NATIONAL LANDCOVER & HABITAT MAPPING IN IRELAND



Highlights:

- Strong evidence for the need for a national land-cover and habitats da-taset for Ireland.
- Several state agencies have been working together to build a national mapping programme.
- Prime2 and Sentinel 2 satellite imagery are core data sources and both are openly available.
- An initial landcover classification system has been designed for Ireland.
- The technical details for mapping landcover have been largely defined.
- A successful pilot project was completed for the Caragh Catchment in Kerry

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Introduction

Ireland is one of the few countries in Europe that does not have a dedicated programme for mapping the national landcover or habitats. This is a major data gap for Ireland and means we have insufficient data to allow for the effective monitoring, assessment and management of our environment.

It's absence limits our ability to plan for and mitigate against pollution, flooding events and climate change. Without detailed data our ability to provide for sustainable development, to conserve the natural landscape, to advance our knowledge of scientifically important habitats and areas of high biodiversity is significantly restricted. Therefore the argument for establishing a national programme for landcover and habitat mapping is compelling.

Over the recent years a cross-agency working group has been working together to establish a national mapping programme. This group has been looking at addressing the policy, organisational and technical details needed to establish such a national programme.

A production model has been devised to take advantage of improved public sector data sharing arrangements, the new high resolution national mapping database from OSi (PRIME 2) and free access to earth observation imagery via the European Space Agency's Sentinel satellites.

The organisation and governance of a national programme is still being defined, however the national working group is linking with the Dept. Public Expenditure & Reform to explore the options for it's inclusion as a sub theme within the National Data Infrastructure.

Once established this programme will deliver a new high resolution national baseline landcover and habitat mapping dataset and it will aim to track the changes over time. Important landuse information will also be included as additional attribution to the data.

This newsletter highlights the national working groups achievements to date.



National Landcover & Habitats Mapping Working Group

Since 2012 a national cross agency working group has been working towards the establishment of a national landcover and habitat mapping programme. The aim of the working group is twofold, firstly to identify the policy and organisational requirements and secondly to establish a technical methodology for the implementation of national landcover and habitat mapping.

Policy & Organisation

Senior managers from the cross agency working group co-ordinated a review of the policy and organisational requirements needed to set up a national mapping programme. This included identifying data sharing agreements, resource requirements, the potential benefits and making policy recommendations to government departments. A policy proposal was defined and submitted to the Department of Arts, Heritage, Regional, Rural & Gaeltacht Affairs, for consideration by Heather Humphreys T.D. in 2015. The Minister was supportive of the proposal and requested her department to investigate options for establishing a national programme.

Technical Methodology

In parallel a technical working group developed proposals on how to implement a technical methodology for mapping national landcover and habitats. This included looking at the spatial mapping of boundaries, classification of land parcels, integration of in-situ datasets and interpretation of earth observation satellite imagery.

An initial pilot project was run for Co. Roscommon which helped identify gaps in data, expertise and knowledge that prohibit successful production. The Environmental Protection Agency funded research through UCC to help resolve knowledge gaps.

Shared Work Programme

With the support of the Minister aligned with better knowledge of the technical requirements, the national working group created a shared work programme for implementation in 2016. The work packages within this aimed at resolving remaining unknowns, these included:

- Establishing a national landcover classification system;
- Establishing a data architecture and model;
- ♦ Implementing a pilot on above;
- Identify the use case & economic benefits.

Each member provided support through funding or provision of resources. The results and outputs of these work packages are highlighted throughout this newsletter.



Technical working group workshop defining the data architecture and data model

Terminology Explained

Landcover describes bio geographical features of the landscape, for example Grasslands, Woodlands, Wetlands, etc. are types of landcover

Landuse describes the anthropogenic (human) usage of an area of land, for example Pasture, Arable, Forestry, Reservoir, etc. are examples of landuse

Habitats are described as the area in which an organism or group of organisms lives, and is defined by the living (biotic) and non-living (abiotic) components of the environment

Remote Sensing generally refers to the use of satellite or aircraft-based sensor technologies to detect and classify objects on Earth, it is very effective at mapping landcover and landuse

Use Case Analysis & Economic Value Study

The national working group had a clear understanding of the benefits of a national programme, however to date there was no independent evidence of this. The Heritage Council facilitated this, under the shared work programme, by commissioning a report on the use cases and economic value of a national landcover and habitat mapping programme.

The report was delivered by Future Analytics and highlights the extensive needs for, and benefits of, a national land cover and habitat mapping programme. It lists the many different policy areas that need the data for their effective implementation, but more specifically it focuses in on the benefits 3 uses cases:

 National Catchment Flood Risk Assessment & Management Programme;

- ♦ National Planning Framework;
- National Climate Change Mitigation Planning & Adaptation Framework.

The detailed report can be made available to interested parties, but in brief it highlights the benefits of a national programme to the above policy areas; the role it plays in public sector reform through shared services and public sector collaboration; how it builds on Irelands investment in the European Space Agency's earth observation systems; and the potential economic value it provides through improved efficiency, productivity, policy effectiveness and sustainability.

The report concludes with a strong endorsement for a programme. It

identifies that there would be a strong return on any investment given the efficiency and productivity gains that will arise, and the benefits for policy implementation, policy targeting, and sustainability.



Data Architecture for National Landcover & Habitat Maps

The OSi Prime2 dataset will form the framework for the national landcover and habitat map. To integrate with Prime2 it was necessary for the working group to establish a Conceptual Data Architecture for a National Land Cover Habitat Map.

This work package was led by the National Parks & Wildlife Service with the support of ESRI Ireland and the OSi. Through this project the national working group managed to:

- Establish a national baseline data standard for high resolution maps and to include important land use attribution information;
- Oesign and integrate a Conceptual Data Model aligning to the Prime2 national spatial data platform to maximise interoperability and effective data sharing between public agencies;

The Conceptual Data Model can be described in terms of the high level entities required to model land cover and associated spatial and nonspatial relationships. This model was informed by requirements analysis workshops, and outputs from both the use case analysis and classification system review projects.

The model entities defined in this work are as follows:

<u>Surface</u>: A Landcover Surface feature (Prime2 polygon) that has been classified with landcover & habitat characteristics & properties captured in related tables and metadata.

<u>Sub-grouping:</u> a classified Landcover Surface feature that has been sub-divided into more components.

<u>Aggregates:</u> classifications of separate tracts of land parcels that can be seen as a single entity.

<u>Mosaic</u>: where the area of classification is not typically suited to be subgrouped using a fixed geometric boundary, e.g. may be represented by percentage coverage.

Fuzzy Surface: is a sur-

face that may cross boundaries of Landcover Surface features.

<u>Conflicts</u>: are used to record where input data analysis and processing has resulted in conflicting classifications for the same tract of land.

Through this work package conceptual, logical and physical data models were delivered. A pilot map for the Caragh Catchment later validated these models.



A Land Classification System for Ireland

There is currently no recognised national Landcover classification system for Ireland. A classification system allows us to represent and describe on a map the type of landcover and habitats that exist on the ground. Establishing such a system is a key requirement for a national mapping programme.

Under the shared work programme, the Environmental Protection Agency led a work package on the development of a standardised Irish Landcover classification system.

A desk study of existing European landcover classification systems was undertaken along with a stakeholder survey of potential users of the data in Ireland, this including experts from public agencies, academia, NGO's and environmental SME's. In total over 120 stakeholders provided input which allowed the working



group to develop a draft classification. The proposed classification system is based on the existing Level 2 of the Fossitt 2000 habitat classification system, this has been revised to allow remote sensing based mapping of all Landcover types in Ireland. The classification system has been developed in such a way to allow for further refinements based on the implementation of a national mapping programme and in field validation.

The final classification system will be published with the first iteration of the national Landcover dataset once completed.

Caragh Catchment Pilot Map - Kerry Life Project

With the design of a national landcover data model and a draft classification system defined, a pilot project was undertaken under the shared work programme to trial the implementation of both elements within the existing landcover mapping production methodology.

The pilot area selected was the Caragh catchment in Co. Kerry, which is part of the National Parks & Wildlife Service's Kerry LIFE project. This was selected as a real-world example of how the improved information can be used as a valuable data source by community groups on the ground.

The Environmental Protection Agency led the pilot on behalf of the national working group. The technical implementation saw the integration of all the methodologies and standards developed over the lifetime of the working group. Remote Sensing analysis was undertaken using a combination of data sources including Sentinel 2 imagery from the European Space Agency, PRIME 2 boundaries from OSi, and in-situ



forestry and agricultural data from the Department of Agriculture, Food and the Marine.

The field data collected from the Kerry LIFE project team was used as sample data to train and validate the remote sensing classification algorithm. The final mapping outputs of the pilot were encouraging with field experts very satisfied with the data. The image above is a sample of the data from the pilot project for the Caragh catchment, detailed maps hosted by Teagasc detailed online mapping will be available shortly at: <u>http://arcg.is/2rfBeRG</u>

This pilot has helped demonstrate that there are no longer technical barriers to the implementation of a national landcover map for Ireland.