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Submission for the Joint Oireachtas Committee on Climate, Environment and Energy on the Coastal Lagoons: Ecology and Restoration (CLEAR) Report on Our Lady's Island Lake, Co Wexford

An Taisce, a member of the Sustainable Water Network (SWAN), welcomes the opportunity to make a submission to the Joint Oireachtas Committee on this very important topic. An Taisce has done extensive work to date on water quality, in particular agricultural water pollution, and would like to highlight the following things for consideration by the Committee.

1. The Importance of Lady's Island Lake

Lady's Island Lake is a lagoon of enormous ecological, historical and spiritual significance. It is also one of the most polluted lagoons in the Republic of Ireland.

Lady's Island Lake is a highly legally protected waterbody, designated as a Special Protection Area (SPA), with the largest mixed tern colony in Ireland. It hosts internationally important populations of Sandwich Tern and Roseate Tern, and nationally important populations of Common Tern and Arctic Tern[1]. The site formerly supported internationally important numbers of wintering waterfowl, but in recent years numbers have declined drastically, possibly due to a decline in the abundance of their main food source, the bottom growing (benthic) Ruppia plant species[2]. In the 1980s, prior to being polluted, the clear water of the lagoon, allowed for a well-developed benthic sward of widgeon grass (Ruppia sp.) which grew on the lake bed. But since the 1980s, the lagoon has switched to a waterbody dominated by plankton (largely cyanobacteria), with the die off of benthic, bottom growing species on foot of increasing pollution and poor water transparency.

The lagoon is also protected as a Special Area of Conservation (SAC) due to its status as a coastal lagoon. It was described by the NPWS[3] as:

> *"an excellent example of a sedimentary lagoon with a sand/shingle barrier. It is by far the largest and best example of this type of lagoon in the country and is in a relatively natural condition"*

Coastal lagoons are priority habitats under Annex I of the Habitats Directive. This places a legal obligation on the State to return this habitat to Favourable Conservation status, which

[1] NPWS SPA SITE SYNOPSIS
[2] NPWS SAC SITE SYNOPSIS
[3] NPWS SAC SITE SYNOPSIS

includes specific targets for water quality, outlined in the conservation objectives for the site[4].

The site is also protected under the Water Framework Directive (WFD), which requires the water quality to be at 'good status' by 2027 at the latest. The lake is currently at 'poor' status.

In spite of what should be strong legal protections, the lagoon has undergone a significant ecological deterioration, primarily on foot of agricultural nitrate pollution, with a loss of its characteristic benthic, bottom growing plant species, and a switch to algae and cyanbacteria, with concomitant impacts on bird species and other ecology.

2. Wider National Context

Lady's Island Lake is indicative of wider water quality trends in the South and Southeast of Ireland, where our waterbodies are suffering from widespread agricultural nitrogen pollution. In trying to understand how we have arrived at a situation in which a heavily legally protected waterbody is being described as 'dead' by ecologists studying it, it is critical that we take the wider picture into consideration.

The EPA has highlighted that 43% of river sites, mostly in the south and southeast of the country, have high nitrate concentrations, and 39% of sites have increasing concentrations[5] This corresponds with where there is more intensive farming coupled with freely draining soils (Figure 1).

[4] ConservationObjectives.rdl
[5] EPA_WaterQualityReport2016_2021.pdf

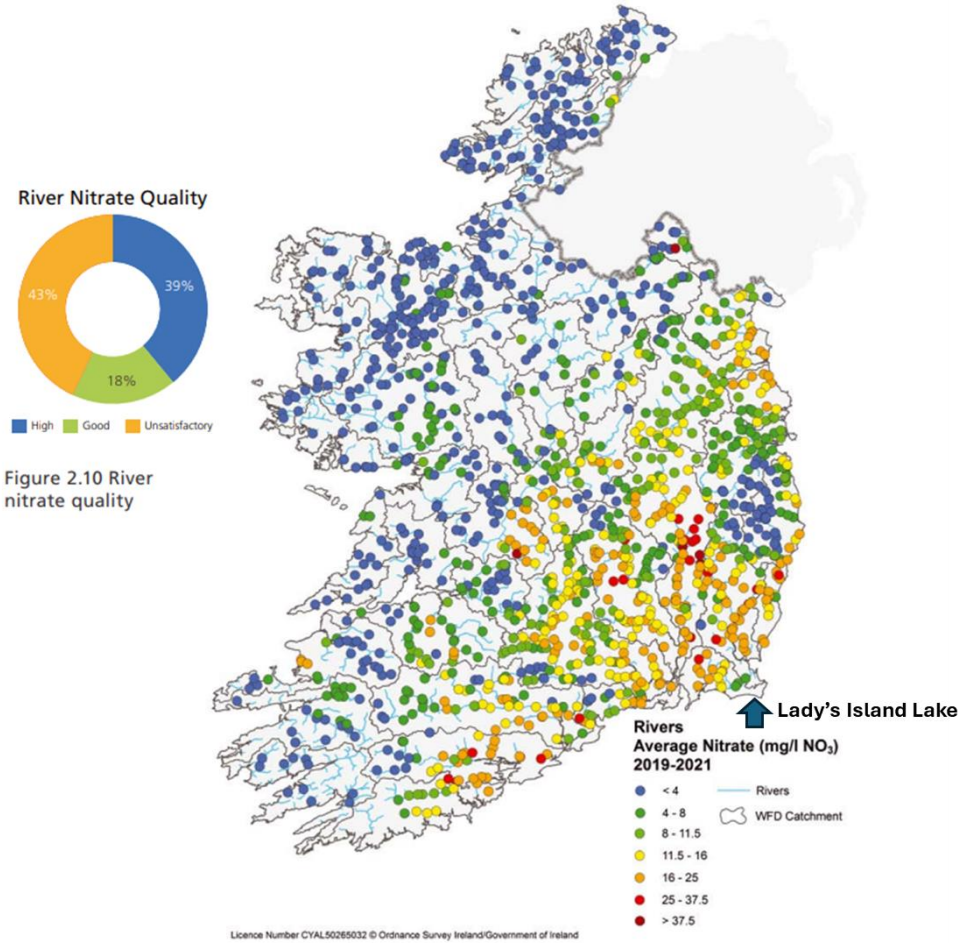


Figure 2.10 River nitrate quality

Figure 1: Average nitrate concentration at WFD river sites for 2019-2021 (Source EPA)

Recent analysis by the EPA[6] shows that more than 85% of nitrogen in rivers in some catchments in the south and southeast comes from agriculture. While tillage can also contribute to nitrate losses, data has shown that even in some of the most tillage heavy catchments, such as the Barrow and Slaney catchments, only 28% and 27% respectively of the nitrate was attributable to arable farming. Most nitrogen in identified problem catchments for nitrate came from pasture-based agriculture.

3. Existing measures to prevent nitrogen loss

A fundamental point is that not all water quality measures are effective for all pollutants. In an Irish context the main pollutants from agriculture to water are phosphorus, nitrogen and sediment. There can be a tendency to assume that measures designed to mitigate other pollutants, such as phosphorus, sediment or ammonia are equally effective at addressing nitrate. This is frequently not the case. For example, if a landowner in a catchments of concern for nitrate wished to mitigate for nitrate run off from their farm, but relied on the use of Low Emission Slurry Spreading (LESS), protected urea or extended buffer zones, these measures, while valid and useful for phosphorus, sediment and/or ammonia mitigation, are not particularly effective for nitrate mitigation. It would not be a good use of time or resources, if the main aim is to address nitrate losses to water.

[6] Assessment of the catchments that need reductions in nitrogen concentrations to achieve water quality objectives - Catchments.ie - Catchments.ie

There is a clear and well-established link between surplus nitrogen[7] and the leached nitrate to water in free draining soils. As shown in the chart below (Figure 2), the greater the surplus nitrogen, the greater the leaching shown[8].

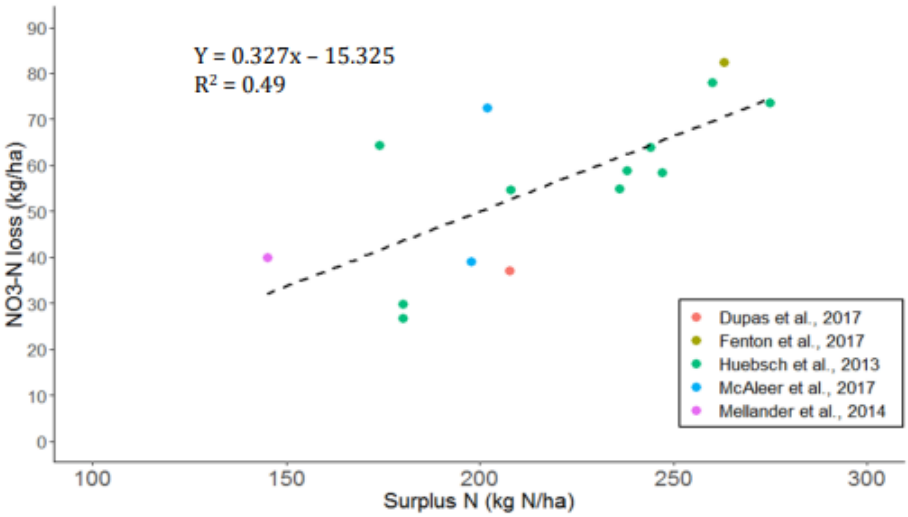


Figure 1.2. Relationship between surplus N and groundwater NO3-N loss from the reviewed literature on well-drained soils

Figure 2: Relationship between surplus N and groundwater NO3-N loss on well drained soils (source Teagasc)

Therefore, it follows logically that if we want to reduce nitrate loss to water then we need to reduce the nitrogen surplus that drives nitrate pollution. This is well illustrated in Table 1 from the Waters of Life project, which assesses the effectiveness of agricultural measures.[9]

[7] Surplus nitrogen= the nitrogen inputs that do not end up in farm production of milk, livestock or cash crops. On all farms, surplus nitrogen, is simply calculated by total farm nitrogen inputs to animals and crops minus the nitrogen exports from the farm in the milk, meat and crops produced.
[8] Nitrogen fertilizer, stocking rate and management impacts on agronomic performance and loss pathways on dairy farms
[9] Resources - Waters of Life

Table 1: Agricultural Measures Effectiveness Table (source Waters of Life Project)

Setting	No.	Measure	Effectiveness rating
	The poorly draining setting has been deleted from this table.		
Freely draining	A11	Reducing N loading, e.g. less LUs/ha	H
	A2	Appropriate N & P application rates*	M
	A3	Soil testing & NMP**	M
	A7	Using low crude protein animal feeds**	M
	A12	Complying with landspreading requirements for fertilisers and soiled water, e.g. closed period*	M
	A15	Cover/catch crops (tillage)*	M
	A19	Application of sulphur	M
	A37	Denitrifying bioreactor	M
	A8	Precision nutrient applications (e.g. using GPS technology in conjunction with NMP).	L
	A13	Liming of mineral soils**	L
	A14	Low emission slurry spreading**	L
	A16	Protected urea	L
	A17	Multi-species swards	L
	A18	Best practice N applications (e.g. taking account of: i) soil temperature, ii) SMD, grass growth rate, iv) rainfall, v) N content of organic fertilisers).	L
	A20	Conservation tillage, contour ploughing & tramline management	L
	A24	Spatially targeted variable width/extended buffer	L
	A29	Wetland buffer/farm pond	L
	A38	Woodlands (outside riparian areas)	L
	A39	Agroforestry (outside riparian areas)	L

Notes:

1. Measures effectiveness ratings: High (H), Medium (M), Low (L). Measures classified as having an insignificant effect are not shown.
2. The ratings are based on consideration of measures in the catchment areas of waterbodies where the objective is restoration to the required water body status or condition.
3. The ratings are intended as guidance, and they may vary depending on local circumstances.
4. The ratings do not account for environmental co-benefits, such as GHG emission reduction, carbon sequestration, terrestrial biodiversity enhancement.
5. For optimum effectiveness, a suite of measures at an appropriate scale will generally need to be established.
6. Mandatory measures are indicated as follows:
   * Mandatory measures.
   ** Mandatory measures only when a stocking rate is exceeded (see GAP Regulations).
7. The measures are categorised based on their location in the landscape.

Source reduction & control measures | Mobilisation control measures

Pathway interception measures | In-stream measures

Source: Slightly amended Table 3-4 in Waters of Life Annex 1: Agriculture
https://www.watersoflife.ie/resources/

Of note is that the only highly ranked measure for nitrate mitigation is reducing the nitrate load, for example through a reduction in livestock units per hectare. To emphasise this point,

Teagasc modelling[10] demonstrated that urine patches from cattle at pasture can be responsible for as much as 62% of nitrate leached. Only 29% of the loss was attributable to artificial fertiliser and just 8% was attributable to slurry (Figure 3).

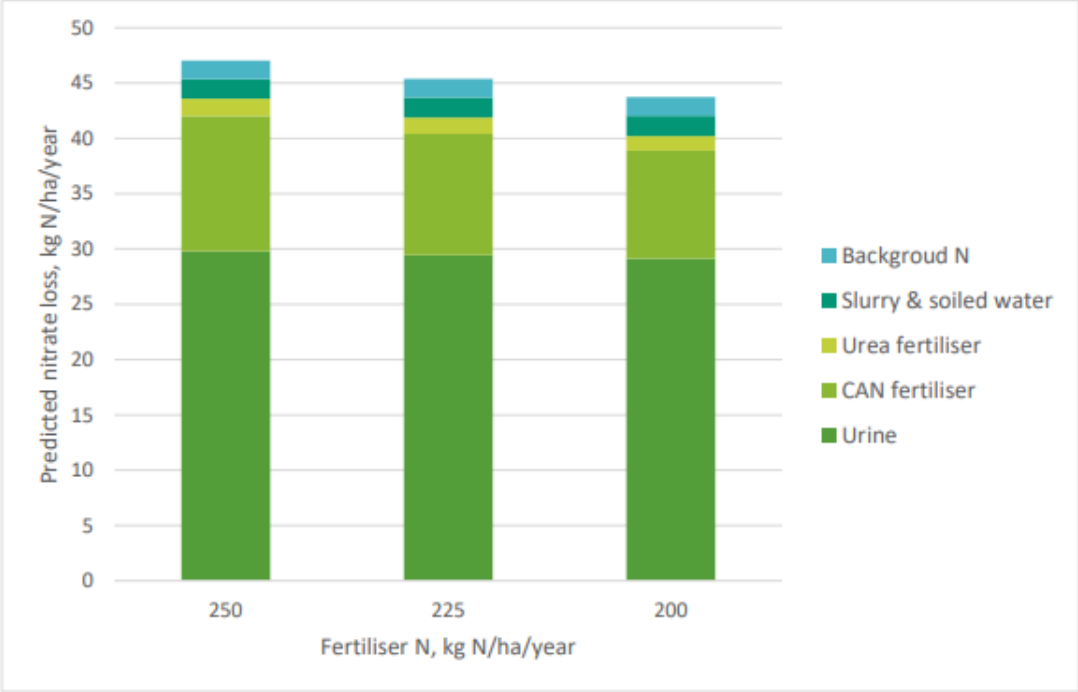


Figure 3.1. The impact of fertiliser N on predicted nitrate losses from a well-drained spring-calving grass-based dairy farm operated at a stocking rate of 250 kg organic N/ha.

Figure 3: Proportion of nitrate lost to urination, artificial fertiliser and slurry. (Source Teagasc)

To put it simply, where nitrate is the pollutant of concern, compliance regarding slurry spreading and storage, while obviously desirable from a broader environmental perspective, will have relatively limited benefit in catchments where we have a serious nitrogen problem. We are all familiar with the phrase 'the right measures, in the right place' for water quality protection, but while we have made significant progress on this when it comes to measures for phosphate and sediment, we are still failing to apply the correct measure when nitrate is the pollutant of concern. There are many farmers willingly putting measures in place on their farms, but frequently they are not measures designed to adequately address nitrate leaching. In many cases what we're seeing is a nitrate problem, with phosphate solutions.

However, we would note the finding in the CLEAR report which clearly indicates that inappropriate slurry spreading practice is likely one of the drivers of nitrate pollution in the case of Lady's Island Lake:

> *"Nutrient modelling (WP 2) has estimated that 60 tonnes of nitrogen enters the lake annually. Much of this is in the form of slurry entering through feeder streams. At the workshop in Wexford in March 2022, a Teagasc representative refuted the suggestion that*

[10] Nitrogen fertilizer, stocking rate and management impacts on agronomic performance and loss pathways on dairy farms

farmers are still allowing this, but the contrary was quite obvious when some of the outlets of the streams were visited during the sampling procedure."

4. What does this mean for Ladys Island Lake?

The authors of the report indicate that 60 tonnes of nitrogen enters the lagoon every year, primarily on foot of agriculture. While strict adherence to, and enforcement of, the Good Agricultural Practice (GAP) regulations is a key first step, particularly in regard to halting the slurry entering the feeder watercourses, when it comes to preventing nitrate loss on free draining pastures, the regulations, and measures are currently inadequate.

Much of the catchment of Ladys Island Lake is on free draining soils, as indicated on Figure 4 and 5 below. Figure 4 is taken from the EPA Targeting Agricultural Measures Map[11], which indicates where measures are needed for nitrate, phosphate, silt or a combination. The yellow colour surrounding the lagoon indicates that nitrogen measures are necessary. Figure 5 is a more detailed look, based on the Pollution Impact Potential Maps, again by the EPA[12]. Areas are assigned a 'High PIP' (Rank 1, 2 or 3) typically due to the presence of freely draining soils and moderate/high livestock intensity, where nitrate losses to water are predicted to be over 35 kg/ha/yr. This is indicated by the dark purple colours on Figure 5.

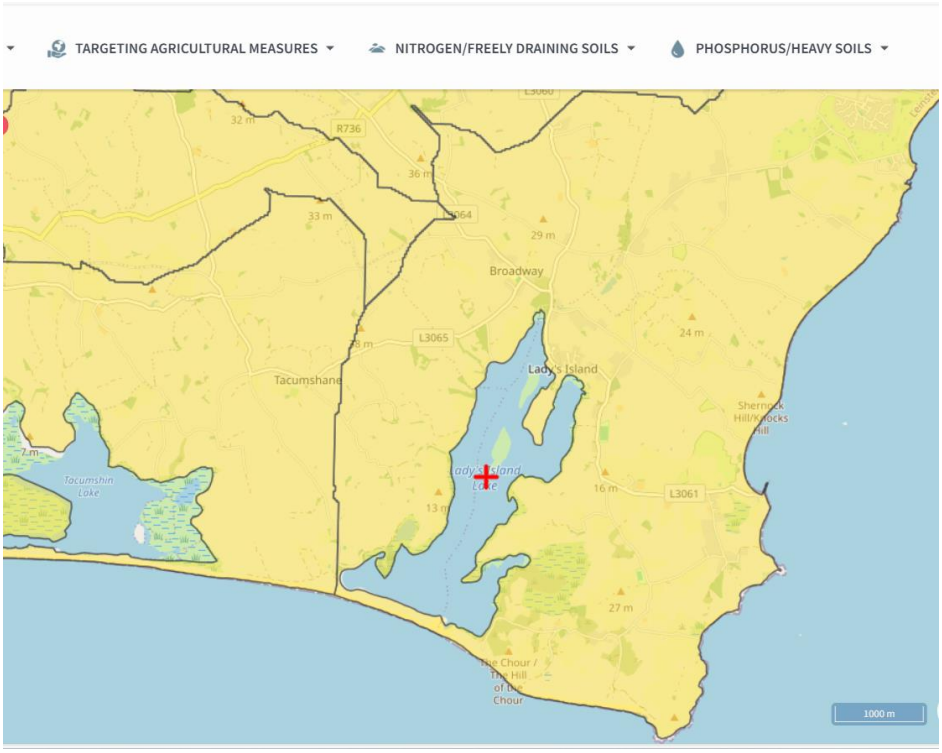


Figure 4: Lady's Island Lake and surrounds on the Targeting Agricultural Measures map from the EPA (yellow = requires nitrates measures)

[11] Updated map published by EPA: Targeting Agricultural Measures - Catchments.ie - Catchments.ie
[12] Next generation Pollution Impact Potential maps launched - Catchments.ie - Catchments.ie

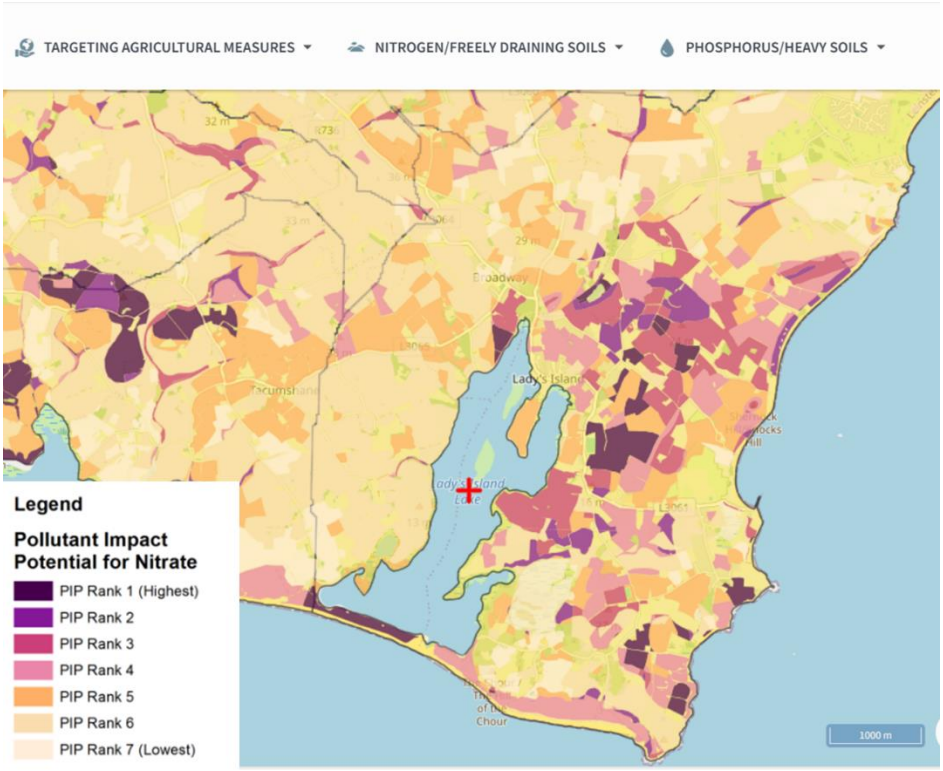


Figure 5: Nitrate Pollution Impact Potential (PIP) map of the area surrounding Lady's Island Lake

On these areas which are at high risk of nitrate loss, the standard measures which are being put in place via the GAP regulations, on foot of the Nitrates Action Programme, will be largely inadequate to address the problem. In order to reduce the nitrate loss, the nitrate load over the entire catchment needs to be reduced, but in particular on the high-risk areas for nitrate loss. Teagasc modelling would indicate that cattle urinating while they are at pasture on free draining soils (or high nitrate Pollution Impact Potential areas) are the greatest driver of this nitrate loss. Essentially stocking density on free draining grazing pastures is the primary driver of nitrate loss. This is combined with the field findings of the CLEAR ecologists who have indicated that slurry entering feeder streams is likely a significant additional driver in this case too.

If the nitrogen load is going to be adequately addressed, a catchment-based approach must be implemented. The catchment of the lagoon is relatively small, at 300 hectares, so a catchment-based approach should be relatively manageable. This approach should model and field test which areas of land are at greatest risk of nitrate loss. These areas should then have reduced stocking density, and limited artificial fertiliser and slurry spreading. The Local Authorities Water Programme have carried out some work on nitrogen modelling at a catchment scale, an approach which could, and should, be applied to this catchment. We would recommend the approach taken in the work of Eoin McAleer of LAWPRO be applied to this catchment.

5. Conclusion

As highlighted earlier, there is a clear load:loss relationship between excess nitrogen on free draining soil, and nitrate leachate to water. The Nitrates Action Programme and GAP regulations do not address this, hence the rapid decline in water quality nationally, particularly

in the south and south-east of Ireland over the last decade. Our nitrogen pollution problem in the south and south-east is a result of ineffective regulation, combined with a notable lack of enforcement of the regulations we do have.

Ladys Island Lake is indicative of a much wider nitrogen pollution problem, and could be a useful case study for the Irish Government to demonstrate the ambition which they claim to have when it comes to addressing agricultural water pollution. However, in order to do that, they will have to look beyond the current ineffective regulations and measures, and implement some far-reaching changes in how the land in the catchment is managed.

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