



What is really happening to our urban and rural landscapes?

Paul Fearn and Andrew Tewkesbury, from Infoterra explain the thinking behind the company's data classification investment and examine how GIS solutions can deliver increased intelligence for decision-makers.

As the world becomes more 'spatially aware' there is an ever increasing demand to measure and monitor our environment, be it for climate change, biodiversity or urban development. Such activities heighten the need in the GIS industry for value-added products, beyond just imagery, to quantify key features present in geographic data.

Infoterra has been operating a Leica ADS40 sensor to capture airborne data - the 'satellite' sensor qualities of the camera have enabled Infoterra to exploit this acquired imagery far more than we ever expected. Once captured, the data has proved particularly impressive, not only in terms of resolution but also in terms of image consistency and radiometric performance. The CCD array, capturing multiple datasets, has allowed us to expand our standard product portfolio beyond traditional natural colour imagery. A complete data stack is now available including colour infra-red (CIR), digital surface model (DSM) and digital terrain model (DTM). This data stack offers a wealth of information such as landcover, feature height and slope information, which can help studies as diverse as habitat analysis and soil erosion estimation.

Today GIS technology is enabling us to really see what is happening to our landscape, and share data and classification intelligence with key decision makers – for example environmental managers and planning officers.

Enhancing Data Classification with Landcover

Landcover information is a crucial first step requirement as it can be used as both a quantitative descriptor of the landscape, as well as a base to derive other information such as habitat maps and land use.

Traditionally landcover information is extracted in two different ways; by either automatically classifying the 'colour' of a satellite image into its most appropriate class, or through the manual interpretation of aerial photography based on colour and contextual information. The satellite method usually gives a spatially coarse measurement, but has the potential to identify quite specific classes quickly. The aerial photo method can create highly detailed mapping but is very labour intensive. Infoterra, using the latest sensor and image classification technology, has moved towards a 'best-of-both-worlds' solution using the 'colour' or 'spectral' descriptor of the four channels, the high resolution and height information for context.

Image classification techniques are used to semi-automate this process, with the imagery being segmented into objects which are assigned specifics such as colour, texture and height, but also contextual information, such as their difference to surrounding objects.

A generic, thematic approach was taken while retaining the high spatial resolution of the original data. The prime reason this approach was taken is that it allows a high resolution measure of the basic landcover make-up, while being suitable for bespoke thematic upgrades to specific client requirements. The result is our new LandBase™ offering.

LandBase provides three Level 1 classes and ten Level 2 classes captured to a MMU (Minimum Mapping Unit) of 50m allowing accurate analysis right down to individual building and tree level. Level 2 classes include: sea & estuary, inland water, artificial surface, buildings, bare ground, herbaceous vegetation, sub-shrubs, shrubs, tall shrubs/small trees and trees.



LandBase Level 2 classification over Derby City Centre, utilising lidar height information to further improve classification accuracy.



LandBase Level 2 classification over Ladybower Reservoir, Peak District, UK.

Landcover & Landuse

Landcover refers to the physical cover on the Earth's surface, be it a simple subdivision of vegetated and non-vegetated land or all the way down to vegetation species. Land use on the other hand is the human modification of the natural environment and includes classes such as cultivated land, residential and industrial. A habitat is a place or set of natural conditions where a plant or animal lives such as a hedgerow or heath land. Land use and habitat maps are inherently difficult to generate because they may include several different landcover types or require a contextual interpretation. For example, a grassy landcover could be either a pasture or for recreational use among others.

Urban and rural settings

In an urban setting landcover mapping can provide useful insights into the make up of a city, such as sealed surfaces (surfaces sealed with concrete or paving for example) and urban density. The vegetation types identified as part of LandBase are suitable to accurately define the green space within a city that can then be used for historical tracking, environmental assessments and flood modelling. As much as possible of the collected data stack is included in the LandBase product to provide height information and local cover statistics. This information can then be used for volumetric analysis and for the measurement of building/tree density. Such information is routinely used for telecommunications network planning, but may also be linked into diverse applications such as air quality models and human geography.

For urban areas, we've also enhanced the LandBase classification by incorporating Lidar height data, where available. This not only improves the height precision it also helps to better define buildings into regular shaped objects.

Classifying rural regions in this way opens up many new possibilities, for example woodland extent is captured in such precise detail to include individual and small groups of trees. Typically, existing woodland mapping by photo-interpretation only captures extents greater than 5000m .

Identification of shrubs gives the possibility of hedgerow extraction and - in turn - an estimate of a crucial habitat. Semi-natural environments, such as upland heath, have also traditionally been mapped as either heather or grass dominant parcels; however using land cover techniques, these can now be broken down in detail to grass, heather and bare earth components, allowing more precise extent monitoring.

Using landcover techniques it is also now possible to fulfil some very specific classification goals. For example, if a local authority or council was introducing a household composting scheme, or monitoring current garden waste collection volumes, then being able to extract garden areas would be useful information. By using growing routines within a spatially aware ruleset, garden extents have been extracted automatically for a 25km test site in Leicestershire. The routine includes grasses, shrubs and trees of small extent, close to buildings, while excluding woodland, recreational and common land.

By using a similar approach of applying logical rules, a more detailed 16 class habitat map was also generated automatically of the same study area to include classes such as reed beds, improved amenity grassland and scattered scrub. Such mapping is used by local authorities for monitoring purposes, but this same approach could be applied to add higher levels of land cover complexity or for detailed land use mapping.

Intelligence to the decision makers

Due to our investment in the technology and process expertise needed for a landcover GIS offering, Infoterra is now ideally placed to help inform those organisations that have to determine what exactly is happening to our urban and rural landscapes.

The statistics available provide essential and quality intelligence to support decision makers to help quantify and monitor the environment/surroundings – such as urban planning, environmental management and flood modelling.

Paul Fearn, Product Development Manager and Andrew Tewkesbury, Product Development Analyst from Infoterra Ltd. See also www.infoterra.co.uk/data_landbase.php

Aligned Assets

Number One For Gazetteers

Five reasons to choose Aligned Assets....

1. We are the only UK company to specialise in gazetteers
2. Different software options available - choose the one that suits you best
3. You can export/synchronise with other system's in 6.3 or 7.3 format
4. Manage LSG, ASD and SNN as well as LLPG
5. Keep your existing system, using our gazetteer as a master



Call today...0870 750 8750

