Ancient Woodlands Ireland

Exploiting the historic Ordnance Survey maps to identify long-established woodlands

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Long-Established Woodland (l) is defined as woodland that has remained continuously wooded since the first edition OS maps of 1830-44, but for which no positive evidence of antiquity has been found in older documentation. These woodlands may however have ancient origins.

Perrin, P.M. & Daly, O.H. (2010) *A provisional inventory of ancient and long-established woodland in Ireland*. Irish Wildlife Manuals, No. 46. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

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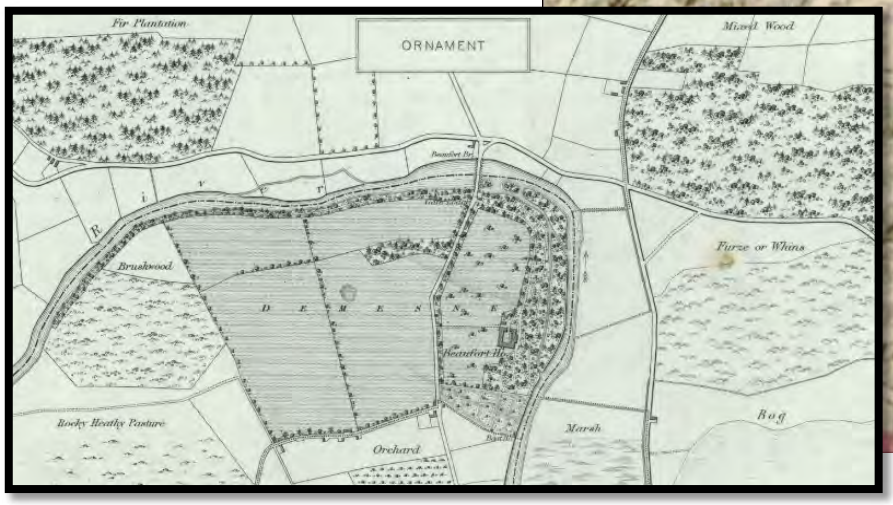
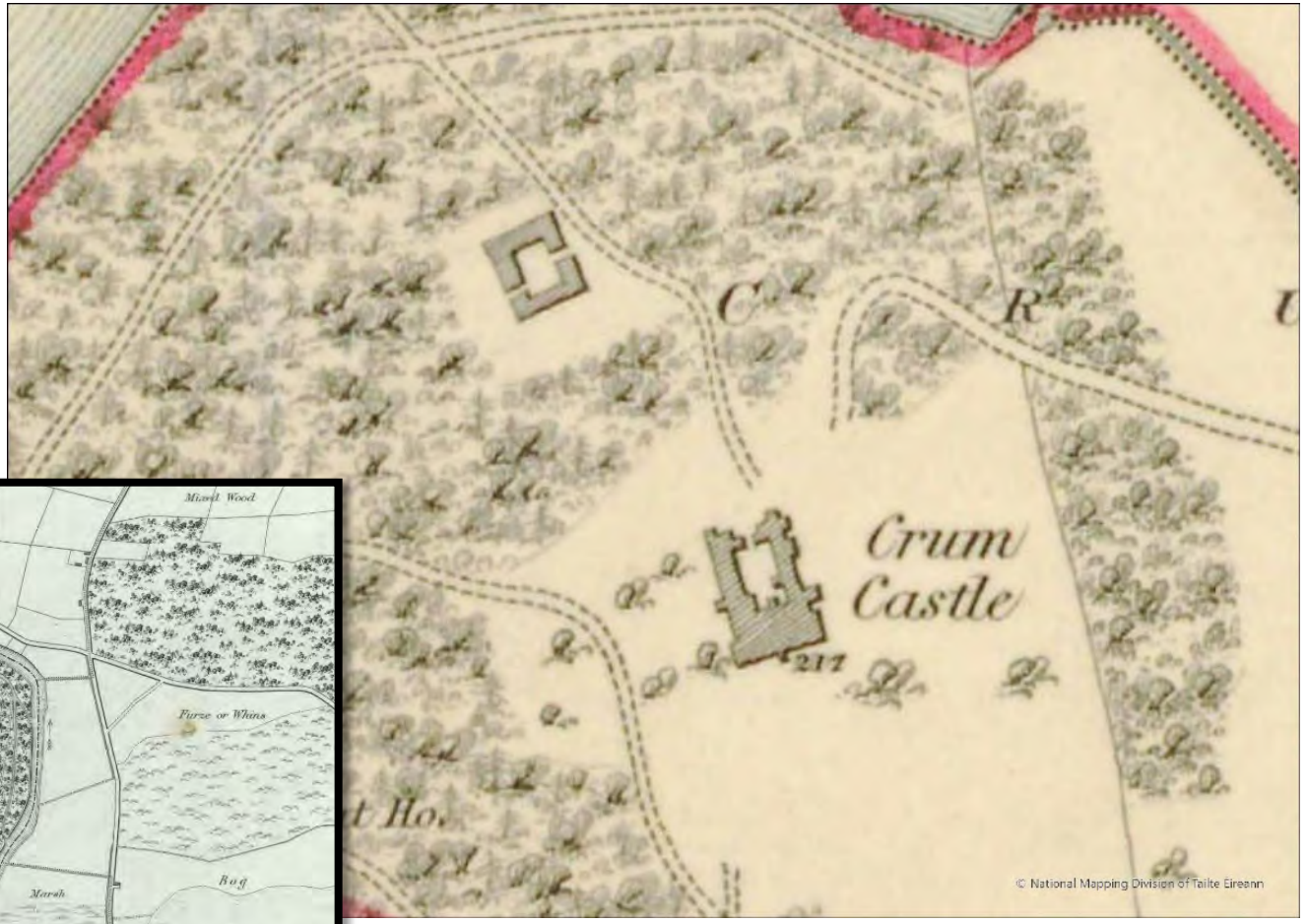
OS 6inch 1st edition colour (1829-41)

Fully scanned and georeferenced
- Available online





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Compare historic maps with current woodland extent

- Data is available
- Simple spatial overlay operation

But…

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Historic data scanned but not categorised

Hand digitising time and labour consuming

- Maps have been partially digitised
  - Perrin & Daly (BEC)
  - Thomas Leniston (MU)

Achieving full coverage is not feasible using manual digitisation

We need to **automate** the process

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Image segmentation

Image segmentation is a computer vision technique that partitions a digital image into discrete groups of pixels—image segments—to inform object detection and related tasks. By parsing an image's complex visual data into specifically shaped segments, image segmentation enables faster, more advanced image processing.

IBM (2024)

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TerrainAI

Terrain-AI is a SFI and Microsoft jointly funded project that aimed at advancing the standards of measurement, monitoring, verification and reporting of carbon stocks and emissions across complex environments.

TerrainAI – Wetland segmentation

As part of the TerrainAI project researchers in Teagasc and Trinity College Dublin used machine learning to automatically map wetlands from the historic OS 1st edition 6inch map.

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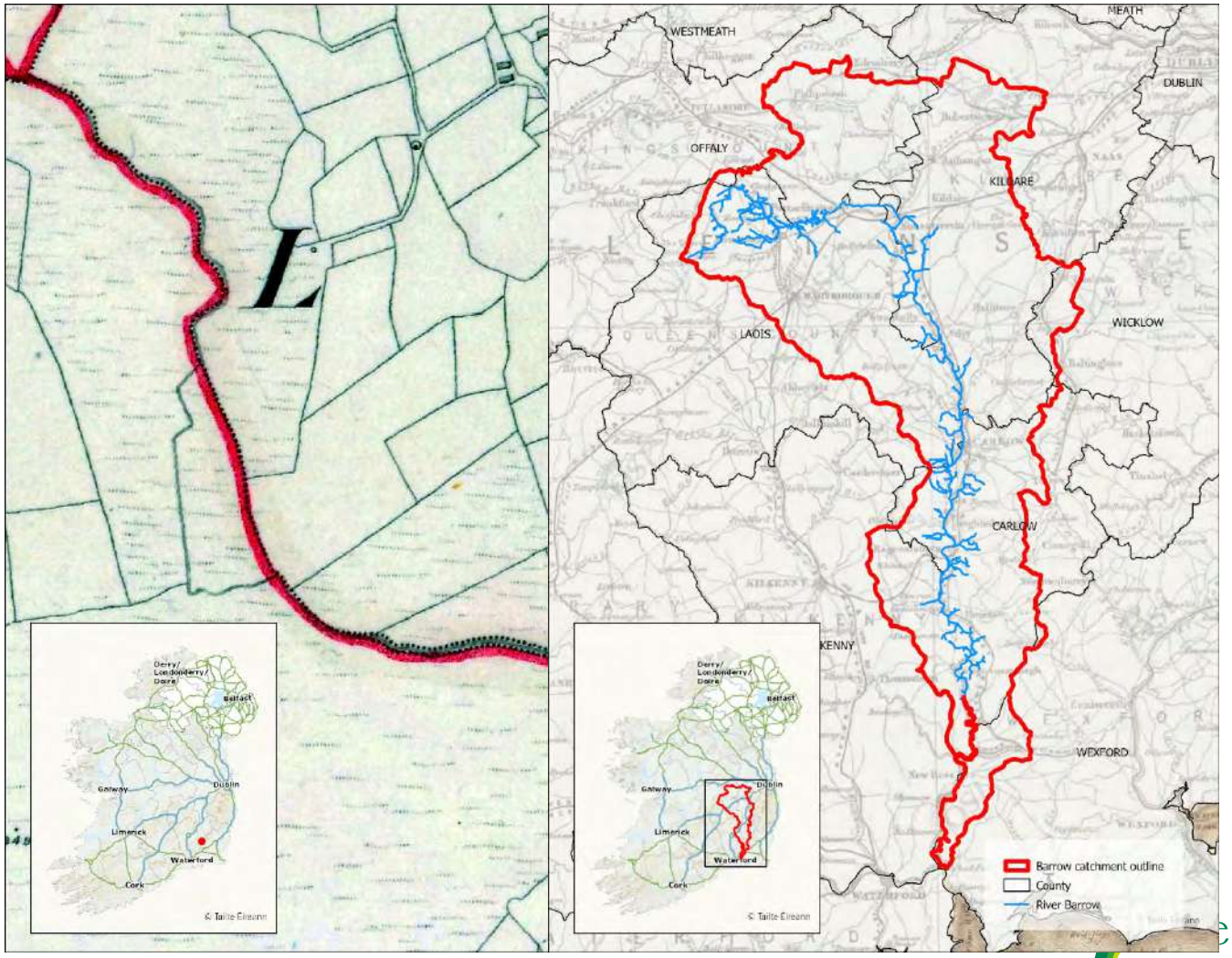

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Select the machine learning algorithm

We used a deep learning method called Unet. It is a form of Convolutional Neural Netowork which has been proven to be an excellent method for image recognition and segmentation.

Source: Ronneberger, Fischer & Brox (2015): U-Net: Convolutional Networks for Biomedical Image Segmentation. In: Medical Image Computing and Computer-Assisted Intervention (MICCAI), Springer, LNCS, Vol.9351: 234--241

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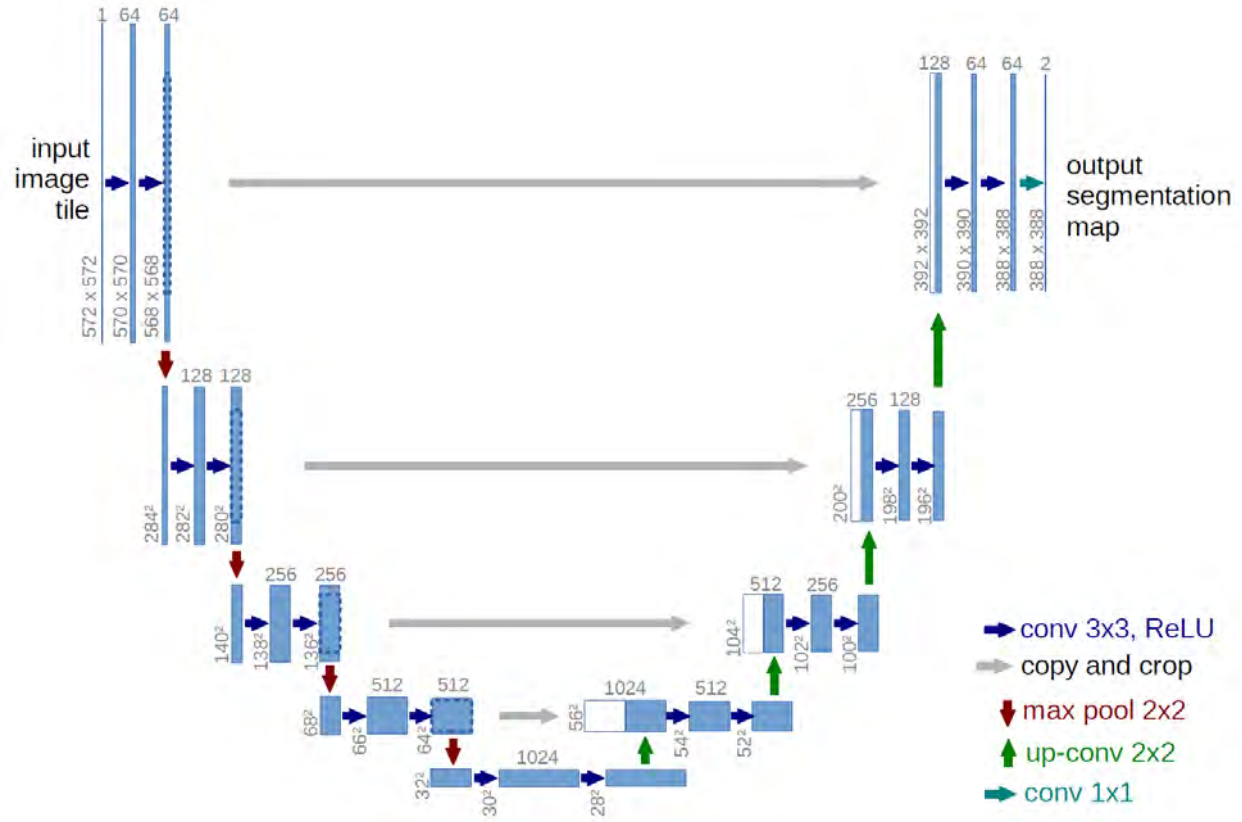

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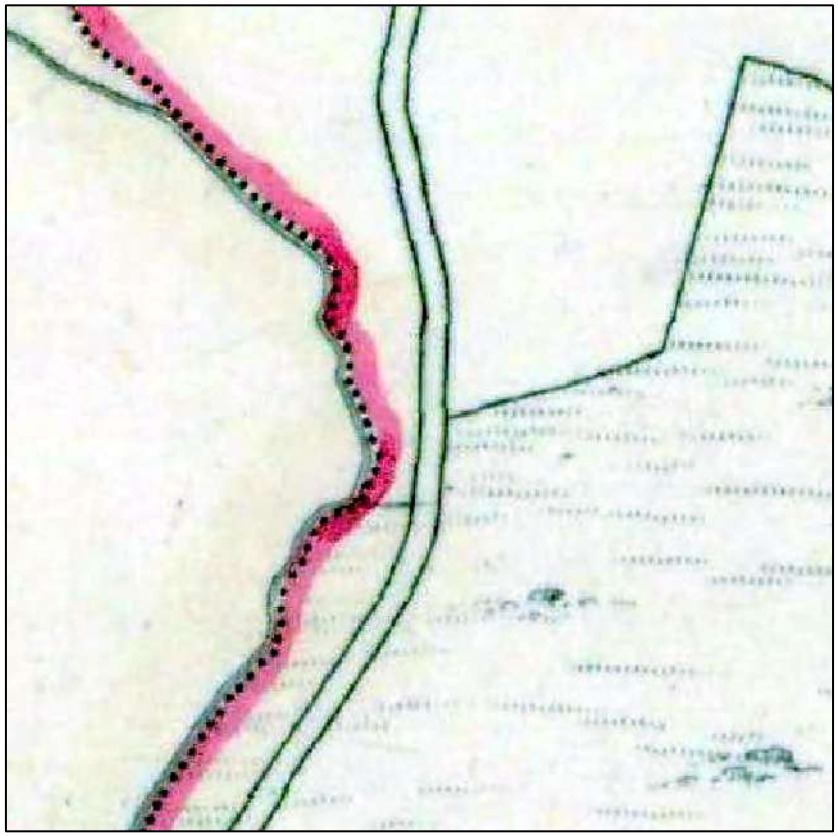

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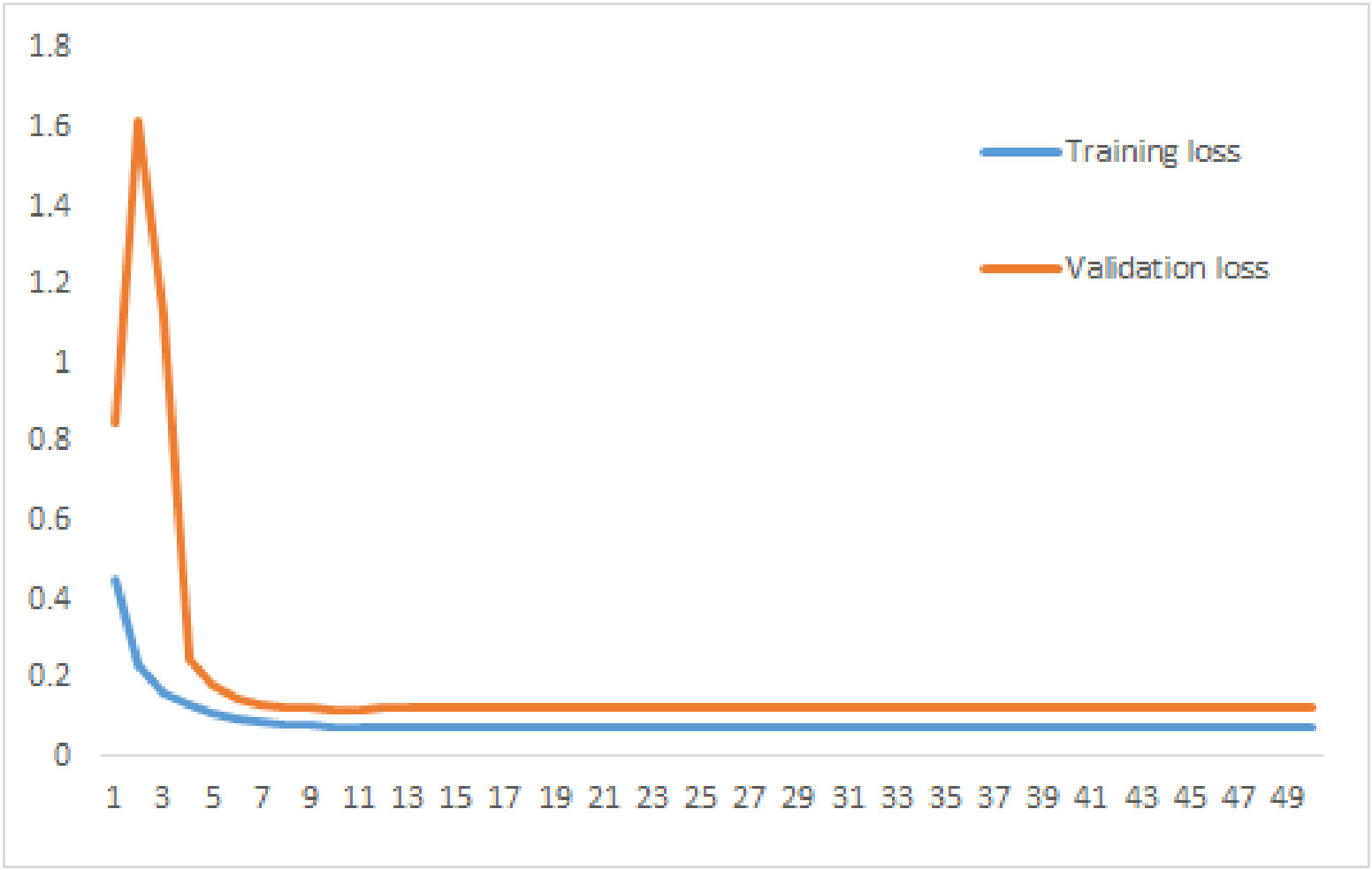

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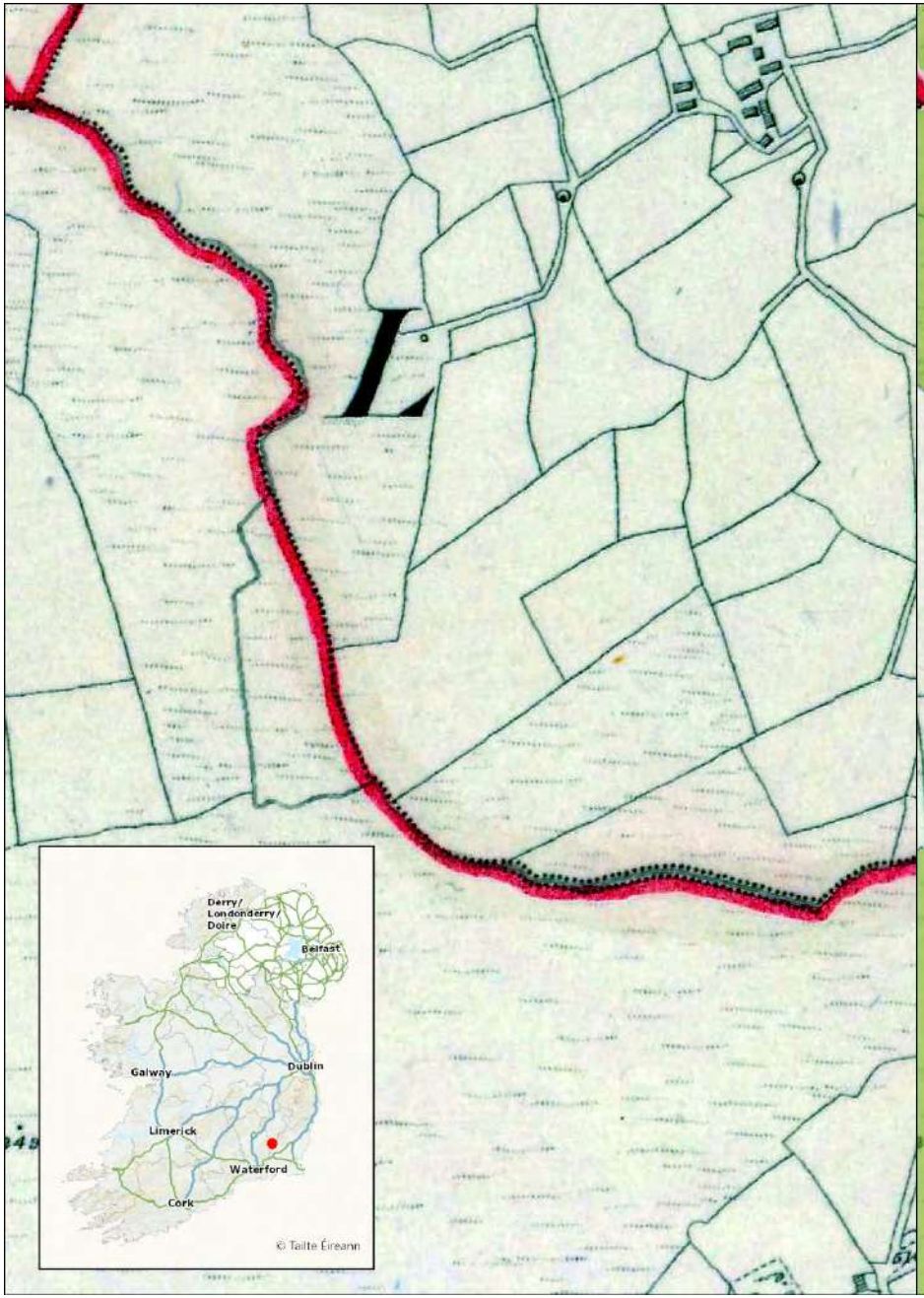

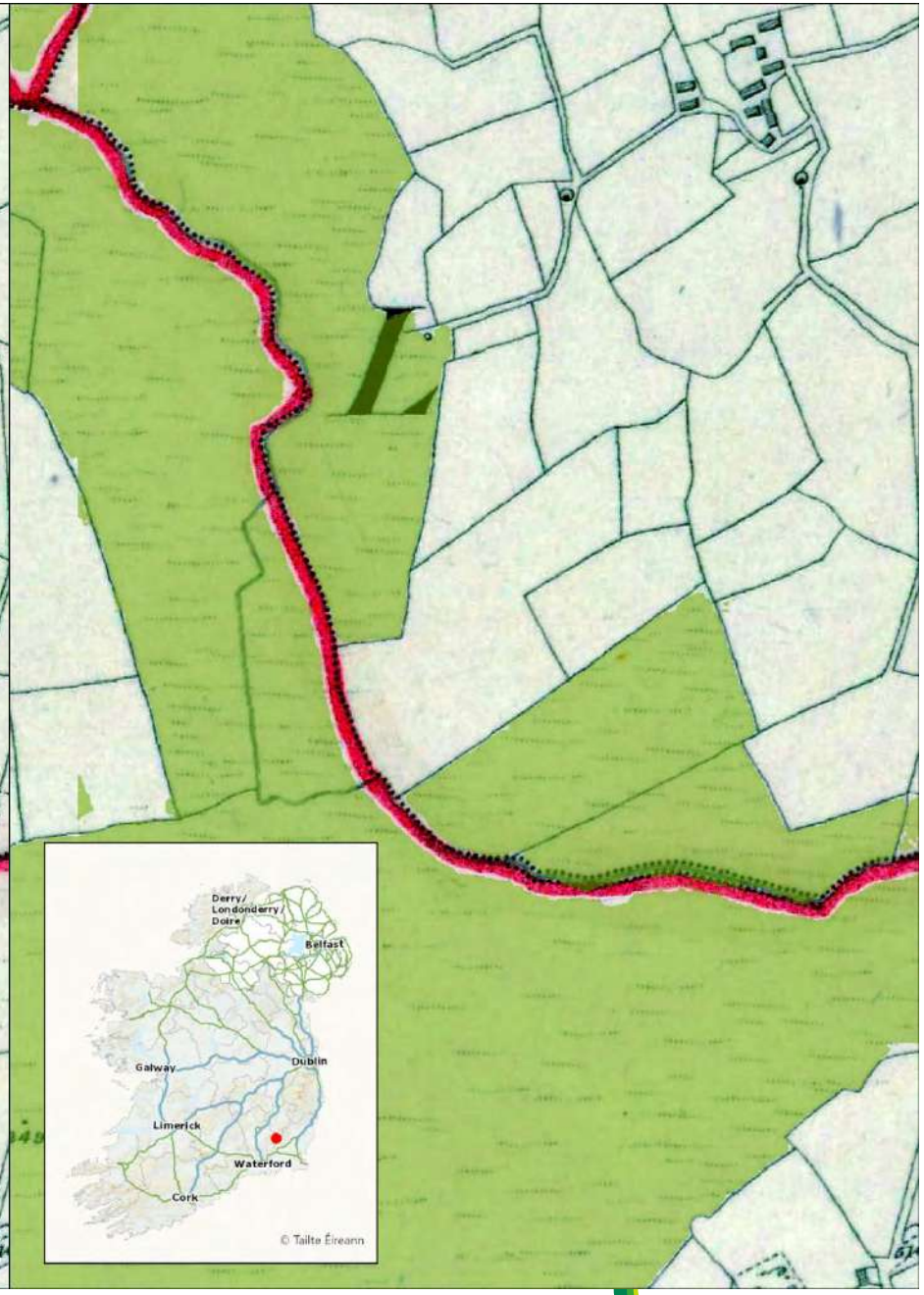

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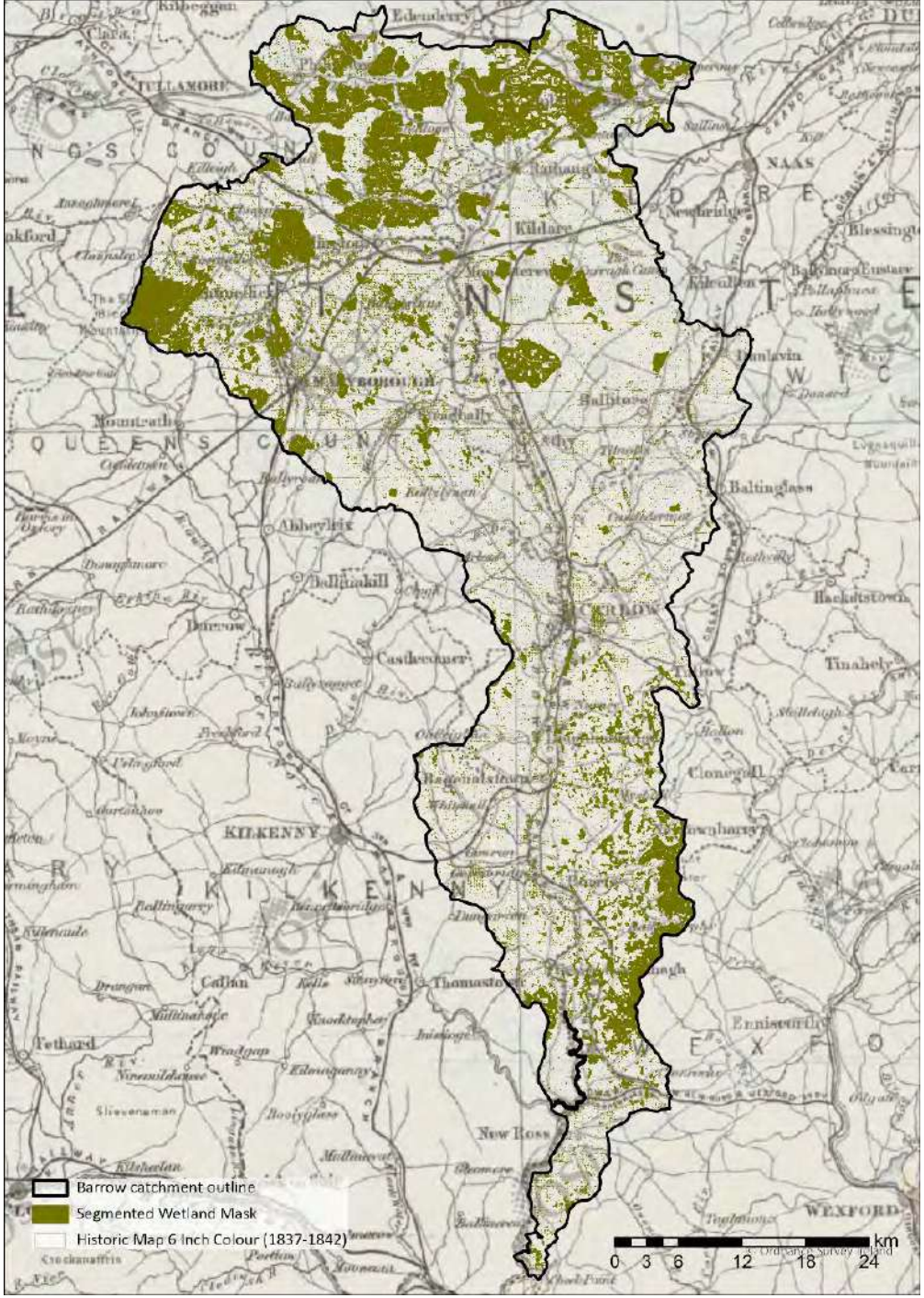

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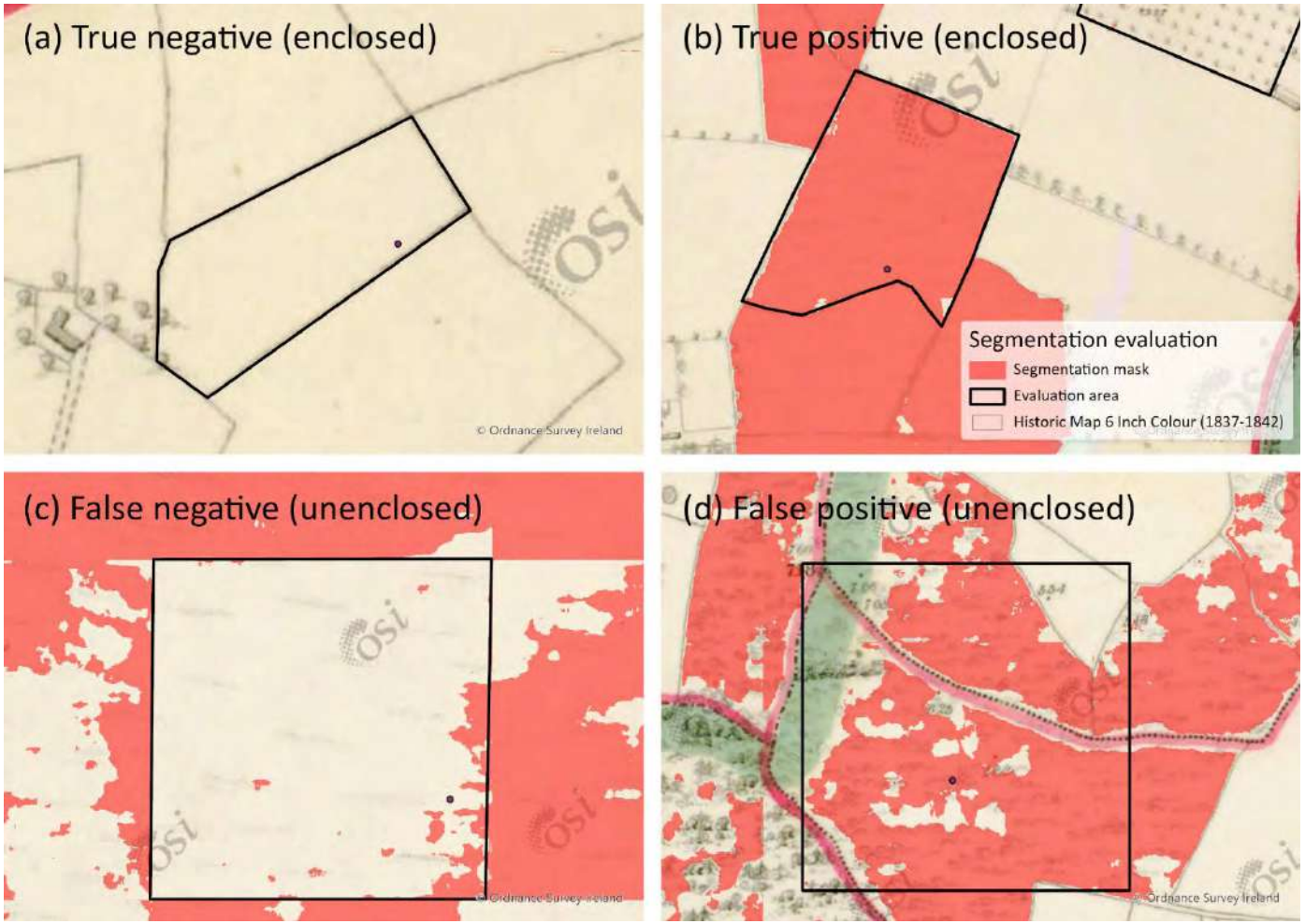

Rob O'Hara, Richa Marwaha, Jesko Zimmermann, Matthew Saunders, Stuart Green (2024), Unleashing the power of old maps: Extracting symbology from nineteenth century maps using convolutional neural networks to quantify modern land use on historic wetlands, Ecological Indicators, Volume 158

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Table 2. Accuracy metrics: positive, N: negative, TP: true positive, TN: true negative, FP: false positive, FN: false negative.

Metric	Derivation	Value
Accuracy	(TP+TN)/(P+N)	97.0% (95% C.I. 95.2, 98.2%)
Balanced Accuracy	(TP/(TP+FN)+TN/(FP+TN))/2	92.9%
F1	2TP/(2TP+FP+FN)	98.2%
Sensitivity (Recall)	TP/(TP+FN)	99.2%
Specificity	TN/(FP+TN)	86.6%
Negative Predictive Value	TN/(TN+FN)	95.5%
False Negative Rate	FN/(FN+TP)	0.85%
False Positive Rate	FP/(FP+TN)	13.4%
Precision	TP/(TP+FP)	97.3%
Kappa	2((TP×TN) – (FN×FP))×(TP+FP) × (FP+TN) + (TP+FN) × (FN+TN)	89%

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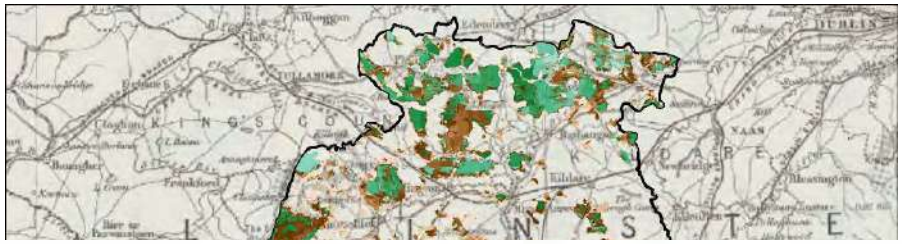

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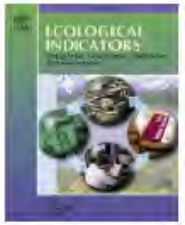

Check for updates

Unleashing the power of old maps: Extracting symbology from nineteenth century maps using convolutional neural networks to quantify modern land use on historic wetlands

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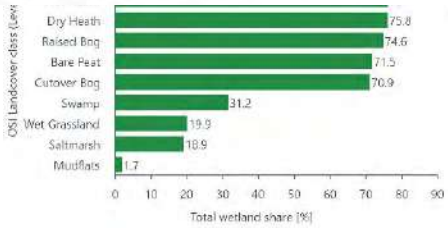

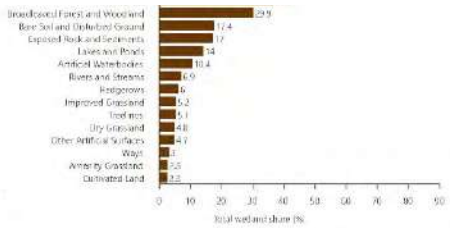

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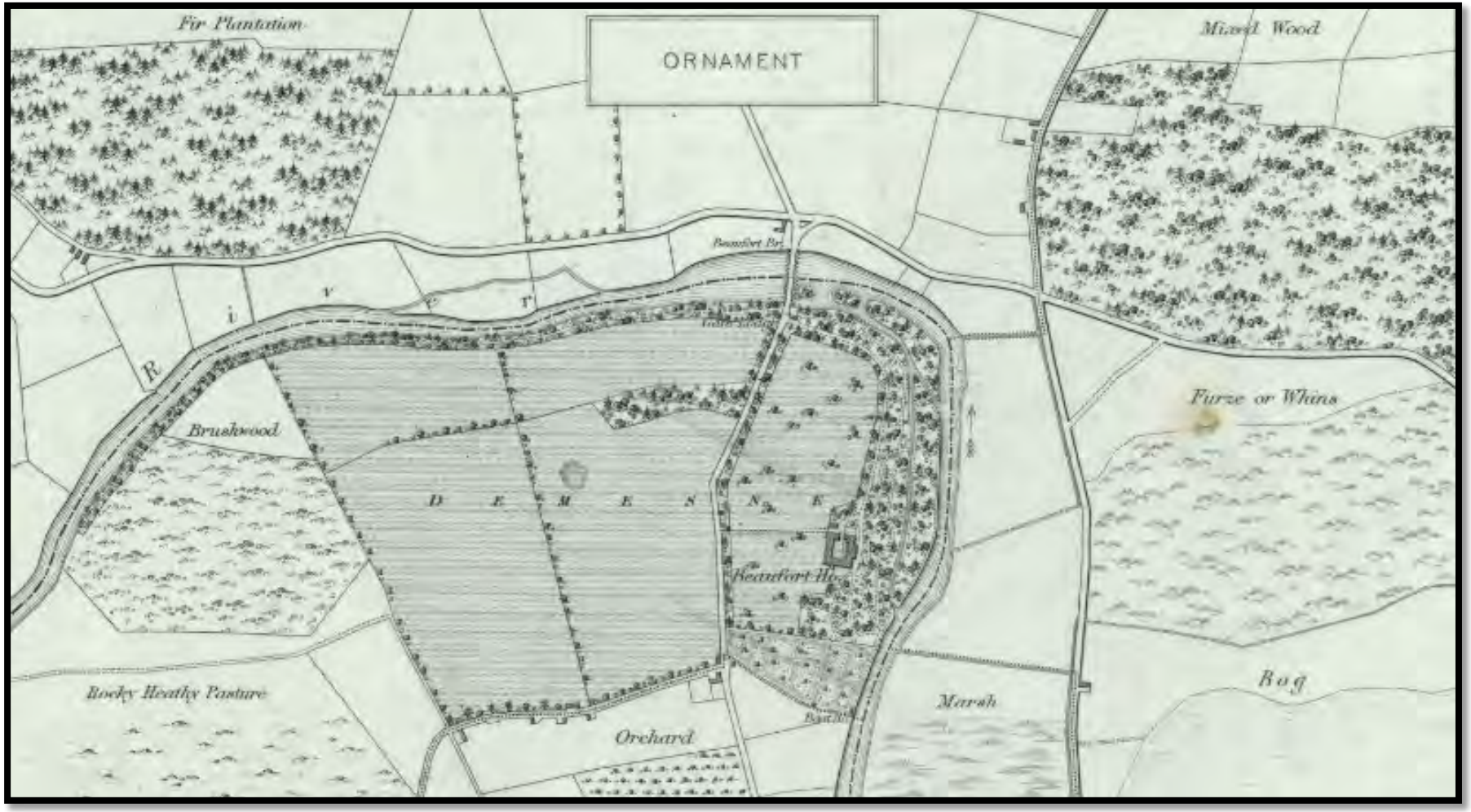

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Acknowledgements

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The Ancient Woodlands Ireland Team

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Thank you!

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