories used very similar colours e.g. Bracken is coloured terracotta and semi-improved natural grassland is orange in the Phase 1 classification. Some loss of colour definition occurred between the scanned images and index code sheets. Differences also exist between the OS 1:10,000 paper maps on which the surveys are based and current OS Land-Line. For example rocky outcrops are very exaggerated on Land-Line compared to the 1980's paper map series. Overall however most of the difficulties were a function of the scale of the task and the requirement to prepare, check and process this number of documents.

In summary the digitisation exercise has created a unique and highly valuable habitats dataset representing a detailed snapshot of the Welsh environment between the mid 1980s-1990s. Field survey on this scale is unlikely ever to be repeated because of the cost. The database will instead be maintained using a combination of aerial photography, satellite imagery, remote sensing and ground survey. The main lesson from the exercise is that there is no substitute for good preparation, planning and project management on a task of this scale. Had the timescale for CROW been such that the issuing of the draft S4 maps could have been delayed by 18 months then the availability of OS DNF would undoubtedly have saved time. However by starting early and despite some overrun the very tight timetable for CROW has been met.

4.5 Generating the open country boundaries for the draft S4 maps

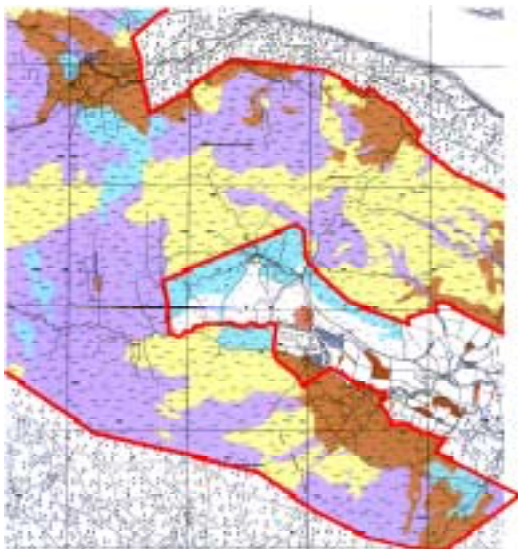
Having collected the constituent datasets different technical procedures were tested by the Geographic Information Unit in CCW for generating the open country boundaries. A semi-automated procedure was adopted. The following is a summary of this:

Select the relevant habitats comprising MMHD into 8 broad categories or ‘clumps’: Heath, Mire, Marshy grassland, Acid grassland, Bracken, Swamp, Down, and Rock.

1. Delineate areas > 5 Ha. that are wholly or predominantly (more than 2/3) MMHD.
2. Add registered common land boundaries and revise the open country boundary to exclude registered common land.
3. Manually assess the usefulness of areas of open country under 5 Ha. omitting those with no useful purpose.
4. Review the boundary of open countryside to produce the clearest possible boundary using a hierarchy of physical features and tied in with registered common land.

Automated selection routines give a good first approximation of where the open country boundary should go but the advice from everyone who has looked at these in the field is that the extent of access land must follow well defined physical features on the ground which are not always apparent from a map. The success or failure of this long awaited legislation will be judged by whether walkers and visitors to the countryside can navigate around easily and by whether farmers, landowners and others who work in the countryside can be confident that their businesses will not be adversely affected by the new right of access. This will depend on the ability of CCW and CA to get the open country boundaries right first time; to demonstrate a clear audit trail of how these were arrived at; and to publicise the new access areas in such a way that they are widely available.

Fig 3 Open country boundary map extract



Key: Open country boundary (red); Mire (purple); Heath (yellow); Bracken (brown); Marshy grassland (pale blue)

5 Progress to date and next steps

The project has moved swiftly in CCW since funding was secured from the Welsh Assembly in April 2000. The data capture has been completed and the production of preliminary draft S4 maps is underway. A 'roadshow' to raise awareness of the extent of common land in Wales is scheduled this summer. Several of the LAFs have been established and the programme of consultations prepared. A database to manage the contact and consultation processes is being developed in Oracle and will be made available across CCW's WAN in each local office. Subsequent to this a second database linked to the GIS tables will be needed to manage the exclusions and restrictions. This will be developed in such a way that it can be made available to CCW's external CROW partner organisations such as the National Parks Authorities.

6 Conclusion

This is a large project for CCW pulling together GIS and other experience from across the organisation. Many discussions have taken place with CA, DETR, NAW, the local authorities in Wales, IDeA, the OS and other government and non-government bodies. The GIS datasets have been collected to national standards; Land-Line/DNF, NGDF and have taken account of national initiatives such as NLIS in their specification. Two important benefits are that the work is helping to raise awareness of the common lands in Wales and of the many anomalies which need addressing, and that a unique national habitats dataset has been collected as a result of the project. The main lessons learnt are generic but are nevertheless worth repeating; that good planning is essential for large projects; that good communication is equally essential; that time can be saved by learning from the experience of others; and lastly that the value of the information portrayed on a map, be it paper or electronic, depends upon how clearly this can be presented.