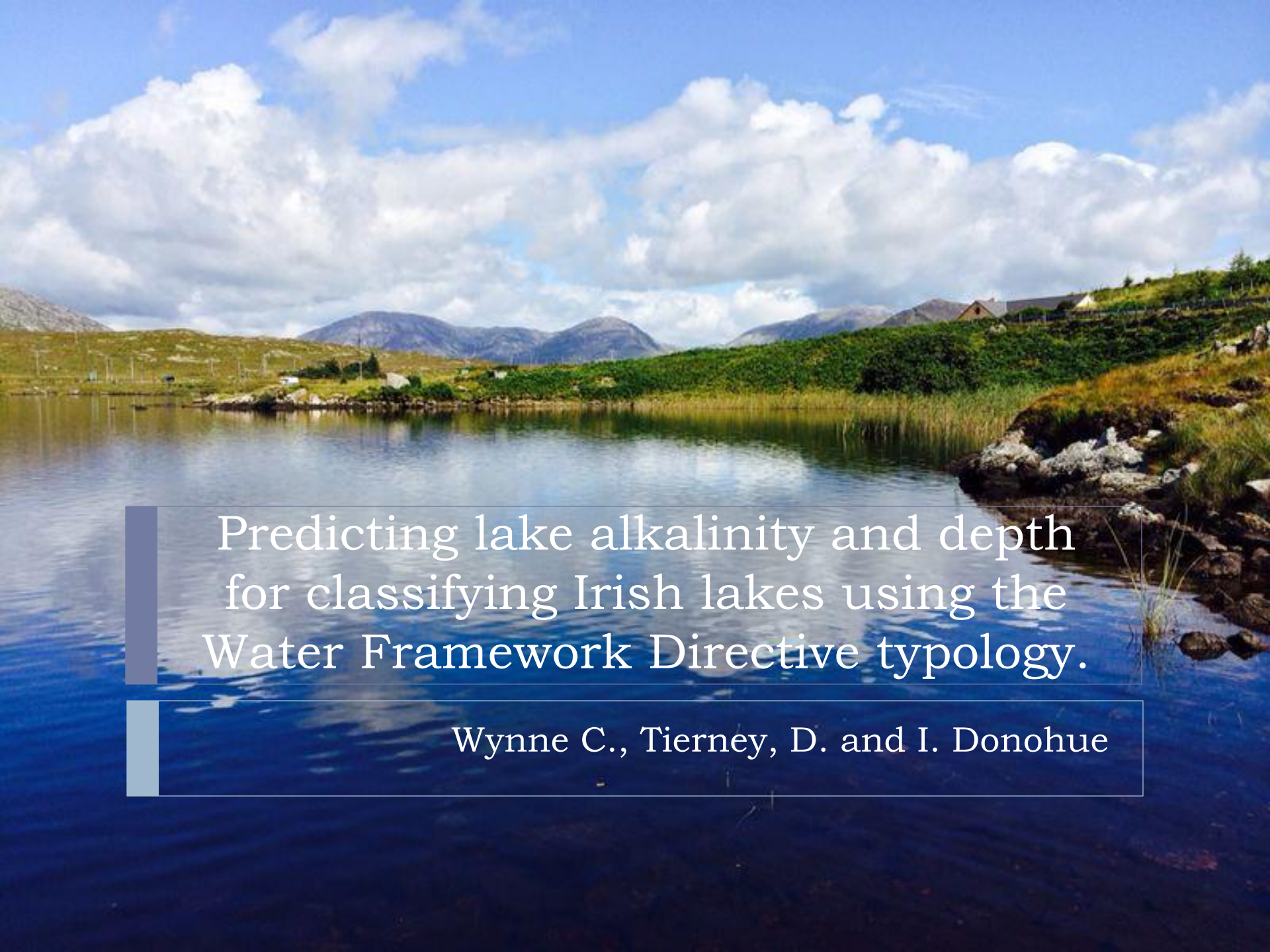


Predicting lake alkalinity and depth for classifying Irish lakes using the Water Framework Directive typology.

Wynne C., Tierney, D. and I. Donohue

Irish WFD Lake Typology

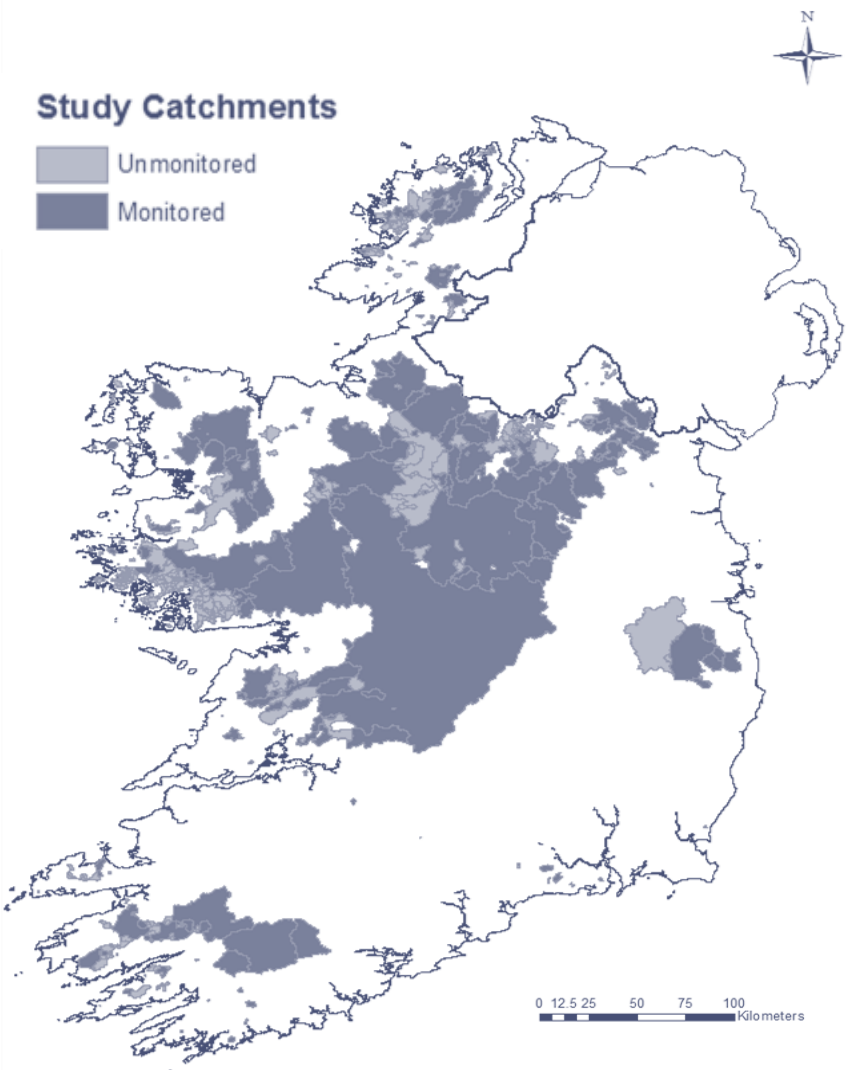
Parameters	Boundaries											
Alkalinity (mg L^{-1} $CaCO_3$)	<20				20-100				>=100			
Depth (m)	=<4		>4		=<4		>4		=<4		>4	
Area (ha)	<50	>=50	<50	>=50	<50	>=50	<50	>=50	<50	>=50	<50	>=50
Type	1	2	3	4	5	6	7	8	9	10	11	12

Note: A provisional type, type 13 has also been proposed to describe high altitude lakes (>200 m).

- Free et al., 2006.

WFD Monitoring Programme Design

- 12000+ lakes in Ireland
- 816 lakes on WFD programme
- 227 monitored for WFD

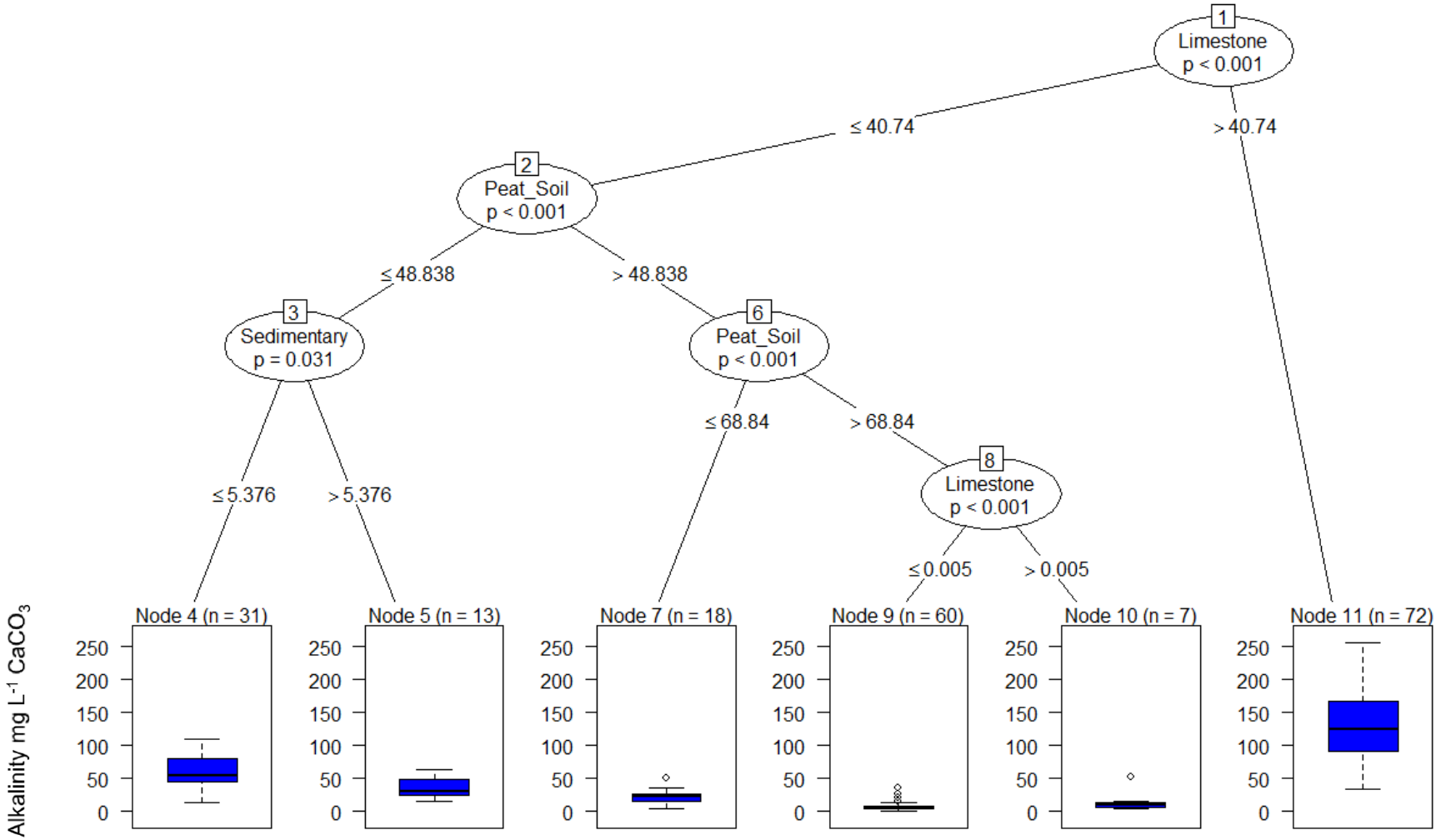


Predicting lake alkalinity

Geology/Soil Category	Source
% Limestone	Expert grouping of Rock Units layer
% Sedimentary	Expert grouping of Rock Units layer
% Metamorphic	Expert grouping of Rock Units layer
% Igneous (Acid)	Expert grouping of Rock Units layer
% Igneous (Non-Acid)	Expert grouping of Rock Units layer
% Peat Soil	Expert grouping Soils layer
% Peat Subsoil	EPA grouping of Subsoil layer
% Acid Subsoil	Expert grouping of Subsoil layer
% Basic Subsoil	Expert grouping of Subsoil layer

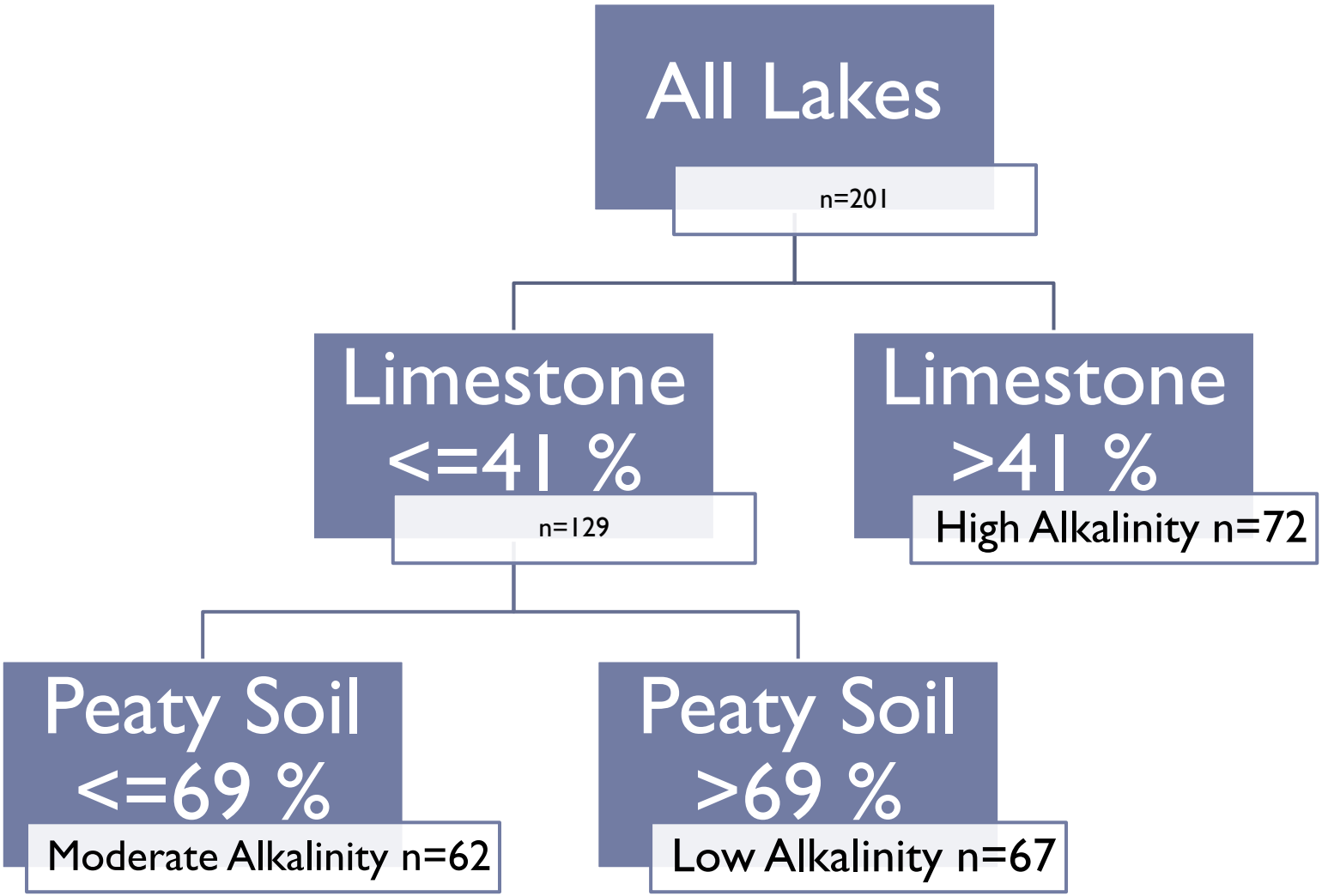
- Source: GSI and Teagasc, with assistance from Katie Tedd (GSI) and Anthony Mannix (EPA)

Decision Tree Output for Alkalinity



- WFD Typology categories <20, 20-100, >100 mg L^{-1} $CaCO_3$

WFD alkalinity prediction model



Correct classification rates (Alkalinity)

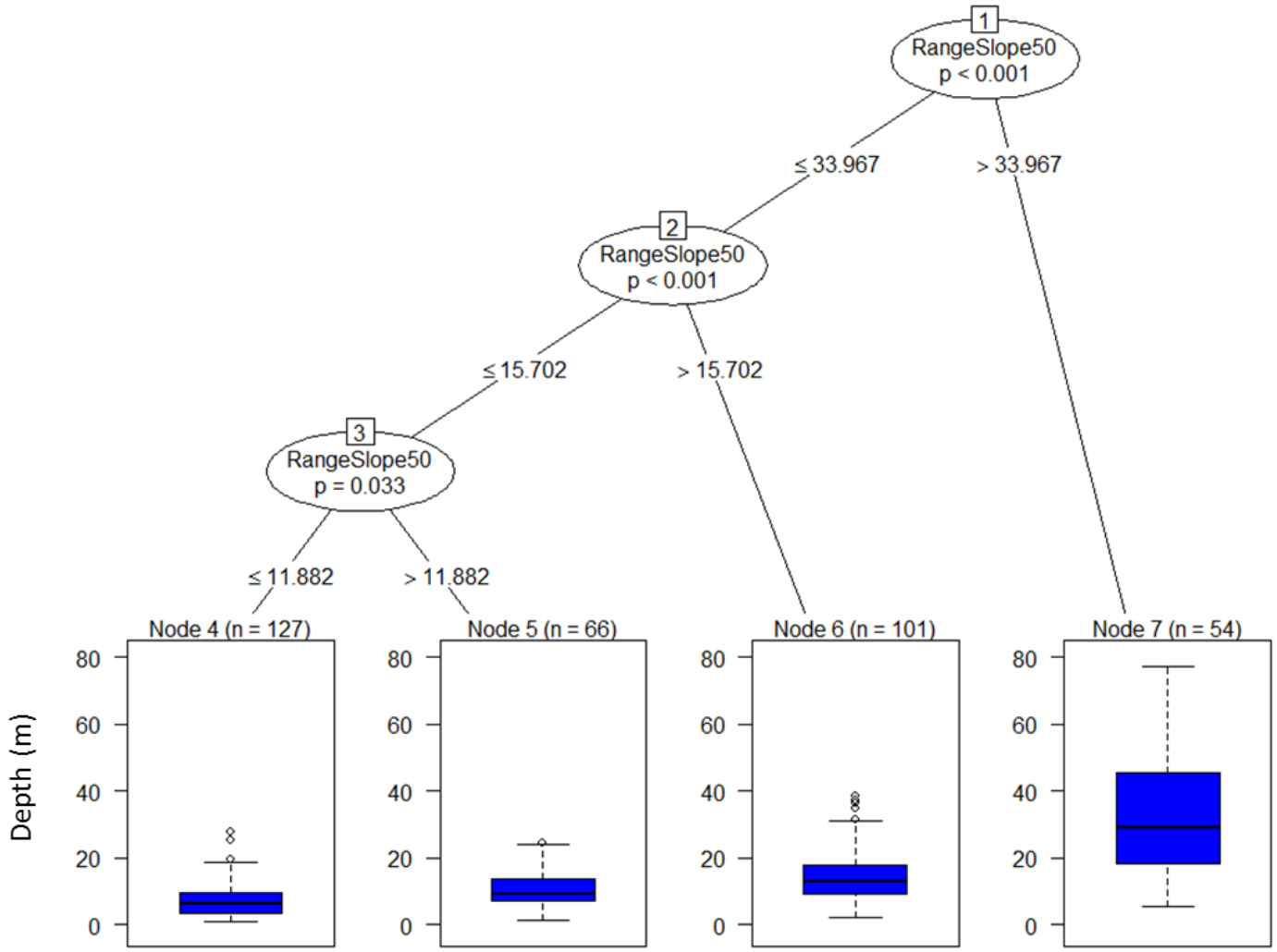
Lake Group	Training	Test
All lakes	80 %, n=201	87 %, n=62
Low Alkalinity	95 %, n=67	94 %, n=32
Moderate Alkalinity	77 %, n=62	92 %, n=12
High Alkalinity	74 %, n=72	72 %, n=18

Predicting lake depth

Predictor	Source
Mean Catchment Slope (degrees)	5 m Digital Elevation Model
Range in Catchment Slope (degrees)	5 m Digital Elevation Model
Range in Slope within 50 m of lake (degrees)	5 m Digital Elevation Model
Range in Slope within 100 m of lake (degrees)	5 m Digital Elevation Model
Lake Area (km^2)	Lake Water Body Layer
Shoreline Development Index	Lake Water Body Layer
Longitude (degrees)	Lake Water Body Layer
Latitude (degrees)	Lake Water Body Layer

- Source: OSI and EPA from http://gis.epa.ie/

Decision Tree Output for Depth



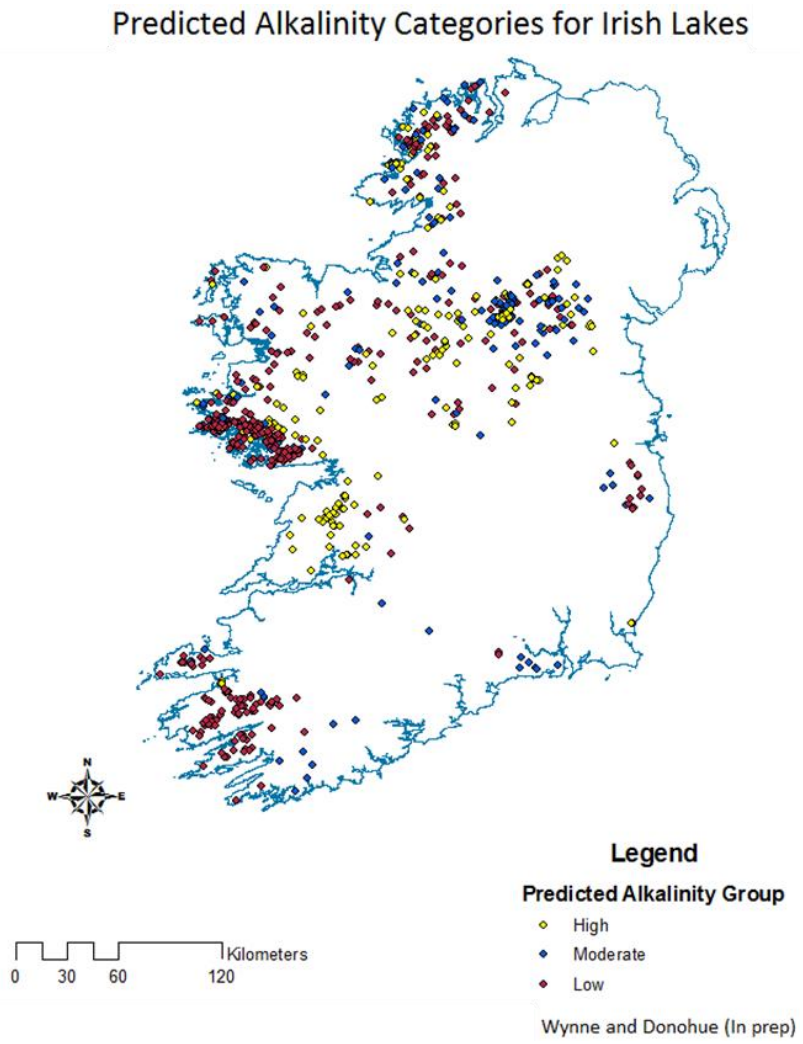
- WFD Typology categories <12, >12 m

Correct classification rates (Depth)

Lake Group	Training	Test
All lakes	89 %, n=348	44 %, n=202
Shallow lakes <12 m	83 %, n=190	25 %, n=96
Deep Lakes >12 m	61 %, n=158	85 %, n=106

Conclusions/Applications

- Correct percentage classification was highest for the low alkalinity category and decreased for moderate and high alkalinity lakes – location of limestone?
- Potential use in locating hot spots for species of conservation interest e.g. Characeae in high alkalinity lakes.
- Bathymetric surveys required to assign typology to unmonitored lakes – surveys are underway.
- Highlights location of deeper lakes, assisting in understanding of nutrient processing for unmonitored lakes.



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