Best Water Related Presentation at Environ 2025: Robert Hynes (PhD candidate in Bacteriology, Antimicrobial Resistance and Microbial Ecology Group, School of Medicine, University of Galway)

"Spatiotemporal dynamics of *Escherichia coli* in rivers and groundwater wells: comparative insights from two sub-catchments in the midland and western regions of Ireland"

Escherichia coli (*E. coli*), a bacterium commonly present in the intestines of humans and ruminant animals, is widely used as a key indicator of faecal contamination in water quality monitoring. Many strains are harmless to humans, however, some strains such as Shiga toxin-producing *E. coli* (STEC) can cause severe gastrointestinal illness.

According to the Central Statistics Office (CSO), over 720,000 people in Ireland obtain their drinking water from private groundwater sources. This presents a danger of waterborne disease due to the potential for contamination. The lack of water testing requirements and inconsistent well construction (Figure 1) further increases the risk for these users. The aims of this study were to (i) identify key contamination trends and risk factors, (ii) provide insights for improved water resource management and (iii) inform mitigation strategies for protecting private drinking water sources.

This study involved fortnightly sampling over two hydrological years at 33 sites, including rivers and wells across the Black River (Co Galway/Co Mayo) and Little Brosna (Co Tipperary/Co Offaly) sub-catchments. Physicochemical measurements were collected on-site along with hydrogeological, agricultural and climatic data. *E. coli* counts were quantified using a standardized method.

Findings indicated elevated levels of *E. coli* in all river samples from both regions, highlighting widespread surface water contamination. However, groundwater contamination patterns differed significantly. The Black River sub-catchment showed a much higher incidence of *E. coli* in wells (54%) compared to the Little Brosna sub-catchment (8%). Further investigation suggested that subsurface geology, along with the quality of well construction and maintenance, played a significant role in groundwater vulnerability.

Figure 1: poorly (left) and properly (right) constructed well.

Overall, these insights not only inform current policy but also pave the way for more targeted, region-specific interventions to safeguard rural drinking water supplies.