Citizen scientist involvement in water quality monitoring in agricultural catchments: a case study

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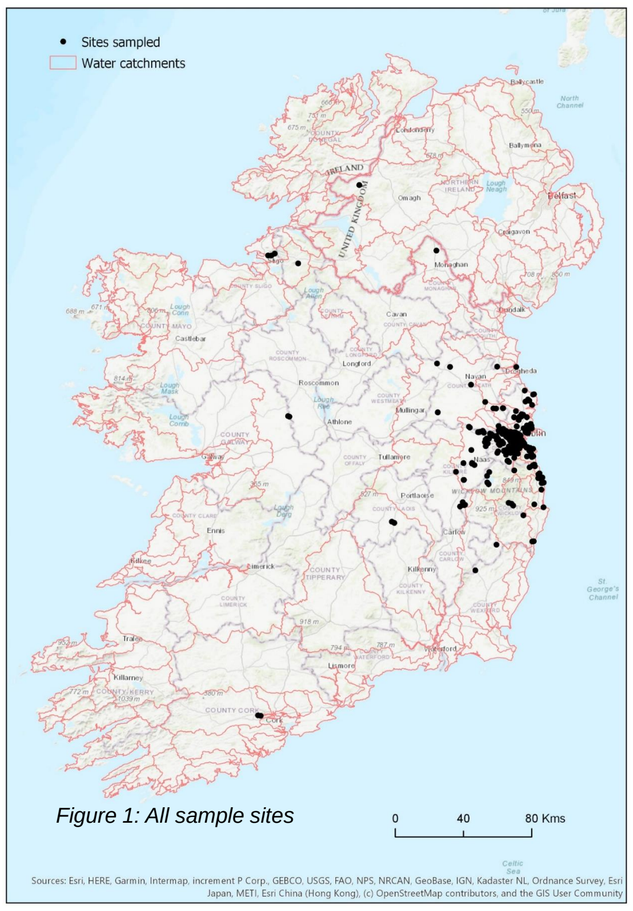

Figure 1: All sample sites

Introduction

From 20th – 23rd September 2019, more than 750 citizens took part in a project to record and map the water quality of their local freshwater body in Ireland, with a focus on Leinster. The project was part of Earthwatch's Freshwater Watch WaterBlitz programme, which in 2019 was rolled out to Dublin, Luxemburg and Paris as well as the Thames catchment in the UK. 202 water samples (53% of the samples) were taken throughout the Liffey Catchment over the four days, with other urban catchments also recording high levels of participation.

Catchment sampling

The initial focus for this first Irish WaterBlitz was the Greater Dublin Area. However, people from across the island of Ireland registered to take part, and so kits were sent out to areas beyond the initial target area. Therefore, although the GDA is well sampled, rural catchments are also represented in the dataset. Citizen scientists recorded higher levels of nutrients in the water bodies in agricultural areas (figure 3). The issues with citizen scientists self-selecting sites, and the representative nature of these, have been documented elsewhere (McGoff *et al*. 2017). Future iterations of the WaterBlitz will include a consideration of this.

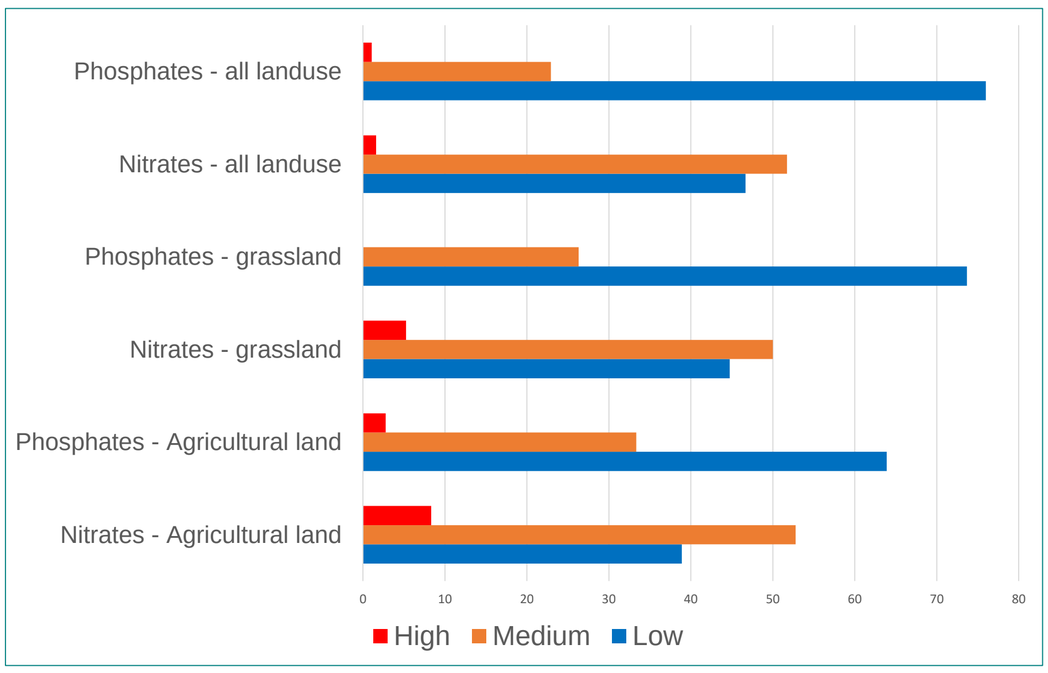

Figure 3: Percentage of sample sites where phosphates and nitrates were recorded as high, medium and low on all land use types (n=375), sites noted as grassland (n=38) and sites noted as agricultural land (n=36).

Methodology

Registration opened after the project launch on 2nd September. The interest was such that, within 24 hours, over 300 people had registered to take part, with registration closing early. In total, 370+ samples were taken. DCU Water Institute sent out *Earthwatch* colourimetric sampling kits to the participants, with instructions on how to take the samples and to read the results (Thornhill *et al*. 2017).

Citizen scientists recorded:

- Land use
- Presence of litter / foam / floating algae / oily sheen
- P-PO_4 (range)
- N-NO_3 (range)
- Photograph of site

Figure 2: Nitrate sample being prepared by one of the participants

Citizen scientists fed the data back to the project leaders and other participants in real-time via an app.

Citizen science participation

The level of participation in this event, and the feedback from others to DCU Water Institute, indicates a desire among great numbers of the general public to take part in initiatives such as this. Participants were drawn from a large cross-section of society, from individuals generally interested in environmental matters, Tidy Towns associations, Scout and other youth groups and families who got involved on the day. These types of events are important opportunities to engage the public, while also collecting robust scientific data, as they promote environmental and scientific literacy and allow ownership over the data collected.

Case study – Grangecon area, Co. Wicklow

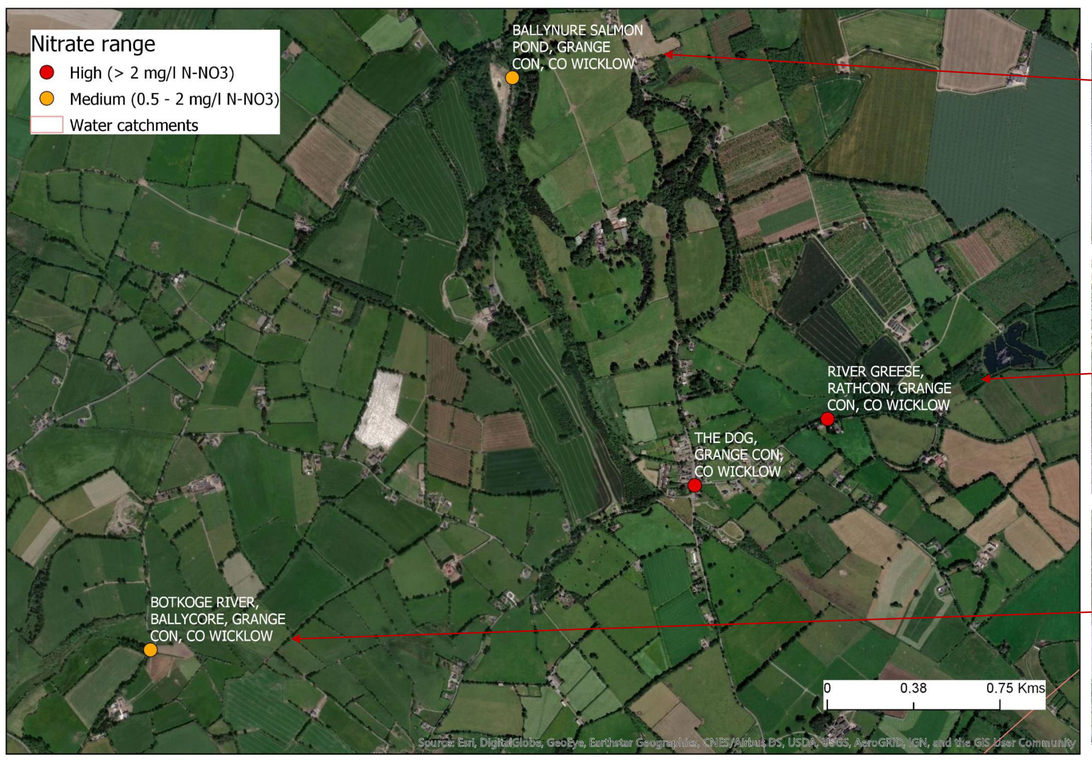

Figure 4: Citizen scientist levels of nitrates and photographs, Grangecon area, Co. Wicklow. Citizens comment on issues such as fisheries, water treatment plants and other concerns in their commentary.

Notes and references

Nutrient ranges:

- Nitrates
  - Low = >0.5 mg/l N-NO_3
  - High = < 5 mg/l N-NO_3
- Phosphates
  - Low = >0.05 mg/l P-PO_4
  - High = < 0.5 mg/l P-PO_4

McGoff, E., Dunn, F., Cachazo, L.M., Williams, P., Biggs, J., Nicolet, P. and Ewald, N.C., 2017. Finding clean water habitats in urban landscapes: professional researcher vs citizen science approaches. *Science of the Total Environment*, 581, pp.105-116.

Thornhill, I., Ho, J.G., Zhang, Y., Li, H., Ho, K.C., Miguel-Chinchilla, L. and Loiselle, S.A., 2017. Prioritising local action for water quality improvement using citizen science; a study across three major metropolitan areas of China. *Science of the Total Environment*, 584, pp.1268-1281.

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