Cattle Exclusion from Watercourses: Scale, Cost & Uptake

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1. Context

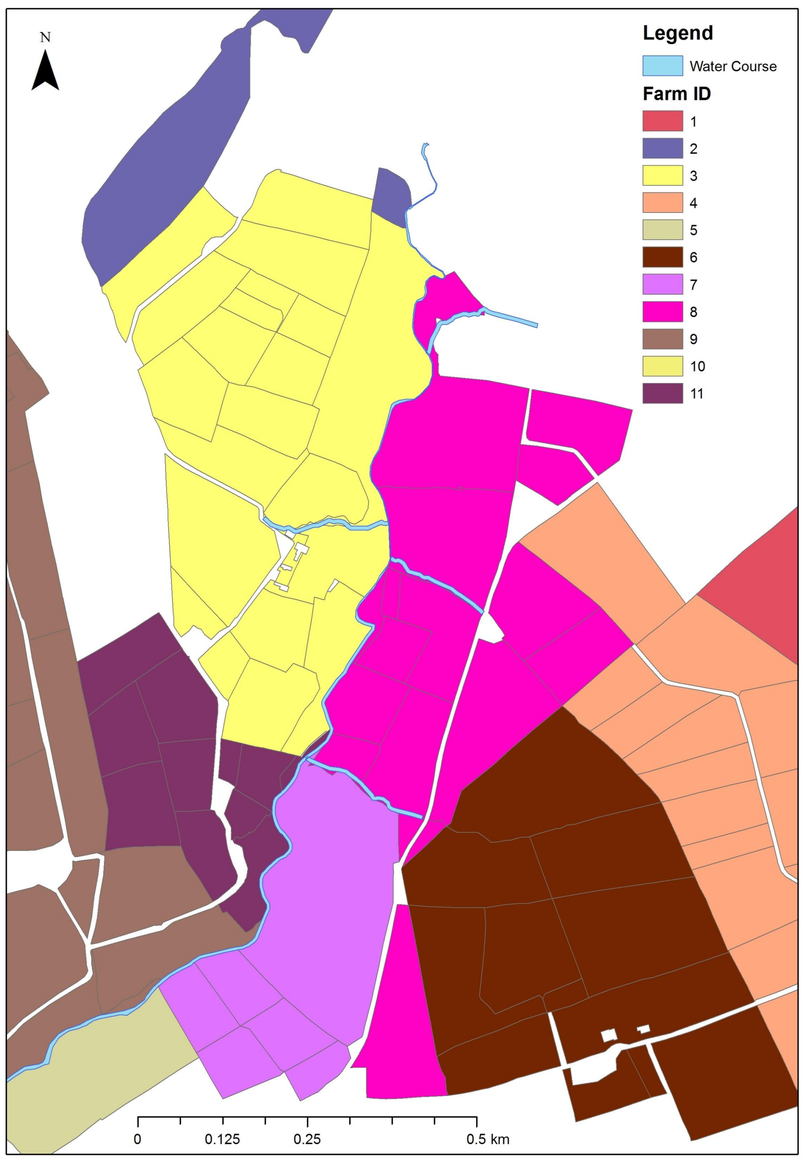
The 4th NAP of the Nitrates Directive requires farms with a grassland stocking rate over 170 kg N/ha (hereafter referred to as derogation farms) to prevent cattle from accessing watercourses from January 2021. This is likely to have environmental and economic implications.

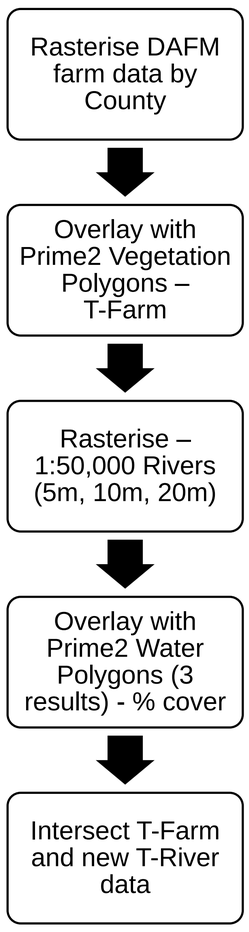
2. GIS: Extent of on-Farm Watercourses

GIS software was used to estimate the total number of farms bordering a watercourse in Ireland which may be impacted by the Nitrates Directive.
Datasets included:

- Ordnance Survey Ireland's (OSi) Prime2 mapping dataset
- DAFM parcel dataset
- Discovery Series 1:50,000 scale OSi river network

DAFM farm data were merged into the Prime2 to create a new farm boundary layer for Ireland, T-farm. The Discovery Series 1:50,000 scale OSi river network was then overlaid with Prime2 river polygons to create a spatially rich river dataset, T-river. Combining the T-farm layer with the T-river layer; the total number of farms bordering a watercourse and length can be quantified.





3. GIS Analysis

Results in relation to the impact of Nitrates legislation on derogation farms are presented

Number of derogation farms	**12,353**
Number of derogation farms intersecting river	**10,933**
Mean river bank length intersection (km)	**2**
Median river bank length intersection (km)	**1.4**
National length of watercourse (km)	**92,213**
Number of fields on derogation farms	**250,109**
Number of fields intersecting a river bank	**46,771**
Length of river bank to be fenced (km)	**22,364**

4. Benefits and Costs

Cattle exclusion has the benefit of reducing sediment, nitrogen and phosphorus and improving instream and riparian habitats.
For example, fencing prevents faecal matter being deposited into streams.
The following formula represents the potential level of faecal matter being discharged by bovines into a watercourse per farm:

$$Fl/year = 210 * 23.6 * Timer * Luhec * hecr$$

Where F = Faecal matter in kg; 210 = Grazing season (days);
23.6 = kg of faecal matter the average dairy cow produces in a 24 hour period;
$Timer$ = Lower bound 6%, Upper bound 10% of time spent in river;
$Luhec$ = Livestock units per hectare; $hecr$ = area of fields bordering river (hectares).

The table shows an estimation of the levels of faecal matter potentially being discharged into watercourses on derogation farms in the absence of riparian fencing.

NUTS 3	Lower bound (kg)	Upper bound (kg)	Inter (km)	Cost Fencing (€) (€3.89 per m)
Border	**171,377**	**268,576**	**2,003**	**7,791,886**
Dublin	**5,545**	**8,689**	**112**	**436,627**
Mid-East	**256,117**	**401,377**	**2,757**	**10,700,000**
Mid-West	**471,494**	**738,908**	**4,503**	**17,500,000**
Midlands	**230,855**	**361,788**	**2,867**	**11,200,000**
South-East	**540,631**	**847,258**	**3,658**	**14,200,000**
South-West	**791,145**	**1,239,855**	**5,290**	**20,600,000**
West	**94,567**	**148,202**	**1,174**	**4,566,758**
Total	**2,561,731**	**4,014,654**	**22,364**	**86,995,271**

Costs relate to direct costs (fencing/water provision) and indirect costs (loss of productivity, labour).

5. Adoption, Impact & Next Steps

The results presented here will be collated with a survey of 1,009 respondents (Teagasc NMP/Harmony) to examine farmer attitudes and intention to adopt riparian fencing measures.

To complete the picture the next step will be to calculate the impact at farm level. This would involve estimating the Marginal Abatement Cost.

$$Marginal\ Abatement\ Cost = \left(\frac{Marginal\ Benefits}{Marginal\ Costs}\right) * Prob.\ (Adoption)$$

Agriculture and Food Development Authority

This work was carried as part of the Teagasc Cosaint Project (Cattle Exclusion from Watercourses) which is funded by the Environmental Protection Agency (EPA)
https://www.teagasc.ie/environment/biodiversity--countryside/research/current-projects/cosaint/

Environmental Protection Agency